



Adapting Upland Ecosystem Services to Climate Change Planning for the Future at Community Level

A 2 day workshop to share knowledge about adapting to climate change in the uplands
and to outline and develop a partnership research proposal.
4th and 5th September 2007

International Centre for the Uplands

Workshop Report

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Purpose

The purpose of this workshop was to initiate participatory discussions on climate change *adaptation*¹ among a wide range of stakeholders from upland environments. The focus was on;

- the identification of vulnerabilities
- the adaptation options based on scenarios of an average 2°C temperature rise
- capacity for uptake of adaptation options based on integration with other land management and community pressures
- the role of governance in adaptation
- the development of demonstration projects and the sharing of case studies

In particular, the workshop allowed for an international comparison of adaptation actions relevant to uplands and mountains and international comparisons of the role of differing forms of governance in the development and success of these actions.

The discussions were aimed at knowledge sharing, consensus building and developing a shared base for the initiation of international adaptation projects and knowledge sharing networks on resilience and adaptation options.

Summary of main findings and outcomes

The need for a participatory approach to land management was a reason for, but also a consistent message of, this workshop.

The requirement for building capacity through knowledge sharing was stressed. It was felt that knowledge sharing must be a two way process and must involve a participatory approach to developing future research questions.

Decisions on adaptation options require a regionally focused set of climate change scenarios. Often these exist but there is a need for wider communication of these scenarios and examination of local context.

Although the IPCC have produced separate adaptation and mitigation reports and the EU is adopting a green paper on adaptation the differences between adaptation and mitigation are not well understood or recognised in regional and local governance or by local land managers.

Local governance finds difficulty in addressing adaptation options in addition to mitigation. Pressure needs to come from local people and groups to allow adaptation onto the agenda.

Climate induced shifts and pressures in the connectivity between uplands and lowlands will need to be examined especially in terms of agriculture. These pressures will include possible ecosystem services, but will be made complex by shifting economic values and political judgments on public goods. Farmers and land managers require economic as well as climate change forecasting.

There is a need to initiate landscape or catchments scale demonstration projects that integrate climate change adaptation with other land management concerns and form feasibility studies to test future management options and markets.

Agricultural payments need to allow flexibility over their 10 year sign-up periods to allow adaptation to new markets and changed ecological conditions.

ICU Actions

- ICU will explore opportunities and seek funding to develop an information resource – perhaps in the development of a monthly digest to ensure actors receive up-to-date relevant information
- ICU will explore funding for the development of an international network to share ideas, case studies and innovation in adaptation options
- ICU will work with agencies and institutions to identify gaps in knowledge and develop relevant applied research
- ICU will develop applications for projects that integrate land management issues under climate change and develop case studies based on the testing of shared visions for future upland management

¹ Adaptation to climate change is *not the same as* mitigation – see Background section on page 2 and the glossary of terms on page ? for a discussion and description

Background

On the 29th June 2007, the EU adopted its first policy on adaptation to climate change². During this year, the Intergovernmental Panel on Climate Change (IPCC) also published a separate report on adaptation to climate change a part of the fourth assessment³.

Adaptation to climate change is not the same as mitigation. Mitigation is the implementation of actions that will *reduce the amount of human induced climate change* in the future by, for example, reducing emissions of greenhouse gas into the atmosphere. Whilst adaptation is the *application of coping strategies* to our actions in order to live with the effects and consequences of climate change.

Even if we successfully manage our use, and decrease our release, of greenhouse gases via mitigation, *which is doubtful*, it is now acknowledged widely (ref to IPCC etc) that we are already committed to further change in climate. This is mainly due to the excess greenhouse gases already released into the atmosphere by human activity. The outcome of various IPCC and other climate change reports is that the EU accepts that:

“Global warming is a fact. Climate change is happening and it is even accelerating. What we are seeing today are only the early signs of climate change and the result of past greenhouse gas emissions. Europe needs a wake-up call to prevent that climate change takes catastrophic dimensions later this century.”⁴

“Catastrophic dimensions” include a failure *to adapt* as well as to mitigate. The EU green paper identifies that we are facing *two challenges* that require action; the acute reduction in greenhouse gases; and, the need *to adapt* to changing climate conditions.

The need to adapt is partly predicated on the fact that climate change will impact on our ability to produce and provide many products and services. This is especially true of many of the land-based goods and services dependent on natural or semi-natural ecosystems⁵. Climate change will introduce new vulnerabilities to the functioning of these natural and managed ecosystems and therefore to our ability to obtain traditional goods and services from them. The Millennium Ecosystem Assessment (MEA) has identified a method of assessing ecosystems in relation to human health and wellbeing⁶ that could be used to develop and identify climate change adaptation strategies relevant to land-based communities and land management options. Related to this is the option to develop scenarios in which the resilience and vulnerability of ecosystems is identified and therefore risk recognised and risk avoidance strategies embraced⁷.

Mountain areas are identified by the EU green paper as one of six areas particularly vulnerable to climate change. This is of little surprise to those with a historical perspective as mountain and upland areas have always been vulnerable, with marginal economies, and their populations have waxed and waned through time according to pressures of climate, economic drivers and population. Mountain and upland areas and their communities, however, provide many “ecosystem services”⁸. They are globally important for their provision of water and they provide areas of natural and semi-natural habitat important for biodiversity and for human health. These areas also contain communities who are heavily reliant on agriculture and land-based industries and therefore vulnerable to change in climate.

Climate change impacts will be integrative, and will need to be assessed within the existing suite of economic, environmental and social pressures (often termed socio-ecological systems). The effects of climate change and the adaptation measures required will need tailoring to local circumstances, and local uptake of adaptation strategies may require strong leadership and knowledge transfer as well as community action. The value of case studies and discussion networks to allow the development of strong, resilient and relevant adaptation strategies is great. The need for mountain areas to unite and

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0354:EN:NOT>

³ *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.

⁴ http://ec.europa.eu/environment/climat/adaptation/index_en.htm

⁵ The Convention on Biological Diversity (CBD) definition of an ecosystem is “a dynamic complex of plant, animal and micro-organism communities and their nonliving environment interacting as a functional unit” (United Nations 1992:Article 2)

⁶ <http://www.millenniumassessment.org/documents/document.300.aspx.pdf> “The Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.”

⁷ The Resilience Alliance provides a source of much research on this and a useful toolkit for action <http://www.resalliance.org/1.php>

⁸ Ecosystem services are the resources and processes and services that are supplied by natural or semi-natural ecosystems according to the MEA they include: Provisioning e.g. livestock, crops, water; Regulating e.g. water filtration, flood prevention, decomposition processes; Cultural e.g. tourism; and, Supporting e.g. soil formation, whilst Daily (2000) adds the additional service of Preserving.

share their specific problems and solutions across Europe is demonstrated by the success of such organisations as Euromontana.

The International Centre for the Uplands (ICU) was set up to explore upland land management issues in an interdisciplinary and integrated way and to challenge and influence thinking from a widely informed context across academia, policy and public opinion. A further emphasis on discussions about climate change was widely requested in feedback after our successful participatory and interdisciplinary conference on Sustainable Upland Management in 2006 (Soane and Shaw, 2006). Climate change as mentioned above is inherently an interdisciplinary issue but also requires integration with and incorporation into a wide range of policies and practices. It has been observed that adaptation to climate change requires a greater emphasis on the bottom-up participatory approach because adaptation will need to be tailored to local requirements from local climate forecasts. For these reasons it is a particularly suitable subject for a Centre with our remit.

The following report outlines the key issues of the workshop held on the 4th and 5th of September 2007 at Newton Rigg Campus of the University of Cumbria and presents the resulting key points for further research, discussion and action.

Scene Setting Papers

The workshop commenced with an introduction to the new Cumbria University by Peter Nixon. Cumbria is particularly interested in maintaining links to the local population and geography. The methodological aims of this workshop, in designing applied research projects and knowledge sharing networks on climate change adaptation in the uplands around a participatory approach fits well with the aspirations of the University of Cumbria.

Frank Gaskell, the president of Euromontana, then introduced Euromontana, the European multi-sectoral association for co-operation and development of mountain territories. The Euromontana mission is “to promote living mountains, integrated and sustainable development and quality of life in mountain areas”⁹. Frank also introduced some of the background figures behind the climate change debate. The need for adaptation strategies is central to the Euromontana cause of sustainable mountain areas. The scientific basis for climate change and the implications for land management were then expanded by the second keynote speaker, Rudiger Grote from the Institute for Meteorology and Climate Research (IMK-IFU) at the research centre in Karlsruhe, Germany. Rudiger highlighted the importance of regional climate change scenarios and showed predictions that Alpine areas would be subject to much higher levels of warming than lowlands or northern latitudes. He identified the wide range of sectors including tourism, water management, agriculture and forestry, and health that would require climate change adaptation responses and concluded that there was a need for integrated studies. Ian Soane and Helen Shaw from the Upland Centre then summarised and contextualized the workshop rationale and the rules of engagement for the discussion workshops.

The following points were summarized from the keynotes and workshop context.

Climate Change is occurring and there is evidence of a *c.* 1°C rise in average temperature over the last century. The weather is likely to change with increased winter rainfall and summer drought, and increased storminess.

Climate change is not uniform in time and models are predicting a *trend*; there will still be yearly fluctuations, for example to colder and hotter than average temperatures, but the overall average temperature will rise.

EU mitigation strategies aim to limit future rises in global average temperature to no more than 2 °C – However:

There are serious doubts whether this aim is deliverable.

Not all regions will face the same increases in temperature. EU mountain areas may face a higher than average increase in temperature. The potential for temperature rises in excess of 2 °C is particularly pronounced in the Alpine region.

⁹ www.euromontana.org

The occurrence of climate change has already affected our environment and effects are likely to increase. This is because changes on the natural environment driven by climate change are not likely to be linear, but are likely to be stepped as thresholds of tolerance are passed¹⁰.

Environmental effects are likely to impact widely across biological and physical systems - biodiversity, soil structure, erosion, flooding, water quantity and quality.

Humans rely on natural and managed ecosystems for many goods and services and these provide a socio-economic background to human existence. The pathways between the socio-economic drivers and the natural environment are short in upland and mountain areas and therefore are likely to be felt first and possibly to have greatest effects on upland communities and economies. This will be exacerbated by the likely greater temperature increases in these areas.

The socio-ecological systems that have developed in upland environments have strongly linked cultural values and cultural landscapes that are valued by upland and lowland dwellers. Climate change may impact highly on these values. Climate change may shift the cultural values that people place on the uplands and therefore affect the security of some of the current landscape payments that land managers receive.

Mountain and upland areas also provide important physical resource services to the lowlands, especially the provision of water. Climate change and integrated land management options have the potential to dramatically affect the water services potential of the uplands.

Not all changes will be bad. Warmer summer temperatures could increase grass production in the uplands and therefore the stock carrying capacity, however increased storminess may make soil management increasingly difficult under this scenario.

Planning can help to make the most of the expected changes and to adapt socio-economic structure and function. Wide-ranging stakeholder discussion is essential to identify the complex and integrated issues in order to avoid the worst impacts and to take advantage of opportunities.

From an identification of resilience and thresholds it is possible to plan to adapt management strategies to ensure ecosystem services remain sustainable, or to adapt society to benefit from different services as ecosystems change and adapt to climate change (Lyytimäki, J. & Hildén, M., 2007). Inherent in the discussion were the need to integrate climate change concerns with other land management pressures and to identify the limitations placed on land management options by different mechanisms of governance.

Existing international examples were presented in the plenary session; these give a flavour of the knowledge transfer opportunities available between mountain regions. **Ilaria Goio** from the *University of Trento* presented work on the economic implications of climate driven changes in ecosystem services as illustrated by a modeling approach of the predicted effects of different tree species production and carbon capture caused by different average temperatures rises. She concluded that policy formulation required more information on the synergies between ecological, economic, social and cultural values of different ecosystem services. A biodiversity approach was considered in a presentation entitled “principles underpinning an adaptive response to climate change” by **John Hopkins** of Natural England who highlighted the complexity of responses of individual species under a changing climate. This individualistic response could lead to a breakdown of community structure in ways that are still little understood. The value of monitoring should not be underestimated and adaptation strategies that aim to conserve a range of ecological variability are likely to help ensure resilience. The presentation drew heavily on a valuable report (Hopkins *et al* 2007) into conservation of biodiversity under climate change. Upland biodiversity may be especially sensitive to climate change due to the marginal nature of the habitat of many species. As climate warms lowland species are likely to move northward and lowland species are likely to move upslope. Some of the mountain-top species will have their habitat severely squeezed and may become extinct. These upland-alpine habitats are currently awarded high conservation status. Habitat and species action plans designated under EU policy may need to be adjusted and reconsidered. The last presentation examined climate change from a social perspective **Matthias Buchecker** from the *Swiss Federal Research Institute* presented a paper on risk perception and its implications for risk communication and risk management. Interviews were used to establish and analyse the differing views of local people and scientists on climate change. Statistical analysis of responses

¹⁰ Thresholds of tolerance are points at which a small change in external forces causes a major shift or breakdown in resilience leading to a massive change in the system, or a “regime shift” these issues are discussed in a paper by Walker and Meyers 2004 freely available at <http://www.ecologyandsociety.org/vol9/iss2/art3/main.html>. Resilience and thresholds are relevant for ecosystems or species, for water provision, for soil structure, for economic and social prosperity, and for maintenance and for interactions and feedbacks between all of these ecosystem services and functions.

demonstrated that climate change action and awareness was concentrated on associated and visible risk and that therefore pro-action rather than reaction may be difficult to achieve. This demonstrates the importance of participative scenario modeling approaches and shared experience.

Workshop Reports

In order to achieve a high degree of knowledge sharing and participation most of the workshop was allocated to breakout discussion sessions four workshops dealt with sectoral relevant questions although the delegates were allocated to the workshops to ensure a range of views from sectoral and non-sectoral perspectives

The **Community Workshop** dealt with the question:

“How can local communities be involved in influencing the ways in which their local landscapes are managed?”

Roger Roberts of *Voluntary Action Cumbria* and **Robert Allan** from *Sustainable Brampton* gave scene setting papers

Will Williams from *The Natural Economy Project* was the Rapporteur

A recent VAC conference on the 21st Century village was a starting point for the scene setting papers. This conference had enabled local people and agencies to come together and identify opportunities as well as threats to their future. The conference had identified peak oil as a major threat to communities. Community challenges need to be seen as an integrated whole. In particular, for the uplands the context of climate change needs to be addressed in an atmosphere of low incomes, an aging population, and reliance on agriculture. Future integrated threats include agricultural restructuring, reducing government support, and the application of urban based policies to the rural and upland environment. This latter leads to problems as top-down decision-making is not solving problems of the rural environment. Roger Roberts identified a need to change the way we look at the problem of climate change. He noted that the question is not “how local initiatives can inform choices about climate change” but “how climate change sits within and informs local decision-making and local action” To answer the workshop question a knowledge base needs to be established to identify how local actions on climate change can be informed and enabled and how community decisions concerning acceptable ecosystem service risks can be informed.

Bob Allan introduced Sustainable Brampton¹¹, an initiative that seeks to influence individual behaviour, encourage community-wide planning and deliver mitigation and adaptation projects. Community sustainability initiatives can respond to future pressures by assessing community risks and taking precautions, by planning to avoid, minimise or adapt to the threats.

Local changes in weather systems and climate will act on local communities and each needs to identify its particular vulnerabilities and strengths. Each needs to seek to minimise impacts by making itself more resilient and self reliant. Bob highlighted that sustainability initiatives can also be used as an opportunity to address existing quality of life issues. Many of the issues raised were linked to the need to adapt to local food production, and to rely less on oil based transport systems. Adaptation to climate change is therefore seen in sustainability initiatives, not just as an adaptation to warming, and weather related aspects of change, but to secondary climate change induced pressures created by our need to mitigate against climate change. This adds another layer of complexity to the management and planning of future communities under climate change.

Specific difficulties of community planning were highlighted that link well to the findings of the Local authority workshop. This community initiative felt that it was not integrated and considered in planning controlled by local and regional government. These LA plans are too focused on economic growth measures and on supporting current markets. There is a lack of capacity to address future change within current governance. There is a need to harness top-down money into community led initiative in order to boost their activity and success. Bob finished with a series of questions and issues which need addressing:

- How do we harness community concern for the future?
- How do we get business to do the right things, before it's too late?
- How do we get economic support agencies to stop supporting markets which are heading in the wrong direction and start supporting appropriate structural change?
- What will be the role of the voluntary & community sector?
- How do we establish the changes needed, with communities playing a central role?
- How do we plan the transition, to minimise discontinuities and unintended consequences?
- How do we get the research done to inform the choices we need to make?

The concept of community is always fraught with difficulty and discussion during the workshop session highlighted this. It was felt that there needed to be some examination of the optimal size of

¹¹ <http://sustainablebrampton.org/>

a community in order to gain the best and most efficient sustainability and adaptation. The difference between urban and upland/rural need to be highlighted and better understood to ensure policy relevance. There would be value in communities mapping and auditing their assets, these could include physical and ecological assets as well as people and skills. Understanding and promoting assets could allow for more relevant and tailored top-down support. The mismatch between governance and local needs was reiterated and discussion centred around the difficulties of deciding who moves first, who leads, especially in the development of local policy.

Delegates considered if communities could develop their own community plan. This would need to sit within local and regional strategies where there is currently a mismatch with community level needs as highlighted by Sustainable Brampton. Again the knowledge base was a key limiter in this approach. Delegates felt that there was a need to brief local communities in the activity of developing local plans.

The **Farming Workshop** dealt with the question:

“What sort of balance between public goods and market opportunities will climate change require in the uplands?”

Geoff Brown from *Leader+ Cumbria Fells and Dales* and **Becky Shaw** from the *Scottish Crofting Foundation* gave scene setting papers

David Morley from H&H Bowes land managers was the Rapporteur

The presentation started with a consideration, from the farmer perspective of what farmers may get from any change in land use driven by adaptation or mitigation to climate change. Afforestation may be a future pressure, there may be benefits for water management as well as carbon sequestration and local energy provision but the financial benefits of forestry can be long-term. Current land management may be hampered by difficulties of stock gathering etc. The pressures for energy provision may create shifts in available land for current agricultural practice and may impact on profitability of current practices. Dairying has disappeared from the uplands, but pressures on lowland areas may lead to a reintroduction, especially given a drive for localisation of production. Consequent ecosystem effects may be poaching, and nitrogen increase and also GHG increases. World prices, especially for animal feed, may shift as high value energy crops are grown elsewhere. This may mean a return to a use of the inbye for crop production in the summer. World prices may also shift landscape values away from the provision of public goods. Currently the high value attributed to traditional rural landscape acts as a limiter to adaptation strategies. The discussion also highlighted the need not only to adapt to climate change in terms of possible ecological thresholds, but also to adapt by accepting that mitigation pressures outside of the uplands will have a knock-on effect on land-use options and ecosystem services in traditional upland landscapes and markets. Connectivity between upland and lowland, urban and rural may be important integrative considerations. Changes are likely to be fast moving over the next few years and agri-environment agreements may be too inflexible within their 10 year sign-up period to allow adequate adaptation response. More farmer involvement and funding for pilot adaptation schemes at the landscape scale with an identification of market opportunities was seen as important.

Becky Shaw highlighted the role of climate change in current shifts in management and community action in the highlands and islands. The key message was that adaptation had started now, on an ad hoc basis but required more structure and planning. One visible action has been the response to increased storminess. In Island communities this is causing a visible retreat from the shoreline triggered by past storms that caused a tragic loss of life. This is now affecting community housing as well as farm fencing. The increase in wet summer weather is triggering a move to silage production, whilst wetter winters are triggering shifts in sheep breed and management systems. Losses to the crofting community are forcing changes in farm management as communal systems break down. It is clear that market forces alone cannot drive the required adaptation shifts as current desired ecosystem services are likely to be put under pressure as management regimes shift to increased grazing of the inbye creating subsequent stresses on soils and water. Becky finished her scene setting presentation with a list of requirements:

- Good communication – ensure no mismatch between aims of policy and reality on the ground ‘rubbish in, rubbish out’
- Engagement and involvement of stakeholders in policy development
- Policy decentralisation (along with the money and policy tools) within overall national framework adapted to take account of climate change. - Regulation and incentive needs to be targeted and appropriate
- Integration of public institutions dealing with land management – at local or higher level

Discussions left no doubt about the complexity of agricultural issues and in general there was a consensus on the need for more knowledge sharing and information gathering around many of the issues outlined. Information would need to be integrated with other land management drivers and to encompass economic and environmental impacts and consider social impacts.

The **Local Authority Workshop** dealt with the question:

“What is the role of the territorial authorities in developing interventions and innovations to take account of climate change?”

Councillor Ian Stewart from *Cumbria County Council* and Alessandro Gretter on behalf of **Dr Mauro Gilmozzi** from the Autonomous Province of Trento gave scene setting papers

David Roberts from the Highland Council was the Rapporteur

The local authority workshop presentations and discussions highlighted the problems associated with management and planning for adaptation to climate change. Local authorities are involved in many projects dealing with mitigation, low profile energy efficiency projects – such as insulation and home energy, as well as recycling projects. These receive a great deal of public support and are in the realm of widespread public concern. This enables Local Authorities to justify spend on these issues. Cumbria has a good record in recycling and in mitigation, these were highlighted by Councillor Ian Stewart. Activity has been very much focussed on raising awareness of climate change, encouraging others to raise awareness and reacting to this public interest where initiatives attract public support.

The situation in Italy is one where the Trentino province enjoys delegated authority for many aspects of legislation and budgetary matters. Ninety percent of its area is recognised as “Mountain” under EU regulations and policies are for its management as a cultural landscape that is vulnerable to climate change. Policy development has benefited from locally generated research activities. There have been five recent EU projects aimed at risk assessment and management of fragile ecosystems, extensive networking between research organisations and public agencies has included quantification of the regional soil and forest carbon sink, and local stakeholders have been involved in spatial planning, new building codes and an economic evaluation of the natural resources of the province.

The Workshop discussion concluded that the Local Authority method is delivery through engagement and influencing. This relies on knowledge sharing for decision-making. A local or regional lead needs networks of influence. So far the influence for adaptation has not been as strong as for mitigation. There has been a policy lag in developing adaptation action. The feeling amongst English Local Authorities seemed to be that their freedom for action was heavily constrained through being hemmed in by legislation operating at national and regional levels and by consultation requirements at local level that were reactive to the national agenda. Delegates noted that they had largely avoided the topic of spatial planning as a matter for discussion and thought that this reflected a major work area in which local action was heavily constrained despite the apparent opportunities offered by recent changes to the Local Planning process.

By its nature, adaptation possibilities require local knowledge and climate change scenarios tend to be generated at a wider geographic scale. It is particularly difficult for Local Authorities to deal with risk management when there are large uncertainties. There needs to be better understanding of how to deal with uncertainties and development of risk strategies. Better communication of these factors would help to allow policy action. A notable quote arising from this Workshop was the statement that as Local Authorities “We need to understand the problem”. However, all delegates were agreed on the usefulness of some form of asset inventory but were uncertain how or whether to translate any such inventory into a comparative valuation methodology.

The Workshop also identified lack of funding as a major limitation for adaptation action. However, given the uncertainties and the way that some land management might contribute to both adaptation and mitigation initiatives there may be further avenues to be explored. Carbon trading was identified as one mechanism worthy of exploration.

The **Agency/Conservation Workshop** dealt with the question:

“How should ecosystem services be assessed for adaptation?”

Stuart Pasley from *Natural England* and **Dr Jakob Lundberg** from the Stockholm Resilience Centre gave scene setting papers

Andrew Herbert from the Lake District National Park Authority was the Rapporteur

Stuart Pasley informed the Workshop of a recent initiative by Natural England to develop a climate change response programme. Their first actions included identification of the valued environmental/landscape /nature conservation assets of four pilot areas in England. The objective of this pilot was to identify the assets, evaluate the likely impact of climate change on these assets and then to produce a costed action plan to allow climate change adaptation for the pilot areas that might be generalised to similar areas elsewhere. The pilot study has so far accurately mapped the extent of valued habitats that make up the asset maps but Natural England is looking for ideas on how to incorporate ecosystem functioning or the concept of ecosystem services into the methodology. There is an intention to engage community stakeholders into the policy making process but the process of doing this is yet to be determined.

Jakob Lundberg presented the Workshop with a comprehensive overview of the Millennium Ecosystem Assessment MEA undertaken for the United Nations that has clearly documented the extent of man induced damage to the world's ecosystems and to the ecosystem services that underpin human well-being. Habitat change, over-exploitation and pollution are all having major deleterious impacts but added to these is climate change which is having an increasing impact much of which will make it difficult for ecosystem services to be sustainably maintained. However, in the past modification of ecosystems has produced substantial benefits for mankind and not all change will necessarily be disadvantageous. For example, in Sweden Climate change could result in more energy production from hydropower, lowered consumption of energy through less severe winters, increased crop yields and improved marine fishing.

The MEA had concluded that it is necessary to promote sustainable systems of ecosystem management looking for synergistic benefits and removing any incentives that favour over-exploitation of natural resources. This will require greater collaboration between stakeholders and a better understanding of the generation and maintenance of ecosystem services.

The Workshop felt that the role of partnerships is crucial in developing an understanding of the issues. There was a need for an evidence base at a level of detail suitable for understanding by appropriate partners for the tasks that could be undertaken in partnership. It was important that “experts” should build trust with society and this could involve recognition that people “on the ground” were often best placed to detect and therefore potentially monitor change. Delegates were impressed by an ecosystem services case study from Sweden where local fishing associations have been given greater management responsibilities in recognition of their local environmental knowledge. There was a feeling that there was a need to explain to society the ecosystem services that farmers provide and that this could also provide a tool for assessing the public goods provided by ecosystem services. It was suggested that the public be asked for their view on the “ecosystem services” that they receive.

The Workshop were more concerned with the issue of communication than addressing the issue of technical development of suggesting how a tool for assessing ecosystem services be developed. They considered that there is a role for “technocrats” in complex scientific fields and that, living in a high-risk world, agencies must carry some of that risk. However, agencies must consult each other and seek ways of generating public understanding by avoiding “techno-speak” and translate ideas into popular language. Sometimes simple ideas are best and sometimes there is a need for a new perspective, otherwise new problems are being addressed by old tool. There is a role for looking at historic approaches (e.g. risk analysis of flooding) but new ways of thinking such as use of the Arts to convey simple messages should also be considered.

The workshop concluded that communication is the key to adaptation. Clear links between impacts of change and the risks to individuals need to be made in order to identify the measurable benefits of an adaptation strategy.

Field Trip to Bampton Village Hall and to Haweswater

The Field trip comprised two activities:

Firstly, the rapporteurs fed back their presentations to an enlarged audience that included farmers, conservationists and local residents on the conclusions of the sectoral Workshops. There was a short debate that was initially concentrated on any new issues raised by locals to the Bampton area and was then widened out to include all present. There was considerable interest in the concept of ecosystem services, not least from United Utilities who manage the catchment of Haweswater reservoir. Other locals raised the issue of habitat improvements to the River Eden as contributing to a more sustainable system. However, there was strong debate about the future of hill-farming in the area. One delegate considered that hill-farming of the hill rough-grazings (fell) was unlikely to persist for economic reasons but that more intensive use of enclosed agricultural land (Inbye) was likely with climate change. This might create opportunities for more radical change in woodland creation to adapt to tomorrow's climate rather than today's. More intensive use might also be compatible with local initiatives to reduce carbon footprint by increasing the role of local production.

Secondly, the Workshop visited Fell land around Haweswater Reservoir in the company of United Utilities, RSPB (who have a nature reserve agreement over the area) and representatives from Bampton Commoners Association. The Water Company explained their interest in managing the catchment to produce a supply of pure water that ultimately supplies Manchester. Any increased erosion might discolour the water in a way unacceptable to the customer. Cattle had been removed from the immediate catchment because of disease concerns. RSPB wished to restore degraded heather and bog habitats and to recreate woodland whilst commoners were concerned that conservation prescriptions were leading to degradation of the habitat through undergrazing of coarse grasses and hence high pressure on more palatable vegetation. Water supply, nature conservation, landscape protection and agricultural production were all recognised as ecosystem services and delegates were reminded of the need to identify integrated approaches to natural resource protection.

Integrated Workshops

Outcomes and discussions of the workshops on day 2 had many common themes. Delegates were asked to debate three questions:

What information is needed to adapt visions for the countryside to those possible taking climate changes into account? Could this be used to develop scenarios capable of an ecosystem approach to sustainable assessment?

What is the role of interdisciplinary and multi-disciplinary academic and action research in developing these visions?

What are the Europe wide issues that would benefit from an international study?

The outcomes were

- An audit of environmental information – more sharing of data
- Better long-term monitoring and datasets
- Models and predictions of the negative and positive effects of Climate Change on tourism. Tourism connections and patterns with weather.
- Examination of the likely changes in peoples behaviour – habits etc under changing climate
- Information on integrated drivers of change and underpinning external pressures e.g. Peak Oil, Local Food Economies, Carbon Footprints.
- Scenario modelling was seen as a good option, and capable of being used in a participatory approach, but there was a need to develop knowledge prior to scenario modelling. Scenario modelling should be informed by, but also limited within, the information available.
- Collation of the research effort and communication of existing research evidence. Tying together of existing research and the development of comparable dataset and measures
- Research to fill gaps and questions identified by participatory discussion, action research.
- Monitoring and research into impacts
- Research into thresholds and resilience
- Research into the connectivity in ecosystems and socio-ecological systems

- Research into different methods of environmental governance and developing the capacity for innovation.
- Research into the consequences of CAP reform – is it going in the direction aimed for under the additional burden of changing climate conditions
- Research into the visions and desires of people – clarity about where we are and where we want to be
- Research and knowledge sharing about the tools and strategies already available that may be adapted to a variety of local situations.
- Evaluation of case studies and ongoing projects
- The ecosystem approach was one angle, but also an integrated landscape approach was suggested.
- Comparative visions, and shared visions – how local visions fit into wider ones.
- The need to fund more pilot landscape scenario projects was highlighted, and also the need to fund projects that implement the scenario visions to act as demonstration projects.

The role of research in developing visions is to give

- baseline information,
- feedback on risk, resilience and consequences of visions,
- to highlight good and bad practice and
- to link modelling to on the ground observation.

Europe-wide issues identified included

- governance comparisons
- wider sharing of climate change scenarios and their uncertainties
- adaptation options, sharing successes

Discussion and Conclusions

The inclusive workshop methodology is an important one, it illustrates that tools developed to assist in understanding the *impacts* of climate change at local level and the policy messages about the actions needed *to live with* climate change are only partially reaching local actors. In some workshops, the lack of prior framing of issues hampered the ability to actually address the substantive questions of the workshop so that the message was more about voicing a need for participation, rather than actually developing participation. This is not surprising, and does not invalidate workshop conclusions, but demonstrates the requirement to build subject specific networks for knowledge sharing ahead of, or alongside, exemplar projects and case studies within regions as a basis for knowledge sharing. It is likely that scenario development for climate change adaptation will be understandably hampered by discussion of current pressing local land management issues until this is achieved. Knowledge sharing is imperative so that we can develop to the point of regional and local scenario discussions incorporating and integrating climate change, ecosystem services and socio-ecological vulnerabilities.

The difficulty expressed by local authorities, in responding to vulnerability threats and adaptation policies is problematic for the development of action. Lyytimäki & Hildén (2007), referring to management of coastal waters, identify some key requirements for a concept of thresholds (or vulnerability) to be useful in policy implementation; these include acknowledgement of the problem, and information about the impact of crossing a threshold but, importantly, a key requirement is the capacity and mandate within institutions and organisations “to take action, but also to debate and (re)interpret research findings to maintain a learning process.” Innovation and leadership in development of local scale policy in relation to adaptation is required, but unless this fits within the remit of local strategic plans it is difficult to see how adaptation options can be mainstreamed.

The problems faced by the local authorities create an interesting dilemma when considered in the light of the problems and issues raised in the community workshop. Communities often require guidance in the early stages of development of community plans, they require information as to how they can gain influence, and structure to aid the development of democratic and shared visions. Communities *can have* skill and assets within them to overcome these barriers, *but they do not always*. Many communities rely on Local authorities to lead and inform. It seems that at the same time Local authorities are waiting on communities to give them a mandate for action, especially in the dispersal of public funds into risk management strategies where outcomes are uncertain. The issue of who takes the lead is complex, but the community workshop demonstrates that communities would benefit from knowledge sharing and mentoring in the role of self-development. Local Authorities may need to take the lead in this by acting as

a conduit for knowledge sharing. Think-tanks, Applied Research Centres and new academic structures incorporating knowledge transfer functions can help LAs and other institutions and agencies to implement this.

Knowledge about local systems requires action research and participation. Scientists must work with agencies and land managers to ensure research is locally relevant and is collected in a way that can be used to set agendas and to debate futures. Data must also be more freely available. However it must also be used objectively and professionally. Supported knowledge transfer must be a key issue for the future among the holders and owners of datasets. Integration of data and interlinkages between drivers or change must be identified and cumulative effects accounted for. For example, the knock-on effect of grain prices on stock farming, and on landscapes, or the suitability of reduced stocking levels as warming shifts grass productivity together with the associated effects of stocking levels on soil erosion, soil structure and water quality.

Knowledge sharing and mentoring is also probably a necessary step in the examination of *global impacts externalities* and social responsibility. Rudiger Grote highlighted the impact of climate change on other regions and the possibility of widespread climate change driven migration is a clear global phenomena with local relevance and impact. Urban based policies may be seen as unsuitable for rural environments, but equally the pressure for urban living and planning systems is one of national sustainability; urban living is seen as more energy and transport efficient. If rural communities are to be considered as part of a future sustainable strategy, then they will need to manage their high ecological and environmental footprint and demonstrate an awareness of their own externalities as well as wishing urban areas to understand their impact and reliance on the rural. Demonstrating sustainability in rural communities may be a step towards strengthening the profile of rural communities in national planning strategies.

There was a general feeling that current economic measures and systems were not helpful in developing an atmosphere for acceptance of change. Perhaps the concept of socio-ecological systems rather than socio-economic ones may be helpful in responding to climate change and developing strong communities, it removes the focus on economics, as they can then be seen as a by-product of the interaction between cultural systems and ecosystem services available for use and consumption within the cultural landscape. A long history of occupation of the uplands despite its marginality for economy supports this socio-ecological viewpoint.

The concept of favourable condition in ecological management must be reconsidered in many areas. Favourable condition is a useful political measuring tool, but may not always be a useful ecological concept when applied in too narrow a context. Favourable condition relies on concepts of sustainable end states for ecological communities, and control of human impacts on systems to either attain that end state, or be maintained in some kind of equilibrium by management (i.e. grazing prevents the end point of woodland establishment). There is a need to re-assess whether appropriate data is being collected in order to judge its suitability for purpose as climate changes impacts increase. Some research and monitoring gaps may be identified by talking with farmers and land managers who can identify effects of current prescriptive management. The Workshop debates did identify the limitations of environmental stewardship schemes and environmentally sensitive area payments in setting agendas for land management in a changing ecological system but they were nevertheless identified as possible mechanisms for climate change mitigation action. By contrast when adaptation was considered, the Workshop identified that policy, and policy interpretation and application, needs to be flexible, and to work with farmers as they try to adapt to new ecological states and new markets. Monitoring must measure and assess the impacts of changing management; measures used must reflect local conditions as well as effect the ability for international comparisons.

Workshop Actions

- A declaration of intent to work together and to share knowledge in order to respond better to climate change risks in the uplands and mountains of Europe. (see appendix 1)
- A compendium of projects dealing with adaptation to climate change, ecological indicators of resilience, vulnerability and thresholds. (To be maintained as a web resource)
- A web based climate change and ecosystem resilience knowledge sharing resource on the ICU web site comprising a monthly digest of project news (Requires a small maintenance budget)
- An international network of knowledge sharing and comparison projects for upland adaptation to climate change (Requires a network budget)

- An application to EU LIFE+ or Interreg for an international joint project. (Requires local institution or agency support)

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Workshop Declaration

Adapting Upland Ecosystem Services to Climate Change Planning for the Future at Community Level

A 2 day workshop to share knowledge about adapting to climate change in the uplands and to outline and develop a partnership research proposal.

4th and 5th September 2007

As delegates to the above International conference we declare the following

As a group of those concerned with land-use in the uplands we conclude

- that climate change is occurring and that adaptive responses are necessary
- that, to adapt successfully, integrated and applied research is necessary and that this needs to be designed and implemented following participatory principles
- that a more detailed understanding of ecosystem services may provide a tool for evaluating scenarios of change encompassing adaptation options

We observe that

- whilst mitigation is essential, and required at all scales of governance, climate change will still occur and many adaptation options must be driven by relevance at a local community level

We note that

- that the International Centre for the Uplands Workshop has identified the potential for us to work together to provide an inclusive participatory framework to exchange ideas and information not just as a conduit for ecological and meteorological science but also on the relationship between the implementation of adaptive strategies and forms of governance
- that there are opportunities for the development of international projects that would be of benefit to participating countries and the European Union generally

We commit to securing the support for our organizations to

- work together with participating organisations at the Workshop, with other researchers and with local stakeholders at existing or potential study sites, to establish a network that will ensure information dissemination and develop participatory research
- further refine our focus on ecosystem services within a scope that includes farming, food networks, forestry/woodland, hydrology, soils, carbon storage/sequestration and their relationship within futures scenarios including adaptation to climate change
- further explore the unique features and values of upland ecosystem services within integrated studies of possible adaptation strategies
- to publicise each other's support for scientific research and for community level planning of adaptation to climate change

Participating Organisations (other delegates to be invited to sign up)

Autonomous Province of Trento, Centre for Alpine Ecology, Crichton Carbon Centre, Cumbria County Council, Environment Agency, Highland Council, Institute of Grassland and Environmental Research, Institute for Meteorology and Climate Research (Karlsruhe), Lake District National Park Authority, National Trust, Natural England, Swiss Federal Research Institute, University of Cumbria, University of Trento, University of Manchester, University of Stockholm

The report should be referenced as

Shaw, H.E. and Soane, I., (2007) Adapting Upland Ecosystem Services to Climate Change: Planning for the Future at Community Level. ICU Workshop Report. From the workshop on 4-5 September 2007 at Newton Rigg Campus, University of Cumbria.