The Ecosystem Approach – guidance for 2020 and beyond

Contents

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Acknowledgements

The Sibthorp Trust was set up as a consequence of a generous bequest in the will of Miss Mary Sibthorp in 1991. It promotes the study and discussion of key environmental issues through the commissioning of workshops, seminars or study groups and publishes the results of such activities as the ‘Sibthorp Papers’. This report was made possible through funding from the UK Government Department of Environment, Food and Rural Affairs (Defra)

Introduction

Nearly two decades ago, the Sibthorp Trust challenged traditional thinking on conservation and was a major driver in the elaboration of the Ecosystem Approach and its underlying principles. The Trust continues to question the conventional ways in which the natural environment is viewed and managed. The adoption of the Ecosystem Approach by the Convention on Biological Diversity and its incorporation into the national policies of many contracting parties has done much to change the attitude of many people, from seeing conservation of nature as an isolated endeavour to one where healthy ecosystems are essential to human well-being.

However, there is much still to be done to overcome the barriers which impede the integration of environmental sustainability, economic prosperity and social well-being. Use of the term "Ecosystem Approach" has often been confused and varied. **There is only one Ecosystem Approach, but there may be many different ways of delivering it.**

The present analysis distils 20 guidelines for more effective implementation and mainstreaming of the Ecosystem Approach. Individually and collectively they advocate more or less significant departures from the "norms" of managing our greatest assets - those of the natural world.

It is hoped that this additional guidance might assist in the formulation of a renewed agenda to build on the Strategic Plan for Biodiversity 2011-2020, stimulate further the achievement of the Aichi Targets and contribute to the United Nations post-2020 agenda.

Preface

"At least half of the world should be made more nature-friendly by 2050 to ensure the wellbeing of humanity," according to Cristiana Pasca Palmer, Executive Secretary of the Convention on Biological Diversity.

The call to strengthen the world's life support system comes ahead of a major conference in Beijing in 2020 that many hope will be the biodiversity equivalent of the Paris climate agreement.

The urgency of the need to alter our attitudes to the natural environment is being increasingly recognised. It is hoped that the new guidance offered here will provide a relevant input to the debate of how we can best achieve the societal changes required to sustain future generations.

Many organizations have dedicated considerable effort to finding solutions to best manage the Earth's natural resources. The Convention on Biological Diversity (CBD - signed by 168 countries worldwide) has adopted the Ecosystem Approach, which is defined as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way". Appendix 1 summarises salient elements of the development of the concept and the particular role of the Sibthorp Trust. The intention is to improve human well-being whilst maintaining biodiversity. Many other complementary approaches have been developed (examined in more detail in Appendix 2) and applied using

terminology specific to particular applications such as in river catchments or coastal zones (e.g. Integrated Water Resources Management (IWRM), Integrated Coastal Zone Management (ICZM), Integrated River Basin Management (IRBM) and the concept of Wise Use in the Ramsar Convention on Wetlands of International Importance). There is often a poor or confused understanding of how these approaches relate to each other and a missed opportunity to share important lessons. We offer further thinking on the Ecosystem Approach through enhanced guidelines to include issues that were not previously covered, such as better communication of the ideas between these approaches and shared experience from practical application. We accept that the Ecosystem Approach, whilst pioneering, does not have exclusive rights in furthering the improved management of natural resources. Nevertheless, we hope that further understanding of the Ecosystem Approach will provide generic enrichment that can be adapted and more widely applied. This further guidance is based on practical experience of how to embed the Ecosystem Approach more effectively whilst conserving existing under-lying principles.

This offering from widely and variously experienced multidisciplinary, professionals and practitioners recognises that the term Ecosystem Approach is now in common usage (usually without qualification) but it is in danger of being misunderstood and hence devalued. It is set also in the context of increasing recognition of the real value of the natural environment in support of human economies and well-being. Human activities have been very significant drivers of change in our natural environment and continue to determine its character. Resulting modifications are superimposed on natural variation and changes that are a normal part of evolution and ecosystem dynamics. Different ecosystems that exist in locations with the same environmental conditions (e.g. soil, water, temperature) and change from one ecosystem to another could be viewed as alternative states rather than degradation or loss. Variation between these states may occur naturally; for instance, a flood event can radically alter river topography, so what was a shingle bank habitat may become a submerged river bed habitat, supporting a different community of organisms. Such changes can result in the loss of benefits to humans, for example, loss of topsoil and desertification creates changes in agricultural productivity. The fundamental challenge is to manage human pressures on ecosystems, to maintain the state that provides the desired flow of benefits for human wellbeing for, both practical and ethical reasons.

The idea that the natural environment represents ‘natural capital’ which may exceed that produced by human economies is gaining considerable traction in new policies. This is notwithstanding the fact that the exact character of natural capital often owes much to human modifications of the environment (such as farmland, moorland and public parks). It recognises that ecosystem functioning results in a wide range of ‘ecosystem services’ on which such economies ultimately depend.

This document provides new guidance to practitioners on the implementation of the Ecosystem Approach, based largely on UK experience, but the original principles and concepts of the Ecosystem Approach together with this additional guidance are widely applicable.

1. Current understanding of the Ecosystem Approach

The Ecosystem Approach comprises principles for the integrated management of land, water and living resources that promote conservation and sustainable use in an equitable way (Box 1). It is based on the application of appropriate scientific methodologies focused on levels of biological organization that encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems.

The Sibthorp Trust has now revisited the process that it had originally initiated in the mid-1990s, when it provided guidelines for ecosystem management that questioned the historic and accepted norms of conservation (Sibthorp 1, Maltby et al 1999). The outcome then provided a key input to the "Malawi Principles" and the principles adopted by the CBD for implementation of the Ecosystem Approach under the Convention. The subsequent challenge was to assess progress and attempt to provide further guidance on the practical implementation of the Ecosystem Approach. This process was started with an interdisciplinary international workshop held at the Royal Agricultural College (now a University) at Cirencester on 14-15 April 2011, jointly funded by the Sibthorp Trust and Defra (Sibthorp 2). Appendix 4 sets out the detailed objectives of the workshop and Appendix 5 summarises the analysis of questions put to the participants regarding the challenges in delivering the Ecosystem Approach. The ideas proposed at this workshop evolved during a decade of major changes and important events and publications throughout the UK and the world including the UK National Ecosystem Assessment and follow-on 2009-2014, workshops on ecosystem services and the Ecosystem Approach (BES/BRAG, 2008; RGS, 2013), IUCN World Conservation Congress (2016) and the Defra 25 year plan (HM Government, 2018).The guidance which follows reflects in part this wider debate on the place of the natural environment in society.

Box 1. 30-second message about the Ecosystem Approach

The Ecosystem Approach provides a flexible framework for environmental management that is widely inclusive and connects all considerations of societal concern with the best available science and other knowledge, to help to achieve practical sustainable development. It can be implemented in diverse ways and at different scales by different organisations according to the problem addressed and its geographical and/or cultural context. An example of a government perspective is given in Box 3.

The twelve underlying principles agreed at the CBD COP5 (decision V/6) provide the backbone of the Ecosystem Approach (Box 2 and Appendix 3).

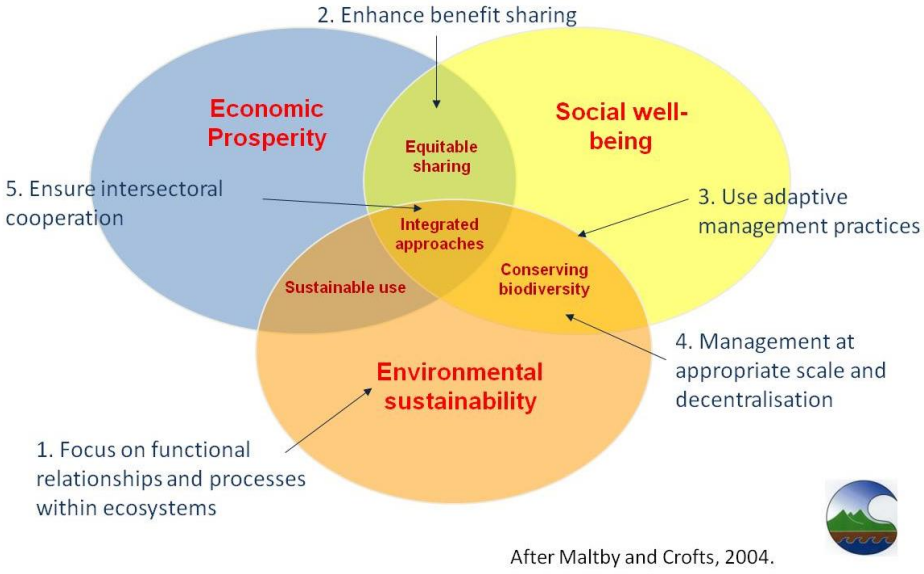
Box 2. Principles of the Ecosystem Approach

1: The objectives of management of land, water and living resources are a matter of societal choices.

2: Management should be decentralized to the lowest appropriate level.

3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.
5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the Ecosystem Approach.
6: Ecosystems must be managed within the limits of their functioning.
7: The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales.
8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, and objectives for ecosystem management should be set for the long term.
9: Management must recognize that change is inevitable.
10: The Ecosystem Approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11: The Ecosystem Approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12: The Ecosystem Approach should involve all relevant sectors of society and scientific disciplines.

Figure 1. Structure, outcomes and guidance for the Ecosystem Approach



Summarised in Figure 1 are the overall structure, outcomes and general guidance in the application of the Ecosystem Approach in the context of the Convention on Biological Diversity. In Table 1 (from Maltby, 2013) examples are provided of what may be required for the implementation of the underlying 12 principles. The requirements will vary according to the context and purpose of the application of the Ecosystem Approach but may assist in providing practical actions.

Table 1. Ecosystem Approach principles and considerations for their implementation

Ecosystem Approach principle	Some considerations for implementation
Societal choice	Societal choice requires engagement throughout the process from initial discussions to full implementation by all communities of interest locally, nationally and internationally, that have legitimacy through long standing rights, traditional practice, legal measures, etc. and are relevant to the issue in question. Societal choice can, for example, set objectives to enhance ecosystem services rather than restore or conserve a natural state.
Management decentralised to lowest appropriate level	Balance local interest with wider public interest. Responsibility, ownership, accountability, participation, use of local knowledge. Key role of the third sector (eg. Rivers Trusts, Coastal Partnerships) alongside the Environment Agency and Marine Management Organisation as well as the business sector.
Consider effects of activities on adjacent and other ecosystems	May require new organisational arrangements for decision-making. Need comprehensive understanding of linkages and impacts from uplands to the sea.
Need to understand and manage the ecosystem in an economic context	Rectify the cost-benefit disconnect. Include externalities. Realign incentives in the light of changes in geopolitical relationships, markets, trade and innovations eg. in agriculture.
Conservation of ecosystem structure and function to deliver ecosystem services is a high priority target	Maintain/enhance resilience especially in the context of climate and related environmental change (Acreman et al., 2014). Enhance natural water retention measures. Identify the wider benefits to society of the natural capital that has previously been taken for granted.
Ecosystems must be managed with the limits of their functioning.	Apply appropriate methods of functional assessment to assess potential management impacts under different (and changing) environmental conditions. Identify the levels and balance of functions required to maintain a desired condition of ecosystems.
Ecosystem Approach should be undertaken at the appropriate spatial scale	Catchment and even larger scales may be required recognising the importance of interconnectivity. Traditional management boundaries may impede the realization of sustainable development and new organizational arrangements may become essential. The Natural Capital Initiative has introduced the concept of “Wholescapes” to advance this thinking (Acreman et al., 2018).
Objectives should be set for the long-term	Early identification and agreement on such

	objectives is essential to avoid conflicts with short-term gains/immediate but often unsustainable benefits. Overcoming conflicts will be the most crucial and most difficult issue given the range of stakeholders and other interests involved.
Recognise that change is inevitable.	Apply adaptive management, avoid foreclosure of options and consider mitigating actions to deal especially with climate change.
Appropriate balance between and integration of conservation and use of biological diversity	Seek a “Productive" vs "Protected" balance and more flexible integration of habitats and their management to optimise ecosystem services as well as securing their integrity.
Consider all forms of relevant information	Promote the widest consultation and use of knowledge networks.
Involve all relevant sectors of society and scientific disciplines.	Improve communication and knowledge exchange as an essential ingredient to deal with complex systems and multiple interactions.

Box 3. An example of a government perspective

The Ecosystem Approach is an integrated method for implementing environmental and related policy (P. Costigan, pers. comm.). Key features of the Defra view expressed at the seminar of the Ecosystem(s) Approach were:

- whole systems, not single outcomes
- the importance of joined-up working
- a greater focus on people: the core of the Ecosystem Approach is how ecological processes contribute to human well-being
- linking environmental, economic and social benefits

Although slow, there has been progress in implementing the Ecosystem Approach over the past decade and the benefits to environmental decision-making include:

- recognition that people and the environment are fundamentally inter-linked i.e. they are one socio-ecological system
- highlighting the relationships between environment and human wellbeing that are not simply utilitarian
- provision of the impetus for making decision-making processes relating to land and nature being more inclusive, equitable and transparent.

A workshop on ecosystem services and the ecosystem approach (BES/BRAG, 2008) distilled some of the current thinking from both government and the scientific community. It identified four priority topics for further scrutiny and development:

1. Valuation and Application - economic valuation is not the only basis on which to make choices or trade-offs

*2. Working Together - th*e need to bring together groups other than ecologists and economists

*3. State of the Science - e*cologists are concerned by the mismatch between the *rate* at which the science is developing with respect to ecosystem services and the *need* they perceive amongst policy-makers to implement an ecosystem approach

4. Public Engagement - There needs to be raised awareness amongst the public about ecosystem services/valuation.

A further workshop (RGS, 2013) debated whether the Ecosystem Approach offers anything new for environmental decision-making, focusing on three topics:

1. The extent to which an ecosystems approach is learning from existing lessons on participatory decision making
2. Whether an ecosystems approach can deliver something different to existing approaches in the future
3. The geographical and social distribution of who might 'win' or 'lose' from decisions using an ecosystem approach

Continuing challenges include:

- confusion about what constitutes the Ecosystem Approach, including conflation of this term with ecosystem service assessment, such as mapping ecosystem services at regional and national scales from available datasets (Henrys et al., 2014)
- the compartmentalised nature of government
- constraints due to property rights e.g. where people can own riparian land and make reasonable use of the water in a river, but do not own the water
- making better use of existing case studies and tools, such as provided in the UK National Ecosystem Assessment follow-on (NEA, 2014)

Opportunities offered include:

- improving the way the natural environment forms part of decision-making
- improving environmental impact assessment processes
- better targeting of funding for inter-disciplinary research

Options for addressing challenges and opportunities include:

- application and review of tools and guidance to case studies at multiple levels including a major national infrastructure project
- more guidance on implementation and a checklist for planning projects
- ensuring the label ‘the Ecosystem Approach’ is only used when all twelve principles are considered

Despite the significant evolution of thinking around the Ecosystem Approach over 20 years, considerable debate has perpetuated over the exact meaning and implications of its application. There remains, therefore, a need for further clarification and guidance to realise its full potential in a changing world.

2. Our ever-changing environment: adapting to change - the ultimate challenge

Five key observations emerged from Sibthorp 1 (Maltby et al, 1999) which provide further background for the present re-evaluation:

1. It is possible for different ecosystems with different functional and biodiversity characteristics to occupy the same global space. This may be expressed at different scales as communities, habitats or land and seascapes. There may be many possible 'stable' states or habitat-species combinations for any single space.

2. Ecosystems are dynamic and respond to environmental as well as human-induced changes. All 'natural' systems are subject to dynamic changes over different scales and time periods. Changes may be accelerated by environmental impacts, which may be catastrophic (e.g. meteor strikes, earthquakes, tsunamis) or progressive and long term (e.g climate warming or cooling). Human societies have been key determinants of ecosystem change since prehistoric times. Human actions are currently the most influential overall drivers of change either directly or indirectly (such as through modification of climate). While some human influence, aiming to provide the maximum flow of resources for human development, may improve the planet, other effects are counter-productive in the longer term and may make the planet less suitable for future generations of humans. Rather than humans being a small population in a big planet we are now a large population on a small planet in terms of our resource use and its impacts. Policy frameworks for transformational change are required if we are to avoid major environmental challenges for future generations (Nakicenovic et al., 2016).

3. "Recombinant biology" is likely to become increasingly important. Climate change, habitat alteration and human mobility are all factors likely to lead to the increased dispersal and mixing of species resulting, for example, in invasions of non-native plants, animals and microorganisms with adverse ecosystem and socio-economic impacts. Although novel communities/ecosystems may have a negative impact, this is now inevitable (because of climate change) and deliberate translocations may be necessary for species survival (Thomas et al, 2004; Acreman et al., 2014).

4. Increasing recognition of links between ecosystem functioning, economic and human well-being (the notion of ecosystem services) is needed. People (in the forms of government and wider civil society) are increasingly aware of environmental dynamics and in particular of threats from 'natural' hazards (floods, droughts, tsunamis etc.). There is still some way to go in improving awareness of the benefits stream derived from healthy ecosystems and the dis-benefits resulting from inappropriate human impacts. It is now more important than ever to ensure communication and understanding of improved solutions to natural resource management which is not just top-down but reveals demonstrable benefits at the local community level. The paradigm has moved perceptibly in recent years from an emphasis on ecosystem services *per se* to their importance in underpinning 'resilience' especially in the context of inevitable environmental change.

5. A contrary view has also been expressed, indicating concern that the preoccupation with the anthropocentric value of nature detracts from the moral and ethical obligations to other species (Tilman, 2000). Notwithstanding the current trend in emphasis from the ethics of conservation to the utilitarian benefits of ecosystems to humans it is important not to ignore the ethical commitment to the rights that people confer on other species (Mace, 2014). Indeed there is now a significant environmental movement campaigning against the economic valuation of ecosystem services. The flexibility of the Ecosystem Approach accommodates this entire range of perspective.

Pre-human ecosystems functioned without people. With “trade-offs” of services an irrelevant concept, there would, however, have been constant change with creation and loss of species, communities, processes and functions. The historic abundance of natural populations of fish and wild herbivores bear testimony to their success without human intervention. Our challenge today is to manage people’s actions by changing behaviours and mindsets that fail to recognise nature and natural systems. Whilst we need to manage these actions rather than managing the environment we still need to know:

1. What are the biodiversity components and landscape/seascape) configurations that will support (all) the benefits that people need from nature? (Lawton, 2010)
2. What spatial scales are needed for governance of both ecosystems and the benefits to people?

There is a need to know where to manage people’s actions and at what scale. Some fundamental tenets of societal organization should be questioned towards endorsing a new approach to the governance of our natural assets and their management. Yet the need for learning outcomes has never been more important in order to achieve the greater coherency necessary across the policy and sectoral spectrum. Over the past decades there has been a dramatic change in understanding about how governance of protected areas impacts on the achievement of their conservation goals. IUCN has issued a typology of four different forms of governance of protected areas. Along with the familiar state-run protected areas, there are those established and managed by indigenous peoples or local communities, privately managed protected areas and a wealth of shared-governance arrangements (Borrini et al., 2013)

There is a plethora of significant initiatives that have underpinned and further advocated a new approach to natural resource management from which we can learn. Arguably there are so many such initiatives that it is difficult to distil easily all those lessons that can assist in better decision-making.

However, there are some fundamental truths. The importance of the scientific evidence base to support new integrated and holistic management approaches can be reconfirmed but this alone is quite insufficient to ensure implementation. The desire to implement and the success of implementation depends on buy-in and ownership of process and outcomes, including the widespread acceptance of scientific evidence and tools developed by academics, together with traditional knowledge and experience, to support decision-making. There will always be

uncertainties and limits to knowledge – all that can be done is to describe the options and their attached risks and in the case of ecosystem services there will always be the issue of trade-offs - who loses will, to some extent, be reliant on power relationships. In this regard traditional and local knowledge has often been ignored. It is essential that such potential input is fully evaluated.

The present analysis attempts to provide some consistency in how the term 'Ecosystem Approach' is used and provide guidance on how it might be implemented. Questions frequently being asked include:

1. How does the concept relate to others that appear to have the same overarching aims or principles such as Integrated Coastal Zone Management, Catchment Management, Integrated Water Resources Management, wetland 'Wise Use' under the Ramsar Convention, and the UNESCO Biosphere Reserves model?

2. Is it feasible or even desirable to replace existing approaches (especially where they already advocate a strongly integrated framework) with the Ecosystem Approach?

3. Is partial delivery of the Ecosystem Approach (as defined by the CBD) through the strengthening and reinforcement of other approaches (by the more formalised application of at least some of the Ecosystem Approach principles) sufficient to qualify as its application?

4. Does it matter whether we refer to 'the" or 'an" ecosystem approach or as singular or plural (approaches)?

This confusion has arisen at least in part because there has been no consistent position on these and other questions. Proponents of other named concepts are naturally reluctant to abandon what they have believed to be good innovative practice, often hard won after years of endeavour, emanating from different disciplines and backgrounds. Competition over terminology is not helpful in this case. It can be avoided if ***the*** Ecosystem Approach is seen as an over-arching conceptual framework informed by a set of principles **all** of which should at least be considered in its application. **There is only one Ecosystem Approach, but there may be many different ways of delivering it** (emphasizing the flexibility of the methodological framework). The ultimate test of success is the outcome of application not the terminology, but qualified by the experiences of implementation, which adds real value to this perspective to ecosystems and environmental management.

It is hoped that the uncertainty raised by questions such as those above may be resolved through the guidance offered here.

3. Why is even more guidance needed?

The Ecosystem Approach may appear to many as common sense, but it needs to be more explicit. Even if common sense, it is easy to miss vital steps in any method that could render

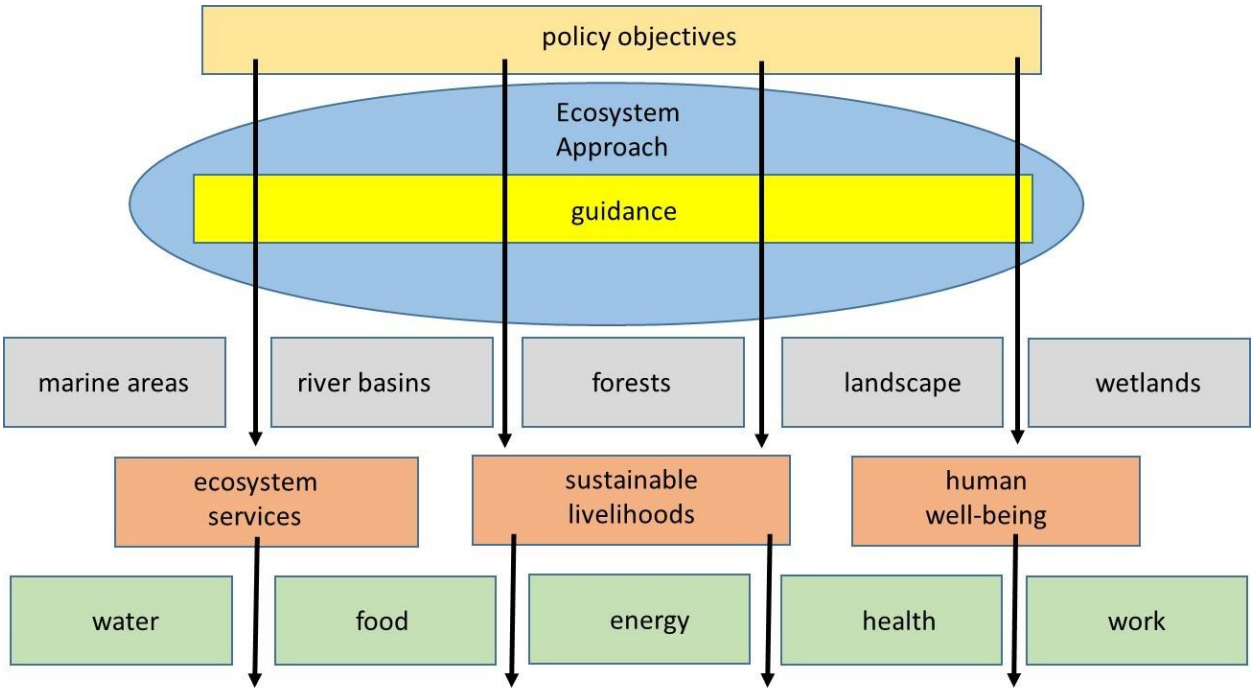
results invalid or, at worse, counter-productive.

Different people and societal groups have often fundamentally divergent views of the same environmental resources e.g. pioneers and scientists in the Murray-Darling Basin (Stewardson & Maltby), so an agreed common approach can help identify and potentially resolve differences.

Government is organised by sector, but the natural environment does not work by the same rules of organisation. By tracing the origins and purpose of the Ecosystem Approach and identifying more clearly the audience (depending on the scale), needs, constraints and opportunities, it is hoped to assist in the more effective delivery of the concept and its framework. As far as possible this is based on the state of understanding of examples which demonstrate what has not worked.

Further guidance is required to achieve a more coherent approach to diverse policy objectives (Figure 2).

Figure 2. A possible model of how the Ecosystem Approach could implement government policy objectives (practitioners may view the diagram in reverse order)



4. Who is the additional guidance for?

While this document is highly relevant to those charged with the formulation or interpretation of environmental policy, it is arguably even more important that many others outside that remit should appreciate the relevance of the guidance offered. One of the overriding constraints in the

successful delivery of the Ecosystem Approach identified during Sibthorp 2 was the conventional sectoral organisation of governments (although some governments may have good cross-sectoral coordination). “The environment does not work that way” (see Maltby 2013; RGS, 2013). Hence, this is a guide to guiding others in a wide range of policy areas, not just those with immediate or direct links to nature and the environment. The application of the Ecosystem Approach requires the awareness of policy-makers across *all* sectors of government and those agencies charged with interpretation and delivery together with the increasingly important third stream organisations with opportunities for implementing innovative delivery mechanisms. It is intended also for academics, scientific and other technical specialists in institutions and commercial consultancies as well as educators (both universities and schools). Above all it provides information and guidance to the wider cohort of groups and individuals, including the business sectors who knowingly or unknowingly have a vested interest in how the natural environment is or should be managed. The full range of so called stakeholders are often marginalised or incorporated only by lip-service in policy delivery. It is hoped that by better communication and understanding of the Ecosystem Approach a greater inclusiveness among civil society can be achieved.

5. What is currently wrong?

Despite considerable commitment and activity to address natural resource management issues, many remain unsolved, get worse or generate additional problems. Notwithstanding the most compelling observational and scientific evidence there is still a failure to universally recognise the reality and far-reaching consequences of human-induced climate change. The bleaching of coral at the Great Barrier Reef provides a key example of how the ‘big’ impact humans are having on their environment has passed a tipping point and is now doomed in terms of a major impact humans are having on their environment (Ainsworth et al., 2016). Barriers to delivering an approach that effectively and coherently integrates the natural environment, the economy and human well-being are:

- Institutional rigidity and inherent difficulties in working across sectoral interests. Institutional structures need to match ecological, social and economic processes operating at different spatial and temporal scales and to address the linkages between those scales. This polycentric approach to governance provides for greater experimentation, learning, and cross-influence among different levels and units of government, which are both independent and interdependent, to develop flexible institutional arrangements (Ostrom, 2010). Such arrangements are difficult to implement, as they require ways of ensuring local organisations interact with each other and with organisations at different levels. It requires public participation across a diverse set of interest groups operating at different scales, from local beneficiaries, to local government, to regional and national organisations and to the international level. The ‘catchment-based approach’ has gone some way towards working with this concept, but needs to be more fully tested.

- Fundamentally divergent views of the same environmental resources are sometimes formed by different stakeholders. Not least that renewable resources are infinite and the

phenomenon of shifting baselines whereby stakeholders accept a degraded state and a lower flow of benefits as normal. As fishermen and farmers amply demonstrate, these apparent 'turkeys voting for Christmas attitudes' are very hard to shift. A good example in the UK is the attitude of farming dominated communities to coastal retreat, which is invariably characterized as providing benefits for wildlife even when the flood protection and alternative food production benefits can be clearly demonstrated e.g. Steart Marshes

- Lack of understanding and knowledge amongst many stakeholders. The key impediment to balancing this perspective is the lack of both public and government understanding of the often hidden and delayed costs in terms of environmental damage that sooner or later need to be paid. Notwithstanding the role of the NEA and specific initiatives in the UK, such as the Nature Improvement Areas and Upstream Thinking projects, there is still a dearth of data to accurately and convincingly value ecosystem services. The Westcountry Rivers Trust remains a beacon of how this might be done, but it remains stubbornly difficult to locate the money to implement more generally.

- Lack of consistent measures of progress. Measures of progress and well-being must be measures of the degree to which society's goals, such as those embodied within the global Sustainable Development Goals (i.e., to sustainably provide basic human needs for food, shelter, freedom, participation, etc.) are met, rather than measures of the mere volume of marketed economic activity, which is only one means to that end. Indicators are needed that promote truly sustainable development i.e. development that improves the quality of human life while living within the carrying capacity of the supporting ecosystems (Costanza et al., 2014).

- Short-term thinking. Adoption of strategies that produce more or less immediate realisable gains and demand-driven economics may yield only short-term solutions while resulting in irreplaceable environmental losses. Benefits are usually analysed on a sector basis and without full assessment of the long term environmental dis-benefits. "Overriding economic need" or "considerations of national interests" are phrases often used to excuse the lack of integrated thinking.

- Lack of data to enable consideration of the 'full' valuation (including but not limited to economic valuation) of ecosystem services and absence of proven innovative mechanisms to rectify imbalances in responsibility for their maintenance and/or enhancement such as through Payments for Ecosystem Services (PES).

- Land ownership that is focused on limited/single outcomes (perhaps resulting from unintended consequences of incentives and restrictions).

- Lack of non-monetary evaluation methods and insufficient knowledge about some processes underpinning ecosystem services.

- Cross-sectoral thinking limited by insufficient decision-maker training/experience (linked to all the above). Government domestic policy is generally focused on priorities such as the economy, employment, health, education, poverty and welfare, terrorism and conflict, taxation and trade, which tend to be seen (erroneously) as completely unconnected with issues concerning the natural environment and specific questions of ecosystem management (Linstead *et al.* 2009).

- Linking government and the private sector. Engagement between government and the private sector is still limited with the possible exception of the water industry and this limits the depth of appreciation by the general public of the reality of the ecological-economic-social linkages. This failure to connect underpins global scale priorities such as poverty alleviation and improvements in water quality and human health. The political timescale is generally short-term measured by popular voter reaction to the perception of immediate benefits but environmental management must be for the long-term if we are to achieve the sustained benefits of natural resources.

The Cirencester workshop distilled a checklist of evidence and policy needs still required to achieve enhanced human well-being from improved management of the natural environment. The list in Box 4 is classified according to needs for changes in behaviour, or better communications, information or tools.

Box 4. What are the outstanding evidence and policy needs to achieve enhanced human well-being from better management of the natural environment?

B=behaviour, C=communications, I= information, T=tools

- (B) long term/non-sectoral thinking
- (B) how government departments achieve a balance between conflicting objectives
- (B) how to change attitudes from material wealth to wider well-being
- (B) willingness for sectors to work together
- (B) better integration of levels of certainty and risks, no regrets decisions
- (B) inter-sectoral cooperation
- (C) targeted support for different audiences
- (C) large scale projects better communicated
- (I) evidence on processes how ecosystems influence human well-being/health
- (I) better knowledge of the drivers of human behaviour
- (I) fear of uncertainty
- (I) lack of recognition of traditional knowledge systems
- (I) risks/costs of inaction in increasingly over-exploited environments
- (I) data on impacts of individual activities on ecosystem services
- (I) horizon scanning for emerging issues
- (I) implementation of sustainable fisheries
- (I) determination of value of many small scale projects providing cumulative

contribution to ecosystem services
- (T) valuation beyond traditional economics
- (T) business case for new approaches to land/water management
- (T/I) better mapping of the sea floor and understanding of marine ecosystems
- (T) improved integration of the Ecosystem Approach and land use planning
- (T) development of tools for Payments for Ecosystem Services

We are reminded almost daily by periodic shortages or unprecedented rates of price increase (notwithstanding the current downturn in world oil prices) and/or transfer of costs to environmental quality that the nexus of water, energy and food will present, as far-reaching challenges to society in coming years. Such challenges are already manifest in terms of food riots, disease, poor sanitation, malnutrition and poverty throughout the developing world. They are likely to be exacerbated by climate change, population growth and socio-economic responses to unparalleled levels of national and international debt. Overexploitation of natural resources such as water, soil, forests, wetlands (Box 5) and fisheries can be seen worldwide for example in rapidly falling groundwater levels in India and China caused by excessive abstraction to increase irrigated food production and excessive conversion of natural ecosystems to intensive agriculture, such as oil palm - yet there is a universal goal to achieve their sustainable use. Whilst some may argue that sustainable development is a contradiction in terms, there has in recent years been a dramatic increase in realisation of the fundamental importance of the "natural environment" in underpinning human welfare. Such thinking underpinned the MEA, TEEB and the UK NEA and is carried forward through the IPBES.

Over the last two decades overwhelming evidence of the intrinsic links between and among the natural environment, economics, human, health, culture and our social organisation and stability has been generated (TEEB, NEA 2009).

Despite growing awareness of the significance of the planet's biodiversity and the natural environment in supporting human well-being, there is continued unsustainable depletion of the Earth's natural assets.

Box 5. Wetland loss – a prime example of loss of natural environmental assets.

Many European countries have lost between 50% and 70% of their wetlands in the last century (McCartney *et al.*, 2000). In Asia, about 85% of the 947 sites listed in the Directory of Asian Wetlands were under threat with 50% of the threatened sites being under serious threat (Scott and Poole, 1989). By the modern era, the United States had lost some 54% of their original 87 million hectares of wetlands (Tiner, 1984), primarily to drainage for agricultural production. In Asia some 67% and in Latin America and the Caribbean 50% of the major threats to wetlands were from hydrological change related to drainage for agriculture, pollution, catchment degradation or diversion of water (WCMC, 1992)) The UK NEA confirmed that 30% of all ecosystem services have been degraded in the last 60 years. It

should be questioned why different approaches to natural resource management have failed (or where in some cases they may have perceived potential advantages over the holistic and integrated framework of the Ecosystem Approach). The reasons for failure (measured by reference to indicators such as species loss, decline in productivity, loss of resilience etc.) are numerous, complex and seemingly so self-evident that questions the rationality of political and human behaviour.

6. Sectoral silos

Single, or at best restricted, cross-sector thinking is embedded in most government and institutional structures. It is linked to approved portfolios, Ministerial briefs and associated budgets or in the case of institutions and business it is governance arrangements, perceived shareholder interests, short-term profit motives, short-term political motives and the client base that may restrict innovative cross-sectoral thinking. A relatively narrow focus may well make for efficient government and commercial enterprise but it is essentially incompatible with the natural environment which works in an entirely holistic way and not according to linear rules. The result is that there is frequently disconnected regulation e.g. between land-based activities, freshwaters and the marine environment. Responsible agencies are sometimes torn between the interests of local communities and nationally, supra-nationally or internationally based regulations or requirements. Institutions as well as ecosystems may be inherently complex and sometimes unwittingly interconnected with those involved often completely unaware.

Even where there may be pressing evidence for and acknowledgement of connections –such as the benefits of access to the natural environment to both physical and mental health (Natural England, 2009; Hartig et al., 2014; Wolch et al. 2014; Church et al. 2014 , Blue Health), we are far from any redistribution of investment from clinical health budgets to nature. How to deal with such strongly embedded and traditional sectoral thinking and organisational arrangements is arguably one of the greatest challenges to sustainable environmental management. On the other hand some local authorities are trying to do this, such as Birmingham and London

7. Lack of direct ownership

Our dominant global resources of the atmosphere and the oceans lack specific conventional ownership. At smaller scales large tracts of undeveloped tropical forests or taiga, although under sovereign control, are often regarded as ripe for exploitation. At even smaller scales there is a general reluctance to recognise the potential significance of human activities for ecosystems, places and people far distant from the location of the activities. There is limited general public awareness, for example, of the effects downstream: from land to freshwater and then the marine environment; of gas emissions to atmosphere and temperature changes altering ice cover and sea levels. The relationships may be accepted but they still may not be sufficiently direct or close enough to influence behavioural response.

8. Failure of Science

Notwithstanding the powerful messages from the UK NEA and the most recent report of the Intergovernmental Panel on Climate Change (IPCC -2014) there is still insufficient translation of the fundamental evidence base into language and explanation that can be readily understood by, and is appealing to, civil society as well as decision-makers at all levels. There is frequently an attempt to discredit evidence rather than accept the need to change behaviour. This has been particularly the case with climate science.

A reluctance to address directly the appropriateness and adequacy of policy is a general characteristic of the academic science community. Any shift in emphasis has been hindered by lack of funding and/or timing in cross-disciplinary areas of applied natural and socio-economic sciences in deference to more fundamental and focused topics deemed by peer-review as more worthy and 'cutting-edge'. Inadequate recognition of the challenges of crossing disciplinary boundaries and in particular those between the natural and social sciences have impeded the research community in moving policy to meet the needs of integration.

Despite global consensus on the problem of climate change, practical and political obstacles to delivering necessary measures remain, e.g. the Paris Climate Change Agreement pledged to keep a global temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels, but with limited binding commitments.

Encouraging scientists to become advocates is somewhat controversial. This is a complex area that encompasses the deficiencies of policy making, human psychology/sociology as well as turning research into evidence and it is very tricky to derive any general prognoses. However, in the case of climate science it clearly cuts across value arguments, individual agency vs collective regulatory action, and it really isn't surprising evidence has no traction (see UCL and Wiley) as science cannot resolve political disagreements. To have policy traction, timing and persistence is important as is how messages are framed and their co-production. However, there is an argument for improving awareness of the need for evidence in conservation practice and to improve knowledge of synthesis methods among the academic science community.

9. Mainstreaming the concept - the devil is in the detail

The Ecosystem Approach has been placed at the centre of government policy in England and Wales for nature and environment (Defra (2007), Defra (2008), Defra (2009), HM Government (2011), Scottish Government (2011), Sustaining a Living Wales (2012) consultation), Biodiversity Strategy for Northern Ireland (2015), Environment Act (Wales) 2016, but other departments as well as local government have not paid much attention to its implications for working practices.

There has been a remarkable level of association with the conceptual framework among various UK government agency-led, academic and NGO initiatives. Mainstreaming has yet to extend

beyond the environment sector and this represents the most challenging aspect of delivery. The Environmental Audit Committee Scorecard report gives an indication of progress. It 'assessed biodiversity, air pollution and flooding as 'red' risks, and thus areas of particular concern. In none of the 10 environmental areas examined is satisfactory progress being made, so the remainder are assessed as 'amber''.

Words and policy documents are easy: doing things on the ground is more difficult and expensive.

The language used is not familiar to non-specialists and especially the general public. Implementation requires appropriate mechanisms and incentives to provide alternative solutions to the familiar and traditional approaches. This is starting to change with funds being generated in a number of initiatives for PES, representing just one important aspect of delivery of the Ecosystem Approach. At the European scale, reform of the Common Agricultural Policy (CAP) reveals an increased awareness of integrated land management influencing farm payments but there is much still to be done in this area.

10. What needs to be done?

Key questions remain - how universally applicable is the integrated approach and how to define under what circumstances a different approach to environmental management may be more effective? Whilst generally, an integrated approach is preferable in most circumstances, the number and character of different elements may vary. Very local issues may still be served better by specific sector solutions.

Integrated approaches may still comprise highly sectoral elements such as sites for strict nature conservation or urban development but these should be seen in the context of the whole landscape and achieving a balance between protection and production/development appropriate to location and well-informed societal priorities. Nevertheless, there remain some dominating issues, e.g. prime agricultural land, critical flooding situations or lack of knowledge/evidence, where a singular approach may be necessary. Whilst the issue may be tightly defined, the solutions inevitably require a systems approach.

Table 2. Areas of outstanding evidence and policy needs

1. Behaviour	2. Think globally act locally
An **integrated approach** is essential, with **multiple linkages.** Cross-department **collaboration** is required **Balance** full integration with sector-dominance. **Caution** and **adaptability** - highly managed systems depend on controlling mechanisms that are vulnerable to management change.	Focus on solutions to **specific issues** eg. flooding. **Spatial planning** should be linked to **land-use planning** and include agri-environment payments. Remember land owners and managers are key to **land stewardship.** The Localism Bill and gardens are examples

There is a need for **cultural change**, overcoming vested (and often very long-standing) interests.	of a **community** bottom-up approach. Connecting people through **communications** at all appropriate levels.
3. Influencing new sectors & policy areas	**4. Linking investment to benefits**
Use existing **networks**. Respect **stakeholders** priorities and time-lines. Incorporate **community needs**. Build local **engagement.** Support **co-management** & **powersharing**. **Incentives** - sticks and carrots needed. Good mechanisms are required to **minimise unintended consequences.**	Stakeholder participation important but needs strong and enlightened **governance** structures. Macro v Micro **economic analysis** for economic gains/losses in national accounts. Build capacity in **regional/local govt.** using targeted, digestible information e.g. tourism. New **tools and skills** are needed to achieve multiple objectives including trade-offs.

A further demand is to identify the outstanding evidence and policy needs required to achieve enhanced human well-being from better management of the natural environment. This requirement should focus on the key areas in Table 2.

11. The guidance 20

The guidance offered is based on the documented discussions and individual presentations at the Sibthorp2 seminar and breakout workshops at the Royal Agricultural University, Cirencester, as well as relevant, prior as well as subsequent, debates and evidence.

The guidance is presented as a new set (G1 - G20) with elements organized into 5 groups. In each case reference is made to the most relevant of the original 12 Ecosystem Approach principles (P1-P12). Links are made to presentations at the Cirencester workshop (housed on the Sibthorp website) by reference to the name of the author raising the issue. The link to the original principles is given by number reference in parentheses.

Group 1 Framing objectives

G1 The Ecosystem Approach will be most effective when it is focused on actual and clearly defined issues (P1, P7, P11, P12).

There is no lack of major issues facing society that will benefit from the new thinking encapsulated in the Ecosystem Approach. Flooding (Couldrick), drought, biodiversity loss (Miere), pollution, food production and safety, human health and poverty are just a few headline issues which have gained strong publicity in recent years both in the UK and internationally. This does not necessarily mean that such issues are not addressed and resourced in the traditional sectoral way but that there are potentially considerable benefits, including efficiency and effectiveness gains, from a more innovative approach based around the scale and inter-connectedness of the problems which need to be tackled. The Ecosystem Approach can provide direct advice to decision-makers involved in specific issues (Hamerlynck).

Application in fragmented landscapes especially urban areas (Miere) may help reconcile major priority conflicts.

The identification of multiple benefits such as in ecosystem service "bundles" is an important advantage together with the recognition and acceptance of trade-offs, whilst relating this to wider landscapes (Clarke) may help reconcile major priority conflicts.

G2 A major aim should be closer collaboration across government departments, agencies, business, academics and other knowledge-holders and all elements of civil society (P1, P2, P4, P5, P11, P12).

Closer collaboration is required because of the highly complex behavioural system involving different stakeholders and the often adversarial structure of planning in some countries that can make local initiatives difficult. In some countries a consensus-based approach is used (e.g. the Netherlands and Germany).

The ecosystem approach provides a mechanism for better links and creates opportunities for better decision-making. (Morris).

It provides a structure to bring together different people (stakeholders) and societal groups who have often fundamentally divergent views of the same environmental resources e.g. the historic example of pioneers and scientists in the Murray-Darling Basin (Stewardson & Maltby).

Stronger links to spatial planning and between land and marine planning in particular are necessary to deal with priority issues and regulating cross compliance between, for example, CAP, WFD, MSP and MSFD and marine policy.

Use should be made of the many and varied networks and social capital which exist already (usually for very different reasons) such as local partnerships (e.g. Coastal, Marine and Estuary Fora, NGOs, local councils, unions, clubs and schools) as well as Local Nature Partnerships, such as Wild Oxfordshire, an independent charity that brings together more than 50 organisations, including local government, statutory bodies, farming organisations, conservation NGOs and local communities, with common aspirations for a better future for Oxfordshire's wildlife.

It should be recognized that different stakeholders have different priorities, timelines and knowledge/experience. This adds to the challenges of incorporating community/stakeholder needs and building local or cross-sectoral engagement to produce consensus solutions which may inevitably involve forms of co-management and power-sharing. The recommendations of the Celtic Seas Partnership offer useful guidance in this area (WWF, 2012).

'Think globally-act locally' will be a key part of implementation.

Full stakeholder participation is essential and will need strong and enlightened governance structures to enable the right decisions to be made and for these to be capable of implementation.

One way forward will be to better link investment (in infrastructure, land-use and water management) to actual benefits-and who receives them. This will require better understanding of individual and local-scale values versus changes in overall welfare and economic gains/losses in the national accounts (micro versus macro-economic analysis).

It will be necessary to build capacity in local government, agencies and business using targeted and highly digestible information. Careful use of language, which currently is not readily understood by non-specialists, will be essential.

Cultural change may be necessary to overcome vested interests and new tools and skills to take decisions which achieve multiple objectives and accepting the complications of trade-offs. The key cultural leap is accepting that multiple objectives will need to be met from the same area of land and/or water (multi-functionality) rather than focusing on one primary ecosystem service, like food production (mono-functionality).

Mechanisms to minimize unintended consequences are at a premium and necessitate a precautionary approach and adaptive management with full involvement of stakeholders**.**

The need for involvement of all sectors from local to regional levels is paramount (Mulongoy).

Joined-up working (Clarke) and to ensure funding is not constrained by sectoral interests (Ross) are exemplified in the presentations.

The unlocking of value of the local environment in North West England (Nolan). The Mersey Forest provides an excellent example where local authorities had funds, conservation groups did the work and of the wider community benefits.

There is a special place for regulators in stakeholder participation – OfWat agreed for SW Water to add to water bills for environmental improvement based on a 'willingness to pay' survey of customers. It may be more efficient and cost effective to work in partnership than through direct legislation. Charging for benefit or desirable outcomes (such as through PES) may be a more appealing basis for engagement than strict adherence to the principle (Ross).

G3 Encourage changes in attitudes from purely material wealth to recognition of wider individual and community well-being (P3, P4, P8, P10, P11).

A change in attitude from financial wealth to wider well-being is easy to say but difficult to do. However, traditional measures of financial and economic wealth (e.g. GDP) are changing to measures of wider well-being, including the value of natural capital (Morris). Natural capital measures are easier to integrate into economic-based decisions and business accounts. Large

companies are now considering natural capital in decision making both directly within their corporate operations and through their supply chains. This guideline may become easier to follow, as the international work of the IPBES gains momentum and in the UK the outcomes of the Natural Capital Committee, National Ecosystem Assessment and Natural Capital Initiative become better recognized and influential.

G4 Management should recognize the value of the multi-functional aspects of land and seascape (P5, P6, P7, P8).

Landscape elements have multiple functions. Focusing on just single functions can be detrimental to other purposes and potential or actual benefits. Decisions need to consider trade-offs and the total value/benefit rather than maximizing partial value. Human modification and use of the land or sea has generally prioritized single sector interests. There is now a need to achieve a better balance between conflicting objectives and better linkage of ecosystem services to human activities rather than to Environmental Impact Assessment (EIA). PES becomes extremely important (Couldrick, Ross).

The arguments favouring the move to include ecosystem function in addition to species numbers in the Ramsar Convention (Davidson) is an example of the change in emphasis away from protected areas and sites to understanding how the whole natural environment system works for public benefit. It does not negate the need for protected areas but recognizes not only their value beyond traditional conservation criteria but also the value of the wider non-protected domains.

Natural capital is ubiquitous and has no clear boundaries, yet we divide the world into separate management units, such as catchments, the coast and the sea that support independent institutions, NGOs and research projects. The Natural Capital Initiative highlighted the need to link management across distinct landscape elements which have previously been considered separately (NCI, 2014, NCI, 2016).

G5 Objectives should be long-term (P8, P9)

Focusing on short term objectives may provide immediate returns but may also compromise long term sustainability.

Risk of inaction in increasingly over-exploited environments may ultimately generate further problems of poverty, food supply and human health.

Already a key underpinning principle of the Ecosystem Approach, there is still too much short-termism (Mulongoy).

Group 2 Working together

G6 At least initially it will be essential to work within existing sectoral arrangements (P2, P3, P11, P12).

This follows inevitably from G2**.** It is required because of existing responsibilities and budgetary constraints and also because in some cases very local issues may require quite specific sectoral and spatial solutions. However, the application of the EA will reveal the benefits and increasing need to integrate across and between sectors in order to achieve the desired outcomes in relation to the particular issue of concern.

Policies are very strongly linked to a sectoral structure of government and more generally within civil society. A greater recognition of the importance of community and of the greater good as opposed to individual gain is a steep challenge within conventional structures but is essential for successful implementation of the Ecosystem Approach.

It takes time to build new links and relationships (Clarke) but co-management arrangements (Hamerlynck) such as with groups representing tourism, mining and agriculture can provide support for traditionally weak stakeholders.

Partnership working between existing sectors is proving very rewarding e.g. South West Water, NGOs and National Parks (Ross) working on "Upstream Thinking" in SW England.

It will be essential to introduce the Ecosystem Approach to some areas of government and business where currently there is no awareness and so leaving out many policy and decision-makers who are entirely disconnected from the arguments and debates.

It is too big and nebulous a job to break-up existing institutions and re-organise them in the short term. Developing new institutional arrangements is iterative and should be organized to deliver the objectives of the Ecosystem Approach, so should be designed as part of the process of active implementation.

G7 Identify clearly who can contribute to making the necessary changes (P2, P3, P10, P11, P12).

Until recently stakeholder participation has been ineffective and those that have participated or championed the ecosystem approach have had limited influence (Mulongoy).

Specify the different participants and audiences, and in particular what can each do that others cannot e.g.

- International (conventions) directives (Mulongoy, Davidson, Hamerlynck)
- national policy makers (Clarke, Costigan)
- national statutory regulatory planning agencies (Logan)
- business sector, research and education communities (Ross, Stewardson & Maltby, Meire)
- local communities NGOs civil society (Couldrick, Nolan)

Identify who/which are the key positions of influence / actors.

Natural England drove the conversation between stakeholders in 3 upland pilots, which helped them to see funding opportunities for farming ecosystem services (Clarke).

Champions and key influencers are not necessarily in government environment departments which are often less powerful than others (Hamerlynck). Governments increasingly have little money and diminishing power; NGOs and business really are key, especially global corporations considering the sustainability of their supply chains and the NGOs that are involved in labelling, e.g. Rainforest Alliance. We need a debate similar to that going on around carbon assets, such that investment in environmental degradation is discouraged.

G8 There is a need for a practical means of inter-sectoral cooperation and to generate a willingness to work together (cf G3) (P7, P12)

The starting point must be the acceptance/ownership of clear objectives across sectors and partners.

Achievement of a new culture of integrated working will require considerable dialogue between groups and organisations more used to working under separate mandates and rules. Nowhere is this more necessary than in the nexus of land, freshwater and marine based activities.

Group 3 Getting the ideas across (co-learning/understanding)

There is still a poor understanding of how the ecosystem approach can make a difference (Mulongoy). There is a poor understanding about biodiversity and ecosystem services generally. Explanation and understanding of the significance of the links between nature and human wellbeing is key.

G9 The concept of the Ecosystem Approach can be transferred, without necessarily substituting the detailed terminology, where it enhances or improves existing integrated approaches. However, where current integrated approaches are trusted and generate satisfactory outcomes, transfers may be unnecessary and simply 'fine-tuned' (all principles).

For example, ICZM, IWRM, IRBM all include key elements of the Ecosystem Approach concept. Don't force users to replace their trusted approach with the Ecosystem Approach if existing methods are working. Instead use any additional aspects of the Ecosystem Approach to strengthen existing interpreted approaches.

In particular: what type of information / actions are needed to get the desired response from the key actors? "speak the language of the decision makers" – or to achieve desired outcomes. Making the links between nature and human wellbeing is probably the key baseline.

G10 A clear communications strategy is an essential pre-requisite of delivery (all principles).

Although development of the Ecosystem Approach was a direct response to an identified need, its initial formulation was focused on achieving academic rigour and technical implementation. It was recognised that widespread adoption would require translation of concepts to a language understood by a range of audiences and in a way that would stimulate implementation. Some of this work has already been completed by organisations such as the Ecosystems Knowledge Network which has promoted the Ecosystem Approach through case studies and engagement of different groups in implementation. Further communication is required at two levels. First to deliver the Ecosystem Approach at a general level to potential users and second as a key part of implementation to specific issues. The guidelines refer especially to the second, recognizing that to date most messages have been developed by, and for, professionals.

Early engagement with stakeholders and especially local communities is vital (Stewardson & Maltby) and targeted towards:

- Linking people and the environment (Clarke)
- Improved understanding and support for different audiences (including language)
- Awareness building
- Public education
- Translating concepts into the language of different sectors and provide strong support and facilitation for weaker stakeholders

Removing the dichotomy between ecosystem conservation and delivery of economic benefits is essential. We need to recognize this is a value constraint – individual hierarchists will not accept this.

Questions of investment, finance and cost/benefit have to be addressed (Nolan) and adopting the language of the decision-makers may be complicated because of the different backgrounds/knowledge/aspirations/cultures of those involved (Nolan).

Group 4 Assembling knowledge

G11 Identify appropriate-scale demonstration / exemplar projects (P7, P8, P9, P10).

There is considerable advantage in learning by doing pilot projects and from others' experiences. The Ecosystem Approach is a new way of thinking, not new content. The Ecosystem Approach principles are consistent with "common sense" to open-minded people implementing field projects. The scale of the application of the EA will depend on the precise nature of the problem being tackled

Make full use of experiences gained from projects e.g. Natural England pilots had both successful elements to repeat and unsuccessful elements to avoid (Clarke). The Ecosystems

Knowledge Network with 2000+ members provides a decided resource for implementing the Ecosystem Approach.

The locational context is especially important. Time is needed to build relationships even where you think they are already strong (Clarke).

G12 Recognise traditional knowledge systems and how related decisions are made (P1, P11, P12).

Local and traditional cultures need to be taken fully into account when applying the Ecosystem Approach.

Lack of recognition of traditional knowledge systems (such as Community Associations, clubs, societies, membership groups e.g. NFU Young Farmers) needs to be rectified not only because relevant scientific research data may not exist or be inadequate but because this will assist community buy-in.

Citizen science is an under-utilised ingredient of implementation – get local people to collect new data using latest technology e.g. mobile phone apps.

G13 Ensure the quality and certainty levels of information are defined. (P5, P8, P9, P11).

Produce trusted evidence and assess the levels of uncertainty/risks whilst recognising complexity (Miere).

This will reinforce the reliability of "No-regrets" decisions and help to understand cumulative effects of many small activities on ecosystem services and their sustainability. The use of scenarios in the NEA and NEAFO gives some useful pointers. The 'Ensembles' approach example uses of a set of climate models rather than choosing just one, even if it is considered the best, should be applied more generally.

G14 Provide an inventory of sources of information to guide users and avoid overload by helping to sift available information (P4, P11, P12).

Data is needed especially on impacts of individual activities and trends in ecosystem services. This could be done by activity, sector or by ecosystem service. There is a particular requirement for better mapping of the sea-floor and understanding of marine ecosystems. It is necessary to know more about functioning and service provision but using language more appropriate to stakeholders and non-technical decision-makers. Inevitably this is going to require long term expenditure on monitoring.

G15 Review the full range of available tools to help implement the Ecosystem Approach most appropriately within the contextual (spatial and temporal) framework of the problem addressed. (P7, P11).

There is a multitude of technical and non-technical tools to assist with implementation most of which are identified on the CBD website More recent work on ecosystem services mapping (Meire) and on economic valuation (see Valuing Nature Network) and stakeholder participation tools (Dialogue Matters, (Logan) is particularly relevant. The development of valuation techniques beyond traditional economics, the business case for new approaches to land and water management and innovative funding mechanisms based around PES can build strong partnerships of common interest for delivering the Ecosystem Approach.

G16 Making knowledge available and enhancing the ability to use it (All Principles).

It may be best to focus effort, especially in relation to capacity building on those who can make a 'real' difference and identify champions to achieve a multiplier/accelerator effect (Mulongoy).

The environment is highly complex and interconnected. There are immense information requirements to assist in management but it is essential to dispel the myth that it's all too difficult (Kumar) and hence 'business as usual' is the only pragmatic solution. The CBD 'Sourcebook' on the Ecosystem Approach provides information on a global range of examples of using the approach. Unfortunately it seems to be little known or used except by specialists in the field. Such a portfolio of experience rather than relying on individual elements of evidence helps to spread the risk of failure (Clarke).

Implementation of the ecosystem approach will require expertise and experience within a wide range of stakeholding institutions on the cross-disciplinary understanding, thinking and development of solutions.

This will require awareness building and training through schools (Couldrick), academic institutions, such as universities, research organizations, advisory and regulatory agencies, planning authorities among others.

Guidance is essential on actions where knowledge/evidence is insufficient or not yet fully conclusive. Action cannot wait for perfect science. Adaptive management will be needed as all contexts will differ slightly. Take a precautionary approach with no regrets (Ross).

One practical example is the communication of ecosystem services by Danone in its publicity for Evian water that highlights the natural purity of the water because of its slow passage through soils and rocks.

The Ecosystems Knowledge Network in UK was established with Defra funding to provide practical knowledge of how to implement the ecosystem approach and is considered a valuable asset with a range of case studies.

Group 5 Delivery

G17 Work at the appropriate spatial and temporal scale, reflecting the nature of the problem or issue being addressed. **(P1, P7**).

Table 3. The problem-shed at different scales.

Issue	**Scale**
Climate change	Global
Air pollution	Local - continental
Water management	Catchment/aquifer unit
Habitat conservation	Site – regional

The focus on division of landscape into protected sites and 'other' areas which has been so prominent in earlier thinking needs to give way to more integrated thinking in which understanding of the whole system is of paramount importance. This is exemplified by landscape scale approaches. It is essential to integrate and understand the whole system as far as possible if we are to make sensible management decisions in the future.

The notion of the problem-shed is crucial here. Table 3 gives just some simple examples of how the scale of consideration may change depending on the problem being tackled. It is noteworthy, that whilst climate change is a global issue, adaptation may be at a more local level.

Alongside the spatial scale it is essential also to consider the political scale. This has not only a spatial (administrative/sovereignty) context but also a time-bound consideration in relation to length of funding, institutional support mechanisms and other aspects reliant on government and the vagaries of policy.

G18 Take note of unintended results of actions taken in implementation (P3, P8, P9).

It is important to be aware and ideally anticipate possible unintended consequences of actions which may raise significant questions of trade-offs. For example a decision to accelerate the release of catchment flood waters may have economic as well as ecological consequences on estuaries and coastal waters.

Make no-regrets decisions.

G19 Ensure provision to collect sufficient information to enable adaptive management, post project appraisal, record learning experiences and communicate outcomes (P6, P11, P12).

There is often insufficient recognition of the wider socio-economic benefits of integrated approaches (Mulongoy). Information should be collected to monitor progress, demonstrate benefits and guide changes to adapt to monitoring outcomes. Adaptive management can help with uncertainty e.g. the Ecosystem Approach learning centre at the 17th UN Sustainable

Development Conference (May 2009).

It is of paramount importance that the evidence is available to confirm success or to identify shortcomings in progress. This provides the basis for any adaptive management responses as well as providing guidance to others through the experiences and knowledge learned. In particular it is necessary to demonstrate the added value of taking an Ecosystem Approach.

G20 Identify where possible the economic gains and/or cost savings for different sectors, especially industry, private and public, of the implementation of the Ecosystem Approach (P4).

This will encourage the private sector to invest in environmental management and overcome and/or reduce the need to raise funds through taxes or public payments.

The wider benefits achieved should be included in national accounts (Kumar) rather than focus on the more traditional measure of GDP. The notion of Gross Value Added (Nolan) may be helpful here. There is movement here such as United Nations System of Environmental – Economic Accounting (UNSEEA) for environmental accounting changes and the indicators being developed by the Office of National Statistics (ONS).

Human well-being needs to be included as a good metric of national status and can help demonstrate that it is possible to obtain a good return on investment in the natural environment (Morris).

12. Communicating the guidance

Our language of communication and potential influence needs improving.

The unique selling point of the Ecosystem Approach is as a concept that provides a framework to deal with complexity of the natural environment and different stakeholders involved. It is based on sound scientific principles but takes account of important social, economic, political and institutional issues and processes.

Its ability to handle complexity means that the Ecosystem Approach is quite broad. There is a need to break the concept down into manageable chunks. For example does every sector or every practitioner need to understand/apply all the principles? This might be especially important for some groups. So, for instance, does someone from the transport sector need to understand issues around ecosystem function? This means that it might be necessary to tailor the information communicated to specific groups, so we can be specific concerning what the Ecosystem Approach means to their sector. However, it also means that there needs to be someone overseeing the whole process of implementation to make sure all the principles are addressed, not just the easy ones, or ones most related to that sector. The Living With Environmental Change (LWEC) Ecosystems Taskforce has been considering a lot of these issues.

Communication needs to be based on real-life situations. These need to be tailored to the group being targeted – one message does not fit all. A wide set of examples needs to be developed so that the appropriate one or more can be selected for a given audience. It is crucial to communicate how the Ecosystem Approach can be beneficial, demonstrating it is a useful framework for making complex decisions.

Different stages of communication need to be identified – don't expect people to understand the whole concept in one go – it's a journey that will unfold. Have a long term vision with key steps, perhaps related to decision points. This is especially important if people are to be involved in any decisions that affect their environment. This process can also be described as a 'knowledge to decision continuum'.

Often there is a tendency to 'dumb-down' messages when trying to communicate. This can come across as patronising. Attention needs to be focused on the language rather than reducing complexity. People make complex decisions all the time even travelling to a meeting (what type of transport, when do you leave, how much luggage) so complexity is not a problem if packaged correctly.

When communicating, we should not be afraid of naming and shaming those whose actions adversely affect the environment. People's forms of communication are often too diplomatic; trying to avoid offending any individuals or organisations. However, pointing out who is to blame for an activity, is part of using real life situations and help identify what actions need to cease.

One of the most difficult issues to consider when communicating is 'who decides what is most important?' For example should environmental, social or economic concerns take precedence? In many instances there is a body or organisation that will make the final decision or there is a regulation to be complied with (e.g. the European Habitats Directive for environmental issues). This ultimately affects what decisions are finally made. Therefore whilst many processes seek to have inclusive/deliberative decision making – there is always a bottom line being complied with.

A key part of communications is how knowledge is transferred and understanding who are the best advocates to do this. For example, in some instances educating school children can be the best way to reach parents. It is important to be aware that different groups need different approaches. We need to read the social landscape to ensure all communications are well targeted.

A crucial question is whether we are, or seen to be, communicating or advising. For example, it is often perceived that those in environmental roles preach about nature. We need to turn this the other way so that other advice is seen to be independent and ensure that target groups / sectors recognise that they have an impact on the environment. The ideal result is that they actually seek out others or the Ecosystem Approach framework to help them make the right decisions?

Decision-making is almost always about trade-offs. It is not possible to maximise the delivery of all ecosystem services. For example, it might be possible to maximise nutrient retention to reduce eutrophication in a system, but this may consequentially reduce biodiversity in retention sites and increase greenhouse gas production such as nitrous oxide.

Research on the relationship between ecosystem services and poverty alleviation in India and the Hindu Kush revealed that integrated management of natural resources based on interdisciplinary understanding could really improve human livelihoods (ESPASSA, 2008). A crucial step is the setting of priorities, for example developing a map of the linkages between ecosystem services and poverty, and pushing to the fore the need for the development of supportive institutional and governmental frameworks.

Key issues include:
- the need to set societal priorities
- the need to strengthen the evidence base
- the need to select desired scales and targets
- developing a socially acceptable valuation of ecosystem services
- how to deal with trade-offs ('optimise' rather than 'maximise')

There is a strong need for increasing recognition of the links between ecosystem functions, a country's economy and human well-being. The CBD objectives will best be met by an Ecosystem Approach attaining the right balance, and the outcome of getting the balance right can be measured in human well-being. Overall, there is a real opportunity to use the Ecosystem Approach but this can only come through the creation of a culture of co-operation within and between relevant organisations.

A major challenge for any new concept or approach is to communicate the idea to the target audience. All too often the developers of the concept make assumptions about the willingness of the target audience to accept their ideas, their ability to understand technical language and the appropriateness of media by which the idea is communicated. A classic example is when developers produce a brochure that they understand and their connection with end-users is to decide who to send it to. The target may not be responsive to brochures or may not understand and therefore will not act on the information. Indeed it may even produce a negative response and a feeling of imposition.

Any communications should begin with a clear strategy that should consider the following steps.

1. Define a clear reason for communicating. Why are things not working as they are? Who can effect change and thus who is the target for communication? What is wrong with any current communications? What are the external challenges to communication?

2. Understand the target audience, their role in the subject area, their likely level of knowledge of technical aspects of the subject, their aims and objectives and their general culture. It is particularly important to analyse the current behaviour and reasons

for this and why you consider this could be deficient or inappropriate or has potential to improve.

3. Define how you would like the behaviour of the target audience to change. This will clearly be related to acceptance of the new idea, approach or method and implementation in their particular sector and role.

4. Examine what is likely to be most the successful media to reach them, get them to take notice and change their behaviour. This might be a technical briefing paper, glossy brochure, newspaper article, radio interview, peer or one-to-one discussion.

5. Collate the communication information needed that will provide the appropriate description of the approach and any necessary evidence to support it with clear aims and objectives for the target audience and guidance on implementation. This may require translation of technical information into the language to which the audience is likely to respond positively, including adaptation of Ecosystem Approach concepts to other frameworks with which they are familiar.

6. Construct the appropriate message, produce the communication and action it. This should include the benefits of action to the target audience and why it is necessary and why there will be better outcomes. Unique selling points are particularly powerful. Communication needs to be based on real-life situations with practical examples.

7. Follow-up and monitor success.

If necessary repeat previous steps.

For communicating the Ecosystem Approach it is essential to make it clear there is a need to be concerned about the environment – this could be achieved by addressing the 'so what?' and 'what does it mean for me?' issues. For instance explaining why a healthy environment is beneficial to people. So the first point is that the communication needs to explain how people's welfare is connected to the environment (natural capital and ecological systems). Establishing this overarching meta-narrative will be key along with making it relevant to people's lives in a tangible way e.g. provision of urban green infrastructure. It is particularly powerful to be able to demonstrate sectoral threats – i.e. if you don't do anything now to either protect or stop abusing the environment then you'll pay for it later. We need to communicate the evidence we have that says if we work in a different way (i.e. sustainably) then there will be better outcomes for the environment and business, among other sectors.

Conclusion

Nearly two decades have passed since the Sibthorp Trust challenged traditional thinking on conservation and was a significant driver in the elaboration of the Ecosystem Approach and its underlying principles. The Trust has continued to question the conventional ways in which the

natural environment is viewed and managed. The adoption of the Ecosystem Approach by the Convention on Biological Diversity and its incorporation into the national policies of many contracting parties has done much to change the attitude of many people, from seeing conservation of nature as an isolated endeavour to one where healthy ecosystems are essential to human well-being. However, there is much still to be done to overcome the barriers which impede the integration of environmental sustainability, economic prosperity and social well-being. This has been well recognised by the Convention on Biological Diversity in its ambition to safeguard the world's life-support systems for future generations. The conceptual framework offered by the Ecosystem Approach will be an essential tool in realising this goal. There is only one Ecosystem Approach, but there may be many different ways of delivering it.

The analysis presented above distils 20 guidelines for more effective implementation and mainstreaming of the Ecosystem Approach. Individually and collectively they advocate more or less significant departures from the "norms" of managing our greatest assets - those of the natural world. The new 20 point guidance involves substantial content and a summary check list to aid implementation is provided in Box 7.

It is hoped that this additional guidance might assist in the formulation of a renewed agenda to build on the Strategic Plan for Biodiversity 2011-2020, the achievement of the Aichi Targets and contribute to the United Nations post-2020 agenda.

Box 6. Check list for implementation of The Ecosystem Approach

1. Clearly identify the need/problem or opportunity at the outset together with the prospects for wider benefits, risks or consequences
2. Assess appropriateness of the Ecosystem Approach to deal with this (against the 12 principles and effectiveness/limitations of existing approaches)
3. Identify stakeholders, including those whose activities either create the problem and/or would be part of the solution
4. Use available information to clarify the problem/opportunity
5. Evaluate with interest groups the practicalities, barriers and constraints to implementation
6. Identify, and where feasible establish, mechanisms for integrated governance
7. Define clear objectives and evaluation criteria for successful implementation
8. Co-design an action plan and responsibilities
9. Secure the funding necessary for the delivery of the plan and operationalization of actions, but ensure funding is unconstrained by sectoral interests
10. Collect necessary new information and undertake scenario analysis of different actions/trade-offs
11. Design instruments for resource management (e.g. fishing quotas) and required enabling mechanisms such as PES and/or other incentives
12. Monitor, evaluate, and adapt where necessary to ensure desired outcomes.

APPENDIX ONE

Historical background

The United Nations Conference on Environment and Development (UNCED – also called the Earth Summit) held in Rio de Janeiro, 1992, gave birth to the Convention on Biological Diversity (CBD), which has now been signed by 168 countries (with a further 28 countries in the process of signing). The Ecosystem Approach was developed as a vehicle for meeting the CBD's three primary objectives of:

- biodiversity conservation
- sustainable use
- equitable sharing of the benefits of genetic resources.

However, the CBD did not, at that time, define what exactly the Ecosystem Approach meant.

The first Sibthorp Seminar in 1996 (Sibthorp 1, Maltby *et al.,* 1999) made a significant contribution to ecosystem management, breaking away from conventional thinking. The seminar identified principles of ecosystem management that subsequently proved strongly influential in guiding the definition and underlying principles of the Ecosystem Approach (elaborated by the expert group that met in Malawi, January 1998; Box 1) for the Convention on Biological Diversity (CBD) and the articulation of the rationale underpinning application of the Ecosystem Approach. Pathfinder workshops conducted in East Africa, South America and South East Asia (funded primarily by the European Commission) subsequently tested the methodological framework and the principles against a wide range of case studies (Smith & Maltby, 2000). The Ecosystem Approach definition, description and principles were formally adopted in Decision V/6 of the CBD in 2004 After nearly two decades since Sibthorp1 there is now widespread (if not universal) acceptance of the need for integrated and holistic approaches to the management of natural resources, such as that encapsulated in the Ecosystem Approach. There remains a need to understand more the experience of applying the Ecosystem Approach in different parts of the world.

The Ecosystem Approach extends back more than 20 years, starting with a particular politically-driven initiative in the United States. It stems from a desire to find socially-just and cost-effective solutions to natural resource management challenges and provides an opportunity to achieve improvements in well-being through the implementation of an integrated framework. The Millennium Ecosystem Assessment (MA, 2005) demonstrated the essential role of healthy ecosystems in supporting human well-being by providing clean air and water, food and building materials and much of what we call quality of life. The human benefits obtained from ecosystems are often divided into four categories of services, following from the global analysis of the MA (1) *provisioning services* such as food, water, timber, and fibre; (2) *regulating services* that affect climate, floods, disease, wastes, and water quality; (3) *cultural services* that provide recreational, aesthetic, and spiritual benefits; and (4) *supporting services* such as soil formation, photosynthesis, and nutrient cycling. The term natural capital is now often used to define the human well-being that results from interactions between and spatial configuration of

environmental assets. The use of natural capital enables business and governments to assess nature alongside other forms of capital such as financial, manufactured and human capital. A key aspect of the Ecosystem Approach is its holistic view, allowing trade-offs in ecosystem services to be assessed from proposed actions. This is particularly important when one or more beneficiary has a private interest and especially when provisioning services are involved, such that private interests win at the expense of public regulating and cultural services (Howe et al., 2014).

The Interagency Ecosystem Management Task Force was established in the United States in August 1993 "to increase understanding of the cooperative framework known as 'the ecosystem approach". This was a response to the mandate from Vice President Gore's National Performance Review, which called for agencies of the Federal government to adopt "a proactive approach to ensuring a sustainable economy and a sustainable environment through ecosystem management" (Report of the Interagency Ecosystem Management Task Force, June 1995). The same term was adopted by the CBD as the methodological framework for delivery of the Convention's three primary objectives, but it was the subsequent work of the Ecosystem Approach Expert Group that elaborated the meaning in the specific context of the Multilateral Environmental Agreement (MEA). It offers a framework for horizon-scanning and to be better at dealing with emerging issues that arise through complex interactions and multiplicative responses. It is not forcing the adoption of the approach for its own sake or as an inflexible structure.

Box 7 Origins of the Malawi Principles, adoption by the CBD and further examples of subsequent related commentaries and policy developments with particular reference to the UK

- 10 Sibthorp Principles (1996) → 12 Malawi Principles (1998). 15 participants from international research community (mainly natural science) / Govt. agencies / IUCN adapting the paper by Safford & Maltby.(1998)
- 2000 Adopted by CBD (COP-5) Call for case studies.
- 2003 Pathfinder Workshops: Southern Africa, South America, South East Asia (Smith & Maltby, 2003).
- 2003 Expert Meeting Montreal endorsed Principles – rationale –explanation - guidance points.
- 2004 Briefings for DEFRA and senior staff from other ministries (Maltby & Crofts).
- 2004 COP-7 Further elaboration / initiation of CBD sourcebook.
- 2005 Millennium Ecosystem Assessment (MA)
- 2008 British Ecological Society/UK Biodiversity Research Advisory Group
- 2009 DEFRA Action Plan for mainstreaming into policy. More than a decade after conceptualisation.
- 2009 Marine and Coastal Access Act
- 2011 UK National Ecosystem Assessment…..2011 UK Natural Environment White Paper.

- 2011 Sibthorp workshop Cirencester
- 2011 Marine Policy Statement including the high level policy objectives
- 2012 onwards Partnership working for regional seas (e.g. Irish Sea Maritime Forum, PISCES and the Celtic Seas Partnership).2012 IPBES established
- 2013 IBG/RGS meeting “An ecosystems approach in environmental decision-making”
- 2013 EU Common Fisheries Policy reform (REGULATION (EU) No 1380/2013), article 2 of which explicitly states ‘The CFP shall implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimised’
- 2013 Final Report of the (UK) Ecosystem Markets Task Force (one of the Natural Environment White Paper commitments)
- 2015 Natural Capital Committee call for 25 year UK plan to protect and restore natural capital to support economy and society
- Environment Act (Wales) 2016 – introducing the principles of the sustainable management of natural resources
- 2016 Scotland's Land Use Strategy.
- 2018 A Green Future: Our 25 year Plan to improve the Environment.
- 2018 Natural Capital Initiative guidance on ‘wholescape thinking’, ‘from rivers to the sea’ and partnership working

Whilst we refer generally to the UK in the text, different initiatives are being undertaken in devolved governments as highlighted in Box 3. For example, the Welsh Environment Act is more advanced in terms of biodiversity and resilience of ecosystems than that in England.

Presentations made in Westminster in 2004 to Defra and representatives from other UK Ministries, on the meaning and potential applications of the Ecosystem Approach generated an enthusiastic response and in particular raised awareness of the cross-cutting and wider relevance of the concept. Figure 1 was used to relate the need for balance of the three objectives of the CBD to outcomes of high societal and political importance and elicited reactions such as its possible application to decide on major infrastructure developments such as a new London airport. Defra has subsequently embraced the Ecosystem Approach in key areas of policy.

The White Paper ‘The Natural Choice: securing the value of nature’ produced by Defra in 2011 defined a new approach to taking account of all the economic and non-economic benefits we get from ecosystem services that enables decision-makers to exercise judgement about how we use the environment. Defra recognises that the Ecosystem Approach meets its ambitions for an integrated methodology, creating a resilient ecological network that restores and supports healthy, well-functioning ecosystems and the benefits they provide to people. Defra established the Ecosystem Knowledge Network (and provided funding between 2011 and 2016) to promote the Ecosystem Approach and to assemble and share knowledge, particularly with groups and sectors whose primary interest is not the environment. Defra established the Natural Capital Committee that provides advice to the government on the sustainable use of natural capital - that is, our natural assets including forests, rivers, land, minerals and oceans that provide a flow

of benefits and services to people. Following the Committee's recommendation, Defra is committed to the production of an ambitious 25 year plan for the environment based on the restoration of natural capital.

The authors believe that the effectiveness of environmental policy will be limited unless it extends fully to include social, cultural and economic considerations. But do such fully integrated models or approaches actually exist in practice? There may be significant experiences from different sectors and from around the world from which lessons can be drawn (see examples from Pirot *et al*., 2000; Smith & Maltby, 2004). However, there is sometimes an inability within responsible agencies to apply lessons learnt from approaches and examples implemented outside specific sectoral areas or elsewhere in the world because of constraints of existing measures, such as agri-environment schemes. Thus voluntary initiatives may be the only way forward. Both in the UK and worldwide, across academia and the public and private sectors, many initiatives using a variety of tools and approaches have been defined and in some case implemented, or are under development, that attempt to deliver integrated solutions. Although not always using the term 'ecosystem approach', in practice other approaches being implemented are often compatible with the framework it sets out.

Many of the tools and approaches being applied are complementary, but there is often a poor understanding of how they relate to each other and there are important lessons to be learned from a critical evaluation of the range of approaches. There are clear overlaps between some tools and methodologies. For example, initiatives such as The Economics of Ecosystems and Biodiversity (TEEB) are consistent with such integrated thinking, but based around economic costs. The Ecosystem Approach is also closely aligned with the approach of Integrated Land Use or Coastal and Marine Spatial Planning, but practitioners using any of these approaches may not be aware of the similarities. Frequently, the complementarity between some approaches and tools is not recognised because of differences in terminology that often relate to the discipline in which the approach was developed. The Wise Use approach developed by the Ramsar Convention follows many similar principles but is focused on sustainable exploitation of wetland resources. This can often lead to a resistance to applying certain approaches and tools such as those facilitating wider stakeholder engagement beyond specific wetland interests. In other cases, the use of seemingly complicated or specialist terminology presents a key obstacle for practitioners, as the fundamental ideas are obscured and difficult to grasp. Presenting the fundamental ideas more clearly would improve the understanding, generic uptake and, where appropriate, integration of the methodologies.
In the UK there is increasing recognition and widespread acceptance of the need for holistic and integrated thinking in ecosystem management, as evidenced by the range of recent projects and programmes that have been initiated, notably the National Ecosystem Assessment (NEA), Natural England's Ecosystem Services pilots and DEFRA's catchment-based approach. The ecosystem approach is embedded in national policy (e.g. Defra's Natural Value Programme and action plan for embedding an ecosystems approach culminating *inter alia* in the rolling out of the catchment-based approach initiative – Defra 2013). Despite this, there are still barriers to the full understanding and acceptance of the Ecosystem Approach amongst some practitioners and barriers to embedding new approaches in practical situations (eg. at the land/sea interface).

While in some cases it has been found to be useful, in other cases there is no clear perceived need for changing current practices. The generality, high level definition and the lack of definition of different scales of operation of the Ecosystem Approach are often regarded as key problems and resulted in some considering that it has no validity, is too superficial or is difficult to implement. Some in the academic community find it difficult to accept a definition and interpretation that apparently departs from a ‘Tansleyan’ view of ecosystems. There is a need to examine what the barriers are, what action needs to be taken to overcome them and stimulate more effective implementation of integrated approaches.

Box 8 Social Ecological Systems The term social ecological systems (SES) is often employed to describe ecological-economic-social linkages that encompass bio-geo-physical units and their associated social actors and institutions. We currently live in an age sometimes referred to as the 'Anthropocene' because environmental conditions are profoundly altered by human activities to the extent that humans must be considered as part of almost every ecosystem (to quote the Stockholm Resilience Alliance Centre ‘There are no natural systems without people, nor social systems without nature’ - RSC, 2015). From the Ecosystem Approach perspective, while institutions and markets can shape the way that individuals interact with and use ecosystems, the status of ecosystems determine the quantity and quality of ecosystem service benefits that are potentially available to society. Changes in the dynamics of SES are regulated by the interaction of slow variables (such as changes in regulating ecosystem services, for example, loss of soil fertility) and fast variables (such as disturbance by flooding). SESs are highly dispersed and decentralized, exhibit emergent behaviour and self-organisation, phenomena that cannot be predicted directly from the properties of their component parts, and are delimited by spatial or functional boundaries surrounding particular ecosystems and their problem context (Holling, 2001).

APPENDIX TWO

Relating the Ecosystem Approach to other concepts

The Ecosystem Approach has evolved out of the discipline of ecology, but has spawned much wider conceptual thinking underpinning the development of new integrated models, although they are often called something else more appropriate to the language of their application and reflecting the varied technical jargon of the given area. DEFRA's catchment-based approach is just one such manifestation, but a noteworthy recent example. Similarly, many such terms have been used to capture integrated methodologies that can be considered part of the Ecosystem Approach "family". Examples are given in Figure 2, but these are by no means exhaustive. It is imperative that such diversity in terminology should not be used as a source of criticism or confusion in the concept (highlighting for example that the idea is nothing new) but as a reinforcement of the flexibility inherent to it.

The IBG/RGS (2013) conference concluded that the Ecosystem Approach (when its 12 principles are followed) provides a way of implementing sustainable development (Box 3) rather than an end in itself.

Box 9 Sustainable Development Sustainable development (SD) is a term that differs widely in its meaning depending on where you are on the scale from weak to strong sustainability. The abstract description of SD is important as it determines how the principles are applied in decision-making. The policy framework for SD evolved between 1972 and 2002 through a series of international conferences and initiatives. The 2002 World Summit on Sustainable Development extended the definition with the inclusion of three pillars of SD: economic, social and environmental. Policy approaches based on weak sustainability trade-off between the pillars on a costs and benefits basis, with different types of capital treated as substitutable. By contrast, the nested model emphasises the dependence of society and the economy on the environment. The state of the environment is a precondition for determining social and economic conditions, but staying within the limits of all three elements is a precondition for achieving strong sustainability. Boundaries or limits have been suggested for the environment (e.g. the planetary boundaries of Rockstrom *et al*., 2009) and economies, although questions remain over the scale at which such boundaries should be set (global, national or local). Where social boundaries lie is also contested, but beyond a certain level of social inequality, such as high unemployment, social capital is inevitably eroded. Raworth (2012) tackles, through a 'doughnut' model, the challenge of ensuing every person has the resources they need to meet their human rights, whilst living within the ecological means of the planet. This idea is further elaborated by Dearing et al. (2014). In 2015 the UN led a process, involving 193 Member States and global civil society to produce the Sustainable Development Goals. The SDGs are a collection of 17 global goals that are interrelated though each has its own targets to achieve. The SDGs cover a broad range of social and economic development issues, including poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, environment and social justice. The SDGs are also known as "Transforming our World: the 2030 Agenda for Sustainable Development" or **Agenda 2030** in short. Unlike the MDGs, the SDG

framework does not distinguish between "developed" and "developing" nations. Instead, the goals apply to all countries. The Ecosystem Approach provides the glue that supports the interrelationships between the Goals.

Figure 3 The Sustainable Development Goals (SDGs)

Box 10 Aichi Targets In 2010, in Aichi Japan, the parties of the Convention on Biological Diversity adopted the Strategic Plan for Biodiversity 2011–2020 with the aim of halting the loss of biodiversity and enhancing the benefits it provides to people. The Plan contains 20 Biodiversity Targets (Aichi Targets), organised under five Strategic Goals.

Goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Goal B. Reduce the direct pressures on biodiversity and promote sustainable use

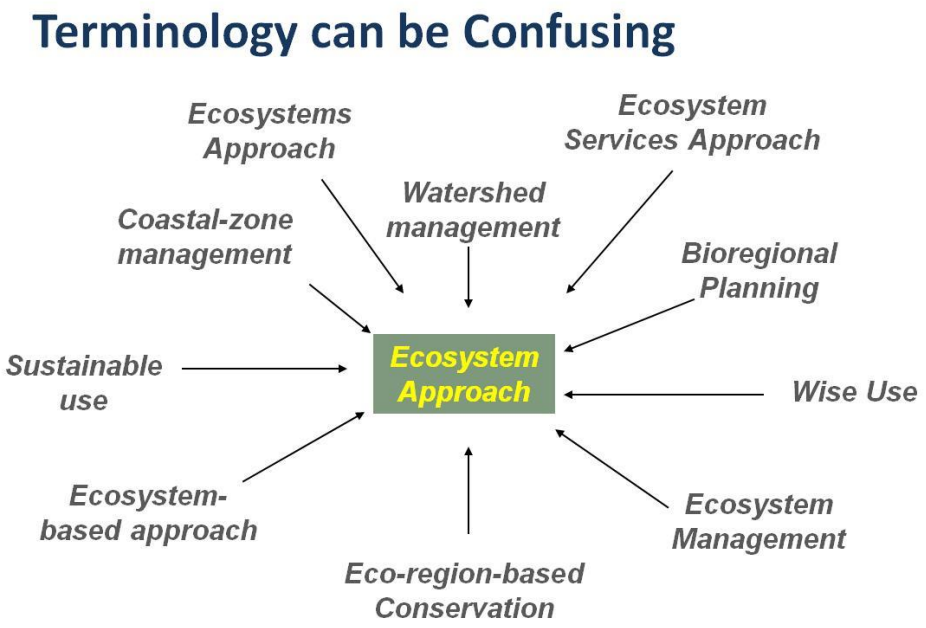
Goal C. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Goal D. Enhance the benefits to all from biodiversity and ecosystem services

Goal E. Enhance implementation through participatory planning, knowledge management and capacity building

The targets themselves have many strong links to the Ecosystem Approach and issues discussed in this paper, they include: making people are aware of the values of biodiversity; integrating biodiversity into national and local development and poverty reduction strategies and planning processes; eliminating incentives, including subsidies, harmful to biodiversity; managing all fish, plant and invertebrate stocks sustainably, legally and applying ecosystem based approaches; bringing pollution, including from excess nutrients, to levels that are not detrimental to ecosystem function and biodiversity; restoring and safeguarding ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being; respect the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources; improve knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends.

Figure 3. Historical examples of different approaches that adopt equivalent principles to the Ecosystem Approach (Maltby 2004)



We struggle to communicate importance of the environment, particular to those with economic training. Understanding has become somewhat complicated by the recent momentum of a parallel process focussed on the increasing recognition of the previously ignored value of nature expressed in terms of 'ecosystem services' performed by the (natural) environment (Box 4). One narrow interpretation of this is the monetisation of ecosystem services, however this raises ethical considerations and a wider definition of value in terms of the importance of ecosystems is preferred by many. Valuation of ecosystem services gained prominence in the MEA and TEEB with particular recognition in the UK through the NEA, widely hailed as a pathfinder for the sub-regional audit of the states and trends in the natural environment. The process has contributed to the development of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and the common use of the term 'ecosystem services approach'. A further development has been the increased use of the term "natural capital" defined as 'the elements of the natural environment which provide valuable goods and services to people such as clean air, clean water, food and recreation'. This puts ecosystems in an economic framework and gives nature equal status alongside: physical capital (e.g. buildings and machinery); human capital (e.g. knowledge, skills), financial capital (e.g. loans from the bank) and social capital (e.g. our friends and relations. Natural capital has enjoyed considerable traction with business and those focusing on economic growth. It has been highlighted in the 2014 Natural Capital Summit (Natural Capital Initiative, 2015) and the 2015 World Forum on Natural Capital (WFNC, 2015). In addition, UK government established the Natural Capital Committee for England, which reports directly to the HM Treasury. Their work has shown that successive 'natural capital deficits' have built up a large capital debt and this proving costly to our wellbeing and the economy. If economic growth is to be sustained, natural capital has to be safeguarded. The

Committee's third report (NCC, 2015) recommended that to meet the Government's commitment to protect and improve the environment within a generation, a 25 year plan to restore or create wetlands, woodland, peatlands, urban green spaces and commercial fishing stock should be developed with appropriate investment and financing mechanisms, working closely with the private sector and non-governmental organisations. Defra (2015) agreed with the aims of the Committee's recommendation for the 25 year plan for a healthy natural economy and to get natural capital into the national accounts by 2020. The 25 year plan was launched by Defra in 2018 (HM Government, 2018) and is underpinned by the concept of natural capital.

Box 7. Ecosystem Services and the Ecosystem Approach: An overview commentary - towards joined-up thinking The ecosystem services concept provides an opportunity for those from the natural and social sciences to work together in a novel and, more significantly, an integrated way. It is very important for there to be a common language and dialogue between the natural and social sciences: Ecosystem Services directly relates to human well-being.

Until now, the Government has developed sector-specific policies, with Government itself organised in a sectoral way. The environment doesn't work like this and sectoral politics can divert from the bigger picture. Government policy has also been largely focused on species and protected areas, diverting policy-makers' attention from ecosystems and ecosystem function in landscapes outside those designated for conservation reasons and fundamental for wider human well-being. It is important to remember that not only species but also biological and structural complexity is needed to support ecosystem processes at the landscape scale. The demand is for a new way of looking at environment issues, with a need to take account of ecosystems being dynamic and responding to both environmental and human pressures.

The Ecosystem Approach requires an appropriate balance between three factors: economic prosperity, social well-being and environmental sustainability. Until now, there has been an inappropriate division between the costs and benefits of managing the environment. It is increasingly necessary to have a fully informed debate to define what "balance" we need and aspire to.

There are many approaches and activities that fully or partially embrace the same concepts as the Ecosystem Approach and this has led to ambiguity on which approach to follow. Indeed, one of the results (not necessarily anticipated) of the successful incorporation of the concept within policy-orientated statements and associated documentation is that there is considerable variation in the precise interpretation of the Ecosystem Approach and what exactly constitutes its implementation. Interpretation has been further confused by conflation with other terms including 'ecosystem services approach' (Holt & Webb, 2010) and treating natural resources as 'capital' significant for social and economic welfare.

APPENDIX THREE

Principles of the Ecosystem Approach

The following 12 principles are complementary and interlinked.

Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.
Different sectors of society view ecosystems in terms of their own economic, cultural and society needs. Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

Principle 2: Management should be decentralized to the lowest appropriate level.
Decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization for institutions involved in decision-making to make, if necessary, appropriate compromises.

Principle 4: Recognizing potential gains 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 affect biological diversity;**
b. **Align incentives to promote biodiversity conservation and sustainable use;**
c. **Internalize costs and benefits in the given ecosystem to the extent feasible.**

The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favor the conversion of land to less diverse systems.
Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species.

Principle 6: Ecosystem must be managed within the limits of their functioning.
In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable of artificially maintained conditions and, accordingly, management should be appropriately cautious.

Principle 7: The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales.
The Ecosystem Approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The Ecosystem Approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency of humans to favour short-term gains and immediate benefits over future ones.

Principle 9: Management must recognize the change is inevitable.
Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change.

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functions and the impact of human use is desirable. All relevant information from any concerned area should be shared with all stakeholders and actors, taking into account, inter alia, any decision to be taken under Article 8(j) of the Convention on Biological Diversity. Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.
Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

APPENDIX FOUR

Objectives of the Cirencester 2011 Sibthorp workshop

To advance the arguments for integrated and holistic solutions to ecosystem management in order to change existing mind-sets and to identify changes needed in policy and practice to enable their implementation in practical situations.

Issues

The workshop focussed on the range of approaches, frameworks and tools that are available to deliver integrated and holistic solutions for ecosystem management problems. It encompassed both UK and worldwide examples and involved both 'high level thinkers' as well as practitioners.

The objectives of the workshop were to:

- **Argue the case for integrated and holistic approaches to the management of ecosystems at different scales.** Also, where are these approaches NOT appropriate? For example what is the case for species protection where we still don't know their role in ecosystem functioning and the delivery of services for human well-being? Can we distinguish the amount of care we devote to a species rich coral reef and a species poor coral reef if they are both economically and socially providing very similar services?
- **Identify general barriers to the delivery of integrated and holistic approaches to ecosystem management (e.g. sectorally based policies);** we need to be clear about but avoid going over old ground (such as lack of evidence, difficulty with language, lack of political/business clout). We could explore e.g., how we can get people to work together better as they need to in new ways and organisations to fulfil this approach – what stops them or what can we do to enable / encourage them?
- **Provide clarity for policy makers and practitioners on the relationship between various approaches and frameworks, and the tools used to deliver them**; Cut through differences in terminology to identify the overlap and complementarity between the commonly used approaches, frameworks and tools; - Different approaches will be set out for everyone to be on the same "page" at the beginning of the session. Are differences in approach actually a problem for delivery? We all talk different languages and have different "takes" on problems – is this an issue here? Might a diversity of approaches be a good thing? What can we do to help various methods to become more mutually reinforcing whilst retaining the individuality of them where this is important to different stakeholder groups (recognising that "invented here" can increase buy-in significantly).
- **Challenge traditional thinking and sectoral divisions to develop practical guidance on implementing integrated and holistic principles and practices across sectoral boundaries**;

Detailed issues likely to emerge were thought to include:

- Making non-monetary values count in decisions. Where does “innate” value play in? How can we ensure decisions are made on the whole story whilst the evidence is incomplete or comes in different forms?
- Payments – What’s the state of the art view on who pays/gets paid, how mechanisms can work with the minimum of governance, and how to avoid further market distortions in their implementation (just setting up “new” subsidies). Are payments for ecosystem services a viable option?
- Who are people in this field talking to? Are climate change people talking to biodiversity people or water people? How do communications channels push this into research, government, etc. What is working and how do we strengthen the most effective channels?
- Can we make timescales and approaches work? How does this careful, considered thinking work in an often very fast moving, politically driven decision making environment? Is it possible to make decision makers “stop and think”? What has been the impact of efforts to date such as Sibthorp, IUCN, CBD, Defra and TEEB?

To deliver these objectives in a practical way they can be framed around particular problems of current relevance by identifying evidence gaps and opportunities for application, for example, catchment management (with special reference to water quality, supply and flood risk), biodiversity loss, climate change, human well-being, aid for environment, distribution of costs and benefits from ecosystem services.

The structure of the seminar is outlined later, the powerpoint presentations and subsequent written contributions made by contributors and notes from breakout discussion sessions are in the Annexes to this document.

APPENDIX FIVE

Analysis of questionnaires as part of Cirencester workshop

Original questions:
1. What do you think are the main barriers to delivering a more integrated approach to the management of the natural environment and the human economy?
2. Is an integrated approach universally preferable? What are the circumstances and examples where a different approach to environmental management are more effective?
3. What are the outstanding evidence and policy needs to achieve enhanced human well-being from better management of the natural environment?

Outstanding evidence and policy needs:
B=behavior, C=communications, I= information, T=tools

(C) large scale projects well communicated
(B) long term/non-sectoral thinking
(B) improved integration of EA and land use planning
(B) inter-sectoral cooperation
(I) Evidence on process how ecosystem influences human well-being/health
(I) knowledge of human behaviour
(T) valuation beyond traditional economics
(B) how government departments achieve a balance between conflicting objectives
(B) Change attitudes from material wealth to wider well-being
(B) willingness for sectors to work together
(C) targeted support for different audiences
(I) Fear of uncertainty
(I) Lack of recognition of traditional knowledge systems
(I) Risks/costs of inaction in increasingly over-exploited environments
(I) data on impacts of individual activities on ecosystem services
(I) Horizon scanning for emerging issues e.g. pollinators
(T) Business case for new approaches to land/water management
(T/I) Better mapping of sea floor, understanding of marine ecosystem
(I) Sustainable fisheries
(B) Better integration of levels of certainty and risks, no regrets decisions
(T) PES
(I)Value of many small scale projects providing cumulative contribution to ecosystem services

Barriers

- Greater understanding of underpinning role of natural environment for economy and society – hidden costs of current activities eventually will have to be paid
- Lack of understanding and knowledge among many stakeholders
- Link between instruments and benefits to individuals/community not always obvious
- Short-term thinking

- Lack of data to enable economic valuation of ecosystem services, absence of PES
- Limited engagement if key decision makers in gov and private sector
- Uneven scientific evidence
- Lack of skills to take decisions to achieve multiple objectives
- Lack of knowledge of trade-offs and unintentional consequences
- Single issue organisations with vested interests
- Embedded cultural resistance to change
- Lack of interdisciplinary training
- Language not easily accessible by non-specialists
- Uncertainty in the impact of management including thresholds
- Land ownership focused on single/limited outcomes
- Lack of non-monetary evaluation models
- Sectoral thinking limited decision-making training
- Lack of incentive for soft engineering (simple) solutions through participatory process (if cheap then no money to distribute). Budgetary constraints
- No money where biodiversity is/no biodiversity where money is
- Inconsistency in development partner priorities (short v long term)
- Market-driven/demand-driven economics
- Lack of bottom-up community engagement
- Complexity of connections and interactions/impact unlikely to be immediately apparent or obvious to all
- Beyond ‘common sense’ nature of issues make them politically intractable
- Political trend that economic growth (Traditionally) pre-requisite to problem solving
- Multiple scale nature of issues
- Disconnected regulation
- Failure to recognise why natural environment in trouble?? Who pays for remedies
- Limited ownership of marine resources.
- Technology barrier little recognition of problem with current approaches
- Integrated approach universal?
- Generally all circumstances – only number of different elements varies
- Except in some dominating issues e.g. prime agricultural land/flooding, or lack of knowledge/evidence
- Also need stick and carrot combination
- Not if sectoral approach yields greater overall benefits
- Linked information may be better to have precautionary/adaptive approach
- Except that some marine systems so damaged/altered that ‘one step at a time’ probably better (but fisheries needs to be integrated)
- Depends on scale (global YES, single field NOT necessarily)
- Isolated actors may contribute greater, wider benefit
- Path to integration not straight!
- Practically may demand different approach

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ACRONYMS USED IN THIS DOCUMENT

BES/BRAG British Ecological Society Biodiversity Research Advisory Group
CAP Common Agricultural Policy
CBD Convention on Biological Diversity
DEFRA Department of Environment, Food and Rural Affairs
EIA Environmental Impact Assessment
ICZM Integrated Coastal Zone Management
IPBES Intergovernmental Platform on Biodiversity and Ecosystem Services
IPCC Intergovernmental Panel on Climate Change
IRBM Integrated River Basin Management
IUCN International Union for Conservation of Nature
IWRM Integrated Water Resources Management
LWEC Living With Environmental Change
MA Millennium (Ecosystem) Assessment
MSP Marine Spatial Planning
MSFD Marine Strategy Framework Directive
NCI Natural Capital Initiative
NEA National Ecosystem Assessment
NEWP Natural Environment White Paper
NFU National Farmers Union
NGO Non-Governmental Organisation
ONS Office of National Statistics
PES Payment for Ecosystem Services
RGS Royal Geographical Society
SDG Sustainable Development Goals
TEEB The Economics of Ecosystems and Biodiversity
WCMC World Conservation Monitoring Centre
WFD Water Framework Directive