Natural Capital Initiative

Linking Environment & Policy

Valuing Our Life Support Systems

April 29 - May 01 2009

Symposium Report

INSTITUTE OF BIOLOGY

Centre for Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL

British Ecological Society

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Background

We all depend on our environment for the supply of our basic needs; air to breathe, water to drink, food to eat and the physical world to sense. We constantly draw upon the products of this 'natural capital' but how can we value it in a way that usefully informs policy, planning and development processes? The benefits which we derive from natural capital are often called 'ecosystem services', and the 'ecosystem approach', which aims to value different elements of natural capital, has been proposed as a framework for development decisions, policy-making and delivery.

The Natural Capital Initiative (NCI) was formed by the Institute of Biology, the Centre for Ecology & Hydrology and the British Ecological Society to create a forum for constructive discussion about our ecosystems and the services they provide, in order to find ways to connect the needs of our communities with the sustainability of our resource use. NCI aims to involve the natural, social and economic sciences as well as the public, private and non-governmental sectors, and to bring relevant debates into the public domain. We believe that whole ecosystems and all the valuable services they provide, our 'natural capital', *can* be considered in decision-making.

Valuing our life support systems symposium

Our first event, the 'Valuing our life support systems' symposium, comprised a day of keynote presentations from leading experts followed by three separate facilitated workshops focusing on Rural Land Use, Urban Planning and the Marine Environment respectively.

In the light of discussions at that symposium, we propose a range of options and issues for policymakers, communicators, researchers and business to consider. These are outlined below. The background presentations and discussions are documented in the appendices to this report.

www.naturalcapitalinitiative.org.uk

Key messages

To policy makers and planners:

- There is a pressing need for systems which act across government to integrate and harmonise departmental policies. Because ecosystem services are the foundation of much of our economic well-being our public policies must safeguard them against unsustainable use.
- Both natural capital and social capital need to be supported. Having a stake in society better equips people to recognise and respond to the environment and treat it with respect. Lowering of social capital may also endanger natural capital.
- Integration of ecosystem valuing mechanisms into fiscal policy and departmental targets is possible. HM Treasury is well positioned to assist with this.
- Valuation of ecosystem services should be by economic and non-economic means. Economic value alone will not provide the quality of services we seek and simple market mechanisms may produce unintended consequences. Clear policy priorities will be needed to guide decisions which cannot rely on fiscal measures alone.
- To meet the urgent need for solutions to some problems it may not be practical to wait for perfect knowledge. Pilot programmes based on science-informed common sense could be facilitated. The planning consent process should develop review mechanisms and adaptable policy tools to capture learning.
- Ecosystem services underpin human health and well-being so fundamentally that health science and opinion should occupy a strategically important position in policy development, planning and implementation.
- Improved integration of science and policy across all sectors is necessary to give a seamless transition between urban, rural, freshwater and marine planning. There should be greater emphasis on landscape-scale planning.
- An ecosystem service-based advisory system could be developed and made available to farmers and other land managers. It would need to be flexible and adaptive, and to include advice on optimising ecosystem services.
- Planners must recognise the importance of ecosystem services in urban zones and protect and extend wherever possible biodiverse areas of urban environments.
- Consideration should be given to the global consequences of national policies.
- We would like to promote the idea that ownership of environmental assets carries a responsibility to optimise, in perpetuity, the value of the ecosystem services they can provide.

To communicators and educators:

- We need to combat the idea that economics and the environment inhabit different universes.
- Conservation of nature is often seen as in opposition to lifestyle aspirations. It is important to change that perception.
- There is a growing and worrying disconnect between significant sections of society and their environment. This should be addressed. By failing to recognise the reality of our absolute reliance on ecosystem services, many do not realise that it is in our self-interest to preserve them.
- Well communicated case studies are a good way to promote the value of an ecosystem approach. Positive, practical and realistic messages about how society interacts with ecosystems can help to communicate value.
- We need a new, more accessible language to talk about our natural capital and the ecosystem approach.
- The cultural value of ecosystem services is underestimated and we need to do more to re-emphasise our spiritual connection to nature. The arts inspire awareness of the beauty and importance of our environment; we need to value and foster this.

To researchers:

- New tools must be developed to include ecosystem services in decision-making.
- Arts and humanities researchers should be more involved in developing valuation tools.
- It is important to increase recognition of the dangers of deforestation. We need to develop a robust formula which can put a value on maintaining forests.
- Collection, collation and integration of data sets are essential in order to facilitate and underpin joined-up environmental impact assessments.
- We need a better understanding of the links between human well-being and ecosystem services. Both case studies and data are required.
- The involvement of funders is crucial in the generation of new data, the development of new policy tools and the dissemination of information.
- Spatial maps and models should be generated to inform management of our natural capital at a national level and the national planning framework. This should provide a comprehensive, high resolution, spatially explicit environmental asset inventory at sufficient resolution (no coarser than 1:25,000) to provide a good basis for models and decision-making tools.
- We should develop 'Urban Ecosystem Maps' which illustrate local knowledge and link local people with cultural ecosystem services as well as illustrating the value of green space, water table management and other ecosystem elements.

To business leaders:

- There is good reason to think that consumers, business and government all desire better resource management. Business should not be reluctant to take the initiative, and government should not fear a lack of public will.
- Businesses can benefit by taking responsibility ahead of waiting for government to do so. By taking the initiative a business can gain strong customer loyalty.
- There are multiple benefits from agriculture but farmers are motivated by their markets. We need to find ways to measure and communicate the value of those other benefits to their marketplace.
- The unpredictability of supply associated with unsustainable exploitation of natural resources is a risk to business.
- We need entrepreneurs who create and promote opportunities for sustainability and are seen to be earning as a result of it.

Symposium speakers

Chair
Fiona Fox (Science Media Centre)

The ecosystem approach and its importance in decision making
Prof Gretchen Daily (Stanford University, USA)
Prof Bob Watson (Department for Environment, Food and Rural Affairs)

Ecosystem services and health
Prof Sir Mark Walport (Wellcome Trust)

Water resources
Prof Maggie Gill (Rural Affairs and Environment, Scotland)
Barrie Clarke (Water UK)

Energy, transport and impacts of climate change
Rt Hon Elliot Morley MP (Energy and Climate Change Select Committee)
Prof Lord May of Oxford (Climate Change Commission)
Richard Brown (Eurostar)
Gearóid Lane (Centrica)

People and their environment
Prof Nick Pidgeon (Cardiff University/Economic and Social Research Council)
Prof Philip Esler (Arts and Humanities Research Council)
Prof Paul van Gardingen (Edinburgh University)

Agriculture food and land use
Helen Phillips (Natural England)
Lucy Neville-Rolfe (Tesco plc)
Andrew Clark (National Farmers Union)

Science and policy challenges
Prof John Beddington (Government Chief Scientific Adviser)
Graham Wynne (Royal Society for the Protection of Birds)
Prof Andrew Watkinson (Living with Environmental Change)
Prof Mark Bailey (Centre for Ecology and Hydrology)

Delegates attending were drawn from government and parliament, NGOs, public agencies and committees, research and business.

Workshops

- **Balancing our options for rural land use. Food, biodiversity, sustainable biofuels and flood prevention.**
  Baroness Barbara Young (British Trust for Ornithology)
  Prof Tim O'Riordan (Sustainable Development Commission)
  Prof Chris Pollock (Aberystwyth University)
  Prof Philip Lowe (Rural Economy and Land Use Programme)
  Prof Michael Winter (Centre for Rural Policy and Policy Research)
- **The urban planning system.**
  Prof Tim O'Riordan (Sustainable Development Commission)
  Pat Willoughby (David Lock Associates)
  Prof Roy Haines-Young (University of Nottingham)
  Prof Mark Tewdwr-Jones (University College London)
- **Sustainable use of the marine environment.**
  Prof John Shepherd (National Oceanography Centre)
  John Clorley (Department for Environment, Food and Rural Affairs)
  Gero Vella (Renewable Energy Systems and Centrica Energy)
  Dr Melanie Austen (Plymouth Marine Laboratory)

Many of the presentations accompanying these talks can be viewed via the Natural Capital Initiative website www.naturalcapitalinitiative.org.uk and key points are outlined in Appendix 1 of this report. All recommendations offered from plenary and workshop sessions were considered and the key messages summarised. The proceedings of the three workshops are recorded in Appendix 2 of this report.

Facilitation and recording for workshop breakout sessions was provided by Graphic Science Ltd.

Aims of the Natural Capital Initiative

Our objective is to highlight the importance of ecosystem services and to inform the government implementation of ecosystem approach.

We aim to do this by:

- creating a forum for debate that is independent and inclusive (industry, business, public sector, NGOs, academia, local & national government, agencies and the wider publics).
- identifying gaps in science, policy and its implementation and facilitating the debate about how to address these gaps.
- engaging the public and inspiring the next generation.

NCI Steering Group Members

Prof Rosie Hails MBE (Chair)	Centre for Ecology and Hydrology
Dr Barbara Knowles	Institute of Biology
Prof Jim Harris	Cranfield University
Prof Paul Leonard	Environmental Consultant
Prof Hugh Montgomery	University College London
Dr Catherine Martin	Institute of Biology
Dr Laura Bellingan	Institute of Biology
Ceri Margerison	British Ecological Society
Kate Groves	Centre for Ecology and Hydrology
Lucy Futter	Science Council

Proceedings of Day 1

Key Messages from Speakers

Ecosystem Services in Decision Making

Prof Gretchen Daily – Stanford University (video presentation)

- Leaders need to use new tools to help them factor natural capital into decision making.
- Conservation is often perceived to be in conflict with human aspirations. We need to change that. We can do this by using case studies as examples of conservation having a positive impact on the economy, health and lifestyle of a society e.g. New York's restoration of the Catskills Delaware watershed which provides water for the city.
- We need to move beyond biodiversity as the major conservation focus and to factor in ALL our life support systems There are models other than biodiversity that we can use e.g. provisioning models, regulating services (pollination, flood control), and cultural services (spiritual values and social relations).

The Importance of the Ecosystems Approach

Prof Bob Watson – Defra (Department for Environment, Food and Rural Affairs)

- A UK-wide National Ecosystem Assessment (NEA) has been initiated.
- We need to recognise the importance of damage prevention (e.g. of coastal infrastructure, wetland and dunes) and to acknowledge the true value of ecosystems, not just economic value.
- We need to include ecosystem services which are not in the marketplace and avoid being bounded by what is already or readily in a marketplace. We must recognise non-use value.
- We need an integrated system working across governmental departments and international organisations, bringing all environmental sectors together e.g. air quality, water quality, biodiversity.
- We need to invest in our ecosystems – rebuilding the watersheds; paying farmers to maintain and build ecosystem services, and we should consider applying fees, taxes and tariffs to activities that degrade biodiversity.
- Need to work across government departments and internationally with other governments, and across sectors.
- Climate change is ONE influence on biodiversity, but not yet nearly as great as it will become.
- Are terrestrial and marine protected areas large enough and do they provide sufficient functional connectivity?
- In the international arena we need to get trade agreements and tariffs right.

Audience Questions

- The audience was concerned about how we talk to ministers and encourage them to instigate institutional change.
- Comments indicated a need to aim documents at HM Treasury – ministries like Defra 'get it,' other less so, we must broaden understanding.
- International footprint must also be considered and shouldn't be increased by 'improved' national planning decisions.

Health Challenges

Prof Sir Mark Walport – The Wellcome Trust

- We need to recognise the importance of environmental conservation and species preservation on human health. For example, pollinators are important for crops and therefore vital to our health and nutrition.
- Disease can spread around the world very quickly (e.g. Malaria, SARS and more recently Swine flu). Disease can have an enormous economic impact on society, as we have seen with foot and mouth.
- There is evidence that new diseases are emerging with increasing frequency as our density and interactivity with animals also increases. New and existing zoonotic infections emerge as a major problem.
- Human travel around the globe increases contagion but shutting down international travel could also have deleterious effects and is not an option.
- The coming together of knowledge on human and animal infectious disease is an important development. The Wellcome Trust supports this in order to strengthen disease surveillance and to integrate both human and animal surveillance for early detection. This requires improved communication between human health professionals and animal health professionals.
- There could be enormous health impacts from climate change – for example, flooding after drought produces an abundance of mosquitoes, leading to higher levels of malarial infection. Adaptation and mitigation measures could bring benefits e.g. discouraging indoor cooking on open fires in the developing world by encouraging the use of stoves not only benefits the climate but also people's health by reducing respiratory disease.
- It is now possible to begin predicting outbreaks of rift valley fever by looking at weather effects, which demonstrates the interconnectivity of environmental and health studies. Bluetongue and schistosomiasis are diseases which show altered patterns of prevalence with changing weather patterns.
- Funders need to support new interdisciplinary research, to foster capacity building and to disseminate new knowledge.

- Malnutrition is not just starvation it is also eating the wrong kind of foods (e.g. diet-related cardiovascular disease in the western world)

Audience Questions

- The audience wondered whether the public understand the integration of environment and human health. Prof Walport responded that we can illustrate this link effectively by choosing simple examples.

Water and Marine Resources

Prof Maggie Gill - Rural Affairs & the Environment, Scotland

- The ecosystem services derived from water go well beyond domestic consumption to food and drink, renewable energy, recreation and transportation. Proper management of water resources contributes to flood protection.
- There is more water held in Scotland's soil than in all of Scotland's lochs – 40 billion litres. The Water Framework Directive aims to protect, enhance and restore bodies of surface and ground water.
- There are multiple beneficiaries of clean water – including communities and the economy. We need to integrate conservation and enhancement of natural resources with social and economic objectives.
- We need a better evidence base rather than anecdotal evidence.
- Who should pay? We need further research to explore valuation.

Barrie Clarke – Water UK

- Even in the heart of a city there is a strong connection between man and environment and the value placed on biodiversity remains high.
- We need to get rid of the idea that economics and environment inhabit different spheres
- A sustainable water industry depends heavily on affordability and costs. A 'polluter pays' model doesn't always work.
- Money has already been invested and there are success stories e.g. there are now many otters in England's rivers, but there is still a long way to go.
- Catchment management needs to be cleverer in the future. In the past concrete was poured, we need to do better in the future.
- There is a disconnect in affluent communities between people and water services. People in affluent communities take water for granted. They see it as a right but don't recognise it as a benefit. Benefits have become so familiar that they are not even recognised as benefits any more.
- There is a disconnect between organisations and water services. Although they may depend on water services and recognise this,

they do not see it as their job to get involved.

- Communities would benefit from knowing more about the full impact of waste and pollution.
- We need to attach a real value to the non-economic benefits of ecosystem services. People understand the language of money and markets but that is not the only credible language. People need to gain trust in scientists' expertise.
- We should be careful about how we explain things – it is tempting to think that money is the only language which government and public understand – but is it a business relationship? Economics won't necessarily reconnect the disconnected or restore trust in science. It would be very positive if NCI could develop other valuation mechanisms.
- An article in the *Financial Times* (28.04.09) quoted Andrew Haldane, Executive Director for Financial Stability at the Bank of England as saying that economists needed to learn from ecologists. http://www.ft.com/cms/s/0/572f5f04-3425-11de-9eea-00144feabdc0.html?nclick_check=1

Q&A Panel Discussions

- The audience suggested domestic metering of water, UK policy on permeable surfaces and the use of porous hard standing instead of cement.
- It was noted that 35% of houses in England and Wales have water meters, and that there are examples in Scottish and European laws which help with runoff management.
- There was concern that people will pay large sums for luxury and leisure but resent and find it difficult to understand the need to pay for necessities. The panel suggested that local human stories were a good way of communicating the importance of these resources.
- It was advised that we think long term about catchment management, such as initiating 10 year plans and considering water quality for future generations.
- It was commented that ordinary people respond to empathy not hectoring.

Energy and Climate Change

Rt Hon Elliot Morley MP – House of Commons Energy and Climate Change Select Committee

- Natural capital has never had the attention it deserves.
- We need to recognise the contribution of deforestation towards climate change. There is no proper formula to put a value on avoiding deforestation. This is necessary, for example for the many people who depend on these biodiverse systems, or who are affected by impacts on the water table.
- There are no reserves of forests, wetlands or water. Once it's gone,

it's gone!

- The losses from degradation of natural capital will be annual and ongoing.
- The successor to the present Kyoto Protocol needs to do more. We have exceeded our targets according to the Kyoto Protocol but many countries have not even achieved theirs. The flooding in China was caused by deforestation. China banned logging but imported logs from Cameroon instead. Countries need to think about the impact of decisions on the entire world, not just their own region.
- The link between natural capital and climate change is inseparable and enormous.

Audience Questions

- The audience was concerned that policy initiatives in respect of deforestation, like enhanced Clean Development Mechanisms (CDMs) and Reduced Emissions from Deforestation and Degradation (REDD) cannot re-balance carbon whereas reforestation can. They wondered if reforestation would be on the agenda in Copenhagen.
- EM replied that CDM and REDD will be tools; that CDM is important because coal reserves will be used by those who have them and carbon capture and storage, encouraged by CDM, is a good way of promoting this. CDM has the capacity to deliver currently uneconomic micro-hydro and associated engineering training to developing areas and should not be underestimated as a potential force for change and good.
- There was discussion of public disconnect from essential services and that ownership of particular segments means they are not integrated. EM commented that people have a great affinity for water, that waterways are cleaner now than before and that this has been at a cost which has been accepted. The Water Framework Directive has the scope to involve people in the cleanup of our waterways (biodiversity is now a measure of quality). Moreover, payment based on use is important as some areas of the UK have a lower rainfall than some Asian countries.
- There is a disconnect between the public and developing technologies e.g. water is not only for sustenance it is also a source of power. There was concern however that this was not the top priority of water companies and so government need to drive an integrated approach. EM responded that we need to engage people i.e. through involvement in the clean up of rivers and management of water courses.

Global trends: Impacts on the environment

Prof Lord May – Climate Change Commission

- At the G8 it was confirmed that climate change is real, primarily human associated and deeply serious.
- Climate change is just one of a suite of issues facing humanity.

- The rising demand for water will intersect the declining availability around 2040, according to a CEH study.
- The WWF ecological footprint for energy is very unevenly distributed.
- Tony Blair's first speech after the 1997 election majored on climate change but the record since then has not been so good. The climate change bill was a first but how do we set a target for 2050? We must avoid a greater than 1% risk of a rise above 4oC. We (UK) need a reduction of 80% on 1990 levels. By 2020 we should, in any case, have a unilateral 35% cut. There will be unilateral economic benefits to the UK even if other countries do not follow suit.
- The human population will increase in size, intensifying our impact on water use, land use, food consumption and energy use. We must reach our targets of reduced consumption. We must all do our share. It won't be easy.

Richard Brown – Eurostar

- We must act now, not in a few years time. If the demand for transport continues to rise, transport companies will be unable to reach the target 80% reduction of energy use.
- In the UK, transport is responsible for roughly 25% of greenhouse gas emissions. This is similar throughout Europe. Importantly, it is the only sector where greenhouse gas emissions have been rising over the last decade.
- Transport patterns are difficult to change and decisions made now have long-term effects. We need to make decisions now, not in a few years time, if we wish to influence energy consumption in the medium term.
- People in cars making short journeys make a very large contribution to greenhouse gas emissions – behavioural change can make a big difference.
- It will not be possible to meet the 80% target if the demand for transport continues to rise. We need to break the link which has developed in rich countries between increasing affluence and moving things and people around more!
- Eurostar has asked passengers about reducing emissions in light of the recession; there is continued enthusiasm and a hunger for leadership from business and government/regulators.
- To reduce impact per mode, travel needs to switch from fossil fuels to electricity. Eurostar make all journeys carbon neutral by off-setting CO_2.
- Businesses have to take responsibility instead of waiting for government. If you get in first, you will gain stronger customer loyalty. Consumers are ahead of business and business is ahead of government so don't be afraid to get business involved.
- Consumers are not happy to stop at carbon, there are other

environmental and social impacts to be tackled and there is a benefit to addressing these.

- Politicians will be pushing at an open door if they advance regulation in this area.

Gearóid Lane – British Gas New Energy, Centrica UK

- Energy production is a major challenge for society and we are pulled in different directions. The major challenge to all modes of energy is energy efficiency.
- Energy consumption has expanded greatly in the last 20 years and this is clearly illustrated by satellite images of the earth at night.
- Security, affordability and carbon emissions – the three forces from politicians, regulators and consumers pull energy companies in different directions. For example, coal could be a secure supply but at a high carbon cost.
- The low carbon route is the only sensible route for a company going forward.
- Centrica has made a major commitment to offshore wind. Through Offshore Skegness they have developed the largest offshore wind farm in the world. Though wind farm production on a large scale has significant environmental impacts itself, it is off-set in the long run.
- The ecological footprint of (energy) companies is not solely their carbon footprint.
- Environmental impact assessments are complex and involve study of a huge range of factors, balancing the individual potential losses and gains is difficult and an ecosystem system approach could be valuable in helping this.

Q&A Panel Discussions

- There was a comment that the overarching obsession with reaching a global agreement is stopping us from getting started at a local level now.
- Lord May commented that free markets do a great job in some areas but not in others and wind energy may be such an example. Markets work badly for example in delivering medicines for developing world diseases.
- The panel was asked what they would do to kick start the transition to low carbon. The response was that attempts should be kept local i.e. retro-fitting houses.
- Richard Brown commented that governments inherently move slowly. While the Department for Energy and Climate Change (DECC) is a very good idea in that it brings together climate change and energy, this pairing will take time to show results. He proposed that every Whitehall department and each local authority should appoint a climate change champion at director level. Their

responsibility would be to look at all the activities of that organisation in terms of impact on climate change of the activities and policies which they sponsor, and assess how they can assist DECC in taking this forward. There needs to be a greater sense of urgency. Decisions need to be taken in weeks and months not years.

People and their environment

Prof Paul van Gardingen – University of Edinburgh

- Traditionally governance has been there to protect ecosystems from people but we need to change this notion – we need to think about how ecosystems and society interact in a more positive way.
- Coming out of the Rio convention there was a lot of interest in ecosystems, however these must be examined in relation to society.
- Don't protect the ecosystem from society, look at how ecosystems and society interact and make it as positive as possible.
- Protected area development has relied on this outdated notion, it would be better to put people and their society at the heart of ecosystems. Governance influences how people interact with their environment.
- Environmental sustainability needs to be higher up the Millennium Development Goals.
- We should recognise that people are part of their ecosystems and change our definitions of ecosystems to reflect this. This lets us move from passive engagement (people receiving benefits from ecosystem services) to active (people getting involved). Society shouldn't be seen as a problem for ecosystems but rather as a potential source of the solution (via skills, knowledge, structures, markets, governments etc.)

Prof Nick Pidgeon – Cardiff University

- Public attitudes matter because societal values affect value judgements on what is acceptable.
- The science can tell us what the risks are but that isn't the whole picture: society determines what risks are acceptable via value judgements. There is tension between science and values e.g. what constitutes 'dangerous climate change' involves both. Attitudes matter because they underpin behaviour, and behaviour has impact.
- People perceive climate change as someone else's problem to take action on and they have an imperfect grasp of their own contribution to (and ways of preventing) climate change. For example people often view recycling as their main activity to combat climate change, yet this should be just one of several behaviour changes.
- To encourage people to take action we need to recognise that there are different publics and target behaviours which both make

a difference but also are low cost for individuals to adopt.

- In 2000, climate change was seen as less important than health and other issues, but since then has been increasing in importance to the public. However, there is little sense that 'my behaviour' is important in driving it.
- There is good evidence that the public want governments to take the lead. As a result people want politicians to take the lead, politicians want individuals to deal with it via their own behaviour and markets. This causes a stalemate!
- We need to understand the barriers to behavioural change; many changes may not be either costly or difficult. The rebound effect is often a problem, e.g. money saved from energy efficiency could be spent on a holiday!
- Behavioural change could be in relation to adaptation as well as mitigation of climate change.
- There are different publics and a single message is not appropriate to all. Communication on its own doesn't always change behaviour; structural change is also essential in some cases. These changes should be compelling or enabling dependant upon the circumstances.

Prof Philip Esler – Arts and Humanities Research Council (AHRC)

- People have a spiritual connection to the environment and demonstrate this through poems, literature and art. What we value spiritually we should also preserve.
- Hard times and hard places often produce great insights.
- The Wordsworthian description of landscapes brought about a revolution in how the environment was viewed and valued. In pictorial terms Turner and Constable greatly influenced the public valuation of landscapes and contributed to a sense of national identity. Archaeology also is increasingly popular and also feeds into spiritual well being.
- The Arts and Humanities Research Council is looking at the interaction of the Bible with environmental ethics. Note Verse 30 Psalm 104 : Send forth you spirit and you will renew the face of the earth.
- National identity is carved into landscapes and some people specifically oppose alterations to landscapes that have been painted by famous artists, i.e. iconic landscapes.
- If we want to conserve our ecosystems, arts and humanities researchers should be involved.

Q&A Panel Discussions

- The audience largely agreed that humans have historically been seen as separated from their natural environment but that a

successful ecosystems approach needs to integrate them.

- There was a comment that some people do not perceive climate change negatively. For example, travel companies in some countries see global warming as potentially increasing their profit.
- People have damaged the environment but have to be part of the solution. People have to feel ownership (equity) and understand the ways in which they can derive benefits from that equity.
- It was noted that it is very difficult to take into account values which are not traded on an open market – e.g. aesthetics.

Multiple demands on the environment

Andrew Clark – National Farmers Union

- There are multiple benefits to agriculture but farmers are motivated by their markets. We need to find ways to measure the value of those other benefits in the marketplace.
- There is a phrase which says 'live as though you are going to die tomorrow, farm as though you are going to live forever!'
- We need to ensure that the people who manage the land have ownership of the problems they create and the solutions that are advocated on their behalf.
- Contributions can be made to environmental land management, food production, mitigating climate change, etc. We need to get fair valuation for the services such as these which farmers provide and mechanisms to pay farmers to deliver them.
- Use can give beauty. Many beautiful landscapes are managed and shaped by a history of use. Iconic landscapes are not necessarily wild.
- Farming covers 75% of the land area of England. There are half a million miles of hedges in England and Wales.
- There is both opportunity and responsibility in managing practices for climate change mitigation. Farmers need to juggle these priorities and drivers.
- We have developed our ability to produce large quantities of food we now need to develop our ability to produce it in better ways.
- Farming has a big climate change footprint. Farming methods are low on CO_2 but high on methane and nitric oxide. We need to find ways to mitigate this e.g. through carbon sequestration and managing water. Carbon sequestration may be a great opportunity for farmers.
- There is a big challenge in valuing the non-food services provided by farmers.

Lucy Neville-Rolfe – Tesco

- Lack of information about which choices are green is a key barrier to

taking action. Tesco focus groups say that they don't know what to do.

- We need to take lessons from history e.g. ecosystem failures led to the fall of Chinese dynasties, mass migration during the potato famines and widespread disease outbreaks.
- Sustainability is an important issue for retailers as for other business. Unpredictability associated with unsustainable exploitation (continued or lasting damage to the environment) is also a risk.
- Packaging is often seen as negative but it has a value in reducing food waste by prolonging shelf life and by protecting it in the supply chain, it is also useful against food terrorism. The challenge is to reduce it and make it more sustainable.
- Tesco experience suggests that embedding 'community' and community promises into the core business delivery framework really works. Forming responsible partnerships and supporting research also delivers benefit.
- It is only by working together on the interdependencies between government and business and consumers that we can progress. As a business we can use our power to begin to convince the customer so that we can begin to solve green problems.

Dr Helen Phillips – Natural England

- Malthus's worries about food security were in large part allayed because England had the financial clout to source food and other goods from overseas.
- Today many problems are of distribution rather than availability.
- More people are consuming more calories than is healthy and are producing more waste than ever. With an increasing population, food and water consumption will only rise.
- Production will have to go up with rising populations.
- We need to ensure that today's cheap food does not come at the cost of tomorrow's environment.
- The ongoing depletion of fish stocks increases pressures on the terrestrial environment.
- There are half as many butterflies around today as there were. This is an important indicator of a whole ecosystem.
- We can't have a healthy economy without a healthy environment. Land has much more to offer; we need to use it, but sustainably.

Q&A Panel Discussions

- The audience raised questions about the tensions between environment and the economy, and asked how we can change consumers' behaviours and market concentration on price. The panel suggested that green incentives can play a part.

- There was a question about the decline in orchards in England and how we can encourage more fruit growth. The panel agreed that consumers have become immune to the seasonality of fruit and vegetables and that we need tools and incentives to help consumers make choices about when to buy. However, it was noted that the customer comes first and if they want bananas they will be imported.
- To meet food security you need both large and small scale and added value farming.

Current and future policy challenges

Prof John Beddington – HM Government Chief Scientific Advisor

- Urbanisation, population growth, energy demand, water demand, food demand, infectious diseases, alleviating poverty, biodiversity. For all these factors the situation is now significantly worse than it was when the Millennium Ecosystem Assessment (MEA) was completed.
- Extinction rates of species now are higher than anything in the fossil record.
- Of the mammals, birds and amphibians which we know well we can say that the rates of extinction are now significantly higher.
- We will miss the 2010 target to achieve a significant reduction in the current rate of biodiversity loss.
- The long timescales used in many predictions can be a "turn off" as they are well beyond the lifespan of most people. The 2030 timescale is much more relevant.
- Recent information shows that the likely outcomes are worse than predicted and that some are already occurring. Some believe that the Arctic could be ice free, during the summer, by 2030.
- Ocean acidification is a real worry – the CO2 in the atmosphere will drive acidification, it is simple physics, but we have no idea how this will feed into climate change. It is highly likely it will impact on coral reefs, upon which millions of people around the world depend.
- We will need to make some hard choices with regard to agriculture. We must ensure the value of ecosystem services are taken into account when making these and other decisions.

Audience Questions

- Generally there is sympathy in government for these issues but these are financially difficult times. Anyone who thinks that the shrinkage of the world economy will help to solve the problem of environmental exploitation is wrong.
- Regarding the depletion of fish stocks it was commented that despite knowing of the problem for years the government has not listened or acted upon this. The question was raised as to whether they would act on climate change now? Prof Beddington felt that

there was a significant difference because of "ownership". Fisheries aren't seen as owned by anyone in the way that we own the land. When there is no ownership, illegal fishing and over fishing is difficult to monitor and enforce. This makes management of fisheries and husbandry of resources very difficult.

Science and policy

Graham Wynne – Royal Society for the Protection of Birds (RSPB)

- Our knowledge base is imperfect on most of the subjects we have heard about today but we have pressing need for urgent action – we can't afford to wait for perfect knowledge. We need to pilot solutions on the basis of best knowledge, to take it through to policy and get proper communication and buy in from the public so that we can then take outcomes to politicians to equip them to take the necessary actions. We haven't yet put a fraction of the necessary energy into getting buy-in from the actors on the front line, be they fishermen, farmers or industrialists. We also need buy-in from the public.
- Policy development needs to be sound but policy implementation needs to have embedded feedback systems which don't just inform but mould and change the policies as required for effective delivery. There are vast swathes of government policy which monitor but don't manage that feedback to develop adaptive mechanisms.
- Many policies deal with ecosystem services separately and aim to maximise return of benefit in terms of that service alone rather than looking holistically at all services and aiming to balance return across all areas.
- Mainstream economists and particularly HM Treasury are generally absent from policy forums such as this.
- The last round of water pricing (PRO4) has been unusually successful in translating knowledge into policy.
- It was an enormous struggle to set up and deliver the Sustainable Catchment Management Programme (SCaMP) to restore the Bowland and Peak District areas from which United Utilities drew water. However the programme has delivered and removed the need for continued end-of-pipe solutions to water quality problems as well as delivering significant benefits to the environment. There are now 70 similar projects in planning in the current pricing round – clear indication that a good pilot is worth the effort.
- Claims are running ahead of knowledge in this area but pilots can help.
- The biofuels debate was a case where policy development went wrong. The knowledge base was poor, we didn't have sensible pilots, we introduced wholesale policy with weak feedback loops so that the policy was very weakly adaptive and unable to react as evidence built up that some biofuel systems were generating more

carbon emissions than they were saving.

- There is a great danger that we may make mistakes in the generation of climate change policy.
- There is an impression that if more NGOs become involved then the job of government would be much easier in bringing about the policy changes necessary. But, without upstream changes to make affordable the kinds of changes and adaptations necessary it will be impossible to get sufficient numbers of people involved.
- Regarding food security, there has been a very simplistic tone to much of the early debates on this, focusing on the need to simply maximise production. Thankfully government and others are portraying a more complex view now but it will take the collective effort of everyone to get the correct solutions to this enormous problem and will only succeed if the policies are properly informed by feedback and designed to be adaptive.
- A to-do list for 30 year's time:
    - take steps to restore soil fertility in what will be the most productive parts of the world
    - at the same time maximise carbon sequestration opportunities, and so protect underlying water provision, protect biodiversity, and protect humanity
    - adapt EU and US policy to encourage long term sustainable food production in Africa rather than protectionism.
    - make sure that all policies are adaptive in order to get the best result.

Prof Andrew Watkinson – Living with Environmental Change (LWEC)

- The LWEC programme is a collaboration of 20 UK organisations with an agenda to accelerate delivery of research on environmental change into policy and business.
- Given the rate of environmental change we need research that is useful on temporal and spatial scales that are relevant to society and the economy.
- The Foresight Future Flooding Programme is an example of a research programme where, through co-design and co-production involving scientists, policy makers and practitioners it was possible to provide the evidence base for policy on a rapid timescale. This is a useful approach and one that is being emulated in LWEC.
- Ecologists have, over recent decades, concentrated on research at the population and individual level of organisation and ignored ecosystems. Consequently, scientists have been slow in delivering research that is relevant to the ecosystem approach and ecosystem services.
- We have destroyed the biodiversity of many landscapes by concentrating on the delivery of a single ecosystem service

(e.g. food production). The delivery of ecosystem services in a multifunctional landscape requires biodiversity to be conserved within the landscape and the maintenance of natural capital.

- LWEC is supporting a number of research programmes that focus on natural capital and the delivery of ecosystem services. These include the National Ecosystem Assessment, the Integrated Pollinator Initiative and Ecosystem Services and Poverty Alleviation. All three are designed to deliver research that is relevant to policy and involve both research councils and government.

Prof Mark Bailey – Centre for Ecology & Hydrology

- The challenges we face include how to quantify trade-offs, (such as flooding versus biodiversity in wetlands), and how to create win: win scenarios, (such as planting for pollinators or adding wildflowers to species poor grasslands so increasing hay yield and biodiversity simultaneously), when they operate at different scales in landscapes.
- Monitoring has provided much information and allows us to know that changes are occurring; we need to develop confidence in our knowledge of the mechanisms underlying these changes and the predictions we can make related to these.
- Hedgerows and walls are declining in number; these are wildlife areas which are very important reservoirs of biodiversity.
- We need to know whether focusing on carbon will have impacts on water quality. What knowledge can we apply to develop management solutions?
- Many of the assumptions we make along the lines of assessing the contribution of ecosystem services are intuitive; we need good strong data to inform this.
- Is it the case that not spraying headlands is necessarily better for pollinators? Is it necessarily a good thing to allow saturation of wetlands when that may contribute to overall local flooding risks?
- We need to examine the effect of interventions locally before we will be able to see how this will play out abroad.
- We need to better integrate our data sets (hydrological, ecological, economic, etc.). We need maps and we need to be able to link the causal effects and trade offs of policy decisions.

Q&A Panel Discussions

- Questions from the audience related to adaptive research and how we might facilitate an adaptive policy that can benefit from experimentation and experience and adapt accordingly (examples from The Netherlands were cited).
- The political system is about balancing vested interests – it was suggested that we need to bring rational, dispassionate, objective voices into the system.

- Ecologists have been constrained by the way we carry out studies (Fisherian, block design randomised trials) we need to look at how to carry out larger scale experiments.
- Experiments of scale not only need to be conducted but also need to bring in sufficient perspectives (economic etc).
- The political system is about balancing vested interests – it was suggested that we need to bring rational, dispassionate, objective voices into the system.
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Prof Rosie Hails – CEH, Chair of NCI

- Both the economy and human health are not traditionally linked to the health of the environment – but these perceptions are now changing. The linkages are not well understood by ecologists, particularly in terms of how the loss of biodiversity causes the loss of ecosystem services and at what stage this will impact on human health and well-being.
- Declines in honey-bees have already been highlighted by both ecologists and medical scientists as illustrating how biodiversity is important in maintaining robust systems which can cope with disturbances.
- It is an illusion that many of the ecosystem services we receive are free. It may simply be that costs become more apparent further down the line. The costs may be difficult to estimate but that doesn't mean that we shouldn't try.
- It is encouraging to hear from Prof Pidgeon that 90% of households are aware that climate change is a serious problem. It is less encouraging that recycling is often perceived as the only appropriate response.
- There are a number of collaborative efforts underway to attempt to bring together different practitioners and sectors e.g. Foresight, LWEC, Rural Economy and Land Use (RELU), etc. so we hope that we will begin to reach a critical mass of activity for real change.

Workshop proceedings

Workshop 1

Balancing our options for rural land use. Food, biodiversity, sustainable biofuels and flood prevention

An overview of natural resource planning

Baroness Barbara Young – British Trust for Ornithology

- We live on a crowded island and our land availability will diminish with climate change. Needs for land are often conflicting. What is land for? How do we value conflicting demands?
- Lovely things are described as 'priceless' which is not very useful!

Prof Tim O'Riordan – Sustainable Development Commission

- Early writers on environmental economics (20 years ago), for example David Pearce, got no recognition from mainstream economics. There are now a number of journals in this area: the Journal of Environmental Ethics and Economics (JEEE) has a good impact factor; ECOS (the quarterly journal of the British Association of Nature Conservationists) has existed for 30 years and is a much loved journal with no "academic" impact factor; Environmental Values is produced out of the University of Lancaster's Department of Philosophy and Environmental Ethics.
- The human exemptionalism paradigm (which sees man as exempt from environmental forces) is often evidenced in the big geo-engineering ideas and "green new deal" triumphalism which aim to get us out of trouble and redress our carbon balance with technology.
- The resurrecting social paradigm rooted around caring for people and empathy for nature is some distance away from Westminster right now, but is beginning to nudge inwards.
- We need a social capital initiative! The destruction of social capital is much more costly in the short term. MEA shows that we are destroying much but breaking down people's capacity to be neighbours is a frighteningly dangerous thing.
- The line between civility and self centred destruction is very fine.
- Break down social capital and you have little hope of preserving natural capital.
- A UK sustainable development strategy is based on teo overarching objectives: 1. living within our natural limits; 2. creating a robust fair and compassionate society. These two are completely complimentary – if you don't have a robust fair and compassionate society people won't care about living within nature's limits – unfortunately it is often only when nature hits a community so hard

that they have to care both for nature and each other. Mutual destruction is always a possibility.

- Getting people to care and to do so with joy is a huge challenge and we haven't got there yet.
- In 'Prosperity Without Growth?' (SD Commission) Tim Jackson noted we need an Eco2 economy – a society which flourishes and prospers within nature's bounds. People who are in trouble are those who have no self esteem; that is extremely damaging to the natural world as well as to each other. We must be reciprocal – we need to help each other; we will not get anywhere with a world of pure competition, we never have done, we never will. We need a society where people act locally but within a globally sustainable framework.
- Incentive structures create an environment where many people are doing things that they don't particularly want to do – and that applies to many public agencies and departments. We need an ethic driven society. We don't have suitable decision mechanisms for dealing with the wide and the long. We can model future coastlines yet we are making decisions and building long-term structures which align with current coastlines, and which will be in jeopardy in a generation.
- Flood risk starts when the rain hits the ground, not when it flows down a river or through a pipe. The planning system should make it mandatory that no collected rainwater goes into a pipe. Roadways should have soak-aways; car parks, houses/patios/gardens etc should have mechanisms of soaking away rainwater.
- 'Green lungs and blue ways:' 'Green lungs' are green river valleys open to leisure use which can become 'blue' from time to time when the river floods (there should be no planning decisions with respect to flood plains which interferes with this).
- The National Ecosystem Assessment needs a National Social Assessment running alongside to see who are vulnerable, who can be helped, who can use these initiatives; we need young people involved because they have a stake in the outcomes.
- To achieve this we need sustainable entrepreneurs that create and promote opportunities for sustainability, and who are seen to be earning as a result of it.
- We need to think about the consequences of policy success – if the suggested use of electric cars is adopted will we have sufficient electricity supply? Probably not! Where will it come from? Nuclear energy? We need to think ahead.
- We need multi-area agreements and locality agreements so that people have a share in creating and enjoying nature.

What should a policy framework for sustainable land use look like?

Prof Chris Pollock – Aberystwyth University

- There is increasing pressure on land, and there is growing awareness of the importance of ecosystem services. In the UK, the land that needs to provide a growing population with food and the land that needs to generate renewable energy is the same.
- Agriculture has changed biodiversity in this country. We have many man-made agro-ecosystems, farmland being one of them. The land cannot deliver either food or the biodiversity we want unless it is actively managed.
- We may not be able to farm sustainably and feed everyone. We need to choose the "least worst" option. The balance requires a systems approach to compare a range of inputs and outputs of different land uses, informed by an ecosystem approach.
- We don't need to know everything before deciding. As long as we recognise the benefits and the risks and have exit strategies we can trial solutions through a partial licensing system.

Strategic land use for ecosystem services

Prof Phillip Lowe – Rural Economy and Land Use Programme

- Are we entering an era of smart production where we must strike a balance between economic and ecological efficiency?
- Are biofuels a 'green' solution or merely the 'gas guzzler's friend' borne out of our desire to drive? Biofuels consume fossil fuels in their production; land is diverted from food production, driving food prices up, so the benefits depend on what they replace.
- We need strategic land use that recognises ecological capacities; sets principles for finding the trade off between different ecosystem services; uses micro-precision farming and employs better management of water.
- There should be a stewardship obligation on landowners expressing their rights and responsibilities. We might even look to The Netherlands where environmental cooperatives have been established including local farmer and non-farmer members.

Whose Land is it anyway? The importance of property rights and the market to the delivery of ecosystem services

Prof Michael Winter – Exeter University

- There are issues relating to property rights and market forces when it comes to the delivery of ecosystem services. A lot of the land is occupied by a few people with strong rights over it. These landowners are also driven by consumers and respond to market signals.
- To what extent do consumers play a role? Does consumer choice really matter? We may need to reduce the diversity of food choices.
- Farmers have technical knowledge of their own land and some

know certain ecosystem services better than others.

- Land ownership is not as simple as 'landlord and tenant' or 'sole occupier'. There are many different land occupancy arrangements, from contract farming, farm business tenancies to new owners with proportions of land dedicated to residential use and not to farming at all. This means that there may be short term arrangements which are not suited to long term stewardship or management of long term crops, such as woodland.
- We need social science research into occupancy systems to find the optimal balance.

Panel Discussion and Q&A

- The audience commented that the panel had not considered the old agricultural extension system and suggested that we need to link with farmers in a better way, through a publicly funded extension system. The panel agreed that agricultural extension worked well but Prof Winter pointed out that there was no funding to reinstate it.
- There was concern about whether farmers see food production as the only market or if they see other ecosystem services as markets they need to meet.
- The workshop chair, Prof O'Riordan, suggested that we need a new notion of land stewardship for the whole landscape and that we need a stewardship fund to pay farmers for long term experimentation. He suggested that the NCI should further engage with the private sector, such as water companies and insurance companies.

Proceedings of breakout sessions

Breakout Group: Subsidies & Regulations

1. Which existing legislative instruments, at national and European level, provide a path towards a truly sustainable future?

The group proposed on the basis of discussions that:

- There is an enormous amount of legislation but it is unrealistic to expect legislation to have all the answers.
  - The group arrived at this conclusion after discussing a lengthy list of legislation. They felt that some policies were pulling in opposing directions (e.g. food safety and the issue of grazing in orchards) and commented that laws often arise in response to a single issue, meaning that there is no driver for their integration. They felt that because legislation refers to existing models of land use, it inhibits our ability to produce creative outcomes.
- Society is already familiar with the language of markets and economics but we need to simplify and normalise the language of natural capital within society, in order to engage people.

    - The group felt that we could use natural capital as a language to identify incoherence and remedy the lack of integration. This might be facilitated by a forum, bringing different sectors together. They highlighted the importance of natural capital case studies to use as a model.
- The concept of 'ecosystem services' needs to be better communicated to ensure that farmers put it on their agenda
    - The group observed that farmers are already inundated with legislation and so we need to do more to put ecosystem services on their agendas. Legislation can be used as leverage, with payments and subsidies as the carrot to draw them in. But, ecosystem services need extensive development in order to justify payments for services for which farmers are not currently rewarded e.g. soils.

2. What are the alternative economic models to ensure sufficient food, access and biodiversity from our rural land?

The group proposed on the basis of discussions that:

- We should reconnect people to ecosystem services.
    - The group recommended that we focus on local and personal issues in order to connect people, and that we need to be careful in our use of language.

- Incentives should be based on solutions rather than problems
    - The group suggested that thinking in terms of solutions could provide us with opportunities to create new markets and to implement better regulation.
- We should encourage policy makers to think of long term goals.
    - The group came to this conclusion because they felt that there was too much short term thinking in policy and that as a result legislation was constantly being reconstructed. They were concerned that HM Treasury makes the important decisions but that there is a lack of engagement and communication with informed stakeholders.
- We need to stop articulating environmental disaster.
    - It was felt that we have done enough to impress the potential of environmental disaster upon society. What we need now is to be positive about solutions and inspire action rather than defeatism.

3. At what scales can agri-environment schemes address the needs of society (national, regional, and local)?

The group proposed on the basis of discussions that:

- We need to build on CAP (Common Agricultural Policy) – evolution not revolution.

    - The group felt that we need to think of land as a national resource, although we ought to be wary of the demand for food as this might trump everything. They commended that incentives must be applied intelligently.
- All stakeholders need to be involved early on to make sure everyone works in the same direction.
    - The group arrived at this conclusion because they felt there was no cohesion between the incentive and market schemes. Change can be driven by working together. For example, water companies can drive behavioural change amongst farmers. There may also be opportunities to engage the food chain in new thinking and practice through supermarkets. However, any new scheme or target must be feasible for farmers.
- There needs to be a stronger evidence base with feedback loops incorporated into policy.
    - The group felt that there was not enough evidence at present and that long term monitoring is the only way to provide this evidence base. They argued that it needs to be at a landscape scale. However, they felt that there must be flexibility to experiment and feedback.
- We need a new agricultural extension scheme.
    - The group recommended that the old agricultural extension scheme be updated and reinstated. They argued that it needs to be personalised, flexible and adaptive.

Breakout Group: Goals & Targets

1. What institutional or governance structures need to be in place to effectively manage ecosystems and services?

The group proposed on the basis of discussions that:

- We need to act at all levels, from individuals through to EU level
    - The group arrived at this conclusion after agreeing that national planning practice is currently heading in the wrong direction. They felt that there should be an overarching vision which should be translated on ground level. This could then be used to influence EU legislation.
- We need local buy-in and engagement.
    - The group felt that it was very important to interpret national targets at a local level and that specific service values of land should be highlighted. They were pleased to note that new partnerships are already emerging which build on local involvement and shared goals.
- The planning process should be made at landscape scale, considering a complete ecosystem. It should be governed by an integrating framework for ecosystem services.
    - The group felt that links between natural units (such as water used in one area, originating from another) make landscape

based planning important. The group felt that a shift in perspective from farm/site based scale to landscape scale creates a positive climate for an agency to coordinate actions. They suggested that an agency should oversee a landscape rather than individuals.

- In order to encourage people to protect and properly manage their environment, we need to educate, inform and inspire people and we need to ensure sustainability of anything we put into practice by educating and inspiring the next generation. We need a new Wordsworth.
  - They arrived at this conclusion because they felt that decisions are based on values and that therefore people need to be inspired. They felt that dialogue with the public is too often monologue and that instead we should capture people's imagination (as can be achieved through inspiring writing). They felt that widespread public support should push government.

2. How do we set targets for land use and management that respect and maintain ecological capacities?

The group proposed on the basis of discussions that:

- Governments need to think long term and globally. Their perspectives should be more than five years ahead.
  - The group argued that if governments cannot think long term, they won't implement long term plans. They felt that governments should have greater responsibility for long term issues.

- We should re-educate people about farming and the countryside.
  - Some publics see the countryside as smelly, muddy and boring. Access and education for the some publics should be a priority.
  - Many politicians also need to be re-engaged with rural issues. There should be more scientists in government.

- We should make use of new technologies to increase accessibility and to engage the public in decision making.

3. What tools and other infrastructure are needed to provide appropriate monitoring of environmental stability/resilience?

The group proposed on the basis of discussions that:

- We need to re-instate the extension service to provide onsite advice to farmers.
  - This new extension service could advise on agricultural technologies and also ecosystem services. There should be training for people in order to fulfil this extension service role. The group were not sure who would supply this training. The group also discussed making a case for expenditure of public

funds to pay for the extension service as there was currently an administrative and bureaucratic burden on farmers.

- We should make greater use of monitoring technologies, in the form of a data collection facility (about the environment and biodiversity) which would feed into a database. It should include a remote service for real time monitoring.
  - They concluded that the data collection facility should feature a constrained input format so that it is easy to use and so that data is collected in the same format. We could integrate modern technologies such as micro samplers, onsite tablet plates and satellites. This should be developed from existing initiatives such as the National Biodiversity Network (NBN).
- Integration of citizen science (amateur birdwatchers etc) and professional science.
  - There is currently a lack of expert rigour in the data supplied and those who want to do the monitoring do not always have access to farm land. Therefore citizen science should be used as a challenge function but should not replace any professional assessment of the environmental status of the landscape.
- Use data to assess outcomes of agri-environment schemes at the landscape scale.
  - Monitoring by farmers could be co-ordinated at landscape level by a dedicated Natural England officer who can help with species identification, soil sampling and water chemistry.

Breakout Group: Valuation

1. How can we ensure that the broader interests of society are properly valued in the appraisal of land use options? Do approaches such as the ecosystems framework help in this respect?

The group proposed on the basis of discussions that:

- We should be aware that valuation will be a long and difficult process.
- The ecosystem approach is valuable, but the market is the current dominant system and motivation.
  - The group pointed out that whether we like it or not, people respond to money and markets.
- Education and market mechanisms will need to work together.
  - We have the potential of education. People can learn and change. We can utilise the potential of the market as a system to incentivise and generate change. However, the group was concerned that we have an uncertain timeframe and that we may not be able to educate people quickly enough.
- We should look beyond monetary value and think in terms of other values, including: employment, enjoyment and spirituality.

2. How can the different services provided by land be meaningfully valued, prioritised, ranked or weighted for decision taking?

The group proposed on the basis of discussions that:

- The National Trust ranking scheme to develop comparable metrics for different services could be used. This measures a variety of different 'values', including money and other factors, for example enjoyment.[1]
    - The group discussed how this scheme proved to be a really useful tool to assess a range of criteria and scenarios without having to assign a monetary value. But in order for this to work, discussion is critical – some values might be subjective. However, the scheme could be used to test against new policies and to address the triple bottom line of social, economic and environmental issues. This avoids using methods such as 'willingness to pay' which can often end in unreliable results.
- Multi criteria analysis is superior to cost benefit analysis.
    - The group suggested that we would need to agree the criteria and values prior to assessment. A forum could be set up to resolve conflict and decide upon criteria. Real people, such as farmers, could be invited to participate in assessments and decision making.
- A key problem is how we ensure that HM Treasury incorporates and acts upon systems that assign values other than economic ones.
    - There is a danger that HM Treasury, used to thinking in economic terms, will be unresponsive to these new methods.

3. What kinds of collaborative working are required amongst the different scientific disciplines, especially ecologists, sociologists and economists, to inform decisions on the management of natural capital and related environmental services? What are the best ways of achieving this integration?

The group proposed on the basis of discussions that:

- Interdisciplinary work is crucial. This should be properly funded, with recognition of its value, (complete with incentive schemes), and should translate research for policy makers and other stakeholders.
    - The group concluded that, though collaboration might be difficult, integrated solutions were key e.g. water services – aquatic and terrestrial biodiversity working together. We should instigate a plan for merging rural and urban planning. The group recommended that we make greater use of case studies and social science research to inform and drive this way of working. They were concerned that research funding might be too thin and that political and administrative constraints could be an issue.

[1]The Tripple Bottom Line (TBL) Tool developed by the National Trust is outlined in its report *Our Strategy to 2010 and beyond*.

- We need better communication, stakeholder engagement and resources. Publication is not the only target for interdisciplinary work. We need an education system.
    - The group felt that stakeholders should be in a position to set objectives and that we should allow and promote dialogue with practitioners. They recommended that academics should think beyond the 'paper' to application and recommendation. This way science may be able to translate into policy. They advised that there should be an annual review across disciplines. In order to implement this we might use new technologies, such as social networking mechanisms to communicate, we should find a common language and we should include multiple stakeholders e.g. MPs, Defra, local parish, farmers and local water boards.

Breakout Group: Overcoming Barriers & Resolving Conflicts

1. How are the interests of landowners and occupiers to be accommodated?

The group proposed on the basis of discussions that:

- We should use pilot projects to trial what ecosystem services will be delivered by different farming systems and environments, and with different levels of regulation. We need to explore existing data and use this to inform policy while pilot projects generate further information.
    - The group concluded that we do not have the time to wait for more information. We need to start trialling and using the data we have now. They understood that it may be difficult to extrapolate from past data and so pilot projects could help fill the gaps. In order to accommodate the needs of landowners and occupiers, the group agreed that they would fully integrate landowners and occupiers into the process and would work from the bottom up, rather than imposing from above. There should be regular reviews of what works; and reviews should lead to adaptive policy about what we might replicate elsewhere. The pilot projects could be designed to take account of spatial, temporal and social variability.
- We need a National Spatial Framework for the environment, to reconcile competing demands.
    - The group decided that, though it may be difficult to achieve consensus, and though it may be costly and time-consuming, we need to identify upfront exactly what we want from our land which can then inform planning. This framework should counterbalance other frameworks such as infrastructure policies and should form national targets for what we want from the land as a background to regional and local policies.

2. How can we reconnect the public and other relevant stakeholders with an awareness of where ecosystem services come from?

The group proposed on the basis of discussions that:

- We need a communications plan to make ecosystem services relevant to people in everyday life, through education and awareness.
    - The group recommended that the communications plan should use language which is accessible to the lay person and should connect people by using payment as an economic benefit. The campaigns should be carefully targeted to audience, age and socio-economics. Information should be relevant to everyday life, providing education at all levels of awareness and highlighting personal importance.
- We need a tiered vision of what people want from their environment (integrated at policy level).
    - The group recommended that we should get people involved in creating a vision for their own environment. This should be carried out on a local and national scale. There should be a community vision for landscapes and environments, creating parish or town plans. They felt that we needed a system to value things that have no monetary value e.g. birds indicate level of quality of life.

3. How can we best balance how conservation incentives are considered alongside monetary incentives provided by food, fibre & energy production?

The group proposed on the basis of discussions that:

- Natural Capital should have representation within HM Treasury to ensure government delivers outcomes. This would involve four mechanisms:
    - A proposed extension service called the 'National Ecosystem Advisory Service' to advise on ecosystem services to landowners, households etc.
    - A planning regime which includes consideration of ecosystem services, delivering spatially explicit decisions.
    - A new LWEC/RELU (Living With Environmental Change/Rural and Land Use)-type programme to foster interdisciplinary research.
    - A strategy to integrate the idea of 'natural capital' into our culture, for example by incorporating it into elements of the national curriculum.

Workshop 2

The urban planning system

Eco Towns

Pat Willoughby – Town and Country Planning Association

- Eco Towns should be: new settlements; free-standing communities; linked along a transportation network; carbon neutral; with good local facilities and provide 30-50% affordable housing.
- There are currently 11 locations around South East England that have been shortlisted for Eco Town development.
- Eco Towns have been successfully piloted in Japan, Sweden and Germany.
- Eco Towns have to live up to agreed standards including energy efficiency standards in homes and buildings; plans designed to reduce transport such as high speed broadband access so that people can work from home, more bikes, settlements planned so that there is no more than 800m between dwellings and schools; and increased biodiversity through the creation of new habitats, water cycle strategies and flood prevention.

Ecosystems services and urban areas

Prof Roy Haines-Young – University of Nottingham

- Already, the majority of humanity dwell in urban areas where the population will continue to grow.
- We need to use biophysical modelling tools to understand the production chains in relation to different ecosystem services and how they fit together. We should then develop new approaches to build scenarios.
- Is the value of ecosystem services supplied to urban systems fully recognised?

Implications for planning

Prof Mark Tewdwr-Jones – University College London

- It is essential to improve the information available to planners involved in the decision making process. There is a gulf between scientists' knowledge and planners' knowledge.
- Planning is susceptible to high political discretion and influence. Our challenge is to ensure that ecosystem services are given a political priority.
- Local government are only partly in control of the things they have planned. Even where there is agreement, central government can step in to impose their solutions.
- Local and individual needs and desires should be considered, with

local community participation prior to strategy agreements.

Panel Discussion and Q&A

- Planners need more information but in some cases complain that there is too much. The audience wondered in what form academics and researchers should provide the information needed to allow planners to employ an ecosystem approach. What is the role of the academic sector? The panel responded that planners should have this kind of information available via the National Ecosystem Assessment and that information should be spatially specific, locally focused and should provide a legacy.
- Planning and restoration requires us to be spatially explicit. How specific do we need to be to provide biophysical models?
- The audience wondered if it might be possible to exploit the current downturn in the housing market and economy to enforce and roll out Eco Town standards on new planning projects. Ms Willoughby agreed that development can be provided differently but that it takes very strong leadership at a local level, which can be very difficult to achieve. It was also noted that we cannot merely copy the European schemes as there are different fiscal regimes elsewhere that do not translate to the UK.
- Cultural ecosystem services are largely neglected but very relevant in urban areas. We need a better understanding of what nature means to people.

Proceedings of breakout sessions

Breakout Group: Subsidies & Regulations

1. How can the subsidy and regulatory regime enhance the ability for urban development and redevelopment to deliver ecosystem goods and services?

The group proposed on the basis of discussions that:

- We need to build ecosystem services into planning regulations.
  - The group felt that there should be a greater association between urban planning and ecosystem services, fitting local and national needs together so that ecosystem services are delivered over more than select, individual sites. They noted that we could take advantage of companies' CSR (Corporate Social Responsibility) agenda to redistribute the tax burden from social measures to environmental measures. They also recommended exploring a tax system that benefits people who incorporate consideration of ecosystem services. Ideally they would like to see central community management of land and resources (i.e. trees lining streets).
- We need to develop an awareness of a place's assets – assess the opportunities and vulnerabilities.

    - The group agreed that it might make a difference if people are persuaded to do something on a large scale, in which case we need to be driven by community needs. This might create competition between councils which could have positive effects. Creating a vision might mean that a community can choose a particular direction – users of services can drive consensus. We need to make greater use of case studies to raise awareness. Water is an excellent example to explain the ecosystem approach, e.g. flooding vs drinking water. Publics can relate to the issues and therefore may more easily understand the need for this approach.
- There should be connectivity over regulation – there should be a permissions process, involving developers and occupiers but land must be the focus.
    - The group pointed out that there are diverse players involved – developers (and planners) can be money driven but occupiers have different objectives.
- We need to focus on education, knowledge and skills.
    - The group concluded that we need to develop our knowledge base to learn how to regulate urban areas – we need a community evidence base.

2. How could we adopt the ecosystem approach to land use in the Planning Regime?

The group proposed on the basis of discussions that:

- A great emphasis is placed on the need for an ecosystem services approach to be adaptive, but the group felt that this might not always be possible – for example replacing recent road infrastructure.
    - The group acknowledged that different ecosystem services are important at different spatial and time scales and that trans-boundary impacts are common.
- Tools are in place to drive inclusion of the ecosystem services approach but cost-benefit decisions must be embedded in planning.
- There are problems with the terminology – the language must be changed in order to improve communication.
- We should not forget that ecosystem services can also be delivered within urban areas e.g. green space.
    - The group pointed out that a lot of people believe in climate change but we need to find ways to get them to take action to mitigate it rather than merely adapting. They suggested that we take account of the conservation value of suburban gardens and identify where these could be extended. They advised that we use citizen science and community participation to increase awareness and to assist with monitoring and research.

- The Ecological Impact Assessment could be revisited; this time looking at the bigger picture (not just protected species and sites).
    - The group reached this conclusion because they felt it was important to consider not just that habitats exist, but that they are also delivering something. Usually people are only aware of ecosystem services after a negative event, such as flooding or contaminated drinking water.
- We could look to other planning systems to replace the current one. We might consider adopting a land resource management system as they have in New Zealand.
- We should integrate the ecosystem approach into the training of planners.

Breakout Group: Goals & Targets

1. How do we set goals and targets in planning urban development and redevelopment, in order to protect and enhance ecosystem goods and services?

The group proposed on the basis of discussions that:

- We should keep plugging the ecosystems approach, especially considering that Defra is embedding this approach.
- We should find ways to engage people in the planning process.
    - We might do this by encouraging people to look beyond the built fabric of the urban environment; integrating Eco Town standards into the government system. We should encourage an awareness of our immediate surroundings.
- We should give more power to communities, allowing community autonomy, looking at things from a local perspective and encouraging a sense of ownership.
- We should ensure that local officials are aware of, and have greater understanding of, ecosystems goods and services.
- We should build on partnerships and expertise with NGOs to help deliver optimum ecosystem services.
- We should develop Urban Ecosystem Cultural Maps which illustrate local knowledge of a place and inspire people with cultural ecosystem services.

2. What is necessary to create robust biophysical models linking function to ecosystem goods and services and their outcomes for sustainable human well-being?

The group proposed on the basis of discussions that:

- We need a better understanding of the links between human well being and ecosystem services.
    - This might involve a definition of ecosystem services in terms of

the benefits delivered to humans e.g. soil formation and how we can improve water retention and provide flood protection. We need to make people aware that we are completely dependent on ecosystem services for our wellbeing.

- Biophysical models need to include manufactured capital where it has replaced natural capital.
- Biophysical models should give bands of outcomes rather than attempt to provide spurious accuracy.
  - The group arrived at this conclusion after discussing the lack of understanding of biophysical limits and biophysical processes. They also recommended that we might encourage more public participation in collecting relevant biophysical data, including the creation of a portal to collate all available data relating to ecosystem services, through a single system.
- Urban areas should be used to pilot and develop experimental methodologies, to determine key data sets and set parameters for models.

3. How do we combine urban and rural planning into one regime? And do we want to do this?

The group proposed on the basis of discussions that:

- Yes, we should combine urban and rural planning but we should use a loose distinction.
  - The group came to this conclusion because they felt that distinctions create mental and physical boundaries and fossilise the current system. If removed, creative solutions can be found.
- Move away from the country serving the town; there is a two way flow and it should be taken into account in planning.
  - There are opportunities for sharing responsibility for environmental flows such as water, food and recreation. The group felt we should work with topography rather than boundaries. However, the group was concerned that we would risk homogeneity and that we should work to maintaining some distinctiveness between urban and rural areas, to avoid the urban sprawl seen in Rio de Janeiro, for example.
- We should stop thinking in terms of high density city and low density rural. We need the best of both.
  - There are opportunities to do many innovative things with new high density living. We need to build on new ways to live in rural areas so that it is not just urban areas that have a high density. Cities contain a lot of public land and therefore there are options for supporting riskier ideas. We should share the positives of each type of location: combining the pleasantness of a rural life with the connectedness of cities. Planners could move between areas, sharing best practice.

- Move from green belts to green fingers
  - The group came up with the idea of integrating urban and rural areas by bringing more green areas into cities. They felt that we could input green areas in the heart of a city and could extend the green belt into urban areas via strips or finger like protrusions.

Breakout Group: Valuation

1. How can we value goods and services in urban areas?

The group proposed on the basis of discussions that:

- We need to first consider, what does 'urban' mean in practice? Is it a city? A town? How far is the footprint of a city? For example if you are bringing in green beans from Kenya should your footprint include the ecosystem services of this country?
  - We need to think locally, regionally, internationally – and in the oceans as well. We need to look at when a city is a net user of ecosystem services – and more interestingly, when it is a net provider of ecosystem services.
- We need some kind of public debating system to lead to agreement about assigning values.
  - The group came to this conclusion because urban areas are complex places; we assign different values depending on who you ask, when you ask and what they already know. Some values are economic and we must find a way of integrating non-economic values.
- We need more case studies, more education and multidisciplinary networks.
  - We need to think in terms of integrated case studies and place-based assessments when we think about valuing the invaluable. For example, when a river is restored, how can you measure a community feeling safer or having greater pride in their surroundings? Case studies can link providers and users and can be used as a step towards Payments for Ecological Services (PES). We talk a lot about interdisciplinary work. Maybe we need to work more with social scientists, and conduct research into long term impacts. The group suggested developing a framework for ecosystem services that is similar to the Water Framework Directive.

2. What are the obstacles to implementation of a commonly agreed valuation regime?

The obstacles identified were:

- Communication – How do we reach the people outside of our room? Can we utilise popular media? We need to be listening to all people – there is no one public.
- What is the role of procedural rationality? How we come to a

decision is of key value in determining whether a decision is a good one.

- Capacity is an obstacle. How can we include the groups that are usually not heard, as well as the strong and powerful groups?
- We have an opportunity to develop new institutions for value development and management, education, economics, communication and to engage both the marginalised and the powerful in debate.

Breakout Group: Overcoming Barriers & Resolving Conflicts

1. Spatially explicit information (i.e. spatially explicit maps) of our natural capital assets – is this data available in sufficient detail/ resolution? And how do we get data/spatial assets to the right people?

The group proposed on the basis of discussions that:

- Data should include social and economic information as well as spatial data.
- We should create integrated ecosystem services interactive maps and models which are accessible to all and which cover both the urban and rural environment.
    - These should be available to everyone, thus addressing the democratic deficit e.g. provided online. The maps should also include scenarios and could be used as a tool for mediations. We might look to the Arts Councils' online toolkit as a model. We would require an extensive asset inventory to inform the maps. The group came to this conclusion because they found that the environmental and economic data available was not detailed enough, not available to all and that different data was stored by different organisations but not shared. These maps could be piloted in select localities (both urban and rural) before being rolled out nationally.
- Maps and models should not be seen as a replacement for involving stakeholders – people should be included in decision making via citizen science forums.

2. What issues impinge on our ability to manage and adapt land use?

The issues identified were:

- Lack of evidence
- Lack of involvement in communities
- The reactive nature of the planning system
- Vested interests

The conclusions and recommendations were:

- Empowering the community.
  - The group suggested that people feel they will not be listened to and so confidence will need to be increased in the ability of the planning system to recognise and meet needs. Planners cannot hope to deliver improvements to our quality of life if they are not sure what they are trying to achieve.
- Innovative taxation and spending.
  - For example you could choose to give 10% of your taxes to an issue you believe in.
- Strong leadership including community champions.
  - We need visionary thinking and strong leadership to drive changes forward. We need to identify local community champions and to give them the support (including financial) that they need. We then need to articulate the vision clearly and specifically.
- We need to quantify the benefits of specific green development and need evidence to do so.
  - Climate change policy might provide a lever to push green infrastructure forward.

Workshop 3

Sustainable use of the marine environment

The Marine Bill – A policy perspective

John Clorley – Defra

- The Marine and Coastal Access Bill provides a new framework for the seas, with provisions for marine planning; improved licensing; new nature conservation powers; improved enforcement powers; a new Marine Management Organisation (MMO); improved inshore fisheries management; migratory & freshwater fish measures and coastal access.
- The MMO will be the government delivery body, bringing together everything from marine planning to fisheries.
- Coastal access is an important part of protecting the environment and through showing visitors to the coast that there are benefits to protecting and conserving the marine ecosystems.
- Marine Conservation Zones (MCZs), a type of Marine Protected Area (MPA), will protect the seas and compliment current and future EU protected zones. Four regional projects, consulting with stakeholders, will choose the location of the MCZs and will be used to create a network across regions.

Offshore renewable energy: A business perspective

Gero Vella – Renewable Energy Systems (RES) and Centrica Energy

- RES and Centrica have developed and constructed wind farm projects under the Government's first and second licensing rounds to produce wind energy in Britain's coastal waters. Centrica, supported by RES, also hope to be awarded a 'zone' under the forthcoming third offshore licensing round. This will see up to 25 GW of offshore wind developed to help meet the Governments 20% renewables by 2020 target and RES are proposing a new round of offshore wind farm development for October 2009, following two previous rounds, to produce wind energy in Britain's coastal waters.
- However, there are a number of problems that impact offshore wind development process, due to multi-use nature of the marine environments, including: wildlife (e.g. dolphins, bird flight paths, reefs created by Sabellaria spinulosa); fisheries; aggregate extraction; protection of areas for military or conservation and busy shipping channels. In addition to finding space within this busy environment to site wind farms, developers must also identify suitable export power cable routes between the wind farms and shore that cause a minimum of impacts.
- A rigorous consenting process, involving a public and stakeholder consultation and an Environmental Impact Assessment (EIA) to assess and ensure that any potential impact on the physical,

biological or human environment is of an acceptable level. Following construction of wind farms, rigorous monitoring is undertaken to confirm the predictions of the impact assessment. For example, pink-footed geese were monitored by radar to determine whether the the Inner Dowsing wind farm has had an impact on their migratory routes.

Valuing marine ecosystems: Experience from the EU and R&D

Dr Melanie Austen – Plymouth Marine Lab

- Ecosystem services delivered by the marine environment include: fisheries; provision of raw materials; gas and climate regulation; disturbance prevention; bioremediation of waste; potential biotechnology; nutrient recycling and cultural services such as leisure, heritage, identity and cognitive values.
- We may be able to move beyond a monetary valuation of marine ecosystems but the key is raising awareness and starting action. It is better to focus on outcomes (i.e. conservation) than figures (i.e. assigning economic value).
- Studies have shown that people are more willing to pay for the conservation of all marine species than they are to pay for the conservation of individual species, although they were willing to pay marginally more for mammals and fish than algae, invertebrates and birds.

Panel Discussion and Q&A

- There was concern that the Marine and Coastal Access Bill, though a good idea, did not have the funding to be successfully implemented.
- The audience suggested that we think about the use of language and how it should be more positive in order to re-connect with the public.
- The audience wondered about the evidence base for marine plans and how Defra might gather the necessary evidence. Mr Clorley assured them that there were a range of research projects under way and that there was funding to support these.

Proceedings of breakout sessions

Workshop 3: Sustainable use of the marine environment

Breakout Group: Subsidies & Regulations

1. How can Marine Protected Areas offer a way forward?
2. How can government measure sustainability and demonstrate biodiversity?

One group tackled both of the above questions together and

proposed that:

- Protected areas highlight how the planning system is failing.
    - It is the 60th anniversary of protected areas. The fact that we still need to protect areas suggests that our planning policies are failing because they are inadequate. If ecosystems thinking was part of planning, then protected areas would exist by default
- There are different regulatory frameworks but with the marine environment there is the potential for relative 'uniformity' which makes joined up thinking more realistic. The Marine Bill should provide an appropriate framework.
    - It is vital to remember that regulation is different in Scotland, Wales and Northern Ireland following devolution, though the Crown is the only 'landowner'. In England, regulation is entirely the remit of the Infrastructure Planning Commission and the Marine Management Organisation. The marine environment is different to the terrestrial and freshwater environments since land planning regulation varies from region to region.
    - We need more integrated thinking between the terrestrial, freshwater and marine environments. In particular the marine environment is often at the mercy of pollution from the land. This can come from point sources e.g. pipelines as well as diffuse sources where chemicals enter water courses from catchments.
- We need to gather more evidence but should not let this stop us from making decisions.
    - There is an important potential role in ensuring that data is shared about the marine environment. This needs to include data from the commercial sector. Can it be freely used and used well? Can the Marine Bill assist with this? There needs to be a focus on monitoring and evidence gathering but how should this be done and what data is most necessary? Having said this, a lack of information should not paralyse decision making or we will be waiting for many years. The precautionary principle can be exercised where there is a vacuum in understanding due to lack of data.
- We should raise the profile of Marine Conservation Zones, ensuring all stakeholders are actively involved.

Breakout Group: Goals & Targets

1. What are the key issues for resolution in the next five years?
2. What tools are needed to demonstrate major environmental changes?
3. How can we integrate environmental, commercial and economic benefits?

One group decided to tackle all of the above questions together and proposed that:

- We need marine spatial planning based on an ecosystem services

map and integrated modelling which is both available in the public domain and responsive to change (in light of biophysical circumstances such as climate change).

- The group were concerned that there was not enough data to inform or validate models and that there was an insufficient understanding of offshore ecosystems. However, they felt that maps and planning would allow effective and efficient regulation and management. They did point out however that getting the map wrong would be disastrous.

- Initiatives should be funded by innovative taxation and funding from industry.
- Marine spatial planning should be integrated with terrestrial maps and planning regimes.
- Benefits and trade-offs should be considered at all scales.
- We need an EU Ecosystem Services Directive, with an all encompassing body (such as an extended European Environment Agency).
- We should reconnect nature and culture by reinvigorating Britain's maritime tradition and sense of national identity.

Breakout Group: Valuation

1. How can we provide practical ways that society will wish to support the valuation of ecosystems ~ social, economic & environmental?

The group concluded on the basis of discussions that:

- We need to capture environmental, economic and social benefits and costs, clearly explain trade-offs and present clearer options to choose from.
- We need to continue to promote access to and enjoyment of the environment so people will attach personal value to it.
  - Engagement needs to be made 'real' through local initiatives and examples. We should consider adding outreach projects to grants and encourage people to visit, see and get involved with the coast.
- We need to have a two way discussion – between those who have the technical knowledge of an ecosystem, and those who live in it.
  - We should encourage the sharing of experiences
  - We need to capture economic environmental and social considerations and develop tools by which these very different measurements can be compared.
- Those who gather at a meeting like this have been saying for a long time that the environment is important and that we need to get people to value it and engage with it. Lack of progress may mean that it is time to become more focused and coordinated, and

really concentrate on drawing out and making explicit the multiple benefits to society.

- We should consider a top-down, coordinated ecosystem services approach, set nationally and applied regionally and locally and tailored accordingly.

2. Given that our goal is a healthy functioning marine ecosystem, is valuation an appropriate tool?

The group concluded on the basis of discussions that:

- Policy is pushing us towards valuation (in a monetary sense) and so is neoclassical economics.
- Valuation as a system is debatable.
- There is a flawed assumption with economics that you can trade something off – which is not the case with marine ecosystems.
- There was disagreement as to whether we should accept a conservation value for the marine environment (i.e. decide on a minimum and act on the basis of that) OR whether more debate is needed!

3. How do you value things that cannot be valued? How do we develop tools to measure the significance of ecosystem change

The group concluded on the basis of discussions that:

- We need to set the bar as high as possible for international consensus. We recognise that it is difficult to assess 'how high is high.'
    - We are in a position that many civilisations have encountered in the past but we are unique in that we now a global civilisation, not a regional one.
- We should shift from valuing commodities to valuing processes (to which it is more difficult to assign a monetary value).
    - Value is actually infinite because once we're gone, we're gone! When we move away from a human-centred view, we realise that this is also true for species, because when they are gone they are gone. We are trying to look at an economic valuation, which is the wrong manifesto. We can look at the value of a species in terms of services – possibly through an economic lens, but the things that are hardest to value are processes.
- We need greater exchange, dialogue and cross fertilisation between those who are engaged with the philosophy of nature, those cultures who have a deeper relationship with nature and those who work within a political/economic framework.

4. How can we balance environmental, economic and commercial benefits?

The group concluded on the basis of discussions that:

- Stakeholder engagement is key. No one group is correct.
    - The group wondered if we might be able to treat stakeholder consultation like jury service.
- We need to bring everyone together to look for common values and common ground. This takes time and money – which is not unusual. The things which are sustainable always need upfront investment.
    - However, the group were concerned that there is a lack of resources to implement this and to look for best practice. They recommended that we look to examples around the world e.g. the Channel Islands.
- We need an alternative values revolution! We may need to explore and express alternatives to GDP.

Breakout Group: Overcoming Barriers & Resolving Conflicts

1. What are the opportunities for overcoming barriers relating to the EU/UK legal framework? And what can we learn from historical conflicts over fishing rights?

The group concluded on the basis of discussions that:

- Capturing social, economic and environmental costs and benefits in one place is important.
    - Although the group warned that we should be aware of the short timescales available for consultation.
- Public education on local food benefits is required, including education about what really lives in UK seas.
    - People assume that the UK marine environment is murky, dirty and empty. They need to be inspired to preserve it. Studies have found that people shown images of UK seas often assume that they are seeing tropical zones.
- We need to reduce long distance importation of fish.
- We need to build trust with skilled staff at an early stage, which requires more skills and knowledge within departments like Defra. We need creative research to support better management and policy making.
    - There are huge opportunities for research on modelling and artificial reefs, which could be shared to avoid closing sites whilst assessments are made.
- We need to employ creative use of flexible legislation.
    - Examples of stewardship on local fisheries (East Asia) should be used in the UK for discussion and to change the legal framework.

- We need a stronger UK representation at EU level.
  - This would require more pressure from voters.

2. Are existing datasets and their management able to support an ecosystem services approach?

The group concluded on the basis of discussions that:

- Existing datasets are partly able to support the ecosystem services approach. The problem is that there is a lack of centrally managed datasets. Different datasets exist across different organisations.
- The recommended solution is the implementation of centrally managed datasets. In order to make this kind of central management work, we will need:
  - sustainable funding
  - better advertising
  - structured management of data
  - flexibility and an awareness that technology moves on
  - requirements to ensure that people submit any data captured

3. How can we raise public awareness of where ecosystem services come from?

The group concluded from discussions that:

- Better use of language to communicate and to help people understand fundamental processes (avoiding technical language).
- Use of iconic images to promote iconic species (with a regional focus).
- Linking with education and the curriculum to enthuse children.
  - In the group's experience children will inform and pester their parents to incite attitudinal change.
- There is often a focus on the terrestrial environment. We need to extend that and to link different environments together. We need to link rural, through to urban through to coastal, and through to marine.
- We need to focus on the impact of research. We need to increase accessibility and dissemination of research and to be confident that what we are communicating is interesting to the public.
- We need to highlight good, sustainable case studies.
- We should foster involvement from industry and those involved in the supply chain such as supermarkets.
  - Supermarkets have enormous power and reach. They have joined campaigns to push ideals in the past. They might be encouraged to campaign on the idea of (better defined) ecosystem services.

Appendix 3

NCI Symposium and workshop delegates

Name	Organisation
Adeniyi Adeleye	Brunel University
Professsor Stephen Albon	The Macaulay Institute
Becky Allen	The British Ecological Society
Dr Kathryn Allton	BSSS/IPSS
Dr Bianca Ambrose-Oji	Forestry Commission Office
Mark Anslow	The Ecologist Magazine
Peter Archdale	CNCC, NI
Dr Melanie Austen	Plymouth Marine Lab
Prof Jon Ayres	University of Birmingham
Hanan Azeem	University of Cambridge
Prof Mark Bailey	Centre for Ecology & Hydrology
Arturo Balderas Torres	University of Twente
Dr Louise Ball	Defra
Sara Banning	Capita Symonds
Dr Manuel Barange	Plymouth Marine Laboratory
Harry Barton	Northmoor Trust
Daniel Bastreri	Cefas
Prof Ian Bateman	University of East Anglia
Prof John Beddington	HM Government
Emma Bee	British Geographical Survey
Katie Begg	University of Edinburgh
Dr Laura Bellingan	Institute of Biology
Robert Blackie	University of Cambridge
Bruce Blaine	Peter Brett Associates
Dr Katie Bolt	RSPB
Dr Aletta Bonn	Moors for the future partnership
Dr Nigel Bourn	Butterfly Conservation
Dr Robert Bradburne	Defra
Dr Richard Bradbury	RSPB
Sarah Brown	Government Office for Science
Richard Brown	Eurostar
Philip Bubb	UNEP WCMC
Dr Seb Buckton	Wildfowl & Wetlands Trust
Dr Paul Burgess	Cranfield University
Jonathan Burney	Natural England

Dr Niall Burton	British Trust for Ornithology
Charlie Butt	RSPB
Dominique Butt	NERC
Dr Robin Buxton	Northmoor Trust
Rory Canavan	Ove Arup
Dr Richard Carden	
Stephen Carver	University of Leeds
Dr Rebecca Clark	Natural England
Andrew Clark	National Farmers Union
Barrie Clarke	Water UK
Dr Andy Clements	British Trust for Ornithology
John Clorley	Defra
Paul Cobbing	
S Coe	EFRA Committee, House of Commons
Dr Emma Comerford	RSPB
Ian Condliffe	
Rev Nigel Cooper	Anglia Ruskin University & Diocese of Ely
Victoria Copley	Natural England
Dr Peter Costigan	Defra
Briony Coulson	RSPB
Victoria Cox	Defra
Robbie Craig	Defra
Matthew Cranford	Economics for the Environment Consultancy
Edward Cross	Farmer
Prof Ian Crute	Rothamsted Research
Dr Caroline Culshaw	NERC
Dr Faith Culshaw	NERC
Savita Custead	Graphic Science
Lucy Darch	Centrica
Dr Glyn Davies	WWF-UK
Emily Dawson	Graphic Science
Marta De Olazabal	University of Cambridge
Jan Dick	Centre for Ecology & Hydrology
Claire Dimond	Graphic Science
Joanna Dodd	EFRA Committee, House of Commons
Dr Owen Dowsett	ESRC
Ian Draycott	CEH
Dr Mark Duffy	Natural England
Dr Deborah Dunsford	Natural Environment Assessment Service
Dr Nigel Eady	Graphic Science

Catherine Early	The ENDS Report
Dr William Eason	Defra Science Advisory Council
Russell Elliott	Countryside Council for Wales
Prof Stephen Emmott	Microsoft Research
Prof Philip Esler	Arts &Humanities Research Council
Dr Mike Farrimond	UK Water Industry Research
Dr John Fellowes	Kadoorie Farm & Botanic Garden
Les Firbank	
Dr Clare Fitzsimmons	School of Marine Science and Technology, Newcastle University
Rachel Forsyth	Institute of Biology
Fiona Fox	Science Media Centre
Tom Freeman	Cranfield University
Isabella Freire Wanderley	University of Cambridge
Dr Matthew Frost	Marine Biological Association
Lucy Futter	Science Council
Prof Chris Gaskell	Royal Agricultural College
Paul Gemmill	
Dr David Gibbons	RSPB
Prof Maggie Gill	Rural Affairs & the Environment, Scotland
Lucy Gilliam	Defra/ACRE
Dr Androulla Gilliland	Defra SAC
Paul Gilson	
Alessandro Gimona	The Macaulay Institute
Jill Goddard	Thames Estuary Partnership
Cathy Goss	Cambridge Centre for Climate Change Mitigation Research, University of Cambridge
Dr Richard Gregory	RSPB
Annelisa Grigg	Fauna & Flora International
Kate Groves	Centre for Ecology & Hydrology
Panchali Guha	Defra
Prof Rosie Hails	Centre for Ecology & Hydrology
Prof Roy Haines-Young	Centre for Environmental Management, University of Nottingham
Tim Hall	Wildlife Trusts Wales
Judith Hanna	Natural England
Alice Hardiman	RSPB
Martin Harper	RSPB
Dr Richard Harrington	Centre for Bioenergy & Climate Change
Dai Harris	Welsh Assembly Government

Dr Frances Harris	Kingston University
Brian Harris	Biotechnology and Biological Sciences Research Council
Prof Jim Harris	Cranfield University
Dr Paula Harrison	Environmental Change Institute, University of Oxford
Minna Hartikainen	Finnish Environment Institute
Dr Caroline Hattam	Plymouth Marine Laboratory
Kit Hawkins	Royal Haskoning
Prof Philip Haygarth	Lancaster University
Dr Justin Haywood	Cambridge Investment Research
Jonathan Hazeldine	Centrica
Prof Louise Heathwaite	NERC
Genevieve Helme	Redbee Media
Dr Helen Hesketh	CEH Oxford
Bernie Higgins	Solihull, MBC
Roger Higman	Friends of the Earth
Dr Alice Hiley	Environment Agency
Prof Anthony Edward Hill	National Oceanography Centre, Southampton
Dr Stephanie Hime	Economics for the Environment Consultancy
Dr Penelope Hirsch	Rothamsted Research
Dr Peter Hodgson	CORUS
Dr Alison Holt	Catchment Science Centre
Laura Hood	Research Fortnight
Dr John Hopkins	Natural England, Peterborough
David Hostert	University of Cambridge
Dr Bruce Howard	University of Oxford
Fiona Howie	Campaign to Protect Rural England
Allison Hulbert	Bracknell Forest Council
Helen Hunter	Cranfield University
Hilary Jackson	Graphic Science
Elisabeth Jeffries	Freelance Journalist
Simon Jennings	Ecology Consultant
Luke Jessop	University of Cambridge
Ben Johnson	Graphic Science
Dr Liz Kalaugher	IOP publishing
Ranjana Kataria	Redbee Media
Dr Sarah Kemmitt	The British Library
Prof Robert Kenward	European Sustainable Use Specialist Group of IUCN
Dr Stephen Kershaw	Brunel University
Nicola Ketling	Urmston Grammar School
Imran Khan	Office Dr Evan Harris MP

Joseph Kidido	Cranfield University
Garry King	Wiltshire County Council
Helen King	Cranfield University
Dr Barbara Knowles	Institute of Biology
Grant Kopec	Cambridge Centre for Energy Studies
Mustafa Kuk	Cranfield University
Dr Noelle Kumpel	The Zoological Society of London
Hannah Kyrke-Smith	Imperial College London
Gearoid Lane	British Gas New Energy
Jason Lavender	High Weald AONB group
Mary Lawrence	Government Office for Science
Poppy Leeder	NERC
Graham Leeks	CEH
Sasha Leigh	Natural Environment Research Council
Prof Paul Leonard	Environmental Consultant
Dr Anne Linley	PML Applications Ltd
Dr John Liu	Rothamsted Research
Natasha Loder	Economist
Jeremy Lovell	Journalist
Dr Jon Lovett	Natural England
Heather Lowe	
Prof Philip Lowe	Rural Economy & Land Use Programme
Dr Nick Macgregor	Natural England
Prof Edward Maltby	Institute for SWIMMER
Ceri Margerison	The British Ecological Society
Simon Marsh	RSPB
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Rachael McCarthy	Met Office
Dr Helena McCrone	West Hatch Parish Council
Dr Greg McInerney	Microsoft Research
Archie McINtyre	Exmoor Trust
Dr Niall McNamara	CEH
Prof Thomas Meagher	University of St Andrews
Helen Meech	The National Trust
David Midmore	Central Queensland University, Australia
Dr Diane Mitchell	NFU, Stoneleigh

Dr Kathryn Monk	BES Public and Policy Committee & Environment Agency Wales
Prof Hugh Montgomery	UCL Institute of Human Health and Performance
Gareth Morgan	RSPB
Rt Hon Elliot Morley MP	Energy & Climate Change Select Committee
Dr Paul Morling	RSPB
Prof Joe Morris	Cranfield University
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Neha Okhandiar	Foresight
Prof Tim O'Riordan	Sustainable Development Commission
Dr Daniel Osborn	NERC
David Over	Royal Geographical Society (with IBG)
Sara Pacitto	Cefas
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Dr Natasha Pauli	The Zoological Society of London
Dr Marco Pautasso	Imperial College London
Prof Denis Peach	British Geological Survey
Dr Helen Phillips	Natural England
Prof Nick Pidgeon	Cardiff University
Steve Pollock	BBC
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Donna Radley	Lowland Grassland HAP Group
Gemma Raiher	Redbee Media
Dr Mike Rands	Cambridge Conservation Initiative

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Prof Mark Rees	University of Sheffield
Chris Reid	Natural England
David Riddle	National Trust
John Robbins	Defra
Gergely Rodics	Pagan Snow Cap Region
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Dr Helen Roy	Centre for Ecology & Hydrology
Neil Runnalls	CEH
Amy Sanders	Graphic Science
Maria Scarlett	Centrica
Prof Marian Scott	University of Glasgow
John Seager	Environment Agency
Anne Selby	Lancashire Wildlife Trust
Graham Seymour	NI Environment Agency
Alan Shepherd	Met Office
Professor John Shepherd	University of Southampton
Gerry Sherwin	High Weald AONB group
Dr Gavin Siriwardena	British Trust for Ornithology
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Dr Andrew Sugden	Science Magazine
William Surman	Farmers Guardian
Peter Sutton	Syngenta
Judith Sykes	University of Cambridge
Jennifer Talbot	University of Cambridge, Department of Geography
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Dr Stephen Tapper	Game & Wildlife Conservation Trust
Prof Mark Tatchell	Mark Tatchell Consulting
Dr Tom Tew	Natural England
Professor Mark Tewdwr-Jones	Bartlett School of Planning, UCL
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Prof Jeremy Thomas	Dept of Zoology, University of Oxford
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Prof Sir Mark Walport	Wellcome Trust
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Janette Ward	Natural England
Dr Ruth Waters	Natural England
Prof Andrew Watkinson	Living With Environmental Change
Christine Watson	SAC
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Joss Wiggins	Kent and Essex Sea Fisheries Committee
Dr Derrick Wilkinson	CLA
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