



Applying an ecosystems approach to land use

Information Note

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Information Note

1. Introduction

This Information Note encourages greater application of an ecosystems approach in decision-making processes affecting land use. It is a first step towards delivery of the proposal in the Scottish Government's Land Use Strategy to demonstrate how an ecosystems approach might be taken into account in relevant decisions made by public bodies, to deliver wider benefits.

It supports the Scottish Government's purpose - to create a more successful country, with opportunities for all of Scotland to flourish, through sustainable economic growth. It also contributes to the objectives of climate change legislation and the development of a low carbon future.

The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.

(The Convention on Biological Diversity, 1994)

We wish to integrate the principles of an ecosystems approach to promote improved decision-making. Our ecosystems provide many services, such as food production, water and flood regulation, carbon capture and recreation. With measures to sustain these services and recognition of their value to our economy and to our health, the Land Use Strategy can help ensure long-term prosperity for Scotland and other communities across the country.

The focus of this information note is terrestrial ecosystems but we recognise that the approach is also applicable in the marine environment. Examples are given in section 8 of the application of an ecosystems approach in Scotland and other parts of the UK. We believe that there is potential for greater use of an ecosystems approach to improve decision-making, increase the quality of our natural environment, and enhance the value which we obtain from it. A quality natural environment is one of the foundations of a successful and prosperous nation, and at a local level it can have significant impacts on the welfare and health of communities. Adopting an ecosystems approach allows us to contribute to a high quality natural environment through a wide range of decisions and actions.

2. Explanation of an ecosystems approach

An ecosystems approach is a set of principles that can be applied to any plan or decision that may positively or negatively affect the environment, whether directly or indirectly. It is about making sure that we recognise and sustain the benefits provided by the environment whilst delivering other economic and social goals. The steps needed to implement an ecosystems approach can be summarised in three main principles:

a) Consider natural systems – by using knowledge of interactions in nature and how ecosystems function. For example - how changing water temperature affects fish species; how grazing animals or fertilizing crops changes the balance of plant species; or how species interact through competition and predation. This implies a need to consider the broad scale as well as the local; and the long-term as well as the immediate. Ecosystem function often shows a capacity to accommodate some change, but a significant impact may result when a threshold is crossed and capacity exceeded.

b) Take account of the services that ecosystems provide – including those that underpin social and economic well-being, such as flood and climate regulation, resources for food, fibre or fuel, or for recreation, culture and quality of life. For example:

- The likelihood of floods affecting people's homes depends in part on how the land is used in the surrounding catchment
- Everyone's food resources depend on clean water and productive soils
- Our quality of life is enhanced by pleasant surroundings for work and leisure

All these services are supplied by our ecosystems. There are ways to account for some of these services using economic and other measures to inform policy and consider offsetting or mitigation.

c) Involve people – those who benefit from the ecosystem services and those managing them need to be involved in decisions that affect them. Their knowledge will often be central to success. Public participation should go beyond consultation to become real involvement in decision-making.

3. How an ecosystems approach may benefit decision-making

The Millennium Ecosystem Assessment, a UN-sponsored study of ecosystems at a global scale, highlighted the effects that human activities have had on the world's ecosystems and on the public benefits that ecosystems provide. A recent international report '**The economics of ecosystems and biodiversity**' has said '**Ecosystems don't depend on economies but economies depend on ecosystems**'.

Describing the potential effects of plans or decisions on ecosystem services, and the economic and social consequences of these, helps to integrate and align economic, social and environmental policies. It may also help the public to engage better with decision-making by reflecting how they value places and by explaining the consequences of environmental impacts.

Though we have always valued some services from the environment (food and other resources such as timber), we have taken many ecosystem services for granted and not fully factored them into our decisions. For example:

- **Coastal protection** by saltmarsh, mudflats, beaches and dune systems
- **Flood mitigation** by woodlands, peatlands, wetlands and soils
- **Carbon capture and storage** in biomass, peats, soils and sediments
- **Water quality** through soil processes and natural filtration
- **Soil fertility** through microbial biochemistry and decomposition
- **Natural beauty** from the diversity of vegetation and wildlife

All these (and others) contribute to human wellbeing and community health. In addition they have real economic value both directly and indirectly through the economic activities they underpin or protect.

Considering the potential impact of decisions which might inadvertently have an impact on these services allows us to ensure they are maintained. It may also allow us to increase the way in which the natural world benefits us and reduce the extent to which we need to take (often costly) action to prevent deterioration or avoid potentially catastrophic change.

4. What kinds of decision-making processes is it relevant to?

Adoption of an ecosystems approach can help ensure that any decision which has the potential to have multiple impacts on the natural environment (e.g. on water quality as well as soil fertility, crop yields as well as biodiversity) is taken with the knowledge of the indirect as well as the direct effects.

It can be used in any situation where the natural environment is affected or managed and can be applied at all scales:

- **At a local scale**, e.g. a masterplan for a new housing development, a windfarm, a forest design plan, a sustainable urban drainage scheme, a marine Natura site, a fishery, a local nature reserve
- **At a regional scale**, e.g. a National Park, the Central Scotland Green Network, a river catchment, a development plan, a Forest and Woodland Strategy
- **At a national scale**, e.g. the National Planning Framework, Climate Change Adaptation Framework, agriculture strategy, forestry strategy
- **At an international scale**, e.g. a North Sea fishery plan

At a local scale, a decision should consider ecosystem function on a small area and any impacts on factors such as hydrological flows and habitat networks. In coastal settings, the impacts on natural processes of erosion and build up of sediment may need to be considered. These impacts should include cumulative effects if there are a number of similar projects close together. Decisions on a small area can impact on the delivery of ecosystem services over a wider area, and can be very significant to some cultural services such as recreation and landscape character. For local decisions, a local level of consultation will often be appropriate.

At a regional scale, ecosystem function should be considered across the decision or plan area, to build an understanding of the present health of ecosystems. If the plan is for one type of habitat, such as forestry, the interactions with other habitats should be considered. Understanding the ecosystem benefits enjoyed by the economy and communities in the area will help the plan respond to key vulnerabilities and opportunities. For example, areas that should be protected and enhanced to improve flood protection could be identified.

National and wider area plans will often focus on more strategic issues, and can still employ an ecosystems approach. The consideration of ecosystem function and services will be at a higher and more summary level. Strategic issues may be identified, such as the overall level of forest cover or the need to mitigate and adapt to climate change. Principles for use in regional and local planning may be identified as well as gaps in ecosystem service provision, such as access to green space. Consultation will be with interested parties on the broad strategic direction.

Many environmental policies already reflect aspects of an ecosystems approach. Examples are given in the box below:

- **Forestry and Woodland Strategies** (which used to be called Indicative Forestry Strategies) have been produced by many local authorities. These Strategies set out a vision, policies and plans for the future of woodlands and forestry in their area. They are prepared with the participation of all key stakeholders, and they guide the future expansion and restructuring of woodlands to maximise the benefits for the local economy, communities and environment. By guiding new planting to the most appropriate locations these strategies help to reduce conflict over proposals, and ensure that the benefits of grants for new planting are maximised.
- The **European Water Framework Directive** represents an enormous step forward in the way that Europe's rivers, lakes, estuaries, coastal waters and groundwater are protected and enhanced. Its ecological objectives and the introduction of River Basin Management Planning means that the management of the water environment takes account of aquatic ecosystem function and is joined-up and sustainable. In addition, the costs and benefits of ecosystems services can be taken into account in decision-making and in setting environmental objectives.
- Many urban regeneration initiatives such as the **Central Scotland Green Network**, a national priority in Scotland's National Planning Framework, apply sustainable development principles. These principles recognise the interconnectedness between the environment, people and the economy, and take account of ecosystem function and the potential impact from development. As part of pursuing sustainable development it helps, therefore, to adopt an ecosystems approach.

5. The practical challenges of using an ecosystems approach

Our goal is to know enough to manage and protect ecosystems effectively, in order to take the best decisions possible based on the current evidence. We expect plans and decisions to be made quickly and efficiently as our pressing needs, for example for new homes and infrastructure and for green energy, will remain.

Dealing with competing expectations and conflicting priorities is an inevitable part of decision-making. For example, maximising some ecosystem services, such as hydropower or timber production, may negatively impact on recreational or conservation goals. There are also important and precious biodiversity resources that cannot be described in terms of ecosystem services. An ecosystems approach will help identify the key issues, evaluate the impact of the decisions and balance priorities.

Many public agencies are facing tough funding constraints with very limited resources for new or more resource intensive processes. Developing the skills public bodies will need to apply an ecosystems approach and addressing significant gaps in our knowledge of how ecosystems work will take time.

We acknowledge that there are data availability and analytical capacity issues that will affect the ability of some processes to consider all aspects of an ecosystems approach in detail. However, it is not unusual in decision-making processes to have factors that can be described but not fully quantified or valued. It is still valuable for decision-makers to have access to the available information and the range of uncertainty attached to it.

So, while we encourage public bodies increasingly to make plans and decisions based on an ecosystems approach, we recognise the challenges in doing so. We aim to support decision-makers in meeting these challenges through the government's research programme and the development of guidance. Helpful information is already available and a useful list of resources can be found in section 9 of this document.

6. Scottish Government research programme and policy development

In light of these challenges, the Scottish Government and a number of agencies are exploring an ecosystems approach through research and project work. Whilst we expect research to enhance our understanding and provide the evidence needed to enhance the techniques, guidance is already available. Scottish Natural Heritage (SNH) is looking at how an ecosystems approach can be used in the Central Scotland Green Network; in a national ecological network; in marine protected areas; and in landscape scale restoration work. The Scottish Environment Protection Agency (SEPA) is developing an ecosystems services approach in relation to environmental risk assessment and management. The James Hutton Institute, responding to Scottish Government coordinated initiatives, will lead the development of the research foundation for ecosystems based policy and decision-making. The Forestry Commission has undertaken research looking at the contribution forestry makes to ecosystems and how this can be valued.

Long term environmental monitoring data held by SEPA, SNH and others will inform the developing ecosystems approach in specific areas, especially in considering impacts on ecosystem services. For example, the Centre for Ecology and Hydrology is looking at Loch Leven and how environmental modification and pollution have disrupted the ecosystem services it provides.

The Scottish Government has set out its Rural Affairs and Environment Strategic Research programme for 2011-2016, working in partnership with five research organisations: James Hutton Institute (forming on 1 April 2011 by merging the Macaulay Land Use Research Institute and the Scottish Crop Research Institute), Moredun Research Institute, Rowett Institute of Nutrition and Health, Royal Botanic Garden Edinburgh and Scottish Agricultural College. The research is organised as two programmes: 'environmental change' (including ecosystem services, water and energy sources and land management) and 'food, land and people' (including food supply, animal and plant health and vibrant rural communities). With the UK-wide National Ecosystem Assessment (due to report later in 2011), there will

be increasing advice and experience to support the adoption of an ecosystems approach for land use policy and decision-making.

7. An ecosystems approach and Strategic Environmental Assessment

For public bodies who wish to make greater use of an ecosystems approach without adding complexity to existing plan and policy making processes, Strategic Environmental Assessment (SEA) may provide a pragmatic means to do so. However, it is important that this is managed in such a way as to ensure the SEA still meets the statutory requirements of the Environmental Assessment (Scotland) Act 2005.

By its nature, a well conducted SEA is likely to encompass an ecosystems approach. Many assessments have already considered the services provided by ecosystems such as regulating flooding or the provision of water. SEA is concerned with the environmental effects of plans and policies and the interactions between these and provides an opportunity to account for the natural processes within ecosystems. An ecosystems approach should therefore complement SEA without considerable additional effort. Involving those who benefit from ecosystem services is a key principle for an ecosystems approach and also fits well with SEA requirements for early and effective engagement with members of the public.

A focus on an ecosystems approach can add value to the SEA process. For example, a better understanding of ecosystem function should enhance the evaluation of environmental effects. An ecosystems approach emphasises the need to consider the limits of finite natural resources and services and could therefore help to identify the significance of effects as well as synergistic and cumulative effects, both important aspects of SEA where there is scope for improvement in current practice.

8. Examples of how an ecosystems approach is being applied: case studies

Scotland

Land use management: an ecosystems approach

LandsFACTS

Assessing ecosystem services by creating scenarios of cropping systems and land uses from the farm level up to the regional scale.

<http://www.macaulay.ac.uk/LandSFacts/>

Mapping and modelling ecosystem services in land systems

Examining relationships between ecosystem services and land systems for north-east Scotland.

<http://iopscience.iop.org/1755-1315/6/34/342009>

Future Landscapes: Climate Change Scenarios, Land Capability and Land Use Scenarios

Exploring future drivers and options for landscape change through scenario analysis.

<http://www.programme3.net/rural/rural38climateLCLUSCCS.php>

Collaborative Deer Management

A case study that has focussed on collaborative management of deer at a scale appropriate to the natural resource, utilising participatory methods and being inclusive of a wide range of stakeholders.

<http://www.macaulay.ac.uk/RELU/>

http://www.macaulay.ac.uk/RELU/dg_poster.php

PROBECO

Investigating the inter-relationships between biodiversity at different biological levels in Scots pine woodlands.

<http://www.macaulay.ac.uk/PROBECO/Index.html>

Cairngorms National Park Plan – implementing an ecosystems approach

The Cairngorms National Park Authority will use an ecosystems approach to identify priorities and opportunities for management as they develop their new National Park Plan.

www.cairngorms.co.uk

Freshwater management and marine: an ecosystems approach

Lunan Water project

Improving our understanding of water management issues through integrating scientific and local knowledge.

<http://www.macaulay.ac.uk/lunan/>

Tarland Catchment Initiative

Managing the catchment sustainably to improve the quality of the catchment's water resources.

<http://www.macaulay.ac.uk/tarland/aim.html>

Coasts@Macaulay

Protecting coastal resources and proposing mitigation measures against impacts in collaboration with relevant partners and communities.

<http://www.macaulay.ac.uk/coast/index.php>

The Scottish Sustainable Marine Environment Initiative Clyde pilot

Aiming to gain an understanding of the nature, value and management needs of Scotland's marine environment and to identify alternative management approaches

<http://www.clydeforum.com/ssmei/index.php>

Irish Sea Pilot project

Testing the potential for an ecosystem approach to managing the marine environment at a regional sea scale.

<http://www.jncc.gov.uk/page-1541>

Value and economic development: an ecosystems approach

Proposed Galloway and Southern Ayrshire Biosphere

This proposal for UNESCO Biosphere status aims to unlock opportunities for economic development, regeneration and capacity building, based around the natural assets and talents in the communities and individuals within the area.

<http://www.gallowayandsouthernayrshirebiosphere.org.uk/>

Valuing Nature Network – a network launched in 2011 for Valuing Biodiversity, Ecosystem Services and Natural Resource Use is being established to scope, develop and promote research capacity in the valuation of biodiversity, ecosystem services and natural resources.

<http://www.valuing-nature.net>

The **Rural Economy and Land Use Programme (RELU)** aims to advance understanding of the challenges caused by change in rural areas. They produce a range of information resulting from their research programme including the policy and practice notes such as the following study of water catchment management.

Catchment management for the protection of water resources: The Ecosystem Health Report Card

<http://www.relu.ac.uk/news/policy%20and%20practice%20notes/Smith/Smith%20PP7%20final.pdf>

Public attitudes to biodiversity

Understanding how people perceive and understand the natural environment and how they would like to see it managed.

<http://www.macaulay.ac.uk/pabd/>

Wales

Welsh Case Studies

A range of case studies which demonstrate an ecosystems approach in Wales.

<http://wales.gov.uk/topics/environmentcountryside/consmanagement/nef/casestudies/?lang=en>

England

Natural England pilot projects

Natural England recently launched three projects to demonstrate the way in which Ecosystem Services can be placed at the heart of land and water management in the landscape.

<http://naturalengland.etraderstores.com/NaturalEnglandShop/NE225>

Parrett Catchment and other case studies

The Management of the Parrett Catchment, Somerset is a case study which shows how specific tools and methodologies were developed to manage the Parrett river catchment.

<http://www.defra.gov.uk/environment/policy/natural-environ/research/case-studies.htm>

East of England Pilots

This project looked at methods for valuing ecosystems services and identifying implications for a range of policy areas within five regional or local case study areas including: Marston Vale, Blackwater Estuary, Cambridgeshire Fens, Great Yarmouth and Greater Norwich.

http://www.sustainabilityeast.org.uk/index.php?option=com_content&view=article&id=6:december-2009-valuing-ecosystem-services-in-the-east-of-england&catid=5:latest-news&Itemid

9. Information and data resources

The **12 principles of the ecosystems approach** according to the Convention on Biological Diversity.

<http://www.cbd.int/ecosystem/principles.shtml>

The **Millennium Ecosystem Assessment** a global UN study that assessed the consequences of ecosystem change for human wellbeing.

<http://www.maweb.org/en/index.aspx>

The **Economics of Ecosystems and Biodiversity** study provides an economic case for the conservation of ecosystems and biodiversity.

<http://www.teebweb.org/TEEBSynthesisReport/tabid/29410/Default.aspx>

The UK **National Ecosystem Assessment** is the first analysis of the UK's natural environment in terms of the benefits it provides to society and continuing economic prosperity.

<http://uknea.unep-wcmc.org/>

UK Government's Ecosystem Approach, which it is currently aiming to embed an ecosystems approach following the recommendations of the Millennium Ecosystem Assessment.

<http://www.defra.gov.uk/environment/policy/natural-environ/change/government.htm>

A Defra guide for policy makers on an ecosystems approach.

What nature can do for you: a practical introduction to making the most of natural services, assets and resources in policy and decision making

<http://www.defra.gov.uk/environment/policy/natural-environ/documents/nature-do-for-you.pdf>

The **Right Tree in the Right Place** provides advice to planning authorities who are producing Forestry and Woodland Strategies.

[http://www.forestry.gov.uk/pdf/fcfc129.pdf/\\$FILE/fcfc129.pdf](http://www.forestry.gov.uk/pdf/fcfc129.pdf/$FILE/fcfc129.pdf)

Further information on **river basin management planning**

http://www.sepa.org.uk/water/river_basin_planning.aspx

The **Central Scotland Green Network** is included in National Planning Framework 2 as one of 14 National Developments considered by Ministers to be essential elements of the strategy for Scotland's long term development. It will help deliver a step change in environmental quality, woodland cover and recreational opportunities and make Central Scotland a more attractive place to live in, do business and visit; help to absorb CO₂; enhance biodiversity; and promote active travel and healthier life styles.

<http://www.centralscotlandgreennetwork.org/>

Sustaining Nature's Services: How Scottish Natural Heritage is adopting an ecosystems approach.

http://www.snh.gov.uk/policy-and-guidance/policy-documents/document/?category_code=Policy&topic_id=1475

Living Landscapes, the Scottish Wildlife Trust's policy on working towards ecosystem-based conservation in Scotland.

http://www.swt.org.uk/docs/002_050_publications_Policy_Futures_Series_1_Living_Landscapes_1292841506.pdf

LandscapePartners

Exploring the contribution of multi-stakeholder partnerships to sustainable landscape management.

<http://www.macaulay.ac.uk/LandscapePartners/>

Copenhagen 2009

Raising the profile of the Ecosystem Approach to tackling climate change mitigation and adaptation, poverty alleviation, disaster risk reduction, biodiversity loss and many other environmental issues.

<http://www.macaulay.ac.uk/copenhagen/>

Living With Environmental Change: a partnership spanning research councils, government and business. The programme connects natural, engineering, economic, social, medical, cultural, arts and humanities researchers with policy makers, business, the public, and other key stakeholders. It aims to help ensure the UK provides international leadership and solutions to the challenges faced during this crucial period, and provide the knowledge and tools to make informed choices about the future.

<http://www.lwec.org.uk/>



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