The Parrett Catchment: A case study to develop tools and methodologies to deliver an Ecosystems Approach

(Catchment Futures)

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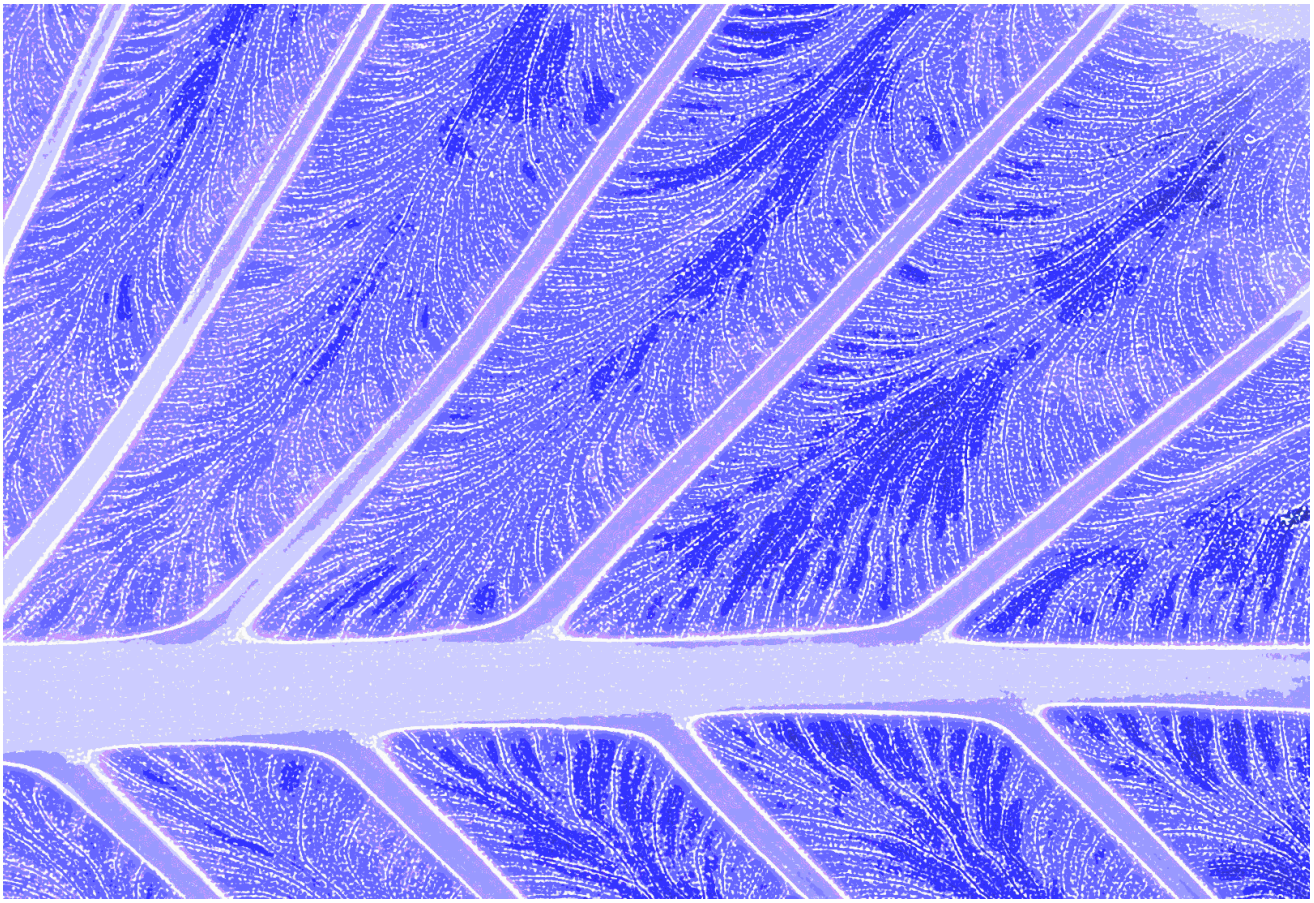

The University of Nottingham

CEM Report | No 6

CEM
Centre for Environmental Management

The Parrett Catchment:

A case study to develop tools and methodologies to deliver an Ecosystems Approach

(Catchment Futures)

Full Technical Report To

(Project Code NR0111)

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This report reflects the views of the project team and is not those of Defra and its partners.

If you use this document please quote it as follows:

Potschin, M.; Fish, R., Haines-Young, R; Somper, C.; and Tantram, D. (2008):
The Parrett Catchment: A Case Study to develop tools and methodologies to deliver an Ecosystems Approach (Catchment Futures). Full Technical Report to Defra, Project Code NR0111.

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Background and Aims

'Thinking globally but acting locally' is often proposed as a way of helping achieve sustainable development. The problem with applying the principle is how to resolve sustainability issues within/between these very different scales. This report considers two important ideas currently being discussed that might help. These are the Ecosystem Approach, promoted under the Convention for Biological Diversity, and the importance that ecosystem services have for the well-being of people. We have considered what contribution these concepts might have to the management of natural resources in the Parrett Catchment.

The Parrett is a highly distinctive and valued cultural landscape located in Somerset, South West England. The area has numerous international, national and local land use designations, which include Areas of Outstanding Natural Beauty (AONB), Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPAs) and Ramsar sites. It also includes portions of Exmoor National Park. Despite its highly valued status, however, there are a number of challenges to people's well-being. These include: issues of environmental security arising from the flood risk and associated development pressures; threats to biodiversity; an economically vulnerable land economy; unstable employment patterns; and, high social deprivation in a number of places. Although the problems in the Parrett are interesting in their own right, the Catchment is also a valuable case to consider because it has a tradition of partnership-working in relation to the problem of flood risk management, in the form initially through the Parrett Catchment Project, and latterly the Water Management Group. In our discussions with stakeholders in the area we have sought to understand how these relate to wider planning initiatives, such as those involving the development of county and district-wide Sustainable Community Strategies and County-level Local Area Agreements. In particular, we have sought to understand in general terms how all these local strategies and actions reflect the principles underpinning Defra's Ecosystems Approach or whether they could be strengthened by including them more explicitly.

The specific aims of this study were therefore to:

Use archive materials and stakeholder experience to review existing planning and land management tools and approaches, and to assess their strengths and limits in terms of reflecting the state and trends of ecosystem goods and services at the catchment scale;

Consider the ways in which current planning approaches might be modified to accommodate the needs of an Ecosystems Approach, and to provide technical advice on its application at a range of spatial scales in the context of current planning frameworks;

Identify what barriers exist for taking an Ecosystems Approach forward in terms of knowledge gaps or data deficiencies, and to make recommendations on how they can be overcome; and,

- Make recommendations on how best to provide advice and guidance on the implementation of an Ecosystems Approach.

Decision making in the Parrett Catchment

The Ecosystem Approach as identified by the Convention for Biological Diversity includes a number of ideas. Key amongst them are that policies and management of natural resources should be based on inclusive styles of decision making, and should be framed at appropriate geographical and temporal scales. The approach also asserts that decision making should take proper account of the value of ecosystem services and the environment more generally, and that the implications of decisions should be considered in a cross-sectoral or 'joined-up way'. We have used these ideas to explore the extent to which current decision or policy making in the catchment conforms to these criteria, what barriers exist that might frustrate the approach, and what might be

done to ensure that in the future such principles are followed more closely. We found that:

- Community involvement is considered important to the development of integrated and sustainable approaches to planning in the Catchment, but that a considerable investment of resources may be needed for transforming public understandings and interest of issues related to the environment, particularly in the area of ecosystem services and their relationship to human well-being.
- Although the 'catchment scale' is an appropriate one for developing integrated approaches to natural resource management, it remains unclear as to the extent to which catchments are meaningful to wider stakeholders groups. Systems aiming to provide access to evidence may need to accommodate the different spatial perspectives of different groups.
- Decision makers in the Catchment used a wide range of frameworks for sustainability assessment, but the integrated nature of these is by no means assured.
- Access to information about the environment in forms that were 'meaningful' and 'useful' to stakeholders was problematic.

Stakeholders agreed that decisions and funding streams geared to administrative areas do not tend to match up very well with how natural resources and land actually function at the level of the catchment. Political imperatives were also seen to be out of step with the long term nature of building more sustainable approaches to catchment planning.

As a result it is difficult to fully embed the principles of an Ecosystems Approach in current decision making, although some progress can be made.

The literature contains a number of variations in terminology designed to emphasise different aspects of the approach: the term 'the Ecosystem Approach' originates from the Convention on Biological Diversity (CBD) and emphasises the higher-level or more strategic issues surrounding decision making. Defra, in a recent publications (e.g. Defra, 2007), refer to 'an Ecosystems Approach', using the plural to emphasise that no prescriptive methodology is implied.

Overcoming the Barriers

Although it may not be easy to introduce an Ecosystems Approach into local decision making, there is evidence from the Parrett Catchment that there is a good basis for taking such thinking forward. In order to overcome the barriers to using an Ecosystems Approach more widely we have recommend that:

- If principles of an Ecosystems Approach are to be made more accessible, locally relevant and user-friendly, and implicit in what people do, then the key concepts should be introduced into new or revised guidance for: Local Strategic Partnerships; Sustainable Community Strategies; Local Area Agreements; Catchment Flood Management Plans; Agri-environment scheme (objectives) and targeting plans; and Local Development Plan Documents, e.g. Core Strategy and Local Development Frameworks.
- Measures to build capacity in communities of interest and communities of place are considered.
- Steps are taken by Defra and CLG to find and promote examples to illustrate the issues and potentials for application of an Ecosystems Approach covering a range of different problems and places.
- Encouragement should be given to developing locally agreed maps of ecosystem service supply and demand as a way of illustrating the geography of issues, potentials and opportunities, and that these maps and related case studies could be made accessible via the CLG planning and community portals as well as Defra's own web site, but more particularly via the Regional Observatories.
- That in addition to providing information on current state and trends of ecosystem services, platforms such as the Regional Observatories also be encouraged to bring together the results of scenario studies for the area they cover, as a way of

informing and supporting the development of community visions and understandings.

- That ways should be found for incorporating questions about ecosystem goods and services into Sustainability Appraisal so that it becomes possible to directly link these to socio-economic prosperity and environmental well-being goals for more integrated, joined-up solutions.

Acknowledgements

We are grateful to Defra's Natural Environment Strategic Unit (NESU)[1] group and especially Sarah Moon as NESU Project Manager (and later Marion Calvini) for guiding us through the process in a very professional but also encouraging and calm way.

The authors of the report would like to thank the whole team for their input (see team logos on page ii).

We would also like to thank the 'Parrett Catchment Stakeholders' for their patience and time input to our project. Without them we would not have been able to fulfil our objectives.

Many more people have contributed to this report, mainly in form of feedback on the draft reports and draft stakeholder consultation material. We are especially grateful to the following for their constructive comments on the science and policy aspects of the project:

- Stephen Dangerfield, Environmental Consultant and Researcher at CEM/University of Nottingham;
- Dr. Eleanor Milne, Macaulay Institute.

During "Seminars/Workshops", held by Defra London during the project period we received many helpful comments and inspiration from: Stephen Bass (former Head of Ecosystems Approach Team, NESU, Defra), David Calpin (Head of NESU, Defra) and Peter Costigan (Head of Natural Environment Science, Defra).

[1] http://www.defra.gov.uk/wildlife-countryside/natres/index.htm

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List of used Abbreviations:

AA	Appropriate Assessment
AONB	Area of Outstanding Natural Beauty
CBD	Convention on Biological Diversity
CC	County Council
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
ELG	Environment Leaders Sub-group
EsA	Ecosystems Approach
GOSW	Government Office for the South West
I&DeA	Improvement and Development Agency
ITT	Invitation to Tender
LAA	Local Area Agreement
LDF	Local Development Framework
LSP	Local Strategic Partnership
MA	Millennium Ecosystem Assessment
NGO	Non-governmental Organisation
NRPP	[Defra's] Natural Resource Protection Programme
PCP	Parrett Catchment Project
PSA	Public Service Agreement [targets]
RSDF	Regional Sustainable Development Framework
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SCC	Somerset County Council
SEA	Strategic Environmental Assessment
SIA	Sustainability Impact Assessment
SSP	Somerset Strategic Partnership
SPA	Special Protection Area
SSSI	Site of Specific Scientific Interest
VCS	Voluntary and Community Sector
WMP	Water Management Partnership
WFD	Water Framework Directive

1 Chapter 1: Introduction

1.1 Project background

'Thinking globally but acting locally' is often proposed as one of the key actions that will ensure that sustainable forms of development are achieved. The problem with applying the principle is how to resolve these very different scales. This report considers two important ideas currently being discussed in the research and policy literatures that may help people bridge this gap.

The first idea is the 'Ecosystems Approach'. This is an evolving framework of ideas, designed to help decision makers take full account of ecological systems and their associated biodiversity[2]. It has been widely recommended, both internationally and within the UK, as a way in which the overall health or integrity of ecosystems can be assessed and managed sustainably in the context of Society's needs and choices, by emphasising a holistic and adaptive approach to management and policy. The second is the concept of 'ecosystem services'[3]. This is an idea which is being widely discussed at present as a way of emphasising the benefits that ecological systems can provide for the well-being[4] of people. It stresses the importance that systems based on biological diversity have for maintaining human existence and the quality of people's lives. By focussing attention on environmental systems as a source of well-being and the ways decisions and actions impact upon them, the aim of both concepts is to encourage people to see that it is in their own interest to manage natural resources sustainably *at all spatial scales*.

In the UK and elsewhere, interest in these two ideas has been stimulated, in part, through the publication of the global Millennium Ecosystem Assessment[5] (MA, 2005), although interest in the Ecosystem Approach goes back much further, particularly in the context of biodiversity policy. The MA was undertaken as the result of the call in 2000, by the UN Secretary-General Kofi Annan, to "assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being" (MA, 2005). The work, which commenced in 2001, involved over 1,360 international experts, and resulted in a series of publications that set out the current state and trends in the world's ecosystems and the services they provide (such as clean water, food, forest products, flood control and natural resources). These reports also described the options open to restore, conserve or enhance the sustainable use of ecosystems.

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[2] It should be noted that the literature contains a number of variations in terminology designed to emphasise different aspects of the idea. Reference is often made to an 'ecosystem-based approach', a term used mainly to promote holistic thinking in the design of specific management strategies for natural resource systems. More commonly the term 'Ecosystem Approach' is employed. The latter originates from the Convention on Biological Diversity (CBD) and emphasises the higher-level or more strategic issues surrounding decision making. Defra, in a recent publications (e.g. Defra, 2007), refer to an 'Ecosystem***s*** Approach', using the plural to emphasise that no prescriptive methodology is implied. In this report we employ the terminology used by Defra – but see no substantive difference in the way the two ideas are conceptualised. In this report we also avoid abbreviating the term 'Ecosystems Approach' as 'EA' because it can be confused with the abbreviation for the Environment Agency; the IUCN CEM suggests using EsA as an alternative (written communication, 2007).

[3] Ecosystem services are defined by the MA (2005) as "The benefits people obtain from ecosystems. These include *provisioning services* such as food and water; *regulating services* such as flood and disease control; *cultural services* such as spiritual, recreational, and cultural benefits; and *supporting services* such as nutrient cycling that maintain the conditions for life on Earth." Note that for convenience the term 'ecosystem services' is often used in this report to denote the longer 'ecosystem goods and services'. Ecosystem services are conceptually considered to include the output of goods.

[4] Human well-being is defined by the MA (2005) as "A context- and situation-dependent state, comprising basic material for a good life, freedom and choice, health and bodily well-being, good social relations, security, peace of mind, and spiritual experience."

[5] http://www.maweb.org/

The results of the MA have been taken up by the wider, policy community, who have been particularly concerned about the implications of these ideas for the way decisions affecting natural resource systems are made. For example, in his evidence to the UK House of Commons Environmental Audit Committee in 2007 the then Minister, Barry Gardiner MP, said that he believes the Government's obligation now is "to try and see how we can use [the MA] to inform policy making and to inform decision making…within DEFRA". He went on to add that current work was "….developing tools that will help other Government departments make better policy decisions on the back of … [the] ecosystem services approach…". The importance of an Ecosystems Approach (EsA), and ideas about ecosystem services, have already been acknowledged by Defra under its Natural Resource Protection Research Programme (NRPRP), using them a starting point for their current work to develop a 'new vision' for natural resource management in England (Defra, 2007a).

In particular this project builds on the outcomes of Phase I of Defra's NRPRP, which suggested that there was a clear need to better understand how ideas about ecosystem values and limits can be applied, and that this could best be done by developing a series of more detailed case studies. This study is therefore one of a number of parallel projects funded under Phase II of NRPP designed to assist Defra in identifying some of the evidence needed to carry thinking forward about this approach into enhanced policy-making and delivery (see Fig. 1.1). The outcomes of this work will be used to evaluate opportunities and obstacles associated with introducing the EsA for England's terrestrial ecosystems, given the current policy and regulatory framework and therefore help to shape Defra's future research programme on Natural Resource Protection, which aims to explore more fully how an Ecosystems Approach can add a new dimension to decision making – not just within Defra but across Government as a whole and other sectors of society.

The need for new approaches and frameworks for managing environmental assets at local scales has recently been emphasised in a report to the Carnegie Trust by Forum for the Future. Although the focus of the work was on ways to secure sustainable rural community development, the authors concluded that *"there is still considerable potential and unmet need for a more joined-up, sustainable approach to developing and making the most of [natural and human] rural community assets…"* (Forum for the Future, 2006). The report also noted that rural delivery for more sustainable outcomes at national and regional levels is becoming a priority, and suggested that success is most likely to be achieved by *"developing a strategic framework and baseline assessment of the 'state' and 'trends' before developing detailed area-wide programmes and action plans from the bottom up"* (Forum for the Future, 2006, 6). Using the EsA and associated ideas about ecosystem services, is clearly one way of encouraging the development of such a framework. In this study we look at how this might be done.

1.2 Project aims and objectives

The aim of this study is to make a critical examination of how an Ecosystems Approach can be applied at local and regional scales and what new insights and opportunities it provides for linking priorities for natural resource protection to wider sustainability assessments.

Fig. 1.1: Defra's Natural Resource Protection Research Programme - Phase I & II Projects

Phase I	
NR0101	*Inventory and assessment of existing resources*
NR0102	*Defining and identifying environmental limits*
NR0103	*Collating and evaluating research on the value of the environment*
NR0104	*Identification and characterisation of pressures on natural resources, including the effects of cumulative pressures*
NR0105	*Characterising the Policy Framework*
NR0115	*Public understanding of the concepts and language around ecosystem services and the natural environment*
SD0314	*Future trends - work on horizon-scanning to identify future trends and pressures that will affect the natural environment and the policy framework*
Phase II	
NR0106	*Inventory study on natural environment data 2*
NR0107	*England's terrestrial ecosystem services and the rationale for an Ecosystems Approach*
NR0108	*An assessment of the economic value of England's terrestrial ecosystem services*
NR0109	*Guiding development in the Kent Thameside development area*
NR0110	*The selection of the M6-Heysham link road route, Lancashire*
NR0112	*Management of the Otmoor protected area, Oxfordshire*

In order to realise the aims of the study, the following more specific objectives were agreed. These map on to the specification set out in the Invitation to Tender (ITT) as follows:

1. to use archive materials and stakeholder experience to review existing planning and land management tools and approaches, and to assess their strengths and limits in terms of reflecting the state and trends of ecosystem goods and services at the catchment scale (ITT, §14a);
2. to consider the ways in which current planning approaches might be modified to accommodate the needs of an EsA, and to provide technical advice on its application at a range of spatial scales in the context of current planning frameworks (ITT, §14b & d);
3. to identify what barriers exist for taking an EsA forward in terms of knowledge gaps or data deficiencies, and to make recommendations on how they can be overcome (ITT, §14c i); and
4. to make recommendations on how best to provide advice and guidance on the implementation of an EsA (ITT, §14c ii, iii and iv).

1.3 Project context: the Parrett Catchment

The focus for this work is the Parrett Catchment in Somerset, south west England. This is a large, well-defined natural resource unit, encompassing a number of local authority, government agency and local area partnerships. It is a highly valued and diverse cultural landscape of which large tracts are nationally designated in terms of their biodiversity, amenity and historic value. In policy terms, the area has been widely praised for its pro-active engagement with natural resource planning. Stakeholders in the catchment have, for instance, recently developed a collective 'vision' for sustainability, one underpinned by a 50 year integrated sustainable management strategy and series of ten year action plans "to benefit the social, economic and cultural life of the catchment whilst conserving and enhancing the environment". Thus, one of the reasons underpinning our choice of case study was that **existing decision making processes in the Parrett Catchment may offer us insight into current best practice with regards to embedding elements of an Ecosystems Approach at the local scale**. At the same time, the opportunity to conduct this research took place at a time when a number of new, but as yet undeveloped, partnerships for action were emerging. As a result, **the project team also considered the study area a potentially receptive policy culture in which to explore further the development and application of principles at the heart of an Ecosystems Approach**. Finally, the Parrett Catchment is inherently interesting in the context of natural resource management for this is an area where there remains widespread local acknowledgement that a range of interrelated issues affecting land use and quality of life need resolving, not least those relating to land economy, flood risk and development. In consequence, the development of strategies for the management of the Parrett Catchment suggests that a range of multifunctional values and cumulative impacts ultimately need to be reflected in decision making and that **core ideas of an Ecosystems Approach could, *in principle*, foster more sustainable outcome for the area.** Thus, the Parrett Catchment was not only a generic object of study in which to test general approaches and develop guidelines for best practice, but also a natural resource unit that may benefit readily from the application of an EsA.

1.4 General theoretical framework employed

The overall concern of this study is to understand how the general principles of an Ecosystems Approach can be fostered at a more localised scale. It is therefore necessary from the outset to explain how the approach is being interpreted and deployed in the context of the Parrett Catchment study, and in particular, how the study's specific concern with evaluating tools and methodologies fits into the overall framework of an EsA.

For Defra, an Ecosystems Approach is a series of core principles around which processes of decision making should ideally be structured; ones that should guide, rather than prescribe, the future character of natural resource management. In particular Defra's understanding of the approach involves:

- taking a more holistic approach to policy-making and delivery, with the focus on maintaining healthy ecosystems and ecosystem services;
- ensuring that the value of ecosystem services is fully reflected in decision-making;
- ensuring environmental limits are respected in the context of sustainable development, taking into account ecosystem functioning;
- taking decisions at the appropriate spatial scale while recognising the cumulative impacts of decisions; and,
- promoting adaptive management of the natural environment to respond to changing pressures, including climate change.

This project was initiated before the publication of Defra's vision, though the parameters of the approach adopted by this study are consistent with each of these principles. In particular, just as Defra's most recent statement of core principles are

effectively a summation and distillation of the 12 principles embodied in the Convention on Biological Diversity (CBD) this study follows earlier NRPRP work (Haines-Young and Potschin, 2008) in seeking to regroup and restate these principles around four key themes (Figure 1.2), namely: inclusive decision making; proper accounting for the environment; appropriate geographical and temporal perspectives, and joined-up policies.

Figure 1.2: An Ecosystems Approach: interpretation of key principles following the convention on biological diversity Source (Haines-Young and Potschin, 2008).

1. Inclusive decision making

The management of environmental resources is a matter of societal choice so we need to ensure that the views and understandings of different people and organisations are taken into account. These views include the values and priorities people have in relation to the management of environment resources, and their knowledge about the systems being managed. The involvement of different groups will help ensure that the costs and benefits of decisions are shared appropriately, and that in the long term management of ecosystems is likely to be more sustainable.

2. Proper accounting for the environment

The management of our environment needs to be set in and integrated with wider social and economic contexts. Thus we need to be sure that the costs and benefits associated with protecting it or of using the resources it provides are fully taken into account, so that they can be considered alongside other societal issues.

3. Appropriate geographical and temporal perspectives

Due to the complex ways environmental, social and economic systems interact, decision making about environmental resources will need to take place at a number of different levels and geographical scales. However, for management to be effective, those responsible for making decisions must work at a spatial and temporal scale that will allow them to use knowledge about environmental limits to act effectively to sustain the resource or to mitigate or modify the pressures that are acting upon it.

4. Joined-up policies

The complex ways that environmental systems are linked to each other and to other social and economic systems means that the broad implications of decision making needs to be considered by all sectors of society. Thus we need to ensure that in the design and appraisal of policy, or the evaluation of management decisions or development plans, the implications of proposals are considered in an integrated way so that the integrity of environmental systems is not undermined and change is managed sustainably.

Based on these four themes the study argues that an EsA represents "inclusive, cross-sectoral decision making at appropriate spatial and temporal scales so that a proper account is taken of the value of environmental systems for the well-being of people". This logic forms the overall framework against which this projects inspects tools and methodologies for embedding the EsA at the catchment scale. Thus:

Inclusive decision making*:* emphasises the need to develop participatory tools and methodologies in the design of environmental policy and management strategies.

In this study we examine the Parrett Catchment as a potential model of best practice, and a context in which participatory techniques can be developed further.

Proper accounting for the environment emphasises the need to evaluate existing tools and methodologies for monitoring and valuing the environment in a holistic and integrated way (such as Environmental Impact Assessment, EIA), and to enhance these in the context of new approaches (such as identifying and monitoring 'ecosystem services').

In this study we describe the assessment practices Parrett Catchment decision makers currently employ, and solicit the views of catchment stakeholders regarding the value of these approaches for fostering integrated catchment management.

Furthermore, we examine the conditions under which new approaches to monitoring and assessment – ones based specifically on the idea of ecosystems services – can be employed in the Parrett Catchment, as the basis for understanding potential applications of this methodologies in similar natural resource contexts. Again, we solicit the views of catchment stakeholders regarding the potential of embedding this fresh way of looking at natural resources into existing structures of decision making.

Appropriate geographical and temporal perspectives emphasises the need to match processes of decision making to the scale of the problem or resource being managed. Here, an important area for the development of tools and methodologies is one that seeks to decouple decision-making from political time-frames such as the use of scenario building.

In this study we explore the value of 'scenario building' as a tool by which decision makers in the Parrett Catchment might make more informed choices about the future. It comes to a judgment about the potential of scenario techniques for embedding ecosystems thinking into decision making processes at the local level, and again, subjects this work to a process of evaluation among catchment stakeholders.

Joined-up policies emphasises the cross-cutting nature of decision making and impacts. We suggest that tools and methodologies are developed for 1-3 in Figure 1.2 it may be possible to manage the natural resources in an integrated way, enhancing the integrity of ecological systems, and expanding the output of services and benefits associated with them.

In this study we therefore come to an overall conclusion regarding the capacity of new and existing tools and methodologies to embed ecosystem thinking into catchment level decision making and what must be done to take this work forward.

1.5 General methodological framework employed

As the section above implies, the project team employed a **mixed methodological** approach to pursue its research aim and objectives. In particular alongside the review and evaluation of policy materials and data sets the project team has undertaken a **significant programme of direct stakeholder engagement** in the catchment. In this study we interpret the idea of stakeholder broadly: as any person or institution who may have an interest in, influence upon or right over the management of natural resources. Engaging with stakeholders was fundamental to the success of the project for it is through such discussions that we can:

- gain insight into the key challenges perceived to face the catchment both now and in the future;
- understand current approaches to management as the basis for identifying examples of good practice for embedding the EsA into catchment level decision making processes; and,
- elicit feedback on the potential uptake of new techniques and methods fostering further EsA at the catchment scale.

In other words, stakeholder engagement allows the project team to direct reactions over the practicalities and likely issues for embedding the EsA into decision making. Indeed, Defra stress that the EsA should not add complexity to current decision-making processes, but should be embedded as a way of thinking to aid the use of existing tools when planning for and funding land use and land management. Thus we considered establishing stakeholder views as vital for enabling the project team to draw conclusions about the most appropriate ways of approaching, and opportunities for introducing, an Ecosystems Approach into local statutory and partnership activities. In pursuing a programme of stakeholder engagement the study has drawn a distinction between three ideal groups who it considered to be central to eliciting reactions to, and assessment of, themes at the heart of an EsA and who could provide insight into aspects of the approach that were already embodied in catchment level decision making. These were:

- *Strategic decision makers* – defined as those who lead on the development and establishment of local visions and make fundamental decisions about, or

affecting, natural resource use, e.g. senior local authority officers and local elected members.

- *Frontline deliverers* – defined as those responsible for translating policy and strategy into action. These stakeholders are often involved in an advisory capacity on groups helping to shape local visions but do not actually take decisions about natural resource use, e.g. local authority, statutory agency and NGO officers.
- *Residents and community groups* – defined as those people living in the catchment, often involved in local voluntary groups and initiatives, bringing them into contact with frontline deliverers and strategic decision-makers, e.g. Women's Institute, other local voluntary interest group representatives and residents

It is also worth noting from the outset that **this framework evolved through initial discussions with senior decision makers in Somerset County Council, and in this sense, may offer Defra a useful framework and terminology around which to articulate the nature of "inclusive" decision making.** Indeed, these three groups were chosen because they are generic ones, i.e. they are not only locally relevant but widely applicable across England and are thus directly relevant to Defra's Natural Environment Strategy and application of the Action Plan.

In taking this framework forward in practical terms the project team initially sought to work in partnership with catchment policy makers, frontline deliverers and communities represented by the Parrett Catchment Project (PCP) Management Group and the PCP's wider Stakeholder Group of around 30 organisations and individuals. Both PCP groups had been working for almost 10 years and were responsible for establishing the catchment's 50 year strategy and phased Action Plan for achieving a sustainable catchment based on an integrated approach to water and land management. However the timing of the project coincided with the dissolution of this group. In consequence, the three stakeholder groups were constituted as follows.

1. Strategic decision makers - *The Environment Leaders Sub-group*

The Somerset Strategic Partnership (SSP) recently established an Environment Leaders Sub-group (ELG, for terms of references of this group see Appendix 1). It was formed under the auspices of the County Council for supporting the Somerset Strategic Partnership's efforts to embed the environment in the next iteration of the Somerset Local Area Agreement (LAA)[6]. Partnership working is therefore an important aspect of its work and membership comprises a representative from each of the statutory agencies, a voluntary sector network representative (SSP nominated), the Environment Portfolio Holder from Somerset County Council representation from the District Councils, an Exmoor National Park elected representative, and a single representative for the Government Office for the South West (GOSW) and the Regional Assembly. A small team of officer advisers from the County Council and District Councils, Exmoor National Park, GOSW and the South West regional Development Agency and Regional Assembly support the ELG in its work.

2. Frontline deliverers - *The Water Management Partnership*

The Water Management Partnership (WMP) replaced the former PCP with the goal of providing an opportunity for stakeholders to meet together to consider water matters of significance affecting, or with the potential to affect the communities, landscape, economy and ecology in the catchment areas of the Parrett, Brue and Axe and their tributaries. It began operating in late May 2007. The role and function of the WMP is to act as a cross-sectoral "community of interest" on water management issues within the catchment areas of the Axe, Brue and Parrett.

3. Resident and community groups – *Wellington and Langport 'citizens'*

Whist working directly with the WMP and ELG is a useful way of engaging with a diversity of policy visions and approaches, a rounded understanding of catchment issues and aspirations is not dependant on these groups alone. As a result the project used local community networks in two, quite different, areas of the

[6] The Somerset LAA can be viewed at http://www.somerset.gov.uk/somerset/council/localareaagreement/

catchment, with the aspiration of soliciting the views of a wider constituency of people. The first locality was Wellington, a small settlement in the upper catchment in a farmed area that contributes both sediment load and diffuse pollution. The second locality was Langport in the lower catchment where a considerable number of flooding events had occurred in recent decades, linked to intensive farming practices further up the catchment. Clearly membership of the Environment Leaders Sub-group or the Water Management Partnership does not preclude community membership and *vice versa*, and in fact, three of the participants who aligned themselves within this third grouping were also parish and district councillors. Again this is an issue that Defra may wish to consider in advising on good practice in adopting an Ecosystems Approach: stakeholder groups are never mutually exclusive. Participating individuals can clearly belong to more than one. In many respects **stakeholders with multiple interests may be key champions of the approach, but care must be taken to go beyond the most willing and vocal, e.g. ensure that those harder to reach voices are enabled to participate as effectively.**

Nonetheless, we have found this framework to be a sound one in terms of capturing a diversity of views within the study area. Overall the process of stakeholder engagement in this study has involved:

1. An **on-line questionnaire** sent to 208 individuals in the start-up phase of the research and covering the 3 main stakeholder groups. This survey elicited general aspirations for the catchment and types of challenges it was perceived to face, alongside an assessment of current approaches to decision making. In total, 55 responses were returned giving an overall response rate of 26%. Only 5% of respondents lived outside of Somerset and 78% lived within the catchment, with the majority (41%) living in or close to the main centres of Bridgwater, Langport and Taunton. Respondents comprised a cross-section of public sector workers (38%) plus local authority officers, members, NGOs, small businesses and large corporation with just over 7% retired or unemployed. However, it is worth noting that only around 35% of respondents felt that their professional role has an impact on the future well-being of the catchment and its communities (See Appendix 2 for original questionnaire and Appendix 3 for overview of results).

2. **Presentations** to strategic and frontline decision makers in which the principle of an EsA was outlined and then discussed. These presentations were held in Spring 2007 and allowed the project team to begin the process of relating existing catchment decision making process to the 12 principles of an EsA detailed in CBD, since these represent the framework upon which Defra's more general re-statement was built.

3. **Focus groups** with resident groups to test understandings and valuations of the catchment, and again, the challenges it faces; In total around 30 individuals were contacted with the aim of generating two groups of 8-10 participants, one group for Wellington and one for Langport. A total of 7 participants were recruited for Langport and a total of 5 for Wellington. Focus group events were held in the summer of 2007.

4, **Semi-structured interviews** to obtain in-depth information, perceptions and views from a representative sample of WMP and ELG members, but also widened to gather views from planning officers (strategic and district level). These key informant interviews were designed to probe strategic and frontline stakeholders further on how adopting an EsA could help to resolve catchment challenges and achieve policy aspirations. Elected members interviewed for this study were each responsible for some aspect of environmental thinking as part of their formal role. As such they should be regarded as being alive to environmental issues and potentials for the study area, so readers should be aware that they are not necessarily representative of the majority of elected members in the catchment.

5. An **on-line web-based consultation** in which strategic and frontline decision makers, as well as the wider policy and academic research community, interacted with the principle of ecosystem services as the basis for evaluating scenario-building methodologies at the catchment scale. Invitations were circulated to 74 stakeholders for the survey which opened for four weeks in early 2008 and secured responses

from key organisations. In total 27 people shared their views about the scenarios with the project team.

1.6 Structure of the report

To fulfil the aim and objectives of this study the report is structured into five main sections. In **Chapter 2** - *Parrett Catchment: characteristics and priorities* - we offer a general introduction to the case study area and make an initial assessment of the types of "well-being" challenges the catchment faces. In **Chapter 3** - *Decision making in the Parrett Catchment; insights for an Ecosystems Approach* - we introduce the reader to current structures and approaches to decision making in the Parrett Catchment and make an assessment regarding how these structures and approaches relate to the core principles of an Ecosystems Approach. In this analysis we identify evidence of good practice in employing elements of an Ecosystems Approach at the catchment scale, and within this, make an identity some of the practices that would need to be adopted to embed this approach into catchment level decision making.

In **Chapter 4** – *Supporting an Ecosystems Approach: Data, Models and Analytical Tools* - we consider the extent to which current data handling tools are sufficient to support the thinking behind an Ecosystems Approach, and make some recommendations about what kinds of tools might be helpful in terms of embedding an Ecosystems Approach in local discussions and decisions. **Chapter 5** - *Developing scenarios for the Parrett Catchment* - links up challenges identified in Chapter 2 and 3 with the methodological issues addressed on Chapter 4 to explore and test a series of 2050 Scenarios for the catchment; ones inspired by the Millennium Ecosystem Assessment (MA, 2005) but adopted to England and on a local scale. **Chapter 6** – *Evaluating the scenarios for the Parrett Catchment* – then examines the value of 'scenario building' as a tool by which decision makers in the Parrett Catchment might make more informed choices about the future.

In **Chapter 7** we draw key conclusions regarding opportunities and barriers to developing an Ecosystems Approach in the context of catchment scale planning. We consider how the principles of the approach can be used in decision making at local scales, reflecting which of the elements of the case study can be generalised for similar sorts of natural resource management contexts. Alongside a reflection and summary of key insights drawn from the study as a whole, we develop this final analysis by examining how catchment decision makers specifically view the key parameters of the approach.

Chapter 2: The Parrett Catchment: characteristics and priorities

2.1 Introduction

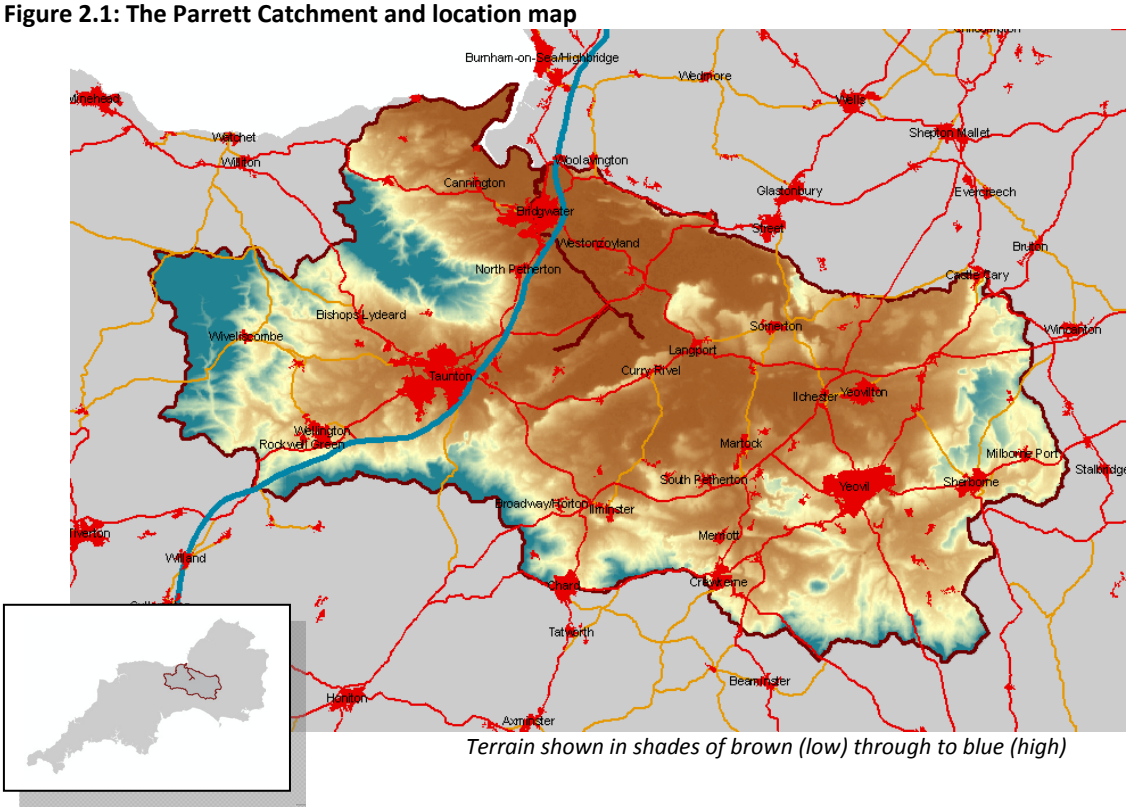
The purpose of this chapter is to offer a general introduction to the case study area and to make an initial assessment of the types of "well-being" challenges the catchment faces. Drawing upon a combination of policy materials and stakeholder views, it describes the study area as a highly distinctive and valued cultural landscape with a number of well-being priorities that need to be resolved; one that an Ecosystems Approach may be well placed to inform and resolve.

2.2 Key Characteristics

The River Parrett is the main river draining around 50% of the county of Somerset in South West England. The river rises in the line of hills comprising the Dorset Heights and the South Somerset border at Chedington, from where it flows 59 km northwards through the distinctive floodplain landscape of the Somerset Levels and Moors, to enter the Bristol Channel near Burnham on Sea, where it flows into Bridgwater Bay. The river's catchment is a large area of some1,690 km^2 and includes not only the main course of the River Parrett itself, but also its tributaries - the Rivers Tone, Isle, Cary and Yeo (Fig.2.1). Land-use is predominantly agricultural, with pastoral farming dominant on the floodplain in the north to the arable uplands around Sherborne and the Polden Hills. Settlements are found on the low ridges and isolated hills with Taunton, the largest urban area, yet covering only 1% of the total catchment. Overall, the catchment contains 180 parish councils and around 138,000 households are located in the area, with the majority of the population living in the major towns of Taunton, Bridgwater and Yeovil.

In ecological terms mudflats characterise the estuarine coastal strip and Steart peninsula to the north of the catchment, while the middle and upper areas of the catchment contain relatively small, dispersed mixtures of deciduous woodland and grassland. The Moors and Levels are dominated by coastal floodplain grazing marsh

Figure 2.1: The Parrett Catchment and location map



Terrain shown in shades of brown (low) through to blue (high)

with a few widely spaced sites of lowland meadow and is the largest extensive area of lowland wet grassland remaining in Britain. It supports huge flocks of waterfowl in the winter, including internationally important numbers of Bewick's swans, golden plovers, teals and lapwings. It is also one of the most significant breeding areas for lapwings, curlews, redshanks and snipe - wading birds, which all require wet grassland. In addition there are important botanical communities and a rich invertebrate fauna[7].

The Parrett catchment's floodplain is culturally, archaeologically and environmentally distinctive, leading to "a strong 'sense of place' among the local community and a great collective pride in landscape heritage"[8]. In policy terms this sense of a highly valued landscape is reflected in the numerous international, national and local land use designations assigned to it. Overall, the catchment contains 47 (41 biological and 6 geological) Sites of Special Scientific Interest (SSSIs), which collectively cover an area of 9,377 hectares. The Levels and Moors, for instance, contain 23 SSSI, covering an area of 6,216.8 hectares. They also contain an area of 5,290.9 hectares of internationally designated Special Protection Areas and Ramsar sites, covered by Natura 2000 regulations.

2.3 Well-being challenges for the Parrett Catchment – an overview

If we were to follow the conceptual framework of the MA (2005) the natural resources that make up this catchment landscape comprise a series of ecosystem services upon which the constituents of local well-being ultimately depend. At this initial and introductory stage of the report we do not wish to explain how the catchment can be interpreted specifically in terms of ecosystem services. We consider that issue specifically in Chapter 4. Rather, here we wish to outline the types of 'well-being challenges' that those living and working in the catchment now face. By "well-being" we mean the processes that define human quality of and while there are multiple interpretation of this term[9] in this section we follow the MA in its general conceptualization (see Table 2.1).

Table 2.1: Parameters of human well-being (after MA, 2005)

- ***Security***: i.e. personal safety, secure resource access, and security from disasters;
- ***Health***: i.e. strength, feeling well, access to clean air and water;
- ***Good social relations***: i.e. social cohesion, mutual respect, ability to help others;
- ***Basic material for a good life*:** i.e. adequate livelihoods, sufficient nutritious food, shelter and access to goods.

In terms of security, perhaps the most salient concern underpinning well being in the catchment is ***security from disasters*** in that much of the Somerset Levels and Moors lies only a few feet above the sea level which is predicted to rise by some 200 mm by 2030 and between 250-500 mm over the next fifty years. This has major implications for the low-lying areas of high ecological interest and for the communities living in the main urban areas and surrounding villages. Most roads are narrow and winding and a proportion can be affected by localised flooding in wet weather. By contrast road heave in dry years when the peat soils of the lower catchment shrink if water levels are not maintained. Inappropriate farming activities, especially on the light sandy soils of the upper catchment, plus changing weather patterns have meant that the area experienced devastating flooding in 1999/2000, and six major flooding events in five years. Adequate ***shelter*** means that new development around the main towns will need to be sensitively located and flood-proofed using appropriate design

[7] See Natural England's "Nature on the Map" and related habitat information at http://www.natureonthemap.org.uk/map.aspx?map=bap

[8] Somerset Cultural Strategy. *"Something to declare"* (2002)

[9] For a particularly useful introduction to this area see a recent report published by the Scottish Government (2006) http://www.scotland.gov.uk/Publications/2006/01/13110743/0

and land management measures. In our 'warm-up' on-line survey, over 80% of respondents suggested that security from natural disasters was geographically highly variable. In contrast, climate change was considered an issue by only 44%. However, the majority (67%) felt that climate change would have a large effect on the catchment over the next 50yrs.

Issues of ***secure resource access*** extend to threats to biodiversity, a process that also impinges on the provision of 'materials for a good life'. Here, it is important to recognize longstanding tensions between the agricultural economy and conservation. Modern agricultural practices on privately-owned land in the Levels and Moors mean that conflicts remain over water-level management in some areas, i.e. land drained for farming can be too dry for sustaining biodiversity interest. Indeed, efforts to increase productivity, especially in the 1970's and 80's, progressively reduced the wetness of the Moors. The highly engineered nature of the Parrett floodplain makes it one of the most complex water management systems in the world. Drainage barriers and sluices built several hundred years ago still remain the source of tensions between farmers and conservationists today (Phillips, 2003).

In terms of ***health***, coronary heart disease is the single largest cause of death in the county, and is thought to be linked to poor diets high in processed foods and saturated fats, obesity and lack of exercise. This is despite the county being 91% rural in character and able to offer a wide range of local foods, landscapes and places of high wildlife interest for leisure and recreation.

The issue of ***adequate livelihoods*** appears to be a key well-being challenge for the catchment. Around 63% of children below the age of 16 in Taunton, the major urban area in the catchment, are living in low-income households. In terms of Gross Value Added[10], Somerset lags behind national and regional levels. The county's economy is dependent on a number of relatively low productivity sectors such as manufacturing and agriculture, which have been in decline over the last decade. This is why tourism and food and drink are now priority investment sectors for the local economy[11]. The context to the changing land economy for agriculture seems particularly salient here and is built out of two related transformations in how European agriculture is understood and organised: on the one hand an increasingly liberalized market economy in which assured prices for commodities are being systematically dismantled; on the other, a litany of high profile environmental and bioethical controversies – BSE/CJD foot and month, GM crops, diffuse pollution – in which models of agricultural production based on expanding productive capacity have been heavily critiqued. As a result the future of farming in the catchment, as elsewhere, is by no means assured.

There are particularly high levels of concern about low income from livestock farming in the lower Parrett Catchment especially, and the likely loss of local livestock husbandry skills if economic prospects cannot be improved within the next few years. Loss of grazing on pastures of high biodiversity and the equally important water meadows will be bad for conservation management goals as well as affecting the local economy. At least one of the ways in which this well-being challenge is being responded to, and one that is highly indicative of an Ecosystems Approach itself, is to position catchment farmers at the centre of a public goods model of the countryside in which agricultural land management is seen to give rise to a range of benefits and services that exceed the formal production of food as part of water management in the catchment. This is reflected in the various designations covering the Levels and Moors and public investment in supporting more environmentally sensitive management regimes and indeed, over the last decade farming has become increasingly dependent on income derived from grants for delivering public services ranging from environmental enhancement to the alleviation of flooding, not least through environmental stewardship programmes. However, considerable tensions

[10] GVA or Gross Value Added measures the contribution to the economy of each individual producer, industry or sector. GVA is used in the estimation of Gross Domestic Product (GDP), a key indicator for the state of the whole economy.

[11] Sourced from "Somerset: a landscape for business" the county's current economic strategy accessible at www.somerset.gov.uk

between farmers and conservationists remain since many fundamental aspects about how best to optimise benefits from the area, i.e. multi-functional land-use and land management for benefiting society as a whole, still need resolving. New policy objectives for achieving more sustainable solutions are adding a new dimension to older tensions.

The majority (85%) of businesses in the county employ ten people or less and although only 0.5% of the businesses employ over 200 staff each these companies employ almost a quarter of Somerset's workforce. Finance and real estate is the largest sector at 23%, with wholesale and retail at 20% and agriculture and fishing at 17%. Hotels and restaurants account for 7% of local businesses, but tourism is an important source of revenue locally. The highly seasonal profile of the county's unemployment rate in recent years suggests that tourism and agriculture account for the majority of seasonal workers. Unemployment rates for 2006 remained low in Somerset, well below the national average but Bridgwater in the lower catchment had the highest unemployment rate for any Somerset town, suggesting that social disadvantage issues may be greatest here. This premise is supported by the low income levels recorded for Sedgemoor District in the same year. Nearly 90% of respondents to the online survey felt that economic sectors reliant on natural resources (farming, tourism and specialist retail) needed some improvement for greater security.

The issue of livelihoods again raises the matter of ***shelter.*** House prices are expected to continue to fall modestly over the next couple of years but affordability remains a serious local issue. Affordable housing is a high priority for the Somerset Strategic Partnership since house prices in Somerset are nine times higher than national average earnings for England and Wales. Census figures suggest that the local population grew by over 7% between 1991 and 2001 and this trend appears to be continuing, fuelled primarily by inward migration. The rising population coupled with the trend for higher numbers of smaller households means that demand for affordable homes is outstripping the supply. Respondents to the online survey tended to reinforce this point. Over 20% felt that "access to well-planned housing making good use of local building materials, timber and renewable energy" was not available at all across the catchment, whilst over 45% felt that its accessibility was dependent upon income.

There are numerous small villages spread out over the catchment, and the County's Strategic Partnership are concerned that community sustainability – in the sense of community cohesion as a constituent of ***good social relations*** – is difficult to maintain in many of the dormitory villages. Public transport links are in fact poor and the majority commute on a daily basis to work in the towns. This issue came over strongly through the online survey. Only 12% of respondents felt that there was 'reliable public transport at a price people can afford', with geographical location a key marker of difference. More generally just over 10% of respondents felt that residents of the catchment had access to safe, tolerant and socially cohesive neighbourhoods, a factor perceived to be influenced by geographical location and social background.

In our survey we asked as to the extent to which local populations had access to fresh local produce. Nearly 20% of people felt that the access to clean air and water was not freely available to all, and highly dependent on geographical location. Surprisingly perhaps, over 80% felt that opportunities for countryside leisure, health and well-being needed improving across the catchment.

2.4 Summary

This chapter has sought to introduce and characterise the Parrett Catchment. It described the catchment as a highly valued and diverse cultural landscape of which large tracts are nationally designated in terms of their biodiversity, amenity and historic value. It has suggested that from the perspective of an Ecosystems Approach the natural resources that make up the catchment landscape comprise a series of ecosystem services upon which local well being depends and has gone to describe some of the principal challenges that those living and working in the catchment now face. These include issues of environmental security arising from flood risk and

associated development pressures, threats to biodiversity and an unstable local economy. Though highly valued as a natural area, a high quality of life in the catchment either now or in the future is by no means assured. The challenges suggest that decision making processes in the Parrett Catchment need to address a range of multifunctional values about, and cumulative impacts on, this landscape. We return to these well-being issues throughout the course of this report. In the next chapter, our attention turns to nature of existing policy frameworks in the catchment and how they are seeking to meet these challenges.

Box 2.1: Key messages from Chapter 2

- The Parrett catchment is a highly distinctive and valued cultural landscape located in Somerset, South West England.
- The area has numerous international, national and local land use designations include ANOBs, SSSIs, Special Protection Areas and Ramsar sites. It also includes portions of the Exmoor National Park.
- From the perspective of the Ecosystems Approach the natural resources that make up this catchment landscape comprise a series of ecosystem services upon which local well-being depends.
- 'Well-being' considers the processes that underpin human quality of life. The concept encompasses issues of security, health, community relations and the basic conditions of a good life, such as adequate shelter, and access to healthy food and clean water.
- Despite its highly valued status, the Parrett Catchment faces a number of well-being challenges. Priorities among these include: i) issues of environmental security arising from the flood risk and associated development pressures; ii) threats to biodiversity, iii) an economically vulnerable land economy, iv) unstable employment patterns and v) high social deprivation in a number of areas.

Chapter 3: Decision making in the Parrett Catchment, and insights for an Ecosystems Approach

3.1 Introduction

Set against the backdrop of key well-being challenges outlined in Chapter 2, we here seeks to introduce the reader to current structures and approaches to decision making in the Parrett Catchment, and in particular, to make an assessment regarding how these structures and approaches relate to the core principles of an Ecosystems Approach. As we explained in the introductory chapter, four key themes embody such an approach of which the issue of 'tools and methodologies' is axiomatic:

- ***Inclusive decision making*** - developing participatory tools and methodologies in the design of environmental policy and management strategies;
- ***Appropriate geographical and temporal perspectives*** - matching processes of decision making to the scale of the problem or resource being managed;
- ***Proper accounting for the environment*** - developing tools and methodologies for monitoring and valuing the environment in a holistic and integrated way; and,
- ***Joined-up policies*** - approaching decision making in cross-cutting way.

This chapter, then, draws upon policy materials and stakeholder views to come to a judgment regarding how these themes are reflected in current Parrett Catchment decision making. In doing so the analysis we present seeks to identify evidence of good practice in employing elements of an Ecosystems Approach at the catchment scale, and within this, to make an assessment of some of the practices that would need to be adopted to embed this approach into catchment level decision making. This work therefore provides a number of key conclusions for this project and provides the context to a more general commentary at the end of the report in which we examine how catchment decision makers viewed the key parameters of the approach itself. Before going any further, however, we introduce the overall policy making context to the Parrett Catchment.

3.2 The overall policy context

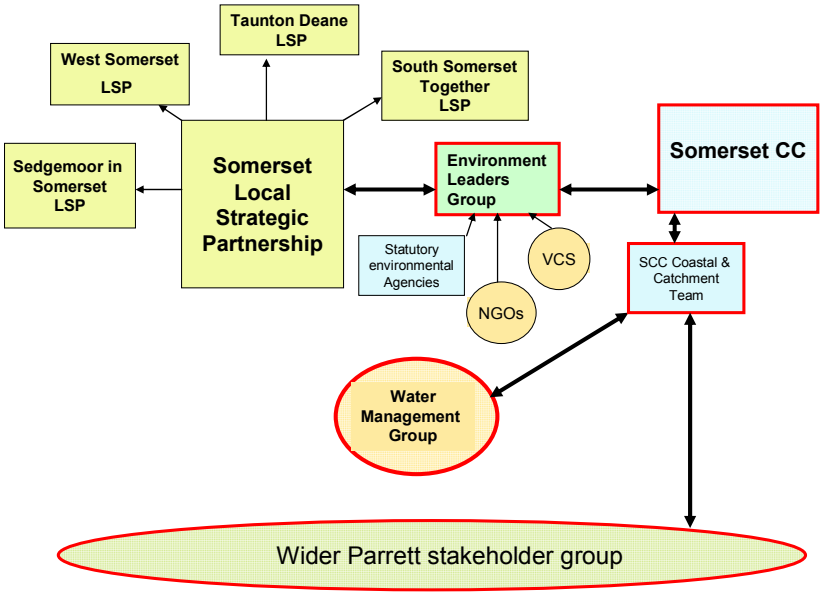
There are a wide range of public sector agencies, local authorities and voluntary organisations working in the catchment. All of these partnerships comprise a diverse mix of socio-economic and environmental interests and agendas that are striving to be cross-cutting and more joined-up. A number of these partnerships are **statutory**, required by central government to work towards achieving local sustainability through the implementation of Sustainable Community Strategies resulting from each vision, for example the Local Strategic Partnerships (LSPs). Others such as the Parrett Catchment Project, superseded recently by the Water Management Partnership, have been locally driven from the outset, developed through **voluntary** partnership and constituted with a diverse membership in response to commonly shared local issues that conventional mainstream policy initiatives were felt to be failing to address.

Figure 3.1 depicts some of the relationships between these groups. In terms of statutory processes, the Somerset Local Strategic Partnership has its own county vision which sets the context for the District LSPs at the next level of governance down (such as the Sedgemoor Vision). Equally importantly, there are various strategies, plans and processes that flow from the county vision, all of which are starting to play a major role in delivering all kinds of public services to improve local quality of life. The most important of these is almost certainly the new Local Area

Agreement (LAA) for Somerset, a decision making framework designed to set out the priorities for a local area **agreed between central government and local authorities/LSPs**. What we should also note here, by way of introduction is that, despite the theoretical distinction between the voluntary and the statutory sector, there is significant **cross partnership responsibility**. For instance most of the organisations and groups involved in the Water Management Partnership (WMP) are also represented on the Environmental Leaders Group which is helping to shape and deliver the Local Area Agreement. In principle this assists the creation of a framework such as an LAA and in developing stronger links between the Parrett and Somerset strategic visions and each partnership's delivery processes and goals for the catchment. For an overview of key policy visions see Appendix 4.

Figure 3.1: Statutory and voluntary partnerships in the Parrett Catchment

(see list of abbreviations, p. xi)



It is not possible within the constraints of this study to examine how all of these use, or could use, elements of an EsA in what they do. While the project has solicited a range of stakeholder views and policy material that tell us much about the general nature of decision making in the catchment, the project mostly focuses on two decision making processes:

- the SSP itself, not least in view of the influence it has on district LSPs responsible for the Parrett Catchment (and for which the ELG is a key source of insight); and;

the WMP, given that this new voluntary partnership has the potential to be extremely influential in implementing emerging policy frameworks (such as the Water Framework Directive) and continuing to promote shared-working and integrated solutions to local sustainability issues.

In consequence, the processes that are most closely attended to in this analysis are the Somerset LAA, which the SSP is responsible for co-ordinating the practical delivery of; and the WMP's catchment strategy and action plans for the Parrett Catchment itself.

3.3 Inclusive decision making in the Parrett Catchment

In the introduction to this study we suggested that an Ecosystems Approach advocated the development of participatory and inclusive approaches to the management of environmental resources. This general idea reflects the belief that

enrolling different communities of interest and expertise into decision making approaches will ensure more equitable treatment of different sectors of society over the long-term. In the Parrett Catchment **local authorities, government agencies and voluntary bodies have a well regarded tradition of using a variety of stakeholder engagement tools and processes to progress their corporate aims and initiatives in ways that will be locally acceptable and meaningful.** It has not always been thus. For instance, the Parrett Catchment strategy report "A future when it rains" (LUC, 2001) states that historically there have been major areas of stakeholder dispute between nature conservation, agricultural and drainage interests about the best way of managing water on the Levels and Moors. Many of the water-land management issues in the catchment's flood plain were exacerbated by inappropriate land management practices in the upper catchment, causing localised flooding, silting-up of drainage systems and waterways lower down. These problems were long standing, but by the late 1990s there was emerging consensus that things needed to change since 'failure to act positively would only result in a declining local economy and social hardship for the areas most directly affected by flooding'. Furthermore, there was also wide recognition that lack of action would also degrade areas of international importance for nature conservation interest. In a sense, this changing political culture to catchment management embodies the key sentiments of an Ecosystems Approach. It clearly indicates, for instance, an emerging local recognition of the links between natural resource management, the economy and human well-being.

As such most organisations today openly recognise that facilitated participation and effective and purposeful communication is necessary to properly engage stakeholders. Methods commonly used in the catchment are the setting up of working groups, using workshops, meetings and seminars targeted at specific stakeholder representatives and groups. There is also evidence of a wide range of media employed, depending on the target groups and whatever these will find most accessible, such as the internet, roadshows and newsletters and technical guidance.

The development of LSPs' community strategies are each founded on participative stakeholder processes and the new LAA was developed using consultative processes with a wide range of statutory and non-statutory bodies. Indeed, the Somerset LAA applies across the whole of the Parrett case study area, representing a very well-organised multi-sectoral, multi-stakeholder partnership committed to a common framework for action, and commonly shared targets and goals. The voluntary and community sector in particular played an important, direct role in the development of the LAA and is also well-represented on the new ELG. **Yet it is the former Parrett Catchment Partnership which Defra may wish to consider a recent model of good practice in the context of inclusiveness.**

This partnership of 27 organisations was created to develop a 50 year integrated strategy for the catchment for dealing directly with these issues. The membership of the PCP reflected the diversity of issues across the catchment and worked together to begin implementing the long term strategy, ensuring that the activities of every single organisation were coordinated and contributed to meeting the strategy's objectives. The **former PCP** ran an annual Parrett River Festival for residents and visitors to the catchment. This celebrated the catchment in a number of 'fun' ways, whilst raising awareness and educating people about the issues and opportunities surrounding sustainable catchment management. In addition, the PCP also developed education packs for local teachers and encouraged schools to take part in pond creation projects. The partnership also ran at least one seminar for planners to raise awareness about appropriate location, design and flood resilience of new development in the catchment. Furthermore it is worth recognising that a locally agreed factor in the success of launching the Parrett Partnership Project was the use of consultants to help facilitate the process of working towards an agreed vision and a commonly shared strategy.

A series of facilitated workshops helped to greatly enable the active participatory involvement of all stakeholder interests. Rural communities, agricultural, forestry and other commercial interests were brought together with government agencies and local authorities to develop new ideas for resolving the area's social, economic and

environmental issues arising from incompatible land and water management regimes In many ways the whole stakeholder approach taken in 2000-2001 for developing the catchment vision, 50 year Strategy and 5 year Action Plans was an exemplary demonstration of what the Scarman Trust [12] would today describe as "learning through doing", helping to see the possibilities of what could be. In summary Phillips (2003) suggests that **the PCP approach was successful because sponsoring organizations shared the project between them. This suggests that cultivating a sense of common ownership between stakeholders groups will be key to embedding an Ecosystems Approach into decision making.**

There are indications too that the new Water Management Partnership is inheriting the PCPs legacy of good governance providing a forum in which consultation can take place, debate issues and test whether a consensus can be achieved. As we suggested in the introduction, the role and function of the WMP is to act as a cross-sectoral "community of interest" on water management issues within the catchment. Its purpose is to inform and consult partner organisations and communities, with wider public engagement a key element of its work. As one respondent put it:

> "Like the Parrett Catchment Project, the new Water Management Partnership will involve the local community through consultation activities and events - the community will be consulted to help identify water quality and quantity issues and solutions with the Parrett Catchment through a series of events in 2007. Stakeholder engagement and community participation play a major part in the water and coastal partnerships that incorporate the Parrett Catchment".

All WMP partners are deemed to be equal partners. The WMP is being facilitated for the first 12 months by Somerset County Council but after this the Chair and secretariat will change. The group's subject matter for consideration must be discussed and agreed by all partners to ensure equity of approach and to demonstrate their commitment to a shared way of working. Agenda items for consideration at each meeting must be submitted via an agreed pro-forma made available to all members of the WMP who then vote whether to progress things. Moreover it suggests that the notes of its meetings will

> "always record the views of each of the representatives of the partners. Where there is unanimity of view, those views will be of the WMP and cannot be taken to be the views of the organisations whose representatives attend the WMP meetings. However there may be circumstances where the consultation process has been managed in such a way as to allow those representatives time to consult within their organisations and with the agreement of those organisations, to speak on their behalf around the WMP table In such circumstances the body requiring the consultation will need to manage the consequences of moving away from any previously agreed or established consultation processes with those organisations and/or with others".

The wider views of catchment Stakeholders solicited as part of this study suggest that **community involvement is, in different ways, regarded as central to the development of integrated and sustainable approaches to planning in the catchment.** Thus:

> "Communities will need to be involved to form a sustainable solution";
>
> "unless the community are fully onboard decisions made will not be seen as valid";
>
> "Community involvement is critical for carrying out or adhering to institutional policies";
>
> "Support from the community is essential"; and,
>
> "Lack of community involvement will be disastrous - it always is".

Even so, it was consistently claimed that the catchment's community was inherently diverse, meaning that **gaining a representative input is fraught with difficulties**; "It's always difficult to obtain a truly balanced public opinion". For some addressing

[12] http://www.publicartonline.org.uk/archive/casestudies/whatwould/scarman.php

this diversity was difficult because of scale of the area being managed "engaging a geographically spread community in a meaningful way is always a challenge". At the same time, willingness to participate was by no means guaranteed from all areas of the community. On a number of occasion "incomers" were cited by stakeholders as being divorced from, and therefore, uninterested in floodplain issues. Yet the more general point was neatly summed up the following respondent:

> "It depends what sector of 'community' you mean - councillor, parish councillor, school governor, businessman, farmers, homeowner? Some sectors of community are more keen to engage than others".

Indeed, for many **"apathy"** pervaded: "it is not easy to obtain a whole communities support" as one put; "The vast majority of the community simply is not interested" said another. According to one strategic stakeholder, speaking of the recent Parrett Catchment Project, community engagement is laudable, but the returns are perhaps "debatable":

> "It is some time since I had any responsibilities relating to the area and the project, but in the early days the project was driven by a small group of enthusiasts against a background of apathy. All credit for making the scheme work goes to the enthusiasts, but I have some doubts as to whether the community return is commensurate with the effort and cost"**.**

For some this sense of apathy could be located in deeper social malaise. One suggested that a "sense of community spirit and involvement is declining. People are more self-centred and selfish"; another that "community involvement in any projects seems to be on the decline - not sure that people care enough". In consequence some stakeholders suggested that **for engagement to be cultivated and fostered, investment of resources need to focus on transforming public understandings of issues**:

> "The views and will of the community to make any necessary changes needs education and co-operation with the plans";
>
> "The public need to be made more aware of catchment related issues"; and,
>
> "There is insufficient understanding of issues and key national/international priorities by local community and tendency to think parochially only. Needs greater community awareness of adverse impacts of climate change on Somerset moors and levels".

Yet others had a quite different view. Some felt that if systems of government, both local and national, offered leadership and clarity on well-being challenges, they would "take the community with them". The idea of **strong leadership was seen as an important determinant of interest and participation.**

Before closing this subsection it is worth noting two final points that seem salient to the concerns of Defra. First, on a number of occasions stakeholders debated whether community engagement *per se* was of value; that there was need to reflect carefully and critically on the objectives of participatory approaches. As one reflected, dubiously: "what do you do with the information you get out of the community - what use will it be in developing the approach?". Clearly **there may be a need on the part of those advocating an Ecosystems Approach to demonstrate to established decision makers the meaningful contribution that the wider community can make to decision making processes.** Second, there was some concern that if community engagement became a marker of quality and value in decision making then other programmes of management could be jeopardized. There was a fear, as one put it, that "absence of, or low level of, community involvement might be used by central Government as evidence that the work was not rated as important and give them a reason for restricting resources." **Thus, advocates of an Ecosystems Approach should be clear in emphasising that community engagement is a principle not requirement of good practice.**

3.4 Appropriate geographical and time perspectives

Alongside the issue of inclusive decision making the idea of an Ecosystems Approach suggests there is a need to match scales of decision making with the scale of the

problem or resource being managed. One of the fundamental questions this study raises is whether the catchment scale can be considered an appropriate unit for planning and decision making. The general assumption behind the Convention of Biological Diversity is that:

> "The concepts of integrated watershed management and river basin management present multidisciplinary approaches to the management of biophysical, social, and economic issues affecting water resources and their uses, and as such are *consistent with the Ecosystem Approach*"[13]

In many respects the definitions that surround ideas of integrated catchment planning and water management tend to be interchangeable with those of the Ecosystem Approach itself. Thus, according to one definition, "Integrated Water Resource Management" (IWRM), can be understood as a process that:

> "[promotes] the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.' (Global Water Partnership, 2000)

This is remarkably close to the definition of an Ecosystems Approach offered in the introduction, where an EsA is understood to be:

> "Inclusive, cross-sectoral decision making at appropriate spatial and temporal scales so that a proper account is taken of the value of environmental systems for the well-being of people" (Haines-Young and Potschin, 2007)

In this study we opened this general principle up to critical scrutiny among stakeholders at the local level. In our on-line survey 69% strongly agreed that a river catchment was a useful geographical unit for looking at ways of integrating environmental, social and economic goals, issues and opportunities. However, whilst 35% felt that people living and working in the area would be familiar with the term "Parrett Catchment", a further 36% disagreed. The remaining 29% were undecided. For many there was the suggestion that the term catchment simply may be too "technical" for wider (i.e. non specialist) public to engage with. Almost 60% of respondents felt that local people would be unable to identify the catchment's boundaries:

> "While catchment is a useful term for local authorities and agencies it is not a good term for local interpretation"
>
> "[Catchment] is a useful term for the practitioners but not necessarily the public.
>
> "I think that the majority of people living in the Parrett Catchment area would be unaware of the term given for it unless they have some local authority knowledge and are privy to information circulated through the various councils etc "
>
> "I don't believe that the public are aware of Parrett Catchment as a geographical area"
>
> "When the public hear 'Parrett Catchment' they probably only think of the area alongside the River Parrett and immediate surrounds"
>
> "I find it difficult to judge whether most people understand what a catchment area is I would guess only 40% would be able to answer immediately and give a good guess at its boundary"

In consequence, for many respondents, the suggestion was that wider Parrett stakeholders would choose a different geographical term to describe and relate to local area.

> "People identify with towns, councils or counties rather than river catchments"
>
> "The majority of the general public relate to County and/or town boundaries"

[13] http://www.cbd.int/decisions/?lg=0&m=cop-07&d=11

> "Most people relate more to political rather than geographic boundaries"
>
> "I think most people would think of 'their' area as being defined by the ridges of ranges of hills, where they exist - although of course this is the same as a catchment area. Example: when I go from the east side of the Quantocks to the west side I feel I have gone to a distinctly different area
>
> "I believe people are more likely to identify their local area in terms of the 'Somerset Levels', 'Quantock Hills' etc rather than the Parrett Catchment. Similarly whilst the River Tone is a tributary to the Parrett, many members of the public not directly involved with catchment issues would not make this connection.
>
> "The main geographical identifier is likely to be the Somerset Levels and Moors, or simply the Somerset Levels.
>
> "There are other well known designations that cover part of the area, for example Somerset Levels & Moors, Polden Hills, Blackdown Hills, that people within the catchment might more readily identify with"

However, in our discussions with members of the Langport and Wellington community, we found that **members of the non specialist general public readily identified with the terms 'catchment' and 'Parrett Catchment'**. As one put it:

> "Well there are catchment areas all over the country. They are geographical areas which mean something…it seems better to have geographical boundaries than non geographical boundaries, it is logical, they are naturally self contained units and the people who live in them are self contained aren't they? "

On balance our stakeholder feedback suggests that **the catchment scale may be considered an appropriate scale for developing integrated approaches to natural resource management, but it remains unclear as to the extent to which this unit of decision making is meaningful to wider stakeholders. The term 'catchment' may need to be given practical definition and expression for some, even though it does not have an administrative role**; **this may be especially so in other areas, where the catchment identity is less strong**.

3.5 Proper accounting for the environment

The Ecosystems Approach suggests that the management of natural resources needs to be set in, and integrated with, wider social and economic contexts. Thus it argues that we need to be sure that the costs and benefits associated with protecting it or of using the resources it provides are fully taken into account, so that they can be considered alongside other societal issues.

According to catchment stakeholders **the principle of 'living within environmental limits' was felt to be little understood and not yet developed in any practical sense**. There was concern about the need to make better choices without knowing the full impacts on the environment over time in order to properly cost different options. Concern was expressed that limits of capacity were being reached but that central government targets failed to address these sorts of local circumstances. **Some decision-makers stressed the need to cost choices and options using full lifetime costs and break out of short-term plan and political cycle costings, but were unclear as to how this could be achieved**. Very few of the decision-makers interviewed mentioned the need to use more effective appraisal and decision-making tools. Discussion around this subject suggests that few had used any or had much exposure to sustainability appraisal or similar decision-support methodologies. This may possibly because the majority are not required to use any, but simply debate the results or outcomes of their use by officers, e.g. sustainability appraisal in the development planning system. As we suggested in the introduction such tools and methodologies for monitoring and valuing the environment in a holistic and integrated way are at the heart of an Ecosystems Approach.

Despite the low level of engagement in these tools by our stakeholders, there are now a range of decision-making tools and frameworks currently being used to aid area-based and sectoral decision-making across the catchment. As suggested earlier

these all tend to be statutory tools and approaches that have been 'imposed' on the area via top-down policies and programmes. They include those from both central government and the European Union such as the Communities and Local Government's Sustainable Communities Programme (DCLG, 2007a, b) and the recently revised Planning System, and various EU Directives, e.g. the Habitats Directive and the Water Framework Directive and the national regulatory frameworks for implementing them. Further examples include the Audit Commission's Comprehensive Performance Assessment [14] tools which must be used by local authorities – County, District and Borough – to measure their performance in effectively delivering a wide range of services, education, health and so on, to residents within their respective jurisdictions. In addition, under the Habitats Directive, all planning authorities are expected to undertake an Appropriate Assessment (AA) for Natura 2000 designated sites such as Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) in order to avoid inappropriate development of any kind on or near these sites, all of which are found in the Somerset Levels and Moors in the south of the catchment

All local authorities are required to carry out a ***Strategic Environmental Assessment*** (SEA*)* of strategic plans and policies such as their Local Development Documents, particularly Local Development Frameworks and the Local Core Strategy that each are required to establish as part of the revised planning system. Strategic Environmental Assessment can be understood as:

> *"the formalised, systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of the evaluation, and using the findings in publicly accountable decision making."*
>
> (Wildlife Trusts/WWF-UK Joint Marine Programme, 2003)

This is a holistic approach that considers the projected environmental impacts of multiple actions within a region or ecosystem which came into effect with the European Directive 2001/42/EC. SEAs provide decision makers with information, strategies and actual and projected information on environmental impacts on species, habitats and ecological processes. It is an assessment tool for establishing the suitability or scale of undertaking a particular plan or programme, whereas Environmental Impact Assessment (EIA) is a planning tool undertaken at the individual project level. In the context of the Parrett Catchment SEA provides potentially, a set of tools to evaluate the impacts of a particular 'vision' or plan for the catchment or region based, for example, on a Statement of Community Involvement in the preparation of a Local Development Framework (LDF). Stakeholder contributions are critical in this context, and would typically be based on a set of consultations with 'key' groups; consultation is a key element of the SEA process.

In the present context CLG, which is developing a growing body of advice that local authorities can access to help them meet national planning goals, advises that Strategic Environmental Assessments' are undertaken alongside or as part of a sustainability appraisal to ensure that sustainable community goals can be achieved more effectively. However, at present, sustainability appraisal is not an assessment tool that must be carried out consistently to a common, prescribed scope and format. A recent SDRN rapid review described sustainability appraisal as:

> *"a variety of methods of inquiry and argument to produce policy-relevant information that is then utilised to evaluate the consequences of human actions against the normative goal of sustainable development"* (Stagl, 2006: page 46).

Sustainability appraisal is more commonly carried out in the UK than elsewhere in Europe as a type of integrated impact assessment. Local authorities, agencies and other organisations working in the Parrett Catchment are urged, rather than obliged, to use the South West's Regional Sustainable Development Framework (RSDF) as the starting point for any sustainability appraisal they may wish to undertake[15]. This was developed for encouraging consistency of approach across the region as a whole and

[14] See http://www.audit-commission.gov.uk/cpa/guide/index.asp for further details.

[15] See http://www.oursouthwest.com/RegiSus/framework/framework.htm for further details.

for making local and aggregated regional monitoring easier by being more consistent, using a common suite of shared indicators.

Since initiatives like the Somerset Strategic Partnership have to deliver on national Sustainable Community Strategies, they are expected by Government to use some form of sustainability appraisal to ensure that objectives are being met in an integrated way. However, it is debatable how participative these appraisals and those carried out for LDF and Core Strategy development, have been with regard to involving stakeholders beyond those who are formal statutory consultees in the planning process.

Non-statutory partnerships like the Water Management Partnership have not yet signed up to undertaking any form of sustainability appraisal. The former Parrett Catchment Project Partnership were approached by leading sustainable development charity *Forum for the Future* in 2005 to be a case study for testing out a new approach to sustainability appraisal developed specifically for area-based initiatives and organisations with a strong interest in land use planning and land management. This appraisal used the **5 Capitals Framework** comprising five types of sustainable stocks or capital from where society derives the goods and services needed for improving quality of life (Box 3.1).

Box 3.1: The "5 Capitals Model"

Natural Capital is any stock or flow of energy and material that produces goods and services. It includes: Resources - renewable and non-renewable materials; Sinks - that absorb, neutralise or recycle wastes and Processes - climate regulation. Natural or environmental capital**,** is the basis not only of primary production but of life itself.

Human Capital consists of people's health, knowledge, skills and motivation. All these things are needed for productive work. Enhancing human capital through education and training is central to a flourishing economy.

Social Capital concerns the institutions that help us maintain and develop human capital in partnership with others; e.g. families, communities, businesses, trade unions, schools, and voluntary organisations.

Manufactured Capital comprises material goods or fixed assets which contribute to the production process rather than being the output itself – e.g. tools, machines and buildings.

Financial Capital plays an important role in our economy, enabling the other types of Capital to be owned and traded. But unlike the other types, it has no real value itself but is representative of natural, human, social or manufactured capital; e.g. shares, bonds or banknotes.

Forum for the Future explains that sustainable development is the best way to manage these capital assets in the long-term. They argue using the 5 capitals should be a dynamic, adaptive process through which organisations and communities of all kinds can begin to achieve integration and balance between their environmental, social and economic activities. The PCP partnership sustainability appraisal used the following steps within a deliberative, stakeholder led process to develop an appraisal of the Parrett strategy's 12 components:

- Identification of current sustainability issues affecting the catchment for each of the 5 types of capital;
- How the PCP was able to tackle these issues, i.e. what direct and indirect action was being or could be taken;
- How 'success' was being measured – what new outcome indicators may be needed. This stage included using a modified appraisal approach to self-score success in resolving sustainability issues per capital from 'undermining' through to 'excellent'; and,

Looking ahead some 20 years or so to brainstorm 'what good would look like' for achieving a fully sustainable catchment. This stage encouraged stakeholders to visualise and describe how sustainability issues had been resolved and by whom, with the aim of seeing how innovative measures and approaches could be applied much sooner, e.g. within the current Action Plan period.

The results were used to help review options for developing the partnership post EU funding and to help bid for future funding. However, the sustainability appraisal was treated as a one-off exercise rather than an integral part of forward business-planning and active management across the catchment. The use of the five capitals framework, as well as others, such as the 'One Planet Living' concept[16], may be a valuable way of articulating some of the key principles of an Ecosystems Approach as the basis for incorporation into decision making at the local level.

All of these decision-making tools have a hierarchical aspect to them in that they can be used at different spatial scales for helping decision-makers choose appropriate options for a given area. That is to say, as the spatial scale becomes more local and more closely defined, the assessment approach and the level of information and data in particular needs to be much more detailed. Thus at a very strategic level broad spatial planning zones can be identified that are appropriate for particular types of development or defined as being inappropriate for development, e.g. a Special Areas of Conservation. This should help to ensure that strategic measures are effective enough to avoid damaging areas or sites of high biodiversity interest.

Within this **Environmental Impact Assessment** (EIA) is required at site level for certain types of development before consent. In the European Union EIA was introduced as compulsory for public and private projects (EU Commission, 1985; 1997) and has been introduced into legislation in many countries. Given the focus of EIA on impacts from specific activities at the site level, EIA tends not to be integrated across policy issues. The procedure requires (in specified cases) the developer to compile an Environmental Statement describing the likely significant effects of the development on the environment and proposed mitigation measures. The statement must be circulated to statutory consultation bodies and made available to the public. Its contents, together with any comments, must be taken into account by the local planning authority before it may grant consent. In recent years EIAs have been required for landfill sites, new infrastructure (including flood schemes) and housing developments affecting the Somerset Levels. Although not required, some organisations have elected to undertake EIA on all their projects as a matter of good practice.

In addition there are other decision-making tools and frameworks for action currently underway in Somerset that apply to the catchment case study area. In relation to the SSP vision for Somerset the county's **Local Area Agreement** (LAA) is extremely relevant to this case study. The government's aim for LAAs is that they will be a mechanism for delivering better local services by building a more flexible and responsive relationship between central government and a given locality, and will work as a stepping stone towards greater local flexibility. The Somerset LAA is a three year agreement under revision for its next iteration for launch in June 2008. It reflects the aspirations of the Somerset Strategic Partnership and all of the other LSPs within the county. It addresses and brings together both national and local priorities for action across the entire county, and how best to effectively act on these. A cross-cutting multi-agency steering group was set up for co-ordinating the development of the LAA targets, delivery processes and indicators of success. This has enabled an alignment of all of the partners' budgets and efforts to achieve common outcomes. The practical delivery of these outcomes is being co-ordinated via the SSP's theme groups, including the more recently established Environment Leaders Group (ELG) and the district LSPs. Each LSP has been able to determine how to achieve the commonly shared outcomes. In this way the LAA is meant to encourage and make possible effective partnership working, making best use of all available resources across all partners. The Somerset LAA has 6 key themes: Children and Young People; Safer communities; Stronger communities; Healthier communities; Older people; and

[16] http://www.defra.gov.uk/corporate/ministers/speeches/david-miliband/dm061011.htm

Economic development and enterprise. However, until 2007 the LAA primarily focused on social and economic regeneration. **Despite the development of a new Natural Environment Strategy for Somerset[17], the LAA is currently largely devoid of environmental cross-references, including how climate change may affect ways of service delivery and local quality of life.**

In the present context it is salient to note that a common issue arising with regards to implementing these approaches and frameworks was the need for new and more refined bodies of evidence in managing natural resources. While it was claimed by some that the primary task was "to pull together existing information in a format that is meaningful/useful" – a point that is central to the data analysis we present in the next chapter - others emphasized the need for producing insight at higher level of spatial resolution.

> "Local authorities regularly chase the same information in putting together their planning documents and Core Strategy. Much of the information, for example from the Environment Agency, is too generic and broad brush to be as helpful as it could be".
>
> "Improved access to more detailed information about different localities, and how changes in one could impact another, would be extremely useful. For example, the Countryside Quality Counts data is of very little practical use as its too aggregated and broad brush. But is this was further developed it would be very useful".
>
> "The scientific need for a model of the catchment such that the affect of changes can be predicted"

Finally, for some respondents, these data needs may extend beyond traditional communities of interest. For instance, easy access to information about local flood risk and opportunities for improving flood risk management was seen as equally relevant for farmers. This point raises the wider issue of how to develop bodies of usable data that reflect the more diverse audiences of an Ecosystems Approach.

3.6 Joined-up policies

The idea of fostering joined up policies and models of working is in many respects an overall, cross-cutting theme for an Ecosystems Approach. It was explained in the introduction that the approach emphasises the need to ensure that in the design and appraisal of policy, or the evaluation of management decisions or development plans, the implications of proposals are considered in an **integrated way** so that the integrity of environmental systems is not undermined and change is managed sustainably. The argument is that while change is inevitable, it may be possible to manage in ways that not only sustain but also enhance and expand the integrity of ecological systems, and the output of services and benefits associated with them. It is interesting in this light to report that, in our survey, nearly 80% of respondents felt that current institutional and governance arrangements were a barrier to achieving more integrated, sustainable solutions for the catchment, of which 46% suggested they were a significant barrier. Many urged that more joined up action, partnership working and communication was necessary.

At least in part this issue reflects the complexity of decision making structures directly or indirectly impinging on the management of natural resources in the catchment. One suggested that "current multi-levels of bureaucracy are incapable of sound judgment and clear decision making" an argument that chimes well with the aims of an Ecosystems Approach. Whilst the approach argues that management should be decentralised to the lowest possible level it is also clear that management has to be undertaken on the basis of an awareness of the hierarchical sets of partnerships and relationships that already exist. The levels above that where decisions are made have to provide the resources and strategic information to facilitate action. Good communications with those below the level at which decisions are made is essential, in terms of gaining the consent and cooperation necessary to

[17] http://www.somerset.gov.uk/somerset/ete/nes/developed/

ensure successful delivery of a policy. As described in the section above many of the statutory tools and approaches employed in the catchment, have a hierarchical element to them.

To what extent this general policy framework worked was debatable for some stakeholders. There was the perception among some that, rather than being decentralised, power to make decisions was increasingly gathering at the centre, with the effect that local conditions were not always properly appreciated. As one put it " "central government - which is what we are moving closer towards - does not appreciate and is not in sympathy with rural England"; and similarly, "the policy of centralising power reduces the scope for initiatives tailored to local needs". For another "[central] State interference only causes problems, because the projects are 'run from London' by people with no [*local*] knowledge or experience". The general point here, regarding centralization, also applied to perceptions of decision making at the local level. As one participant added " any bureaucracy will be a barrier [to integrated working] especially if Somerset goes to a unitary council, distancing local issues. How high a priority will the Parrett Catchment [then] be on Somerset's list [of priorities]?" Within this and perhaps not surprisingly there was the feeling that **decisions and funding streams geared to administrative areas don't tend to match up very well with how natural resources and land actually function at the level of the catchment.**

Moreover, **political imperatives were often perceived to be out of step with the long term nature of the building more sustainable approaches to catchment planning**, an issue central to the concerns of an Ecosystems Approach. Despite "a willingness to move things to a more sustainable footing" the perception was that this would be more costly and not possible in the short-term, primarily because most plans and funding mechanisms work on fairly short term 5-10yr cycles. Elected members in particular talked about the need to 'balance things' when making choices about what to support and fund and that, in their eyes, this led to a frustratingly conventional view of how to factor environmental benefits (or not) into paying for local improvements in housing, living standards and so on, e.g. renewable energy for a new local school would not be installed as it was too costly in the short term, despite being clearly cheaper to run and cleaner in terms of being virtually carbon neutral in the mid to long-term. This response was interesting given the concerns about climate change and availability of energy supplies expressed by respondees to the on-line survey: "Being more sustainable often seems to cost more in the short term but the current pots of money are too small so we get business as usual and little changes". The 'Catchment Sensitive Farming Initiative' was also cited as a case in point here, an initiative that was perceived to have built up some momentum only for the funding to then disappear. Others pointed to the tensions and obvious conflicts between achieving short term favourable condition targets for SSSIs and the more naturalised and sustainable, less managed brackish water systems and landscape that perhaps ought to be worked towards for the Levels. In this context it was suggested:

> "EU legislation is really driving change but this is hampered by domestic legislation that served a purpose 20 yrs ago but really needs to change now. Much is too site-based and protectionist when it really needs to be at the landscape scale and more holistic. This is where the EsA should really come into play".

In other words short-termism was cited as a barrier to more sustainable options being pursued, compounded by current funding structures tied to the English political and governance cycles. Others pointed to there being **no correlation between decision making time frames for different sectors (water, health, education, environment) so "nothing matches" leading to intractable problems for effective planning and decision making.** It was suggested that there were quite different planning and management cycles for various aspects of environmental management such as the WFD, the SSSI and PSA targets, the CFMP process and so-on. One interviewee suggested that the planning process and LAA process was currently too urban-focused to readily take environmental resource functions and

cycles into account. Defra's lack of involvement in the planning process was also seen as a barrier towards a more joined-up approach to environmental management:

> "The CLG provide guidance on using SEA and SA in the planning process (e.g. PPS12) but Defra has no role in these, thus planning is currently struggling to cope with Defra policies and initiatives. Things can get very complex and subtleties lost at the local level".

Better linkage between the Regional Spatial Strategy process and the environment through Strategic Environmental Assessment (see below) was felt to be a way forward, so that firm strategic connections could be translated down to the local level, but sensitive to local knowledge and perceptions about environmental capacity and local aspirations for the future. There was considerable frustration that the sensible and sustainable longer-term options for managed retreat, washland creation and improved water management were at odds with short term political goals and policy targets. Equally **there was also considerable frustration locally that national [planning] policies were "forcing change" that local levels thought inappropriate in the long term**. One interviewee, for instance, suggested that more development occurs in Bridgwater – an area of significant flood risk - because planners were less stringent with developers about incorporating affordable homes. It was suggested that while a local flood risk assessment is being done that takes into account potential sea-level rise due to climate change over the next 50yrs the Regional Spatial Strategy largely determines where new development will go: Bridgwater has been identified as a strategically significant town earmarked as having potential for further growth. In other words short term aims and long term goals between different areas of the well-being agenda - in this case flood risk and home – are conflicting. Clearly it is in these areas of tension that an Ecosystems Approach should be able to foster new patterns of working. In this study we return to this issue directly in the context of scenario building (Chapters 5 and 6)

Finally we wish to note here that some respondents suggest that recent and current studies on the catchment, e.g. the Catchment Flood Management Plan consultation, were felt to be too narrow and single issue in scope, and further that there was a danger that local agendas were proliferating. This situation in part reflected pressure from national government to meet a diverse target but also a sense in which decision making cultures were often in-ward looking and led by their own internal agendas. For some this was a pragmatic response to the 'real world' in which decision makers worked when undertaking professional and quasi-professional responsibility for catchment management.

> "There is a willingness, but equally organisations like to do their own thing and some aren't very good at communicating. It also depends on the individuals involved - they are influenced by the amount of time they have versus their day job, the level of awareness of the value of the approach and the length of time in post - staff turn-over issue"

The now dissolved Parrett Catchment Project was cited a touchstone example, one that "demonstrated that the organisations with the Parrett Catchment are capable of working across institutional boundaries"

3.7 General Summary

There are numerous public sector authorities and agencies operating in the catchment, working closely with commercial and voluntary partners to implement national, regional and local policies for managing the area as sustainably as possible. The current policy framework and its related processes for delivering more sustainable outcomes within the study area are all in place, but key decision-making processes like the newly revised planning system and evolving Local Area Agreement (LAA) are still 'bedding down'. The creation of the new Environment Leaders Group (ELG) to begin working with the Somerset Strategic Partnership should start to make a very necessary contribution towards building the environment into the LAA. The ideal structures and ways of working set out by the DCLG and I&DeA are being put in place across Somerset but this is taking time. **Whilst in principle these structures**

and processes are easily capable of delivering local integrated solutions and more sustainable outcomes, because the environment and natural resources do not yet feature there is still some way to go. These top-down 'prescribed' processes are complemented by local, bottom-up initiatives such as the Parrett Catchment's forward looking 50yr strategy for integrated catchment management. However, the dissolution of the former Parrett Catchment Partnership and its replacement by the new WMP has caused a hiatus in stakeholder engagement, possibly making it harder to ensure a 'meeting of minds' between the top-down statutory and bottom-up non-statutory goals for the catchment. However, this current 'disconnect' could be resolved given time and effort.

Inclusive decision making

Local authorities, government agencies and voluntary bodies have a well regarded tradition of using a variety of stakeholder engagement tools and processes to progress their corporate aims and initiatives in ways that will be locally acceptable and meaningful. Defra may wish to look to the Parrett Catchment Partnership as a recent model of good practice in the context of inclusiveness. The PCP approach was successful because sponsoring organizations shared the project between them. This suggests that cultivating a sense of common ownership between stakeholders groups will be key to embedding an Ecosystems Approach into decision making.

Among stakeholders community involvement is, in different ways, regarded as central to the development of integrated and sustainable approaches to planning in the Catchment. **However, our study suggests that those promoting an Ecosystems Approach may need to demonstrate the nature of the contribution that the wider community can make to decision making.** Advocates of an Ecosystems Approach should be clear to emphasise that community engagement is a principle, not a requirement of good practice in local decision making. Gaining a representative input can be fraught with difficulties at the local level. According to many of the decision makers consulted "apathy" often tends to pervade. For engagement to be cultivated and fostered, it was suggested that investment of resources needs to focus on transforming public understandings of issues. At the same time the idea of strong leadership was seen as an important determinant of interest and participation.

Appropriate geographical and temporal perspectives

The catchment scale may be considered an appropriate scale for developing integrated approaches to natural resource management, but it remains unclear as to the extent to which this unit of decision making is meaningful to wider stakeholders. Members of the non specialist general public we consulted readily identified with the terms 'catchment' and 'Parrett Catchment' but we recognise that the term will need to be given practical definition and expression for many**.**

Proper accounting for the environment

The principle of 'living within environmental limits' was felt to be little understood and not yet developed in any practical sense by the decision makers we consulted. Some stressed the need to cost choices and options using full lifetime costs and break out of short-term plan and political cycle costings, but were unclear as to how this could be achieved. Decision makers in the catchment use a wide range of sustainability assessment tools (e.g. EIA, SEA). However, the current Local Area Agreement does not incorporate the environment in any way at all, and the Somerset Strategic Partnership is largely economic in its focus and vision. Local Development Frameworks are also probably not as focused on sustainability issues as they need to be. There is very little easily accessed information about how the agreements and frameworks were assessed; this information is not shared across sectoral groups and organisations outside of the planning system. Outside of these statutory processes we suggest that sustainability appraisal may be a valuable way of articulating some of the key principles of an Ecosystems Approach as the basis for incorporation into decision making at the local level.

Joined-up policies

The perception at the catchment level was that decisions and funding streams geared to administrative areas don't tend to match up very well with how natural resources and land actually function at the level of the catchment. Political imperatives were also often perceived to be out of step with the long term nature of building more sustainable approaches to catchment planning. Funding is still too short term for many initiatives so not as effective as it could be.

There was felt to be little correlation between decision making time frames for different sectors (water, health, education, environment) so "nothing matches" leading to intractable problems for effective planning and decision making. Equally there was also considerable frustration locally that national [planning] policies were "forcing change" that local levels thought inappropriate in the long term.

Many of the key partnerships, (e.g. the SSP, LSPs and the WMP) have visions and agenda's that are cross-cutting, strongly indicating that, in principle, they are committed to holistic methods of working.

Box 3.2: Key Messages from Chapter 3

Current structures and approaches to decision making in the Parrett were examined to determine how they relate to the principles of an Ecosystems Approach. We found:

Inclusive decision making

Community involvement is considered important to the development of integrated and sustainable approaches to planning in the Catchment. However, Defra should consider that

- Community engagement is a principle, not a pre-requisite, of good practice in local decision making.
- Decision makers may need to be convinced of the meaningful contribution that the wider community can make to decision making processes.
- Gaining a representative input may be fraught with difficulties at the local level.
- A considerable investment of resources may be needed to focus on transforming public understandings and interest of issues.
- Strong leadership is an important determinant of interest and participation.

Appropriate geographical and temporal perspectives

- Although the catchment scale is an appropriate for developing integrated approaches to natural resource management, it is not a meaningful unit to many stakeholders.

Proper accounting for the environment

- Stakeholders stressed the need to fully cost choices and options to break out of short-term plan and political cycle, but were unclear as to how this could be achieved.
- Decision makers in the catchment use a wide range of framework for sustainability assessment but the integrated nature of these is by no means assured. The 5 capitals approach to sustainability appraisal may be a valuable way of articulating some of the key principles of the Ecosystems Approach.

Joined-up policies

- Decisions and funding streams geared to administrative areas don't tend to match up very well with how natural resources and land actually function at the level of the catchment.
- Political imperatives are perceived to be out of step with the long term nature of building more sustainable approaches to catchment planning.
- There is little correlation between time frames of different sectors of planning and decision making.

Chapter 4: Supporting an Ecosystems Approach - Data, Models and Analytical Tools

4.1 Introduction

The previous Chapter examined the extent to which key elements of an Ecosystems Approach (EsA) are currently reflected in structures and approaches to decision making in the Parrett Catchment. We found that there was acceptance that a holistic approach to decision making is important and a good tradition of joint working, as was illustrated by the Parrett Catchment Partnership. Moreover, there was a sense in which decision making was 'adaptive in character', in that processes are in place to revise, for example, Local Area Agreements to include environmental issues. However, our consultations suggested that other key elements - possibly the most critical - of an Ecosystems Approach, such as those dealing with ecosystem services, environmental limits, geographical scales and environmental valuation were less well understood or used. In this Chapter, we examine why this is so. The aim is to identify what barriers exist for taking an EsA forward in terms of knowledge gaps or data deficiencies, and to make recommendations on how they can be overcome

The background to this Chapter can best be illustrated by referencing the material gathered via a series of ten face-to-face and telephone interviews with key informants ('strategic' and 'frontline' delivers) who were either involved in the preparation of the Local Area Agreement via the Environmental Leaders Group, or who were members of the catchment Water Management Partnership. In terms of the extent to which the principles of an Ecosystems Approach mapped on to the LAA, we found that only the participatory cross-sectoral and socio-economic elements were thought to be reflected in the way the Agreement was constructed. The fit for those involved in the work of the Water Management partnership was better, although as with the LAA group, the concept of ecosystem services and the need to frame strategies at appropriate spatial and temporal scales was considered problematic.

"People just don't take the environment seriously." suggested an elected Councillor and member of the Water Management Partnership (SI-3)[18], "The majority of decision makers [in the area] just don't think about pollination – its value to local produce and businesses. People only seem to latch onto an ecological thing like dormice if they want to stop a road scheme going ahead." Although this might be considered a somewhat extreme position, it was certainly clear that people took environment to 'mean' a very diverse set of things, ranging from 'biodiversity' through to waste management and congested roads. The 'language of the environment' was certainly a barrier, however. Another local Councillor (SI-9) responded, once the thinking behind an Ecosystems Approach was outlined to them: "Drop all jargon – don't mention ecosystems or biodiversity at all! Use everyday English and make it relevant to local issues and aspirations." Except in the case of flooding and climate change, the connection between natural resources and well-being was not always strongly appreciated.

The idea of environmental limits, like ecosystem services, was also a principle of an Ecosystems Approach that people found problematic. "Environmental limits are not thought about at all", observed the same Local Council Member (SI-3). "The biggest driver locally is how to fit more houses in. The pressure for new development is coming direct from national government." The prospect of developing a wider ranging discussion about limits seemed to some, doubtful, however. A local Conservation Officer (SI-7) commented "There are too many local agendas and diversity of views and self-interest to get a more strategic discussion about limits".

[18] SI – Stakeholder Interview numbering according to Appendix 7.

Some of those consulted made specific suggestions about how an Ecosystems Approach could be included in local decision making. One idea was to make it part of Sustainability Appraisals. One local authority office argued "SA is enough and should be at the heart of any local decision-making process – wouldn't want another approach on top of this and it would be very easy to incorporate the EA [EsA] into SA". However, for such a development to be effective access to relevant information is a key issue. There was a perception amongst a number of stakeholders that access to information was difficult. An employee of Wessex Water (SI-8), for example, suggested that "It would be easier if all information and data were centralised for easy access by all stakeholders/users, enabling people to find out who to speak to, where they are based and so on".

This view about data access was also supported by a Planning Officer (SI-12) who felt there was a need for "improved access to more detailed information about different localities". However, he went on to make a further point about the nature of that information, that developed the conclusion of Chapter 3, namely that it was important that evidence was available in formats that were 'meaningful' and 'useful'. Knowing "…how changes in one [area] could impact another, would be extremely useful", he suggested. "Ideally it would be very helpful to have far more co-ordinated information about likely scenarios and impacts at a more local level, i.e. more level of detail and appropriate to planning decisions that need to be made today but with due regard for what may happen to the locality in the future".

To summarise, the feedback we gained from our key informants suggested that there were two major sorts of barrier to embedding an Ecosystems Approach, namely that relating to institutions and governance, and that related to information and evidence. Chapter 3 has already exposed some of the institutional and governance issues. In the remaining part of this Chapter we examine questions of data availability and the extent to which it is possible to implement an Ecosystems Approach given the state of the current evidence base.

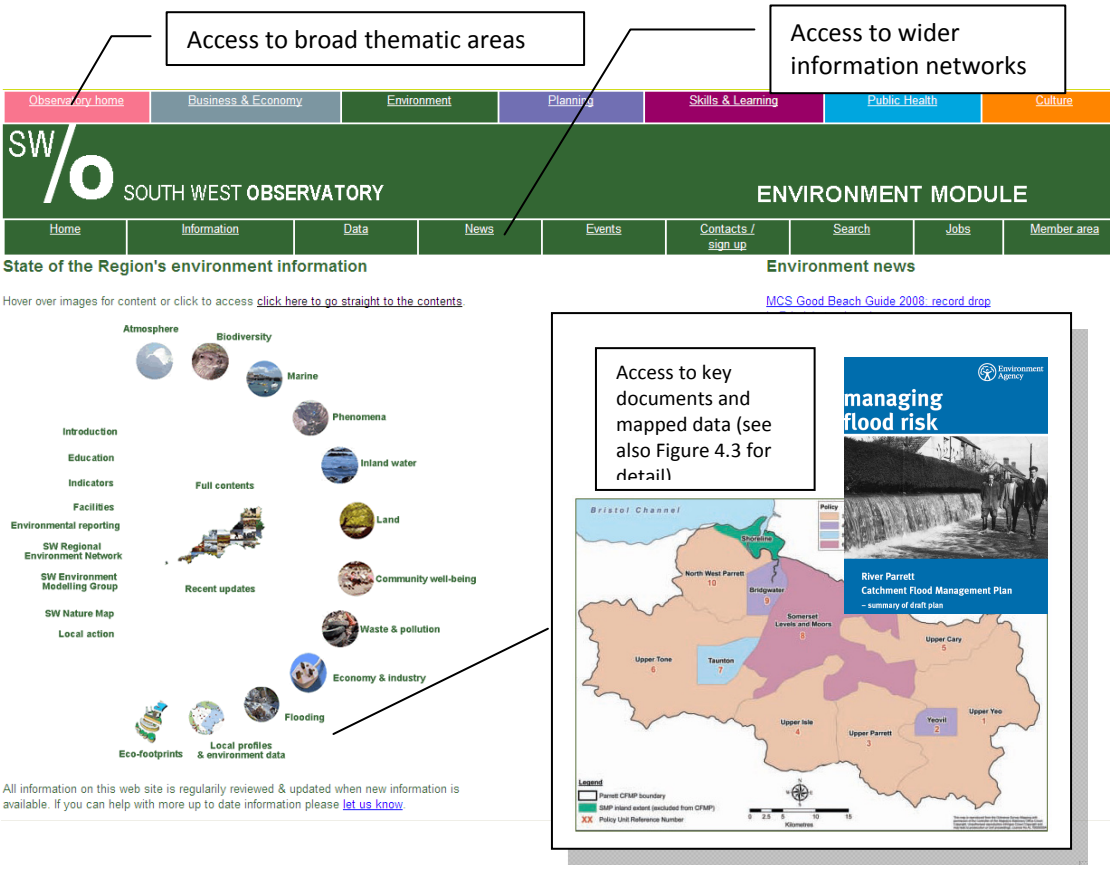
In an attempt to go beyond simply reviewing the data sources, in this Chapter we have endeavoured to explore the extent to which existing bodies of information can be used to map and value ecosystem services within the catchment. Although we recognise that an Ecosystems Approach is about much more than assessing ecosystem services, the latter are nevertheless a valuable focus because they emphasis the close connection between natural resources and the well-being of people. Moreover, they are also a topic around which there has been much recent debate about the importance of valuation of service flows for decision making and the limits to service output. What kinds of information handling tools are needed to support an Ecosystems Approach? In what *ways* can existing data be used and presented so that people better understand the issues surround the management of natural resources?

4.2 Evidence, information and data islands

In the UK we are fortunate in that we have access to a rich body of data about the social, economic and biophysical environments (Osborne et al., 200; ADAS, 2007). The South West of England and the Parrett Catchment are no exception, as a review of the findings of these studies and the resources available through the SW Observatory will reveal[19]. Thus it seems paradoxical that people still find data availability an issue. Why is this so?

[19] http://www.swo.org.uk/observatory/home-1/introduction.shtm

Figure 4.1: The SW Observatory Portal



The Regional Observatory, like others in the UK, has been established as a result of partnerships between the Regional Development Agencies, Government Offices, Regional Assemblies, and other bodies with the aim of 'supporting evidence-based policy and improved decision making'[20]. It brings together a range of aggregated local and national sources of information and evidence, and provides access to reports, guidance and wider public information networks (Figure 4.1). Users can quickly gain access to a wide range of local information and in many cases use the site links to place that local and regional information in its wider national context. It is essentially the kind of system that people consulted felt they needed to support an Ecosystems Approach.

We have used the resource of the Regional Observatory as the starting point of our analysis of the ways people gain access to evidence, because it is typical of what is available across all the English regions. Moreover, since the construction of these Observatories is the result of partnerships between all the key public bodies in the regions, the offer a good indication of what kinds of evidence and support are available and the extent to which it might support an Ecosystems Approach.

A review of the extent to which a resource provided such as the SW Observatory can support 'ecosystems thinking' suggests that, while access to a wider range of evidence is available from the site, in general information is provided on a 'topic by topic' basis (cf. Figure 4.1). Thus, while for example through the biodiversity links users can gain rapid access to the rich information contained in the SW Nature Map (Figure 4.2), there is currently no possibility of looking at this alongside, say, the EA Catchment Plan for the Parrett (Figure 4.3). The latter proposes a zonation of the area for different degrees of flood protection. As a result, users interested, say, in the supply and demand for ecosystem services in the catchment, would need to find

[20] http://www.regionalobservatories.org.uk/

ways of linking up these separate islands of data if they were interested in the

Figure 4.2: Extract from South West Nature Map for Somerset (red line indicated the Parrett Catchment)

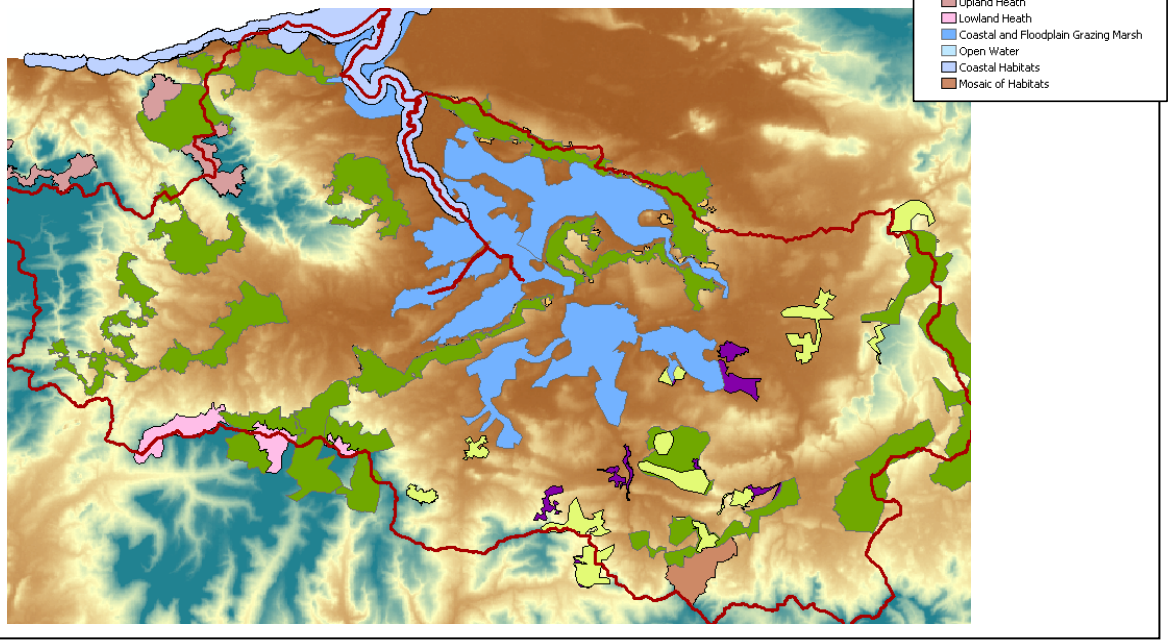
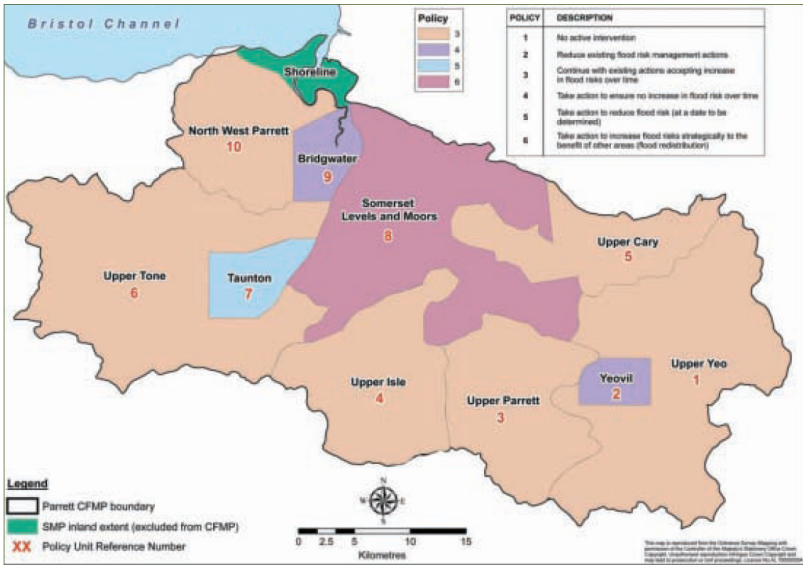


Figure 4.3: Policies for flood protection in the Parrett Catchment proposed by the Catchment Management Plan, April 2008



Source: Managing Flood Risk, River Parrett Catchment Management Plan – Summary of draft plan, April 2008:

contribution that different habitats made to flood regulation.

Thus it is perhaps hardly surprising that some users find access to appropriate data difficult. **Despite the extensive data resources available through sites such as that hosted by the SW Observatory and other public bodies, it is still the case that the evidence base consists of a number of separate 'data islands' or subject domains.** This situation would clearly potentially hinder anyone attempting to gain a strategic overview of the ways in which natural resource systems interact with each

other and other sectors of society. The situation is also made difficult by the fact that the SW Observatory and other such sites suggest that they make little or no reference to ecosystem services or an Ecosystems Approach. Although those consulted may not be users of the Observatory site itself, it could be argued that the lack of the kinds of strategic information needed to support an Ecosystems Approach on such sites is symptomatic of the general paucity of information that is available in the wider, public arena.

This situation illustrated by the SW Observatory is perhaps inevitable and not a fault of the Observatory system *per se*. To a large extent the Observatories are dependent on the sorts of data provided by other organisations. As noted elsewhere (Haines-Young and Potschin, 2008; Osborn et al., 2005; ADAS, 2007) the fragmented nature of evidence about ecosystem services to a large extent reflects current institutional responsibilities and perspectives. As organisations like Natural England or the Environment Agency begin to focus on ecosystem services and deliver information about them, the form and content of the resources available through the Observatories are likely to evolve. Nevertheless, if people and local groups are also encouraged to think about ecosystems and ecosystem services by, for example, including reference to them in guidelines for sustainability appraisals, strategic environmental assessments or other planning procedures, then demand for such information would grow and the key data providers are also likely to respond accordingly.

As we have seen, the SW Observatory, like others, provide access or links to, both 'primary data' as well as higher level interpreted or derived information in the form of indicators, and local and regional statistics (Figure 4.4). It also directs users to key publications, such as state of the environment reports and other documents outlining key policy or management strategies and seeks to provide users with an overview of key concepts and procedures. Through the SW Regional Observatory site users can, for example, find explanations of methods underpinning Strategic Environmental Assessments and Sustainability Appraisal, together with published studies [21] that apply these concepts within the region. The SW Observatory and Observatories in general therefore seem to offer one platform through which the principles of an Ecosystems Approach might also be promoted and explained, and as a result become more deeply embedded in decision making at local scales.

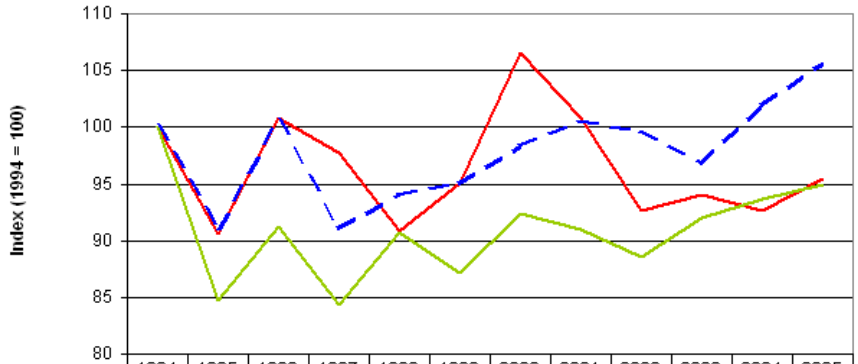
A role in facilitating an Ecosystems Approach appears to be within the remit of the Observatories. The Association of Regional Observatories, for example, identifies a number of ways in which these sites can support evidence-based policy and decision making. They include:

- Providing 'bespoke' regional intelligence and forecasting;
- Identifying key regional indicators and research on a large range of topics;
- Providing access to key datasets;
- Informing people of recent regional developments;
- Facilitating joint working on issues of common interest within a region; and,

Commissioning and conduct research to fill regional data gaps.

[21] http://www.swenvo.org.uk/environment/SEA.asp

Figure 4.4: Example indicators of farmland and woodland birds for the SW available through the Regional Observatory



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Farmland (16)	100	90.6	100.8	97.7	90.9	95.1	106.6	100.8	92.6	94	92.6	95.4
Woodland (29)	100	84.7	91.2	84.4	90.7	87.1	92.4	91	88.6	92	93.6	94.9
All (78)	100	91.1	100.6	91.1	94.1	95.1	98.4	100.5	99.6	96.9	102	105.6

Thus in the same way that the SW Observatory presently links people to a range of work surrounding such as flooding or carbon management, which includes current modelling and other detailed research and assessment studies, the Observatory could in the future be used to stimulate the assembly of other kinds of analysis and evidence that to draw out the links between ecosystem services and well-being issues. In other words, Regional Observatories could both trigger studies that integrate existing sources and eventually provide access to resources that bring together existing information in ways that users find "meaningful and useful". **Ecosystem assessments could become a key part of the 'bespoke' regional intelligence that the Observatories seek to provide – thus overcoming some of the data and evidence barriers that stakeholders in the Parrett currently identify as significant.**

We will make some specific recommendations on how the Observatory network might help embed ecosystem thinking in the final part of this Report. Before these more operational issues are considered, however, it is necessary to take stock of the information resources currently available should such an undertaken be considered. A key question that must be addressed is to determine whether *in principle* the kinds of assessment that might be needed to take an Ecosystems Approach forward can be constructed for a catchment like the Parrett. Given the feedback we gained from our stakeholders, tools are needed to map and value ecosystem services, identify limits, and to think through how future changes in one might affect another.

4.3 Building an Atlas of Ecosystem Services

There is at present growing research and policy interest in the problem of mapping ecosystem services and ultimately of constructing atlases to help people understand and take account of the relationships between ecosystems and wider social and economic processes. In the context of identifying the links between sustainable resource management and poverty alleviation, for example, the World Resources Institute have recently published an atlas of ecosystems and human well-being for Kenya (WRI, 2007). In the US, the Environmental Protection Agency are now considering how an atlas of ecosystem services might be constructed at national scales (Neil and Wickham, 2008; EPA, 2008) and in the UK Natural England, the Environment Agency and others are investigating what kinds of mapping might be attempted given the types of evidence currently available for England (Haines-Young et al., 2008a). Mayr et al. (2006), for example, have examined the the possible mapping of soil functions.

Mapping ecosystem services is, however, not an easy task. Any comprehensive treatment of the issue requires both an understanding of the capacity of ecosystems to supply a service and where the beneficiaries of that service are to be found. Successful mapping thus requires both the supply and demand side of the service chain to be identified. Moreover, since the areas where a service is generated may not be the same as those where any benefit is enjoyed, the task of mapping can potentially become a complex undertaking.

Troy and Wilson (2007a&b) have recently considered some of the issues associated with mapping ecosystem services, and particularly the challenges and opportunities for linking GIS and methods of value transfer. They argue that the development of spatially explicit valuation methodologies is presently in its infancy but suggest that they are nevertheless essential if we are to better understand the relationship between the ecologically important elements of the landscape and the other relevant pressures associated with the use and transformation of land. For them, the construction of Ecosystem Service Value (ESV) maps are regarded as the 'end point' of the analytical exercise, which they suggest can be achieved through a step-wise process, which we have collapsed down to five stages:

1. The designation of the extent of the study area;
2. The establishment of a land cover/use typology whose classes can be used predict variations in the output and value of ecosystem services;
3. A meta-analysis of peer-reviewed valuation literature to link per unit area coefficients to available cover types;
4. Mapping service flows, calculating values and reporting; and,
5. Scenario or historic change analysis.

Even if the construction of ESV maps is not regarded as the ultimate goal, the approach can be adapted as a guide for the mapping of service flows measured in physical rather than monetary units. Thus their work provides a useful framework in which to consider the extent to which successful mapping of services might be attempted in an area such as the Parrett. Their approach is also broadly consistent with the 'impact pathway' approach recently described in Defra's (2007b) Introductory Guide to the Valuation of Ecosystem Services, which recommends that to value an ecosystem it is first necessary quantify the relationships between ecosystems structures and processes and the provision of ecosystem services, and then to identify the ways in which these impact on human welfare.

In the sections that follow we consider the kinds of analytical and conceptual tools needed to map and value ecosystem services with particular reference to the Parrett. In making this analysis our concern has been to use the case study to explore whether data resources and analytical tools are sufficient to help embed an Ecosystems Approach in decision making, and how the process might be supported through initiatives such as the Regional Observatories, or the information systems of other public bodies.

4.3.1 Defining the area of study

Troy and Wilson (2007a&b) suggest that the definition of the area of study is an often overlooked, but important, aspect of any mapping and valuation study, because changes in boundary can have significant effects on the final calculation of values. While this is certainly a significant technical issue, a more fundamental question concerns the extent to which the unit of interest is an appropriate one to capture variations in ecosystem services. Indeed, the assertion that ecosystem assessments should be conducted at an appropriate spatial and temporal scale is one of the principles underlying an Ecosystems Approach.

Although the brief for this study has meant that our focus has been set at a catchment scale, our consultations with stakeholder groups in the area has challenged the assumption that there is a single 'best' or 'appropriate' unit at which to make any assessment (see for example, section 3.4). The argument that the catchment is the appropriate object of study can be sustained, perhaps, in the context of land and water management issues. However, our consultations

suggested that once the relationships between a number of different services is being considered, or when relationships between particular services and wider economic and social drivers needs to be explored, the 'catchment logic' may no longer strictly apply. This finding differs from that of 'The Parrett Catchment Project' study which argued that the development of a strong identity for the *catchment* was needed (Forum for the Future, 2005). Our study has suggested that there is a sense in which the 'Parrett Catchment' is more of an arena within which a number of resource and planning issues play themselves out, rather than an operational unit that is justified on strictly 'scientific grounds'. One might even go so far as to suggest that it is only useful as a focal point or unit of study, insofar as it helps people define or conceptualise a common set of problems involving the relationships between people and their environment. The definition of the study area is, in other words, more about 'social choice' than rigidly applied scientific theory.

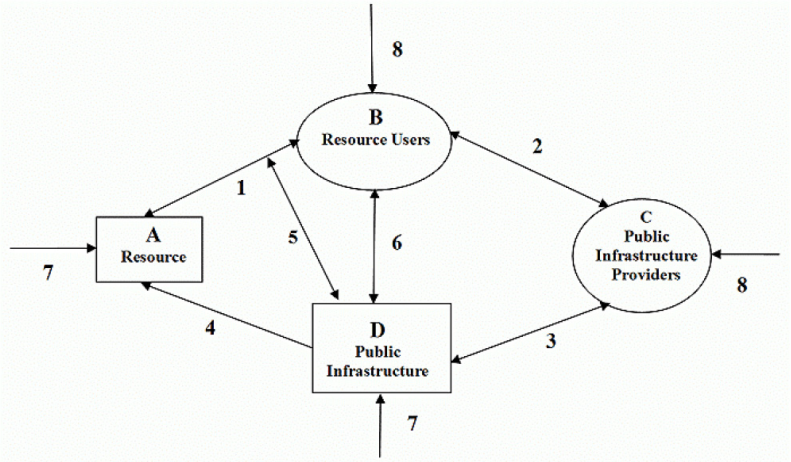
The arbitrary or even contested nature of the 'area of study' is something that can be overlooked when in attempting to apply an Ecosystems Approach, which seems to suggest that if stakeholders would 'only' make decisions at the appropriate biophysical scales then many management problems would be resolved. In contrast, our experience in the Parrett suggests that there may not be an 'appropriate scale' for analysis, and that the definition of the unit of study is part of the process by which society frames a given management or policy problem.

In support of this position, it could be argued that the open nature of the problem of defining the unit of study is in fact a direct consequence of dealing with 'coupled social-ecological systems' (SES). The notion of a social-ecological system is one that has been used in the research literature to emphasise the 'humans-in-the-environment' perspective that an Ecosystems Approach seeks to promote. The term SES is also used to emphasise the fact that ecological and social systems are generally both highly connected and co-evolve at a range of spatial and temporal scales (see for example Folke, 2006; 2007). More particularly, Anderies et al. (2004) have gone on to suggest that their structure is best understood in terms of the relationships between resources, resource users and governance systems (Figure 4.5). If we follow this logic, then the definition of the area of study depends not only on scientific understandings, but also the relationships of biophysical systems to wider social and economic structures.

The implication of this argument for those involved in the analysis of ecosystem services or the design of information systems such as the Regional Observatories is that the geographical views of the evidence base that is offered must be flexible. Users must be empowered to construct particular views of the evidence base that makes sense in the context of their own perspectives, and be helped to understand the consequences these choices in terms of the assumptions the underlies the data [22]. At a very minimum, systems should separate the geographies used to make the analysis from those at which the results are reported. Thus in the case of the Parrett it makes sense for some users to extract and report data at the catchment scale, while for others, the issues about flooding or erosion make more sense if they are handled as units that reflect the places that they are familiar with (districts, wards etc.). We suggest that a cross-sectoral approach to decision making will not be supported by any system or analytical approach that compartmentalises ecosystem services into one particular sort of geography – administrative or 'natural'.

[22] For a helpful discussion of the Modifiable Unit Area Problem (MUAP) see for example Huby et al. (2005).

Figure 4.5 Conceptual model of a social-ecological system (after Anderies et al., 2004)



Definition of Links (1) Between resource and resource users; (2) Between users and public infrastructure providers; (3) Between public infrastructure providers and public infrastructure; (4) Between public infrastructure and resource; (5) Between public infrastructure and resource dynamics 6) Between resource users and public infrastructure; (7) External forces on resource and infrastructure; (8) External forces on social actors

4.3.2 Service typologies

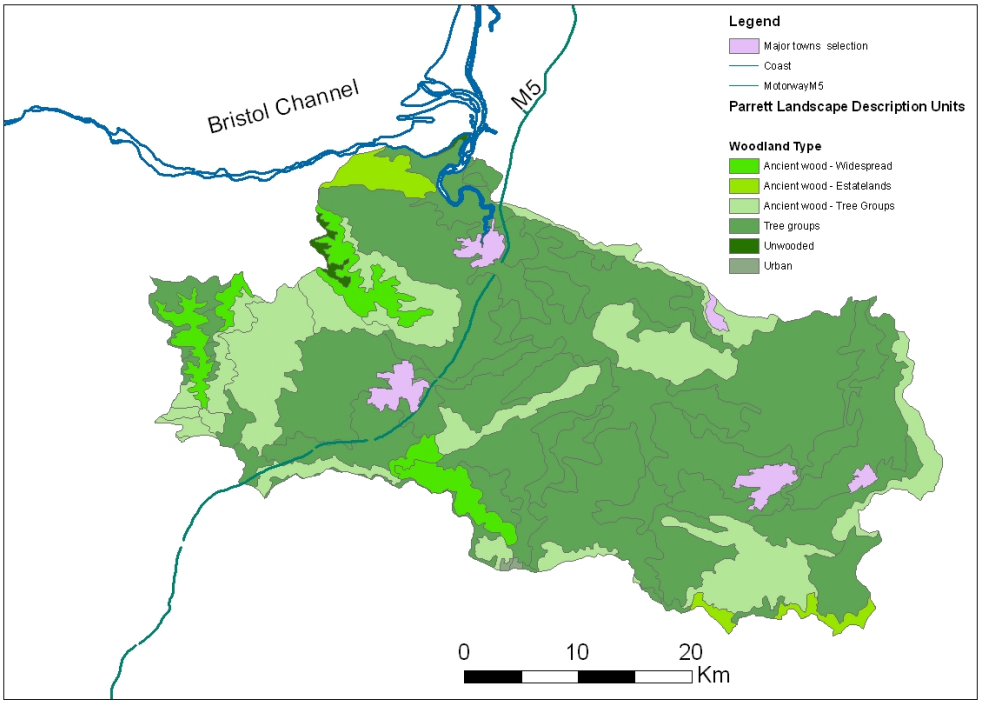
The approach to ecosystem service and value mapping outlined by Troy and Wilson (2007a&b) employs land use or land cover maps as the analytical framework for service typology. Having determined the basic land cover/use types in the study area, they then proceed to associate 'value coefficients' with them, so that aggregated estimates can be made for different reporting units. We will review the availability of these coefficients below. At this stage, the most important methodological aspect to consider in the Parrett and wider UK context is whether, in principle, services can be mapped in this way.

The account of Troy and Wilson (2007a&b) treats the issue of how land use and services are associated as relatively unproblematic. However, as has been argued elsewhere, in the UK at least, while we can use expert judgement to identify which services might be associated with which habitat[23], there is very little evidence available that might help determine how important each habitat is to the overall provision of a service (Haines-Young and Potschin, 2007). Moreover, it is also apparent that for some services, output may be more influenced by the combination of habitats and their spatial arrangement across a landscape than simply their spatial extent.

It could be argued by those seeking to apply the methodology suggested by Troy and Wilson (2007a&b) that differences in the importance of a given land cover to service output is in the value coefficient, which could be modified according to the context of individual land cover parcels. However, as we will argue below, given the general lack of availability of basic valuation data and limited tools for making benefit transfer we are still a long way from implementing such an approach. We recommend that as a basic step further work is needed to look at ways of mapping the spatial characteristics of potential service output, which could then be used as the basis of detailed valuation studies.

[23] We regard habitat and land cover/use elements as broadly synonymous.

Figure 4.6: The character of woodland in the Parrett Catchment



Source: Griffiths and Vogiatzakis (2007)

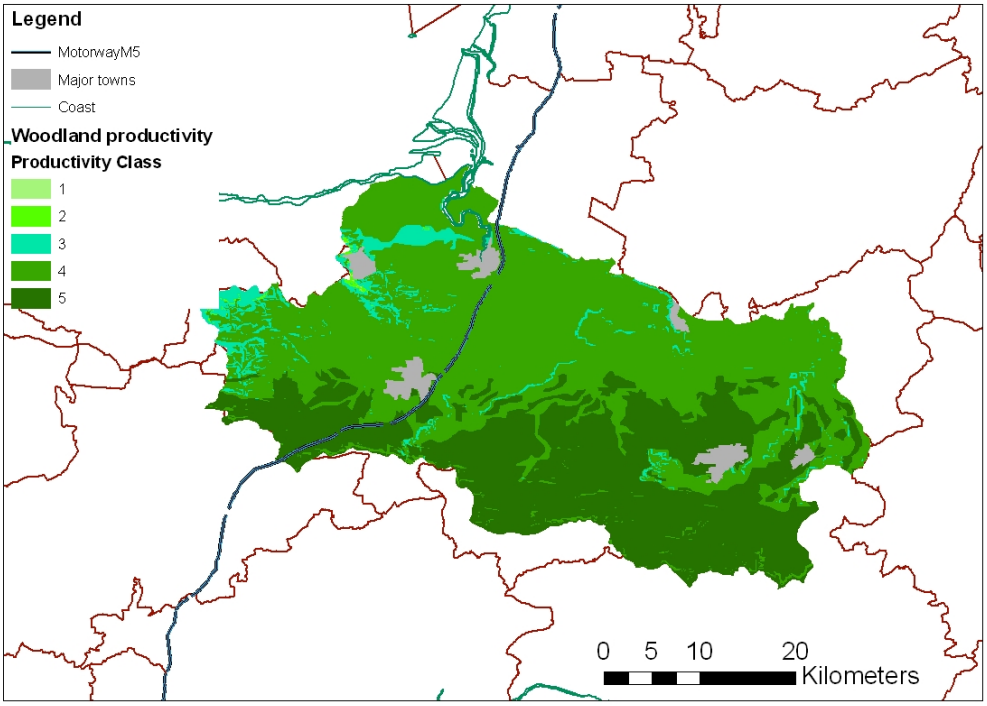
As an illustration of the kinds of work that is required in relation to mapping 'service potential', we have considered the case of two ecosystem services associated with woodlands in the Parrett Catchment, namely their contribution to landscape (aesthetic service) and carbon sequestration (regulation service).

An important factor that determines the contribution of woodland to landscape character is simply its form and location. Figure 4.6 shows the distribution of woodland types across the catchment, based on information from the New Typology for England. The map is built up from the 'Landscape Descriptor Units (LDUs) which is the framework for constructing the typology; each LDU identifies an area that is homogeneous in relation to their biophysical characteristics and assigns them to a specific landscape type. These units have then been characterised according to a range of other landscape characteristics, such as woodland cover. Figure 4.6 shows how the role of woodland in the landscape varies across the catchment. Such a map could be used to modify any value estimates that describe the contribution that individual woodland patches make to the overall 'landscape service'. Unfortunately, we lack any comparative data on how people value woodland in different types of location, and so it is difficult to convert this map into a 'value surface' of the type suggested by Troy and Wilson (2007a&b).

Woodland, particularly fast-growing, productive woodland has the potential to sequester carbon. The potential is highest for new woodland, but the service can be maintained by appropriate management of mature woodland stands. The sequestration potential (i.e. amount of carbon fixed per unit time) is a function of a number of factors including: soil type, species composition, productivity (yield class and/or stand height/density), age class structure and management prescriptions. Figure 4.7 shows how a simple woodland productivity potential surface might be generated. It uses generalised soil type data from the Agricultural Land Classification of Great Britain, general woodland type, derived from the National Inventory of Woodlands and Trees, and 25m resolution elevation data from the Ordnance Survey. Data on woodland age class and management, both important determinants of woodland productivity, were not included because they are not available at national scales. In Figure 4.7, the most productive areas, and thus those with the highest

potential for carbon sequestration, are those with low elevation; shallow slopes and

Figure 4.7: Woodland productivity potential surface, Parrett Catchment



Source: Griffiths and Vogiatzakis (2007)

favourable soils. The mapping units are those of the National Landscape Typology described above. Since values are available for the social costs of carbon, it would in principle be possible to convert such a service into a value map.

The woodland examples presented here illustrate that it is possible to map some aspects of the supply side of ecosystem services, and so show how their contribution varies spatially across an area of interest. The examples happen to be for the Parrett Catchment, but they can be constructed on a much more general basis. By reporting them at the catchment scale, however, one can begin to think how these issues might relate to other topics like flood control. Whether monetary valuation data are available or not, such maps could provide an input into 'cross-sectoral' decision making if, for example, the implications of different woodland planning strategies were compared in particular places, such as the Parrett when it might be a goal say, to find the most productive locations for new woodland that do not undermine the traditional landscape character, but which might also contribute to flood regulation. **The mapping of service potentials is one contribution that initiatives such as the Regional Observatories might provide, although it is clear that given current data resources it might not be possible for all services.**

4.3.3 Value transfer

Troy and Wilson (2007a&b) use the term 'value transfer' to describe the process of using existing valuation information to infer values in some new policy contexts where basic valuation data is absent or limited. They prefer the term 'value transfer' rather than the more common 'benefits transfer' to emphasise that the approach is not restricted to economic values alone, but can be extended to include cost information, as well as welfare issues. The need to construct so-called benefit-transfer functions comes about because it is generally accepted that primary valuation studies are difficult and time-consuming to construct and so may not be feasible for every study. Thus some method of deriving acceptable estimates based on the empirical work done elsewhere is needed.

Value transfer studies typically depend on undertaking a literature search with the aim of identifying information about suitable analogues that can be adjusted for the circumstances of the particular study. Increasingly, however, to speed up the process researchers are drawing upon one of the benefits transfer databases, such as the Environmental Valuation Reference Inventory (EVRI)[24].

The issues surrounding the valuation of ecosystem services have been considered by other studies recently funded by Defra[25], and so there is no need to discuss the issues of benefit or value transfer detail here. The key point that emerges, however, is that there is a general paucity of value information for the UK and that this is a major barrier for those seeking to take a better account of the benefits natural resource systems provide to society. Moreover, there is a general lack of understanding of the ways in which values reflect notions of the limits of service supply. We found few valuation studies that could easily be applied to issues identified by stakeholders in the Parrett Catchment.

Access or at least links to benefits transfer databases is one facility Regional Observatories might provide, and in the longer term these sites could point to places where service valuation has been undertaken in the region. This could be done in the same way that the SW Observatory site currently points to examples of Strategic Environmental Assessment studies. Ultimately tools could be provided to help users make the value transfer. As Defra's Introductory Guide notes, the linkage of benefit transfer techniques and GIS has the potential to produce more robust estimates than traditional approaches (Defra, 2007b).

4.3.4 Mapping service flows, calculating values and reporting

Although a discussion of issues surrounding the mapping of service flows partially overlaps with that relating to service typologies it is useful to separate them because, as Troy and Wilson (2007a&b) note, it involves the combination of the information about land cover and values. It results in the construction of an ecosystem service flow map and summary estimates for a desired set of reporting units such as catchments or administrative districts. An example of the kind of output that might be produced is shown in Figure 4.8.

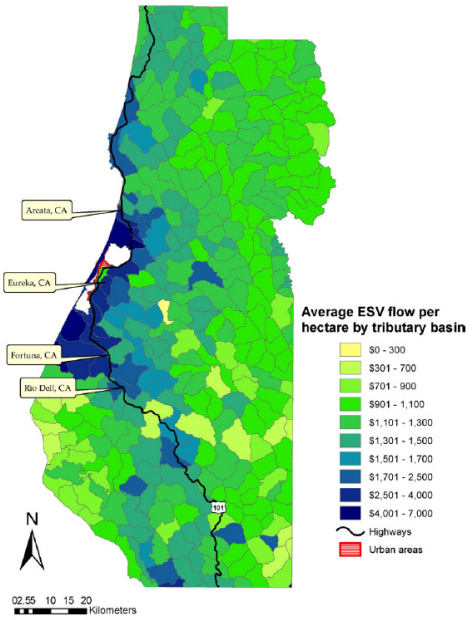
The important thing to note about the example shown in Figure 4.8 is that the reporting units used for mapping and tabulation of results are different to those used initially to assign values; the value units are the individual land parcels, and the reporting process is one of aggregation. While for some applications the two might be the same, the example shown here emphasises the importance of the question we posed at the outset about the definition of the study area, and the need to allow users to be flexible in the ways they extract and present data. Providing the scaling issues that surround ecosystem services are understood, then it is clear that questions about the 'appropriate unit' are more how service characteristics are assessed than reported.

[24] http://www.evri.ca

[25] NR0103 (Eftec, 2006) and NR0108 (Jacobs, 2007)

This conclusion has implications for those designing tools for handling information about ecosystem services. If facilities such as those offered by the Regional Observatories are in the future to provide easily accessible and useful information about ecosystem services, then they must enable people to report ecosystem service characteristics for a range of spatial units including administrative districts (census output areas, wards, postcode units, districts, etc.) as well as biophysical units (catchments, view sheds, landscape units).

Figure 4.8: Average yearly ecosystem service value flows per hectare by Tributary Basin for Humboldt County, CA in 2004 dollars (after Troy and Wilson, 2007a&b)



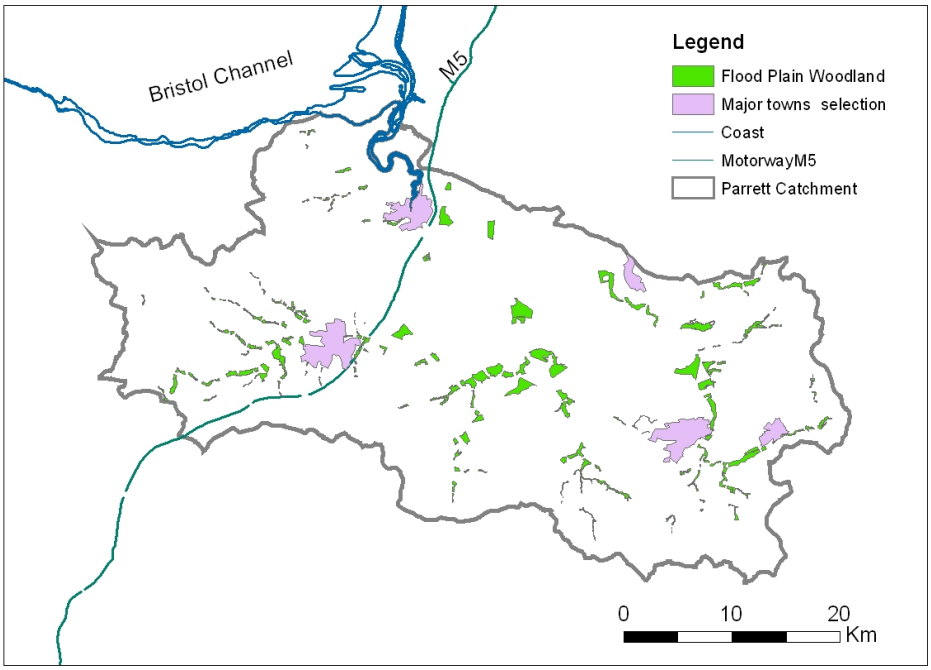
Land cover	Average value ('000$/ha/yr)	Area (ha)	Total ESV (M$)
Agriculture	2192	15.9	349.3
Conifer forest	821	114.2	938.2
Desert shrub	NA	0.0	0
Desert woodland	NA	0.0	0
Estuary	5898	0.0	0.1
Fresh wetland	10,973	9.6	1052.6
Hardwood oak woodland	439	112.2	492.9
Herbaceous	NA	83.1	0.0
Mixed forest	826	261.9	2162.9
Spotted owl habitat	998	89.7	894.9
Riparian forest	8792	49.5	4349.6
Redwood 2nd growth	815	99.6	811.9
Redwood old growth	950	39.7	376.8
Shrubs	NA	22.5	NA
Saltwater wetland	6044	0.5	33.2
Disturbed and urban	0	17.4	0.0
Urban green	5605	3.3	182.4
Vineyards	2192	0.0	0
Open fresh water	7237	7.1	517.1
Total		926.2	12162.0

4.3.5 Scenario analysis

A number of commentators have emphasised the important role that scenario analysis can play in valuation studies. Defra (2007b), for example, also emphasis the importance of scenario studies for policy making, and suggest that the most relevant types of valuation studies are those that seek to discover the marginal changes in value potentially brought about by different policy options. Troy and Wilson (2007a&b) construct scenarios of past and possible future change by varying the basic input values either for land cover or valuation.

Although valuation data were generally lacking for the Parrett, we attempted to explore what kinds of policy scenario might be constructed as a way of illustrating the types of information that facilities such as the Regional Observatories might provide. Once again our focus was on woodlands and the issue considered was the contribution that new planting might make to flood regulation.

Figure 4.9: Potential sites for woodland planting for flood mitigation



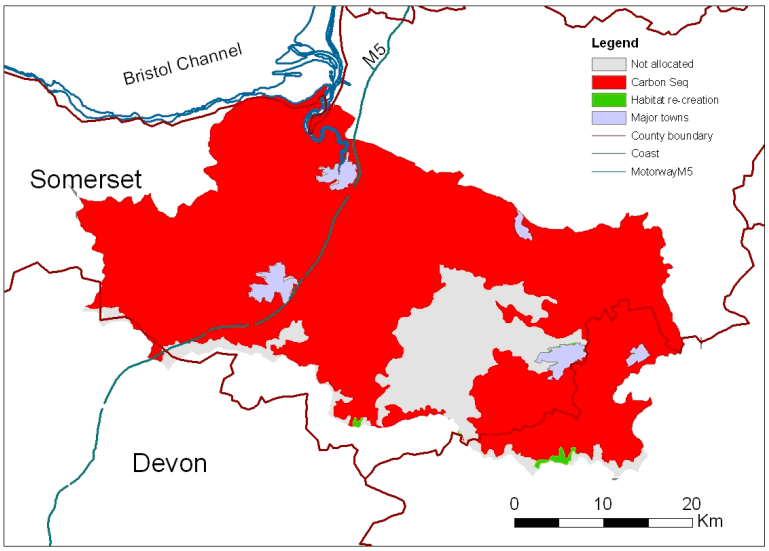
Source: Griffiths and Vogiatzakis *(2007) after Nisbett, Forest Research*

Figure 4.9 shows the output from a recent study conducted by Forest Research (Nisbett, pers com). The results were generated using a GIS 'sieving' technique in which areas of land close to the river network were progressively eliminated on the basis of their suitability for planting that would have some benefit in terms of flood control. Thus, areas of land close to sites identified as suitable for new flood-plain woodland planting were scored high, i.e. given a favourable weighting in the suitability map. Taken in conjunction with the other maps of woodland service potential shown in Figures 4.6 and 4.7, it is clear that the decision maker can begin to consider the trade-offs that such planting might involve. Some of the areas shown in Figure 4.8 that might be beneficial in terms of flood regulation occur in areas whose landscape character is one in which woodland is not an important element. The implication is that such planting might transform that character and thus affect the aesthetic or habitat value of such areas.

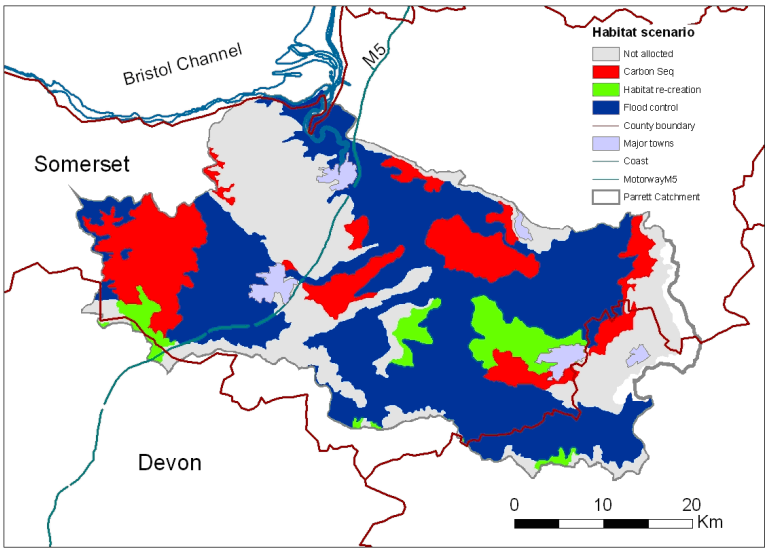
Figure 4.10 has been derived from Griffiths and Vogiatzakis (2007) who have suggested how the construction of scenarios might be taken further using the kinds of spatial analysis tools that are currently available. The three suitability maps shown in Figure 4.6, 4.7 and 4.9 were input into a Multi-Objective Land Allocation (MOLA) routine, which was run using the parameters shown in Table 4.1.

Three scenarios were constructed, each giving priority to carbon sequestration, woodland creation for habitat and woodland planting for flood control. The MOLA procedure is used for solving multi-objective land allocation problems where there are conflicting objectives. Based on the information from a set of suitability maps, one for each objective, the algorithm finds a compromise solution that maximizes the suitability of land for each objective. The solution depends on the relative weights assigned to the objectives and the area of land to be allocated to each (Table 4.1).

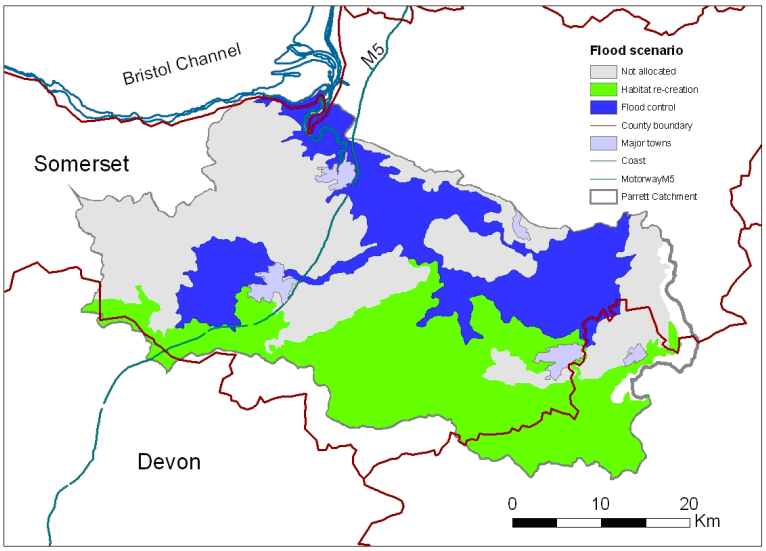
Figure 4.10: A comparison of three alternative policy scenarios for the Parrett Catchment



(a) This scenario seeks to give priority to the allocation of land to the carbon sequestration service. A high percentage of the catchment is suitable for new woodland planting since it is relatively low-lying and has good soils. Thus the model appears to heavily favour this 'service' with no areas allocated for flood alleviation and minimal area, at higher elevations on steep slopes, for woodland habitat.



(b) The habitat scenario seeks to give priority to the allocation of land to habitat creation. With the weights assigned, the model gives a fairly balanced output, with areas split between the three services. Interestingly, the area allocated to habitat creation is the smallest of the three, while the largest amount of land goes to flood control.



(c) The flood control scenario seeks to give priority to locations that might help regulate water flow. With the weights assigned, the model gives a more tightly specified area where such planting might be targeted, while the area assigned to habitat creation is much larger. No areas are assigned for carbon sequestration.

Source: Griffiths and Vogiatzakis (2007)

Table 4.1: Parameters used for MOLA Procedure

(a) Factors and weights used to generate suitability maps based on Multi-criteria Evaluation (MCE)

CARBON	**Factors**	Elevation	Slope	Soil type
	Elevation	1		
	Slope	3	1	
	Soils	7.00	5	1
	Weights	**0.08**	**0.19**	**0.73**
HABITATS	**Factors**	Proximity	Area (ha)	Landscape type
	Proximity	1.00		
	Size	3.00	1	
	Landscape	5.00	2.00	1.00
	Weights	**0.11**	**0.31**	**0.58**
FLOOD	**Factor** Proximity to woodland for flood control (**source:** Forest Research)	1.00		

(b) Relative weights and target areas in relation to the total area of the Parrett catchment (Ha)

	SCENARIO 1		SCENARIO 2		SCENARIO 3	
	Weights	Area (ha)	Weights	Area (ha)	Weights	Area (ha)
MOLA						
CARBON	0.33	100000	0.33	40000	0.33	20000
FLOOD	0.33	40000	0.33	20000	0.33	100000
HABITATS	0.33	20000	0.33	100000	0.33	40000

Source: Griffiths and Vogiatzakis (2007)

Figure 4.10 suggests that depending on the assumptions very different types of outcome might be generated. Clearly, if valuation data were available then, given the existing pattern of woodlands and the new areas allocated under the different scenarios, the marginal changes in overall value could be estimated – and potentially considered in terms of the costs of the different policy options. The method is, however, problematic in terms of the way the weights and area targets are assigned. Any number of different outcomes, it seems, can be generated depending upon the choices that are made. To make the analysis robust would require an extensive, and possibly an iterative process of consultations with stakeholders to decide what the appropriate input parameters should be – a process which others have found to be less successful than anticipated (cf. Walz et al., 2006). A further difficulty is the implication that somehow, by fixing these weights and area goals, an optimal or 'best' solution might be found. All policy discussions are surrounded by uncertainties, not least concerning the way that various drivers of change might impact upon decisions. None of these issues are easily being included in these land allocation routines.

The approach to scenario building illustrated by these land allocation tools is only one of a number that could be used to explore different policy goals and options. On the basis of the experience we gained from the discussions with people in the Parrett catchment it seemed ***unlikely*** that these particular methods could routinely be used to help them frame discussions. Setting technical issues aside, the methods seem to assume that users already know what the policy goals and options are, which our discussions showed was clearly not the case. Moreover, the methods depended on setting targets, when very little information was available on what the minimum requirements or limits of service output were. Nevertheless, from our wider

knowledge of what has been achieved through scenario building elsewhere, it did seem that this general approach, if done sensitively, could be one way in which a range of relevant information, including service maps and ideas about limits, could be brought together and presented in ways that are both 'meaningful' and 'useful'. In order to keep them distinct, these alternative approaches to scenario building are considered in the next part of the Report.

4.4 Analytical Tools to support an Ecosystems Approach

This Chapter has considered the kinds of analytical tools that are currently available or being developed to help people better understand the character of ecosystem services. Mapping techniques are now being widely promoted in the literature, and although GIS appears to be a useful platform on which new analytical methods can be developed, the availability of the technology itself is not enough. Mapping and valuing ecosystem services is a complex undertaking (see for example Haines-Young et al., 2008a) and, if data platforms like the SW Observatory are representative of what is generally available in the public domain, then, although a good starting point for data retrieval, it is clear that more needs to be done.

There is much that can be achieved technically. Thus, for example, relevant public agencies could contribute maps of ecosystem services so that facilities such as the Regional Observatories could host a comprehensive atlas of services that could be interrogated by users at a range of spatial scales. The Observatories could also provide links to valuation studies and valuation tools, so that users can better characterise the importance of natural resource systems in their area. However, these technical challenges must not obscure what is also required in promoting and supporting new forms of *governance*. If an Ecosystems Approach is to become embedded in decision making, then ways have to be found both to highlight the importance of natural resource systems, and the way they are coupled to wider social and economic processes. To achieve this it has also to be recognised that the process of embedding is essentially a process of *social learning*, or part of what others have described as 'transition management' (Wiek et al., 2006).

Transition management is an approach widely applied in the context of sustainability planning that seeks to understand how to promote adaptive approaches to problem solving. Van de Kerkhof and Wieczorek (2005) describe it as a strategy or framework to help policy makers address the issues of global environmental change through a joint learning process that includes policy makers, scientists *and* (other) stakeholders. Thus the design of facilities such as the Regional Observatories has to go beyond the technical challenges of data provision and modelling. The aim should be to promote and support the kinds of public discussion needed to ensure that new approaches to governance, such as Local Area Agreements, are effective and take account of the benefits that natural resource systems provide.

Following Loorbach and Rotmans (2004), Van de Kerkhof and Wieczorek (2005) suggest that the transition management cycle consists of a number of steps:

1. Organisation of multi-actor networks;
2. Development of sustainability visions;
3. Exploration of transition pathways (scenarios); and,

Evaluation, learning and monitoring, and preparation for the next 'transition round'.

In order to examine what this approach might mean for the Parrett, we have attempted to build on our understanding of the various interests groups and networks that exist in the catchment, and explore how 'science-based stakeholder dialogues' can be built up most effectively using the tools that have been identified above. Following the recommendations of a number of workers involved in transition studies, it was decided to user scenario construction as the focus of this work, because it offered the opportunity of presenting the various tools and concepts that surround ecosystem services, values and limits in a kind of narrative that might make the principles underpinning an Ecosystems Approach more meaningful and useful to stakeholders.

Box 4.1: Key messages from Chapter 4

- In the UK we are fortunate to have access to a rich body of data about the social, economic and biophysical environments. However, a review of a range of stakeholder responses to the principles underpinning the Ecosystems Approach suggested that the integration and analysis of information across different policy sectors is difficult.
- There is at present little systematic mapping or valuation of ecosystem services. However, although this situation is likely to change, as public agencies begin to examine the topic, there is a role for bodies such as the Regional Observatories, to bring these analyses together to provide an integrated picture for a much wider community of interests.
- A review of the technical and conceptual issues surrounding the mapping and valuation of ecosystem services suggests that despite the extensive data available, the analytical tools available need refinement. The tools should make a clear distinction between the geographies used for analysis and reporting.
- The task of presenting information and evidence in ways that are 'meaningful' and 'useful' to a wide range of stakeholders is, however, not simply a technical issue, but has to be seen as part of a more general process of 'transition management'. That is, the development of governance structures appropriate to address the cross-sectoral challenges that the Ecosystems Approach poses.
- Linking the issues that surround the problem of sustaining ecosystem services to wider social and economic drivers through scenario building techniques is proposed as one way in which the Ecosystems Approach can be embedded in discussions between stakeholders and public agencies.
- It is argued that the design of facilities that provide information to people, such as the Regional Observatories should be looked at as part of the process of 'transition management'.

Chapter 5: Developing and evaluating scenarios for the Parrett

5.1 Introduction

The purpose of this chapter is to examine the value of 'scenario building' as a tool by which decision makers in the Parrett Catchment might make more informed choices about the future. In particular we will examine the extent to which scenarios can be one way in which 'science-based stakeholder dialogues' might be promoted in ways that can help embed an Ecosystems Approach.

Experimentation in scenario building techniques is growing in the public policy arena, but their use does not yet represent standard practice in approaching issues of natural resource management, allocation and valuation. This seems particularly the case in the context of decision making processes taking place at the regional and sub-regional level, where the application of these techniques remains largely unrealised, and their implications for embedding an Ecosystems Approach therefore unknown. Assessing the value of scenario building for decision makers working in the 'strategic' and 'frontline' contexts of practical catchment planning is thus a logical way in which this potential can be explored.

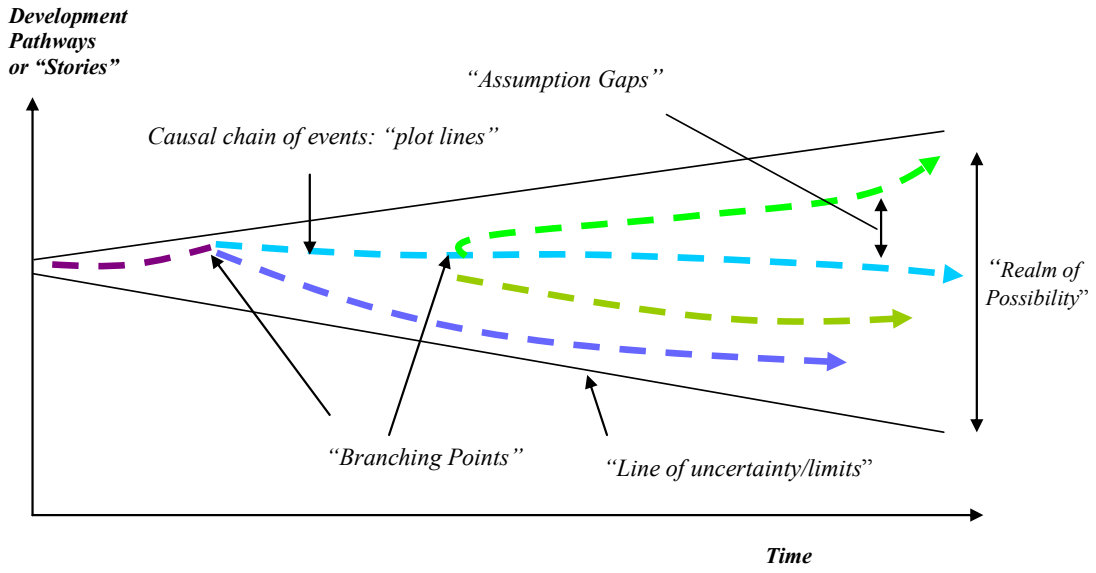
As a result, this chapter reports on a programme of work that, taking the Parrett Catchment as its case study context, has sought to come to a judgment about the potential of scenario techniques for embedding ecosystems thinking into decision making processes at the local level. The Parrett Catchment is particularly interesting in this context for, as explained earlier, while the area has been widely praised for its pro-active and visionary engagement with natural resource planning the research took place at a time when a number of new, but as yet undeveloped, partnerships for action were emerging, including the Environmental Leaders Group of Somerset County Council and multi-stakeholder Water Management Partnership. Thus, the study was well placed to take advantage of these recent changes, and test the viability of an innovative methodology in a receptive policy culture.

The chapter begins by introducing the general history and objectives of scenario building, and within this, specifically addresses the case for employing this approach in conjunction with an Ecosystems Approach. It then goes on to provide an overview of the steps taken to initiate and conceptualise a scenario building process in the catchment, and in particular, how the project team's work was designed to reflect the methodological approach, and substantive claims, of the global MA (2005). The chapter describes in detail the critical trends and drivers underpinning change in the catchment and how these were then translated in three 2050 scenarios of the case study area. It is against this context that the chapter outlines a process in which the scenarios were translated into a web-based consultation for evaluation by key catchment stakeholders. In the final section of the chapter, we report on the outcomes of this consultation process as the basis for evaluating the wider potential of this technique for embedding an Ecosystems Approach into catchment based decision making.

5.2 What is scenario building?

In general terms, scenario building can be understood as the process of describing a contrasting set of narratives about the long term future given a series of "if-then" propositions (Henrichs et al., 2007: 2). In the context of environmental decision making, Swart et al. (2004: 139) characterise scenario building as the process of creating:

Figure 5.1: Scenario building: general conceptualisation



> "coherent and plausible stories, told in words and numbers, about the possible co-evolutionary pathways of combined human and environmental systems. They generally include a definition of problem boundaries, a characterization of current conditions and processes driving change, an identification of critical uncertainties and assumptions on how they are resolved, and images of the future"

A pictorial overview of the general parameters of this technique is depicted in Figure 5.1 overleaf. In this schematic, each scenario is shown to represent a different development pathway for human and environmental systems. These pathways are the product of exploring how drivers of change interact under different sorts of hypothetical conditions and are represented as "stories" encompassing logical sequences of cause and effect. Each of the sequences proceeds from the 'here and now' but they branch into different plot-lines depending on how hypothetical conditions change. Levels of uncertainty grow, and ranges of possibility expand, the further in time these plot lines are developed and pursued. The process of scenario building therefore encourages decision makers to acknowledge the contrasting development pathways that may emerge over time, and challenges the sense in which a particular future is inevitable.

Importantly, then, the process of building scenarios is designed to serve a different purpose to establishing a policy 'vision'. For instance, scenarios are unlike the ideas embodied in the Parrett Catchment Partnership Vision, or those reflected in more recent initiatives such as 'Project Taunton'; 'Bridgwater Challenge', the 'Yeovil Vision' and the 'Somerset Strategic Partnership Vision' (see Chapter 2). Such visions conform to what Swart et al. (2004) have described as a *normative* view of the future, by which they mean processes specifically designed to focus on identifying a desirable future around which policy interventions can then be designed. While normative views ultimately condition how decision makers think and interpret different pathways of development, scenarios themselves are first and foremost *descriptive* in character. That is to say, the process of building scenarios is designed to be a means by which normative visions can be assessed and existing approaches to decision making evaluated in terms of their long term efficacy given a range of possible outcomes. Thus, this project does not seek to arrive at a single 'accurate' picture of the future to which the catchment must then adapt. Neither does it seek to identify a single 'desirable' future to which catchment stakeholders can subscribe. Rather, the

purpose of the scenario building exercise is to explore whether catchment decision makers might be better placed to make decisions about the future given the different ways in which drivers and trends may unfold. In this our purpose is similar that envisaged by the leading futurologist Schwartz (1998, xiii-xiv):

> "[S]cenarios comprise a tool for ordering one's perceptions. The point is not to pick one preferred future, and hope for it to come to pass…Nor is the point to find the most probable future and adapt to it… Rather the point is to make strategic decisions that will be sound for all plausible futures"

In sum, scenarios are devices by which decision making process can begin to accommodate, prepare for and reflect upon different pathways of development

5.3 Why is scenario building important?

Decision makers responsible for effective ecosystem management work in a problem context where the long term future is multidimensional and where the idea of effective natural resource planning is subject to a range of competing management options. Just as the future cannot be guaranteed, society's understanding of what the future should 'look like' is also highly variable. Addressing these controversies and uncertainties in a timely and thoughtful fashion raises significant challenges for decision makers. Defra's Action plan draws attention, for instance, to the "short-termism" of political and budgetary cycles as a significant feature and barrier to embedding an Ecosystems Approach, especially at the regional and local level (Defra, 2007a:18). Scenario building is potentially one way in which the Department may advocate and foster more integrated and anticipatory responses to future needs.

As a tool for strategic decision making the emergence of scenario building has been well documented. It is a technique that became popularized as a tool for strategic learning in commerce, most notably through the work of Royal Dutch/Shell in the early 1970s, and its efforts to plan for changing markets for oil. While there has been significant progress in the uptake of these techniques in the environmental decision making arena, exercises are still relatively embryonic in design. As one recent report concludes: "despite the growing number of forward looking studies ...[ ]… very few of these have taken environmental concerns as their entry point and even fewer assess plausible environmental futures in an integrated manner" (Henrichs et al., 2007: 36) The report suggests that, in the context of environmental change, most experimentation in the use of the technique has taken place in the context of national and international policy arenas, highlighting over 80 examples of scenario building based on 'global' visions of the future and significantly more fashioned at the sub-global scale (Henrichs et al., 2007). The impact of these exercises on decision making processes, as well as public acceptability of long term policy priorities, is considered significant by many; deployed to great effect in shaping responses to large scale environmental processes As Robert Watson, Chief Scientific advisor to the UK Government, recently remarked: "I think scenario building is unbelievably important. It's the only way we've actually solved the stratospheric ozone depletion issue, which is now largely a sold policy issue. Or how we've moved it forward on climate change" (Fresh, 2007) Through the scenario building process, then, the implications of possible development pathways are translated into compelling narratives about the future against which policy agendas can then take shape.

In respect of this project's concerns, the recent work of the global MA (2005) is an important development here. Alongside the MA's assessment of current states and trends, it employed a scenario-building methodology as a means of informing decision-makers about "the consequences for ecosystem services of contrasting development paths", and illuminating the "cause and effect and probable outcomes of certain approaches or decisions" (MA, 2005: 122). In particular, the MA suggested that through this process it would be possible to begin identifying among other things:

- the costs, benefits, and risks of plausible future changes in ecosystems and how these affect different sectors of society and different areas;
- the response options that might lessen the vulnerability of people and communities;
- and finally, the circumstances under which thresholds, regime shifts, or irreversible changes are likely to occur.

One of the distinctive aspects of the MA scenarios *vis*. Henrich et al's assessment of current work, was that it explicitly sought to develop understanding of the future by integrating social, environmental and economic concerns.

It is partly in the context of the findings of the global MA that Defra have sought to understand its own evidence needs in relation to developing an Ecosystems Approach at the national, regional and local level. In consequence, Defra's Action Plan makes specific provision for experimentation in scenario building techniques as the basis by which we may begin to attain a "better understanding of the influence of drivers of and pressures on ecosystems and ecosystem services" (Defra, 2007a: 34) Nonetheless in specifying this particular need, it seems important to emphasize from the outset that conducting such scenario exercises cannot be considered in isolation, but instead as a process dependent upon, as well as informing, other evidence needs identified by Defra. Indeed, many of the scientific arguments made for incorporating these exercises into environmental decision making process chime strongly with the wider concerns of the Action plan. Swart et al. (2004) argue for instance, that through the process of scenario building the science-policy community will be better positioned to:

- understand socio-ecological change at various levels of spatial resolution in a common and consistent framework;
- explore the relationship between short-term societal decisions and long-term goals, aspirations and challenges;
- encourage decision makers to look at systems holistically;
- identify processes of change that challenge prevailing wisdoms about what the future may look like;
- foster wider stakeholder and public interest in processes of environmental decision making;
- incorporate varied needs, values and visions of stakeholders as part of the decision making process.

For the purpose of this study scenario building exercises are therefore interpreted as part of a 'linked' process of enquiry in which the stated evidence needs outlined by Defra in its Action Plan may are progressively met.

One simple way of thinking about these links is to position scenario building as part of a wider assessment process, much in the way the Global MA was developed. In this sense, scenarios will be effective in the context of Defra's vision of an ecosystems approach in so far as decisions have '[i]mproved information on the relationships between biodiversity, ecosystem functioning and the supply of ecosystem services" and "[i]nformation on the state of and trends in ecosystems and ecosystem services and ways to monitor this over time" (Defra, 2007a: 34). That is to say, establishing the formal parameters for identifying, classifying and valuing ecosystem services and then assessing how services are currently performing, puts decision makers in a position to then use scenarios in which they can better understand the influence of drivers of, and pressures on, ecosystems and their services. Yet equally, it is through the process of scenario building that burdens of responsibility in natural resource valuation can then begin to be clarified and through which wider questions of "process response" can be explored. Specifically, scenarios may help provide for: "[i]mproved understanding of the impacts of ecosystem change on human wellbeing and ways to establish public preferences and

values"; an "evidence base on environmental limits and how to define them"; as well as "[i]mproved methodologies for valuing ecosystem services in decision-making" and "[i]mproved understanding of policy options for responding to future change" (Defra, 2007a: 34). In other words, scenario building is not removed from the process of understanding the wider evidence needs as envisaged by the Action Plan. It is integral part of a process in which improved systems of classifying and monitoring ecosystems services are linked to enhanced forms of decision making.

5.4 Designing scenarios for the Parrett Catchment

There are now a range of published scenario building exercises that have offered this project a basis upon which specifically Parrett Catchment Scenarios could begin to be devised (See Table 5.1) though it is it the global MA that is a key influence in our work, both in terms of the substantive claims of its four scenarios, and the conceptual framework employed by the assessment team to develop them.

In this, we are close to the recommendations of the MA itself which envisaged that, while its efforts were "not able to perform detailed analyses of local processes and impacts" future exercises might look towards "using the global scenario framework and outputs of global models to drive them". (MA, 2005: 450). Even so, it is worth noting further that, to some extent, precedents for the development of more localised MA inspired scenarios are found in work of the MA itself, for alongside the development of global visions it also produced a series of 'sub-global' scenarios across a diverse range of problem contexts and scales, including marine territories (e.g. a study of the Caribbean Sea), nations (e.g. a study of Portugal) and city regions (e.g. a study of Sao Paulo). Stakeholders responsible for creating these scenarios at the sub-global scale shared with the wider MA its focal issue, (ecosystem services), and incorporated in its work similar types of drivers of change, but the scenarios themselves were developed largely independently, using varied methods and timescales This is what some have called a 'loose' form of multi-scale scenario building (Biggs et al., 2007) and our project continues in that tradition.

In summary, the process of building scenarios for the Parrett Catchment is designed to be a means of exploring the "scale-dependency" of decision making which is an important feature of an Ecosystems Approach and central to the concerns of Defra's Action Plan. In particular, the case study area provides a backdrop in which we might begin to move beyond the "global" outlook of much recent experimentation in scenario building and explore how the technique might be usefully employed at the practical and local level. As debate surrounding the sustainability agenda have more widely shown, macro visions come with a certain 'health warning' in terms of organising practical programmes of action. Images of the future at such vast and sweeping levels can be hugely disempowering at the scale of the individual and community. Without purchase over the more immediate and everyday contexts in which the vast majority of people might take action, such exercises risk operating at the level of political gesture, with little meaningful in them to guide and inform behaviour. This seems particularly important in the context of an Ecosystems Approach, for as Robert Watson has also explained creating scenarios for ecosystems "is much much harder [than those for climate change] because it's way more local. It's not a global issue in the same way" and "I don't think we've sold ecosystems as a serious issue. I think that is a way harder sell. When you mention the word biodiversity all you see are glazed eyes" (Fresh, 2007).

Table 5.1: Recent examples of scenario work

Scenario Origin	Spatial and Temporal Scale	Context	Scenarios Developed
Millennium Ecosystem Assessment (MA, 2005)	Global –2050	*Ecosystem services (All)*	*Global Orchestration scenario* *Order from Strength* *Adapting Mosaic* *TechnoGarden*
Energy Needs, Choices and Possibilities: Scenarios to 2050 *(Shell, 2001)*	Global- 2050	*Energy*	*Dynamics as Usual* *The Spirit of the Coming Age*
Land-use scenarios for Europe: *European Environment Agency (2007)*	Europe-2035	*Land use (general)*	*Great Escape* *Evolved Society* *Clustered Networks* *Lettuce Surprise U* *Big Crisis*
Headline Messages *The UK Climate Impacts Prog.(1997*	UK 2020-2090s	Climate change UK	*Low emissions* *High Emissions*
State of countryside 2020 *Tomorrow Project/ Countryside Agency (2003)*	England-2020	*Rural change (general)*	*The countryside means business* *Go for green!* *All on board* *The triple whammy*
Rural Futures Project: Scenario Creation and Backcasting *Future Foundation/ Defra* (2005)	England 2024	*Rural change (general)*	*The Consumption Countryside* *The Rise of the Rurbs* *Twenty-First Century Good Life*
	England 2054	*Rural change (general)*	*Vibrant Variety* *Gardens and Guilds*

Developing scenarios at the localised scale may therefore be one means of 'winning hearts and minds' about an Ecosystems Approach. It is this vein that the project team has sought to construct scenarios for the catchment that:

- explore repercussions of climate change and global warming for the catchment, particularly managing for the implications of flood events in the winter and hotter and drier weather in the summer but also other forms of environmental action, such as the propagation of local biodiversity; the development of carbon sequestration activities; the visual enhancement of built and natural environments as well as other sensory engagements with locale, such as enriching 'tranquillity' and 'rurality';
- consider how the catchment may be shaped by more liberalised systems of trade. Scenarios for agriculture are particularly important here including: the implications of the single farm payment and cross-compliance for approaches to land management; the availability and differential uptake of environmental stewardship initiatives; the diversification of land into novel forms of agricultural and non-agricultural production; the market strengthening of agro-food networks; experimentation in the 'withdrawal' of agriculture from marginal landscapes. This is particularly relevant in terms of the pros and cons of managed retreat at the seaward edge of the Somerset Levels in response to changing agricultural economics and climate change leading to sea-level rise;
- investigate how the catchment will be shaped by the long-term necessity to make housing community buildings and commercial enterprises more energy efficient, coupled with the systemic need to create new infrastructures and

markets for sustainable energy provision at the national, regional and local scale;

- investigate how agricultural and municipal waste materials could be treated and used as valuable products within the catchment for sustainable construction, energy generation and/or land management purposes to comply with and implement regional and national waste management policies;
- understand the implications of demographic trends for the management of the catchment. Mobile and affluent populations wishing to relocate to/visit an area of high amenity and cultural value will bring a range of expectations and material impacts to bear upon the landscape. Disparities in wealth and poverty across the locale coupled with changing household structures will have varied environmental and social outcomes not least accessibility to, and development of, local housing markets;
- explore the potential outcomes of changing patterns of consumer taste and sovereignty. The rising importance of ethical and social agendas across the food chain - including issues of animal welfare, food quality, fair trade, as well as the ecological footprints of food – will, to varying extents, transform working practices (such as through the application of quality assurance methodologies), present new business opportunities (such as the development of niche products) as well as encourage new social and economic engagements with landscape (such as more localised and civic forms of agricultural production and exchange);
- exploring the implications of rapidly developing capabilities in virtual and material communications including the fostering of a knowledge-based economy underpinned by more flexible working practices, as well as the continuing expansion of air and road travel for increasingly mobile populations.

5.5 From Drivers to Scenarios: the MA Framework applied

In general terms, the project follows the sentiments of the MA in claiming that, while scenarios should be sufficiently 'distant in time' to incorporate developments unimaginable by short term planning functions, they need be traceable to present conditions and frameworks of action. Indeed, just as global scenario building exercises run the risk of disempowering local decision makers because of the scale at which operate, so too can scenarios seem irrelevant if the consequences of current action cannot be exemplified in them. Like the MA, the project team judged that 2050 was an appropriate temporal frame of reference for developing scenarios that could strike this importance balance between distant and present time, one in which it would be possible to build chains of cause and effect from the current condition of socio-ecological systems to future possibilities. As the MA suggests, at the heart of this process is the need to explore how changes might occur given the hypothetical development and interaction of key "drivers".

According to the MA a "driver of change" can be understood as "any natural or human-induced factor that directly or indirectly causes a change in an ecosystem" with 'direct' drivers referring to factors that "unequivocally influence ecosystem processes" and 'indirect' drivers to those that "operate more diffusely, from a distance, often by altering one or more direct drivers" (MA, 2005: 87). Whereas the impact of the former can be "identified and measured to differing degrees of accuracy"; the influence of the latter can "seldom be identified through direct observation of the ecosystem; its influence is established by understanding its effect on a direct driver." [*Ibid*: 87]. The study follows the MA in categorising indirect drivers in five key ways: demography; economy; socio-political, science and technology and cultural. It also follows the MA in understanding these indirect drivers as processes that interact and underpin change in the environmental realm. For the MA, the environmental realm is the single "direct" driver of change in ecosystem services, but it is multidimensional and complex in character,

encompassing both natural and human- induced physical, chemical, and biological drivers of change. Furthermore, the MA suggests that while drivers of change appear to operate beyond the immediate control of society in the short term decision makers have the capacity to intervene and shape these processes over time:

> "[D]rivers appear *exogenous* to decision makers. Their current condition cannot be influenced effectively. Changes in these drivers are generally slow and are the cumulative effect of many diverse local and regional decisions. But viewed with a longer perspective, these drivers become subject to the influence of human decisions, (that is, become *endogenous*)" (2005: 91)

Scenario building is designed to inform: 'Strategic policy makers' (composed of those who shape and establish local policy visions) and Frontline deliverers' (composed of those directly responsible for translating local visions into action).

The specific constitution of these groups, together with a rationale for their inclusion, has already been described in Chapter 1. A summary overview of direct and indirect drivers, and their relationship with ecosystem services and decision making, is provided in Figure 5.2.

In the MA the process of identifying drivers of change initially involved extensive interviews with key experts from five continents concerning the character of future development pathways; a process that was designed to make scenarios sensitive to a range of thematic and geographical concerns. These were then developed as integrated and holistic scenario "plot lines" through the establishment of a 'Scenarios Working Group. The process of designing scenarios involved an interpretive and creative process in which group members experimented with the different conditions under which drivers might function and interact. This process formed the basis for four different scenarios which were conveyed in written and graphic format and labelled them with 'catchy' labels in order to evoke interest and convey the scenarios 'key message. A penscript of each of the scenarios is depicted in Table 5.2.

Figure 5.2: Drivers of Change, Ecosystem Services and Decision Making in the Parrett Catchment (after MA 2005: 92)

MA 'Indirect' Drivers……

Demography: *including population size and rate of change over time (birth and death rates), age and gender structure of a population, household distribution by size and composition, spatial distribution, migration patterns, and levels of educational attainment.*

Economy: *including the extent to which economic growth will occur and how it will be distributed; changing patterns of international trade, capital flows, and technological development; changing pattern of lifestyle and associated consumption*

Sociopolitical: *concerning the means by which decision are made with society and including: changing structures of governance at the local level; the relative role of state and private sector in the provision and regulation of public goods; the mechanisms by which nations solve their disputes, peaceful and otherwise.*

Science and technology drivers: *the development and diffusion of scientific knowledge and technologies; rates of investment in research and development, changes in the productivity and extractive capabilities of new technologies.*

Cultural: *referring to the values, beliefs, and norms that a group of people share and how these conditions individuals' perceptions of the world; what they consider important, and what courses of action that are appropriate and inappropriate*.

MA 'Direct' (environmental) Drivers…..

Natural drivers: *including solar radiation, climate variability and extreme weather events (such as droughts, floods, hurricanes, and cyclones), fires, volcanic eruptions, earthquakes, pest and disease outbreaks, and natural biological evolution.*

Human-induced drivers: *including land use changes, climate change, air and water pollution, acid deposition, soil erosion, soil salinization and fertility changes, irrigation, fertilizer use, harvesting, the use of persistent organic chemicals, and the introduction of non-native species.*

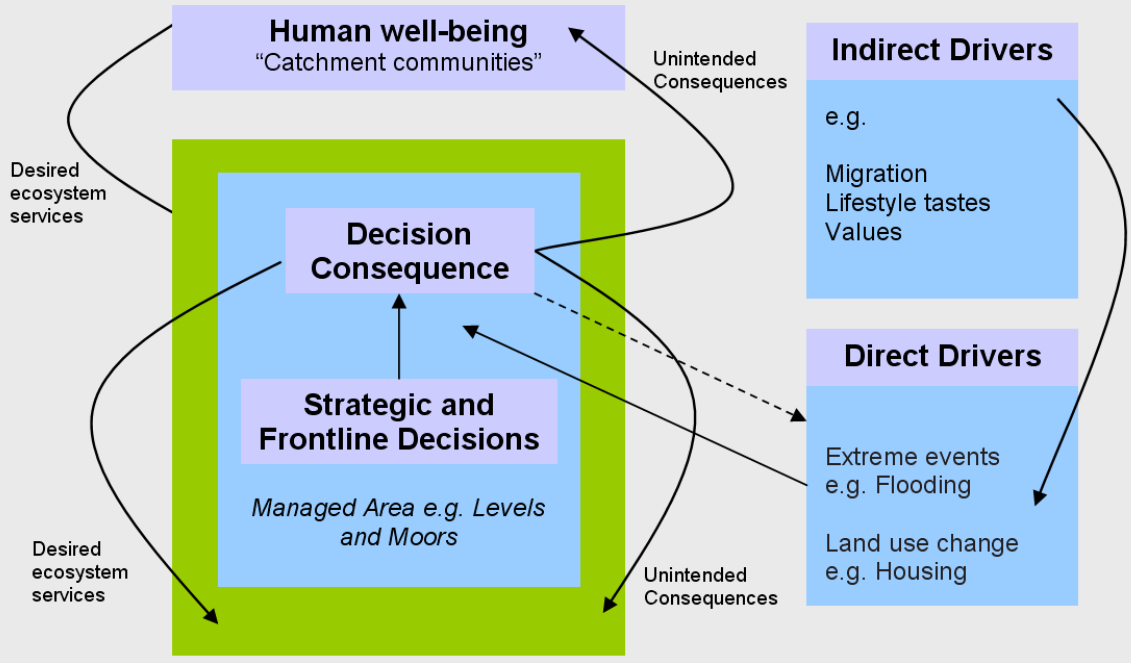


Table 5.2: Pen scripts of the MA Scenarios (After MA, 2005)

Global Scenario 1: Global Orchestration

This scenario emphasised the possibilities of a world in which global economic and social policies are the primary approach to sustainability. The recognition that many of the most pressing problems of the time seem to have roots in poverty and inequality leads many leaders toward a strategy of globally orchestrating fair policies to improve well-being of those in poorer countries by removing trade barriers and subsidies. Nations also make progress on global environmental problems, such as greenhouse gas emissions. The results for ecosystem services are mixed. While human wellbeing is improved in many of the poorest countries, it is still not clear in 2050 whether the net impact on ecosystems will be positive or negative.

Global Scenario 2: Order from Strength

This scenario emphasized the outcomes of a world in which protection through boundaries becomes paramount. The policies enacted in this scenario lead to a world in which the rich protect their borders, attempting to confine poverty, conflict, environmental degradation, and deterioration of ecosystem services to areas outside the borders. Poverty, conflict, and environmental problems often cross the borders, however, impinging on the well-being of those within. Protected natural areas are not sufficient for nature preservation or the maintenance of ecosystem services. In addition to losses of ecosystem services in poor regions, global ecosystem services are degraded due to lack of attention to the global commons.

Global Scenario 3: Adapting Mosaic

This scenario emphasized the benefits and risks of local and regional management as the primary approach to sustainability. In this scenario, lack of faith in global financial and environmental institutions, combined with increasing understanding of the importance of resilience and local flexibility, leads to diminishing power and influence of these institutions compared with local and regional ones. Eventually, this leads to diverse local practices for ecosystem management. The results are mixed, as some regions do a good job managing ecosystems and others do not. High levels of communication enable regions to compare experiences and learn from one another. Gradually, the number of successful experiments begins to grow. While global problems are ignored initially, later in the scenario they are approached with flexible strategies based on successful experiences with locally adaptive management.

Global Scenario 4: Technogarden

This scenario emphasized the potential role of technology in providing or improving the provision of ecosystem services. The use of technology and the focus on ecosystem services is driven by a system of property rights and valuation of ecosystem services. In this scenario, people push ecosystems to their limits of producing the optimum amount of ecosystem services for humans through the use of technology. Often, the technologies they use are more flexible than today's environmental engineering and they allow multiple needs to be met from the same ecosystem. In the beginning of the scenario, these technologies are primarily developed in wealthier countries and slowly dispersed to poorer places, but later—promoted by a global focus on education—they are developed everywhere .Provision of ecosystem services in this scenario is high worldwide, but flexibility is low due to high dependence on a narrow set of optimal approaches. In some cases, unexpected problems created by technology and the erosion of ecological resilience lead to vulnerable ecosystem services, which are subject to interruption or breakdown. In addition, success in increasing the production of ecosystem services often undercuts the ability of ecosystems to support themselves leading to surprising interruptions of service provision and collapse of some ecosystem services. These interruptions and collapses sometimes have serious consequences for human well-being.

5.6 Scenario Inputs: Drivers of Changes for the Parrett Catchment

In the Parrett study, we followed the MA in establishing an internal 'scenario project team' and which comprised two project partners: ORMI and the Centre for Environmental Management. In order to make sense of the wealth of current information surrounding drivers of change in terms that were relevant to the Parrett Catchment, but general in their application, the team begun its scenario building work by making an initial assessment of the insights developed by the MA about the drivers of change underpinning each of its four global scenarios. This process gave the project team a series of 'headline' messages regarding some of the key certainties and uncertainties that might drive change in the catchment at the meta/global level and allowed the scenarios to reflect, from the outset, some of the axiomatic concerns of the MA itself (see Table 5.3). In terms of "certainties", the scenarios imply that, while drivers of change vary in terms of their magnitude and thresholds of influence, they may well exhibit a number of common patterns or trends in terms of their *direction of influence.* In particular, the MA scenarios imply that any given pathway for the Parrett Catchment must recognise the likelihood of:

- substantial increases in global population, with moderate population growth in the developed world;
- substantial global increases in the demand for energy;
- climate change of +2.0°C and significantly rising thereafter, coupled with sea level rises of up 30 cm, and again, significantly rising thereafter;
- significantly increased life expectancy globally and markedly ageing demographic profile in the developed world;
- Reasonably strong, but steadily declining, economic growth in the developed world.

However, what gives these MA scenarios their distinctive shape and expression are a series of more interpretative and qualitative claims about the nature of change, and in this the MA's work highlight a number of important ambiguities the project team considered guiding principles of its own work. These were:

- Innovation: whether technologies will develop rapidly or slowly;
- Openness: whether market/borders will be open or protected;
- Adaptiveness: whether attitudes to environmental management will be pro-active or reactive.

In order to build upon these general claims of the MA and to develop insight more firmly related to the geographical specificity of the study area the project team consulted more detailed bodies of national forecasting research, which were tested in turn, through the stakeholder focus groups and interviews. The review stage included incorporating the insights of the recent 'horizon scanning' initiative[26] which has covered a range of thematic areas relevant to this study including: "Future Landscapes"; Rethinking the Food Economy", and "Environmental Constraints". It also included consulting research managed by the Office of Science and Technology's *Foresight Programme*[27] and in particular two recent and complementary strategic scans of future: first, the 'Sigma Scan' by Outsights - Ipsos MORI[28] and second the 'Delta Scan' by the Institute for the Future (IFTF)[29].

[26] http://horizonscanning.defra.gov.uk

[27] www.foresight.gov.uk

28 www.sigmascan.orgn

[29] www.deltascan.org

Table 5.3: Cross-cutting themes in the MA scenarios

Driver Category	Issue	Global Orchest'n	Order From Strength	Adapting Mosaic	Techno-garden	Key Message
Demography	Global Population Growth	Up 2.5 Billion Globally	Up 4 Billion Globally	Up 4 Billion Globally	Up 3 Billion Globally	Substantial Increases in global population
	Population Growth (OECD)	Up 200 Million	Down 20 Million	Up 50 Million	Up 140 Million	Low to moderate increases in OECD
	Proportion of global population above age 65	22% (2050) rising to 42% (2100)	17% (2100)	Not stated	Not Stated	Significantly Ageing global populations
	Proportion of global population above age 65 (OECD)	Doubles to at least 30% by 2100	Doubles to at least 30% by 2100	Doubles to at least 30% by 2100	Doubles to at least 30% by 2100	Very significant ageing in OECD populations
	Unrestricted Movement of people	Very High – (Implied)	Very Low (Implied)	Possible but fragmented (Implied)	Very high (implied)	Great Uncertainty
Economy	Annual Growth Rates of GDP per Capita (OECD)	2.4% (Present-2020) 1.9% (2021- 2050)	2.1% (Present-2020) 1.3% (2021- 2050)	2.0% (Present-2020) 1.6 % (2021- 2050)	2.1%q (Present-2020) 1.7% (2021-2050)	Steady to strong economic growth, but declining
	Market systems	Globally orientated: unprotected/ open	Nation state Orientated: protected/ closed	Locally orientated within a global system	Globally orientated: unprotected /open	Great uncertainty
	Energy Use	Substantial increase. fossil fuel dominates but cleaner	Substantial increase. Fossil fuel dominates.	Substantial increase. fossil fuel dominates. Steady growth in renewables	Substantial increase. Zero and low carbon'' energy consumptio n up to 50% of market	Substantial increase, but critical uncertainty over sources
Science and Technology	Rate of technological Development in the environmenta l sector	High	Low	Medium to Low	High	Great Uncertainty
Cultural &Socio-political	Endemic attitudes to environmenta l polices and management	Reactive	Reactive	Proactive: Emphasising Learning	Proactive: Emphasising Innovation	Great Uncertainty
Environment	Global warming	+2.0^{o}C (2050) then rising to 3.5 ^{o}C (2100)	+ 1.7^{o}C (2050) and then rising to 3,2 ^{o}C (2100)	+ 1.9^{o}C (2050) and then rising to 3.0 ^{o}C (2100)	+1.5^{o}C (2050) and then rising to 2.0^{o}C (2100)	Significant rises
	Sea level rises	30 cm (2050) and then rising to 78 cm (2100)	30 cm (2050) and then rising to 62 cm(2100)	29cm (2050) and then rising to 61cm (2100)	27cm (2050) and then rising to 48 cm (2100)	Significant rises

Other Defra relevant work that has been pertinent to this stage in the process has included that undertaken by the Natural Resource Protection Futures Project (Project SD0314), a descriptive report of key trends and their associated implications for natural resources, and one that explicitly suggests could be usefully linked to emerging research into ecosystem services. On the basis of this review and consultation work the Scenario team distilled 5 key driver themes that it deemed were of critical importance to the construction of 'catchment sensitive' scenarios:

- The changing size and structure of the population;
- Household structure and housing demand;
- The movement and mobility of people;
- Changing markets for energy;
- Changing markets for food;
- Environmental changes associated with global warming.

5.6.1 The changing size and structure of the population

The scenario team followed the assumption that between now and 2050 there will be substantial increases in global population accompanied with low to moderate growth in the UK. Birth rates will continue to fall in the UK but there will be significantly increased life expectancy owing to advances in health care provision and reinforced by scientific advances, such as in developmental biology.

Most estimates suggest that the UK will see a declining share of their total population in the 16 to 59 category. By 2031 the numbers of those aged between 60 and 74 is likely to rise by 50% and those over 75, by 70%. The percentage of pensioners is expected to range between 22% and 31%. By 2050 the number of those aged over 60 could double to at least 30% of the overall population (Capital Economics, 2005). As the Sigma Scan (2006a) suggests "the ageing of the UK population is a strong unfolding trend, close to a racing certainty". However, recent projections suggest that the UK population will nonetheless increase, reaching 71 million by 2031. This is due to natural increase (more births than deaths) and because it is assumed there will be more immigrants than emigrants (a net inward flow of migrants) (ONS, 2007).

The social and economic implications of an ageing population are unclear. In the short term, there is likely to be a wave of "second-lifers": those who benefit from increased life expectancy in retirement, whilst being supported by the state to conduct (largely) work-free lifestyles. But the idea of a 'standard' age of retirement will probably become meaningless over the course of time. It is likely that the state will increasingly incentivise 'lifelong working' because an ageing demographic profile reduces savings, impacts on investment and lowers tax returns. The economic burden of an ageing population may be mitigated by in-migration, a process which will service labour-shortages across the economy.

Medical care spending will change in line with these demographics (Wanless, 2002), though those taking private health care insurance may rise as budgets are squeezed, and provision becomes more slim-lined and targeted (Sigma Scan, 2006a). Within this context there is likely to be a concerted effort on the part of the state to encourage preventative action based around the idea of 'active lifestyles'. New economic sectors are likely to open up that can capitalise on this social trend. In political, cultural and economic terms there will be an increasingly significant and well-organized grey lobby: the so called 'age and engage' demographic (Sigma Scan, 2006b).

5.6.2 Household structure and housing demand

Allied to these demographic trends the scenario team judged that there will be significant demand for new housing, as a result of new household formation and changing housing dynamics. In essence it has been suggested that social trends will lead to increasingly less people per dwelling by 2050: family units will become smaller and more fragmented; a greater number of individuals will choose to live

alone for economic and cultural reasons; capital wealth amongst the grey lobby may increase demand for second homes.

Significant programmes of housing building will therefore be a feature throughout this period. The rate of demolition will be slower in order to 'soak up' some of this demand. The total number of homes needed to meet demand in the UK is estimated to be up to 31.8 million in 2050 equating to up to 10.8 million new homes: a net increase of 140,000 – 150,000 dwellings new homes per year (Environmental Change Institute, 2007).

Models of housing development may vary widely. These may include approaches that emphasise 'concentration', such through the reclamation of brown-field sites, and the controlled expansion of existing settlements. Alternatively, development may be more dispersed and small scale and involve the active creation of new settlement structures. In all of this, market processes may override careful planning of housing resources especially in relation to environmentally vulnerable zones (such as building developments on flood plains). This process may also result in changes in the design and feel of living environments, such as the creation of "singleton settlements" based on, what the Signma Scan (2006c) terms, a 'mix of communalism and highly protected 'individualism'. A trend towards more intelligent - environmentally friendly - forms of design could be a feature of housing development in the future

5.6.3 Mobility

It is suggested by many that between now and 2050 people will be increasingly mobile at the global level (Glover, 2001) Global migration will increase exponentially through a combination of 'pull' factors (e.g. the need for skilled/unskilled workers) and 'push' factors (e.g. civil unrest, poverty, lifestyle choices and rising affluence). (Sigma Scan, 2006d) But like today, governments may continue to "manage migration". Mobility may not be available to all, and indeed, may positively discourage.

At the UK level, rapid developments in communication are likely to transform the necessity for people to move daily in the course of their work (Ware, 2003). An increasingly service-based UK economy may seize the opportunity to divest itself of formal workspaces. The distinction between home and work environments may increasingly disintegrate for a substantial section of the population. Commuting may become unusual. Dormitory towns and villages will increasingly have day-time occupants. Residential patterns may shift accordingly. For instance, migration to historically inaccessible or impractical locations may become more common place. Some of these movements may exacerbate the affordability of housing for local residents.

5.6.4 Changing markets for energy

Sustained global economic growth, along with population increases in the developing world, will drive a nearly 50 percent increase in the demand for energy over the next 15 years. It has been suggested that over the past 15 years the consumption of energy increased at about 1.5% per year. Forecasts for the next 20 years expect energy consumption to grow by 2% per year at which rate current consumption of energy would double in only 36 years. Conventional wisdom suggests that peak oil is likely to be reached over the next 50 years and that competition for energy will theore increase between nations (Roberts, 2005). It is suggested that global energy prices are likely to become increasingly unstable: periodic price rises alternating with collapses. Conflict in locations where available resources can be tapped is likely to be amplified further.

Most projections of the energy economy, but by no means all, suggest that fossil fuels are nonetheless likely to dominate. There will certainly be greater investment in oil and coal extraction techniques and in technologies and techniques that can mitigate against their carbon emissions. Yet critical uncertainty over sources could result in a number of possible energy development pathways. There is likely to be an increased push for greater energy efficiency in the UK for it decreases reliance on foreign energy sources, and saves money. Drives toward national self-sufficiency may

witness the propagation of nuclear energy programmes, and faster investment in 'green' alternatives: hydrogen, wind, wave, solar and biofuels (Sigma Scan, 2006e)

5.6.5 Changing markets for food

There will be increased food demand in association with rising world populations, growing affluence and ageing populations. Many commentators and analysts have voiced concerns about the planet's capacity to support global per capita consumption at the rates currently enjoyed by developed nations. The global demand for meat will be an interesting feature of this process, for as people get wealthier, they tend to eat more.

It is a matter of some debate whether agricultural markets will become increasingly liberalised over the next 50 years (Potter and Tilzey, 2005). A number of commentators have suggested that the future may be characterised by a renewed sense of economic protectionism, though the weight of opinion suggests this will not be so. If, as many have argued, UK markets become more 'exposed' the organisation of the agricultural economy may change dramatically. Some suggest this process would result in a spatially differentiated countryside (Marsden, 2003; Wilson, 2007). There will be growth in larger production units to exploit world markets and maintain competitive efficiency in areas where UK agriculture has a comparative advantage. This process of consolidation may result in the resurgence of some sectors of the agricultural economy, such as livestock farming, where assured products become an important guarantor of quality and perhaps a unique selling proposition abroad. At the same time, exposure to world markets will mean many medium and smaller-sized food producers will be faced with the prospect of going out of business or otherwise adapting their practices substantially to bend with prevailing consumer attitudes and tastes.

If farmers go out of business they will need to be progressively retrained and reintegrated into the economy in new ways. If farmers choose to adapt, new models of land-based production may emerge. For instance, the UK's population, well versed in the sustainability issues surrounding food quality, safety and animal welfare and biodiversity may drive the expansion of food markets that combine short supply chains with the production of public desirably environmental goods, such as biodiversity and tranquillity. In the UK, state-supported environmental stewardship schemes, as well as the wider mandates of cross-compliance, are arguably part of the transition towards this model (Potter, 2007). Indeed, under this assumption, the state will have entirely retreated from the agricultural economy by 2050.

In the UK as elsewhere, it is likely that will be shifts to new forms of food production in light of changing climatic patterns, such as viticulture, while vulnerability of the agricultural industry to environmental hazards may mean that experimentation and uptake of GM food production will be common place. The production of energy crops is likely to be a standard feature of UK countryside in 2050.

5.6.6 Environmental changes associated with global warming

Set against these processes of social change the project accepts that the implications of climate change and global warming will be keenly felt in the future. The UK Climate Impacts Programme (www.ukcip.org.uk) suggests, for instance, that while caution must always be exercised with climatic projections, there are number of things we can now say with some confidence.

- *The UK will continue to get warmer.* Average annual temperature for the UK could rise by 1˚C by 2040 and 5˚C by 2100. There will be greater warming in the summer and autumn than in the winter and spring, the thermal growing season will continue to lengthen while soil moisture levels in the summer and autumn will decrease.
- *Summers in the UK will continue to get hotter and drier***.** By 2040, the average summer temperature for the UK could rise by 2˚C, and by 2100 by 6˚C, By 2100, there could be up to 50% less precipitation in summer months. The number of days when buildings require cooling is expected to rise in consequence.

- *Winters in the UK will continue to get milder and wetter*. The average winter temperature for the UK could rise by 1°C by 2040 and 4°C by 2100. There is expected to be up to 30% more precipitation in winter months, and far less occurrence of snowfall events.

These processes will be accompanied by global sea level rises. By 2100 these could have risen by as much 80cm around the UK coastline. Extreme sea levels are expected to be experienced more frequently. By 2100 storm surge events could occur up to 20 times more frequently. If these trends are realized, they will have major implications for patterns of living and economic production in the UK, not least in the land-based economy. Even so, while extreme events (such as flooding) will become more common the UK will appear an environmental safe-haven compared to many other countries. This may have a demographic effect: pressure to accept environmental refugees in light of environmental disasters may become common place, while the UK may be viewed a residential 'hotspot' for the wealthy and mobile.

5.7 Next steps

The aim of this chapter has been to construct a set of scenarios that can be used to help people discuss some of the issues that might affect the management of ecosystem services and well-being issues within the catchment. The scenarios have been constructed to reflect the global concerns of the Millennium Ecosystem Assessment, but built in such a way that they capture some of the cross-cutting local issues that may impact on the natural resources that are found in the Parrett. In the Chapter that follows these scenarios have been operationalised using a range of mapping approaches, and used to test stakeholder reactions to the method, the ideas about an Ecosystems Approach that they convey and the types of future they suggest.

Box 5.1: Key Messages from Chapter 5

This chapter examines the value of 'scenario building' as a tool by which decision makers in the Parrett Catchment might make more informed choices about the future.

Scenario building is process of describing a contrasting set of narratives about the long term future based on hypothetical propositions about the character and interaction of drivers change. While scenario building techniques do not yet represent standard practice in approaching issues of natural resource management, allocation and valuation, an understanding of these techniques is central to ecosystems approach and Defra's (2007a) Action plan.

While there are many scenario building exercises at the global level, there is a need to develop and evaluate these techniques at more localised scales. This issue was explored within the context of the Parrett study, which followed the MA approach in establishing an internal 'scenario project team'.

For this study the scenario building work begun by making an assessment of the insights developed by the MA, about the drivers of change underpinning each of its four global scenarios. This process gave the project team a series of 'headline' messages regarding some of the key certainties and uncertainties that might drive change in the catchment at the meta- and global level. This approach also allowed the scenarios to reflect some of the axiomatic concerns of the MA itself.

The MA scenarios imply that any given pathway for the Parrett Catchment must recognise the likelihood of:

- substantial increases in global population, with moderate population growth in the developed world;
- substantial global increases in the demand for energy;
- climate change of +2.0^{o}C and significantly rising thereafter, coupled with sea level rises of up 30 cm, and again, significantly rising thereafter;
- significantly increased life expectancy globally and markedly ageing demographic profile in the developed world;
- Reasonably strong, but steadily declining, economic growth in the developed world.

In order to give the resulting scenarios their distinctive shape and expression, a series of more interpretative and qualitative claims about the nature of change were considered, including:

- Innovation: whether technologies will develop rapidly or slowly;
- Openness: whether market/borders will be open or protected;
- Adaptiveness: whether attitudes to environmental management will be pro-active or reactive.

To develop locally relevant scenarios, the project team refined thinking about these issues by consulting more detailed bodies of national forecasting research, and tested potential scenario storylines through the stakeholder focus groups and interviews.

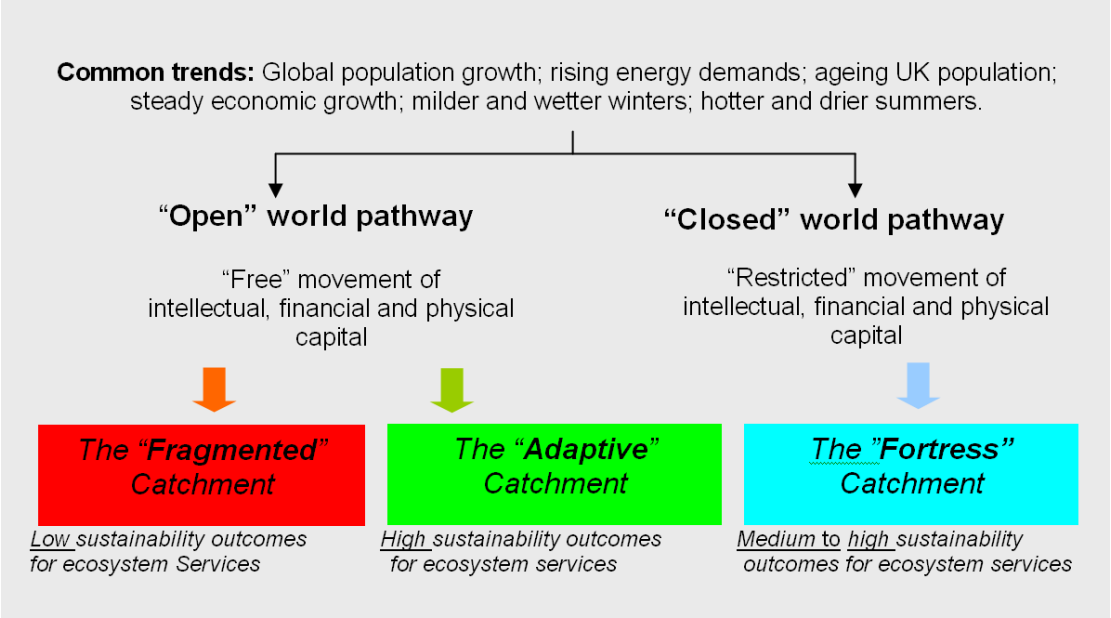
Chapter 6: Evaluating the Scenarios for the Parrett Catchment

6.1 Introduction

The project team have developed 3 scenarios for the Parrett Catchment. These are termed the *'fragmented'* catchment, the '*adaptive'* catchment and the *'fortress'* catchment respectively. The general parameters of these scenarios are shown in Figure 6.1.

Given the analysis above each of the scenarios we describe share a number of key assumptions. In terms of *indirect drivers* they share the view that: global populations will rise; that the demographic profile of the UK will age; and further that there will substantial global increases in the demand for energy. They also work on the assumption that in the UK there will be reasonably strong, but steadily declining, economic growth. In terms of *direct drivers* all of the scenarios work on the general assumption that winters in the UK will be milder and wetter and summers hotter and drier. What initially distinguishes the scenarios is the extent to which their pathways of development are governed by an 'open' or 'closed' world. This distinction reflects two, fundamentally different, views about how the future will unfold.

Figure 6.1: Scenario overview



Under the **'open world'** pathway the Parrett Catchment develops in a world of global inter-connectness, one premised on expanding open world markets and the generally free movement of intellectual, financial and physical capital. Here the role of the nation state as an agent of change has been progressively diminished. It has been replaced with a litany of supra-national organizations attempting to regulate this increasingly globalised world to good and ill effect. In the open pathway, environmental problems, such as climate change, continue to be met with co-ordinated programmes of action at the supranational level, but these efforts are less responsive to local circumstances. Indeed, while the focus of many of these

organisations is on improving human quality of life, they tend to be cumbersome from the point of view of managing local systems. In an important sense, then, this results in a world that involves a fairly reactive approach to natural resource management at the global scale, despite good intentions. By 2050 systems of global governance seem to be disconnected from the lives and livelihoods of ordinary people on the ground.

In contrast under the **'closed world'**-pathway the Parrett Catchment operates in a world of where the ascent of globalization has been progressively resisted and rejected. The expanding open world markets of the early 21st century have been replaced by a culture of protectionism and introspection among 'liberal' western democracies. This is a development pathway in which the rich protect their borders, and attempt to confine poverty, conflict, environmental degradation, and deterioration of national resources to areas outside of those borders. This process has been driven by a series of real and perceived crises in globalization: the widely felt economic 'downside' of exposing industry to the disciplines of free trade; the perceived 'burden' of hosting economic and environmental migrants; instability in world financial markets; the spread of international 'terrorism'; as well as periodic fuel and food shortages resulting from widespread dependency on imports. Under this pathway, the role of the nation state as an agent of change has been progressively re-asserted and established. There are new drives towards national "self-sufficency" and "self-determination" across the whole ambit of the sustainability. This is the old-world order re-visited. Localised action is governed by the imperatives of national strategic planning.

Under each of these general pathways the more specific scenarios for the catchment begin to emerge. Two of these scenarios - the 'fragmented' catchment and the 'adaptive' catchment depict responses to the 'open' pathway, while the 'fortress' catchment represents a possible response to the 'closed' pathway.

*6.1.1 Catchment responses to 'open' pathway (i) – **The 'Adaptive' Catchment***

Under this first scenario a lack of faith in global institutions combined with the 'retreating' state has lead to approaches that favour local experimentation in the management of natural resources. This is a process that has created a highly effective culture of resilience and adaptation, one based on devolved autonomy and participatory political structures. Intelligent spatial planning has effectively created a catchment of mixed-use 'bio-communities', one where positive links between local energy and food production, homes and access to open space have been mutually reinforcing. Development has been extensive but is generally disperse, low impact and includes extensive provision for affordable housing. The integration of local resources into the design of these communities is widely accepted practice.

Food production and exchange is geared towards the 'proximity principle': that is, on short supply and distribution chains. Livestock and arable farmers thrive, as do those cultivating land for energy. In the absence of heavily incentivised state support for environmental stewardship, land managers are encouraged to exploit low cost ways of adapting to climate change, such as the creation of new wetland habitats to attenuate flood waters. This is a catchment that meets the repercussions of global environmental change with ingenuity. The creation of "amphibious" homes, where buildings effectively float on the water when a storm surge occurs, is but one example of the adaptive spirit at the heart of this scenario (See Table 6.1).

Table 6.1: Parrett Catchment Scenarios 2050 - key themes

Driver Issues	Fragmented Catchment	Adaptive Catchment	Fortress Catchment
Population	Significantly growing population due to high immigration, steady birth rate and advances in healthcare. Polarisation between residents who enjoy protected tranquillity/leisure versus workers	Moderately growing and ageing population due to steady in-migration, low birth rate and advances in healthcare. Diverse (mixed use) and novel types of communities	Low to moderate growth in population/ significantly ageing due to low birth rate, low in-migration and advances in healthcare. Concentration in existing centres.
Mobility	Commuting to work still necessary for some of the population, despite expense. Lack of integration/investment in public transport. Restricted or regulated access to protected areas	Reduced commuting reflects more local orientation of employment and leisure patterns Access to open space a high priority – but emphasis on local provision rather than high-status 'honey-pots'. Good public transport	An expensive necessity – also commuting aided by good public transport. Access to the leisured countryside - parkland expansion to accommodate wider use
Energy	National sources	Emphasis on local sources	National and local sources,
Climate	Warmer summers, milder wetter winters, increase unpredictability of weather patterns.	Warmer summers, milder wetter winters, increase unpredictability of weather patterns.	Warmer summers, milder wetter winters, increase unpredictability of weather patterns.
Housing	Conversion of redundant farm buildings, ribbon development. Some expansion of population in rural areas, but also urban concentration of development – ribbon developments and development on flood plains reflect weaker controls	Dispersed/low intensity/mixed. Expansion of population in rural areas but development is 'sustainable'	Renewal and protection of status quo. Concentration of existing patterns of housing and employment
Land Use and environmental Management	Polarised with intensification in some areas and abandonment in others, lack or low commitment to stewardship – except in areas with high conservation or cultural value. Increased diffuse pollution risks from intensified agriculture. Land abandonment in marginal areas and intensification on best land. Ad hoc approaches to environmental management and regulation. Targeted conservation measures	Local markets, with market led approaches to stewardship to assure food quality. Some intensification in best areas and diversification into energy crops. Expansion of local recreational opportunities. Reduced diffuse pollution risks from lower-input agriculture and better farm practices. Expansion, restoration and buffering of areas of high conservation value. Soft engineering solutions flood mitigation rather than control. Market-based approaches to environmental management and regulation	Some intensification in best areas to meet national needs, but also focus on local markets, stewardship schemes mainly target priority areas in farmed landscape. Hard engineering solutions, flood control rather than mitigation. Additional river and flood control measures to protect existing assets. Levels of diffuse pollution risk hardly change from today. Protect, ring-fence key conservation areas rather than expand and buffer
Employment	Polarisation of employment patterns – patterns dependent on location and context	Diversification of employment patterns with focus on local markets and home working.	Employment patterns follow national trends rather than local needs, opportunities depend on mobile workforce.
MA (2005) parallel	This scenario approximates most closely with the 'Global Orchestration' scenario	This scenario approximates most closely with the 'Adapting Mosaic' scenario	This scenario approximates most closely with the 'Order from Strength' and 'Technogarden' scenarios

*6.1.2 Catchment responses to 'open' pathway (ii) – **The 'Fragmented' Catchment***

The fragmented catchment is effectively the adaptive catchment *gone wrong*. This is a future where the drive towards more open systems of global trade has been met with passive indifference. It is one that has left us with an agricultural industry on its knees, at least as we understand it today. Smaller and medium sized enterprises are no longer viable propositions. Efforts to reinvigorate the agricultural economy around more localized systems of production and exchange didn't work. Consumers simply continued to buy cheap imports from the big supermarket chains. Instead, a handful of "super-farms" have emerged in the catchment that can generate sufficient economies of scale to exploit emerging energy and food markets.

And yet, this is a scenario in which land use controls are also weak in the face of market signals. Unsympathetic ribbon development is common, as is the building of homes on flood plains. Protected areas of high environmental value in the catchment remain, but access to them is limited to those who are prepared to pay directly for them. These changes have come with few environmental guarantees, not least because incentives for stewardship are no longer in place. Some areas of land are simply abandoned. The farm properties and out-buildings that populate this rural landscape have been redeveloped, partitioned and sold off to private individuals. Such developments, like others in urban areas, have often been 'intelligent', reflecting the environmental tastes, values and work requirements of those who dwell in them. Yet this is a scenario in which land use controls are also weak in the face of market signals. Unsympathetic ribbon development is common, as is the building of homes on flood plains. Protected areas of high environmental value in the catchment remain, but access to them is limited to those who are prepared to pay directly for them. In the fragmented catchment scenario, social cohesion and environmental equity is poor. On the one hand we have the people who occupy these landscapes of tranquillity and leisure. On the other we have the people whose job it is to service their aspirations and desires. This latter group are people who live, of course, in the catchment's most environmentally vulnerable areas (See Table 6.1).

*6.1.3 Catchment responses to 'closed' pathway: **The 'fortress' catchment***

Like the adaptive catchment scenario the fortress catchment scenario has some positive messages for sustainability agendas in 2050, but it rests on an entirely different approach to management. It is a highly interventionist and centralist of account of the future, one that places the nation state at the heart of catchment decision making. This is a world in which the government of the day offers unambiguous direction and clear leadership to local decision makers. Indeed, the UK's progressive retreat from the disciplines of market liberalisation has been accompanied by the development of wide ranging and highly prescriptive strategies across the environmental, social and economic arenas.

Catchment planning is based on a "mosaic" approach, whereby different land uses are configured on a sub-regional basis to help meet national targets for the production of food, energy, leisure and shelter. Food targets, for instance, are driven by nutritional standards and the need to create a "five a day" farming system. This has the effect of transforming an otherwise ailing agricultural economy in the region, though such opportunities for production have to juggle with other priorities. For instance, a reinvigorated national approach to habitat and environmental protection effectively ring-fences off large areas of the catchment as publicly desirable (and accessible) parkland, ones that have strict land management controls placed upon them. Urban development is also highly restricted. The overriding principle is concentration and renewal, not expansion. Growth in renewables is steady, driven by the need to meet local energy 'quotas' Interventions in the catchment designed to adapt to the effects of climate change are based on effective, but highly engineered and technological, solutions: dredging river channels; the raising of the riverbanks; the building of new drainage systems across the catchment, and so forth (see Table 6.1).

6.1.4 Implications for ecosystem goods and services

In Chapter 4 we suggested that although rich body of potentially useful information exists to map the geography of ecosystem services in the Parrett Catchment, the way these relate to the ecosystem services that are significant in the study area is at present unknown and that the potential lack of time-series data, and the extent to which the dynamics of ecosystem service provision might best be explored through the construction of models and scenarios. As part of the process of constructing these scenarios we therefore sought to make a reasoned attempt to ecosystem service "proof" each of the scenarios.

The principles that underpinned the development of ecosystem service scenarios are outlined in Table 6.2; they attempted to cover both demand and supply side issues. Their application can also be illustrated by reference to Figure 6.2, which shows a comparison of the three different scenarios for the Somerset Levels. In each case the maps show the extent of the EA Zone3 flood risk zone (1:1000 year flood), the zone in which the major wetland areas located. In the ***'Adaptive'*** (Figure 6.2a) catchment flood risk is assumed to have been managed in the future in an 'intelligent' way through an integrated strategy covering the whole catchment. Thus in this scenario, an expanded area for the levels is shown so that they deliver maximum flood alleviation benefits. Moreover, since the ecosystems are functioning, healthy systems, they deliver a wider range of other benefits across broader areas; the benefits include biodiversity, carbon sequestration and recreation etc. All of the wetland areas in this scenario are assumed to have achieved favourable conservation status, whether they are formally designated as a SSSI or not.

For the '***Fortress***' catchment scenario (Figure 6.2b), flood risk managed mainly through

Table 6.2: Ecosystem services: supply and demand under the three scenarios

	Adaptive	Fortress	Fragmented
Demand for ecosystem services	○ *High demand for all ecosystem services which are used to support employment in rural areas*	○ *Value of ecosystem services not fully recognised unless their direct market value can be recognised*	○ *Localised demand for ecosystem services*
Supply of ecosystem services	○ *Good design creates opportunity for enhanced output of ecosystem services – esp. regulation*		○ *Locally some opportunities to supply ecosystem services are realised – but not those that operate at broader landscape scales.*

engineering solutions to minimise inundation. Total area of wetlands reduces but the condition of the remaining patches is assumed to improve through strong national policies for environmental protection. Wetlands systems are healthy but the total benefits they deliver is diminished by loss of area compared to the adaptive strategy. In this scenario only SSSI are assumed to have achieved favourable conservation status and be functioning optimally. Finally, for the ***'Fragmented'*** catchment (Figure 6.2c), flood risk has been assumed not to have been managed in an integrated way, and so different strategies have been tried in different places. The map thus shows that the ability of the Levels to deliver benefits such water quality and wildlife is impaired - the core area reduces and patches fragment.

Similar kinds of logic were applied to develop the maps that supported the account of the for the other scenario themes (Table 6.1). The approach essentially took existing patterns across the whole catchment (of say farm type or housing structure) and modified according to the general assumptions that underpinned each scenario.

Thus in relation to future farming and settlement patterns in the ***'Adaptive'*** catchment the growth and vibrancy of local food markets was assumed – and this was reflected in the diversification and spread of farm types and controlled growth of small settlements across the region. By contrast, in the '***Fortress***' catchment, the responses were dominated by national factors, and concentration both of farming and settlement was shown. The concentration also resulted in abandonment of some of the higher, marginal areas. Finally in the ***'Fragmented'*** catchment a more disjointed, mixed picture was shown to emerge.

The maps were produced using the ArcMap GIS and all drew on present data as the base-line, which was modified according to the different assumed trends. The aim of the mapping exercise was to give people a visual understanding of what the implications of the different scenarios were, rather than to make precise predictions of the future. Thus no deterministic or stochastic modelling techniques were used, although clearly if the approach was refined then this could be attempted. No differentiation was made about the speed with which the different scenario outcomes would be achieved. Once created, each map coverage was converted to 'pdf' format and loaded to the project web site with accompanying narrative. All the maps produced can be reviewed by accessing the consultation section of 'catchment futures'.

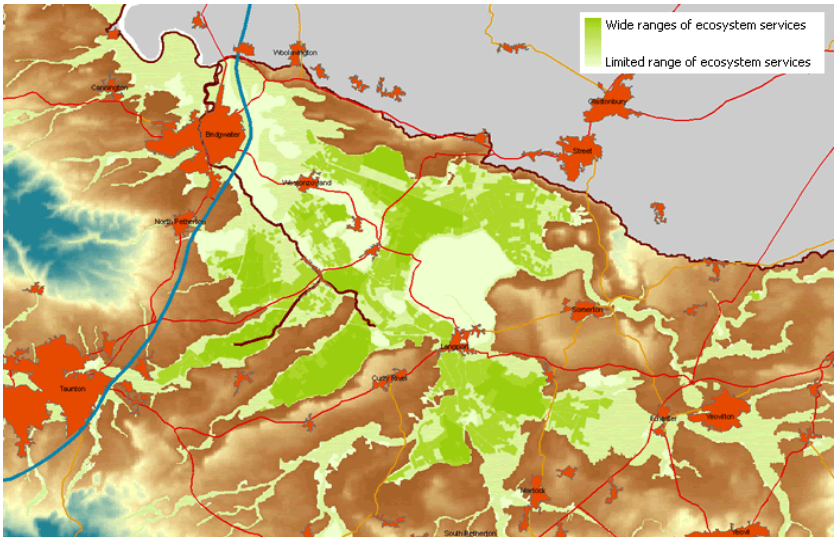
6.2 Stakeholder consultation on Scenarios

While the scenarios we have constructed are by no means exhaustive of the possible pathways of development the Parrett Catchment might face, the process we have initiated serves as a useful basis for beginning to gauge the value of this approach to decision makers working with the case study area, and as a result, to make more general judgments as to the efficacy of the technique for helping to embed an Ecosystems Approach into decision making arenas at the local level. In order to pursue these concerns the project team initiated a process of consultation in which the substantive tenets of the scenarios could be communicated to stakeholders in a format that might be plausibly used by them in future circumstances. In other words, the consultation process was designed to assess the value of presenting scenarios in a particular format as much it was designed to evaluate the content of the scenarios *per se.*

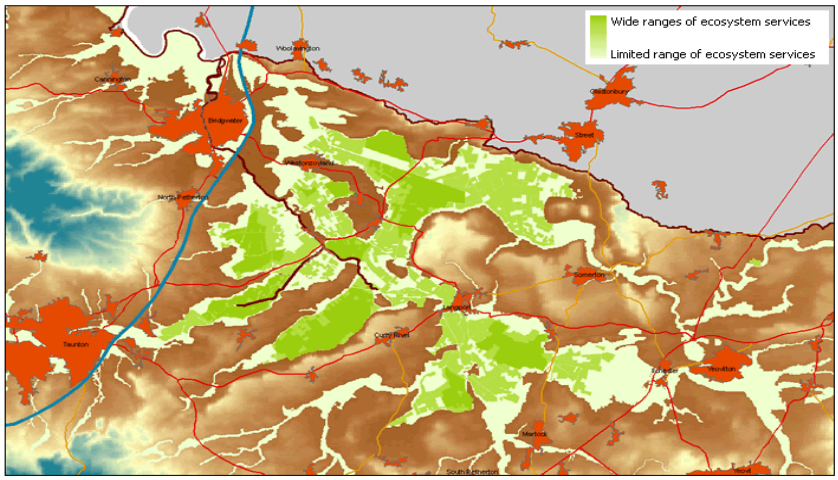
The project team judged that a likely means in which scenario work might proceed is through a web-based interface. Web resources are potentially useful for they can present scenarios through a widely accessible medium, and offers opportunities for decision makers to navigate around graphic and written forms of scenario information. As a result, a web interface for communicating the details and implications of the three scenarios was developed, employing text, diagram and map-based methods to convey insight and linking these to a structured on-line questionnaire. In essence, the project team translated the information outlined above into series of web pages that could guide consultees through the logic underpinning each of the scenarios as the basis for a more general evaluation of the technique (see Figures 6.3 – 6.6 for an overview).

Figure 6.2: Ecosystem Services in the Parrett Catchment - Somerset Levels (2050)

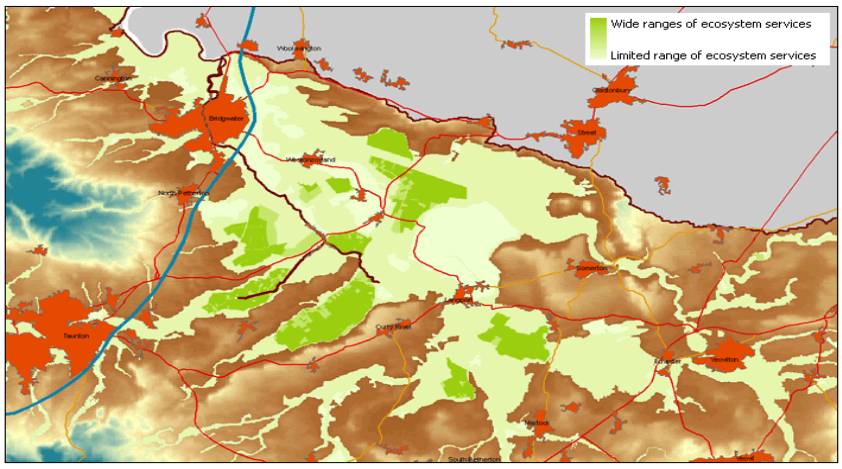
(A) *Somerset Levels and Moors under the 'Adaptive' scenario*



(B) *Somerset Levels and Moors under the 'Fortress' scenario*



(C) *Somerset Levels and Moors under the 'Fragmented' scenario*



We have mapped the ability of the Levels to provide ecosystem services (such as water regulation, conservation and recreation) under each of these scenarios the darker the green on the map the more services the different parts of the Levels provide. Terrain is shown in shades of brown to blue

In the ***'Adaptive'*** catchment flood risk is managed in an intelligent way through an integrated strategy covering the whole catchment. Image A depicts an expanding area of the Levels to deliver flood alleviation benefits since ecosystems are functioning, healthy systems.

In the ***'Fortress'*** catchment scenario, flood risk managed through engineering to minimise inundation. Total area of wetlands reduces but the condition of the remaining patches is improved through strong national policies for environmental protection. Wetlands systems are healthy but the total benefits they deliver are diminished by loss of area compared to the adaptive strategy.

In the ***'Fragmented'*** catchment scenario flood risk has not been managed in an integrated way - different strategies have been tried in different places. Image C depicts that the ability of the Levels to deliver benefits such water quality and wildlife is impaired - the core area reduces and patches fragment.

Figure 6.3: Scenario Consultation home page

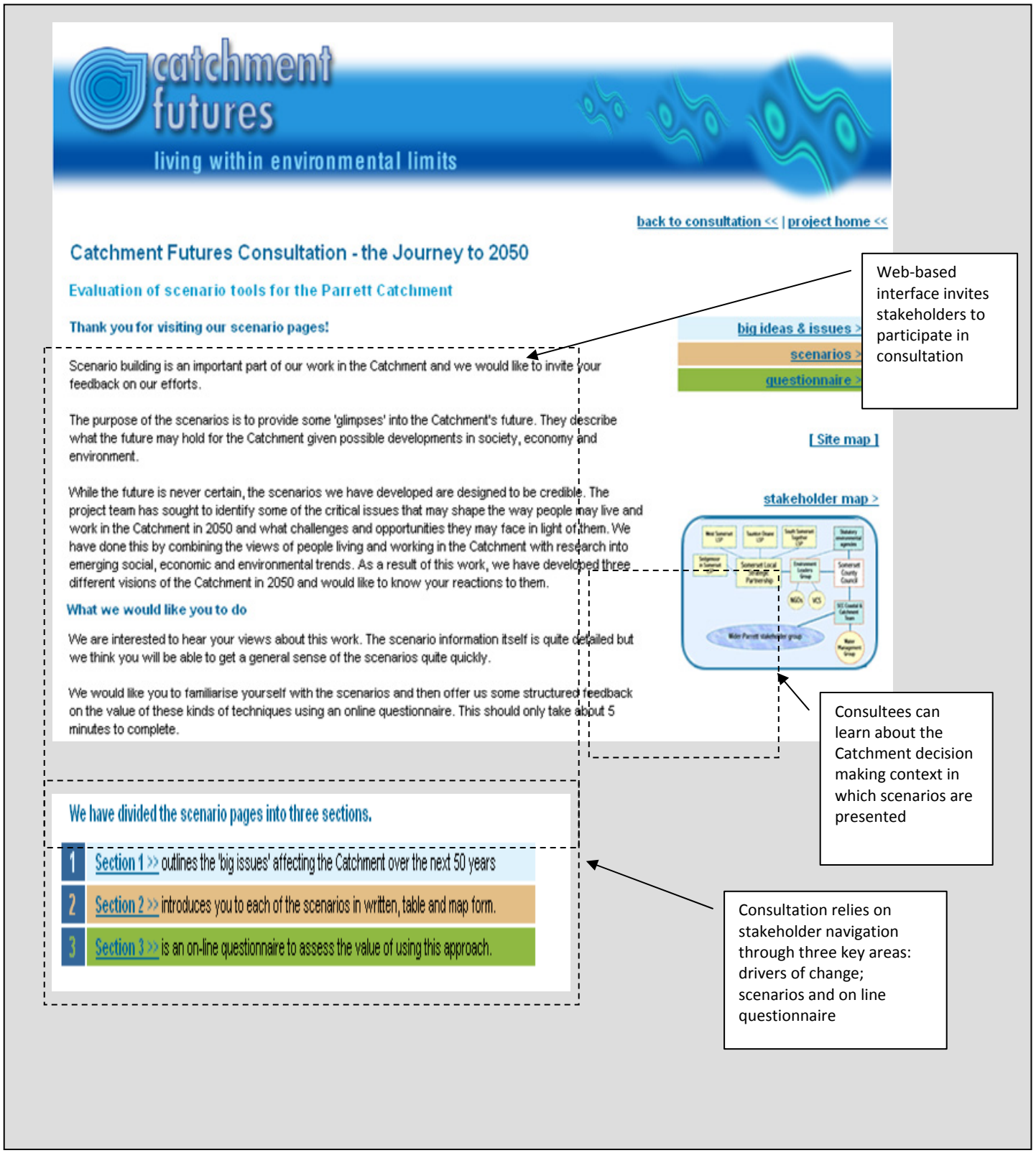
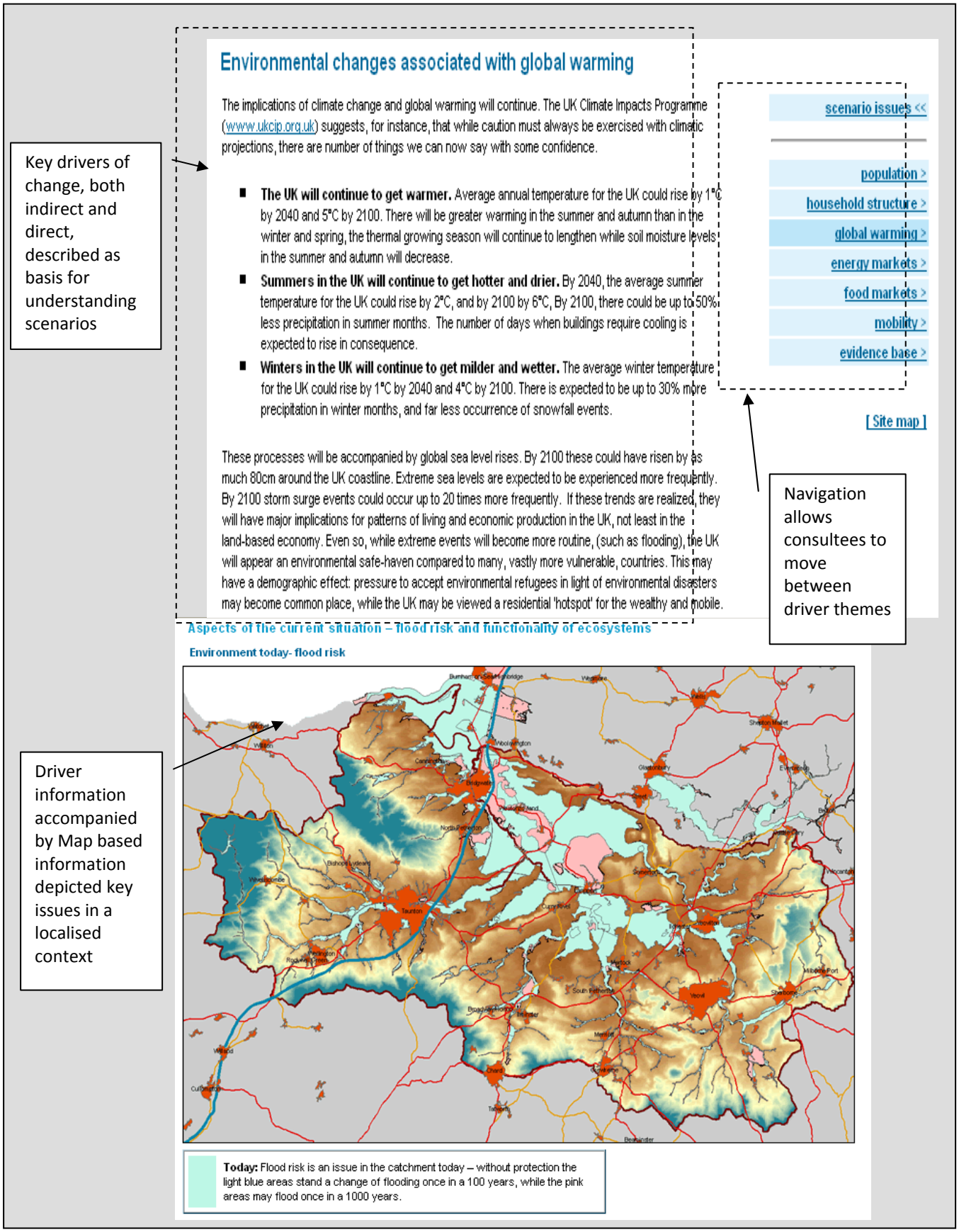


Figure 6.4: Web consultation - Depiction of emerging trends (Drivers)



Scenario 1 - the 'Adaptive' catchment

This scenario operates in the same kind of the world as the Fragmented Catchment, but local responses are entirely different.

scenario introductions <<
1 adaptive catchment >
2 fragmented catchment >
3 fortress catchment >
[Site map]

General Trends in 2050

Under this scenario the Parrett Catchment operates in a world of global inter-connectness, one premised on expanding open world markets and the generally free movement of intellectual, financial and physical capital. The role of the nation state as an agent of change has progressively diminished. It has been replaced with a litany of supra-national organizations attempting to regulate this increasingly globalised world to good and ill effect.

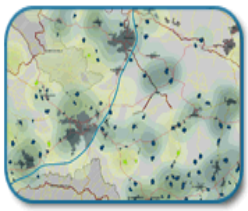
Environmental problems, such as climate change, continue to be met with co-ordinated programmes of action at the supranational level, but these efforts are less responsive to local circumstances. Indeed, while the focus of many of these organisations is on improving human quality of life, they tend to be cumbersome from the point of view of managing local systems. In an important sense, then, this is a world that involves a fairly reactive approach to natural resource management at the global scale, despite good intentions. Systems of global governance seem to be disconnected from the lives and livelihoods of ordinary people on the ground.

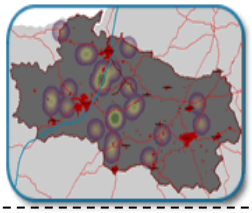
Local Responses in 2050

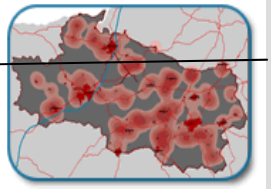
Unlike the fragmented catchment a lack of faith in global institutions combined with the 'retreating' state has lead to approaches that favor local experimentation in the management of natural resources. This is a process that has created a highly effective culture of resilience and adaptation, one based on devolved autonomy and participatory political structures. Intelligent spatial planning has effectively created a catchment of mixed-use 'bio-communities', one where positive links between local energy and food production, homes and access to open space have been mutually reinforcing.

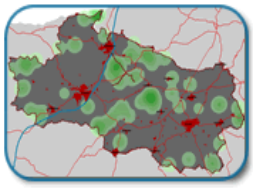
Development has been extensive but is generally disperse, low impact and includes extensive provision for affordable housing. The integration of local resources into the design of these communities is widely accepted practice. In the advent of unstable world markets for energy, communities effectively start to 'power' themselves through integrated, clean and soft energy systems: domestic wind turbines are as common place as television aerials! Food production and exchange is geared towards the 'proximity principle': that is, on short supply and distribution chains. Livestock and arable farmers thrive, as do those cultivating land for energy.

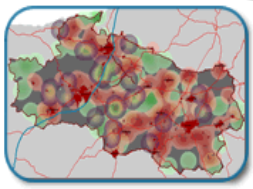
In the absence of heavily incentivised state support for environmental stewardship, land managers are encouraged to exploit low cost ways of adapting to climate change, such as the creation of new wetland habitats to attenuate flood waters. This is a catchment that meets the repercussions of global environmental change with ingenuity. The creation of "amphibious" homes, where buildings effectively float on the water when a storm surge occurs, is but one example of the adaptive spirit at the heart of this scenario.

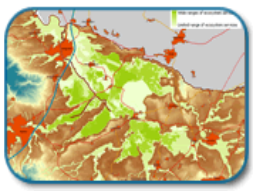












The Adaptive Catchment – Overview of Key Trends

Issues	Key Trends
Population	Moderately growing and ageing population due to steady in-migration, low birth rate and advances in healthcare. Diverse (mixed use) and novel types of communities.
Mobility	Reduced commuting reflects more local orientation of employment and leisure patterns. Access to open space a high priority – but emphasis on local provision rather than high-status 'honey-pots'. Good public transport.
Energy	Local sources.
Climate	Warmer summers, milder wetter winters, increase unpredictability of weather patterns.
Housing	Dispersed/low intensity/mixed. Expansion of population in rural areas but development is 'sustainable'
Land Use and environmental Management	Local markets, with market led approaches to stewardship to assure food quality. Some intensification in best areas and diversification into energy crops. Expansion of local recreational opportunities. Reduced diffuse pollution risks from lower-input agriculture and better farm practices. Expansion, restoration and buffering of areas of high conservation value. Soft engineering solutions flood mitigation rather than control. Market-based approaches to environmental management and regulation.
Employment	Diversification of employment patterns with focus on local markets and home working.

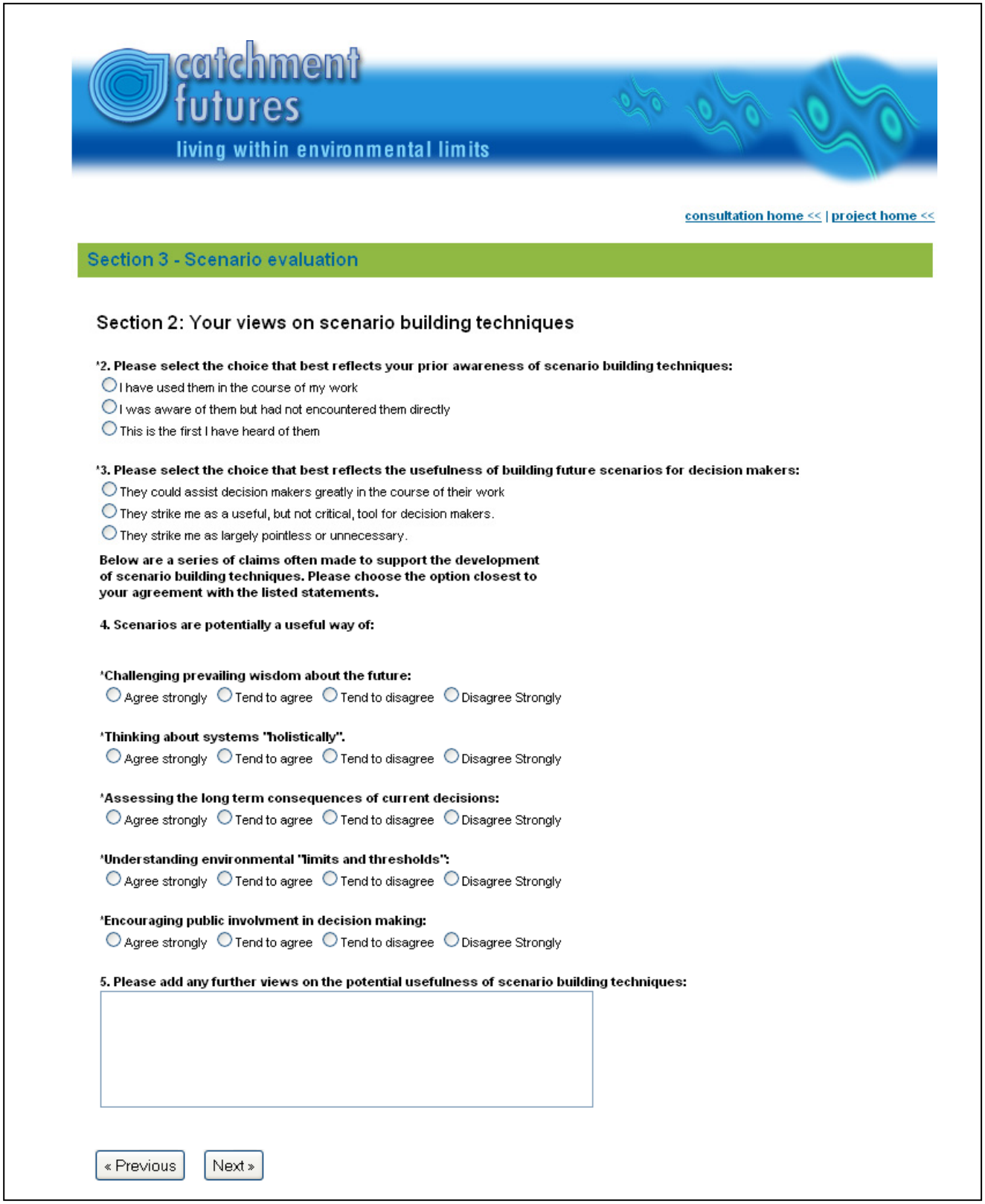
Navigation allows consultees to move between Scenarios

Key issues in scenarios are depicted in map based form at different projections

Written pen script of is presented for each scenario.

Key themes of scenarios are emphasised in table form

Figure 6.6: Web consultation - on-line questionnaire



In terms of the key areas of questioning for the consultation, the project sought to elicit specific views on:

- prior awareness of scenario building techniques;
- perceived usefulness of building scenarios of the future for decision makers;
- extent to which the technique can potentially:
  - challenge prevailing wisdoms about the future;
  - clarify the 'synergies' and 'trade-offs' between different policy areas;
  - think about systems 'holistically';
  - develop a common vision for the future among stakeholders;
  - assess the long term consequences of current decisions;
  - understand environmental 'limits and thresholds;
  - encourage the involvement of the public in decision making.
- adequacy of information provided to explain the scenarios;
- clarity of language and maps used to describe the three scenarios;
- importance of using written text, summary tables and maps to characterise scenarios;
- potential value of using hand drawings and photo-realistic representations of whole landscapes to characterise scenarios;
- plausibility and robustness of scenarios

A detailed description of the online questionnaire is presented in Appendix 6 and Figures 6.2 – 6.6.

6.3 Responses to the consultation

Invitations to participate in the online consultation were disseminated among strategic and frontline stakeholders who occupied roles either on, or working in conjunction with, the Environmental Leaders group and the Water Management Partnership and who interacted with the project at earlier stages of the research. While the technique may be potentially used directly in conjunction with the wider Parrett Catchment community, this consultation did not include citizen reactions to the scenarios. Invitations were circulated to 74 stakeholders although the primary purpose of the consultation was not to conduct an extensive survey. The survey was designed to be purposive in its sampling: eliciting detailed views on the technique from contrasting stakeholder organisations and networks across the catchment. The consultation opened for four weeks in early 2008 and in terms of the *range* of organisations and groups operating in the catchment, the project team secured responses from:

- RSPB
- The Environment Agency
- Somerset County Council
- Taunton Deane Borough Council
- Sedgemoor District Council
- National Farmers' Union
- Natural England
- NGOs (such as Forum 21: West Somerset)

In addition, the project team also evaluated the value of the scenarios with wider groups who may potentially use this technique in the course of their work. To this end the scenarios were presented and evaluated at the "Going underground" scientific network[30] in January 2008. This network comprises a multidisciplinary community of researchers working specifically in the area of land management and pollution, often in a catchment specific context. The consultation also elicited the views of engineers working on drainage management in the catchment and independent research consultants working in the field of ecosystem

[30] http://www.shef.ac.uk/going-underground

management and valuation. In total 27 people shared their views about the scenarios with the project team. Most respondents preferred to offer verbatim views on the materials rather than completing the structured on-line questionnaire. This partly reflects the nature of the technique in that it tends to generate reactions that are not necessarily amenable to a structured and closed questionnaire. Thus many wished to elaborate upon their views directly. All responses to the consultation have been anonymised.

Key messages

The potential value of scenario building exercises

With some important caveats and reservations, most consultees were positive about the value of scenario building as a potential tool for catchment level decision making. As one put it, echoing the concerns of Defra's action plan, "this country is so short term in terms of the planning horizons, often only thinking 5 and 10 years ahead…[scenarios]… are a way of "trying to deliver the bigger picture. We need to know where we might be going". All of our respondents were aware of the technique though the majority had not used scenarios personally. In total, over ninety per cent of respondents suggested that they thought scenarios could potentially be either a "useful" tool for decision makers, or assist them "greatly" in their work.

In particular, the majority of respondents felt that the technique had the potential to deliver important insight about the future across a range of cognate issues, from challenging 'prevailing wisdoms' to thinking about systems 'holistically' and into assessing the long term 'consequences' of current decisions. However, a significant number of respondents were less convinced that as to the extent to which scenarios might help them understand 'environmental 'limits and thresholds'. Over 40% of respondents tended to disagree with this proposition, an issue that partly reflects the nature of the scenarios presented. In our work, the delimitation of thresholds was not an explicit feature of the scenario building process. (See Table 6.3)

Table 6.3: Potential value of scenario building tools

Scenarios are potentially a useful way of:	***Agree strongly***	***Tend to agree***	***Tend to disagree***	***Disagree Strongly***
challenging prevailing wisdoms about the future	20%	70%		10%
thinking about systems 'holistically'	40%	60%		
assessing the long term consequences of current decisions	30%	60%	10%	
understanding environmental 'limits and thresholds	40%	20%	40%	
encouraging the involvement of the public in decision making	20%	60%	10%	

As the last of these tabulated responses suggests scenarios are not only regarded as of value to decision makers, but to wider stakeholders as well. As one put it "I think scenarios are a valuable exercise because they provide a good way of engaging a range of consultees from policy makers through technical experts to the public". They are a "useful communications tool" according to another. In particular, for many respondents, the value of scenarios was in their ability to help make abstract ideas 'real':

> "I think the [catchment] scenarios are really useful because having used scenarios in the past I find that people find that much easier than conceptual ideas, because once

you are beginning to describe what it will be like I think for people who are used to the terminology *it's just a bit easier* because you can start to see the difference"

"I think it's definitely got scope for further development if we want to really start saying 'Where we are and how do we start scoping out different options' particularly for things in the future that people struggle to say what does this mean for my community? We do quite a lot work on climate change and it's about trying to paint that picture about what that means for Somerset. With these techniques I think there is potential for getting people to begin to relate to it, rather than understanding the issue as something very distant – a global issue - which they have no impact on. I think with the scenarios you are starting to get to that level where the public can say 'I can understand what this means for my community'"

As this latter respondent implies, the scale at which issues are conveyed is crucial to peoples' perceived capacity to act. Scenarios working at a localized scale seem to be an important way in which investment in wider issues can begin to occur. However, the key for many decision makers was how to then translate that investment into distinct programmes of action:

"When you go so far forwards you have to have to always say what needs to happen in the next 5 years. So I think the techniques good but then how do you to start building towards that 50 year point?"

"At some place [in the process] we need to - if we are going to take the [implications of the] scenarios forward - we need to break them down into manageable chunks for people"

For one respondent, quite critical of the technique as a whole, creating these links was ultimately problematical. While scenario building could play a role in helping to plan for catchment futures, the real challenge of decision making was to understand "how to minimise wasted time and resources without knowing the future at all. That is the trick!".

Plausibility and completeness of scenarios

Scenarios are designed to elicit reasoned responses and arguments about the future. They are designed to initiate debate and raise controversy. Indeed, the scenario building process has not worked if they do not generate a reaction. It was therefore not surprising that respondents were quite vocal as to the plausibility and completeness of the scenarios. As one put it:

"Plausibility has a sell-by date! After all the scenarios presented are based on current thinking: the Adaptive scenario still seems to be based on continuing economic growth for example. I would like to see more clarity and robustness in the evaluation of how existing trends may develop".

Some respondents suggested that the exercise ignored important dimensions of change in the catchment, and offered alternative views as a result. Others highlighted concerns about what these pathways of development implied:

"All three scenarios ignore two entirely plausible outcomes: either that the area has been flooded from the sea and become salt marsh, or that it has been drained and is highly productive agricultural land producing both food and bio-energy. The latter is marginally the more likely."

"I don't quite trust the analysis that future land use links so closely to different global and national government input/controls."

"I am concerned that industrial crops form a significant part of the 'adaptive' scenario. In view of recent findings re the environmental impact of biofuels, I cannot accept that they would be grown in 2050. Is the range of possible agricultural change sufficient (perhaps food will become scarce again so increasing agricultural production/demand)? Habitats may change beyond all recognition - are we planning to change what we protect?"

Such responses suggest that this is a need to refine scenarios in light of stakeholder reactions to them and, to think broadly and generously about the nature and extent of change. As one suggested, there is a need in these processes:

> "to look very wide on future change. If we look back 50 years, the world has changed almost beyond recognition - should we think that the next 50 years will be any different?"

Nonetheless, the more general point here is that the process of scenario building clearly has a potential to open up fundamental debates about the nature of long term regardless of whether the 'world views' of particular stakeholders are exemplified within them. To what extent the process is able to capture the range of possible outcomes over a given scenario time span is a highly debatable point. As one put it:

> "You need a pretty big health warning on these. Something can come in sideways that nobody's even thought of. There are schools of thought to say that the future may be even more catastrophic than what you suggest by the scenarios. Sea level rises would be one example. Rather than a few millimetres over the years, it may be a few centimetres. The scenarios are only ever one group's visions."

At the same time, one thread of response by stakeholders was the need to make judgments about the relative likelihood of one development pathway occurring over another. According to one stakeholder in the catchment:

> "It would be really powerful if we could say these are the only futures. This brings in the issue of confidence in the likelihood of different scenarios, which is fundamental to whether and how far people take them seriously".

This point was reiterated in the scientific group of responses, where it was argued that effective interventions could only occur if decision makers planned for the most likely outcomes, or more subtlety, acknowledged what was common to them all.

A further argument consistently articulated by respondents was that scenarios had to be closely related to the provision of hard, quantifiable, data. That is to say, scenarios need to be 'ground truthed' wherever possible:

> "I suppose some people would look and say "what they are based on?" and if they are not based on hard data someone would immediately discount them."

> "There are so many different variables that can influence things it's difficult to say with any certainty what kind of scenario we are moving towards. I suppose its kind of 'pie in the sky' unless you inject some reality data into it"

> "We need to edge towards a modelling approach that uses real data rather than just use scenarios that have been invented in an office. So we need hard data as well with these approaches, such as 'it will be 'X'% wetter and therefore we will need to move the road here'. Wherever possible you have to ground truth it. You need to update it constantly because the evidence base is changing"

> "Their usefulness is a function of the truthfulness of their construction. They are very useful for improving understanding of issues and encouraging participation in developing long-lasting solutions, but they need to be constructed in a sound way"

However, for some respondents, the idea that scenarios could ever be constructed "objectively" was a problematical premise. One suggested that the process "invariably involves projecting current preoccupations and prejudices forward - the wish is father to the scenario!" Another argued that decision makers should make a virtue of the interpretive and subjective nature of the process. It was suggested, for instance, that a useful way of employing this technique would be to encourage different stakeholders - such as the RSPB, or the Environment Agency – to produce their own (singular) scenarios of the Parrett Catchment which could then be compared. This could be potentially very powerful. At the very least, many respondents felt that axiomatic to the success of scenario building was the need to be clear and explicit about underlying assumptions:

> "The inherent difficulty of scenario building is that the assumptions need to be clearly articulated and understood by those who are interacting with the scenarios, otherwise the link between cause and effect can be missed leading to doubt about the validity of the whole process and subsequent decoupling from the process"

> "If done well, it is a useful tool but caveats must be made. Scenarios are valuable as long as limitations carefully explained i.e. futures are never certain, scenarios chosen to provide indication of likely changes in future."

Characterising scenarios

The consultation generated wide ranging views regarding the specific techniques employed to characterise and convey the three scenarios. For some respondents, the use of 2050 as a marker in time was potentially problematical. According to one "40 years doesn't sound unreasonable but it's very distant for many", while for another, "25 years [from now] is the sort of cut off point". Even so, many respondents could see logic of taking a long term view and suggested that decision making strategy was increasingly geared up to this, thus:

> "In terms of the regional spatial strategy we are talking about 2026 now as where we looking to. But I think we are getting more and more comfortable with thinking longer term, particularly around the climate change agenda, we are happy to talk with about 40-50 years hence"

In terms of the quantity of information provided to explain the scenarios, approximately 70% suggested that the level of detail was "about right". Around 50% of respondents suggested the language used to describe the scenarios was appropriate to the purpose, with approximately 30% suggesting it was complicated. The remainder suggested the language employed was either simplistic or uneven in its clarity. All bar one respondent suggested that written text was needed to convey the substantive messages of the three scenarios, while approximately 70% of respondents suggested that map and tabular based information were absolutely necessary devices in this respect. Approximately 40% of respondents felt that the use of either hand drawings or photo-realistic representations of landscapes would have enhanced their understanding of the scenarios. In this respect, it was clear from the consultation process that scenario techniques need to be adaptive to different audiences. Care must be taken when making assumptions over want people understand, and what captures their interest:

> "They could be useful. In some ways it's about adapting them in different ways. But if you wanted to talk to the public obviously the maps you've got at the moment even these are quite difficult. So you almost have to get in the story telling to create clear descriptions of what the catchment would be like with this scenario. And you've done a bit of that which I found very useful. But if you are looking at people who are more technically involved they are more interested in the information side of it. But with the public I tend to find the storytelling part of it more important. i.e. what would it be like to live in the area at the time. Having started out in the process and the difficulty I think we all had understanding the terminology of it"

> "I think there's potential to link it to artistic impressions of what the landscape would be like. I think that would be really powerful and colourful and capture peoples' imagination. It depends on your audience. If you are talking to people in the local government environment they understand maps, they're fairly comfortable with then. But if you speaking with the public we know form experience a lot of people really struggle with maps. Therefore sometimes the artistic impressions can make it a lot more meaningful. A lot of people struggle with maps and we tend to forget that. I do like the maps, and I just think you have to be careful about your audiences."

6.4 Summary and conclusions

The investigation into Scenarios examines the value of 'scenario building' as a tool by which decision makers in the Parrett Catchment might make more informed choices about the future and concluded:

- Scenario building is process of describing a contrasting set of narratives about the long term future based on hypothetical propositions about the character and interaction of drivers change.
- While scenario building techniques do not yet represent standard practice in approaching issues of natural resource management, allocation and valuation, an understanding of these techniques is central to ecosystems approach and Defra's (2007a) Action plan.
- While there are many scenario building exercises at the global level, there is a need to develop and evaluate these techniques at more localised scales.
- Three MA inspired scenarios were created for the catchment based on how underlying trends and themes in the catchment may unfold.
    - *The 'Adaptive' Catchment* describing a catchment where highly localized, low impact and generally 'low tech' responses to wider trends prevail. This is a scenario where communities have become increasingly resilient as processes of globalisation become stronger, and nation states weaker. By today's standards this scenario is what many would describe as 'sustainable'.
    - *The 'Fragmented' Catchment* describing how an increasingly open and deregulated world dictates the fortunes of the catchment. Here it is the free market that shapes environmental, economic and social well being. Local communities are disempowered and disorganized, while the nation state lacks influence and power over global trends. The outcomes for sustainability are highly mixed.
    - *The 'Fortress' Catchment* describing a catchment where planning for the future becomes increasingly centralized. This is a world where seemingly unstoppable trends toward globalization have been resisted. The nation state is increasingly closed and inward looking and leads the way in planning for national self-sufficiency. High impact, high tech and over engineered approaches to sustainability prevail.
- The scenarios were translated into web-based material as the basis for an online consultation. As a result of the consultation it is suggested that scenarios building exercises have strong endorsement - in principle - from a range of different stakeholders. In particular:
    - scenarios are considered a useful way of engaging a range of stakeholders - policy makers, technical experts and the public – in discussions about the future.
    - the process of scenario building has a potential to open up fundamental debates about the nature of long term regardless of whether the 'world views' of particular stakeholders are exemplified within them.
    - there is a need to refine scenarios in light of stakeholder reactions to them and, to think very broadly about the potential scope of change.
    - scenarios are particularly useful because they help make abstract ideas 'real' and therefore help build investment issues that would otherwise seem distant and difficult to act upon. However, there is a need to make scenario materials sensitive different audiences.
    - part of the success of scenarios will rest on how well long term pathways of development can be translated into distinct programmes of policy action today
    - where possible there is a need to make judgments about the relative likelihood of one development pathway occurring over others
    - effective interventions could only occur if decision makers planned for the most likely outcomes, or acknowledged what was common to them all.

Where possible, scenarios should also be backed-up by quantifiable data sets and modelling outputs. However, the interpretive and subjective nature of the process has its own benefit, in that it is able to reveal stakeholder value systems. Where there are uncertainties it is important to be clear and explicit about underlying assumptions.

Box 6.1: Key Messages from Chapter 6

Three MA inspired scenarios were created for the Catchment based on how underlying trends and themes in the Catchment may unfold.

- *The 'Adaptive' Catchment* describing a catchment where highly localized, low impact and generally 'low tech' responses to wider trends prevail. This is a scenario where communities have become increasingly resilient as processes of globalisation become stronger, and nation states weaker. By today's standards this scenario is what many would describe as 'sustainable'.
- *The 'Fragmented' Catchment* describing how an increasingly open and deregulated world dictates the fortunes of the Catchment. Here it is the free market that shapes environmental, economic and social well being. Local communities are disempowered and disorganized, while the nation state lacks influence and power over global trends. The outcomes for sustainability are highly mixed.
- *The 'Fortress' Catchment* describing a catchment where planning for the future becomes increasingly centralized. This is a world where seemingly unstoppable trends toward globalization have been resisted. The nation state is increasingly closed and inward looking and leads the way in planning for national self-sufficiency. High impact, high tech and over engineered approaches to sustainability prevail.

The scenarios we used as the basis of a further round of stakeholder consultations. They were translated into web-based material as the basis for an online consultation. As a result of the consultation it is suggested that scenario building exercises have strong endorsement - in principle - from a range of different stakeholders. In particular:

- scenarios are considered a useful way of engaging a range of stakeholders - policy makers, technical experts and the public – in discussions about the future;
- the process of scenario building has a potential to open up fundamental debates about the nature of long term regardless of whether the 'world views' of particular stakeholders are exemplified within them;
- there is a need to refine scenarios in light of stakeholder reactions to them and, to think very broadly about the potential scope of change;
- scenarios are particularly useful because they help make abstract ideas 'real' and therefore help build investment issues that would otherwise seem distant and difficult to act upon. However, there is a need to make scenario materials sensitive different audiences;
- part of the success of scenarios will rest on how well long term pathways of development can be translated into distinct programmes of policy action today;
- where possible there is a need to make judgments about the relative likelihood of one development pathway occurring over others;
- effective interventions could only occur if decision makers planned for the most likely outcomes, or acknowledged what was common to them all; and,
- where possible scenarios should be backed-up by quantifiable data sets. However, the interpretive and subjective nature of the process has its own benefit, in that it is able to reveal stakeholder value systems. Where there are uncertainties it is important to be clear and explicit about underlying assumptions.

Chapter 7: Discussion and Recommendations for using an Ecosystems Approach

7.1 Introduction

As described at the outset, the aim of this study was to examine how the principles of an Ecosystems Approach can be fostered at the local scale. Throughout this research we have therefore attempted to focus on general issues exposed or illustrated by the experience of stakeholders working at the catchment level, rather than the particulars of the Parrett catchment itself. In essence the insights we have developed are designed to advise on its wider application in a range of current planning and decision making contexts. In order to do this we have attempted to identify what barriers exist for taking an Ecosystems Approach forward, in terms of knowledge gaps or data deficiencies. In this final Chapter we take stock of what we have found and use this experience to develop recommendations on how best to embed an Ecosystems Approach in decision making at local scales.

7.2 Barriers of Language and Understanding

In the dialogues that we have had with strategic, frontline, and community stakeholders in the catchment, we found that introducing the EsA to them was a difficult undertaking. With a few notable exceptions, **it was a concept that stakeholders found very hard to 'get to grips' with in a tangible way. Its terminology and language appeared to be alien to how most stakeholders think about the environment.** Many considered it "jargon", and some of the elected members found it unintelligible. Individuals across every category of stakeholder consulted strongly advised that, if the ideas behind the EsA are to be promoted and ***used***, then more accessible 'everyday' language would be essential to make it meaningful and relevant.

Clearly many new ideas and concepts probably start off by generating such reactions. As has been illustrated by the recent transformations in the ways ordinary people think about such things as 'climate change' and 'carbon footprints', barriers to understanding and reluctance to use new ideas can be overcome. However, this does not mean that things should be left to themselves.

The study commissioned by Defra on *Public understanding of the concepts and language around ecosystem services and the natural environment* (Define, 2007) concluded that people found the language and terminology of environmental debates complex. They suggested that the public connect most strongly to the natural environment through aspects that enhance the quality of their lives. They place real value on those aspects of the natural environment that they relate to and use day-to-day, such as 'green space'. This seems to help them engage in the concept in the first instance. The study also found that people also seem to be far more interested in the concept when the cost implications of environmental damage are made clear. Experience gained in this case study bears out these findings. People were far more comfortable talking about 'quality of life or 'well-being' issues' and how they related to particular localities or places. We found that such issues could be used as 'hooks' for exploring links to ecosystem goods and services, as in the case of security from flood risk and the link to 'natural' flood management services provided by woodland and similar features within the catchment.

Despite the difficulty that people expressed with the *language* of an Ecosystems Approach, and ecosystem services, it is important to note that they did not have the same reaction to the intrinsic *principles* or *key ideas* upon which the concept was based. Indeed, our experience with decision makers in the catchment was that in many

respects an Ecosystems Approach is tacitly understood *and* employed by decision makers in the Parrett. Local authority stakeholders were readily interested in discussing the benefits that local communities get from the catchment's environmental resources, and how these impact on disparities in local quality of life, or could help considerably improve quality of life. Perhaps this is not surprising, given the nature of the case study itself. The catchment was selected *because* there was a track record of joint working and partnerships in area, and the catchment is a distinct biophysical unit with a clear set of local issues associated with it. Nevertheless, the study is of interest because it helps us identify how far the principles of the EsA can be taken and what barriers might frustrate the application of these ideas.

We found that while no one argued against core principles of an Ecosystems Approach, such as 'inclusive decision making', the need to make decisions at 'appropriate geographical and temporal scales', 'taking proper account of the environment' and the goal of 'joined-up policies', a number of obstacles to the effective application of these ideas existed. For example, while some could see the connection between people's well-being and the environment, the majority of those interviewed felt very strongly that there was no real discussion at all about the supply of ecosystem services in the catchment, or across Somerset as a whole. Ecosystem services and the benefits they bring were poorly understood and given very little thought by the majority of local politicians and communities. This was possibly because the majority of decision-makers were not sufficiently prioritising the environment into their thinking, let alone in terms of ecosystem goods and services. The environment is not yet a central component in how all local decision-makers are obliged to think about meeting local needs and resources. **The goal of improving understandings of the links between ecosystem services and benefits to local community well-being was felt to be a big issue by many respondents.**

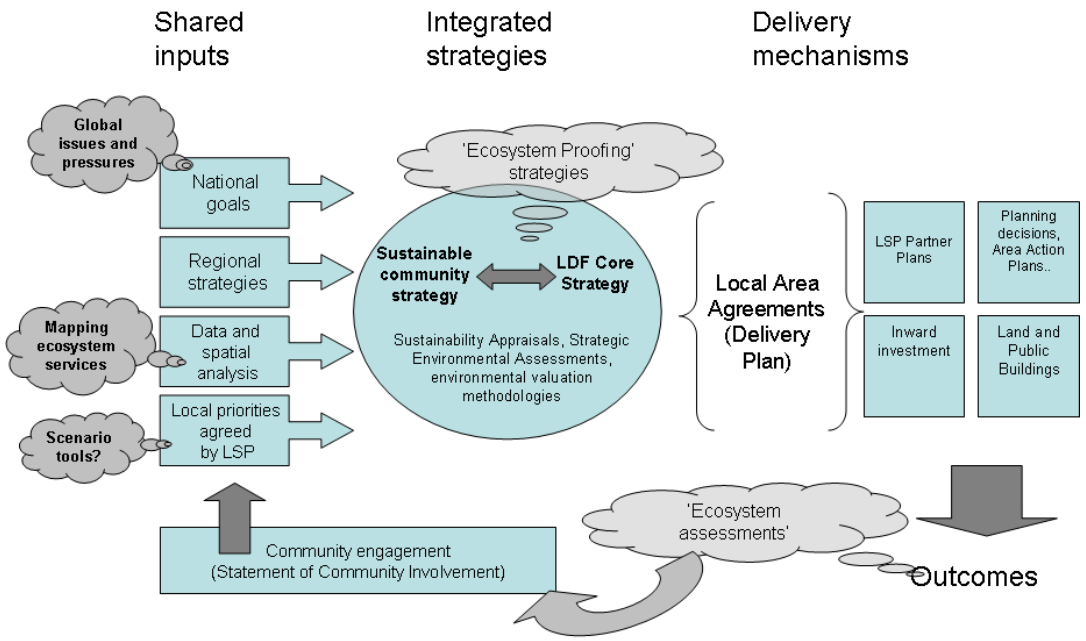
The experience we gained in the Parrett Catchment suggests that the problem of embedding an Ecosystems Approach in local decision making is not simply one of language, or of persuading people that the principles of the EsA are 'right' or a more reliable or robust way of solving problems. Rather, it is about empowering people to work through the issues highlighted by the EsA. This involves giving them access to appropriate information, and by better defining the frameworks in which debates occur. We therefore now focus on what kinds of mechanisms might be used to promote the approach

7.3 Mechanisms for embedding an Ecosystems Approach

The Planning and Compulsory Purchase Act 2004 reformed the plan-making system in England. The statutory development plan now consists of the Regional Spatial Strategy (RSS), prepared by the regional planning body and the development plan documents assembled into the Local Development Framework (LDF). The latter is prepared by the local planning authority. The reforms were put in place to ensure that Local Authorities became more effective in 'shaping places' by helping to develop and take forward more ambitious and more widely supported collective visions for their area than had been the case in the past. With the new planning system, there is a strong emphasis on partnership working, sustainable change and community involvement. Overall the goal is to promote sustainable development through the integration of social, environmental and economic factors.

Figure 7.1 provides an overview of the key elements of the new planning system that are relevant to the local concerns exposed by the Parrett study. The schema is based on the account by I&DeA (2008) but has been modified to highlight where connections to the elements of an Ecosystems Approach are particularly relevant. According to the model, the Sustainable Community Strategy (CSC) is the mechanism that sets out the vision for a place and the ways in which the long-term challenges facing an area might be addressed. The LDF documents how key spatial strategies for the area should reinforce it. Collectively they provide the basis for the Local Area Agreement (LAA) which is essentially the delivery plan for the CSC.

Figure 7.1: Potential connections between the core strategy of the Local Development Framework, the Sustainable Community Strategy and an Ecosystems Approach



Based on I&DeA (2008), CLG and RTPI
(see http://www.idea.gov.uk/idk/core/page.do?pageId=6967704#contents-4)

Most of the decision-makers we interviewed were adamant that if an Ecosystems Approach and the principles that underpin it are to be used *explicitly*, then they the must be a mandatory part of the planning system, and specifically the Local Area Agreement process. Most people were very clear that unless use of 'EsA thinking' is made mandatory and "irrefutable" it would not be used. Stakeholders felt there could be no real choice in the matter.

Leadership and joined-up thinking at the highest political levels - particularly between Defra and DCLG, but also within Defra - was therefore seen a crucial for encouraging confidence and 'buy-in' at more local levels in the idea of an EsA. The new Public Service Agreement (PSA) framework announced as part of the Comprehensive Spending Review (CSR) 2007 would seem to be an important step in this respect, but it was clear through our engagement with stakeholders that more guidance about how this would play out on the ground is needed. However, it was also noted by some of those consulted that while putting the concept into mainstream planning and land use decision-making through guidance, regulation or even legislation is one thing, to succeed on the ground it would have to be seen as "*a real vote winner*" by local politicians. It might be that this could be achieved through a social marketing approach that makes clear links between people's health and well-being and the appearance and 'well-being' of the local environment and landscape.

The Local Strategic Partnerships and Sustainable Community Strategies were seen by the majority of decision-makers as highly relevant for successfully introducing an EsA into local decision-making processes. These were seen as some key inputs into the integrated strategies represented by the CSC and LDF (Figure 4). **There was consensus that these local partnerships and strategies appear to be beginning to engage local communities across Somerset. They were achieving the sort of 'buy-in' that has the potential to shape future development of local areas and how they might function. The view was that they should be vehicles for introducing and embedding the EsA concept and ideals for making environment core to people's thinking.** Embedding the ideas through a bottom-up-process directed at resolving local issues was felt to be far more satisfactory strategy than imposing top-down targets decided at strategic levels. However, it is unlikely

that this would be spontaneous process, but one that would need to be encouraged over the long term.

While guidance and examples of best practice were seen as important mechanisms that might influence the Local Strategic Partnerships, more effective use of Sustainability Appraisal and Strategic Environmental Assessment was also suggested by those consulted as a possible mechanism for more deeply embedding the thinking that lies behind the EsA. At present, Sustainability Appraisal is required for all development plans (such as the LDF), and aims to evaluate the social, economic and environmental effects of a plan or programme. Strategic Environmental Assessment (SEA), on the other hand, is a process for identifying and assessing the likely effects on the environment of a policy, or plan. It is required under the EU SEA Directive, and like the Sustainability Appraisal it has to be prepared by the local public authorities. Clearly there is overlap between them, and it is increasingly accepted that there is potential to satisfy both requirements through a single assessment process, and that in the context of the development of the LAA, Sustainability Appraisal should be applied to the whole Sustainable Community Strategy and not just the LDF.

In terms of helping to embed an Ecosystems Approach, another interviewee who discussed the role of appraisal and assessment argued that much better guidance on how to undertake Sustainability Appraisal was probably needed. Current advice was felt to be too "broad brush" and "bland" to be really useful. For example, a local authority stakeholder suggested that it would be worth considering how a list of key ecosystem services and benefits, tailored to the catchment, or Somerset as a whole, could be introduced into the current planning process, so that an EsA became an explicit part of it. A further advantage of using Sustainability Appraisal for implementing an EsA was that this decision-tool encourages longer, more realistic timeframes for making decisions about natural resource use and issues like climate change. This could help overcome the constraints of local political and local plan timeframes considered by many interviewees to be hampering better environmental decision-making. As well as Sustainability Appraisal, one consultee suggested that integrated accounting methods for the environment were necessary to replace conventional cost-benefit analysis. **The development of more detailed guidance for Sustainability Appraisal, Strategic Environmental Assessment and potentially environmental valuation at local scales could be an opportunity for the DLCG and Defra to work together to jointly meet each Department's aims for land use planning and natural resource management.**

If an Ecosystems Approach is to make a difference to the ways things are done then it has also be effective in changing things on the ground. Outcomes are important. In looking to the future many stakeholders in the Parrett felt that a less complex ownership and management structure for the catchment would be desirable, because it would be easier to make decisions about the area's long-term management. Compulsory purchase and amalgamation of Environment Agency and Internal Drainage Board objectives, for example, was felt to be something else that would help towards implementing an EsA. Using spatial plans of the catchment was also seen to be important, together with efforts to stimulate informed debate about ecosystem goods and services. It was suggested that this could encourage agreement about shared objectives and long term targets and the development of a single, integrated management plan for the catchment that could be seen as "*really getting to grips with implementing the spirit of the Water Framework Directive*".

The suggestions about land ownership concerned particular measures that *some* stakeholders thought might resolve issues in the Parrett and the Somerset Levels. In terms of looking at more general ways of embedding 'ecosystem thinking' in local processes people seemed to welcome the freedom to implement a systems approach but suggested that it could mean a very radical re-think of current priorities and funding streams. Having the time and space to think through what this would mean was felt to be impossible, given the current pace of activity, especially with implementation of the new planning system. More than one interviewee advised that good, practical examples of how to implement an EsA together with spatial data for the supply of services and 'sensitive ecosystems' would need to be readily available from Defra and its agencies, or we might suggest following the discussion of Chapter 4, the Regional Observatories.

The potential for decision-making using different spatial structures (sub-catchment, landscape types and soils) was mentioned by several consultees as being worth considering if an EsA were to really make a difference. This was because decisions and funding streams geared to administrative areas often do not match up with how natural resources and land actually function. This was true for both agri-environment scheme delivery and planning in the flood-plain. Thus mechanisms for linking strategies at different scales and in different administrative areas would also be beneficial. Since over 84% of respondents to the on-line survey felt that a river catchment was a useful geographic unit for exploring the connections between social, economic and environmental issues this aspect could be given far more serious consideration in future scheme and Local Area Agreement development. **Given that the Local Area Agreements will be linked to new Comprehensive Area Assessments from 2009 onwards, and that Multi-Area Agreements of a more strategic nature are planned, it would make considerable sense for Defra to explore ways of introducing the EsA into these processes with CLG as a matter of priority.**

7.4 Conclusions and Recommendations

Although it may not be easy to introduce an Ecosystems Approach (EsA) into local decision making, there is evidence from the Parrett Catchment that there is a good basis for taking such thinking forward. There are clear similarities between some basic elements of the approach and the objectives of the new planning system which sees community partnership, local choice and integrated strategies as fundamental to delivering a sustainable future. Local Area Agreement and the new Multi-Area Agreement processes appear to be the right kind of 'vehicles' for incorporating an EsA (CLG, 2007). EsA principles readily fit with LAA criteria and it should be possible to develop indicators that more readily reflect EsA goals. **Most importantly, when local decision makers become aware of the thinking behind an Ecosystems Approach, despite its unfamiliarity and technicalities, they can see the synergies between the different frameworks too.**

We found that the local authorities and other statutory organisations engaged in the decision-making processes in the area understand and accept the benefits of incorporating an Ecosystems Approach into decisions about how resources are funded and delivered. Examination of the various area-wide visions and strategies that are relevant to the catchment shows that there is much potential for incorporating the approach into the way the objectives are formulated, but this potential is yet to be realised. Indeed, its introduction would make these far more comprehensive, integrated and capable of delivering "better outcomes". However, because many of these decision-making processes are still relatively new, and new groups are being set-up to deliver them, an EsA could be seen as an unwelcome extra burden at this stage. There are obviously difficulties in getting local sectoral 'join-up' to meet *current* statutory goals for the LAA, the new planning process and Defra's objectives for the Water Framework Directive and the UK Biodiversity Action Pplan. Nevertheless, the evolution of the Parrett Catchment Partnership into the new Water Management Partnership initiated in April 2007 is an opportunity for exploring how an EsA could be made integral to the decision-making tools and processes that the Partnership will be using.

The first aim of this study was to review existing planning and land management tools and approaches within the Parrett and to look at their strengths and limitations in relation to embedding an Ecosystems Approach and the management of ecosystem services. **Our key conclusion here is therefore that, while the underpinning philosophy of the current planning frameworks is often consistent and compatible with an Ecosystems Approach, the complexity of the language surrounding it makes it difficult to use, and the novelty of the ecosystem services concept means that consideration of their state and trends is not taken into account at present.**

On the basis of this finding, then, we may move on to consider the issues surrounding the other three aims of this study, which concern how current planning frameworks might be modified to accommodate the needs of an Ecosystems Approach, what kinds of barriers current evidence gaps present to using the framework, and what kinds of guidance on embedding the approach might be needed.

Giving guidance and leadership

We found that an Ecosystems Approach is a totally new concept to the majority of stakeholders in the catchment, and it would need to be comprehensively explained and justified within the existing suite of planning guidance being rolled out by the CLG and I&DeA if it were to be used. The concept and language of the EsA does not currently feature in the planning process at all and any benefits to ecosystem services arising from the planning process are currently more accidental rather than by design.

Making the EsA an integral part of the planning process – at least as a core strand of the Sustainability Appraisal for plans and policies – would mean that stakeholders of every kind would have to get to grips with it. This would almost certainly present some issues over data availability and indicators but the iterative nature of the EsA should allow for this to be developed in response to local data needs and priorities.

We recommend that to make the principles of an Ecosystems Approach more accessible, locally relevant and user-friendly, and implicit in what people do, then the key concepts should be introduced into new or revised guidance for:

- **Local Strategic Partnerships;**
- **Sustainable Community Strategies;**
- **Local Area Agreements;**
- **Catchment Flood Management Plans;**
- **Agri-environment scheme (objectives) and targeting plans; and**
- **Local Development Plan Documents, e.g. Core Strategy and Local Development Frameworks**.

The preparation of this guidance could be done unilaterally by Defra with agreement from the CLG, though it would be far better if both Departments worked together to produce this jointly and present examples of good practice (see below) for each of the above and for a professional audience of planners and local decision-makers. Any such guidance should also show how the EsA fits into Strategic Environmental Assessment and Sustainability Appraisals, as an explicit component of the process. In the context of SEA, this could be done within the existing terms of the Directive, i.e. there would be no requirement for seeking approval at EU level.

Empowering local people

The Parrett study suggests that the framework of Sustainable Community Strategies are probably key to getting local residents and businesses engaged in the thinking that lies behind the an Ecosystems Approach, as part of a local 'place-shaping' agenda. Given the variation in environmental and socio-economic issues and opportunities for change across the catchment, this could work very well for introducing the notion of ecosystem or perhaps "environmental" goods and services and how these can be made more or less accessible, depending on how resources are managed. However, from our experience we conclude that the development of local partnerships working will need to be supported by inter-departmental working at the national level. The lack of strong representation of environmental issues in the current LAA is symptomatic not only of the need to promote awareness of these issues more widely, but also of the need to provide people with the tools to deal with them. **Therefore we recommend that measures to build capacity in communities of interest and communities of place are considered.** These measures would cover such stakeholders as local elected members, voluntary groups, planning officers and would be essential alongside the introduction of new guidance for using an EsA in existing plan development and decision-making processes. Resources would be needed for training local elected members in understanding and using the EsA principles. This would need to be a part of any induction training for new members regardless of whether they are to hold an environmental post.

Steps must be taken by Defra and DCLG to find and promote examples to illustrate the issues and potentials for application of an Ecosystems Approach covering a range of different problems and places.

Examples of best practice would show people what "joining-up agendas" means in practical terms. It is important note, however, that the presentation of these case studies would need to be carefully thought through, given the reactions we found to the language in which an Ecosystems Approach is currently framed. We have suggested how the key ideas can be collapsed into four key themes, namely those covering issues of 'inclusive decision making', the need to make decisions at 'appropriate geographical and temporal scales', 'taking proper account of the environment' and the goal of 'joined-up policies', but these would still need to be presented in terms that have resonance at local scales. So for example, we found that the term "sustainably managed" currently means different things to different stakeholder groups, but that climate change is a common thread running through local decision-making and stakeholder processes. This latter topic might be a useful 'way-in' to the issue of the benefits that ecosystem services provided in particular localities. An analysis of these services in terms of threats and opportunities could be a means by which communities could be encouraged to think about the general problem of living with environmental change.

Improving the evidence base

Our study suggests that easier access to better, more user-friendly and integrated data and information, across all policy sectors remains an issue. This conclusion is not specific to the Parrett. It echoes the finding of the 2005 review of Community Strategies (ODPM, 2005, ii) which found that very few Community Strategies "included sufficient material to suggest whether evidence had been used appropriately to derive the strategy and a series of actions". Such a situation clearly poses difficulties for Defra in terms of its need to ensure that environmental policy at all levels is based on robust evidence and understanding.

We recommend that encouragement should be given to developing locally agreed maps of ecosystem service supply and demand as a way of illustrating the geography of issues, potentials and opportunities requiring action. These maps could be tested and developed for wider use by a set of action research projects involving the key Statuary Agencies. The maps would also act as good practice examples for a wide range of stakeholders elsewhere to draw on. **These maps and case studies could be made accessible via the CLG planning and community portals as well as Defra's own web site, but more particularly via the Regional Observatories**. Links could be set up with the Local Government Association and similar stakeholder organisations with the aim of spreading understanding and good practice thinking, building capacity and 'normalising' the EsA concept and language.

As Chapter 4 highlighted, it is important to note that there is a spatial mis-match between administrative and governance areas, i.e. counties and districts, and how natural resources operate or function. There are a number of 'natural resource units' such as river catchments, landscape types, e.g. uplands and landscape character areas (and their sub-units) that can be used to describe and quantify ecosystem goods and services. The challenge is bringing these two types of unit together. The most logical way would be for local authorities to make more use of these natural resource units and their ecosystem data via the planning system and the Local Area Agreement process. Alternatively Local Authorities should be able to extract information about ecosystem services that makes sense in terms of the geographical environments in which their work is set. For example, the Somerset Strategic Partnership's county vision provides the context for the District LSPs at the next level of governance down. Thus information needs to be nested in such a way that people can see how the plans and strategies at more local levels flow from this, so that they could be 'EsA-proofed'. This should mean that it will be easier to cascade ecosystem thinking -- and the experiences gained in working the ideas through – so that a consistent approach for each of the sub-county LSPs is achieved. **These kinds of data warehousing tasks are ones that Regional Observatories could quite easily provide.**

Although maps of the present situation for ecosystem services are essential as a base-line for decision making, as Chapter 5 and 6 of this report demonstrated, scenarios describing future possible change can also be important in shaping peoples ideas. They help people evaluate current evidence and identify what more needs to be known if effective future strategies are to be built. The consultation suggested that scenario building could be a potentially fruitful and imaginative way in which stakeholder think about the long term. **We recommend that in addition to providing information on current state and trends of ecosystem services, platforms such as the Regional Observatories also be encouraged to bring together the results of scenario studies for the area they cover.** The construction of region specific scenarios would, however, require a broad partnership to be formed, that would include the Statutory Agencies, Local and Regional Authorities, NGOs and other people's groups. Local champions for taking such scenario work forward are needed. In the Parrett, the Water Management Partnership is an ideal platform. In other areas means would have to be found to lead such work. **The possibility of a Defra-led England-wide assessment of ecosystem services, along the lines of the Millennium Ecosystem Assessment may be a framework that could be used to stimulate local thinking (Haines-Young et al., 2008b).**

Ecosystem Proofing Strategies and Plans

In theory, Strategic Environmental Assessment (SEA) takes a holistic approach to considering possible projected environmental impacts over time of multiple actions within a region or ecosystem. According to WWF, SEA's wider frame "*enables policy-makers to anticipate effects on species, habitats and ecological processes that site-specific studies do not capture. SEA also facilitates an Ecosystems Approach, which emphasises the importance of holistic analyses*". Thus, in principle, SEA already focuses decision making on many of the issues highlighted by an Ecosystems Approach in an implicit way. Similarly, Appropriate Assessment (AA), through its sequential methodology, inherently delivers an EsA by filtering and sieving out areas unsuitable for specific activities and land use or development. Thus by making an Ecosystems Approach far more explicit in SEA and AA it would be possible to support more holistic, integrated local planning documents, Local Area Agreements and site specific EIAs.

We conclude that given that many SEAs are now undertaken in tandem with Strategic Sustainability Appraisal (SSA) the potential for integrated assessment incorporating an Ecosystems Approach is already possible in the current planning system. Ensuring that this potential is met, however, will require considerable institutional and cultural change.

A fairly strong message coming out of the work with Parrett Catchment stakeholders is that Sustainability Appraisal holds considerable potential for applying the EsA in very practical ways. Doing so would enable an objective and transparent assessment of the state and trends in ecosystem goods and services for any given area. Sustainability Appraisal can be carried out at any scale and on any type of plan or 'product'. It is a mandatory part of the planning process so it is already in widespread use throughout the country. **We recommend that ways should be found to incorporate questions about ecosystem goods and services into Sustainability Appraisal so that it becomes possible to directly link these to issues of socio-economic prosperity and environmental well-being goals.**

Our findings suggest that the LAA would be a very useful focus for seeing how an Ecosystems Approach could be used to 'ecosystem-proof' a local decision-making procedures. The development of new tools is particularly timely given the fact that ways for delivering the LAA are still being developed. Steps to build **Comprehensive Area Assessments and Multi-Area Agreements provide further opportunities to embed ecosystem thinking at a range of spatial scales.**

7.5 Embedding an Ecosystems Approach

If we are to encourage people to think globally and act locally, then a raft of measures will be needed. We need to help them make the transition from current approaches which often neglect the wider impacts of decisions on the environment and undervalue the benefits that natural resource systems can provide. Promotion of an Ecosystems Approach is one such measure. It is, along with the notion of ecosystem services, an idea that has stimulated attention at national scales. However, the task of translating it down to the local scales at which people live is potentially challenging, given the technical language in which it is often set and the way environment has to compete with other issues. Nevertheless, the experience in the Parrett suggests that the general principles behind an Ecosystems Approach have strong synergies with current approaches, and there is great potential for embedding the thinking behind it, if it is promoted sensitively and strategically.

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Appendices

Appendix 1: Environmental Leaders Group (ELG) terms of reference

Appendix 2: Stakeholder warm-up questionnaire (online)

Appendix 3: Results of the warm-up questionnaire

Appendix 4: Overview of visions and stakeholder involvement in Parrett Catchment

Appendix 5: CBD principle and possibly application in existing decision making processes

Appendix 6: Outline Questionnaire for online scenario evaluation

Appendix 1: Environment Leaders Group's Terms of Reference

Purpose of the Environment Leaders Group

- To lead on the strategic delivery of environmental priorities in Somerset to contribute to the delivery of a dynamic, successful modern economy that supports, respects and develops Somerset's distinctive communities and unique environment.
- To contribute to and champion the Somerset Natural Environment Strategy for the Somerset Strategic Partnership, ensuring that the strategy reflects and advances the region's environmental priorities while retaining a distinctive and relevant Somerset focus on key issues.
- To advise key stakeholders on sub-regional environmental issues, particularly those relating to climate change, protection and use of Somerset's unique and diverse physical and natural environment and the opportunities the environment presents in terms of spatial planning, a vibrant economy and stronger and healthier communities
- To broker, monitor and evaluate the delivery of strategic environmental development actions in Somerset, including those relating to sustainable communities, climate change and energy provision.
- To advocate Somerset's environmental and infrastructure priorities regionally and to engage, influence and maximise the benefit and relevance to Somerset of regional policies.
- To act as the key sub-regional environmental partnership recognised by the Government Office for the South West, South West Regional Assembly and other relevant partners and stakeholders.
- To deliver an annual work programme to take forward this work on behalf of the Somerset Strategic Partnership.

The membership of the Environment Leaders Group consists of:

- One representative from Natural England
- One representative from the Environment Agency
- One representative from the Forestry Commission
- One Somerset Voluntary sector network representative (SSP nominated)
- Environment Portfolio Holder from Somerset County Council and one representing the District Councils
- Exmoor National Park elected representative
- Government Office for the South West
- Regional Assembly
- Advisers – Somerset County Council and District Council Officers: Exmoor National Park officer, Government Office for the South West, South West regional Development Agency, South West Regional Assembly.

Working methods

- Meetings to be held at least four times a year.
- The meetings to be chaired by ? (*currently Sonia Davidson-Grant, SCC)*

- Meeting agendas will be dedicated in the main part to debate and decision-making on a maximum of two issues at any one meeting.
- Each issue is to be led by a nominated member of the group who will prepare an issues paper to be circulated at least 7 days prior to the meeting.
- The Environment Leaders Group will be supported operationally by the Environment Leaders Group Officers Meeting which comprises officers from the six local authorities and other county wide agencies.
- The Head of Environmental Regeneration and Regulation, Somerset County Council will act as the secretariat for the Environmental Leaders Group.
- Agendas, minutes of previous meetings and other supporting documents will be issued at least one week prior to a meeting.

Appendix 2: Warm-up questionnaire (survey instrument)

DEVELOPING AN ECOSYSTEMS APPROACH FOR THE PARRETT CATCHMENT

Thank you for agreeing to take part in this survey

The study aims to understand how natural resources in the catchment provide communities with a range of different goods and services and what must be done to manage them effectively within environmental limits. Defra describe this way of thinking as adopting an "Ecosystems Approach"; one that places the natural environment at the core of policy-making.

For more information on the Parrett Catchment project please visit the websites listed below:

www.catchmentfutures.org.uk

www.defra.gov.uk/wildlife-countryside/natres/rationale.htm

This project is conducted with the following project partners:

[LOGOS INSERTED ON WEB PAGE]

The following questionnaire marks the start of the study. It is designed to help the project team understand the different ways that individuals and organisations think about the value of the Parrett Catchment area in environmental terms, and the types of challenges it may face in the future, for example, how the area may alter due to climate change.

Your answers will help us to plan and focus our research over the coming year. They will feed directly into a wider programme of public debate and stakeholder consultation including workshops and web-based discussion.

In accordance with the Market Research Society code of conduct, all responses you provide will remain confidential. Your responses will be aggregated with all other respondents and will be published in the final report. Your name and personal details will not be published and will remain confidential at all times to the research team. For internal quality checking purposes it will be helpful to us if we can have a few details about the individuals responding to this survey

For most of the questions you simply have to select your answers by clicking the button/box next to the answer(s) you want to give.

The survey will take about 15 minutes to complete for most people.

Section 1: Your Details

Q1 What is your full name?

Q2 Which district do you reside in?

- ❑ South Somerset
- ❑ Sedgemoor
- ❑ Taunton Deane
- ❑ West Somerset
- ❑ Not sure
- ❑ Other

If answered other at Q2Other....Please Specify the county you reside

_____

_____

_____

Q3 Do you live in the Parrett Catchment area? If unsure please refer to the map below.

- ❑ Yes
- ❑ No

Map of the Parrett Catchment Boundary

Map source: http://www.somerset.gov.uk/somerset/ete/pcp/wherewework/

Q4 From the list below please tick which town you live in or live closest to?

- ❑ Bridgwater
- ❑ Crewkerne
- ❑ Ilchester
- ❑ Ilminster
- ❑ Langport
- ❑ Yeovil
- ❑ Taunton

Q5 With reference to your main occupation, what type of organisation do you work for?

- ❑ Public Sector - Agency
- ❑ Public Sector - Local Authority Officer (County)
- ❑ Public Sector - Local Authority Officer (District)
- ❑ Public Sector - Health
- ❑ Public Sector - Police Authority
- ❑ Public Sector - Elected Member
- ❑ Public Sector - Other
- ❑ Non Governmental Organisation - Environment
- ❑ Non Governmental Organisation - Socio-economic
- ❑ Non Governmental Organisation - Other
- ❑ Private Sector Organisation - Small/Medium Enterprise (Less than 250 employees)
- ❑ Private Sector Organisation - Corporate (250 Employees or more)
- ❑ Other

If Q13 = otherOther.....Please specify the type of organisation you work for

_____

_____

_____

Q6 Following on from question 5, do you believe your occupational role may have an impact on the future of the Parrett catchment?

- ❑ Yes
- ❑ No
- ❑ Don't know

Q7 If so, could you describe this impact

Q8 Does your occupational/professional position have a community role with reponsibility for the future planning of the catchment area?

- ❑ Yes
- ❑ No
- ❑ Don't know

Q9 If so, please give brief details

Section 2: Defing the Study Area

We have chosen to focus upon the "Parrett Catchment" as an area to explore and develop the long term planning of environmental resources and their integration with socio-economic issues.

Q10 To what extent do you agree with the following four statements?

	Strongly Agree	*Agree*	*Neither Agree nor Disagree*	*Disagree*	*Strongly Disagree*
A "river catchment" is a useful geographical unit around which to explore ways of integrating environmental, social and economic goals, issues and opportunities	❑	❑	❑	❑	❑
Most people living and/or working in the Parrett Catchment would be familiar with the term "Parrett Catchment" as a description for the area	❑	❑	❑	❑	❑
Most people living and/or working in the "Parrett Catchment" would be able to identify the "catchment's" approximate boundaries	❑	❑	❑	❑	❑
Most people living and/or working in the "Parrett Catchment" would probably choose a different geographical term with which to identify their local area.	❑	❑	❑	❑	❑

Q1 1 If you have any further information to provide in relation to the statements you have just read, please enter your comments below:

Section 3: Assessing the Environmental Goods, Services and Benefits of the Parrett Catchment

We all recognize that the environment underpins the survival, well-being and prosperity of people by providing a wide range of goods and services e.g. fresh water, healthy soils, local fresh foodstuffs, timber, high quality greenspace and wildlife. However, to what extent do you feel that residents of the Parrett Catchment have access to these sorts of services, enabling them to be part of a "sustainable community":

Q12 For each service statement please tick the option that best descibes your opinion

	Available to all across the catchment	*Only available to some within the catchment: varies depending on geographical location*	*Only available to some within the catchment: Varies depending on social background*	*Not available within the catchment area*
Security from natural hazards/disasters, e.g. storm surges and flooding.	❑	❑	❑	❑
Access to fresh local produce	❑	❑	❑	❑
Well-planned, affordable housing that makes good use of local resources, e.g. renewable energy, local timber, rain-water for toilet-flushing	❑	❑	❑	❑
Clean air and safe drinking water	❑	❑	❑	❑
Reliable public transport and infrastructure, planned and used in harmony with the catchment's environment	❑	❑	❑	❑
Socially cohesive communities where people care about and work together to enhance their local environment.	❑	❑	❑	❑
Secure employment in sectors dependent on natural resources, e.g. farming, tourism, specific retail and so on.	❑	❑	❑	❑
Opportunities for countryside recreation for leisure, health and well-being	❑	❑	❑	❑

Q13 Taking each of the following service statements into account, to what extent do you feel that each service needs improving within the Parrett Catchment? Please tick the box that best resembles your opinion.

	Needs Improvement	*Needs Some Improvement*	*Needs No Improvement*	*Don't Know*
Security from natural hazards/disasters, e.g. storm surges and flooding.	❑	❑	❑	❑

Access to fresh local produce	❑	❑	❑	❑
Well-planned, affordable housing that makes good use of local resources, e.g. renewable energy, local timber, rain-water for toilet-flushing	❑	❑	❑	❑
Clean air and safe drinking water	❑	❑	❑	❑
Reliable public transport and infrastructure, planned and used in harmony with the catchment's environment	❑	❑	❑	❑
Socially cohesive communities where people care about and work together to enhance their local environment.	❑	❑	❑	❑
Secure forms of work in sectors dependent on natural resources, e.g. farming, tourism, specific retail and so on.	❑	❑	❑	❑
Opportunities for countryside recreation for leisure, health and well-being	❑	❑	❑	❑

Q14 What do you think are the key factors for making the Parrett Catchment sustainable? Please tick between 1 and a maximum of 6 factors listed below that represent what you believe to be the most important factors when developing a sustainable community within the Parrett Catchment

- ❑ Local sources of food
- ❑ Local fibre for building materials, packaging, biomass
- ❑ Genetic resources
- ❑ Natural medicines, pharmaceuticals
- ❑ Fresh water
- ❑ Water regulation
- ❑ Water purification and waste treatment
- ❑ Air quality regulation
- ❑ Biochemicals
- ❑ Climate regulation
- ❑ Erosion regulation
- ❑ Disease regulation
- ❑ Pest regulation
- ❑ Pollination regulation
- ❑ Natural hazard regulation
- ❑ Spiritual/religious inspiration from the natural world
- ❑ Aesthetic benefits from the natural world
- ❑ Cultural heritage benefits from the natural world
- ❑ Recreational benefits from the natural world
- ❑ Tourism opportunities
- ❑ Resource cycling, e.g. water cycle, nitrogen cycle
- ❑ Primary production
- ❑ Soil formation
- ❑ Other

If other, please specify a factor you believe to be most important when developing a sustainable community

_____

_____

_____

Q15 Which factor do you think is the single most important one for making the Parrett catchment sustainable? Please tick ONLY 1 BOX next to the factor you believe to be the most important.

- ❑ Local sources of food
- ❑ Local fibre for building materials, packaging, biomass
- ❑ Genetic resources
- ❑ Natural medicines, pharmaceuticals
- ❑ Pest regulation
- ❑ Pollination regulation
- ❑ Natural hazard regulation
- ❑ Spiritual/religious inspiration from the natural world

- ❑ Fresh water
- ❑ Water regulation
- ❑ Water purification and waste treatment
- ❑ Air quality regulation
- ❑ Biochemicals
- ❑ Climate regulation
- ❑ Erosion regulation
- ❑ Disease regulation
- ❑ Aesthetic benefits from the natural world
- ❑ Cultural heritage benefits from the natural world
- ❑ Recreational benefits from the natural world
- ❑ Tourism opportunities
- ❑ Resource cycling, e.g. water cycle, nitrogen cycle
- ❑ Primary production
- ❑ Soil formation
- ❑ Other

Section 4: Long Term Change in the Catchment

Q16 Thinking about each of the following factors in turn, please state the level of concern you have for each one

	Of Great Concern	*Of Some Concern*	*Of No Concern*	*Don't Know*
Climate Change	❑	❑	❑	❑
Economic restructuring and globalisation	❑	❑	❑	❑
Population growth and migration	❑	❑	❑	❑
Availability of energy	❑	❑	❑	❑
Waste management	❑	❑	❑	❑

Q17 How do you feel the catchment will be effected by the following social, economic and environmental processes over the next 50 years? (For each factor, please tick one circle that best describes your opinion)

	Large effect	*Some effect*	*No effect*	*Don't Know*
Climate Change	❑	❑	❑	❑
Economic restructuring and globalisation	❑	❑	❑	❑
Population growth and migration	❑	❑	❑	❑
Availability of energy	❑	❑	❑	❑
Waste management	❑	❑	❑	❑

Q18 Taking all factors into consideration would you say that the future outlook for the Parrett Catchment is:

Very Positive	*Pretty Positive*	*Hard to Say*	*Fairly Bleak*	*Very Bleak*
❑	❑	❑	❑	❑

Section 5: Obstacles

Please state to which level the factor below will be a barrier to developing integrated approaches and sustainable solutions for managing natural resources across the catchment?

Q19a Please tick the one box that best describes your opinion

	Strong Barrier	*Slight Barrier*	*No Barrier*	*Don't Know*
Institutional/governance arrangements	❑	❑	❑	❑

Q19b Please state the reasons for your opinion

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Please state to which level the factor below will be a barrier to developing integrated approaches and sustainable solutions for managing natural resources across the catchment?

Q20a Please tick the one box that best describes your opinion

	Strong Barrier	*Slight Barrier*	*No Barrier*	*Don't Know*
Availability of sufficient scientific information	❑	❑	❑	❑

Q20 b Please state the reasons for your opinion

_____
_____
_____
_____
_____
_____
_____

Please state to which level the factor below will be a barrier to developing integrated approaches and sustainable solutions for managing natural resources across the catchment?

Q21a Please tick the one box that best describes your opinion

	Strong Barrier	*Slight Barrier*	*No Barrier*	*Don't Know*
Level of community involvement in Catchment issue	❑	❑	❑	❑

Q21b Please state the reasons for your opinion

_____
_____
_____
_____
_____
_____
_____
_____
_____

Please state to which level the factor below will be a barrier to developing integrated approaches and sustainable solutions for managing natural resources across the catchment?

Q22a Please tick the one box that best describes your opinion

	Strong Barrier	*Slight Barrier*	*No Barrier*	*Don't Know*
Lack of a common approach between organisations/groups	❑	❑	❑	❑

Q22b Please state the reasons for your opinion

_____
_____
_____
_____
_____
_____

Please state to which level the factor below will be a barrier to developing integrated approaches and sustainable solutions for managing natural resources across the catchment?

Q23a Please tick the one box that best describes your opinion

	Strong Barrier	*Slight Barrier*	*No Barrier*	*Don't Know*
Adequacy of funds	❑	❑	❑	❑

Q23b Please state the reasons for your opinion

_____
_____
_____
_____
_____
_____

Q24 Lastly, we are using existing local 'visions' for developing future scenarios for the catchment, e.g. the Somerset Strategic Partnership vision and the PCP integrated catchment vision. Are there any other future visions for the Catchment that you feel we should consult/be aware of in developing our work?

❑ Yes
❑ No

Q25 If yes, please provide details

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Thank you for taking the time to answer these questions. Your opinions are very much appreciated.

For more information on the Parrett Catchment project please visit the websites listed below

www.catchmentfutures.org.uk

www.defra.gov.uk/wildlife-countryside/natres/rationale.htm

PLEASE PRESS THE SUBMIT BUTTON BELOW

Appendix 3: Results of the initial 'warm-up' on-line survey of views and perceptions

A3.1 Purpose of the on-line warm-up survey

The on-line survey comprised the first element of the stakeholder engagement plan and process. It was designed to cover each of the three phases listed above but in an introductory way to literally begin 'warming-up' a range of local stakeholders to the concepts and ideas at the core of the case study. The first phase was all about starting an iterative process of learning between the project team and stakeholders about the potential for applying an Ecosystems Approach to catchment management, thus the on-line survey provided an ideal way of initiating this process.

The stakeholder engagement plan identified three main groups of stakeholders. However, because membership of these groups overlaps to some extent they are not mutually exclusive so the decision was made to use a different structure for the on-line survey, asking respondents to identify which stakeholder category they belonged to, i.e. self-categorisation.

The aim of the on-line warm-up survey was to invite stakeholders to describe their aspirations and understanding of the catchment and, by introducing them to the language and service-led approach of the EsA in a limited way, thus pave the way for more detailed discussions at the main workshop in the autumn. Deciding who to invite to take part in the warm-up survey was straightforward for the ELG and WMP groups because their membership lists were provided by Somerset County Council who currently facilitates the running of each of these groups.

A bigger problem was identifying an existing, representative group of residents and community representatives. Given time constraints the most obvious solution was inviting the catchment's Parish Clerks – as local residents representing local communities - to take part in the survey using an up-to-date email list, again provided by Somerset County Council.

A3.2 Designing and launching the survey

It was important that the survey was simple, easy and fairly quick to complete so that respondents were encouraged to answer each question, finish the survey and email their response within the space of around 10-15 minutes. A set of structured 'closed' questions were developed to cover the geography of service provision across the catchment, the main drivers for change and possible futures that may happen. Making the questions flow by losing technical terms and jargon was challenging but this was largely overcome by focusing on benefits and quality of life across the catchment in relation to ecosystem services.

As an introduction to the survey respondents were given a brief summary of the project and a web link to both the project and Defra web sites in case they wanted more information. They were also given a name and phone number to contact should they anyone have any queries about the survey or the project more generally. Respondents were also asked to identify which district of borough they lived in, or

whether they resided outside of the catchment. They were also asked about whether they had a professional role within the catchment in terms of land use planning and management, or not. Asking these types of question enabled the project team to see how different groups value services, goods and benefits in different ways.

Following the initial draft, Snap software[31] was used to design and format the survey as an on-line tool. The penultimate version of the survey form was tested over a two week period by six selected stakeholder representatives chosen with advice from Countryside staff at Somerset County Council (SCC). Following this the survey was finalised and launched slightly later than planned towards the end of April to avoid the Easter holidays. Unfortunately the delayed inception of the Water Management Partnership and the ensuing delay in securing a list of email addresses from SCC meant that members were unable to take part in the on-line survey until mid June, thus all of the responses were analysed in early July

A3.3 Headline results and analysis

In total the survey went out to 208 people and 55 responses were returned, giving an overall response rate of 26%. Only 5% of respondents lived outside of Somerset and 78% confirmed that they lived within the catchment, with the majority (41%) living in or close to Bridgwater, Langport and Taunton.

Respondents comprised a good cross-section of public sector workers (38%) plus local authority officers, members, NGOs, small businesses and large corporates with just over 7% retired or unemployed. However, only around 35% of respondents (about a third) felt that their professional role has an impact on the future well-being of the catchment and its communities. Some 69% strongly agreed that a river catchment was a useful geographical unit for looking at ways of integrating environmental, social and economic goals, issues and opportunities. However, whilst 35% felt that people living and working in the area would be familiar with the term “Parrett Catchment”, a further 36% disagreed. The remaining 29% were undecided. Furthermore, a majority of 58% felt local people would be unable to identify the catchment’s boundaries and that currently, most would choose a different geographical term to describe their local area. This is obviously a governance issue that needs considering carefully in looking at ways of embedding an EA in local decision-making processes.

Opinions were divided as to whether quality of life benefits like security from flooding and access to local produce were freely available to all across the catchment, irrespective of where people lived or their social background. This was especially marked for access to well-planned affordable housing making good use of local building materials, timber and renewable energy, with only 20% of respondents stating that this was not available to anyone in the catchment, 45% felt that it was available depending on social standing (in terms of income). A minority of 14% felt that this benefit was openly available to all.

Interestingly 89% of respondents felt that economic sectors reliant on natural resources (farming, tourism and specialist retail) needed some improvement for greater security. Similarly 84% felt that opportunities for countryside leisure, health and well-being needed improving across the catchment. Key factors for helping to make the catchment more sustainable were local foods, fresh water, tourism and recreation, closely followed by resource /nutrient cycling, erosion and water

[31] Snap software is a highly flexible package that can perform and link every step of the survey process seamlessly using a single file and interface. For more information see www.snapsurveys.com

regulation in that order. Perhaps surprisingly primary production and aesthetic benefits came lower on the list.

Climate change was of some concern to 46% of respondents and of great concern to a further 44%, but of no concern to the remaining 10%. The majority (67%) felt that climate change would have large effect on the catchment over the next 50yrs, and a similar majority (69%) thought that globalisation and economic restructuring would have some effects locally.

Lastly, 46% of respondents felt that current institutional and governance arrangements are a strong barrier to achieving more integrated, sustainable solutions for the catchment and a further 33% felt that these were a slight barrier, supported by additional comments from 44% who urged that more joined up action, partnership working and communication was necessary. In contrast there was more polarisation of views about whether more scientific information was needed, with 53% saying little more was required (of which 33% felt that it should be used more effectively) around 18 % who felt this was a strong barrier or gap to fill, and a further 29% who felt they didn't know enough to be able to comment.

The results are also given in pie charts and can be viewed on the project homepage (www.catchmentfutures.co.uk).

Appendix 4: Overview of Visions and stakeholder involvement in the Parrett Catchment

Owner	Vision	Plans and Assessment Frameworks (Tools)	Stakeholder involvement	Purpose	Role for EBA?
South Somerset Together Local partnership	No definite vision articulated but sustainable development is a key goal.	Sustainable Community Strategy based on 9 cross-cutting themes	All partners (in differing ways) carry out consultation on different topics, bringing together information on people's wants and needs, updated through an annual survey	Focus is on effective service delivery	EBA focus on services would be compatible and encourage greater integration between the different aspects of sustainability
West Somerset Strategic Partnership	New 2007 vision that by 2020 WS will be prosperous, welcoming, strong, balanced, self-sufficient. Further divided into social, economic and environmental visions; last looks at low carbon measures and minimising natural resource use	Sustainable Community Strategy comprising 9 themes of which residents identified environment as the most important. Developing their Local Development Framework for land use planning with Exmoor National Park Authority, also encouraging Parish and Community plans	Partnership undertakes residents surveys on a regular basis, plus consultation events	Appears well-rounded and with a strong environmental resource focus in relation to how people live and work	Appears to have a stronger environmental focus than other district strategies. A good candidate for introducing the concept of ecosystem goods and services for applying an EBA in next iteration of vision.

Owner	Vision	Plans & Assessment Frameworks (Tools)	Stakeholder involvement	Purpose	Role for EBA?
Somerset Strategic Partnership	Somerset: A landscape for the future - Overall vision for 2025 is of a dynamic, successful modern economy that supports, respects and develops Somerset's distinctive communities and unique environment	Six strategic priorities and 5 action themes. Directly linked to the Somerset Local Area Agreement (LAA). The LAA brings together locally based, bottom up initiatives with Central Government and top down policies – impact of this process will often be at a neighbourhood level, breaking down inconsistencies and constraints to ensure delivery is more efficient and effective.	Various area and sector partnerships, groups, initiatives co-ordinated by a few overarching groups including the **Environment Leaders Group**	Various, but pre-dominantly socio-economic in scope and content.	Inclusive and broad-based in terms of stakeholders but very limited environmental scope. The vision, strategy and LAA, could each be EBA-proofed, drawing on the developing county-wide Natural Environment Strategy.
Taunton Deane BC	To be a regional centre of excellence, ensure future economic growth, be a premier retail centre, enhance well-being and prosperity, leisure and cultural facilities and quality of life, effects spreading out to surrounding villages and towns	Masterplan plus themes/action plans per sector and per zone.	Public consultation via partnership, range of local area initiatives.	Urban regeneration to benefit both the town and the surrounding hinterland.	Strong socio-economic focus, limited environmental measures. Applying EBA would probably require a broader spatial focus to address links with rural hinterland goods and services.
Parrett Catchment Project (Water Management Partnership from April 2007)	50 year vision for an integrated catchment so that "the existing quality of life in the Parrett catchment will be sustained and enhanced through integrated management of its land and water resources". The vision has 25 components covering all socio-economic and environmental aspects relevant to quality of life.	Long history of initiatives (originally EU-funded) leading up to development of 50 Yr Strategy and 5yr Action Plans to implement vision. , Sustainability appraisal of partnership activities in 2006 used the 5 Capitals Framework.	Established, fully representative stakeholder group and co-ordinating Management Group incorporating Levels and Moors Partnership and other local groups. Strong, still evolving outreach to communities	Integrate land use, land management and water management for sustainable outcomes	Sustainability appraisal was a one-off exercise. Introduction of goods and services concept could help to maintain focus on broader and fully integrated approach.

Appendix 5: CBD Principles and Parrett Catchment Stakeholder Group response

CBD principles for using the Ecosystem Approach	Somerset LAA (Via ELG)
1. Involving all members of society in decisions associated with the management of land, water and living resources	Yes - The cross-sectoral multi-agency steering group and 'theme' working groups fully represent all views
2. Ensuring management is de-centralised to the lowest appropriate level	Yes – practical action is being devolved to the most appropriate group or organisations
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems	No – not yet a part of the LAA
4. Ensuring the economic context is be understood	Yes, the LAA has a strong socio-economic focus – it now needs the environment to be threaded through it.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the Ecosystem Approach	No – although the LAA is primarily concerned with service delivery, it does not currently recognise the importance of ecosystem goods and services
6. Considering what measures can be taken to ensure ecosystems are managed within acceptable limits	No – this principle does not currently feature in the LAA
7. The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales	No – this will need discussion and agreement by the partnerships via the ELG
8. Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term	No? The LAA covers a 3 yr period, but priorities and actions for delivery may well go beyond this
9. Using adaptive management to address the problem(s) identified	No? The LAA process is almost certainly adaptive but it does not currently address changing ecosystems
10. Seeking an appropriate balance between, and integration of, conservation and use of biological diversity	No – not currently addressed
11. Ensuring all forms of relevant knowledge including scientific, indigenous and local knowledge, innovations and practices are included	No – since ecosystem thinking and the evidence base behind this are not currently being used for the LAA
12. Facilitating the involvement of all stakeholders including all sectors of society and scientific disciplines	Yes – now that the ELG is established, environmental stakeholders and conservation interests will be fully represented within a socio-economic context

CBD principles for using the Ecosystem Approach	Catchment WMP (via Management Group)
1. Involving all members of society in decisions associated with the management of land, water and living resources	Yes - Cross-sectoral management group and fully representative stakeholder group involve all living and working within the catchment
2. Ensuring management is de-centralised to the lowest appropriate level	Yes – the emphasis is on landowners, businesses and communities taking responsibility in managing land and using water
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems	Yes – management activities are under regular review as part of the strategy implementation, however some tensions need resolving between farmers and conservationists in parts of the catchment
4. Ensuring the economic context can be understood	Yes – this has always been integral to the Parrett strategy, seen as vital to success
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the Ecosystem Approach	Partially? The concept of ecosystem goods and services is not explicit in the Parrett strategy, making it so may alter priorities for action.
6. Considering what measures can be taken to ensure ecosystems are managed within acceptable limits	Yes – this is a key concern of several stakeholders and an integral part of the strategy, although further definition of acceptable limits may be necessary
7. The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales	No – this will need discussion with the WMP although the majority have views backed by knowledge and experiences about appropriate spatial and temporal scales
8. Recognising the varying temporal scales and lag-effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term	Yes – the strategy looks ahead fifty years and addresses the impacts of climate change
9. Using adaptive management to address the problem(s) identified	Yes – although this may not be as explicit as it needs to be in the strategy and its 5 year action plans
10. Seeking an appropriate balance between, and integration of, conservation and use of biological diversity	Yes – this is core to the strategy and how it is being implemented, although there are tensions that still need resolving
11. Ensuring all forms of relevant knowledge including scientific, indigenous and local knowledge, innovations and practices are included	Yes – the whole history of the PCP and the implementation of the strategy demonstrate the use of all kinds of knowledge
12. Facilitating the involvement of all stakeholders including all sectors of society and scientific disciplines	Yes – stakeholder facilitation is a characteristic feature of the PCP partnership and strategy approach

Appendix 6: Outline questionnaire for scenario evaluation

Thanks very much for giving up your time to take a look at the scenarios. We'd be grateful if you would take just a few minutes to answer some questions about these. Your views will help us and Defra come to view about this technique, and how we might develop it further in the Catchment and elsewhere.

Section 1. Personal Details

1. We will respect the anonymity of all respondents in publicising the results of our work, but it will be helpful to us if we can if we have a few details of those responding to this survey.

Name	
Occupation/professional role	
Organisation	
Contact Email	

Section 2. General views about scenario building techniques

2. Please strike the box that best reflects your prior awareness of scenario building techniques

I have used scenario building techniques in the course of my work	
I was aware of scenario building techniques, but had never encountered them directly	
This is the first I've ever heard of scenario building techniques	

3. Please strike the box that best reflect the usefulness of building scenarios of the future for decision makers

I could imagine scenario building techniques assisting decision makers greatly in the course of their work	

Scenario building techniques strike me as a useful, but not critical, tool for decision makers. ☐

Scenario building techniques strike me as largely pointless or unnecessary ☐

4. Below are a series of claims often made to support the development scenario building techniques. Please strike the box that reflects the extent to which you agree with the listed statements.

Scenarios are potentially a useful way of:	***Agree strongly***	***Tend to agree***	***Tend to disagree***	***Disagree Strongly***
challenging prevailing wisdoms about the future	☐	☐	☐	☐
clarifying the 'synergies' and 'trade-offs' between different policy areas	☐	☐	☐	☐
thinking about systems 'holistically'	☐	☐	☐	☐
developing a common vision for the future among stakeholders	☐	☐	☐	☐
assessing the long term consequences of current decisions	☐	☐	☐	☐
understanding environmental 'limits and thresholds	☐	☐	☐	☐
encouraging the involvement of the public in decision making	☐	☐	☐	☐

5. If you wish to express any further views regarding the potential usefulness of scenario building techniques then please do so in the box below:

Section 3. Presentation of the Catchment Scenarios

Below are series of questions regarding how three scenarios are presented on this website. Please tick the appropriate box that best represents your views.

6. Overall the amount of information provided to explain the scenarios was

Insufficient for the purpose ☐ *Sufficient for the purpose* ☐

Highly sufficient for the purpose ☐ *Overly sufficient for the purpose* ☐

7. The language used to describe the three scenarios was:

Complicated ☐ *Appropriate to the purpose* ☐

Simplistic ☐ *Uneven in its clarity* ☐

8. The maps used to depict aspects of these three scenarios were:

Unclear ☐ *Appropriate to the purpose* ☐

Lacking in detail ☐ *Uneven in their clarity* ☐

9. The use of written text to characterise the scenarios was

Absolutely necessary ☐ *Helpful, but not crucial* ☐ *Unnecessary* ☐

10. The use of summary tables to characterise the scenarios was

Absolutely necessary ☐ *Helpful, but not crucial* ☐ *Unnecessary* ☐

11. The use of maps to characterise the scenarios was

Absolutely necessary ☐ *Helpful, but not crucial* ☐ *Unnecessary* ☐

12. Do what extent do you feel the following techniques might also be necessary to convey scenarios effectively?

	Absolutely necessary	*Helpful, but not crucial*	*Unnecessary*
Hand drawings or photos representing aspects of the scenarios	☐	☐	☐
Photo-realistic representations of whole landscapes	☐	☐	☐

13. If you wish to express any further views regarding the way that scenarios might be enhanced in terms of their presentation then please do so in the box below:

Section 4. Plausibility and Robustness of Scenarios

14. In your view how plausible are the scenarios of the catchment?

All scenarios are highly plausible	☐
Some scenarios are more plausible than others	☐
All scenarios have some aspects to them that are plausible	☐
The scenarios are not plausible at all	☐

15. In your view how well do the scenarios capture the range of issues facing the catchment?

The scenarios do a good job of capturing the range of issues facing the catchment. ☐

The scenarios do a reasonable job of capturing issues but there are important gaps ☐

The scenarios are very partial and incomplete ☐

16. If you wish to express any further regarding the plausibility and completeness of the Scenarios then please do so in the box below.

Thank you very much for answering these questions. If you have any further views about the value use of scenario building techniques either generally or specifically in relation to the catchment then please make them know below.