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Non-Technical Summary

The Synergies of Multi-Level Integrated Linkages in Eco-social Systems (SMILE) project seeks to further develop and apply a tool kit. This toolkit consists of three models: SUMMA (Sustainability Multi-criteria Multi-scale Assessment); MuSIASEM (Multi-Scale Integrated Analysis Societal Ecosystem Metabolism) and ASA (Advanced Sustainability Analysis). This report is a contribution to WP5: Interfacing with societal/policy processes, and explains how one set of stakeholders, staff from the Cairngorms National Park Authority (CNPA), view the utility of the SMILE toolkit (SUMMA and MuSIASEM). The objectives for the report are to:

- explain the rationale for undertaking a utility evaluation;
- provide the context for our application;
- present the findings to date; and
- illustrate what lessons have been learnt.

Utility is one of the key factors linking the outputs of research (in the form of knowledge embodied in peer reviewed articles, software or datasets) to *Outcomes* (changes in values, attitudes and behaviour in the world beyond the walls of the research institute). However, there are a series of interdependent problems to be overcome to ensure that research based tools and methods are useful for, and used by, policy makers and management. In our case study, the policy and management stakeholders are the CNPA, who are support sustainability decision-making in the Cairngorms National Park (CNP).

The results are based on two workshops held in November 2008 and December 2010, plus discussions with CNPA staff from 2007 to present date. The main issues regarding using the tools were the staff time commitment; availability of, and access to, data; whether the CNP was a suitable exemplar and difficulties in understanding the technical language used. These themes also occurred in the workshops. The content of the workshop discussions, combined with the evaluation results, suggests that MuSIASEM was seen as a more useful tool than SUMMA. It appears that the main difference between SUMMA and MuSIASEM was that SUMMA was perceived to be less transparent. However, SUMMA raises some useful questions. The evaluation suggested that the CNPA staff would not use the tools themselves, but given suitable refinements, would be very interested in using the outputs as evidence to inform future spatial plans. The tools are located in multi-level governance networks, as they could inform the CNP's contribution to achieving the Scottish Government's goals of sustainable economic growth; a transition to a low-carbon economy and to an integrated land use strategy.

It is important to recognise that the results and discussion presented here are tentative. This report will be updated with these further results, leading to final conclusions and recommendations.

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1 Introduction

The Synergies of Multi-Level Integrated Linkages in Eco-social Systems (SMILE) project seeks to further develop and apply the DECOIN¹ tool kit. This toolkit consists of three models: SUMMA (Sustainability Multi-criteria Multi-scale Assessment); MuSIASEM (Multi-Scale Integrated Analysis Societal Ecosystem Metabolism) and ASA (Advanced Sustainability Analysis). The ambition of the SMILE project is to combine these tools into a system of sustainability accounting that provides a useful insights into the dynamics of the sustainability of complex coupled eco-social systems (Giampietro et al. 2009).

This report is a contribution to WP5: Interfacing with societal/policy processes, and explains how one set of stakeholders, staff from the Cairngorms National Park Authority (CNPA), view the utility of the SMILE toolkit (SUMMA and MUSIASEM). The ASA tool was not implemented in the Scottish case study, as its requirement for specific data to be available as time series were unable to be met for the Cairngorms National Park (CNP).

The objectives for the report are to:

- explain the rationale for undertaking a utility evaluation;
- provide the context for our application;
- present the findings to date; and
- illustrate what lessons have been learnt.

Understanding how stakeholders view the utility of the tool is central to MLURI's contribution to the overall SMILE project, which is to look at the role of the researcher(s) as a process manager (Sterk et al. 2006), facilitating a process of challenge, evaluation and refinement of the DECOIN tools and their outputs. The D16 Scottish case study report set out three main objectives that give focus to the Macaulay research effort within SMILE. These objectives are being implemented in the Cairngorms National Park (see Section **Error! Reference source not found.** below), which is both an area of land and a new institution with a remit to support sustainable rural development. These objectives are:

Objective 1 - Test the transferability of the DECOIN concepts and tools.

Objective 2 – Assess with key stakeholders the utility of the DECOIN outputs and outcomes

Objective 3 - Add *land* as a key factor within DECOIN analyses.

This report therefore contributes to objective two. The importance of taking the tool kit beyond the academic community and considering its policy relevance was highlighted in the

¹ <http://www.decoin.eu>

recent external review of the SMILE project by Redclift (2010); and this report is a first step in illustrating how and why this approach is required.

The report is set out as follows: firstly we explain the scientific and policy context for this research (section 2); then we lay out the methodology for this research (section 3) – note some of the research is also described in D16 – Scotland Case Study, but the methods and results are summarised again in this report for completeness. Section 4 presents the main findings regarding views of the toolkit's utility to the CNPA participants, and section 5 interprets and discusses what these findings might mean for the overall project and this area of research. The report ends by explaining how these results will influence the final activities for the Scottish case-study Jan – June 2011 (section 6).

It is important to recognise that the results and discussion presented here are tentative. A combination of delays in analysis due to familiarisation with the tools and difficulty in sourcing data to run the tools meant that the utility workshop was not held until December 2010, rather than Spring 2010 as planned. These issues also meant that we did not have a full and final set of results to present. The full application of SUMMA to wider land use and more detailed analysis using MuSIASEM will not be available until March 2011. Holding a workshop two weeks before the Christmas holidays, during unseasonably cold weather, also affected the number of participants able to attend the workshop. Therefore, we treated the utility workshop as a scoping study, and will run another workshop in spring 2011, with more participants and a wider set of results. This report will be updated with these further results, leading to final conclusions and recommendations.

2 Rationale for the Research

This section sets out the rationale for undertaking a utility evaluation of the SMILE tools, SUMMA and MuSIASEM. Section 2.1 sets out the purpose for the research; section 2.2 discusses the reasons for addressing semantic and formal aspects of models; section 2.3 introduces the evaluation framework; section 2.4 defines the evaluation criteria and section 2.5 summarises the policy context for the case study application.

2.1 Purpose of the research

The choice of the Cairngorms National Park as the Scottish Case study for the SMILE project was deliberate as this provided an opportunity to consider how the SMILE toolkit could contribute to real-world sustainability assessment, and in turn, contribute to adaptive planning and management for a nationally important area facing a range of pressures. The SMILE project is taking place in parallel with Scottish Government funded research on sustainable farming systems and sustainable land use for rural communities (2006 – 2011); and this research is explicitly required to be policy relevant and contribute both to evaluation of existing policy and appraisal of possible future policy options. Therefore, the research is designed to support sustainability decision-making in the Cairngorms National Park.

2.2 Semantic and formal models

Stakeholders and scientists are equally fallible in seeing a system through particular lenses, and putting weight on some areas and ignoring others. Sterk *et al.* (2009) note that models play a *heuristic role* to help multiple stakeholders understand complex systems; a *symbolic role* in making issues visible to politicians and a *relational role* by creating a *boundary object* around which a social network can be developed. Our research supports their conclusions that it is the interactive learning involved that facilitates these roles; and that the practice of working with models can be improved. This view also reinforces calls to practice sustainability science that takes non-academic knowledge seriously (Carolan 2006) and pays attention to the politics and power relationships involved in any evaluation of a system (Smith & Stirling 2008).

The SMILE tools are extremely powerful at illuminating the parameters of the existing system and the trade-offs that have to be considered when pursuing normative goals of sustainable development. They quantify trade-offs and illustrate whether certain policy goals are feasible and/or desirable. With particular reference to modelling suitability, our results illustrate the importance of having a shared semantic understanding *before* implementing formal representations of a system using inferential, mathematical or simulation models. Our contribution has been to set out an approach to capturing the semantic aspects and how this can be used to 'decode' the model outputs with the stakeholders. These semantic steps are essential if the tools are to be seen as credible, salient and legitimate (Matthews et al. 2008).

2.3 A framework for evaluating research based (software) tools

The assessment of the utility of the DECOIN tools is contextualised by a growing literature that recognises a there are a series of interdependent problems to be overcome to ensure that research based tools and methods are useful for, and used by, policy makers and management. A review of these issues is provided by the authors (Matthews et al. 2011) with some of the key arguments reproduced here since they have informed the design of the evaluation process for the DECOIN tools / approaches and the interpretation of the evaluation process outputs.

Utility is one of the key factors linking the outputs of research (in the form of knowledge embodied in peer reviewed articles, software or datasets) to *Outcomes* (changes in values, attitudes and behaviour in the world beyond the walls of the research institute), see Figure 1. Recent evaluation literature has increasingly focused on understanding *how* and *under what conditions* information or other outputs from processes are interpreted, used by stakeholders and can result in outcomes (Blackstock et al. 2007; Patton 1998). This recognition of the importance of evaluation has been accompanied by a move away from an *information deficit* model where an identified “gap” is filled using knowledge derived and packaged by “expert” researchers and then delivered for use by “lay” practitioners. Instead a less linear and directed model of *knowledge exchange* (Ekboir 2003) is preferred. This report’s authors recognise that sustainability assessment tools and methods follow three loosely coupled *adaptive cycles* – research, development and operations (see Figure 1). This conceptual framework is a generalisation of the “consultancy” model for successful Decision Support System use proposed by McCown (2002a) where knowledge (or data) is passed between phases rather than software tools.

The Research phase (the left column in Figure 1) is where the basic, strategic and systems science is undertaken that underpins later phases. Sustainability assessment activity here is concerned with developing new theories, methods and tools as proofs of concept. The DECOIN project would be an example of such activity.

In the Development phase activities undertaken may resemble those of the Research phase (model building, software engineering, generation and communication of case studies). They are, however, differentiated by being more *transdisciplinary*, *participatory* and *action oriented*. Transdisciplinary means recognising that research is not the only source of knowledge relevant to achieving the outcomes desired (Hochtl et al. 2006). Participatory requires a meaningful sharing of the control over decision making for a project (Arnstein 1969). Action oriented means having a primary concern for outcomes rather than academic innovation (Argyris et al. 1985). The research conducted by MLURI within SMILE falls primarily within this development phase.

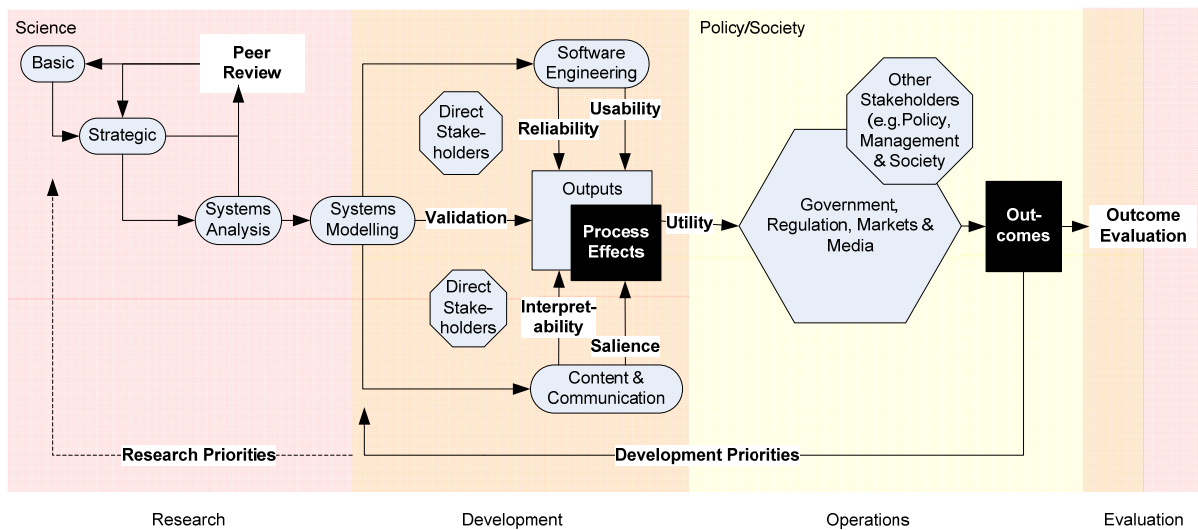


Figure 1: Conceptual framework for assessing the utility of software tools

Operations is a phase where the knowledge is used within the much larger social processes of government, regulation, markets and media and by a wider range of stakeholders and interested public. Demonstration of outcomes lies beyond the current scope of SMILE but it has been possible to make in-principle assessments of the utility of some of the DECOIN tools and methods, and this can usefully inform any subsequent mainstreaming process.

2.4 Factors that underpin utility

The authors argue here that, while operational utility is affected by a wide range of factors that lie beyond the scope of the SMILE project, it is possible to identify and evaluate a number of preconditions for utility. These preconditions are all necessary, as they can undermine the perception by stakeholders of utility, but are not alone sufficient to guarantee operational phase utility or outcomes. Five underpinning factors are identified, validation, saliency, interpretability, reliability, usability (see Figure 1).

Validation is multifaceted, but in essence it entails defining criteria that will be taken into consideration in the choice of an “acceptable” model, and then testing the model performance according to those criteria (Bellocchi et al. 2010). Such evaluation often represents the assessment of the performance of a model against an independently collected dataset. Within an experimentalist and/or reductionist paradigm, such systems of validation are effective. Validations of environmental systems models, particularly when conducted with direct stakeholders, can also significantly enhance the credibility of their outputs (Carberry et al. 2002). Validation based evaluations are weaker, however, where key data cannot be falsified or directly measured (e.g. the preferences of stakeholders), where the systems of interest are very large and/or very complex (introducing issues of pre-analytical choices, scale and equifinality in parameterisation) or where experimentation for validation would raise practical

and ethical concerns and is not permitted (Giampietro 2004). Validation based evaluation can also fail to address issues of relevance. That is, the tools and methods may perform well in a given context but be overly specialised, too demanding of input information or fail to address key relationships that are of interest to outcome evaluation (McNie 2007). A comprehensive approach to validation and related issues is provided by Jakeman et al. (2006) and examples by Robson et al. (2008) and Welsh (Welsh 2008).

Salience means that a tool should address the issues of most interest to the stakeholders. The focus here is on deciding what is included within the scope of the sustainability analysis (formalized as a requirements analysis). In making such decisions, an honest and ongoing partnership must exist between developers of analysis and the relevant direct stakeholders (Van Ittersum et al. 2008). If a competent requirements analysis is apparently all that is needed, why then is salience still an issue? One challenge lies in the path-dependencies between the phases in Figure 1, where decisions made in the Research and Development phases may conflict with later Operational use. When “gaps” are identified in the capabilities of EMS in Development and Operational phases these need to be addressed in subsequent phases of Development or Research (the feedback loops at the bottom of Figure 1). This is more difficult when all phases of EMS activity are not funded by the same agency or undertaken by the same team. At a macro level reconciling the supply from the Research phase with the demand from the Operational phase is a serious challenge for the governance of EMS projects (McNie 2007). A further challenge identified by Checkland and Holwell (Checkland & Holwell 1999) in their Process for Organisational Meaning model is that each piece of information used in environmental policy and management can have significantly different meanings to different people. Even an apparently simple process of requirements analysis may therefore be fraught with differences of interpretation.

Interpretability is the degree to which the information content of the analysis can be understood by the relevant direct stakeholders. The focus here is on the outputs of the tools and methods (though as was seen above interpretability can also be significant in requirements analysis). Limitations on interpretability can mean that otherwise relevant outputs are disregarded. Interpretability partly means being clear on the assumptions being made, particularly what is left out and how the compromises in translating reality into formalism affect the outputs. Interpretability is not however, entirely about content, it is also about how well the outputs mesh with the existing knowledge and expectations of stakeholders (Carberry et al 2002). It is unlikely that without the tool or method developer to act as an intermediary, the outputs of any but the simplest analysis will be interpretable and influential in the social processes of decision making and policy.

Reliability is assessed through processes of software quality control – either formal or informal. These range from simple debugging to larger structured processes of software testing with hierarchical, recursive breakdown and testing of software components, units and modules (Britton & Doake 1996). These can be undertaken by developers (in smaller projects) or by testing and change management teams for larger systems with ongoing development. Such software testing can be assisted by automated testing to ensure repeatability of results or to benchmark systems (Hutchins et al. 2006). It represents a potentially significant overhead in tool/method development. Such evaluations also typically have a quality assurance of outputs focus rather than assessing the outcomes of tool/methods use.

Usability at its simplest is the ease (and thus efficiency) with which a given instance of EMS can be applied to a new problem. The limited success of software tools in other domains (McCown et al. 2006) despite greatly improved usability (e.g. through graphical user-interfaces) perhaps highlights that, in terms of outcomes, usability is a necessary but not sufficient criterion. Overly simplified user interfaces may detract from the credibility since they may reduce the transparency of inherently complex analyses. Indeed, Oxley et al (Oxley et al. 2004) found that the process of integrating and transforming scientific models into tools for policy application presented a range of difficult and in some cases insurmountable simplification problems to ensure usability. As previously noted the assumption in the conceptual framework is that it is the knowledge not the software that is the output. This imposes a far less strenuous demand on the user-interface as the users of the tools can be assumed to be well trained both in the use of the tool and its underpinning assumptions.

Utility is defined here as an evaluation of how useful the outputs from the EMS are for achieving Operational phase outcomes, in the view of stakeholders beyond those participating in earlier phases of the project. It is assumed here that any issue of utility for the direct stakeholders will (or at least should) have been addressed within the Development process. This wider stakeholder group will have a key role in mediating the influence (and therefore outcomes) of the outputs in the Operational phase. Indeed it has been argued that their *perceptions* of utility are more influential in determining the outcomes of than later verifications of utility (Diez & McIntosh 2009). The *implementation gap* between development and operational use phases is widely recognised (McIntosh et al. 2008) and has been a persistent feature in a variety of domains e.g. operation research and agricultural DSS (McCown 2002b) and desertification (Diez & McIntosh 2010). Both stakeholders and developers of sustainability assessment tools and methods need to be realistic in agreeing what can be

achieved for the resources being invested (in this case benchmarking tool/method development projects against other activities can perhaps be illuminating)².

2.5 Policy context

The Scottish case study is focussed on assessing the trends occurring within the Cairngorms National Park and the delivery of the National Park (Scotland) Act 2000 via the Cairngorms National Park Plan (CNPP). The National Parks (Scotland) Act 2000 has the following four objectives:

- To conserve and enhance the natural and cultural heritage of the area;
- To promote sustainable use of natural resources in the area;
- To promote understanding and enjoyment (including enjoyment in the form of recreation) of the special qualities of the area by the public;
- To promote sustainable economic and social development of the area's communities.

As interpreted in the CNPP, the Act aims to deliver better outcomes through coordination; develop solutions for rural Scotland through innovation and disseminating good practice; provide a Park for all backgrounds, interests and abilities and promote 'The Pride of Scotland' – Scotland's most iconic landscapes and heritage that shapes that nation's identity.

The CNPP is a strategic spatial planning document with statutory remit, in that all public (governmentally funded) agencies have to have regard to the plan, but it is not supported by any direct regulation or funding initiatives. It is related to sustainability as it delivers the four aims of the National Park Act. The CNPP has a 25 year vision, five guiding principles and 22 strategic objectives arranged under three themes (conserving and enhancing the Park, living and working in the Park & Enjoying and Understanding the Park). The short term focus has been on 7 'priorities for action' as listed below. Each PFA has a delivery team and has been working on projects relating to the aims of the CNPP.

- Conserving and Enhancing Biodiversity and Landscapes
- Integrating Public Support for Land Management
- Supporting Sustainable Deer Management
- Providing High Quality Opportunities for Outdoor Access
- Making Tourism and Business More Sustainable
- Making Housing More Affordable and Sustainable
- Raising Awareness and Understanding of the Park.

² For example the whole 5-year programme of Scottish Government sustainability research will pay for approximately 100 metres of a local motorway extension.

The Strategic Environmental Assessment (2007) identified 42 policies and plans that the National Park has regard to and the CNPP itself lists a further 88 policies although some have been superseded since then, and other important policies have been enacted since 2007. Our policy analysis in 2009 suggests there are 103 Global, European, UK or Scottish policies of relevance to the CNP. We have selected the ten most relevant policies for the CNP and briefly describe them below.

The **Scottish Rural Development Programme 2007-13** is a £1.6 billion programme of economic, environmental and social measures. The scheme is the main economic incentive mechanism available to land based and community initiatives within the CNP. Unfortunately, the delivery of the SRDP is split into regions, and the CNP falls into three regions (Grampian, Highland and Tayside). The CNPA have employed two support officers to help land managers access the Rural Priorities and land manager contracts that make up rural development contracts.

The **Common Agricultural Policy Reform** is the main form of support to farmers in Europe. Major reforms in 2003, simplified previous subsidy payments into a single scheme, the Single Farm Payment Scheme. The 2003 reforms decoupled payments from production and made them conditional to meeting certain environmental, animal health and welfare and food safety requirements (known as cross-compliance). As part of the ongoing reforms to the CAP, the European Commission has undertaken an initial consultation on the efficiency and effectiveness of current CAP measures and is now proposing new draft legislation. The legislation aims to make the direct aids system more effective and simpler, to make remaining market support measures more relevant to the world we live in and to tackle new challenges such as climate change, bio-fuels, water management and the protection of biodiversity. The CAP is very important to land based industries in Scotland, and approximately half of the land in CNP is registered for CAP payments.

The Scottish **Government Economic Strategy** aims “to focus the Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth”. There are five strategic objectives: WEALTHIER & FAIRER; SMARTER; HEALTHIER; SAFER & STRONGER and GREENER. There are 15 outcomes that the Scottish Government will seek to measure progress over time. The policy influences all public sector bodies including those active within the National Park. The review indicators are to be achieved by 2011, and 2017.

IUCN Management Guidelines for IUCN define a protected area as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. IUCN has defined a series of six protected area management categories, based on primary management objective, ranging from Ia to VI. The CNP is Category V, defined as a “Protected

Landscape/Seascape: Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area". There are seven objectives for this category and a set of management prescriptions that recognise that such an area will have a governance pattern of public and private ownership and a mix of statutory and voluntary measures. The CNPA look to these principles to give legitimacy to their actions, as demonstrated by publishing these management principles as an annex to the CNPP.

The **Land Reform (Scotland) Act 2003** establishes statutory rights of access to land and water and provides opportunities for local communities and crofters to acquire land and water through right to buy provisions. It has created a framework for responsible access to land and inland water, formalising the tradition in Scotland of unhindered access to open countryside, provided that care was taken not to cause damage or interfere with activities including farming and game stalking. The Act is very important to the CNP as the access aspects directly relate to the third objective of the NPA; while the philosophy of community empowerment influences housing and economic development policies. There are no indicators or reviews within the Act, but a report on potential indicators of the socio-economic impact of the LRA was carried out in 2008 (this has not been adopted).

The **Local Government in Scotland Act 2003** created a statutory process of Community Planning "by which the public services provided in the area of the local authority are provided and the planning of that provision takes place". Local authorities have a duty to initiate, maintain and facilitate this process and Scottish Ministers have a duty to promote and encourage the use of Community Planning. A number of public sector organisations are statutory partners in Community Planning. In addition to the statutory partners, Community Planning Partnerships (CPPs) typically involve other public, voluntary, community and private sector partners. In 2007, a Concordat between the Scottish Government and Local Government set out the terms of Single Outcome Agreements, which are the means by which Community Planning Partnerships agree their strategic priorities for their local area and express those priorities as outcomes to be delivered by the partners, either individually or jointly, while showing how those outcomes should contribute to the Scottish Government's relevant National Outcomes. This has important implications for how many of the social and economic issues within the CNP will be delivered.

The **Climate Change (Scotland) Bill** was passed on 24th June 2009. The Bill creates a long-term framework that will: introduce a statutory target to reduce Scotland's greenhouse gas emissions by at least 80 per cent by 2050; establish an interim target of at least 42 per cent

emissions reductions by 2020, with a power for this to be varied based on expert advice from the UK Committee on Climate Change; establish a framework of annual targets; and include emissions from international aviation and international shipping. Scotland's Climate Change Delivery Plan sets out how to achieve the statutory emission targets which lie at the heart of the Bill. The Bill will have implications for energy use and activities across Scotland.

The **European Landscape Convention** promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. It is the first international treaty to be exclusively concerned with all dimensions of European landscape. However, the UK was not a signatory to this convention. The CNPA do note the convention, and have their own landscape policy that is strongly influenced by the convention.

The **European Charter for Sustainable Tourism in Protected Areas** is a practical management tool which helps protected areas to continuously improve the sustainable development and the management of tourism taking account of the needs of the environment, the local population and the local tourism businesses. The European Charter covers 58 protected areas from seven European countries. The CNP is a member of EUROPARC and undertaken steps to gain accreditation. CNPA staff participate in the network to exchange views. As part of the charter, indicators of sustainable tourism are supposed to be developed, but these indicators are still at the draft stage and have not been implemented.

The **Nature Conservation (Scotland) Act 2004** imposes a wide-ranging duty on Scotland's public sector to conserve biodiversity and protect the nation's precious natural heritage. Implementation is linked to a national biodiversity strategy. The Act is directly related to the first objective of the NPA and conservation is one of the key aspects of the CNPP and activities within the National Park. The national biodiversity strategy has outcome targets.

The **Water Framework Directive** – requires an integrated river basin management planning process to get all water bodies to good ecological status by 2015, 2021 and 2027. The RBMP process involves multiple stakeholders in managing land and water to achieve this goal. The CNP contains the headwaters of many of the major rivers in Scotland (Tay, Dee, Spey).

The main questions for our SMILE case study are:

- how does the system perform at different levels?
- what are the implications of its current performance for possible future states?
- how can the tool kit inform and influence policy?

These questions raise further some further, more normative, questions about what is to be sustained? for whom? at whose cost? and who benefits?

The case study takes the year 2001 as a baseline, which is before the implementation of the National Park Act and the creation of the Cairngorms National Park in 2003. However, the timescales are constrained by the availability of datasets. SUMMA analyses use 1991, 2001 and 2007 time periods. The timescales of the policies vary, for example:

- National Parks (Scotland) Act requires a review every five years (carried out in 2008);
- Cairngorms National Park Plan has a 25 year strategic vision and five year priority actions (2007-2012);
- Common Agricultural Policy has a Health Check due in 2013; and it is implemented via the Scottish Rural Development Programme (2008 – 2013);
- Government Economic Strategy sets targets for 2011 & 2017.

Finally, in terms of stakeholders, the Cairngorms National Park Authority is the main delivery agent, on behalf of the Scottish Government (Landscapes and Habitats Division). The identified partners for the final CNPP are: 5 local authorities (Aberdeenshire; Angus, Highland, Moray, Perth & Kinross); Communities Scotland, Highlands & Islands Enterprise, Scottish Enterprise; Forestry Commission Scotland; Scottish Natural Heritage; Scottish Water; Scottish Environment Protection Agency; SportsScotland; VisitScotland; Deer Commission; Historic Scotland and University of Highlands & Islands. These are all listed as partners in the CNPP and are mostly public bodies funded by Government. We would also identify the following members from the list below as being main stakeholders in the CNPP: Association of Cairngorms Community Councils; Cairngorms Chamber of Commerce (now Cairngorms Business Partnership); National Farmers Union of Scotland; Scottish Rural Property and Business Association; Environment LINK; Scottish Government Rural Payments and Inspections and numerous private landowners and households. It should be noted that the overall WP5 questionnaire was sent out to 150 stakeholders, illustrating the range of interests contributing to the implementation of the CNPP.

This section therefore provides the policy context for the application of the tools; and the stakeholders who could utilise the tool kit, should the tools be taken into the Operation phase (see Figure 1). The remainder of the report focuses on the question: how can the tool kit inform and influence policy? The other questions will be tackled in later deliverables D28 – D30 (see section 6).

3 Methodology

The following section describes the methods used to collect and analyse the sets of data utilised for this report. These data fall into 4 phases:

- Introducing the study (3 sets of field notes/transcripts from interviews and two letters)
- Systems Diagramming workshop (2 sets of field notes, one transcript)
- Follow up discussions (5 sets of field notes/transcripts from interviews)
- Utility workshop (2 sets of field notes, one transcript, 3 evaluation forms)

The SMILE project is working in parallel with a longitudinal research project funded by the Scottish Government from 2006 – 2011, which aims to collaboratively evaluate the development and implementation of the Cairngorms National Park Plan. The approach is qualitative, focussed on ongoing social learning through collecting, analysing and sharing findings on a regular basis. The focus is on which stakeholders are involved in the planning and implementation process; and how different interests are shaping the outcomes. Therefore, the interviews referred to in the introducing the study and the follow up discussions were held for the longitudinal research project, where SMILE was just part of the discussion. In these cases, the interviews were with individuals or groups of CNPA staff, held in their offices. The interviews were semi-structured, using a topic guide, but deliberately conversational and informal in style. Where possible, the interviews were taped, providing a combination of field notes and verbatim transcript. These were loaded into NVIVO for data management and analysis. The transcripts and field notes were coded in teams. The data coded to the node 'SMILE project', covering all comments about the project's intentions, results and impressions, were then analysed by the first author seeking themes and also looking at the language and intonation used.

3.1 Introducing the study:

The project was originally presented to the CNPA during a group interview with the chief executive, communications officer and another senior manager in December 2007. It was described as a project to evaluate the utility of three tools intended to help assess trends in sustainability and the consequences of management choices. The tools are used to investigate the flows of money, energy, environmental goods/services and people; the implications of these flows; and the interdependencies between: sectors or local areas within the Park; the Park as a region; and Scotland. These results would be assessed in terms of meeting the aims of the National Park (Scotland) Act 2000 and the objectives of the Cairngorms National Park Plan. It was also discussed with one of our other key informants at another interview in December 2007. We wrote to the chief executive in April 2008 on receipt of funding from the EC. We wrote a follow up letter to in August 2008, describing the project and the required input from the CNPA. The project was also discussed at a group interview in August 2008. The data

collection and analysis is described above. These interactions provide the context for our first workshop held in November 2008.

3.2 Systems diagramming workshop:

The system diagramming workshop involved five participants from the CNPA and four from the MLURI (see Appendix one). The workshop is described in D16 – Scotland Case Study, but the methods and results are summarised again in this report for completeness. The systems diagram workshop held at the CNPA offices in Grantown-on-Spey was one of three processes used to develop the diagram. The decision to run a workshop to generate a systems diagram with a set of managers from the CNPA was to ensure we based the diagram on the views of those living, working and managing the Park. It should be noted that the final process used the outputs from a two year strategic planning process that had involved considerable stakeholder involvement (Cairngorms National Park Authority 2007) and could be considered to be a useful proxy for a wider set of views on the Park system.

The CNPA systems diagram workshop was a deliberative group process. Working initially in pairs, the participants were asked to write what they thought were the main important components of the Cairngorms system onto post-it notes. Once a reasonable number had been generated, this exercise was stopped and the pairs of participants were given the opportunity to reflect on what they had generated. The entire group then discussed the post-it notes they had generated, grouping duplicate or similar concepts, and identifying any gaps that became obvious. This process started to create higher level groupings. The group then started to arrange the post-it notes onto a large piece of A0 paper to develop a 'systems diagram'. Note this was a rapid participatory process to illustrate the main content of the system and their relationships to one another. During this diagramming stage, 'missing' content was identified and added. There was much debate about how to construct the diagram – do you start from the natural capital or the people? Do you work from left to right or from the centre out? And as a result of discussion and debate, some post-it notes were moved around several times. Furthermore, it became clear how many components were linked in different ways to many other components – illustrating the complexity and the richness of the system. The 'diagram' of post-it notes were then entered onto an Excel spreadsheet and converted into a graphics package called FlowCharter, providing an electronic version of the diagrams. The content of the diagrams is further discussed in Section **Error! Reference source not found.** and full versions of **Error! Reference source not found.** can be found at www.macaulay.ac.uk/smile/).

The content of the post-it notes (representing elements of the system) was classified using several sustainability-oriented coding schemes. The intent here was to try to explore how best to simplify the representation of the system (and its context) to make it tractable whilst not over-simplifying or ignoring important issues. The classification stage allowed us to interrogate

the data using concepts, such as *capitals* from the sustainable livelihoods model (Carney 1998); notions of *stocks* and *flows*; whether things were *exogenous* or *endogenous*; and heuristics such as PESTLE³ (Grundy 2006). This step was another opportunity to check that all aspects of the system had been considered.

Figure 2 shows the energy system diagram developed by the Macaulay team for the CNP. The diagram was formalised using Odum's graphical conventions in collaboration with the Parthenope University team. The diagram is read from left to right: with extensive and natural inputs to the system on the far left and increasingly anthropogenic inputs of the system along the top border of the system. The outputs of the system are conventionally found on the right hand edge and the waste exiting the system is indicated along the bottom. It is important to note that the diagram contains several resources such as reputation/image and culture, skills and knowledge that are a serious challenge to include within the formalism in a way that retains the meanings associated with the categories by stakeholders. This diagram was emailed back to the workshop participants along with a minute of the meeting; and also highlighted in one of our feedback meetings in February 2009.

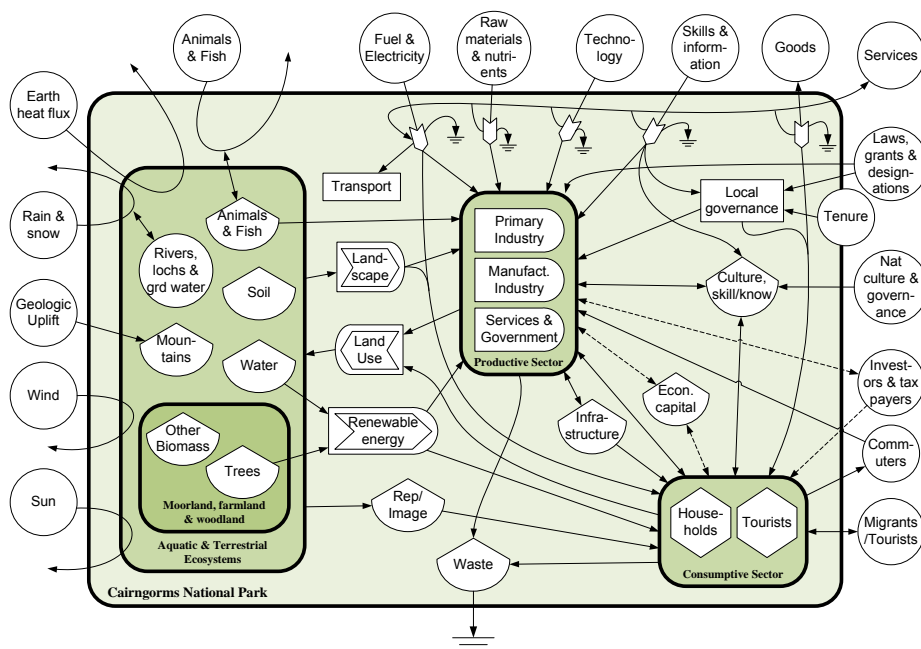


Figure 2: First energy systems diagram for the CNP

In consultation with partners at Parthenope University it was decided that in the first instance for the SUMMA based analysis there would be a focus on the production-oriented land-based industries (PoLbi) (agriculture, forestry and sporting estates). The importance of the sector has been variously argued as ranging from minimal (gross value added), to marginal (employment),

³ PESTLE is Political, Economic, Social, Technical, Legal and Environmental

to important (downstream environmental impacts) and finally as crucial (as the management that creates or maintains the landscape/character of the region). In this case the decision to start with the PoLBI reflected the expertise of the research team and their knowledge that there were adequate quality sources of data available. There was also reported (Blackstock pers comm.) to be some difficulty for the CNPA accessing all of the agricultural statistics available for the CNP from other agencies, so the research team were able to act as facilitators. Given the resource constraints on both Italian and Scotland teams and the limitations on the skills of the Scotland team noted previously (Section **Error! Reference source not found.**) there were also pragmatic reasons for starting from the existing, tested SUMMA model for the agricultural sector in Campania (Ulgiati et al. 2008). **Error! Reference source not found.** illustrates the system components that could be accommodated within the SUMMA analysis at this stage (highlighted). This diagram was also used in the utility workshop workbook (see slide 18 in Appendix two).

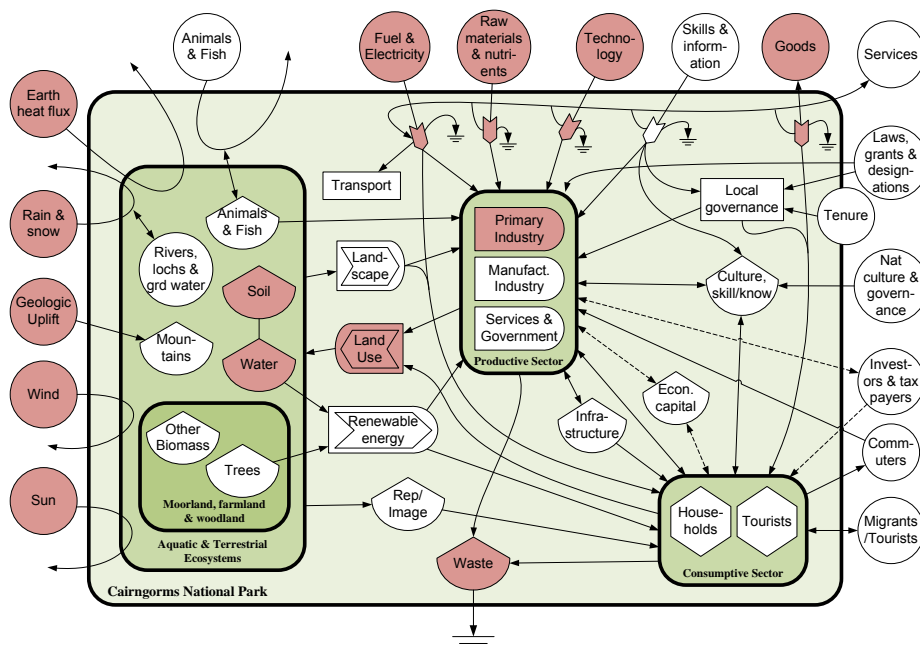


Figure 3: The components included in the CNP and Scotland SUMMA analyses

3.3 Follow up discussions:

The SMILE project's progress was raised and briefly discussed in five individual or paired interviews, involving two of the key informants who took part in the workshops. These interviews were held in February, September, October and November 2009 and August 2010. The data collection and analysis is described in the introduction to the methodology section, as the interviews were part of the ongoing longitudinal research on the CNPP. However, it is important to recognise that the two workshops (the system diagram and the utility evaluation)

are set within this context of an ongoing conversation about the management of the CNP and the implementation of the CNPP.

3.4 Utility workshop:

The utility workshop was held on 2nd December 2010, at the CNPA offices in Grantown-on-Spey (in the same room as we used for the system diagram workshop). Three participants from the CNPA and two from MLURI attended (see Appendix One) – four of us were also participants in the system diagram workshop and have also been in contact via the discussions described above. One of the three participants did not know about the SMILE project before the workshop; and all the participants had between a little and a fair amount of knowledge about sustainability assessment.

As described in the introduction, this was a scoping or pilot workshop and the workshop will be run again in spring 2011, when a full set of results can be evaluated and when more attendees will be available.

The workshop was designed to be a round table, interactive process; therefore the information was presented in workbooks rather than as a paper or a presentation. These workbooks are kept by the participants, and were annotated during the workshop with ideas, questions and comments, illustrating that it was a genuine workshop, not just a ‘chalk and talk’. The workbook is reproduced in Appendix two (two pages to one page to save space).



Figure 4: Participants at the Utility Workshop, 2nd December 2010

The content of the workbook sought to balance sufficient explanation of the methodology to allow the participants to understand how the results were generated, with a sufficient range of

results to illustrate what the tools can do. Given constraints of an afternoon workshop, these choices were difficult. SUMMA in particular, has a specific language that is unfamiliar to most non-specialists. Whilst each technical co-efficient is documented and explainable, the tool itself consists of approximately 200 of these co-efficients; and consists of a large and complex matrix of input and output data. Therefore it is impossible to fully describe the toolkit in a short introduction at a roundtable workshop. There were also over a hundred graphs generated by the analysis; and again it was difficult to choose what results to present. The results were screened by looking for those that met the needs expressed in the previous stages – that had most relevance to climate change, environmental loading, showed trends for the Park Plan and showed performance relative to the Scottish average. Conversely, MUSIASSEM has no complex ‘model’ or co-efficients to present, but the fund-flow diagrams are very difficult to explain to, and interpret with, stakeholders. Again, the choice of which diagrams to present were guided by the feedback from previous comments in interviews and the desire to extend the socio-economic baseline recently commissioned for the Park (Cogentsi, 2010). The workbook was piloted within the MLURI research team before the slides were finalised and printed out.

The workshop was designed to fall into four sections and lasted from 1pm to 5pm. At first (slides 1 – 12), the project is (re)introduced and the aims of the workshop were presented. This took approximately 20 minutes, with little discussion. Then the SUMMA tool was presented, alongside a set of results (slides 13 – 35). This section took about an hour and three quarters, and generated considerable discussion. The participants were asked to fill in the SUMMA evaluation sheet during the coffee break. The MUSIASSEM tool was presented, with results (slides 36 – 49), lasted about an hour and there was also much discussion. Given the time, we then went straight into the final section on overall evaluation of the tools and the next steps for the project, which was a group based discussion. The participants then filled in the MUSIASSEM and overall evaluation form. One participant had to leave the workshop at 4pm; so only two participants completed these sections. The other participant sent a long email the next day with their reflections, and this has been included as data for the report.

The entire workshop was recorded and transcribed, and both MLURI participants took field notes to complement the transcript. The transcript and field notes were analysed for themes arising and also with attention to the discourses used to describe the results and the tools themselves. The analysis was guided by the following questions:

- When and why did the CNPA participants question the methodology of the tools?
- When and why did the CNPA participants question the results from the tools?
- Which results seemed most interesting to the CNPA participants and why was this?
- What are the learning points for the next workshop and the further analysis using the tools?

The evaluation sheets were based on a standard template used by the research team for previous deliberative workshops evaluating the utility of metrics (see Matthews et al., 2008). A copy of the evaluation form is provided in Appendix three. The choice of criteria reflects the main findings in the literature (see section 2.4) above. We do not claim generalisability from the evaluation metrics, given the size and purposive nature of the sample. However, it is useful to combine deliberative qualitative data with individual quantitative scores. The feedback sheets allow individuals to express opinions that may be difficult to express verbally in a group setting. The metrics also allow us to consider if scores vary between individuals; and if they vary over time, should the same participants attend the Spring 2011 workshop.

4 Findings:

This section highlights the views expressed by CNPA staff about the tool kit during 2007 -2010, including the systems diagram workshop in section 4.1. The results from the utility workshop are presented as follows. In section 4.2, we discuss the issues that arose in the discussion as the participants moved through the workbook pages relating to SUMMA, followed by the evaluation results for SUMMA. In section 4.3, we discuss the issues that arose in the discussion as the participants moved through the workbook pages relating to MuSIASEM, followed by the evaluation results for MuSIASEM. Note there was both less discussion on MuSIASEM and less data presented. Section 4.4 summarises the discussion on the overall utility of both tools and differences between the tools highlighted by the participants. Both participants who filled out the final evaluation sheet felt the work book had provided new information on sustainability assessment. However, only one felt they had changed their views on sustainability assessment and neither changed their views on the sustainability of the CNP after the workshop. Further implications of these results are discussed in section 5 below.

4.1 Views on the SMILE project expressed prior to utility workshop

It is important to note how the project was presented to the CNPA participants. We were open about the choice of case study being to help us with our second objective, to test the utility of the toolkit. The first introduction to the SMILE project came on the back of a long discussion of how the implementation process was going and where the CNPA should put their limited resources. In this context, the project was promoted as an opportunity, for MLURI to “bring these models to the Cairngorms National Park Authority to see if they actually help you make some of your decisions about priorities” (6th December 2007). The conversation went on to discuss where the application could focus, with an initial agreement taken to look at the economic profitability of the land use sector, its environmental impact particularly with relation to climate change and aspects of social justice.

A similar introduction was given to another participant at a separate interview, where again the tools were described as complex and powerful and an opportunity to assist with decision making, to see if the toolkit would highlight new trends and altered decision making for the CNPP (13th December 2007). By the progress report to CNPA staff members in August 2008, the toolkit was being more fully explained as a set of quantitative modelling approaches working at three different levels (Scotland, National Park sectors and communities in place within the National Park) to assess the flow of resources, money, energy and people in terms of imbalances in social issues and the environmental externalities of economic growth. The novelty of the toolkit was highlighted in that it is trying to combine multiple issues in one framework and illustrate multiple levels of analysis simultaneously.

The main questions raised when the project was introduced were the requirements for the CNPA in terms of staff time commitment; availability of, and access to, data; and whether the CNP was a suitable in terms of being a relatively new spatial area and a new institution and therefore atypical of Scotland. Language was also an issue from the start.

It was clear that available staff time was crucial to CNPA staff participation in the project. One CNPA staff member said they were fascinated the ideas and the challenge of putting these ideas into practice but “My only hesitation is how much of our own time it will take. But if it’s not going to take too much then I don’t see how we can object” (6th December 2007). This last quote suggests that any tool has to be both practical and require relatively little staff time to be attractive. The point was confirmed during a discussion in August 2008 about organising the systems diagram workshop, when the main contact was concerned about whether he could generate sufficient interest in the project to generate enough participants for a workshop. The comment that “people are interested but things are bit tight” was repeated several times by both interviewees. The lack of available time for interested participants to commit to attending the SMILE workshops was also highlighted in the lead up to the utility workshop in December 2010.

Data came up again at the later December 2007 meeting; as this had been a frustration for staff working on the CNPP “because of the way that we have four different or lots of different places joining together ... most of the time they are not that comparable and the other problem is that we have got quite a small area when it comes to data to do with people, we are not ... mostly not significant” (13th December 2007). The problems with incompatible data sets arose in interviews in February 2009; September 2009; October 2009 and August 2010. During the interview in August 2010 when we discussed which types of analyses should be presented at the utility workshop, the staff members noted that the utility would depend on ‘robustness’ of the results as they had reservations over whether the results of the model would be reliable and they thought it was unlikely that we could get sufficient data to make the model work.

In terms of data, a specific request for information on land tenure and land ownership in Park was made at the systems diagram workshop (November 2008) – although the data is in theory available, the agency providing it is ‘pushed for time’ so they had not got the information needed. Indeed, informal discussion after the workshop suggested that the staff were particularly interested in how the SMILE project could help the CNPA improve their spatial datasets, which could then be used as a baseline for future monitoring. Other potential sources of data (e.g. from North East Scotland biological recording centre) were also raised. At the same workshop, the CNPA noted they have access to public expenditure data for the park. The staff noted that they were hoping to have the Park region represented within a Scottish Environmental Information Portal being developed, although this database and portal was still

under development at the time of writing in 2010. The CNPA have successfully lobbied the Scottish Government and from 2009 onwards, Scottish Neighbourhood Statistics will be available at the scale of the National Park. This is useful for MuSIASEM, but will not help SUMMA which takes a time series of 1991, 2001 and 2007.

Although the CNP is new, it was also seen as a suitable case study due to the nature of its sustainability decision making “you potentially have a fascinating, albeit very complex, situation where you have got decision making by a number of different organisations in a national park and if you took one organisation and looked at their decision making it would be a much simpler job” (6th December 2007), the latter comment being something we have since appreciated as the other SMILE partners have tended to take the single organisation approach. At a feedback discussion in February 2009, CNPA staff members teased the MLURI team for being ‘far too enthusiastic’ when we noted that we were the only case study using two new tools for the first time whilst trying to apply the tools to policy processes with stakeholders.

The language and terminology used by the SMILE project team has proved somewhat of a barrier to raising awareness of the tools and interest in their utility. The initial response by a CNPA staff member when MLURI interviewer circulated the SMILE concept note, spelling out the full name of the project gives an indication of the typical response to the language used: “Oh my god, I can see why there was an acronym now!” (Dec, 2007). During later discussions in August 2008, the need to “put it in layman’s terms” was reiterated, with even terminology like ‘a systems diagram’ being seen as off putting to many staff members. At the interviews in 2009 and 2010, the MLURI interviewer noted that whenever the SMILE project and the tools were mentioned, there would always be a smile or joke about the complex and longwinded names.

Our ongoing communication with the staff at CNPA has helped us continue to connect the application of the SMILE toolkit with their policy priorities. However, it has been interesting to see the shift in timescales regarding the use of the results from SMILE. At the systems diagramming workshop (November 2008), it was hoped that the research would support the review of the current CNPP (2007-12) and inform the second phase of the Scottish Government’s National Park Review. Indeed, one participant suggested using the material for a key note speech the following month (indicating the different timescale between research and policy!). However, the Scottish Government 2nd phase review was cancelled and it became clear that our results would not be available in time for the CNPA’s internal review processes in autumn 2009. Therefore, by February 2009, the staff members explicitly connected the application of the SMILE toolkit with their plans for starting to develop the next CNPP (2012 – 2017). Indeed, later that year (November 2009), the same individual noted the need for indicators to aid decision making to be back cast from desired outcomes to required management actions. These indicators should be both achievable and ambitious. Learning from

the collaborative evaluation of the current CNPP suggests that there are some 'good intentions' and 'good desires' but they are not grounded in reality, nor does the plan provide a pathway between current issues and achieving the vision for 2030.

During discussions in September and October 2009, the importance of exploring how to deliver sustainable development, and the tensions inherent within the concept itself, were raised. In terms of focus, participants at the systems diagramming workshop (November 2008) highlighted earlier research carried out by the CNPA on the special qualities of the Park when developing the Park's brand and marketing strategy. The main findings of the systems diagramming workshop with regard to what elements the SMILE toolkit should focus on are recorded in D16 and in Blackstock et al., (2009). However, we summarise them here for completeness. The process generated 57 'elements' of the Cairngorms system, which were summarised into the following groups:

- Natural capital
- Land use & industries
- Icons & wilderness
- Settlements & people
- Tourism
- Governance
- Culture, history & tradition

The main difficulties arose from classification problems – to what extent should similar ideas be amalgamated or split; and how to deal with elements that were actions or linkages ('flows') rather than 'capital' or 'stocks'. The elements were arranged into a diagram and any gaps were discussed. The main additions were external elements that influenced the flow of materials, money, people and energy around the Park, but were not geographically located in the Park – for example taxpayers were a key element to fund the preservation of cultural and natural heritage.

The participants were struck by the focus on social aspects of the system, and the lack of elements associated with iconic Scottish wildlife. This is despite the very brand for the Park being such an icon. It was later explained that the participants felt that the inclusion of natural elements such as mountains, forests and moorland implicitly included the wildlife that are supported by these habitats. Indeed, one participant noted: "The diagram appears to be a good reflection of a Scottish National Park – everything relates to humans" (systems workshop, November 2008).

Three specific aspects of sustainable development to explore with SMILE were raised in discussions during 2009 – 2010. Firstly, anything 'to flesh out the picture on economic growth in

the park would be good'. The CNPA have commissioned a baseline economic state of the park report and were interested in how the SMILE tools could complement this; particularly in terms of providing some insights into future trajectories of change, and the consequences arising. The CNPA are exploring the application of an ecosystem approach and were interested in how the SMILE tools could relate economic and social well-being to the Park's natural assets. Staff members used the explicit example of water as an example of something that both constrained and enabled development, and again were interested to see how the tools could add further information to the information available through existing catchment management plans and groups.

Therefore, within the broad suite of issues and policies that the next strategic CNPP will cover (see section 2.5 above), we were able to confirm that the most relevant plans and policies to inform using the SMILE tool kit included the local development plan, the climate change action plan, GHG mitigation targets and the land use strategy. Links to the Rural Land Use Strategy and the ecosystem approach were also noted during the earlier systems diagram workshop (November 2008).

During these interactions between the systems diagram workshop (November 2008) and the utility workshop (December 2010), two further themes regarding the national perspective and legitimacy of decision making processes emerged.

The need to interest and engage the Scottish Government in the research and the idea of social metabolism was raised during the systems diagram workshop (November 2008). The CNPA participants felt the Scottish Government would be pleased to be able to demonstrate how Scotland was contributing to a European project and that the results would be presented to the European Commission. Staff members suggested that if the Scottish Government were engaged with the project, it would make it easier for the CNPA to support the process and provide more resources. Given sufficient political support, the CNPA staff offered to present some interim findings from the SMILE project at other meetings (systems diagram workshop, November 2008). Indeed, at this stage of the project, one participant said: "We can help with that [raising the profile of the project with Scottish Government] by providing some of the policy solutions that we would want to promote to government to get their support for the Park as well, so it probably works for both of us"

However, the difficulties in using tools like SMILE with policy makers was also raised at the systems diagram workshops (November 2008). One participant noted: "I'm very keen on this multivariate analysis, but policy is very.... uni-variate shall we say... it usually focuses on one particular issue". They went on to encourage the MLURI researchers to illustrate how SMILE connects into other Scottish Government funded projects, to develop a 'more sophisticated' approach to policy. "I think it is good to connect all of those Kirsty, especially if it can actually

get the policy people on board otherwise what we're going to find is there is going to be a huge divergence between the work that you're doing which is important and relevant and yet is just too complex for policy to actually engage with".

One thing that was noted in the systems diagram workshop was the positive aspect of applying the SMILE toolkit to a specific policy issue in a specific geographical region. One participant noted that having read the initial briefing papers on the toolkit, they had considered pulling out of the project as "the level of abstraction is just so distinct from any sort of policy convergence that it would have been a waste of time – I couldn't have contributed usefully. But after today I feel much more positive about it" (November 2008).

During an interview in February 2009 with two staff members, the challenge of selecting indicators to support decision making was discussed. During this discussion, it was noted that where possible, the CNPP would adopt the same indicators as the Scottish Government's Economic Strategy to minimise data collection costs and maximise the policy traction of these indicators. When the MLURI interviewer raised the need for more complex or context specific indicators, such as provided by SMILE tools, one staff member observed: "Whilst there's pressure to have reams of good, high quality information and data and information, but we haven't got a demand, a clear demand for anyone to be using it yet [laughs]" (February 2009). This suggests that a key attribute for any tool kit is its ability to resonate with national indicators that are visible and important to the sponsor department in government.

In the words of one interviewee: "that's really useful, to think about what kind of tools we might use in a sort of practical way, and equally I'd be quite keen on your views on how, bearing in mind some of the things we've said about the relationships with partners and the balance of power and responsibility, are there ways that we can adopt right from the start of developing the next Plan that shift that balance of power and responsibility?" (February 2009). This quote illustrates that for this individual, in this context, the utility of the tool has to be judged in the wider context of the legitimacy and accountability of sustainability decision making.

During the systems diagramming workshop (November 2008) the SMILE project was put within the wider context of developing a concordat or memorandum of understanding between the CNPA and MLURI. This illustrates the wider institutional context for the analysis; and the ongoing social capital between built up between the individuals. It is important to remember that all these interactions described in the methodology built social capital between the stakeholders and the MLURI research team. Therefore, we are able to joke about the fact that despite the literature encouraging stakeholder involvement in modelling processes, it is still not always enacted. When we were talking about our experience with the toolkit and the difficulties of trying to align the model use with real policy questions, one of the staff members

joked that stakeholder knowledge is awkward because it “It messes up your models [laughs]” (February 2009). This illustrates they both understood the challenge we set ourselves, and were able to act as informal critics of progress.

4.2 Specific feedback on SUMMA from utility workshop

4.2.1 Findings from the discussion:

Once the participants had been given an extended introduction to the tool itself, including the concept of energy and the indexes used, the following discussions arose. The participants were energised and ‘excited’ (evaluation email) by some material, such as slide 22, where the discussion lasted for over ten minutes. However, this might also demonstrate the time required to explain the results.

The results on slide 22 show the CNP has low emissions from the agricultural sector per hectare compared to Scotland’s agricultural sector’s average, but the situation is reversed when it comes to units of dry matter, energy and money. The participants were interested in this and also commented on the distinctive pear shape within each of the graphs. Initial ideas related to the energy mix and the higher transport distances, but these were discounted by the participants, as they would show up in the particulate indicator (PM10). The group felt that it reflects the embodied energy within farm machinery and also servicing this machinery. A participant was surprised as his perception was that the sector did not use much heavy machinery. The point was made that whilst there may be less machinery; those there are not used intensively, so there are inefficiency in this kind of resource use – “you can’t have half a tractor”. One participant shared an anecdote about a farmer using a tractor that would be classed as an antique. It was pointed out that geography affects ability to intensify and to share capital (e.g. there are no machinery rings available). The participants were also confused by the fact that emissions per euro were lower. This was explained that the product mix was weighted to higher value products, so although resource use is inefficient, it is partially offset by higher monetary returns. The distinctive pear shape found on the spider diagrams were again commented on within slides 24 and 25, where the ‘global warming potential’ was more pronounced for metrics regarding dry matter or energy; and less for money or hectare based metrics.

The participants also had a long discussion about the results of the slide 31, especially why the CNP performed less well than the Scottish average. It was explained as the fact that the Park’s agricultural system is less efficient than the Scottish average. Participants felt the farming sector tend to be quite traditional and not particularly innovative, although there are innovative individuals. Also the age profile and tenancies tend to militate against innovation.

Interestingly, at this stage one participant intervened, noting that whilst the trend has got worse, the change is marginal. For example, Energy Unsustainability Index has shifted from 0.18 to 0.25 between 1991 – 2007; and the changes are of a similar magnitude for environmental loading ratio and energy investment ratio (slide 31). He also pointed out that whilst the Energy Unsustainability Index was worsening, it was still better than the Scottish average. There was a discussion about why the energy sustainability might have decreased. The areas where the Park performed worse than Scottish average haven't changed 1991-2007 in terms of ratios of money, energy or dry matter per solar equivalent joules. The MLURI facilitator suggested that the CNP is a marginal system and does not use resources as efficiently as some agricultural sectors, but it does use more renewable resources than other places, hence why some metrics are better than Scotland. In terms of trends, he suggested it might be due to the changes in prices and product mix. The participants noted that 2007 saw a 'bounce back' in sheep and barley prices.

However, there were plenty of queries about the inputs to SUMMA and how these might affect the results as presented. There were questions asked about the input data before the results were presented. For example, one participant queried the land cover figure used as they believe that IACS returning land parcels comprised 70-80% of the Park, not 47% as the workbook suggested⁴. Later, it was asked whether crofting land was included in the analysis. Other areas that were queried included how timber inputs were handled and whether renewable energy provided by the domestic sector was included. One participant was uncomfortable with the diagram on slide 18. The diagram, he said, seemed to suggest that animals and fish were somehow not part of the wider ecosystem and he would prefer the diagram to represent landscapes or habitats as they are managed, or at least using standard classifications (e.g. the CEH land cover habitat classifications). He noted that the 'formalisms jangled' as they did not fit with how he conceptualises the system.

The MLURI facilitator also noted that we are yet to calculate uncertainties for the data input; that fuel use doesn't yet include solid fuel and that the methane results have not included the direct emissions from livestock. These are all areas that will be fixed by the final analysis. However, they may explain why one participant noted that "there are too many caveats and gaps in the input data to give me confidence that the outputs are a reliable basis on which to shape or monitor policy" (email, December 2010).

These queries about the quality of data inputs to the tool can also be related to the theme of the need to contextualise the tool and to avoid averaging across the Park. For example, emissions from peat are an important policy and management issue in the CNP, but currently SUMMA uses emissions from an average agricultural soil. The same participant also questioned

⁴ 47% was the coverage in 2007 with ~75% in 2009.

the value of treating all grassland management the same, when the CNP had grassland managed for high nature value. Some farms use Highland cattle, who require lower inputs, but provide a lower yield (or at least are a lower term investment); and the grazing regime is also supposed to produce positive biodiversity benefits.

The issue of having a 'typical' value for a sector also came up when discussing how to apply SUMMA in future. The participants noted that forestry in the CNP varies from highly productive plantations to land managers who plant and fell woodland for conservation purposes – therefore some felling is carried out but is not used for production and should be handled differently. Much of the 'agricultural' area is in fact part of estates, which are highly heterogeneous and differentiated enterprises. Some estate rough grazing and moorland are actively managed for field sports, but others are primarily managed for public good provision (nature conservation and recreation). Some grazing is for production, but in other areas sheep are put in the hill as 'to mop up ticks' – requiring three monthly inputs of sheep dip but resulting in no meat production.

Finally, sometimes the data from SUMMA seemed to contradict existing results from other policy processes. For example, one participant expressed surprise at the results on slides 24 and 25. The fact that the intensive indicators suggest the CNP fares worse than Scottish average for eutrophication and acidification contradicts the Scottish RBMP results that suggest many of the water bodies in the CNP are high or good status. Their body language suggested they found it hard to believe the SUMMA results.

4.2.2 Evaluation results:

As shown by the Figure 5 below; views on the overall utility of SUMMA varied. The lower scores for the utility of the tool, and the validity of the tool were explained by the lack of confidence in the input data, described variously as "could be more useful if there was a better set of inputs" and "very data dependent e.g. CH₄ and CO₂ from soils". Indeed, one felt there was the potential to be useful but not 'as currently set up' due to the way the inputs had been scoped. None of the three participants thought they would try to run SUMMA themselves. This explains why most of them did not answer the evaluation questions on reliability and usability. One thought they might want others to use it on their behalf to answer a specific question.

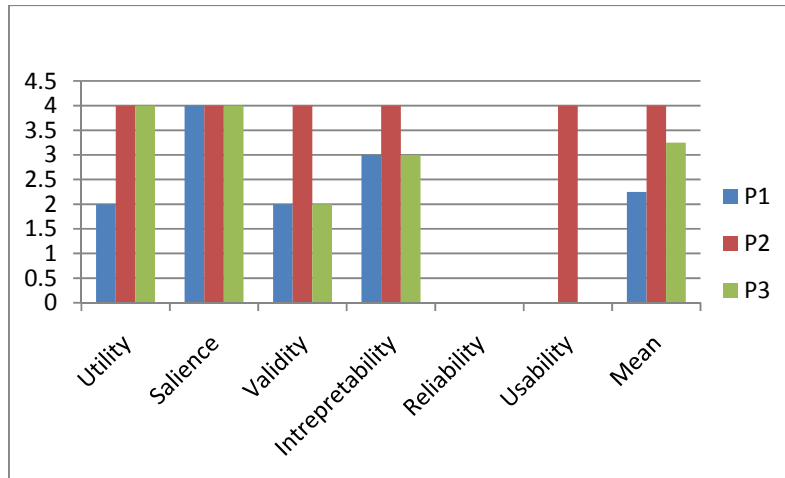


Figure 5: Evaluation results for SUMMA, December 2010

Table 1 below shows the results of the ranking for criteria when evaluating utility of SUMMA:

Table 1

Ranking	P1	P2	P3
1	Utility Salience	Utility Salience Interpretability	Validity
2	Validity	Validity Reliability Usability	Utility
3	Interpretability		Salience
4	Usability		Reliability
5	Reliability		Interpretability
6			Usability

This demonstrates the diversity of preferences for calculating utility of tools. Interestingly, although offered a free choice for additional criteria, no participants mentioned other issues on the form.

4.3 Specific feedback from MUSIASSEM from utility workshop

4.3.1 Findings from the discussion:

There was less of an introduction to this tool and fewer results to interpret. It also should be noted that the participants had been working for almost two hours when starting on this section. As with SUMMA above, the participants were interested in the results, and immediately began to try to interpret and explain the trends.

When shown the graph on slide 40-1, the participants tried to guess why the CNP was clustered with City of Edinburgh, City of Glasgow and Aberdeen City, Shire and Moray. The reasons given included the influence of distilleries and the number of wealthy people living in the Park. The explanation regarding rich retirees did not help to explain the differences when looking only at the paid work sector. The best explanation to 'fit' the structure of CNP was that the CNP has less dependants and more workers to average out the GVA; and the tourism/service profile is more typical of a city than a rural area. The participants felt the results might illustrate the average hours worked – slide 44 shows that CNP has 12% of human activity in paid work compared to 9% for Scotland as a whole. This may be due to long hours culture in some industries, and the propensity for pluri-activity (although much of this is seasonal and/or in the black economy so will they show in the GVA figures?).

The MLURI facilitator noted, for slide 44, that the CNP figure for human activity in paid work is higher than the Scottish average; and is typical of urban centres such as Edinburgh, Glasgow or Aberdeen. Therefore the CNP "metabolically is a rural city". There was some discussion about this characterisation, as the participants agreed that there were more young adults migrating to the area to work than is normal for a rural area; but equally there was still a big ageing population, which is a rural problem. The participants were intrigued that GVA for the CNP seemed to be the same as the Scottish average but the average income for the CNP is below the national average (the latter statistic was not part of our presentation, but is a figure the participants offered). One noted that the economic baseline report highlighted that the distilleries earn 'millions of pounds in terms of GVA' for the park but due to the large leakage, very little of the wealth remains in the Park. There are also asserted to be lots of 'oil workers' who live in the Park but earn their money elsewhere. This led into a discussion about the ability to capture the benefits of high yield industries, and the social benefits of having these industries in the Park.

The major issue regarding inputs to MUSIASSEM was whether GVA was the most appropriate metric. All were unsure if the GVA includes changes in house values, and if it does then this is likely to have increased the figures as there has been a big change in housing values in this period. There was also a question about whether GVA included pensions and incomes earned elsewhere. If not, participants felt GVA may not be a good indicator of the flow of money within and between the park and Scotland. Given the proportion of second home owners, and semi-retired people living (at least part of the time) in the CNP, GVA may not be the best measure for a small region or one where people commute across its boundary. However, there was less discussion about the quality and appropriateness of the inputs, beyond the focus on GVA. This may be because there are fewer inputs to the tool, and those inputs are more generic in their character, so are less contentious?

4.3.2 Evaluation Results

As shown by the Fig 6 below⁵; views on the overall utility of MUSIASEM varied but were less varied than for SUMMA. Again, the answers on validity were qualified with respect to the availability of data. Also, one participant qualified their answer on interpretability by noting 'with guidance only'. Neither of the participants who answered the evaluation thought they would try to run MUSIASEM themselves, although this time they did answer the evaluation questions on reliability and usability.

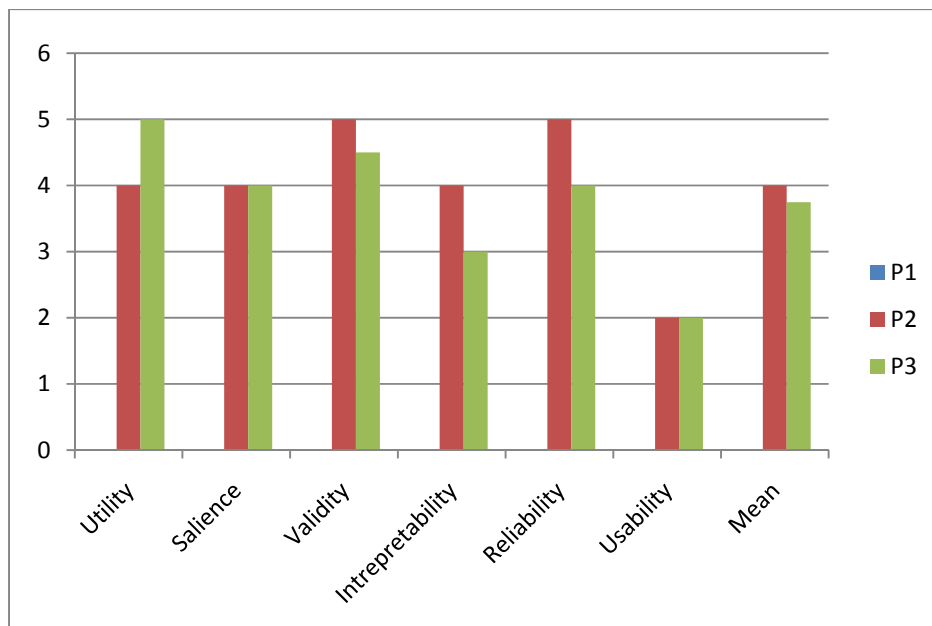


Figure 6: Evaluation results for MUSIASEM, December 2010

Table 2 below shows the results of the ranking for criteria when evaluating utility of MUSIASEM:

Table 2

Ranking	P1	P2	P3
1	N/A	Utility Saliency Interpretability Reliability Usability	Validity
2	N/A	Validity	Saliency
3	N/A		Usability
4	N/A		Utility
5	N/A		Interpretability
6	N/A		Reliability

⁵ P1 did not fill in an evaluation form for MUSIASEM or the overall workshop due to leaving before the end.

Again, there is diversity in preferences for calculating utility of tools. Interestingly, the preferences expressed by ranking have changed between the two tools.

4.4 Overall views on utility of tools

Language was a barrier for both tools, especially to the participant who had not been introduced to the project previously. It was interesting that this participant had to ask what we meant by tools during the introduction, as he was struggling to connect the abstract framework and models with the concept of a tool. All participants struggled at the start of the MuSIASEM section to understand the difference between ‘societal average’ and the ‘human activity for paid work’. The conceptual unfamiliarity of the methodology, and the difficulty in presenting these methodologies, may also have affected the results. Whilst the participants were often most intrigued by the comparison between the CNP and Scotland (or the Scottish average); many times the facilitator had to explain that they should not directly compare the case-specific SUMMA spider plots⁶, and this was confusing for participants. At times, the MLURI facilitator was not able to answer all the questions and explain all the trends. This occurred particularly in relation to slide 25 and slide 27. The volume of information provided by SUMMA, combined by the fact that the team did not generate the metrics themselves, meant that it was impossible to understand every nuance prior to this pilot study. However, it is reasonable to suggest that this inability to explain all aspects may have influenced the participants’ views of the usability of the tool; and the confidence they may have had in the results.

The content of the workshop discussions, combined with the evaluation results above, suggests that MuSIASEM was seen as a more useful tool than SUMMA. MuSIASEM was seen to be more accessible to one participant, although the other participant felt the SUMMA diagrams were more interpretable. The issues of scale and averaging seemed to matter less for MuSIASEM as well: compare the long discussions about whether it is appropriate to generalise agricultural inputs across the CNP with no comments to this effect when discussing human activity for the CNP. When asked to compare the utility of the tools, the participants felt that the SUMMA application at Park level was not “instantly useful” as the scale was not appropriate. The national scale did not illustrate the important regional differences in Scottish agriculture; and the Park level also overlooked important differences in agricultural systems between areas. They felt the ‘blanket’ coverage of MuSIASEM was okay and was more relevant and more attractive.

It appears that the main difference between SUMMA and MuSIASEM was that SUMMA was perceived to be less transparent. They noted that SUMMA raises some useful questions and

⁶ Each of the SUMMA plots is relative to a baseline allowing comparison within a case (CNP or Scotland) but not between. For comparison between the CNP and Scotland specific SUMMA plots were implemented showing CNP relative to Scotland.

they found the presentation of both the trend and the degree of the results very useful. They would like more of these trends at the 'landscape scale' but the data quality needs to be improved, e.g. ensuring that soils are taken into account and that methane from livestock is calculated. They wanted to understand more about the 'black box'; as they noted that if they can't explain how the results are produced, then they are wary of using them in their work "its hard to defend a trend if you can't understand how it is was generated". They need to "have faith" in the results, and also be able to interpret the results without overstating what they mean. This view is clearly spelt out below:

"the 'black box' nature of it means that I still wouldn't trust the outputs, because I don't know what assumptions are being made, what values are being put into the system etc. If we were to use something like this as a tool in policy development for the Park, I would want to know and influence exactly what system and values were fed into the model, and I would want to ground-truth that with partners and relevant experts, in order for partners to agree this is a meaningful model to use. Only then would it be useful in the sense that it would give outputs that we and partners could have some confidence in. "

This quote comes from someone who participated in the systems diagram workshop, so did have some influence on the process. However, they were not providers of the input data, nor did they set up or run the co-efficients.

Linked to this issue are questions about the costs and benefits of using the tool. SUMMA was perceived to be data hungry, and the participants talked about the need to trade off the cost of accessing and preparing the data to the benefit gained from the information. One pointed out that it is not just the one off cost of accessing the data but also the ability to replicate the analysis – "if the analysis can't be replicated, then it loses its value". Another participant then wanted to know what would happen to the tools when the project ended, "would they just sit on a shelf?" It was explained that the social metabolism approach is written into the next five year Scottish Government funding programme, so the capacity will be maintained within the MLURI. This is important given the evaluation returns that suggest that none of the participants intend to use the tools themselves.

There was a very interesting discussion about the policy salience of the results. It seemed clear that the participants feel the results have most applicability to the Scottish Land Use Strategy and the CNPA's landscape strategy. They also were interested in how the information could assist the Low Carbon Cairngorms project. Of course, these choices will partly reflect the roles and preferences of those present, but it is interesting that these are slightly different preferences to those expressed at the November 2008 workshop. Whilst tourism is still of marked interest to the CNPA, the participants felt that analysis of this sector was too difficult

and a full analysis of the land based sector would be more useful. The tools might help answer questions about the impact of an increase in woodland cover; especially when looking at where the woodland cover might go (up the hill, down the hill) and how that impacts on other habitat networks. The Park Plan, as a spatial strategic plan, and the LUS for the Park would be something the tools could try to inform.

During this discussion, the notion of scale was reintroduced. One participants pointed out that many of the questions raised by the tools are not able to be solved by the CNPA, so what does this analysis tell the CNPA? For example, they already know they have to reduce emissions so what does this analysis tell them. It might help them identify the main sectors were they could reduce emissions and so it could be used to prioritise resource allocation. A more specific, sub-sector analysis makes this easier. The Park area as a boundary is problematic, as it is only an administrative boundary whereas the decisions are made at Scottish Government or the farm level. It is interesting to have a good baseline and see the changes over time but the CNPA can't tell land managers how to change things. Therefore, it will easier to interest CNP-level stakeholders if Scottish Government are interested in the idea of social metabolism, and are willing to use it to make policy decisions.

The participants summarised the tools as “very clever to do but very hard to explain”. They would like to see the strong messages from the most significant findings picked out and presented. They did not feel that the MuSIASEM fund/flow diagrams or the SUMMA spider diagrams could be presented to stakeholders as they were presented to them, unless the stakeholders were comfortable with taking an ‘abstracted systemic view’ of the Park. They noted that the CNP participants were willing to “make an investment” to try to understand the material, due to their personal interest and their role at work, as someone expected to use research to inform their activities. However, they did not think other stakeholders, with less interest in research, would be willing to invest the time and mental energy in these processes.

This led into a discussion of who is the audience for these results? The participants felt the board, and other key stakeholders, like the land managers forum, would be interested in the main findings and their implications, but not in the methodology or the diagrams themselves. The community of researchers who participated in the recent Cairngorms Knowledge Transfer Project workshop⁷; especially the research orientated staff from agencies and consultants would be most appropriate. Other stakeholders e.g. the Board, the Cairngorms Business Partnership, the SPBRA etc might have an interest in the issues but the complex information might antagonise or frustrate them. However, one felt that the problem was that there is ‘no natural constituency for the tools’ so ‘what is in it for them’ when inviting busy stakeholders to

⁷ <http://www.perth.ac.uk/SPECIALISTCENTRES/CMS/CNP-KTP/Pages/default.aspx>

the meeting. The tools are quite diffuse, so there is a diffuse audience who might be interested in some of the messages, but few interested in all of them.

5 Discussion:

This discussion section covers the implications of our findings in light of the literature; the implications for mainstreaming the tool kit and the lessons we have learnt for the next workshop.

5.1.1 Contextualising the findings within the literature

As illustrated above, the tools themselves are unlikely to be used by anyone other than researchers. Therefore, the issues of reliability and usability are not explored further but this section focuses on what our findings contribute to the discussion about validation, salience and interpretability. These three criteria are located within the wider characterisation of tools as heuristics, symbolic or boundary objects.

Prior to the workshop, based on the literature above, the lead author expected that the participants would score the validity of SUMMA lower than MuSIASEM. This is because the SUMMA tool was described and presented as a 'black box' and appears to have more complex inputs, co-efficients and outputs, that would more sensitive to uncertainty and spurious assumptions. She expected the participants to rate the interpretability, reliability and usability of MuSIASEM lower.

As highlighted in section 4, issues with validity did seem to compromise the overall view of SUMMA's utility although validity was not ranked as the top criteria by all participants. As noted above, the issue of validity was closely linked with whether the participants felt the outputs from the SUMMA tool were credible and reflected their perspectives of the system. Interestingly, two of the three participants participated in the systems diagram workshop and therefore constructed the semantic 'code' for the formalised model. Despite, or because of this, they still raised questions over the ability of SUMMA to properly represent the heterogeneity of the Park's agricultural activities and impacts. The questions over validity are not surprising given that the literature suggests validity is often problematic when dealing with complex issues and/or issues where values and preferences are relevant. The more interesting question therefore is why the validity of MuSIASEM was not raised, given the complexity and value-laden issues of economic and social performance.

The salience of both the tools was ranked relatively high and also prioritised by most rankings. This partly reflects the fact that we had selected a case study where we believed the tools would be salient; and then tried to focus on trends and indicators with policy traction. However, the results do resonate with the comments about feedback loops, whereby there are

path-dependencies between decisions made in the Research and Development phases which may not suit the needs for the operational phase. This relates to the fact that policy priorities are dynamic and often shift more quickly than the pace of tool development and application. Our findings illustrate that the policy priorities have shifted, albeit only subtly, during the 2008-2010 period, altering the context within which the results of the tools are interpreted. This also relates to the changing relationship between the CNPA and their partners as well as with the Scottish Government (discussed further below). Interpretation issues also arise, as it is likely that how we interpret what might be needed to support the next CNPP or the landscape strategy will differ from what is meant by our participants, particularly when these strategies and plans are under development with little formal content available. Due to lack of time on the part of both researchers and CNPA staff, a formal requirement analysis has not been done. Instead the requirements have been interpreted from our ongoing discussion about the development of the current CNPP and the transition to the new CNPP. Our findings suggest that we were broadly correct, although our ability to service the changing policy requirements are limited.

Our findings clearly demonstrate that the CNPA participants did not expect to use the tools themselves, so the issues of interpretation relate to the ability to interpret and use the results, not the tools themselves. In terms of interpretation, our findings show that there was a major problem with the language used by the SMILE tool developers. Our findings also suggest diversity of abilities to interpret the outputs, and in preferences for the different styles. However, our findings suggest that outputs from both tools needed to be explained before they could be interpreted. For example, one participant noted at the December 2010 workshop that he has discussed the SMILE project and its outputs a number of times, and it's only now that he is starting to understand the implications.

We also return to issues of trust in those applying the tools, and our findings illustrate that relationships and social capital are important at development phase. Our participants were frequently reminded that we were not the tool developers, so they may have been more comfortable and frank with us when talking about the drawbacks of our tools. Also, our participants have worked with us over the past five years and have found other analysis we've done to be useful and to be credible, so we have some reputational capital on which to draw when presenting challenging data. Data from the longitudinal research project also suggest that these participants are willing and able to use outputs from other modelling projects, when they find the results credible, and they have a history of working with those modellers.

Finally, reflecting on Sterk et al.'s typology of tool use, our findings suggest that the participants are unconvinced about SUMMA's role as a heuristic or either tools' role as a boundary object. The comments about the validity suggest that they are unwilling to place much faith in the trends that SUMMA produces, until the inputs are contextualised for the different land use

subsystems within the Park. However, the fact that they were comfortable with the 'blanket' approach of MUSIASSEM and the flow/fund ratios may suggest that this tool could play more a heuristic (or early warning) role. Of course, this result may reflect the fact that the participants were land use and planning experts and if the socio-economists had attended, they may have differed in their views. The comments about the interpretability mean that the tools are unlikely to be a first choice as a boundary object for social learning.

Therefore, the tools are most useful as symbolic objects, to communicate key trends to politicians and policy makers. The issues of interpretability are important here, given the findings suggest that it would be difficult to present these complex ideas either to the CNPA Board or the Scottish Government, who, participants argued, want 'uni-variate answers'. The findings highlight the fact that tools are part of a complex multi-level governance network, and that for Park level stakeholders to use the results in policy, they need sufficient policy support from national government. The findings also resonate with the difficulties of engaging policy makers with long term, complex and intractable problems requiring adaptive management. However, it is precisely in these conditions when (a) more meaningful sustainability assessments are needed and (b) when social learning processes of knowledge exchange, rather than formal knowledge transfer, are needed.

5.1.2 Implications for mainstreaming SMILE

The overall focus of the utility evaluation was, as the name suggests, establishing the utility of the tool to stakeholders involved in sustainability decision making. As noted in section 2.3, the SMILE project is located within the development phase (Figure 1) with the intention of appraising the challenges when trying to overcome the implementation gap and mainstream the use of these tools in an operational setting.

Two very practical issues were raised from the very start of our engagement with the CNPA, access to data and demand on staff time, which are not well covered by the criteria in the literature above. Access to data is partly covered by reliability and validity, but the issue really relates to who provides the staff time to input data into these tools and run the analyses. It seems clear that the CNPA struggle to make time to discuss the interpretation of these results, far less be able or willing to run the analyses themselves. In the words of one participant:

"I'm also wary that anything that needs such complex explanation is unlikely to be used by policy makers – though it may be a perfectly valid tool for specialists to use in informing policy"

Therefore they are dependent on an intermediary between the tool developers and themselves. The utility of the tools are based on having ongoing trend analyses and evidence to

use with Scottish Government and other Park level stakeholders, so they in turn are reliant on us having ongoing capacity to replicate these analyses.

Mainstreaming tools, looking ahead to operational phase of tool evaluation, requires a different set of relationships. It requires us to move beyond working with our colleagues at the CNPA to those who might use the tool outputs to alter real world outcomes. As noted above, the participants question who the “natural constituency” for these tools are. This illustrates the difficulty with the holistic nature of sustainability assessments, when sustainability is relevant to everyone, yet few policy makers or stakeholders are explicitly responsible for ‘sustainability’. One of the reasons for selecting the CNP, and the CNPP, as our policy application is that sustainability is an explicit requirement for the National Park (Scotland) Act and the CNPP.

However, the multi-level governance aspects noted above mean that for the CNPA to enact sustainability, they must maintain the good will and support of Scottish Government and local landowners and communities (Dinnie et al., submitted). Therefore, when considering using tools and their outputs, the CNPA staff must consider how the tool use will impact on their relationships with others, their personal and organisation reputations and their credibility in order to protect their claims to legitimacy. There is a relatively high level of social capital between us and these participants, although the delays in producing the results may have compromised these slightly. However, these are weak bonds of reciprocity when set against their day-to-day relationships and the current political climate, where budget cuts are forcing all staff to prioritise and demonstrate delivery of Scottish Government policy priorities. Within this context, salience of tools remains vital, but must be complemented by the ability to provide timely and credible evidence that sure up the legitimacy of the policy maker using them.

5.1.3 Lessons learnt for the next workshop

The main lessons learnt from the pilot study were that we will present less data to allow more time for discussion and interpretation by the participants. We will start with the narrative about some interesting and thought-provoking findings, where possible, matched to the policy contexts of interest (e.g. the new CNPP, divergences from the indicators for the existing CNPP, scenarios for the Cairngorms Land Use Strategy and/or the Low Carbon Cairngorms project). However, we will still have to tackle some of the technical aspects of how these methodologies work and the metrics used (e.g. emergy indexes). Where possible, we will try to make SUMMA more transparent, by showing how it runs and having some sample co-efficients available to discuss. We will spend more time on explaining how these tools illuminate things that are not illustrated by other methodologies.

We would like to extend the discussion to those beyond our immediate partners in the CNPA, in order to bridge between the development evaluation phase and the operational evaluation phase (see Figure 1). Therefore, we hope to involve land based industry stakeholders who

should be interested in land based sustainability trends and metrics. However, we will retain our workshop methodology, which implies a maximum number of participants (10 – 15) in order to ensure all participants can contribute to a discussion. Our sample will be purposive and small with the emphasis on interpreting high quality qualitative data rather than statistically analysing quantitative data from a larger sample.

6 Next Steps

6.1 Strategy

The intention of the MLURI team is to continue to develop both SUMMA and MuSIASEM analyses. Neither analysis was seen as lacking in merit or as being or irrelevant to the CNPA deliberations on sustainability. The MLURI research team, however, recognise that neither approach at this stage has overcome the “implementation gap” and neither will feature strongly as an evidence base for decision making in relation to the next CNPP. This partially reflects the inexperience of the MLURI team in using the DECOIN tools, but also the challenge in resource terms of a SMILE single partner making operational two of the DECOIN tools for a single case-study.

In the remaining months of the SMILE project there is a significant opportunity in undertaking SMILE deliverables (D28-30) to test whether it is possible to overcome the remaining “implementation gap”. To do so it is clearly necessary to increase the perceived utility of the DECOIN tools (particularly their salience, validity and interpretability). Taking a narrower interpretation of the scope of the Deliverables D28-30 and focusing on issues and analyses most relevant to the CNPA, would allow for a more definitive assessment of the potential for the DECOIN tools. While this is a narrower analysis than perhaps was envisaged at the inception of SMILE, it would, in view of the MLURUI team, be an acid test for the DECOIN tools in terms of their transition from academia. This is arguably the most useful contribution that the MLURI team can make to the overall objectives of the SMILE project. This refocusing would need to be agreed with the SMILE consortium and Project Officer.

It has been possible to identify some high priority issues and modification to the analyses that would greatly increase the salience and credibility of the outputs (for specifics see the SUMMA and MuSIASEM sections below). We will prioritise these issues/modifications rather than opening up new avenues of research. By the end of March we will deliver three outputs, D28 - Role of economic growth in achieving multiple objectives, D29 - Synergies and trade-offs at different scales and D30 - Role of policy and other actions.

6.2 SUMMA specific next steps

The intention for SUMMA will be to complete the production-oriented, land-based industry analyses rather than undertaking a new analysis of the tourism/recreation sector. Specific issues and improvements include:

1. Differentiate between land that is stocked with domestic livestock and land managed for hunting/conservation. This differentiates rough grazing based on altitude and makes per ha intensities for farming more realistic (higher). The team will also consider differentiating the extents and intensities of: cropping, improved grassland and rough grazing based

enterprises – though this introduces issues of attribution of fixed capital (machinery and infrastructure shared by enterprises).

2. The SUMMA emissions analysis does not include those direct from livestock. This can be easily rectified using IPCC Tier 1 GHG emissions per head and it may be possible to use more sophisticated analyses that distinguish based on breed and diet since these are known for the Scotland/CNP systems.
3. Another key GHG emission source in the CNP is seen as the emissions from peatlands. This respiration is not included in the current SUMMA model but the MLURI team have access to models of soil carbon fluxes for all soils in the Park under cultivation or semi-natural coverage so these can be included and their relative importance judged.
4. Materials usage (steel, concrete and plastic) has yet to be quantified. Volumes of intermediate consumption of such products are present in the national accounts but only as expenditure not as physical quantities. Other physical accounts sources will be investigated.
5. Currently only average national prices are used for both inputs and outputs. The realism of this was queried and efforts will be made to assess if there is a premium for produce from the Park and whether this offsets higher input prices.
6. Forestry is a significant land use in the CNP but data on felling volumes and use is difficult to determine (particularly for private rather than state-owned forests). New data sources are becoming available but it remains unlikely that conservation forestry practice will be easy to identify/quantify. This may perhaps be done for small areas via interview. Use data is unlikely to be possible to determine within the scope of SMILE.
7. The SUMMA analysis needs to include the management of land for sport/hunting. In physical terms the numbers of red deer are the most significant but grouse are also a significant income stream. Deer numbers (population) and culls (stag and hind numbers) are available but the value of the physical products is small relative to the payment for shooting rights. How best to represent such as system within SUMMA needs to be carefully considered particularly the infrastructure required, seasonal use of labour and the impacts of vegetation management which can include burning to encourage regeneration but which could have implications for net GHG emissions. Validation of the SUMMA model may be possible against existing audits of exemplar Estates.

8. The desirability of quantifying the effect on outputs of uncertainties in the input datasets was raised. Estimation of uncertainty is possible (though not easy given the spreadsheet based data structures of SUMMA). More important, however, is to validate the inputs against the CNPA staff, other trusted experts or local knowledge. There is a challenge in balancing model complexity (seen as undesirable by stakeholders) against the need to include distinctive local variants on systems (seen as desirable).

6.3 MuSIASEM specific next steps

For MuSIASEM the priorities will be to: include the spatially explicit land use analyses and to investigate the theoretical and practical issues of including other quality of life metrics within a MuSIASEM framework – e.g. wage rates and house-prices.

The following specific investigations were also seen as useful.

1. Include a sub-CNP (n-1) analysis that differentiates Deeside (oriented to the city of Aberdeen) from the Speyside/Highland parts of the CNP.
2. Include non-GVA metrics. Questions were raised on whether GVA is a useful metric for the CNP. One industry (distilling) generates large revenues but almost none remain within the CNP (small employment and little other spill over). Other issues raised included the need to quantify pension income flows for the significant retired population within the CNP and the balance of income from activity outwith the park (residents who work outwith the CNP) versus the incomes generated within the CNP that are spent elsewhere (non-resident works). Despite these issues the stakeholders were still interested in the sectoral mix of GVA for sub-CNP regions.
3. House prices are an interesting indicator where growth is seen as desirable by some but can also have significant social downsides for quality of life.
4. Mapping of land take and energy consumption at sub-CNP level were seen as useful. It was essential that any metrics be sensitive to fine grained differentiations in alternative scenarios, for example not 0 vs. 5000 house but the consequences of 0 vs. 50 or 0 vs. 100 houses in several locations.

6.4 Timetable

With the more comprehensive results from D28-30, it is intended to repeat the workshop with the CNP. We will aim for April 2011 and will include a wider range of stakeholders with the specific invitees decided on in consultation with the CNPA. The aim will again be to assess the overall utility of the DECOIN tools but with secondary aims of testing that refined analyses and improved ways of communicating the outputs (resulting from the D23 workshop) have been

effective. Results from the April 2011 workshop will be used to update D23 with a supplementary report before the end of the project in June 2011.

After the completion of the SMILE project both approaches will continue to be developed as part of the SG funded research on “Transition to a Low Carbon Rural Economy”, 2001-16. It is also possible that the SMILE project will underpin further research within the EU Framework Programme 7 since a research proposal (LAUGH) has been submitted for 2011-13.

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Appendix One: Workshop Attendees

The following attendees took part in the systems diagramming workshop, held 4th November 2008:

- Gavin Miles – Strategic Planning Policy Officer
- Hamish Trench – Head of Heritage & Land Management Team
- Murray Ferguson – Head of Visitor Services & Recreation
- Chris Bremner – Sustainable Economy Manager
- Eric Baird - Cairngorms National Park Authority Board – *via videoconference*
- Kirsty Blackstock – Macaulay Land Use Research Institute workshop organiser
- Keith Matthews – Macaulay Land Use Research Institute facilitator
- Dave Miller – Macaulay Land Use Research Institute sound recorder & scribe
- Kevin Buchan - Macaulay Land Use Research Institute scribe

The following attendees took part in the pilot utility workshop, held 2nd December 2010:

- Gavin Miles – National Park Plan Officer⁸
- Hamish Trench – Director of Land Use
- Matthew Hawkins – Senior Heritage Officer
- Keith Matthews – Macaulay Land Use Research Institute workshop organiser
- Kirsty Blackstock – Macaulay Land Use Research Institute facilitator & scribe

The individuals above have been associated with the Cairngorms National Park for between seven and four and a half years.

Apologies were received from Chris Bremner - Sustainable Economy Manager; Murray Fergusson - Head of Visitor Services & Recreation; Eric Baird, ex-Cairngorms National Park Authority Board Member and local land manager. Dave Miller and Kevin Buchan were also unable to attend due to poor weather and other work commitments. The choice of who to invite was left to Mr Miles and Mr Trench. We also suggested that they invite their planning officer, their GIS technician and another board member, who has expressed an interest in sustainability assessment.

⁸ Same participant as for Nov 2008 workshop but has had a change in role within CNPA. Ditto for Mr Trench.

Appendix Two: Utility Workshop Workbook Slides

SMILE Workshop with CNPA




Keith Matthews & Kirsty Blackstock,
Kevin Buchan, Dave Miller & Mike Rivington



1

Plan for the workshop

- Introduction by participants
- Introduction to the SMILE project
- Presentation and discussion of the SUMMA tool and its outputs
- Evaluation (SUMMA)
- Break
- Presentation and discussion of the MuSIASEM tool and its outputs
- Evaluation (MuSIASEM)
- Next steps
- Overall evaluation



2

SMILE Overview

- Synergies in Multi-scale Inter-Linkages of Eco-social systems
- EU funded Framework 7 research project
- Social Science and Humanities theme
- 25% match with SG research programme
- From Jan 2008
- Builds on DECOIN FP7 – small project developing tools and methods
- Application for follow up FP7 Environment project 2011-13 – knowledge-brokerage for mainstreaming beyond GDP approaches.



1

Consortia

- Finland Futures (U. Turku) – coordinators – forest industry
- Autonomous University Barcelona – national, urban and land use systems
- Parthenope University, Naples – agricultural systems, local, regional and national
- Institute of Economic Forecasting, Bucharest – industrial systems, transition economy
- Free University, Amsterdam – assessing factors that are critical to the success or failure of sustainability policies (Pentagon)



4

The Need for New Tools

- Overly simplistic single indicators - monomania
- Ad hoc frameworks of incoherent metrics – fail to deliver understanding of trade-offs or relative performance
- Methods compatible with multiple dimensions of values/costs
- Beyond GDP agenda(s)
 - Questioning the role of growth
 - Well being
 - Global challenges – climate change, biodiversity



5

SMILE Innovations

- Systemic - not ad hoc – but still limits on social dimension
- Multi-scale – explanatory and contextual - dependencies
- Multi-metric – but coherent
- Key factors, people, money, energy (and now land)
- Extents and intensities combined – avoids Jevons Paradox
- Feasible?
- Communicable?
- Useful?

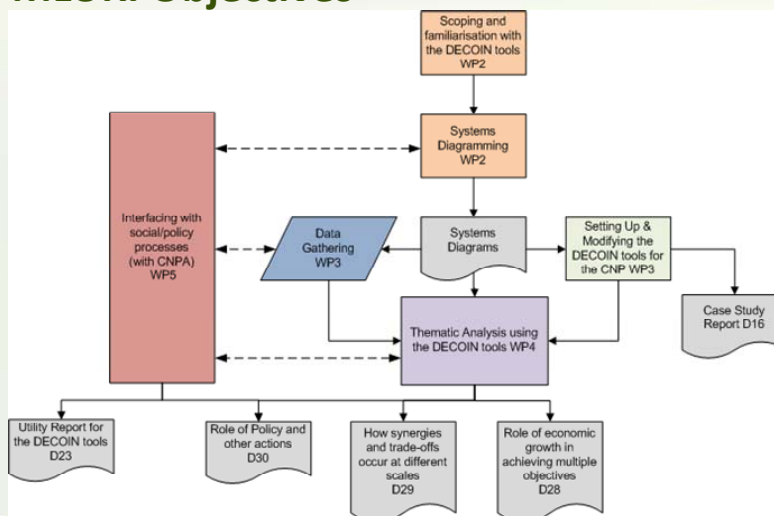


6

SMILE Objectives

- **Four research WPs**
- **WP2** – Further development of the DECOIN tools.
- **WP3** – Case-study development.
- **WP4** – Analysis of synergies and trade-offs.
- **WP5** – Conceptual and operational barriers to uptake of DECOIN tools for policy and practice.

MLURI Objectives



Land as part of the analysis

- Finite resource
- Areal intensity as a significant indicator of the nature of a system
- Where things happen is often important

CNP case study

- Both an area of land and a new institution for rural sustainable development.
- Assist the CNPA and their partners in delivering the aims of the National Park (Scotland) Act
- Transferability of the DECOIN tools
- Utility of the DECOIN tools

Timetable

- Started January 2008, real work from Autumn 2008
- Familiarisation, data gathering, development of frameworks
- Plan for completion of case-study & trade-off analysis mid 2010
- Utility workshop planned for after case study completion
- Disruption means it's late 2010 and still interim results
- Fewer results but more opportunity to influence the final case study?
- Target for completion of the analysis is end March 2011



10

Workshop Process

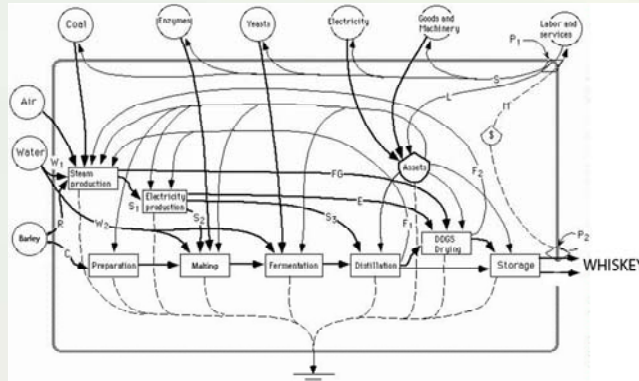
- Presentation and discussion – using workbooks
- Comments and questions all welcome
- Main focus of formal evaluation is Utility – broken down into
 - Saliency
 - Validity
 - Interpretable
 - Reliability
 - Usability



11

SUMMA - Intro

- Sustainability Multi-Method Multi-scale Assessment (SUMMA)
- UniParthenope, in Campania region for agricultural systems



12

SUMMA Concepts

- Model - Inputs - Outputs
- Life-cycle based - includes upstream (e.g. embodied labour and services) – and downstream (e.g. pollution)
- Stocks and Flows of materials – physical accounting (with financial)
- Same units – Emergy - solar equivalent joules (seJ)
- Technical coefficients convert x to y
- Extents (tonnes, ha, mJ) and Intensities (seJ per €, g, (ha), J)
- Indicators – returns on investment, renewables, global to local ratios, environmental loading (emissions or eco-toxicity)

13

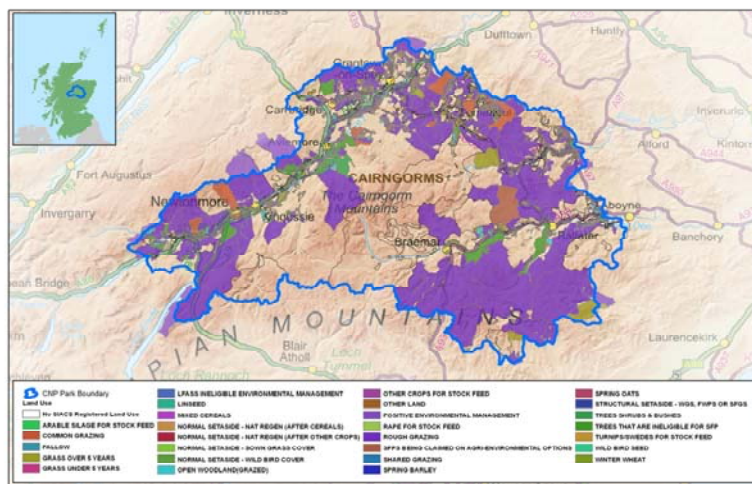
Ag Sector Analysis

- Part of co-funding from SG programme
- National scale analysis (n+1)
- CNP (n)
- Time series 1991, 2001, 2007 (at time most recent)
- Ag sector well documented – down to small units (IACS/JAC)
- Significant as land area (CNP ~ 47% in IACS – most RGR)
- Significant policy area
- Forestry & sporting more so for CNP – **being followed up**



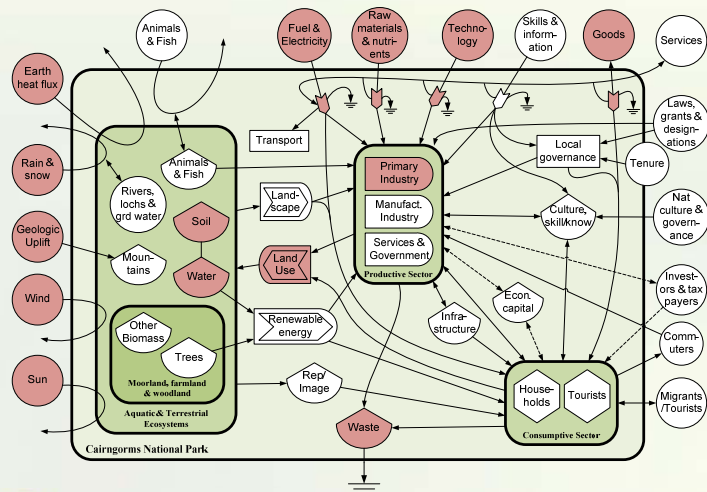
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Ag Sector Map 2007



15

Systems Diagramming



■ Whole system (simplified) with Ag Sector highlighted 16

Inputs

- ~200 – IACS, Census, etc
- Physical parameters – altitude, land use areas, albedo, climate, soil erosion, water use
- Fuel use – petrol, diesel, lubricants, electricity, gas (should be others)
- Fertilisers – N, P, K
- Pesticides – fungicides, herbicides, insecticides etc.
- Machinery – physical mass
- Materials – plastics, steel, wood, concrete
- Work – persons, hours, cost.
- Livestock – sales (tonnes), energy (kcal) content, economic value (farm gate)
- Crops – sales (tonnes), energy (kcal) content, economic value (farm gate)

Results - types (CNP_{AG} & Scot_{AG})

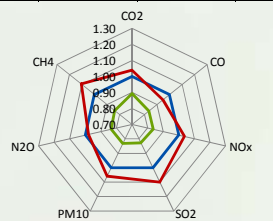
- Tables – time series of values (1991, 2001, 2007)
- Normalisation
 - within series – relative to 1991 (1991 = 1)
 - between regions or scales (CNP vs. Scotland)
- Allows - multi-metric spider plots
 - Compare between metrics
 - Overall assessment
- Need for care when using normalised metrics
 - doubling does not always mean the same thing
 - use native unit extents i.e. the tables.



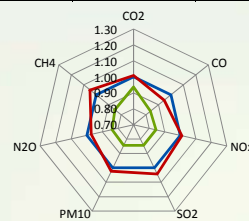
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CNP_{AG} & Scot_{AG} Emissions (Extents)

Tonnes	CNP1991	CNP2001	CNP2007	Sco1991	Sco2001	Sco2007
CO ₂	63,794	64,364	59,742	3,271,817	3,401,175	2,921,717
CO	14	14	12	1,711	1,620	1,429
NO _x	85	86	72	8,204	8,491	6,852
SO ₂	127	133	107	10,616	11,685	8,783
PM ₁₀	5	6	4	534	566	445
N ₂ O	0.46	0.44	0.38	48	47.58	40.49
CH ₄	0.81	0.85	0.69	68.28	75.53	57.24



— Sco1991 — Sco2001 — Sco2007

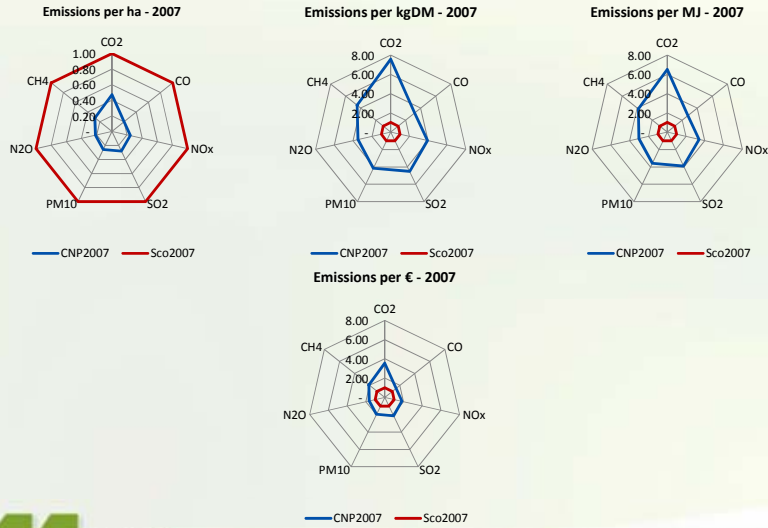


— CNP1991 — CNP2001 — CNP2007



19

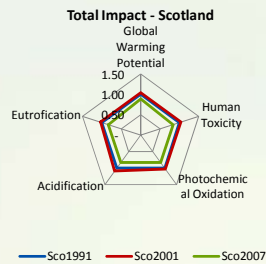
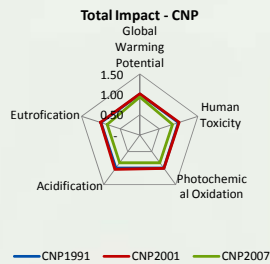
CNP_{AG} & Scot_{AG} Emissions (intensity metrics)



20

CNP_{AG} Environmental Impacts

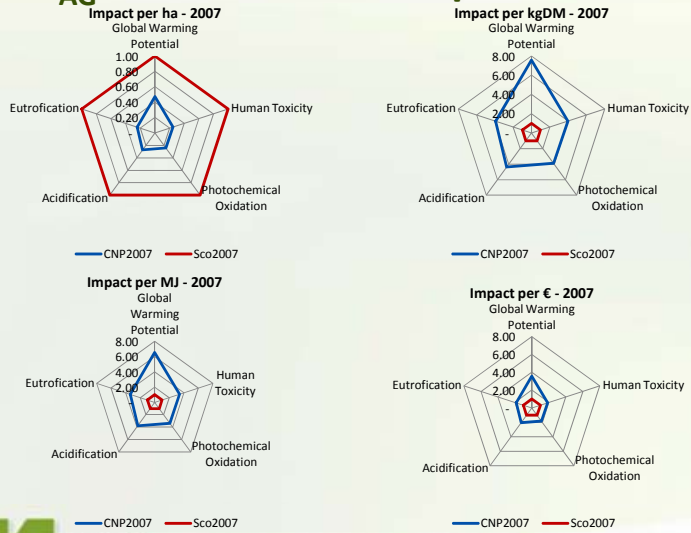
Impact	CNP1991	CNP2001	CNP2007	Sco1991	Sco2001	Sco2007
Global Warming Potential	63,950	64,518	59,873	3,287,986	3,417,242	2,935,216
Human Toxicity	115	117	97	10,865	11,312	9,066
Photochemical Oxidation	12	12	10	1,201	1,236	999
Acidification	196	203	165	16,842	18,268	13,967
Eutrophication	11	11	9	1,079	1,116	901



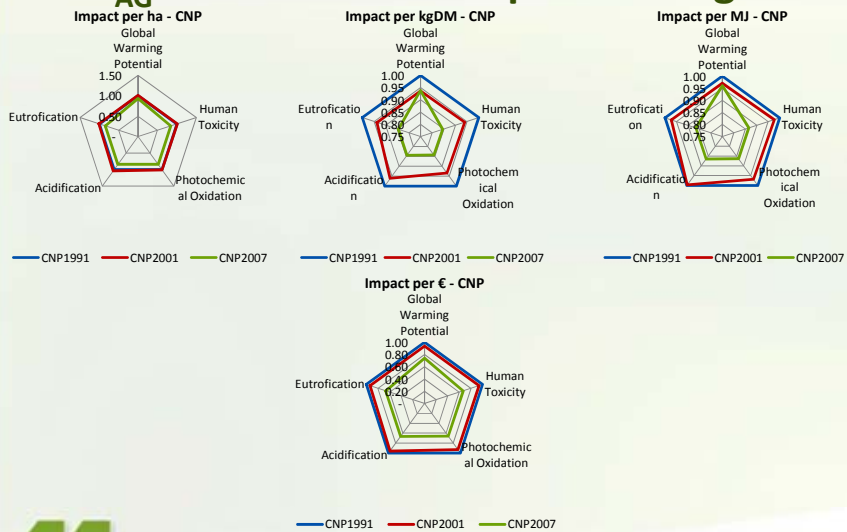
Global Warming Potential 100yr - (t CO₂ eq.) Acidification - (t SO₂ eq.)
 Human Toxicity - (t 1.4-dichlorobenzene eq.) Eutrophication - (t PO₄ eq.)
 Photochemical Oxidation - (t ethylene eq.)

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CNP_{AG} Environmental Impacts

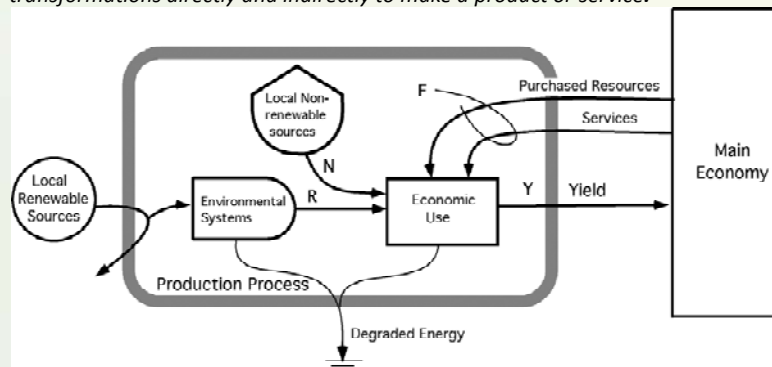


CNP_{AG} Environmental Impacts change



Energy

Definition: *Energy is the available energy of one form that is used up in transformations directly and indirectly to make a product or service.*



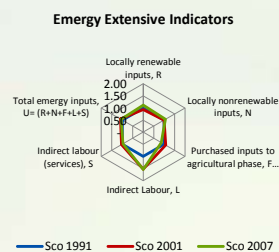
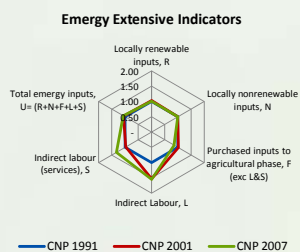
R: local renewables (e.g. solar, wind); N: local non-renewables (e.g. soil, oil);
 F: total energy imported from outside the system (e.g. fuels, machinery);
 L: labour, S: services (usually embodied); Y = total energy yield



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CNP_{AG} & Scot_{AG} Energy Extents

Energy Extensive Indicators - all sej/yr	CNP 1991	CNP 2001	CNP 2007	Scot 1991	Scot 2001	Scot 2007
Locally renewable inputs, R	1.00	1.03	1.01	1.00	0.93	1.11
Locally nonrenewable inputs, N	1.00	1.00	1.00	1.00	1.00	1.06
Purchased inputs to agricultural phase, F (exc L&S)	1.00	1.02	0.86	1.00	1.07	0.86
Indirect Labour, L	1.00	1.52	1.54	1.00	1.52	1.54
Indirect labour (services), S	1.00	0.97	1.32	1.00	1.03	0.96
Total energy inputs, U= (R+N+F+L+S)	1.00	1.06	1.07	1.00	1.09	1.06



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CNP_{AG} & Scot_{AG} Energy Indicators

- **Material Intensities (4)** – Energy (seJ) per €, per g of dry matter, per ha, per J of output
- **Energy Yield Ratio (EYR)** is the ratio of the total energy yield (local and external) to the energy invested (external). Y/F where F includes L&S. The lowest possible value of EYR is 1.0, which indicates no local resources are mobilised. Higher values are normally better – **not used in later figures except as part of ESI (see below)**
- **Energy Investment Ratio (EIR)** compares the imported energy to the yield of local energy. So F/Y . Where F includes L&S, and $Y = N+R$. Lower values indicate that larger investments of external resources are needed to exploit one unit of local resource – the complement of EYR.
- **Environmental Loading Ratio (ELR)** = compares the amount of local non-renewable energy (N) and purchased energy (F) to the amount of locally renewable energy (R). Lower value means more renewable. $(N+F)/R$.
- **Renewable Energy Requirement (%REN)** = R/Y where $Y = (F+L+S+N+R)$. Higher value is more renewable. Inverted for figures (**Non-Renewable Energy Req.**) lower is better.
- **Energy Sustainability Index (ESI)**, the ratio of EYR per ELR can be used to compare how sustainable one or more systems are at a point in time. Higher is better so inverted for figures.



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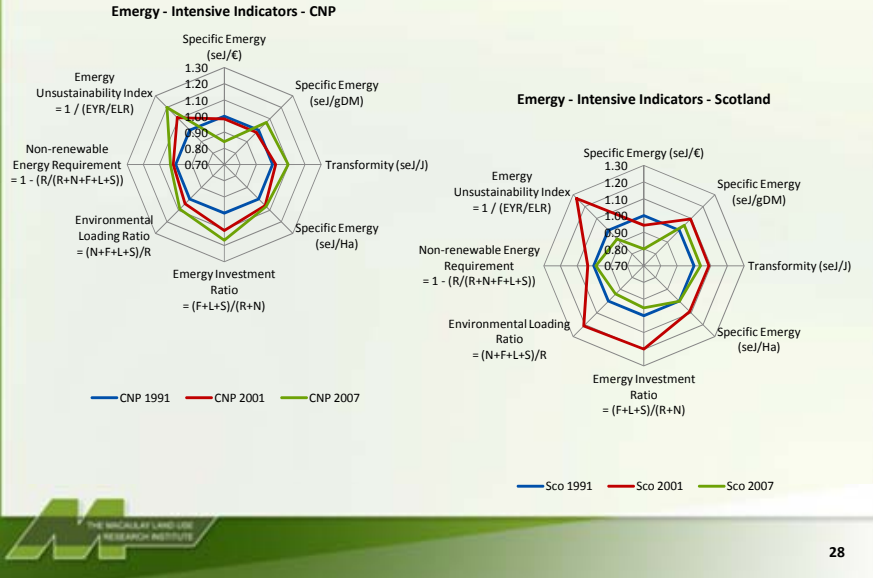
CNP_{AG} & Scot_{AG} Energy Extents

Energy Intensity Indicators (inc inversions)	CNP 1991	CNP 2001	CNP 2007	Scot 1991	Scot 2001	Scot 2007
Specific Energy (seJ/€)	2.25E+13	2.21E+13	1.89E+13	8.93E+12	8.41E+12	7.15E+12
Specific Energy (seJ/gDM)	2.88E+10	2.83E+10	3.08E+10	5.24E+09	5.74E+09	5.46E+09
Transformity (seJ/J)	1.70E+06	1.73E+06	1.86E+06	3.68E+05	4.00E+05	3.82E+05
Specific Energy (seJ/Ha)	1.39E+15	1.48E+15	1.49E+15	4.22E+15	4.59E+15	4.23E+15
Energy Investment Ratio = F/Y	0.56	0.62	0.66	2.51	3.01	2.39
Environmental Loading Ratio = $(N+F)/R$	1.62	1.69	1.77	4.00	4.83	3.75
Non-renewable Energy Requirement = $1 - (R/(R+N+F+L+S))$	0.62	0.63	0.64	0.80	0.83	0.79
Energy Unsustainability Index = $1 / (EYR/ELR)$	0.58	0.65	0.70	2.86	3.63	2.64

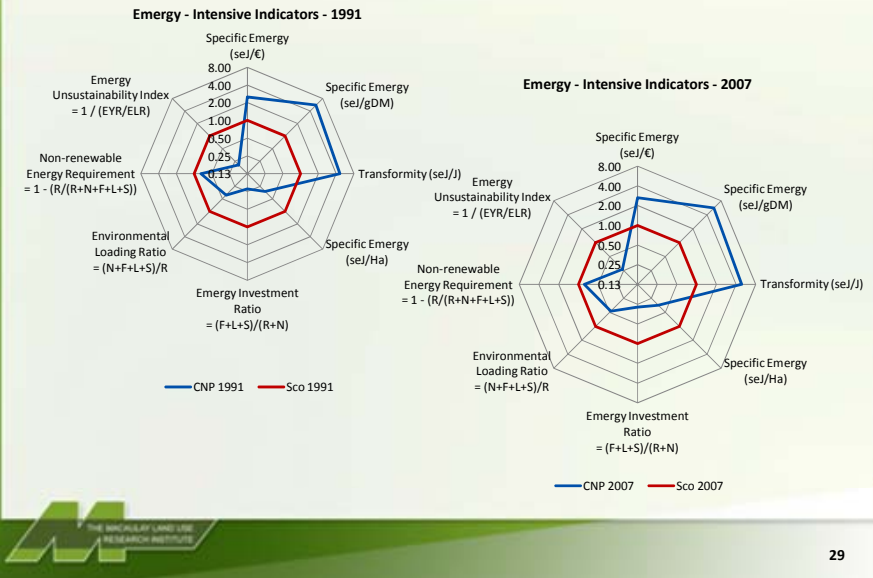


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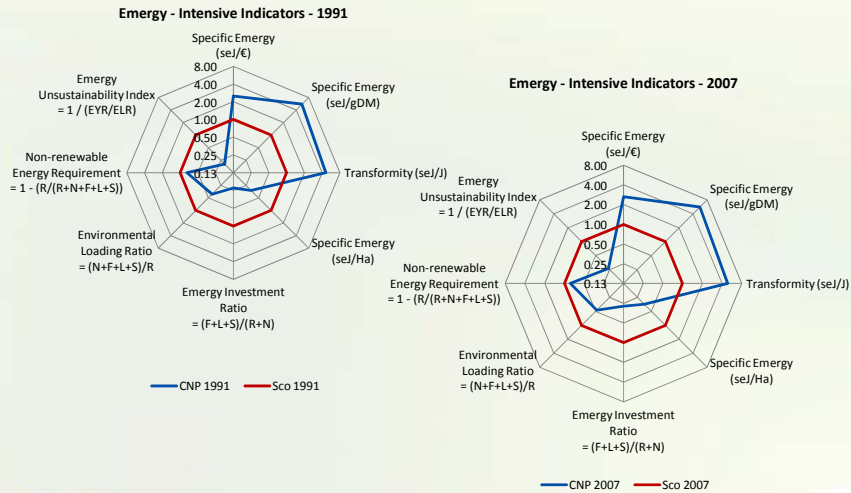
CNP_{AG} & Scot_{AG} Energy Intensity



CNP_{AG} vs. Scot_{AG} Energy Intensity (2)



CNP_{AG} vs. Scot_{AG} Energy Intensity (2)



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Challenges

- Uncertainty
- Materials usage (Survey of Ag Prod Methods)
- Agro chemicals (Fertilisers and Protection)
- Local returns and margins
- Physical parameters
- Geographical reporting units
- Interpretation
- Communication

30

Your Interpretation

How might these results inform ...

- Park Plan
- Policy and market drivers
- CAP – post 2013 reforms
- GHG mitigation targets – 40% and 80%
- Land management and tourism / recreation
- Others



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Next steps

- Forestry – output with FC
- Sporting estates – deer & grouse – counts and culls
- Tourism – a consumption sector - limits of SUMMA? – Jan – Mar 2011.

- New SG Research Programme and Centres of Expertise (2011 – 2016) – transition to low carbon rural economy



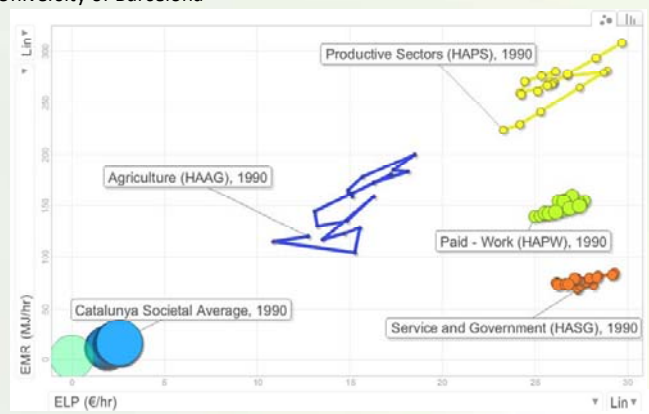
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Summa Evaluation

- Forms and Coffee

MuSIASEM - Intro

- Multi-scale Integrated Analysis of Societal and Ecosystem Metabolism (MuSIASEM)
- Autonomous University of Barcelona



MuSIASEM – concepts

- Multi-scale and integrated analysis
- Mixtures – “opening up the box” – components of averages
- Sectors: Societal Average (SA), Households (HH), Paid Work (PW), productive, service and government, agriculture (PS+SG+AG) etc
- Regions, NUTS, local authority, intermediate, data zones
- Land types
- Time series, trajectories
- Extents and Intensities together



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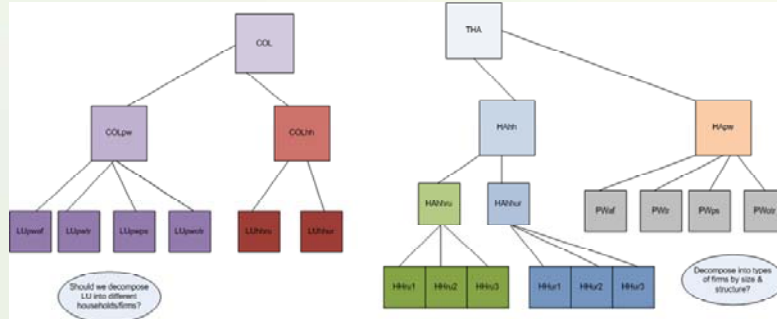
Metrics – the building blocks

- GVA – gross value added (£)
- THA – total human activity (population)
 $THA_{HH}, THA_{PW}, THA_{PS}, THA_{SG}, THA_{AG}$
- TET – total energy throughput
- TAL – total available land
- Exosomatic Metabolic Rate - $EMR = TET/THA$
- Economic Labour Productivity - $ELP = GVA/THA$
- Not GVA/TET ! – or Subsistence = Industry



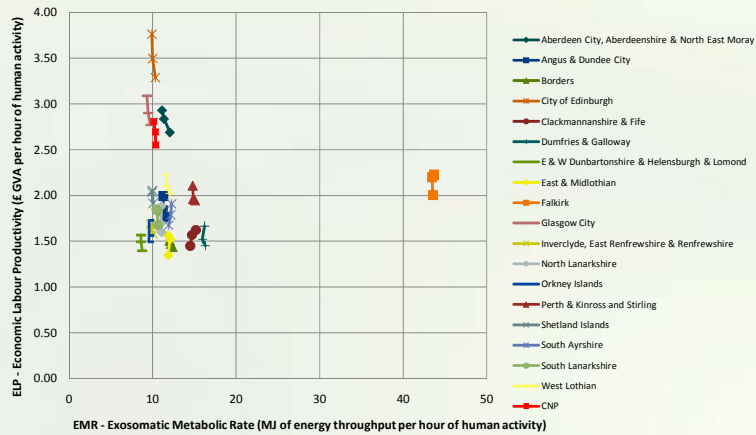
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Example - decompositions



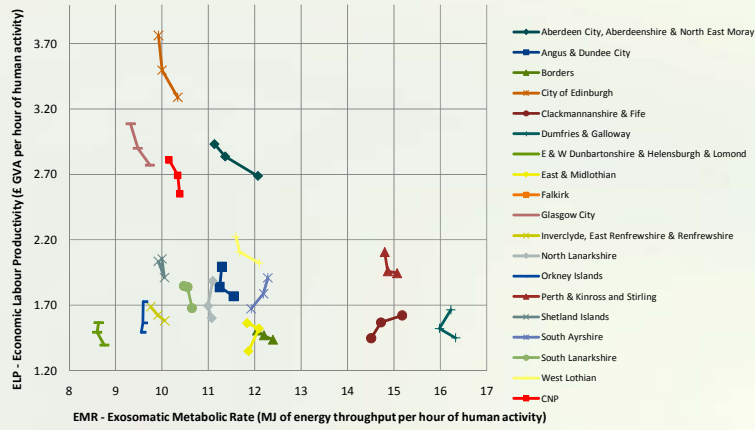
Results – SA – Regional

ELP_{SA} vs EMR_{SA} by region



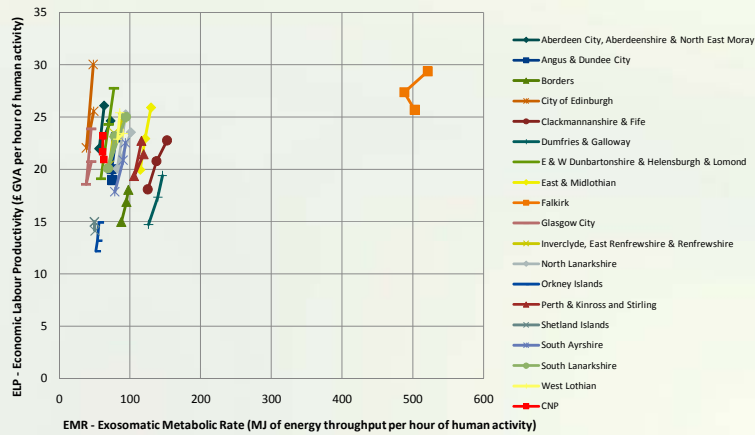
Zoomed-in

ELP_{SA} vs EMR_{SA} by region (zoomed section)



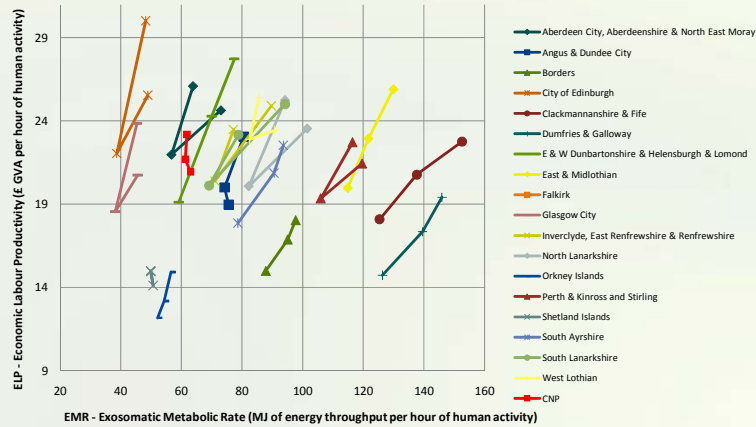
Results – Paid Work

ELP_{PW} vs EMR_{PW} by region (paid work)



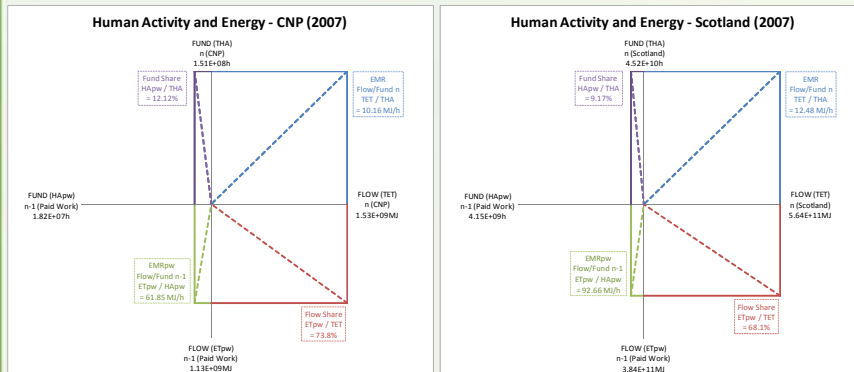
Zoomed-in

ELP_{PW} vs EMR_{PW} by region (paid work) (zoomed section)

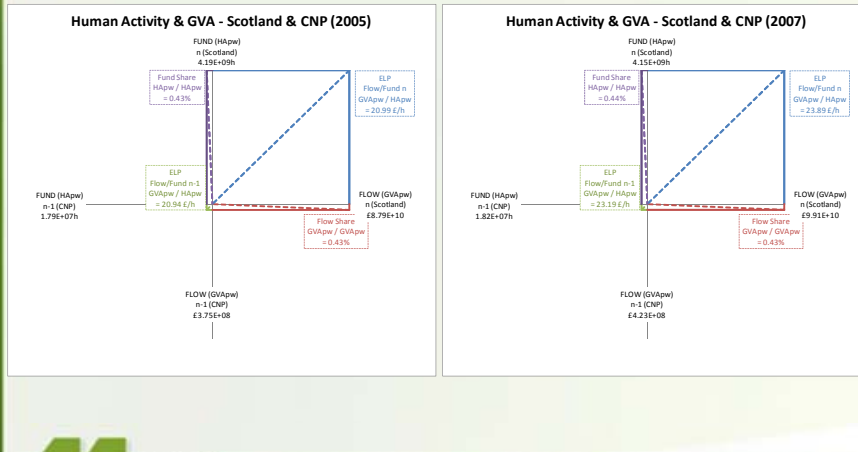


Results- fund-flow diagrams

- Both extents and intensities – fund flow diagrams



Results- fund-flow – CNP vs. Scot



Challenges

- Energy data
- Land use data
- Economic data
- Defining the grammar – linking the approach to the problem

Your Interpretation

How might these results inform ...

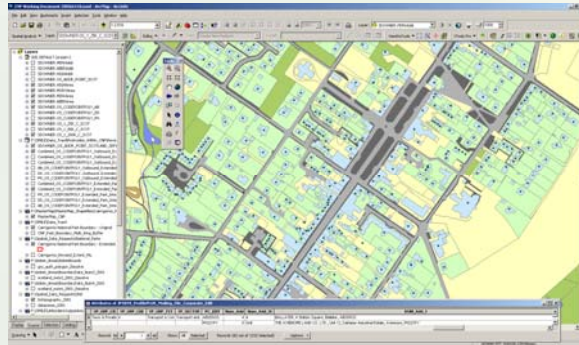
- Park Plan
- Policy and market drivers
- CAP – post 2013 reforms
- GHG mitigation targets – 40% and 80%
- Land management and tourism / recreation
- Others



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MuSIASEM next steps

- CNP Land Use – Admar, Address Point, MasterMap
- CNP Economics – Admar/SAM – with Amsterdam – survey.
- CNP Energy – improved breakdowns.
- Other metrics – house prices, etc.



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MuSIASEM Evaluation

- Forms

Overall Discussion of SMILE Toolkit

- What are the main differences (strengths and weaknesses) between the two tools?
- Do you have any further views about their utility that we haven't discussed?
- Are there any particular opportunities to exploit when doing our further analyses?

Next steps – Overall Project

- Any views on the focus for our analysis Jan – March 2011?
 - D28 on role of economic growth on achieving multiple objectives;
 - ▶ What is your perception of growth in the Park?
 - ▶ Which objectives should we consider?
 - D29 on synergies and trade offs at multiple scales; and
 - ▶ What are the potential synergies?
 - ▶ What are the trade-offs that you wish to manage?
 - D30 on role of policy and other actions.
 - ▶ What policies are most important to the CNP?
 - ▶ What 'other actions' might we consider?



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What will we do with workshop data?

- Analysis of evaluation forms transcript to answer D23 Utility of tools to stakeholders
- Feed into D28 – 30 analysis for CNP and Scotland
 - How to feed back these further results – another workshop? Who might attend? Email summary?
- Feed into overall policy brief on implications for sustainability
 - Complement Dutch questionnaire on sustainability scenarios
 - ▶ Pentagon model – social & institutional factors most important; being tested by questionnaires
- One final evaluation sheet to be completed, please!
- Thank you for your input and attention.



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Appendix Three: Evaluation Forms for SMILE workshop

In order to have some individual data to analyse for our project, we will ask you to fill in these forms at stages during the workshop. Please fill them in as honestly as you can as we are interested in your personal opinion. We will be bound by the Data Protection Act, thus this information will be kept confidential and only used for our SMILE research project. All contributions will be anonymised, but for our analysis it will be useful to distinguish between individual responses (hence our request for personal data below).

Name:

Organisation:

Role in Organisation:

Length of time been connected with the Cairngorms: years

SUMMA

We have just discussed how the SUMMA tool works, what it can deliver and how we plan to use it within the national park. Please take 5 minutes to answer the following questions to help us evaluate the tool – don't worry if you repeat anything you have said in the group discussion. When answering, consider what we have done to date and what we plan to achieve by March 2011, rather than what could be achieved in an ideal world with infinite resources and data!

Overall, what is the utility of SUMMA to you in your current role? In other words, could this tool help you develop the next Cairngorms National Park Plan, or equivalent? Please choose one of the options below:

Not useful ① ② ③ ④ ⑤ ⑥ Very useful

Utility: the ability of the tool to help in your operational or strategic tasks.

Now we will break down why you feel this way using some other criteria. Firstly, is the tool salient to your current role?

Not salient ① ② ③ ④ ⑤ ⑥ Very salient

Salience: the ability of the tool to answer questions that are relevant to your day to day operations or strategic planning.

Secondly, do you believe the tool is a valid representation of the Cairngorms National Park?

Not valid ① ② ③ ④ ⑤ ⑥ Very valid

Validity: the accuracy of the representation of the system; covering factual accuracy and setting of boundaries for analysis (including what should be included and excluding what should not be).

Thirdly, is the tool is interpretable to you?

Not interpretable ① ② ③ ④ ⑤ ⑥ Very interpretable

Interpretability: the ability for you to understand what the analysis tells you and interpret the results as presented from the tool

We have two further criteria (reliability and usability) but these only apply to those who will use the tool themselves. Do you think you would ever wish to run SUMMA yourself?

YES NO

If you were to run the tool yourself, from what we've presented, how reliable does the tool seem to you?

Not reliable ① ② ③ ④ ⑤ ⑥ Very reliable

Reliability: the consistency of the tool and the likelihood of a data processing error occurring

And what about the usability?

Not usable ① ② ③ ④ ⑤ ⑥ Very usable

Usability: the ease with which you can input data, run the programme and extract the results.

Are there any other criteria that we have not mentioned here, but you feel are important in explaining your evaluation of the utility of SUMMA? Please note below:

.....
.....

Finally, please rank the criteria in order of which matter most to you (1 = most important):

Utility
Salience
Validity
Interpretability

Reliability
 Usability
 Other (added by you above)
 Other (b) (added by you above)

MUSIASSEM

We have just discussed how the Musiasem tool works, what it can deliver and how we plan to use it within the national park. Please take 5 minutes to answer the following questions to help us evaluate the tool – don't worry if you repeat anything you have said in the group discussion. When answering, consider what we have done to date and what we plan to achieve by March 2011, rather than what could be achieved in an ideal world with infinite resources and data!

Overall, what is the utility of Musiasem to you in your current role? In other words, could this tool help you develop the next Cairngorms National Park Plan, or equivalent? Please choose one of the options below:

Not useful ① ② ③ ④ ⑤ ⑥ Very useful

Utility: the ability of the tool to help in your operational or strategic tasks.

Now we will break down why you feel this way using some other criteria. Firstly, is the tool salient to your current role?

Not salient ① ② ③ ④ ⑤ ⑥ Very salient

Salience: the ability of the tool to answer questions that are relevant to your day to day operations or strategic planning.

Secondly, do you believe the tool is a valid representation of the Cairngorms National Park?

Not valid ① ② ③ ④ ⑤ ⑥ Very valid

Validity: the accuracy of the representation of the system; covering factual accuracy and setting of boundaries for analysis (including what should be included and excluding what should not be).

Thirdly, is the tool is interpretable to you?

Not interpretable ① ② ③ ④ ⑤ ⑥ Very interpretable

Interpretability: the ability for you to understand what the analysis tells you and interpret the results as presented from the tool

We have two further criteria (reliability and usability) but these only apply to those who will use the tool themselves. Do you think you would ever wish to run Musiasem yourself?

- YES NO

If you were to run the tool yourself, from what we've presented, how reliable does the tool seem to you?

Not reliable ① ② ③ ④ ⑤ ⑥ Very reliable

Reliability: the consistency of the tool and the likelihood of a data processing error occurring

And what about the usability?

Not usable ① ② ③ ④ ⑤ ⑥ Very usable

Usability: the ease with which you can input data, run the programme and extract the results.

Are there any other criteria that we have not mentioned here, but you feel are important in explaining your evaluation of the utility of Musiasem? Please note below:

.....
.....

Finally, please rank the criteria in order of which matter most to you (1 = most important):

- Utility
- Salience
- Validity
- Interpretability
- Reliability
- Usability
- Other (added by you above)
- Other (b) (added by you above)

Overall Evaluation

To help us improve such workshops in the future, please answer the following questions.

Q1. Did you know about the SMILE project before you attended this meeting?

- YES NO

Q2. How much did you know about sustainability assessment before this meeting?

- NOTHING A LITTLE FAIR AMOUNT GREAT DEAL

Q3. Has this meeting provided new information on the topic?

- YES NO

Q4. Have you altered your views on sustainability assessment after attending this meeting?

- YES (if so note in what ways below) NO

.....

Q5. Have you altered your views on the sustainability of the CNP after attending this meeting?

- YES (if so note in what ways below) NO

.....

Q6. Please rate the following:	Strongly Dislike				Strongly Like	
Layout and comfort of venue	1	2	3	4	5	6
Format of workbook	1	2	3	4	5	6
Content of workbook	1	2	3	4	5	6
Quality of facilitation	1	2	3	4	5	6

Please add any further comments on the project or the topic below or overleaf:

.....

Keep updated by checking out our website on www.macaulay.ac.uk/smile

PLEASE RETURN THIS FORM TODAY or to

Kirsty Blackstock; Macaulay Land Use Research Institute, Craigiebuckler, Aberdeen, AB15 8QH –
k.blackstock@macaulay.ac.uk

