SCOPING STUDY ON AGRICULTURAL LANDSCAPE VALUATION

Final Report to DEFRA by

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GLOSSARY

At the request of the Project Steering Group this glossary includes definitions of a selection of some key terms from both the landscape and economic literature:

TERMS FROM THE LANDSCAPE LITERATURE

Landscape
Is about the relationship between people and place. It provides the setting for our day-to-day lives. The term does not mean just special or designated landscapes and it does not only apply to the countryside. Landscape can mean a small patch of urban wasteland as much as a mountain range and an urban park as much as an expanse of lowland plain. It results from the way that different components of our environment - both natural (the influences of geology, soils, climate, flora and fauna) and cultural (the historical and current impact of land use, settlement, enclosure and other human interventions) - interact together and are perceived by us. People's perceptions turn land into the concept of landscape.

Landscape perception
Studies in landscape perception investigate the psychology of seeing and attaching meaning to landscape

Landscape preference
The extent to which people like one landscape better than another and the reasons for this.

Landscape Evaluation
Approaches to finding a numerical expression for the subjective response of individuals to aesthetic or scenic quality.

Landscape classification
Describing the nature and range of landscapes in an area and grouping together those of a similar type.

Landscape character
A distinct and recognisable pattern of elements that occur consistently in a particular type of landscape. Particular combinations of geology, landform, soils, vegetation, land use, field patterns and human settlement create character. Character makes each part of the landscape distinct, and gives each its particular sense of place. Whether we value certain landscapes for their distinctiveness, or for other reasons, is a separate question.

Landscape Character Types
Distinct types of landscape that are relatively homogeneous in character. They are generic in that they may occur in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern.

Landscape Character Areas
Discrete geographical areas of a particular landscape type, but which are in themselves unique. Each has its own individual character and local identity, even though it may share the same generic characteristics with other areas of the same landscape type.

TERMS FROM THE ECONOMIC LITERATURE

Direct use values
Where individuals make actual use of an environmental resource such as an agricultural landscape, in either a consumptive way, for example farming, or a non-consumptive way, such as walking for recreation, bird watching, enjoying the landscape.

Indirect use values
Are unrelated to current use but are linked to the environmental resource, for example, ecosystem functions such as watershed protection or carbon sequestration.

Non-use value
The benefits that people obtain from an environmental resource simply because it continues to exist, including existence, altruistic and bequest values.

Existence values
Values that arise because individuals may value the existence of an environmental resource in a way that is unrelated to their current or future use of it.

Altruistic values
Values that arise when individuals are concerned that the environmental resource in question should be available to others in the current generation.

Bequest values
Measure individuals' willingness to pay to ensure that future generations will be able to enjoy the environmental resource in its undeveloped state.

Total Economic Value
Is the total value attached to an environmental resource, combining both direct and indirect use values and all three forms of non-use value.

Revealed preference valuation techniques
Are based on people's actual behaviour in real markets related to the particular 'good' with actual expenditure involved. Such techniques can only be used in relation to use values and the most common methods used are **hedonic pricing** where values such as house prices are used to indicate the value of an environmental resource; and the **travel cost method** which is usually applied to recreational use value of specific resources such as woods and forests, country parks, water areas or designated areas such as national parks. It requires estimates of the costs involved in travel time and distance, the number of visits per annum, and entry fees where these exist.

Stated preference valuation techniques
Must be used where there is no related market for the environmental resource in question but where a hypothetical market is created. People are asked to indicate how much they would be willing to pay for an environmental good in that hypothetical market. In theory such techniques can be used in a variety of different circumstances and can provide monetary values for all the categories in the table of total economic value, including non-use values. Stated preference techniques include Contingent Valuation and Choice Experiments.

Substitutes
Two landscapes or landscape features are substitutes if they fulfil the same need and if the presence of one can compensate for the absence of the other. As landscapes provide many varied environmental goods and services it is essential to specify the good/service that the substitutability relates to. Two landscapes may be substitutes with respect to the provision of

one environmental service (e.g. recreation) while not being good substitutes for other goods and services (e.g. species conservation).

Complements: Two goods are complements if consumption of one is required for the consumption of the other, therefore the existence of one cannot compensate for the absence of the other. In landscape valuation an example of this is the complementarity between access to a landscape and the characteristics of the landscape being valued.

Embedding

Embedding is said to occur in stated preference studies when the willingness to pay values for a good differ according to whether the good is valued on its own or as part of a package of goods. In landscape valuation two effects related to embedding are of particular importance; the scope effect and the sub-additivity effect. The scope effect is found when different magnitudes of an environmental good have the same willingness to pay value (for example agricultural improvement on 5 hectares of a landscape has the same value as the same improvement on 10 hectares). The sub-additivity effect refers to the situation in which willingness to pay for a combination of individual changes to a landscape is smaller than the sum of the willingness to pay values for the individual changes.

1.0 INTRODUCTION

BACKGROUND

1.1 It is now common practice for policies, programmes and projects to be subjected to economic assessment and evaluation, in line with the requirements of HM Treasury's Green Book[1]. Such evaluations aim at ensuring that both the costs and the benefits have been considered before decisions are made on new initiatives. This requires consideration of a whole range of areas of potential impacts and where possible the valuation of these impacts in monetary terms. In the environmental sphere such impacts embrace a wide range of factors, including those such as noise, air quality and emissions, which lend themselves more readily to quantitative evaluation and to monetisation, and others, for example biodiversity, cultural heritage and landscape, which often do not. In common with other Government Departments, the Department for Environment, Food and Rural Affairs (DEFRA) is responsible for a wide range of policies, all of which have the potential for both positive and/or negative impacts on the landscape. These impacts need to be identified and valued in order to provide a comprehensive policy appraisal or evaluation. In such evaluation studies it has proved particularly difficult to deal with the valuation of impacts relating to landscape. The aim of this research is therefore, according to the terms of reference "to enhance our understanding of the methodological issues involved in, and best practice for, the valuation of landscapes for policy appraisal in England".

1.2 In the last ten years there has been a great deal of research on the topic of economic valuation in relation to the policies of Government Departments, and notably DEFRA. The main relevant reports are listed below and together they demonstrate progressive development of ideas about the way that different aspects of the environment should be valued, focussing on the economic approach to valuation:

- Estimating the Value of Environmental Features, Stage 1 Report (IERM and SAC, 1999, for MAFF)
- Estimating the Value of Environmental Features, Stage 2 Report (IERM and SAC, 2001, for MAFF)
- Framework for Environmental Accounts for Agriculture (Eftec and IEEP, 2004, for DEFRA)
- The Value of Undeveloped Land (Eftec and Entec, 2002, for ODPM)
- Economic Valuation of Environmental Impacts in the Severely Disadvantaged Areas (Eftec et al, January 2006, for DEFRA)
- Valuing our Natural Environment (Eftec and Environmental Futures Ltd, March 2006, for Defra)
- Valuing Transport's Impact on the Natural Landscape (Eftec et al, October 2006, for the Department for Transport)

1.3 These reports, and a wide range of related academic and other literature, cover a range of environmental topics and address the way that valuation might be approached for a variety of different purposes. It is, however, clear that particular difficulties and uncertainties have arisen in dealing with approaches to the economic valuation of

landscape. DEFRA decided to commission this scoping study to try to clarify some of the uncertainties and point to ways in which the difficulties might be overcome. To this end the study has a number of very specific research objectives and questions to address. They are set out below.

RESEARCH OBJECTIVES AND QUESTIONS

1.4 The brief for the scoping study set the following objectives and posed the questions included in them:

1. Investigate the extent to which it is possible to value agricultural landscapes in terms of their component features. How much is sacrificed or gained by this approach relative to valuing composite landscapes? Issues such as aggregation of individual components into whole landscape values, complements and substitutes and embedding effects that may occur when considering individual components should be examined in detail and informed suggestions made as to which is the most effective way to value landscape.

2. Identify best practice for landscape valuation, addressing any specific valuation issues that have been raised in the literature (e.g. that respondents find landscape a particularly difficult good to value). Examine if there are specific circumstances under which the issues occur most frequently or occur with most severity. Investigate what can be done to help reduce or eliminate them.

3. Investigate the extent to which it is possible to distinguish landscape values from the value of the various ecosystem services provided by environmental assets, in order to avoid double counting when biodiversity and ecosystems service values are included with landscape valuation in overall policy appraisal and evaluation. Does it make any difference to this issue if you value composite landscapes or component features?

4. Investigate how to generate a limited number of valuation data that can be used to estimate marginal values for all/the majority of the English rural landscape through benefits transfer. With reference to data on existing rural landscapes, (e.g. Joint Character Areas?) can a manageable number of representative rural landscapes be characterised? Would it be easier/more appropriate to value these landscape types compositely or based on their component parts? How should we go about generating transferable valuation data either way? Consideration should be given to how GIS may be used to advance this area. It is important to establish if and where there are data gaps.

5. Investigate the appropriate counterfactual to be used for agricultural landscape valuation. In particular, when designing any studies to generate values for benefits transfer, how should we maximise the chances that the counterfactual will be appropriate for DEFRA's future policy needs? This could involve assessing a number of likely counterfactuals for each of the landscape types identified.

6. For each landscape type/counterfactual combination, assess how values should be adjusted for transfer to account for issues like context, complementarity/ substitutability, accessibility/ number of users, etc

7. Use this analysis to assess the feasibility of compiling a database of transferable landscape values that could, with adjustment, be used to assess the value of

changes to landscapes. Assess the limitations to this approach and make any appropriate alternative suggestions.

8. Review, together with Defra, the policy needs for different types of landscape value and, accounting for the findings of previous objectives, advise on the most cost-effective way to meet those needs. This should include advice on the extent to which Defra's Environmental Landscape Features model should be used.

FOCUS ON AGRICULTURAL LANDSCAPES

1.5 This study is focused on valuation of agricultural landscapes. This distinguishes it from many other valuation studies which are often concerned with more specific and easily defined resources such as forests, wilderness areas or different types of recreational resource. The undertaking of benefits transfer for policy analysis, especially if it is to make use of existing studies, makes it important to recognize this distinction. We have taken agricultural landscapes to mean all rural landscapes in England, outside major built-up areas, which are predominantly in agricultural use. Defined at the broad scale they may of course also include other land uses such as woodland and smaller developed areas which form part of the fabric of the landscape.

APPROACH AND METHODS

1.6 It is important to stress that this is only a scoping study and does not involve any new empirical work. It relies mainly on literature reviews, together with review of relevant data sources and map information, a limited amount of consultation and discussion, and analysis of the research questions noted above. More specifically it has involved the tasks described below:

Economic Valuation Literature

- a review of relevant recent valuation reviews and valuation studies, as listed above, to see what light they throw on the issues raised by the brief;

- critical review of key academic papers that help to answer the questions posed including methodological issues such as complements, substitutes and embedding effects. A wide range of papers which collate information on the range of values attributed to landscape, and especially agricultural landscapes, including British and European work, was included where relevant and helpful in addressing the core questions in the brief.

Literature on the use of GIS in economic valuation projects

- review of both academic and practice literature on the potential role of GIS in benefits transfer in relation to landscape typologies.

Landscape evaluation and public perception Literature

- critical review of the academic literature on both landscape quality/value and landscape character, and public perception of both;

- review of relevant material in the 'grey' literature, not necessarily in the public domain, resulting from various consultancy and research contracts for public sector bodies.

Literature and project material on landscape typologies and visualisation

- identification, location and review of material and data relating to potential sampling frameworks for landscape valuation studies and testing and discussion of their potential value for future work;

- review of relevant literature and projects using visualisation as a stimulus for public engagement with landscape change and landscape value, and assessment of issues relating to its potential use in valuation studies.

Consultation

- consultation meetings with potential policy users in DEFRA and elsewhere, and landscape experts in the Natural England, through the meetings of a project steering group, and separate meetings with representatives of Natural England and through contact with consultants engaged in other related projects for DEFRA, namely Jacobs for the project "Environmental Accounts for Agriculture" and Roy Haines Young of the University of Nottingham for the project "England's Terrestrial Ecosystem Services and the Rationale for an Ecosystem-Based Approach".

1.7 An interim report setting out our preliminary conclusions was submitted to the Project Steering Group in April. A written summary of the comments from Project Steering Group members on these interim conclusions has informed our preparation of this final report.

NATURE, FORMAT AND ORGANISATION OF REPORT

1.8 The brief for this study raises a number of difficult, technical questions which need to be addressed using the theory and practice of environmental economics. The subject matter is, however, also of interest to people who are not economists, including policy makers in DEFRA and other government departments and government agencies. We have therefore attempted to make the discussions of the economic principles as non-technical as possible while still retaining the sense and validity of the underlying principles and theories. Equations based on economic theory have been kept to a minimum but, where we have felt it useful to include one or two for clarity, they are placed in a separate box in italic script and can be passed over by those who do not require this level of detail.

1.9 Much of the background to the subject matter of this report has been set out in great detail in previous studies, especially those listed above in Paragraph 1.2. In general we have sought to focus on the core objectives and questions in our brief rather than setting out to repeat this background material. Nevertheless there are some areas of background information and terminology that are fundamental to understanding the subject matter of this report. We have included this information where necessary to aid understanding, particularly for non- experts, even though it may have been previously included in some form in previous studies.

1.10 Following this introduction the rest of this report is divided into three further chapters, as follows:

Chapter 2 : Concepts and theories in landscape valuation

Covers research questions 1 and 2 and deals with the concepts and theories underpinning landscape and landscape valuation, and the conclusions that can be drawn from the literature both on landscape perception and evaluation and on economic valuation of landscape.

Chapter 3 : Practical challenges in landscape valuation

Covers research questions 3 to 8 and addresses: potential policy applications for economic valuation of agricultural landscapes and the range of alternative future scenarios and related counterfactuals that would need to be examined to provide relevant valuation information; the relationship between landscape values and ecosystem services, including the possibility of double counting; approaches to developing spatial frameworks that would allow benefits transfer and the use of GIS in environmental economic valuation studies. We also draw conclusions about a preferred approach to mapping agricultural landscapes for use in such studies.

Chapter 4 : A suggested approach to evaluating agricultural landscapes
Draws conclusions from the rest of the report and sets out an approach that would allow the suggested spatial framework to be combined with collection of new valuation data, to allow the values to be applied to the full range of agricultural landscape types in England.

1.10 The Appendices include summary information about the more detailed literature reviews carried out in the scoping study. **Appendix A** briefly summarises relevant academic literature dealing with landscape evaluation and related areas such as landscape perception and landscape preferences, concentrating on issues such as whether whole landscapes or components should be valued. It also contains a summary of studies demonstrating the role of Geographic Information Systems (GIS) in valuation studies. **Appendix B** summarises a wide range of relevant economic valuation studies that have been carried out in the United Kingdom and in Europe and which have agricultural landscapes as their focus. It includes a table that summarises the values generated by each of these studies for different agricultural landscapes or their components. Much of the European literature on the economic valuation has been summarised by translation from its original language, which has allowed us to significantly extend its scope compared with previous reviews of this type. APPENDIX C summarises papers dealing with the role of Geographic Information Systems (GIS) in economic valuation studies. Each Appendix is fully referenced. References in the main text are included as endnotes at the end of the main report.

2.0 CONCEPTS AND THEORIES IN LANDSCAPE VALUATION

INTRODUCTION

2.1 This chapter addresses the first two research objectives and questions namely:

- investigate the extent to which it is possible to value agricultural landscapes in terms of their component features. How much is sacrificed or gained by this approach relative to valuing composite landscapes? Issues such as aggregation of individual components into whole landscape values, complements and substitutes and embedding effects that may occur when considering individual components are examined in detail and suggestions made as to which is the most effective way to value landscape (Objective 1);

- identify best practice for landscape valuation, including any specific valuation issues that have been raised in the literature (e.g. that respondents find landscape a particularly difficult good to value), examination of any specific circumstances under which the issues occur most frequently or occur with most severity and investigation of what can be done to help reduce or eliminate them (Objective 2).

2.2 In order to examine these questions it is necessary to examine ideas about what landscape means, the implications of research on landscape evaluation and theoretical perspectives relating to landscape perception and preference, and to consider how these issues are currently dealt with in policy and practice relating to landscape and environmental planning. The handling of landscape in economic valuation studies is then considered.

WHAT DO WE MEAN BY LANDSCAPE

2.3 Although landscape is a complex construct with many layers of meaning and interpretation, there is generally agreement in the UK that it is concerned with the relationship between people and place and with many different facets of this relationship. Since 1985 the UK has developed a largely informal, non-statutory but reasonably coherent approach to landscape planning which is focused around the concept of landscape character - that is, what makes landscapes distinctive and different from each other. This has been expressed largely through the practice of Landscape Character Assessment, which has become a major tool to support decision-making in rural, peri-urban and urban areas, as described in the current Landscape Character Assessment guidance[2]. This includes the definition of landscape in **Box 1**:

Box 1 : The meaning of landscape
Landscape is about the relationship between people and place. It provides the setting for our day-to-day lives. The term does not mean just special or designated landscapes and it does not only apply to the countryside. Landscape can mean a small patch of urban wasteland as much as a mountain range, and an urban park as much as an expanse of lowland plain. It results from the way that different components of our environment - both natural (the influences of geology, soils, climate, flora and fauna) and cultural (the historical and current impact of land use, settlement, enclosure and other human interventions) - interact together and are perceived by us. People's perceptions turn land into the concept of landscape.
Swanwick, C. and Land Use Consultants (2002) Landscape Character Assessment for England and Scotland. Countryside Agency, Cheltenham and Scottish Natural Heritage, Battleby.

2.4 This concept of landscape and the accompanying focus on landscape character is enshrined in the text of the European Landscape Convention (ELC)[3]. This Convention, now signed and ratified by the UK government and effective from 2007, defines landscape as:

"an area, as perceived by people, whose character is the results of the action and interaction of natural and/or human factors. The term 'landscape' is thus defined as a zone or area as perceived by local people or visitors, whose visual features and character are the result of the action of natural and/or cultural (that is, human) factors. This definition reflects the idea that landscapes evolved through time, as a result of being acted upon by natural forces and human beings. It also underlines that landscape forms a whole, whose natural and cultural components are taken together not separately."

2.5 Thus in current approaches to landscape and environmental planning, landscape is considered in an inclusive way, rather than as a matter predominantly of scenery and aesthetics, as was the case in the first half of the 20th century and, to varying degrees, up to the 1980s. Viewed in this broader, more inclusive way it can be seen that:

- landscape is an integrating concept, because by definition it embraces all the physical, natural and social/cultural influences that shape the land, together with the ways that people interact with and perceive it to transform land into landscape;

- landscape is also spatially comprehensive - it is everywhere, not just in highly valued landscapes that have been identified for special protection. As demonstrated by the ELC, landscape can be considered in terms of geographical areas or spatial units and therefore can provides a valuable spatial framework to underpin planning and management;

LANDSCAPE EVALUATION, PUBLIC PERCEPTION AND PREFERENCES

2.6 Over the years there has been widespread academic interest in the question of why we like some landscapes better than others. Researchers from a very broad range of disciplines (including landscape architecture, planning, cultural geography, psychology, philosophy and sociology) have investigated this and related questions, and there has been an ongoing search for some form of unifying theory. There have been several significant reviews of this literature which have set out to try and derive practical lessons of relevance to practitioners, notably, and most relevantly:

- a review of recent practice and research in landscape assessment carried out by the Landscape Research Group (LRG) for the Countryside Commission in 1988 as part of the Commission's exploration of methods of assessment following the public enquiry into the Designation of the proposed North Pennines Area of Outstanding Natural Beauty (AONB)[4];

- the scoping study on public and professional attitudes to landscape carried out in 2002 by the Landscape Research Group (not the same as LRG as above) of the School of Architecture, Planning and Landscape at the University of Newcastle for Scottish Natural Heritage (SNH) to help them to develop a better understanding of the public's attitudes and landscape preferences and their attitudes to landscape change[5];

- work by the Macaulay Institute for the Countryside Council for Wales (CCW) in 2005 on the impact of wind turbines, which included a review of approaches to landscape evaluation[6].

2.7 The first and third of these reviews are largely concerned with literature on landscape evaluation from the period 1970 to 1990. The Newcastle review is more up-to-date and concentrates on literature from the late 1980s up to 2002. Unfortunately, where conclusions are drawn in these reviews, there is generally a consensus that no clear or consistent messages emerge from this plethora of research. The 1988 LRG review refers to "the lack of any clear direction to emerge from the mass of academic research and practical studies which has accumulated over the last 30 years, and especially in the 1960s and 1970s". The 2002 Newcastle review suggested that "the academic literature is fairly limited in its practical application" and "we cannot therefore recommend any robust findings from the academic literature which can be generically applied to the type of work SNH are interested in carrying out". Nevertheless, while we agree with these conclusions, there are some areas of the academic literature that are particularly relevant to the task in hand, which are therefore explored in greater detail below.

Whole landscapes or components?

2.8 A prolonged debate took place, mainly in the 1970s but also subsequently, about the best way to evaluate landscape. Many favoured what they considered to be objective approaches, which generally coincided with a focus on expert evaluations (note that this is very different from the quantitative approach which economists have taken, which relies on public preferences instead of expert views). This approach was usually based on quantitative methods in which correlations were established between overall judgements of value and the presence and quantity of the different elements or components that make up the landscape. In the UK this approach was apparent in a number of practical studies carried out in different local authority areas (with East Sussex and Coventry and Solihull the most well-known) as contributions to the then new approach to Structure Planning that accompanied local government reorganisation in 1974.

2.9 The alternative view, strongly advocated by some academics at the time, favoured a more subjective approach, based on public preferences (as distinct from expert ratings) and generally reflecting the importance of considering landscape as a whole. In this approach the literature is divided into those that consider holism to be the appreciation of the aesthetic dimensions of a landscape and those who consider it to be something more than simply what can be seenand to be a way of dealing with evaluation of the whole landscape experience. In addition to these two alternatives there are combined methods, drawing on both of them, in quantitative holistic methods which combine both public preference surveys and landscape features inventories and make use of multiple regression analysis to relate components of the landscape and the scenic preferences of observers. Strands from this overall debate have been taken forward in a number of different areas.

2.10 Some of the main research literature on this subject is described in **Appendix A** and from this it is possible to summarise the main features of these approaches, and of their advantages and disadvantages. The table in the Appendix provides a brief summary of the main advantages and disadvantages of studies based on individual components, on whole landscapes or on a combination of these approaches. and provides further detail of the sources and references. The key points about these three approaches are summarised below.

Studies focusing on individual landscape components or features

2.11 There is a body of work in the field of landscape perception which assumes that measuring the extent of different components that make up the landscape can be used to evaluate the worth of the landscape as a whole. This is the essence of the quantitative, 'objective' approaches described above. The premise of this type of research is that there is a standard set of components that contribute to landscape quality or landscape value. Another assumption in such work is that the value of these different components can be transferred between places and evaluations be made in areas that have not been investigated or visited. Such studies have the advantage that ranked lists can be produced of what people find important and that it is arguably easier to establish the value of different components. They are in some ways better suited to informing policy because they can allow policy makers to focus on action related to the individual components and are able in some cases to generate maps that are good for planning purposes. On the other hand such component based studies do not investigate the way components interact or what the hierarchical structures are in terms of the way they are perceived. This type of approach may also not be as objective as it first appears as the components have to be chosen by the researcher in the first place and they may not be transferable between places because peoples responses are place specific.

Studies focusing on whole landscapes

2.12 These studies are related to the more subjective, often qualitative, studies based on public preference described above. Considering the whole landscape allows exploration of the relationships between the different components and the varying combinations that may occur in different places. It is therefore related to the idea of landscape character which has become so important in landscape planning in the UK in recent years. In such studies value is associated with perceptions of how components come together to create landscapes that are different from each other even though the components may be very similar. It also allows the effects of emotional feelings and knowledge of the landscape to be taken into account rather than relying on visual perception alone. The whole landscape approach therefore captures the ideas that in landscape the whole is greater than the sum of the component parts and also that experiential value is significant. Such integrating studies can, however, be difficult to achieve in practice because of the complexity of the interactions both between components in the landscape itself and between people and the landscape. There can also be problems of choosing the appropriate scale and scope of such holistic studies that capture the main processes and forms of the landscape and recognise the way that people perceive them.

Studies combining both approaches

2.13 Those who are aware of the limitations and the benefits of studies based on the components approach sometimes adopt a combined approach. Here public preferences towards landscape scenes are investigated and then statistical analysis is used to discover whether any specific components within the scene are responsible for the preferences or values that are expressed. Combined studies have the advantage of bridging the gap between delivering policy requirements whilst satisfying some of the theoretical and qualitative aspects of the holistic approach. However, while combined studies share the benefits of both approaches they also share their limitations. One of the biggest problems in developing quantitative assessment methods is that of measuring the contributions of specific landscape components or elements to overall preference. A holistic view creates a 'complex' idea of landscape that requires many variables to represent it. This in turn creates statistical complexity. Research has also shown that positive responses to a landscape can often arise from responses to the whole scene, whereas negative responses often stem from a dislike of individual components. A combined approach can be helpful in revealing this. The disadvantage

of combined approaches is that there is a sometimes awkward juxtaposition between people's opinions and values and quantitative mathematical or statistical approaches. Researchers often note how difficult it is to measure opinion and belief in numbers and equations and note that some studies rely on statistical exercises when a simple qualitative method would do.

2.14 The influences of this long running methodological debate about the balance between quantitative and qualitative, objective and subjective, expert and public and components or whole landscapes are still apparent in ongoing academic research and practice.The main strands of recent developments are discussed in the paragraphs below.

Progression from landscape evaluation to landscape character assessment

2.15 In landscape and environmental planning practice, the research of the 1960s and 1970s was brought together in the "Manchester Landscape Evaluation Study" of 1976[7]. At this time the main emphasis was on the idea of landscape evaluation - that is on what makes one area of landscape 'better' than another. The search for a consensus about such approaches to landscape at this time did not succeed. Emphasis on supposedly objective, scientific, often quantitative approaches to determining landscape value, which was very much the fashion at the time (and was exemplified by the Manchester Study) led to a considerable degree of disillusionment with this type of work. This was largely because many believed it inappropriate to reduce something as complex, emotional and so intertwined in our culture, as landscape, to a series of numerical values and statistical formulae. As a result, something of a vacuum emerged and those involved in landscape planning were sometimes reluctant to tackle the visual and perceptual aspects of landscape.

2.16 Landscape assessment developed from these initiatives during the mid to late 1980s and early 1990s. The history of this change has been documented elsewhere[8] [9] and shows a clear process of development from ideas about landscape evaluation to a focus on landscape character assessment. **Table 2.1** summarises the key differences that have emerged as approaches to the assessment of landscape have evolved over the last three decades and ultimately brought all the countries of the UK and the Republic of Ireland to varying degrees to an approach based primarily on landscape character.

2.17 The majority of landscape professionals are today likely to agree that landscapes are more than the sum of their components and that therefore the value of a particular landscape is also likely more than the cumulative value of individual components of that landscape. Valuing only selected individual features is likely to miss several matters of concern, including a) the way that individual features are arranged and interact together to create character and distinctiveness in different places; b) the less tangible, aesthetic dimensions of landscape character that are an integral part of its quality and the value that is attached to it; and c) the range of values that people attach to landscapes that are not linked to the presence of specific features. All of these factors are, to varying degrees, encompassed in the Landscape Character Assessment approach set out in the Landscape Character Assessment guidance.

2.18 This Landscape Character Assessment approach combines both objectivity and subjectivity and although part of the process is about recording individual landscape components (usually referred to as elements), the focus is upon the way that these elements come together to create character in different places, including the aesthetic and perceptual qualities of the landscape as a whole. The emphasis on comparative landscape evaluation has been replaced by recognition of the need for a variety of

Table 2.1 : The evolution of Landscape Character Assessment

Landscape Evaluation	Landscape Assessment	Landscape Character Assessment
• Focused on landscape value • Claimed to be an objective process • Compared value of one landscape with another • Relied on quantitative measurement of landscape elements	• Recognised role for both subjectivity and objectivity • Stressed differences between inventory, classification and evaluation of landscape • Provided scope for incorporating other people's perceptions of the landscape	• Focused on Landscape character • Divided process of characterisation from making judgements • Stressed potential for use at different scales • Linked to Historic Landscape Characterisation • Emphasised need for stakeholders to be involved
Early 1970s ⇒	**Mid 1980s** ⇒	**Mid 1990s** ⇒

From: Swanwick, C. (2004) The assessment of countryside and landscape character in England: an overview. In *Countryside Planning – New Approaches to Management and Conservation'* (eds K.Bishop and A. Phillips), pp. 109-124. Earthscan. London.

different judgements, which may sometimes involve value, but are equally likely to address the sensitivity to change or management needs of particular landscapes. Professional judgement of such matters is, as far as possible, informed by the involvement of different groups of stakeholders, including the general public and there has been continuing exploration of approaches to stakeholder involvement in the process[10]. Attempts to quantify absolute value are on the whole quite rare although scoring systems sometimes form part of surveys partly because of the need to manipulate information through Geographic Information Systems (GIS). Quantitative landscape evaluation has therefore, with one or two exceptions, all but disappeared in the landscape planning and research community in the UK since the advent firstly of landscape assessment and then landscape character assessment. This stands in somewhat stark contrast to the developing practice of economic valuation of landscape, whether based on "whole landscapes" or on landscape elements.

Landscape perception and public preferences

2.19 Work on public perception reflects a wide range of alternative paradigms that are emphasised to different degrees according to the discipline. These are usefully summarised in the Newcastle review referred to in Paragraph 2.6 but have little practical relevance for the current task other than to confirm that the whole subject of how and why people perceive and value landscape is exceedingly complex and embraces a wide range of responses and interactions often classified as cognitive, psychophysical and experiential. Despite this complexity there has continued to be a practical interest in public preferences for and attitudes towards landscape and a small number of relevant studies have been carried out that are related to policy and practice in the UK. The most relevant are the public perception component of the New Map of England project[11], work in the North Pennines on Environmental Capital[12] and work in Wales related to LANDMAP[13]. All of these use character as a starting point (although less explicitly so in LANDMAP) and have explored people's responses to different landscape types or areas, both in terms of their elements or features and their aesthetic and perceptual aspects, as well as overall responses and reactions to change. Importantly,

these studies do not, in general, include any form of overall evaluative judgement. They mirror the approach used in landscape character assessment in that they are more concerned with what makes landscapes distinctive and different from each other, rather than necessarily better or worse or more or less valuable.

2.20 The New Map of England study involved a questionnaire survey and focus groups carried out in six 'character areas' (although these had not at this time been formally defined) in South West England, using samples of 70 residents and 70 visitors in each area. This work was designed to test whether the landscape character approach was valid. It found that ordinary people, whether resident or visitors, could, to varying degrees, identify areas of distinctive character but with notable differences between well-known areas of strong character and identity, and others which are much less distinctive and less easily recognizable. They could also, to varying degrees, describe the landscapes in their own words, select characteristic elements and appropriate descriptive adjectives and choose photographs that they considered typical of each area, in each case producing results not dissimilar to the assessment of landscape professionals.

2.21 In Wales the LANDMAP initiative has included public perception work for all the local authority areas covered, again based on questionnaires and focus groups. The Denbighshire study has been reported in the academic literature (see reference[13])and focussed on what people liked about the landscape, which features they considered it important to conserve and which they thought needed to be changed or enhanced, in all cases seeking reasons for these views. The research explored responses to a small selection of predetermined landscape types from the LANDMAP work. Based on a sample size of 100 the results suggest that people's perceptions and their liking for certain landscapes is based mainly on perceptual and aesthetic factors relating to the landscape as a whole, such as diversity, contrast and colour, rather than the presence or amount of individual features, even though these may be mentioned.

2.22 This is supported by the findings of the project in the North Pennines (see note [12]) which asked a small sample (40 in total) of local people in three different parts of this upland Area of Outstanding Natural Beauty (Weardale, Allendale and Teesdale) why they valued both the North Pennines as a whole and individual areas identified by them as important. The findings suggested that, for the area as a whole for example, the emphasis was on:

- The dramatic contrasts between the remote, wild and open character of the moorland landscapes and the enclosed, sheltered and domestic landscapes of the Dales;
- A strong identity based on the particular combination of geology and landform characteristics and land use and settlement history;
- Settlement features, particularly the remaining evidence of the former lead mining industry which is an important part of the culture, history and identity of the area;
- A deeply rural remote character, contributing to feelings of peace, quiet and tranquillity, solitude and being close to nature, all contributing to the special sense of place of the area;
- A strong sense of community and of continuity in the interactions between people and the environment over time, contributing to a strong sense of identity and feelings of community, and a sense of timelessness and links with the past;
- Special aesthetic and perceptual qualities, notably wildness, bleakness and the challenge of upland weather and openness, big skies and quality of light.

2.23 In discussion some of the North Pennines residents commented on what they most valued about the area, with replies reinforcing this integrated holistic view, for example:

"It's something about that contrast between the bleakness and openness and wildness with the incredibly intimate little landscapes of valleys, and the gill valleys in particular. I think it's those two together that really make it"

"I think what struck me when I first came here was that I'd never before been in an area which I'd label so strongly as a rural area - how little industry, how unspoilt"

"I think that Teesdale for me is those particular wildlife habitats such as sugar limestone and the indigenous flora. That's a very, very special area and we are always very thankful that it is being protected. You know, just seeing those little pink primroses, and Teesdale gentians, it's just magic in the springtime"

Yes, I wrote down lead mining remains. I think it's really important, there is something about a sense of continuity with the past and seeing that incredible triumph of nature over human activity as well, which is what I love about those mining remains now."

2.24 All of these studies also explored public attitudes to change in particular types of landscape. The results of the New Map of England work are particularly relevant to the issues addressed in the current scoping study because the research explored people's reactions both to change they had noticed and to different potential directions of change in the future. With respect to previous change in South West England new housing was consistently the most frequently mentioned and, on the whole, was considered to be unwelcome. In terms of the fabric of the agricultural landscape, removal of hedges was universally unwelcome but was not considered to be an issue in all areas. New tree planting was considered particularly welcome where it had occurred. When offered a choice of future scenarios for the different landscapes there was an almost universal preference for alternatives which showed conservation, restoration and enhancement of the current landscape, except in Penwith at the Western extremity of Cornwall where rural development options were favoured.

2.25 More recently SNH have also carried out a scoping study and pilot survey to explore public attitudes to landscape change[14] using simulations of a number of possible changes both individually and in combination. Positive responses were associated with field boundary enhancements and, in some cases, smaller windfarm development, afforestation and biomass cropping. The most negative responses were associated with those images showing a number of different changes in combination and with urban development and new pylons in a lowland landscape setting, and with mineral working and larger windfarms. Overall work of the type carried in these two studies suggests that there is general public support for rural landscapes which are conserved, have traditional features, display strong and consistent character and which appear to be positively managed. There is a general preference for existing landscapes, or for conserved and enhanced landscapes, rather than new landscapes resulting from change and especially from development. At the same time there is evidence that responses are subtle, suggesting for example that some respondents at least, can enter into discussion about the effects of materials and design on the way that specific land use changes affect the landscape. They also show that results are responsive both to people's knowledge and understanding of the issues,to the landscape context in which the changes are shown. It is also clear that participants often find it difficult to separate landscape issues from wider environmental, social and economic perspectives. It is therefore important not to read too much into responses if very complex issues of landscape change are oversimplified in designing surveys.

2.26 These studies of responses to change are of particular interest because they are similar in principle to the economic valuation studies of landscape change that are discussed

below. They explore people's responses to change, looking at the addition or subtraction of individual components, but viewed in the context of the landscape as a whole. As indicated above some academic studies[15] have similarly used approaches that combine a whole landscape valuation with assessment of the contribution of individual components, but these still tend to be concerned with the absolute or comparative value of landscapes and people's preferences for them, and none of them have been carried out in the UK so their usefulness is perhaps debatable.

Factors influencing responses to landscapes

2.27 Most quantitative studies on public attitudes to landscape attempt to explore some of the attributes that determine people's responses. Some studies focus on factors derived from an individual's interactions with the landscape, such as perceptions of sense of place, cultural associations, degree of perceived naturalness, the importance of sounds and smells and the perceived value of the landscape. A large number of studies have also investigated the effect of personal attributes. There is a large and varied body of work in this area much of which is particular to a specific context, making it difficult to draw general conclusions. Some of the more relevant literature is summarised in **Appendix A**. Overall the findings suggest that people's perceptions of landscape and the value they attach to it are likely to be influenced by:

- age and socioeconomic status;
- gender, although this has been relatively little explored;
- cultural background and ethnic origin although these are not easily translated into universal predictors;
- relationship with the landscape in terms of status as residents/visitors or insiders/outsiders or urban/rural dwellers, with familiarity an important related factor;
- use of the landscape, for example differences between farmers, tourists and landscape managers;
- levels of educational attainment;
- environmental value orientations which may or may not be correlated with another influential factor, membership of environmental organisations.

Qualitative, sociological and place based approaches

2.28 It is widely argued that quantitative survey techniques, such as one off questionnaire surveys conducted face to face or by telephone or over the internet, can tend to give misleading results as people have often not thought deeply about such issues and need time to reflect on their values and preferences, and to understand the nature and significance of the issues at stake. Deliberative qualitative techniques that permit a deeper lever of engagement and reflection are thought to give greater insight into the formation of attitudes and reactions. The application of such techniques to landscape is exemplified by the early work by Burgess, Harrison and Limb on perceptions of urban and urban fringe landscapes[16]. This approach is closely linked to the wide range of work in several different disciplines on 'place' theory. The relationship between this extensive area of research and landscape research is complex and there are considerable overlaps, but place theory goes beyond landscape as the physical setting for people's lives and is equally, or more concerned with social and cultural constructs.

2.29 The areas of overlap and the different disciplinary approaches to place research have been usefully reviewed recently in relation to forest landscapes[17]. Researchers in the 'place' research field are often particularly critical of quantitative economic valuation methods applied to environmental resources and articulate some of the key arguments against applying such approaches to landscape. As O'Brien says (as in note [17]):

"Much previous research on environmental values has focused primarily on assigning economic values, even for intangible or non-market benefits such as aesthetic value….. These approaches have increasingly been contested and debated as they focus values down to a single monetary unit and are based on the idea of nature as a commodity - something that can be, actually or hypothetically, bought and sold in the market place. Qualitative research approaches are increasingly being advocated by many researchers for exploring public values for particular places, as they allow people to come together to describe and negotiate their values and this allows for ethical and moral judgements to be incorporated into environmental decision making".

2.30 There are of course varying degrees of 'qualitativeness' and economic valuation studies already recognise the dilemma to some degree by adopting mixed method approaches, incorporating focus groups and other more deliberative methods into surveys, to inform survey design and convey information to participants (see Paragraph 2.60). This is, however, still in the overall context of using quantitative methods to produce statistically valid estimates of willingness to pay, which can never be achieved by qualitative studies alone. Interestingly one sector of the place based community of researchers have themselves developed a quantitative strand to their work in the area of mapping landscape values[18]. This developed in North America, mainly in relation to forest environments, but has also been applied to wilderness landscapes. It is based on questionnaire surveys that ask people why they value certain places, based on choices from a pre-determined set of value statements. The quantitative nature of this work allows values to be mapped using GIS and analysed in terms of, for example, value 'hot spots'. Although such work has been applied in other countries there are no UK or European examples.

ECONOMIC VALUATION OF LANDSCAPE - THEORY AND PRACTICE

2.31 Approaches to attaching monetary value to landscapes have been receiving attention for many years, particularly in the United States but also in the UK[19]. In 1991 a report to the then Countryside Commission[20] considered questions similar to those posed by the present study in terms of the challenges involved in applying economic valuation techniques to landscape, but in that case particularly in the context of sustainable development. The terminology and the methods have moved on but many of the underlying issues remain. Over the last fifteen years environmental economists have to some degree picked up the thread of quantitative evaluation of landscape that all but disappeared from the UK (but not from European or North American) landscape research literature in the 1980s and perhaps not surprisingly there is some degree of overlap between the literature in the two areas.

2.32 When landscape is defined as a spatial unit or area (see Paragraph 2.5) environmental economics considers it to be a physical asset. This asset generates a number of useful services or benefits which can in turn be valued, with the economic or monetary value reflecting people's preferences for the service or benefit in question. The relationship of landscape values to the idea of ecosystem services and benefits is considered further in Chapter 3. Here we focus on the related framework of economic values and the ways in which they can be estimated. Classifications of economic values have evolved as the discipline has developed. There still appear to be occasional disagreements and discrepancies in terminology and definitions but a clear classification appeared in a report by EFTEC and ENTEC for the then ODPM/DTLR[21] and is included, in slightly modified form, in **Table 2.2** below. This shows the components that make up Total Economic Value. The inclusion of benefits like recreation and landscape under the category of 'direct use value' means that people actually 'consume' the resource, in our

case an area of landscape, by using it for recreational activity or enjoying its aesthetic qualities. 'Non-use values' for landscape also cannot be ignored because they are undoubtedly important to people. For example, people may value policies aimed at protecting landscapes in the Peak District even if they do not live there, and even if they do not visit the area for recreation. This, and related classifications of ecosystem services and benefits, are discussed further in **Chapter 3**.

Table 2.2 : Classification of economic values

Total Economic Value					
Use Value			Non-use Value		
Direct Use Value (outputs directly consumable)	**Indirect Use Value** (relates to functional benefits)	**Option value** (future direct and indirect values)	**Existence value** (value derived from knowledge of continued existence)	**Altruistic value** (value from benefits accruing to others)	**Bequest value** (both use and nonuse from environmental legacy)
Includes: • Recreation • Landscape • Cultural Heritage • Tranquillity	Includes: • Carbon sequestration • Habitats • Biodiversity	Includes same list as for direct and indirect uses			

Modified from Table 5.1 in[1] EFTEC and ENTEC (2002) The external benefits of undeveloped land - a review of the economic literature. Report for the Department of Transport, Local Government and the Regions.

Methods of economic valuation

2.33 Within this framework of total economic value, environmental economists have two broad categories of method available to examine the monetary value of some or all of these categories namely:

- **Revealed preference techniques** which are based on people's actual behaviour in real markets related to the particular 'good', with actual expenditure involved. Such techniques can only be used in relation to use values and the most common methods used are:
  - **hedonic pricing** where values such as house prices are used to indicate the value of an environmental resource;
  - **travel cost method** which is usually applied to recreational use value of specific resources such as woods and forests, country parks, water areas or designated areas such as national parks. It requires estimates of the costs involved in travel time and distance, the number of visits per annum, and entry fees where these exist.
- **Stated preference techniques** which must be used where there is no related market for the environmental resource in question but where a hypothetical market is created. People are asked to indicate how much they would be willing to pay for an environmental good in that hypothetical market. In theory such techniques can be used in a variety of different circumstances and can provide monetary values for all the categories in the table of total economic value, including non-use values. Stated preference techniques include Contingent Valuation and Choice Experiments.

2.34 Landscape as a service or benefit of an area of land cannot easily be dealt with through revealed preference techniques alone. Their use would require consideration either of the value of landscape as a "venue" for outdoor recreation, which can then be estimated with the travel cost method, or of the aesthetic value of landscape in contributing to house prices, which could be estimated using hedonic pricing. There are, however, important problems in applying revealed preference approaches to landscape valuation:

- travel cost models will generally only reflect landscape values in recreational behaviour and as recreation and enjoyment of landscape are closely linked it would be very difficult to tell whether it is for recreation itself or for the landscape experience that people value the "landscape asset";

- hedonic price models will only reflect landscape values to local residents, and are very data-intensive. Only one significant UK economic valuation study exists using this approach to estimate landscape values[22].

2.35 Of these two revealed preference methods the travel cost method, despite the issue of unravelling exactly what sort of value it is measuring, may have some potential for further exploration.There are two forms of travel cost valuation methodologies. The single site continuous travel cost method and the multiple site discrete travel cost method. The continuous travel cost method was developed in the 1960s to estimate the economic value of recreational use for a single site. This method is not designed to value environmental attributes associated with a recreational site and is therefore not suitable for valuation of landscape characteristics and their impact on recreational value. The multiple site travel cost method was developed to value environmental attributes associated with recreational activities. The method is based on modelling choice between alternative sites, given the cost of access and the characteristics of the site. It uses the same mathematical framework as the choice experiment approach but the choices modelled are observed real choices rather than hypothetical choices. This method could offer some insight into valuation of landscape features, as they could be used to characterise alternative recreational destinations. This would allow an identification of the landscape characteristics, which are in high demand from recreational users and the economic value associated with changes to such characteristics.

2.36 Economic valuation of landscape services or benefits must therefore rely predominantly on stated preference techniques. These techniques are essentially of two main types which differ mainly in the way that information is presented to survey respondents in the form of questionnaire and survey design.

- **Contingent valuation methods** bundle the various attributes of an environmental good together and ask questions about willingness to pay, or willingness to accept compensation, for change (see below) in the bundle as a whole. In landscape terms this might, for example, mean illustrating a typical agricultural landscape with a number of changes represented, reflecting the holistic approach to landscape evaluation. Respondents then have to decide on their preference, expressed as willingness to pay or willingness to accept compensation, for the whole existing landscape or for the hypothetical alternative on offer. Multiple changes in landscape elements can be included in the hypothetical scenario.

- **Choice experiments** on the other hand are related to the analytical, component based approach to landscape evaluation and reflect the idea that any environmental good, such as a landscape, has a number of attributes, such as the presence and amount of hedgerows or ancient woodlands. Changes in the landscape are reflected

in different combinations or amounts of these attributes and a price tag is attached to each combination. Respondents must choose a combination and its price tag and subsequent analysis reveals the value attached to the components rather than to the whole landscape – although quasi-whole landscape values may be produced by adding up attribute values.

The emphasis on change as the basis for valuation

2.37 Economic valuation is not concerned with the total or absolute value of a landscape. Instead it is concerned only with: (a) changes in the economic value of given landscape types due to some policy intervention or other change (such as house building, afforestation or re-wilding for example); and/or (b) the economic value of a given landscape type, relative to an alternative – for example, draining a wetland and replacing it with arable farming. There is no absolute value of landscape which has any economic meaning in the absence of either of these two contexts. Thus economic valuation should be defined only in terms of a prospective or actual change in landscape quality or quantity.

2.38 There is a theoretical basis to this (see **Box 2**) but also an intuitive one. A person's Willingness to Pay to protect a treasured landscape only has meaning if that person thinks about some alternative state, for example a windfarm is constructed which ruins the view or the wilderness experience. The person is only willing to pay in the context of an alternative where **not** paying implies a prospective loss of this landscape. For this reason, contingent valuation studies should always be careful to make clear the "with and without" conditions: for example, if people are willing to pay higher national park entry fees, then the windfarm is stopped; versus the windfarm going ahead if no extra payments are made. This is a key part of constructing the hypothetical market within which *contingent* valuation takes place.

Box 2 : The theoretical basis to economic valuation based on change

That economic values are defined over changes is also obvious if one considers the formula used to calculate WTP for a policy option in either choice experiments or discrete choice contingent valuation. The Hanemann utility difference equation shows this clearly:

$$Value_i = -1/\beta_m \left[\ln\left[\sum \exp(V_i^1(\beta_i^1))\right] - \ln\left[\sum \exp(V_i^0(\beta_i^0))\right]\right]$$

Where $Value_i$ is the value person i places on the change, V^1 is utility in some "changed" situation, e.g. a loss of woodland cover, and V^0 is utility before the change occurs (the β terms show the effects on utility of changes in landscape attributes which affect utility, V, whilst βm shows the marginal utility of income). This view of change as fundamental to environmental valuation is also apparent if one thinks of an indifference curve between landscape quality and income: WTP is defined by relative movements around this curve, that is, what reduction in income keeps utility constant for a given increase in environmental quality? As criticism of Costanza's infamous "value of everything" paper[23] made clear, using absolute values without making obvious what the prospective change is, is likely to lead to implausible and imprecise claims.

Whole landscapes or components – where does the balance lie

2.39 The issue of whether people perceive landscapes as a "whole" or as a collection of component parts, is not one upon which economists are able to cast much light. However, different economic methods of valuing landscape do imply a judgement about which approach is most useful in a given situation. Choice experiments deal more explicitly with how values relate to individual landscape components, and combinations of components, and are not so concerned with the overall landscape context. Contingent valuation methods may show changes in landscape components but are more focussed on valuing the whole. The difference essentially lies in how individual choices are

organised and presented in the data collection and how the data is analysed. The way choice experiments are designed allows the researcher to break down the value into individual components while this cannot normally be achieved in a contingent valuation study. But this does not mean that the choices people make, and the thought processes they go through, are necessarily any different.

2.40 It has been noted[24] that both contingent valuation and choice experiments could estimate the value of landscapes, but that the choice experiment approach *"is more suited to measuring the (marginal) value of the individual landscape and wildlife characteristics"* that make up natural and semi-natural areas. They also note that there is a very large set of such characteristics available and the welfare measure may be influenced by which ones are chosen. With regard to this last point we should note that, as indicated in **Table 2.1**, attributes are chosen by the researcher (albeit with the help of focus groups) and so are subjective and not objective components of the landscape. As a result it is quite possible that the chosen bundle of attributes may not do a good job of explaining the general public's perceptions of landscape. In this case, the final results of the landscape valuation may be seriously affected by the selection of attributes and how their levels are described.

2.41 Apart from the appropriate choice of the attributes another important issue for landscape valuation concerns the mutual exclusivity, separability and independence of the chosen attributes. If the selected attributes are not independent or exclusive, then multicollinearity may be encountered in revealed preference work[25], whilst potential double counting means that landscape value may be over-estimated.

2.42 Some evidence is available from previous economic studies which compare attribute-based approaches (eg choice experiments) with whole landscape based approaches (contingent valuation). A study in Portugal[26] presents a comparison between the dichotomous choice contingent valuation (DCCV) and choice experiment (CE) elicitation formats designed to value preferences. The survey values alternative landscape scenarios for the northeast of Portugal. Alternatives are defined in terms of the values taken by two attributes: *almond yards* and *woodland* (that is where the alternative landscape results from afforestation). Both attributes, almond yards and woodland, were presented to the respondents as alternatives to landscape abandonment, an option represented by the attribute *undergrowth.*

Table 2.3 : Comparison of Contingent Valuation and Choice Experiment results for landscape change in northeast Portugal

WTP estimates (in £) and confidence intervals			
Landscape scenario	**DCCV data**	**CE data**	**DCCV and CE data (joint model)**
	E(WTP)	**E(WTP)**	**E(WTP)**
Landscape 1	88.72	118.68	106.70
Landscape 2	38.26	83.17	68.46
Landscape 3	68.82	105.41	92.60
Landscape 4	53.95	91.80	77.98
Landscape 5	35.87	65.59	55.39
Landscape 6	19.61	22.85	17.50
Landscape 7	10.22	8.94	6.20
Note: Values are annual tax increases in 1999.			

Each landscape represents different combinations of almond yards and woodland. See Appendix B for further details.

2.43 The DCCV and CE elicitation schemes were included in otherwise-identical questionnaires, which were administered to two random sub-samples drawn from the urban population of north east Portugal. Two and four versions of the questionnaires were used, respectively for DCCV and CE. Each respondent had to perform five independent choices, randomly allocated to the questionnaire versions. The results are presented in the **Table 2.3**. The main findings are that the DCCV format can be used to measure preferences for multi-attribute variation and also that DCCV tends to give lower estimates for the WTP compared with the CE format. The relatively higher variance of the DCCV compared with the CE responses, tends to argue in favour the CE format.

2.44 Comparisons are also available from a study of the economic value of the conservation benefits of Environmentally Sensitive Areas (ESAs) in Scotland[27]. In this study the Contingent Valuation Method (CVM) and Choice Experiments (CE) are compared. The authors conclude that CVM seems best suited to valuing the overall policy package and CE to valuing the individual characteristics that make up this policy. **Box 3** contains more details of the results.

Box 3 : Differences between CVM and CE in valuation of ESAs in Scotland
In the case of the CE two models were considered, a quadratic and a linear. In the quadratic model, marginal WTP varies from £50.46 for woodlands to £6.65 for archaeology, while the overall WTP for the ESA policy is £107.55 per household per year. The quadratic estimate can be compared with the open-ended CVM estimate for residents of £31.43 and the dichotomous choice estimate for visitors of £98. Whilst the CE estimate is greater than either of these, it lies within the 95% confidence interval for the visitors' WTP estimate (although it is outside the 95% interval for residents).

2.45 A further comparison of results derived by the application of both CVM and CE is reported in a study[28] on public preferences for alternative forest landscapes. The CE design incorporated three attributes: shape, felling and species mix. In the CVM survey, respondents were asked to state their preference between each photograph in a pair/triple, and then to state their maximum WTP (open-ended) to move from their least preferred to most preferred image, assuming that landscape improvements were costly to produce. Respondents also stated their WTP for an "ideal forest", which incorporated each attribute at its most desired level, relative to status quo which set each at its least preferred level. **Table 2.4** presents the results. Since the attribute sets used in both experiments over-lap, the valuations can be compared. From the results we note that the implied ranking of attributes is identical and the attribute values produced by the two methods are quite similar. Finally, the "ideal forest" bid from the CVM, whilst not directly comparable with the combined-attribute bid from the CE, is nevertheless quite close to it.

Table 2.4 : Comparison of Contingent Valuation and Choice Experiment results for forest management options

Comparing CE and CVM bids				
Attribute	CE sample		CVM sample	
	WTP	Rank	WTP	Rank
Felling: small scale rather than large scale	£12.89	2	£11.73	2
Shape: organic rather than straight edges	£13.90	1	£12.75	1
Species mix: most diverse rather than least diverse	£11.36	3	£7.52 (average)	3
"Ideal forest"	*		£29.16	
All attributes at preferred level	£38.15		*	

2.46 While the two UK examples show similarities in the results from the two approaches there are differences in the Portuguese example where, in all but one of seven scenarios, DCCV gave more conservative estimates of value than the choice experiment. Intuitively this is perhaps surprising given what, at least in the landscape literature, is a widely held view that the value of a landscape is greater than the sum of its parts, and that looking at change through whole landscape value reflects not just the presence and quantity of the components, but the way that all the different components of landscape, not just specific features like walls, moorland and meadows, come together in particular places. The anticipated higher whole landscape value would then reflect the effects of context (in terms of overall landscape character or sense of place), aesthetic aspects such as the way that components are arranged and generate visual and other aesthetic responses, and interactions with the observer, reflecting for example knowledge, memory and associations. However, as is well known, DCCV estimates of willingness to pay are very sensitive to econometric treatment since different assumptions about the comparability of the first and second bid responses – for example, whether they are drawn from the same underlying distribution – can make a big difference to mean WTP estimates.

2.47 The higher CE values in this study may be related to the concerns about mutual exclusivity and independence of the chosen attributes described above and the discussion of complements, substitutes and embedding that follows. The whole landscape view suggests that people may not be mentally able to separate the components from the whole. The values based on individual components may, in this case at least, include value attached to context and other factors, which may not be apparent to the analyst. It cannot be assumed in the choice experiment approach that everything is captured that is relevant to choice or underlying utility, since this "partial un-observability" is the defining principle of Random Utility theory.

2.48 As can be seen from the discussion above, there are now several papers which compare choice experiment estimates with contingent valuation estimates for a comparable environmental change. However, no clear pattern has emerged about which method gives higher values. Any comparison of choice experiment and contingent valuation estimates is in any case complicated by three factors. First, there may be differences in the econometric treatment between the two approaches. Second, we know less about the demand-revealing properties of choice experiments relative to contingent valuation. Third, to compare the two we have to assume that the "value of the whole" is equal to the "value of the sum of the parts" – which from a landscape perception viewpoint, as discussed in the earlier part of this chapter, is something that could easily be challenged.

Complements, substitutes and embedding effects

2.49 Demand for landscape quality is characterised by its multi-attribute nature. Hence, each one of the attributes is part of the landscape's value, but they may also be complements in utility. It has been suggested that the benefit of conserving attributes that are complements for consumers within a joint programme is greater than the sum of the benefits of conserving them independently[29]. If this is not the case (and the attributes are substitutes for each other) the joint benefit is smaller than the sum of the individual benefits. As a result, the conventional methods of valuation, such as contingent valuation, have to face the multidimensional character and the structural complexity of landscape and the relevant problems that derive from this.

2.50 Standard economic theory tells us that demand for a good depends on the prices and availabilities of both substitutes and complements. Willingness to pay for a given area of heather moorland, for example, should depend on the availability of similar heather

moorland sites elsewhere in the region, although the degree of similarity is important here. Given the many different reasons for valuing a particular landscape (cultural, historic, social for example) this degree of substitutability may be considerably over-stated if one simply bases it on comparable land cover types – in other words, not all hectares of heather moorland are equal. **Box 4** (overleaf) summarises some of the evidence about how other studies have tackled these difficult areas and more detail is provided in **APPENDIX B**.

2.51 These issues, of complements, and substitutes, can be cross related to landscape research ideas about landscapes viewed either as a whole or as bundles of individual components. In environmental economics relatively little is known about these relationships as they apply to landscape. For example, does complementarity relate to components of landscapes set within a greater whole? Does substitution depend on individual factors such as mobility? It is also far from clear whether people consider landscape or any of its attributes, in a consumptive way in which the idea of marginal rates of substitution has any meaning. Continuing with heather moorland as the example, a person seeking enjoyment of such a landscape may seek a quite different experience – a piece of urban fringe landscape for example – if the piece of heather moorland becomes unavailable for some reason. This type of behaviour was indeed shown to be the case at the time of the foot and mouth crisis.

2.52 Further criticism relating to the validity of CV results focuses on the existence of the part-whole and embedding problems[30]. Part-whole bias implies that an individual's WTP responses fail to distinguish between the specific good under analysis (the part) and the wider group of goods (the whole) into which that specific good falls[31] while embedding a good within a more comprehensive good can significantly lower WTP[32]. Embedding can be geographical or related to policy packages and their components. The idea of geographical embedding can be related in part to the concept in Landscape Character Assessment of a nested hierarchy of landscapes (see Chapter 4) with landscape types defined in increasing degrees of detail in moving from the higher national level of the hierarchy to increasingly more local levels[33].

2.53 Previous studies, described in **Appendix B**, illustrate how embedding issues can be tackled through survey design and phrasing of questions. Respondents may, for example, firstly be reminded of the budget constraints that their replies must assume. Questions can also be designed to ask respondents first about a higher level resource, for example a broad national landscape type, and then about a specific local area. In one of the studies reviewed[34] a three stage budgeting structure asked people first about their WTP for higher quality of the state of the environment, then their WTP for extra measures to prevent existing characteristics of rural landscape from disappearing and then their WTP for conservation of wildlife. Hence, the landscape is valued as a whole and then is compared to the value of specific landscape features.

2.54 With respect to ESAs in southern England[35] the problem of embedding was tackled by asking respondents how much they would be willing to pay for the South Downs (or Somerset Levels and Moors) ESA out of their tax budget for all ESA landscapes. The marginal benefit provided by the South Downs and Somerset Levels and Moors ESAs in relation to the whole ESA programme in 1992, was also valued using this method to minimize the embedding problem. The marginal value of the South Downs and Somerset Levels and Moors ESAs, conditional upon the continued protection and preservation of the other 8, could be ascertained by (a) asking respondents their total WTP for 8 ESAs, and then their total WTP for all 10; and (b) asking respondents their total WTP for 8, and then their added WTP for the South Downs and Somerset Levels and Moors ESAs.

Box 4 : Evidence from research literature on complements and substitutes

- In a study in Ireland by O'Leary et al on the valuation of non-market benefits arising from landscape improvements provided under the Rural Environment Protection Scheme (REPS), respondents were made aware of and reminded that the good under consideration (i.e. the rural environment) is embedded in an array of substitute and complementary goods;

- In a study of natural parks Leon (1998) provides information about potential substitute landscapes, designing an experiment in which a group of individuals in the sample are reminded about other possible environmental goods that may compete for their restricted budget constraint. The experiment finds that there is a significant difference in individual behaviour if subjects are reminded about the possibility of spending some amount of their restricted budget on the preservation of competing landscapes;

- Brouwer and Slanger (1998) study the benefits of agricultural landscape management in the Netherlands. A verbal description of the different rural areas and their amenities needing protection (the substitutes) in the introduction to the second WTP question is very brief and general, while in the third WTP question, respondents are only reminded of 'other characteristic rural areas'. The authors argue that "respondents have been prompted or forced to behave rationally because of the embedded structure provided in the questionnaire";

- Willis et al. (1996) address the problem of estimating the value of improvements to one wildlife habitat amongst a large number of others (which may or may not be substitutes). Respondents were informed of the current cost of the Pevensey Levels Wildlife Enhancement Scheme to them, and then asked, bearing in mind the many other worthwhile nature conservation programmes they might wish to support, the maximum the household would be willing to pay for the Pevensey Levels compared with what they currently paid. Respondents were reminded of their budget constraint and of the availability of substitute wildlife programmes and sites;

- Santos (2001) claims that Independent-Valuation-and-Summation (IVS) bias is an issue that may occur in landscape valuation, if one tries to estimate the total demand by simply summing individual values for the different non-commodity outputs. It is very likely for possible substitution relationships to exist among multiple non-commodity outputs;

- Estimates from the Pennine Dales ESA case in Santos (1998), suggest that the IVS bias increases with the size of the bundle, with the most complete bundle (3 outputs) exhibiting the highest IVS bias. Yet, this trend is not confirmed by Santos parallel study in the Peneda-Gerês National Park. As the author notes "We would expect that the more similar two outputs are the more close substitutes they are. This is because similar goods tend to satisfy similar (or the same) needs of individuals. Thus, purely aesthetic/cultural landscape attributes, such as stone-walls, barns and terraces would be poor substitutes for meadows and woods, which were largely perceived by respondents as providing wildlife habitat, not purely aesthetic elements";

- Santos (2001) also states that if the non-commodity outputs to be supplied by a policy are for example, substitutes (or complements) for each other, the IVS bias will be positive (or negative). This is because in the (correct) sequential valuation procedure, marginal value functions for each non-commodity output are shifted down (or up) along the sequence, as more and more substitutes (or complements) are added. This is not taken into account by independent valuation. Thus, in this case, summing up independent values leads to overvaluing (or undervaluing) the multiple-output change. When all non-commodity outputs are independent in demand from each other, the IVS bias is nil. If some are substitutes and other complements, it may (very unlikely) happen that all effects cancel out each other, in which case the IVS will be nil as well'

2.55 The literature thus throws considerable light on the importance of these interlinked issues in terms of the valuation of landscape. An important task of any new empirical work would therefore be to try to identify and then quantify what factors determine "substitutability" for different agricultural landscape types. Indeed, this would be crucial to any benefits transfer system of the type discussed in Chapter 4.

Specific problems in valuing landscape and implications for good practice

2.56 In landscape planning and landscape research the greatest problem in landscape valuation is that landscape is itself a complex and, to some degree, contested construct, and that the ways in which people value it are individual and can be highly varied. It is difficult to represent these complexities in quantitative surveys because in most cases these rely on questionnaires which must, almost by definition, simplify and codify and cannot therefore reflect the multi-layered nature of responses to landscape. This is especially the case when respondents are required to attach a specific value (on a rating scale, for instance) by comparing different landscapes, but also to some extent when comparing different versions of the same landscape, represented by change scenarios.

2.57 The issues are therefore most prominent in studies that oversimplify complex landscape matters in order to gain large numbers of responses to quantitative surveys. As a result such surveys may not have great credibility in the landscape policy community, the majority of who have little if any understanding of economic theory. Equally there will be resistance from those who believe that only highly qualitative techniques can realistically address the complex values that people attach to landscapes and the way that these values are constructed. There has therefore been a tendency in some quarters to dismiss economic valuation on the basis that it is simply quantitative landscape evaluation in another guise. This is, however, to some degree misunderstand the point that, as explained above, economic valuation techniques focus on comparing the value of landscapes with and without some form of change (that is to say, a focus on marginal value) rather than comparing the absolute value of one type of landscape with another, which was the focus of many earlier landscape evaluation studies in the UK. Rather than rejecting economic valuation techniques out of hand, thereby running the risk that landscape issues are not included in decision making processes, it is important to ensure that surveys are designed which, as far as is practically possible, address these concerns about oversimplification of complex responses.

2.58 A small number of policy relevant rather than theoretical studies have suggested that although these problems cannot be avoided altogether, well designed surveys can generate valuable data which can be of use in informing policy. The New Map of England perception studies referred to above (Paragraphs 2.19 – 2.26) addressed many issues that were similar to those raised by the current brief, looking at predominantly agricultural landscapes, and at different change scenarios, although they did not use economic valuation techniques. Similarly the more recent study of Landscape Change scenarios in Scotland (Paragraph 2.25) examined responses to forces for change in lowland Scottish landscapes. Both examined changes both individually and in combination. There have also been a series of economic valuation studies that have addressed related issues in UK agricultural landscapes, notably studies of National Parks and of Environmentally Sensitive Areas, as detailed in **Appendix B**. All have produced interesting and useful data on people's responses to landscape change and there are areas of agreement in the findings of both types of study in terms of what it is that people do or do not value about landscapes.

2.59 In terms of detailed economic valuation methods we know from the literature that standard valuation approaches struggle most when respondents are asked to reveal

their preferences and values for environmental goods or contexts which are *unfamiliar* and *complex*. This raises several difficulties. In general terms there are issues about whether ordinary people perceive landscapes and differences between them in the same way as professionals, especially in terms of the different scales and levels of detail at which landscape can be described and characterised. For example, can people address the idea of landscape character at the large-scale, as in Joint Character Areas, or broad landscape types, or will they always think about the local landscapes around them? The landscape planning studies referred to above throw some light on these issues and do suggest that these problems can be overcome and useful results obtained, especially if quantitative techniques are combined with qualitative approaches that allow perceptions and preferences to be examined in greater detail.

2.60 Values attached to landscape can also depend on context, in several different ways. For example, from an environmental economics viewpoint, there is evidence that the value people place on protecting a given landscape feature, such as heather moorland, depends on what change to that landscape is in prospect, such as a change to rough grassland rather than a change to forestry[36]. We also know that values for landscape change (such as either a fall or a rise in woodland cover) can depend on what people think of as the "natural" landscape, and what they know about past changes in that landscape[37]. Finally, a very common finding is that the value of a particular landscape change (for example a 10% change in heather moorland cover) depends on whether a loss or a gain is in prospect. So clearly there is no such thing as "absolute" value for change in landscapes: all values are context dependent.

2.61 Whilst many people are familiar with individual landscape elements such as woodlands or heather moorland, they are not highly accustomed to being asked to think about their preferences for possible changes to the landscape, and especially to being asked to place a monetary value on these changes. This suggests that while landscape valuation may not be as difficult as valuing, say, biodiversity change, it will still encounter problems with lack of experience. Lack of experience has been important in explaining some of the preference anomalies which environmental valuation has highlighted, such as inconsistencies between valuations based on loss and gain of features such as the loss-gain asymmetry problem – namely that people consistently place different values on gains and equivalent (symmetric) losses in environmental quality.

2.62 Standard survey methods such as in-person individual questionnaire surveys, which are most frequently used to collect stated preference data for landscape valuation, are rather inadequate as a means of coping with many of the problems noted above, especially those of lack of familiarity, lack of knowledge, and the need to unbundle landscape components. Recently, a number of authors have suggested a variety of ways of combining elements of stated preference methods with participatory approaches such as citizens' juries. Approaches that help respondents to consider – or even construct – their preferences as well as how these preferences map into values may be particularly useful. This again suggests the use of more participatory methods of economic valuation, such as the valuation workshop[38]. Whilst problems exist in applying approaches that combine quantitative and qualitative techniques, they would seem to be part of any best-practice approach to developing believable landscape values in the future. They go some way to addressing the concerns about over reliance on quantitative methods.

2.63 It is also the case that using methods which give respondents repeated experience in valuing landscape – such as the repeated tasks in a choice experiment - and do not stress the direct statement of WTP, may be favoured. Both these points suggest that

choice experiments have advantages over contingent valuation. However, in terms of choosing the most appropriate method, we note that:

- use of choice experiments rather than contingent valuation methods assumes we are content to think about the value of landscapes in terms of the value of their component features or attributes rather than a whole landscapes, a key point given the earlier discussion about the debate surrounding landscape evaluation;

- valuation workshop approaches, in isolation, bring their own problems with small sample sizes and non-random sampling. This might be overcome if they could in some way be combined with more standard quantitative methods and used to calibrate results from the latter.

2.64 The literature reveals a further difficulty which is that, in some cases, direct questioning of respondents about WTP for environmental goods that people feel are "special" or "priceless" can encourage respondents to refuse to state WTP amounts, as they feel the trade-off being offered is somehow inappropriate. This particularly applies to prospective losses in the environmental good where WTA formats are used[39]. In such cases, "lexicographic" preferences (that is a strict ordering of preferences with no possibility of trade-offs between alternatives – that is, no indifference curves) may emerge, which can be manifested as protest votes, infinite WTA statements, and WTP statements that are do not significantly vary with the quantity of the good offered. There is no evidence in the literature that prospective change in landscape itself results in this kind of behaviour to a more than average degree; however, approaches that do not stress the direct statement of WTP/WTA may be advantageous.

Whole landscapes or components?

2.65 We were asked to investigate the extent to which it is possible to value agricultural landscapes in terms of their component features and to how much is sacrificed or gained by this approach relative to valuing composite landscapes. From an overview of the literature, both on landscape evaluation, public perception and preferences and on economic valuation, we conclude that there are strong arguments for a whole landscape approach as representing more realistically the way that people view and value landscapes. However a choice between whole landscape and component based approaches is really dependent upon the use that is to be made of the survey results, which in turn relates to their policy application.

2.66 We also conclude that stated preference methods are best suited to the question of agricultural landscape value although there is scope for further exploration of the role of travel cost methods provided it is recognised that this would only address the value of landscape as a "venue" for outdoor recreation. Among the stated preference methods Contingent Valuation is more suited to whole landscape approaches, whilst Choice Experiments are designed with a landscape component approach in mind. It is possible that the two approaches can be combined in one study, and there are several existing examples of this, but it can make for more complex survey instruments, and risks confusing respondents.

2.67 Taking applications to Environmental Stewardship as an example, if the interest is in the whole policy package and in providing aggregate values for landscapes conserved or enhanced through the implementation of Stewardship measures as a whole, for example to set against the global costs of the scheme, or if the question is how resources should be divided between different types of agricultural landscape at a broad level, then whole landscape valuation using contingent valuation is most likely to provide useful values. If

on the other hand the interest is in informing the allocation of Stewardship funding to different features in different types of agricultural landscape, then valuation based on components or features using choice experiments would be preferred.

2.68 The issue of whole landscapes or components is also closely related to the matters of complements, substitutes and embedding. Though these can pose difficult problems in the landscape context there is plenty of evidence from the literature to suggest that they can be addressed successfully through careful survey design. We return to this issue in the final Chapter.

Best practice for landscape evaluation?

2.69 Clearly there are significant issues and difficulties that arise in applying economic valuation techniques to landscape. These can only be completely avoided by declining to apply these techniques altogether, but this would fly in the face of current practice and would risk landscape issues being left out of important decision making processes. In terms of the acceptability of such studies in the wider community of landscape practitioners, policy makers and researchers, it is important that non-economists who may be exposed to the findings are aware that the techniques focus on marginal and not on absolute value, thus defusing concerns about a return to landscape evaluation by the back door.

2.70 The complexities require that when a study to value different agricultural landscapes is initiated it seeks as far as possible to respond to these issues. This means:

- very careful thought about selection of appropriate techniques, depending on policy applications (see above);
- detailed consideration of how information packs, visualisation material and questionnaires can be designed to address and, as far as possible minimise, the difficulties;
- attention to the way that standard quantitative survey methods can either be informed by, or linked with, more deliberative, qualitative methods, including valuation workshops or citizens' juries or similar approaches.

A balance will inevitably have to be struck between a 'perfect' solution and a practical one, given the realities of resource constraints.

3.0 PRACTICAL CHALLENGES IN LANDSCAPE VALUATION

INTRODUCTION

3.1 This chapter addresses a number of the practical challenges related to valuation of agricultural landscapes. It tackles several key parts of the research objectives and questions, namely:

- investigate the extent to which it is possible to distinguish landscape values from the value of the various ecosystem services provided by environmental assets, in order to avoid double counting; and whether it make any difference to this issue if one values composite landscapes or component features (Objective 3);
- investigate how to generate a limited number of valuation data that can be used to estimate marginal values for all/the majority of the English rural landscape through benefits transfer; and with reference to data on existing rural landscapes, can a manageable number of representative rural landscapes be characterised? How might GIS be used to advance this area? (Objective 4);
- investigate the appropriate counterfactual to be used for agricultural landscape valuation and how we should maximise the chances that the counterfactual will be appropriate for DEFRA's future policy needs? (Objective 5);
- review, with DEFRA, the policy needs for different types of landscape value and advise on the most cost-effective way to meet those needs (Objective 8);
- provide advice on the extent to which DEFRA's Environmental Landscape Features model should be used (Objective 8).

LANDSCAPE VALUES AND ECOSYSTEM SERVICES

3.2 In the emerging approach to natural resource policy in the UK much emphasis is being placed on the idea that we value environmental features or areas for the services or benefits that they provide. This approach owes much to environmental economics and is increasingly linked to the 'ecosystems approach' to resource management, promoted in particular as a result of the 1995 Convention on Biological Diversity, in which ecosystems are the 'unit' on which attention is focused, though the spatial scale of the ecosystem focus can vary. DEFRA is promoting this approach to natural resource management and has set out its proposed approach to quantifying and valuing these "ecosystem services" to help public sector decision making[40]. A number of studies are in progress, at the time of writing, to develop the approach further

3.3 One of the first difficulties in addressing this question is that there are differences and inconsistencies in the language that is used to classify and describe the services in question and the values related to them. The phrase 'ecosystems services' itself is clearly interpreted in different ways. According to the Millenium Assessment[41] ecosystem services are *" the benefits people obtain from ecosystems".* They define them as including: a) provisioning services, that is the products obtained from ecosystems; b) regulating services, that is the benefits obtained from the regulation of ecosystem processes; and c) cultural services, that is the non-material benefits obtained from ecosystems, such as aesthetic and inspirational values. Although a valuable start it seems to be widely agreed that this framework needs to be developed further and work is progressing in many areas to achieve this[42]. In this study we interpret ecosystem

services as a broad umbrella term embracing all the benefits that arise from ecosystems, however they may be defined. The term implies that the interest is in ecosystems as the spatial unit offering the services but again it is increasingly acknowledged that other spatial definitions of the environment may also be adopted.

3.4 The words benefits and services often seem to be used interchangeably, and economists sometimes separate "benefits" from "values" and classify them separately. Some of these difficulties are considered in the work examining the application of the ecosystem services approach in the English policy context[43]. **Figure 3.1** reproduces a helpful diagram from a working paper for that study, which in turn draws on an earlier study, and shows how the researchers conceptualise the link from the environmental asset, to the eventual economic benefit and hence monetary value. Distinctions are thus drawn between the asset itself, the function it fulfils, the service it provides and the benefit to people.

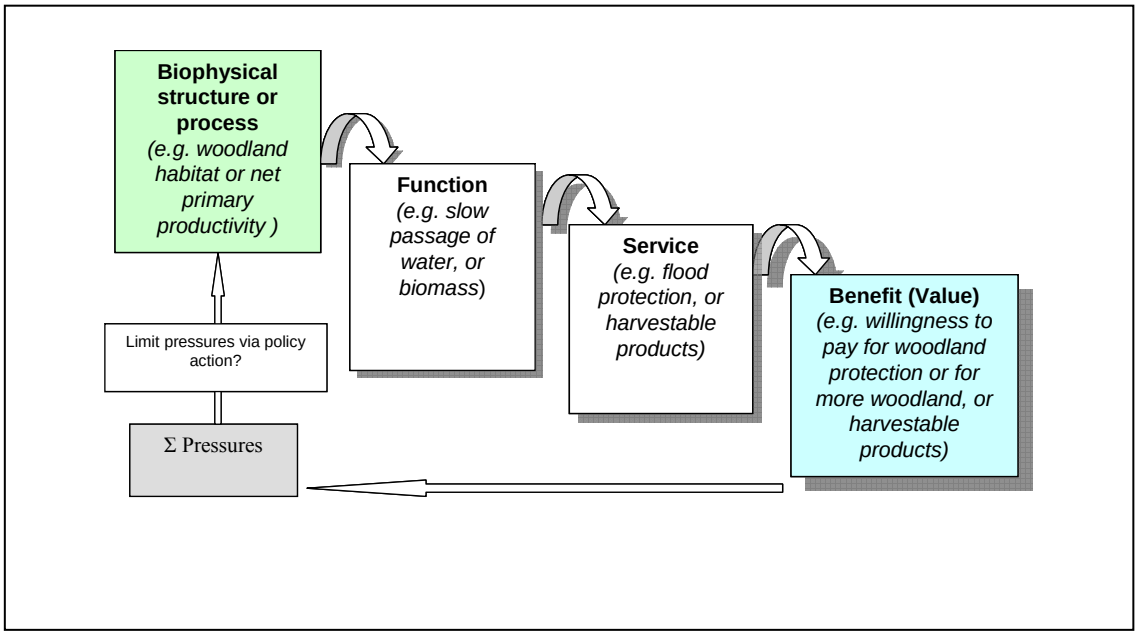


Figure 1: The logic underlying the ecosystem goods and services paradigm[44]

As the paper says: *"Whether this function is regarded as a service depends upon whether 'flood control' is considered as a benefit or not. People or society will value this function differently in different places at different times. Therefore in defining what the 'significant' functions of an ecosystem are, and what constitutes an 'ecosystems service', an understanding of the spatial context, e.g. 'place' and societal choices and values is as important as knowledge about the structure and dynamics of ecological systems themselves."*

3.5 Turning to the place of landscape benefits and values in this complex and evolving set of concepts, it is apparent that there are further complications because the word 'landscape' is used in two different and contrasting ways. Firstly, as in the definition in the European Landscape Convention and in the UK approach to Landscape Character Assessment, landscape is an area of land of common character, embracing physical, natural, social and cultural dimensions of the environment and the interactions between them. A landscape is made up of separate elements or components which come together to create its character. In this case the landscape types or areas so defined, and their constituent elements, can themselves be considered as environmental assets which fulfil functions and provide a wide range of services and benefits that can be valued.

3.6 Used in this sense, the spatial landscape units, whether they be landscape character types or landscape character areas, or indeed their constituent landscape elements, can provide a spatial framework for considering services, benefits and values. Landscape offers one alternative to a spatial framework based on ecosystem or habitat definitions, or indeed other spatial units, such as water catchments, that might be considered. Arguably landscape is particularly useful in this context as it offers a particularly comprehensive and all embracing place-based framework because of its integrated nature, linking physical, natural, social and economic aspects of the environment.

3.7 Ideas about the 'services' offered by landscape at different scales were tested in the evolutionary stages of the Environmental Capital Assessment method (later to become Quality of Life Assessment) developed by the Countryside Agency, English Heritage, English Nature and the Environment Agency in the mid 1990s. The method sets out an explicit approach to assessing environmental, social and economic assets by identifying the benefits and services that they provide and evaluating (in a non-economic way) those benefits and services. The overview of the eighteen contrasting pilot studies carried out to test the approach showed that benefits could be identified in a hierarchy or cascade, for whole character areas, for landscape types or sub-areas within the whole character area, and for individual landscape features or components (sometimes referred to as attributes)[45]. The pilot study on the North Pennines demonstrates this (as in note[12]).

3.8 In its second sense the word "landscape" is often used to describe one of the groups of services or benefits provided by environmental assets. To clarify the way in which it is used we have found it helpful to examine where landscape appears in various different typologies of ecosystem services that have appeared. Some of these are summarised in **Table 3.1**, which highlights (shown by darker shading) those that are judged to be definitely concerned with landscape and also (in lighter shading)those that may be judged to be at least partly related to landscape. This table simply selects some relevant examples to help make the point and does not attempt to provide a comprehensive view of classifications of services. Similarly the identification of which services relate to landscape is based on the judgement and experience of the authors and is by no means definitive. For comparison this table also includes the list of 'values' developed in the work of some of the place-based researchers in the social sciences in work on mapping landscape values, as in Paragraph 2.30. This is based on survey of attitudes based on a pre-determined list of value statements, originally designed for forest valuation[46], so the blanks in the statement originally referred to 'forest' but other environmental assets could be substituted instead.

3.9 It seems clear from this table that landscape services and benefits fall into two broad categories: those relating to the landscape itself, for example its landscape character or sense of place, or its rural character; and those referring to its role in providing aesthetic enjoyment, inspiration and visual amenity. This last phrase is often used as a 'catch all' but is not always helpful as it is rarely clearly defined. The typology of the external benefits of undeveloped urban land (see Table 3.1 and note[47]) links it to ideas of landscape character and quality but this is not a widely used definition. This twofold view of landscape benefits is similar to the way that landscape is dealt with in Environmental Impact Assessment where, in the landscape and visual impact assessment part of the process, a distinction is drawn[47] between matters relating to:

- landscape as a resource in its own right, dealing with changes in the fabric, character and quality of the landscape and requiring expert knowledge of factors such as, for example, landscape character, typologies, distribution, rarity, condition and quality;

Table 3.1 : Landscape in typologies of ecosystem services or related value systems

Millennium Ecosystem Assessment[48] (A functional approach)	Typology of External Benefits of undeveloped urban land[49]	Non market outputs from agriculture[50]	Place based theory of landscape values[51] (….. means the environmental asset, forests in the original)
Provisioning Food Freshwater Fuelwood Fibre Biochemicals Genetic resources **Regulating** Climate regulation Disease regulation Water regulation Water purification Pollination **Cultural (nonmaterial benefits)** Spiritual and religious Recreation and ecotourism Aesthetic Inspirational Educational Sense of Place Cultural heritage **Supporting (necessary for all other ecosystem services)** Soil formation Nutrient cycling Primary production	**Recreation** Sport Informal Recreation Tourism **Landscape** Character of landscape Visual amenity (defined as combination of landscape character and quality) **Ecology** Habitats of plants and animals Particular assemblages of plants and animals **Cultural Heritage** Legacy of buildings and other artefacts Archaeological sites Built environment including listed buildings, parks and gardens **Hydrology** modification of hydrological regimes production of flooding and erosion impacts **Air quality and climate** Modification of microclimate Interception of particulate matter Trees as carbon sinks **Tranquillity** Reducing exposure to noise, vibration and light pollution **Accessibility** Contribution to permeability of urban areas Soil Protection of soil and mineral resources	**Environmental** Landscape Habitats Biodiversity Water quality Soil conservation **Cultural/Traditional** Landscape Traditional industry Rural character Local food Recreation Prevention of urban sprawl **Health and safety** Animal health and welfare prevention of animal to human infection Food safety Managed genetic modification Biosecurity **Social** Local employment and economy Vibrant communities Tourism Social cohesion Educational resource	**Aesthetic value:** I value the … because I enjoy the scenery, sites sounds smells etc **Economic value:** I value the ….. because it provides timber, fisheries minerals or tourism opportunities.. **Recreation value:** I value the ….. because it provides place for my favourite outdoor recreation activities **Life sustaining value:** I value the ….. because it because it helps produce, preserve, clean, and renew their soil and water **Learning value:** I value the ….. because we can learn about the environment through scientific observation or experimentation **Biological diversity value:** I value the ….. because it provides a variety of fish, wildlife, plant life etc **Spiritual value:** I value the ….. because it is a sacred, religious, or spiritually special place to me or because I feel reverence and respect for nature there **Intrinsic value:** I value the ….. in and of itself for its existence, no matter what I or others think about it **Historic value:** I value the ….. because it has places and things of natural and human history that matter to me, others, or the nation **Future value:** I value the ….. because it allows future generations to know and experience the … as it is now **Subsistence value:** I value the ….. because it provides necessary food and supply is to sustain my life **Therapeutic value:** I value the ….. because it makes me feel better, physically and/or mentally **Cultural value:** I value the ….. because it is a place for me to continue and passed down the wisdom and knowledge, traditions and way of life of my ancestors

- visual impacts, dealing with change in the perceived landscape and the effects this may have on aesthetic experience and visual amenity.

Economic value of landscape benefits

3.10 In economic terms the issue is about the way that benefits are valued and the standard economic definitions used in assessing Total Economic Value (TEV) underlie this question about double counting. As discussed in Paragraph 2.32 and shown in Table 2.2, TEV is generally divided into use values and non-use values. Non-use values are related to existence value, altruistic value (other people using the resource) and bequest value (future generations). Use value is broken into direct use and indirect use. *Direct* use value (excluding activities with a market value) relates to people directly 'consuming' the resource for recreation, for aesthetic pleasure, for watching wildlife or enjoying its cultural heritage, while *indirect* use value relates to the functional role of land in supplying a flow of ecosystem services. In terms of economic theory there is a clear conceptual difference between the nature of the WTP estimates built into a benefits transfer model for landscape, and the evaluation of indirect use values related to functional benefits, as in Table 2.2. This is set out in more detail in **Box 5**.

Box 5 : The theoretical difference between direct and indirect use values

In a standard benefits transfer model we are estimating the direct (non-market) use value of environmental resources, in terms of its contribution to utility. In other words, we think of a utility function as U = f (Q, X, Y) where Q is environmental quality, X is market goods and Y is income. By contrast, the ecosystem service value approach values the environment *as an input* (Barbier, 2007). We thus think of environmental values in terms of U = f (X, Y) and X = g (Q, K, L) where g(.) is the production function for X, the value for which depends on inputs of ecosystem services Q, capital K and labour L. This is a very clear conceptual difference. Adding direct use values (WTP to pay for landscape conservation and enhancement say) to indirect, input based functional values (contribution of wetlands to avoided flood damages) to arrive at Total Economic Value for a natural asset does not necessarily result in double counting, although it might if the same functioning is included in both f(.) and g(.) above.

3.11 The variables which drive differences in direct and indirect values are likely to be quite different. A benefits transfer model dealing with direct use values for landscape assumes that individual characteristics such as income, attitudes, education and recreational activities are likely to be important determinants of preferences and therefore of values. In contrast, for indirect ecosystem services or benefits the variation in these values is more likely to be determined by technical relationships between, for example, soil type, land use and net carbon release in the case of the "carbon fixing" value of agricultural soils. These factors are not linked to the preferences or characteristics of the population living in an area. Although even indirect values can ultimately be linked back to preferences – for example in the case of wetlands functioning as flood regulators, to preferences relating to risk – those individuals whose preferences "count" may be far removed in space from the natural asset whose indirect value is being assessed. This is most obvious in the case of the benefits of carbon sequestration. The rate of flow of indirect values can depend on human actions – for example, in terms of crop choice in thinking about the carbon sequestration value of a given catchment, but this is rather different from the nature of the dependence of direct values on human preferences.

3.12 Since the variability in direct use values of the environment depends most importantly on *human characteristics* whereas the variability in indirect values of the environment as an input depends most importantly on *natural system characteristics*, it seems very

unlikely that an approach to valuation designed to deal with the former could be any kind of good match for a benefits transfer system designed for the latter. Put another way, the issues involved in developing an approach suitable for dealing with indirect values are rather different than the issues involved in developing an approach for direct values. The former require expert knowledge that most members of the public simply do not have and where even some experts struggle when making judgements about such matters (for example in the Environmental/ Quality of Life Capital pilot studies run by the Countryside Agency in 1998/99). Indirect values like those for carbon sequestration or flood risk reduction are estimated using production function based approaches which do not include the environmental service directly in the utility function. Rather, the production function is used to see how these services would change if, for example, a catchment was de-forested, and then use market prices to value these changes (eg the market for carbon permits, or the housing or insurance markets)

3.13 In the light of the discussion above about the nature of landscape benefits, it can reasonably be argued that when considered as a resource in its own right, dealing for example with changes in the fabric, character and quality of the landscape and requiring expert knowledge of factors such as, for example, landscape character, typologies, distribution, rarity, condition and quality, landscape could also be considered as an *indirect* use value. This has links to the argument advanced in the University of Leeds paper on the treatment of landscape in public investment appraisal (as in note[20]) which noted that landscape may also be perceived as a 'merit good' where "decision-makers believe that the public deserves to receive and consume more of it than it would willingly choose to do". The argument is based on the idea that future generations deserve to inherit good landscape within which to conduct their affairs and live their lives and has links to wider ethical arguments about sustainable development.

3.14 The points made earlier about the twofold meaning of landscape are especially relevant here. Landscape in its spatial sense, defined as a geographical area or type of landscape, is defined by the interaction of physical, natural and cultural components, as perceived by people, and is a holistic, integrating concept. Wildlife contributes to landscape character (for example the sights and sounds of curlews on the Moors) as do cultural heritage features including archaeological remains and buildings (for example hill forts in the Dorset Downs, or buildings of local stone in the Cotswolds). So, almost by definition there are overlaps. In typologies of *direct* use values for landscape, through its 'consumption' by the public, landscape is usually grouped with recreation and cultural heritage, but might well also include activities such as bird watching which rely on wildlife and so potentially overlap with biodiversity. These values, which for the reasons set out above are most suited to exploration by valuation surveys involving the public, pose the greatest problems of possible double counting.

3.15 As a direct use value the concern for landscape *per se* is about public perception and enjoyment, of aesthetics or visual amenity or some combination of these. It includes inspiration and, arguably, also includes or is at least closely related to tranquillity and spiritual values. Some perception surveys (for example the work on environmental capital in the North Pennines (Note[12]) and the recent research related to the definition of tranquillity[52]) suggest that if people are asked unprompted questions about what they value and why, their responses are likely to mix these values together. For example the top contributors to tranquillity were 'being in a natural landscape' and 'birdsong'.

3.16 It seems to us that the general public, who are largely non-expert, are unlikely to differentiate between their use of landscape for recreation and their use of it for enjoyment of the aesthetic aspects of scenery, whether by living in it, visiting it or

driving through it on the way to work. Appreciation and enjoyment of cultural heritage and wildlife are a part of this enjoyment, both in recreational and non-recreational use. While people might recognize that both have value in their own right, especially if they have a specialist interest in one or both, we are doubtful that a general survey of public respondents could meaningfully separate out the monetary value that people would attach to them. There is therefore a very high probability that there would be double counting if the public were asked to value landscape, tranquillity, cultural heritage, and wildlife separately, either in the same survey or in individual surveys, and then these values were added together. The best way to avoid this would be to bundle the direct use values of agricultural landscapes together for the purposes of valuation surveys. The aim would be to seek a global value at the high level, but also to include questions about knowledge of and appreciation of wildlife or cultural heritage, and about use of the landscape for recreation. The answers would then provide one of the underlying sets of information that would be analysed to see if it might explain variation in values.

APPROACHES TO BENEFITS TRANSFER

3.17 Benefits transfer is an approach to economic valuation which assumes that values for an environmental asset determined by a valuation study in one place can be transferred and used in another place. Valuation studies of the type discussed in this report can be complex and expensive to carry out. The idea of using studies from elsewhere to answer questions in other locations therefore has obvious attractions. The database in the tables at the end of Appendix B summarises values from a wide range of previous studies relating to agricultural landscapes that have been carried out in the UK and in different parts of Europe. The literature review does however suggest that benefits transfer in relation to landscape must be treated with considerable caution. Since, as discussed in Chapter 2, landscape is a complex social and cultural construction, it seems that the estimation of landscape values is more sensitive to natural, cultural and social conditions of the original surveys than with other environmental goods[53]. There are no universal rules by which people value landscape quality and the way that people think about this matter varies according to the nature of the individuals, their social groups and cultures and the time at which the study is carried out[54]. It therefore seems inadvisable to consider transferring values from studies in other European countries where the nature of the landscape and of the population is very different from the UK.

3.18 This means that only the studies from England and Scotland should be considered to offer the possibility of benefits transfer for valuing UK landscapes, and even then only within those individual countries. Even studies from the Republic of Ireland must be treated cautiously since they relate to a very different environmental, social, economic and institutional context. Review of the studies carried out in England that are included in Appendix B shows that four cover upland types of landscape, four cover wetlands/marshland/levels types of landscape, one covers chalk and limestone landscapes and two cover general agricultural or farmed landscapes. In Scotland, of the studies concerned with landscape as opposed to biodiversity, four are concerned with predominantly upland types of landscape, one is focused on a coastal area and two are concerned with general agricultural landscapes. The studies in England and Scotland mainly use stated preference methods to determine values, with contingent valuation most commonly used. Only the most recent studies focus on choice experiments.

3.19 It is therefore apparent that existing studies are focused on the uplands more than any other type of landscape, with reasonable coverage, at least in England, of wetland and equivalent landscape types and some coverage of unspecified broad types of farmed landscape. Some deal with whole landscape values or general matters of landscape

appearance or landscape amenity, while others provide values for individual components of the landscape in question. The majority of the studies are specific to particular policy or change scenarios, particularly matters relating to Environmentally Sensitive Area payments or other incentive payment schemes, and to issues such as flood control in wetland areas. We have therefore concluded that, while all of the values obtained in the studies are interesting and valuable in their own right, it is not possible to simply transfer them to try to answer the questions that DEFRA might now wish to address in relation to agricultural landscapes more generally.

Environmental Landscape Features Model

3.20 The brief for this study asked us specifically to provide advice on the extent to which Defra's Environmental Landscapes Features (ELF) model should be used in valuation of agricultural landscapes. ELF was developed by Nick Hanley and David Oglethorpe as a simple benefits transfer model[55] which concentrates on individual features. It is based on summary data from a range of contingent valuation studies of landscape values across Europe, and uses a bid curve for each landscape feature included in the model to estimate WTP per hectare for that feature in different regions of England. It allows for the extent of existing habitat in that region in making the WTP estimate (albeit based on a very few surveys relating WTP to area), and for variations in regional average income.

3.21 However, ELF is rather limited with regard to future development suitable to meet DEFRA's policy analysis needs. First, it uses a range of habitats as the "goods to be valued" which are not consistent with the whole landscape and landscape character type classifications argued here to be more relevant to how people think about landscape values. Indeed, the list of habitats included was originally selected on ecological criteria rather than in relation to landscape. Second, the studies on which ELF is based are highly variable in quality and, just as importantly, highly variable in terms of the counterfactuals (see Page 3.39 and 3.48 below) which are used to generate WTP estimates. Finally, ELF does not allow for substitution effects in terms of the value of a given landscape type in a given location. Overall therefore we do not think that ELF can be relied upon to meet DEFRA's current policy needs.

A SPATIAL FRAMEWORK FOR VALUING AGRICULTURAL LANDSCAPES

3.22 If new studies are to be carried out that derive values for agricultural landscapes or their components under specified policy scenarios, some form of spatial framework will be needed that groups together landscapes of a similar type. This is essential if values are to be meaningful, related to a particular landscape context, and hence transferable. The current approach to landscape character assessment, which is now the mainstay of landscape planning and management in England and also in Scotland, has been introduced in Paragraph 2.3. In this approach, characterisation normally results in the identification of one or both of the following:

- *Landscape Character Types*: these are distinct types of landscape that are relatively homogeneous in character. They are generic in that they may occur in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern.

- *Landscape Character Areas*: by comparison these are discrete geographical areas of a particular landscape type, and are in themselves unique. Each has its own individual

character and local identity, even though it may share the same generic characteristics with other areas of the same landscape type.

3.23 The approach can be applied at a number of different scales, from the national, or indeed European level, down to the local Parish level. Assessments carried out at different scales should ideally fit together as a nested series or a hierarchy of landscape character types and areas so that assessment at each level adds more detail to the one above. The three main levels at which Landscape Character Assessment may be carried out are:

- **National/regional scale:** work at this level is large-scale and may cover the whole of a country or a large region, typically at a scale of 1:250,000. It seeks to identify broad patterns of variation in landscape character resulting from the underlying geology and landform overlaid with the influence of broad ecological associations and key aspects of settlement and enclosure history.

- **County/District scale:** within these broad overarching patterns it is possible to identify a finer grain of variation in landscape character, which can be mapped and described through Landscape Character Assessment applied at the county or district (or unitary authority level), typically at a scale of 1:50, 000 or 1:25,000.

- **Local scale:** sometimes it may be necessary to carry out an assessment of a smaller area such as an individual Parish, an estate or farm in single ownership, or the area of a proposed development site. Such work is usually carried out at 1: 10,000 or less and will add detail to larger scale assessments.

3.24 Joint Character Areas (JCAs), whose origins and nature have been described elsewhere[56], provide the top tier of the hierarchy of Landscape Character Assessment in England and in the last ten years have become a key component of the policy arena for landscape and land management policy. The map and descriptions of the 159 areas are, for example, used as the basis for targeting of agri-environment schemes such as Countryside Stewardship and now Environmental Stewardship. Most recently the Countryside Quality Counts project[57] has reported its findings entirely in the framework of JCAs. The JCAs work at the national or regional level but not the more detailed levels referred to above. The emphasis is entirely, as the name shows, on character areas not on landscape character types, and so each JCA has individually distinctive character.

3.25 In an ideal world valuation studies would provide information on each of these areas, reflecting their distinctive character and the particular environmental, social, economic and policy context of each. In reality the number of areas means that this is just not practical and so it is necessary to find some form of classification of agricultural landscapes into types which have similar character which can then form the basis for studies. Valuation of benefits derived from surveys in one location of each type can then reasonably be transferred to other areas of the same type. In this study we have set out to find a classification which is best suited to this purpose. In determining what we think might be the most useful classification we have used criteria which suggest that an ideal framework:

- should be focused on the agricultural characteristics of landscape;
- should be relevant to the range of possible policy applications;
- must mean something in terms of the way people think about and value landscape in general and agricultural landscapes in particular;
- should provide a practical basis for transferring values /benefits to landscapes of a similar type and so contain only a limited number of categories with a minimum

degree of variation within the classes and a maximum degree of variation between them;
- be capable of being spatially related to data on numbers of residents, visitors, and those enjoying non-use value.

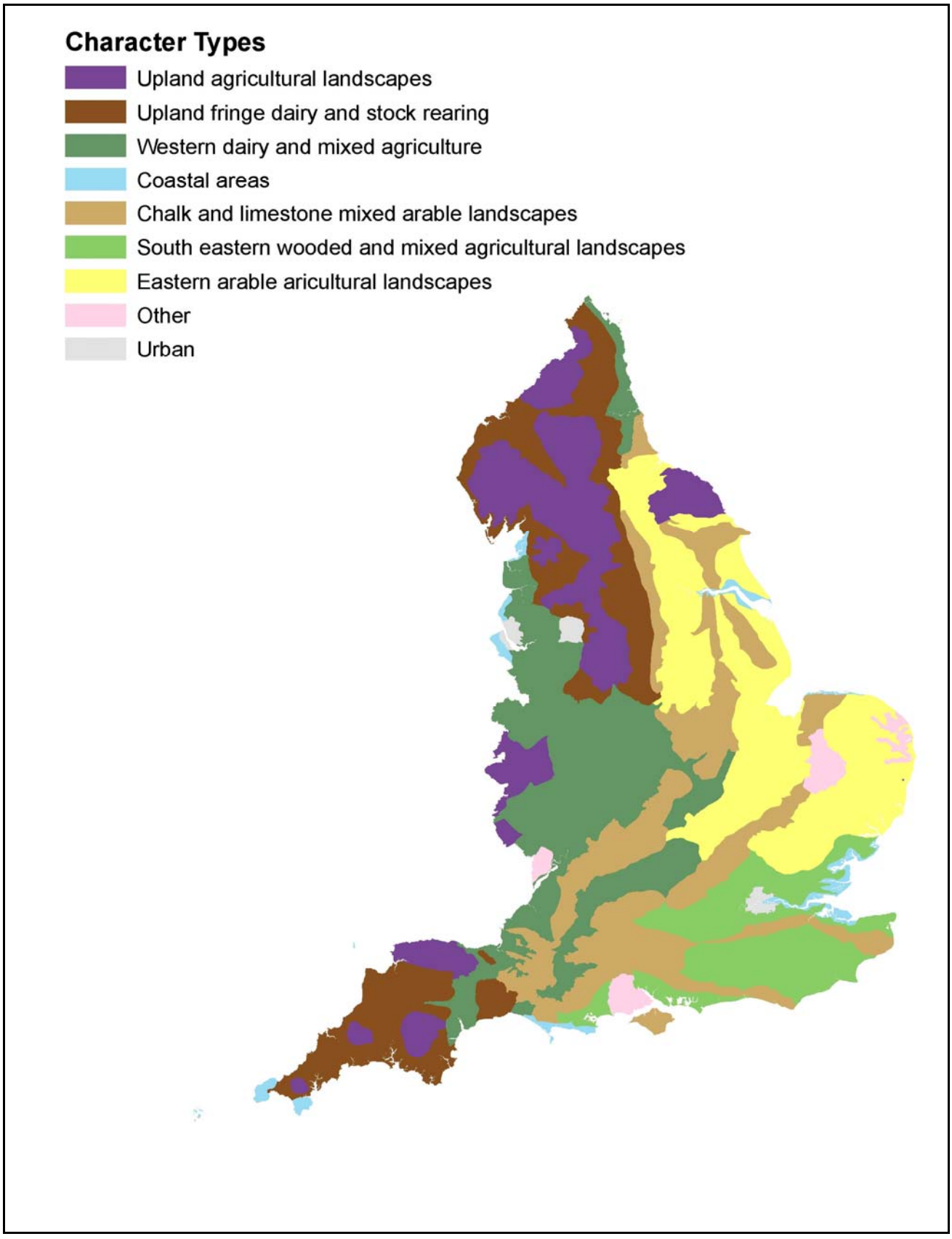
3.26 We have looked at a number of options for a potential classification of agricultural landscapes, namely, in increasing level of geographical resolution, the:

- landscape types used in the European Environment Agency's PRELUDE scenario project[58];
- categories used in LANMAP, the European landscape character mapping project, the report from the European Landscape Character Assessment Initiative (ELCAI)[59];
- three environmental zones used in the reporting of the results of Countryside Survey 2000[60];
- English Nature's groupings of Natural Areas, both by occurrence of Institute for Terrestrial Ecology (ITE) land classes and by grouping into so-called 'focus groups'[61];
- ITE/ Centre for Ecology and Hydrology (CEH) Land Classification used in the series of Countryside Surveys[62];
- framework of 'broad landscape types', based on grouping the JCAs into 18 broad types, which was devised as part of the so called 'Lexicon project' to help the Rural Development Service develop the survey pro-formas and guidance for Higher Level Stewardship[63].
- Countryside Agency/Living Landscapes National Landscape Typology, complete for the UK at Level 1[64];
- Fine Grained Classification, which subdivides the JCAs but still above the detailed level of individual local Landscape Character Assessments for counties or districts[65];

3.27 We have concluded that in terms of the criteria none of these are perfectly suited to the task but all give useful indications as to the type of classification that might be appropriate. To develop a tailored classification that is focussed on agricultural character and aspects of soils and geology, land form and land use that are most closely linked to this and which are likely to influence people's perceptions of the differences between agricultural landscapes at a broad scale, we have, with the assistance of Natural England, examined the datasets on types of farming, landform and generalised geology, as used in the generation of the National Landscape Typology, as well as maps from the National Inventory of Trees and Woodlands, and the 'Soilscapes' data set from MAGIC. We have used the Joint Character Areas as building blocks, so that any classification can be related back to these distinctive areas, and overlaid them on these datasets to see if there is a sensible basis for a high level grouping.

3.28 Using heuristics rather than a full data led analytical approach, which is not feasible at this stage, we have concluded that there are six clear groupings of agricultural landscape types that would provide a suitable basis for benefits transfer and which we think meet the prime requirements of a framework in terms of the criteria we set. Although we have used the character area boundaries in association with the other datasets to define the extent of these broad types, the character areas are not explicit in the final map representations of the typology. They can remain in the background as one of the underlying datasets or layers and can, if required, be used as the basis for sampling and analysis if appropriate. Our preliminary grouping of possible types, which will require further refinement and discussion should more detailed work on this topic result from this study, is shown in **Figure 3.1** and consists of:

Figure 3.1 : Suggested typology of agricultural landscapes for use in valuation studies and benefits transfer



- Eastern arable agricultural landscapes
- South eastern wooded mixed agricultural landscapes
- Chalk and limestone mixed agricultural landscapes
- Western dairying and mixed agricultural landscapes
- Upland fringe dairying and stock rearing agricultural landscapes
- Upland agricultural landscapes

3.29 There are currently several Joint Character Areas that do not fit easily into these six agricultural types. There a few small areas of coastal landscape that might best be omitted from the definition of agricultural landscapes as they will be perceived as predominantly coastal in character. Another group are difficult to fit into the categories of agricultural type around them as they have unique non-agricultural characteristics for which they are best known. They are the New Forest, the Forest of Dean and Breckland which are known for specific woodland, heathland or grassland habitats, and the Broads, a character area known for its wetland and open broad habitats. All are particularly valued for their recreational opportunities and their unique landscapes, rather than as agricultural landscapes. Both of these categories are separately identified on Figure 3.1.

3.30 We are confident that this typology is a broadly accurate reflection of the range of variation in agricultural landscapes in England. There is of course a degree of variation within each type, even at this coarse level of definition. It would be possible to subdivide some of the categories if it is considered that other agricultural types need to be treated separately. The clearest example of this is the extensive, flat and naturally wet but usually drained landscapes of the levels and moors, to be found in the Somerset Levels and Moors, the Humberhead Levels, the Fens, the Pevensey levels and Romney Marsh. The same argument might also be made for the heavily wooded or former Forest landscapes including the High Weald, Charnwood Forest, Needwood, Arden, Cannock Chase. Creating such subdivisions would increase the number of agricultural types from six to eight with implications for the scale and cost of new valuation work. At present we are not convinced that this is necessary, although much will depend on how the character of the landscapes and the effects of change are presented to the public.

3.31 A well designed survey using appropriately designed and presented scenarios of change and related counterfactuals (see below and Chapter 4 for more details) should allow the generation of transferable valuation data that could be applied to these six main types of agricultural landscape. The uplands type is to some degree already well covered, but much of this data is based on components and would only be useable in a comprehensive database if all the other landscape types were to be treated in the same way. There are also individual examples of valuations of whole landscapes that are relevant to some of the other types, for example the South Downs (chalk and limestone landscapes) and the Somerset Levels (western dairying and mixed agricultural landscapes), but the methods vary and it is not clear that these data could realistically be used.

Use of Geographic Information Systems

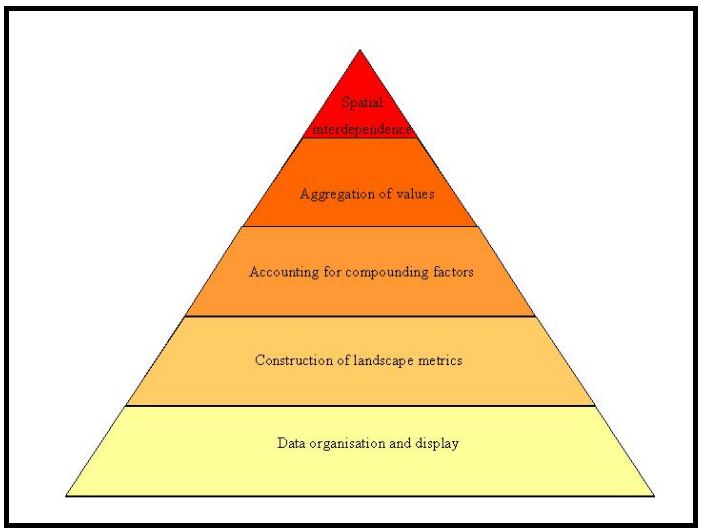
3.32 In the context of this research question the brief also asked us to consider how Geographical Information Systems (GIS) may be used to advance this area (a classification of agricultural landscapes) and to explore where there are data gaps. We have already used GIS in exploring datasets and generating the map of suggested agricultural landscape types in Figure 3.1. In terms of data gaps, it should be noted that

the datasets on agricultural land use that we have referred to in defining the six categories of agricultural landscape are now quite old and should ideally be updated before boundaries are finally drawn. It may be, for example, that the extent and distribution of arable and pastoral land is now significantly altered, although the map used is already a generalisation from more detailed data and the broad patterns may persist. It is outside the brief for this study to carry out detailed technical work but this is a matter which would require further investigation before a typology is finally confirmed for use in valuation studies.

3.33 Although manipulation of map data to assist in devising a classification is the most obvious application of GIS, we have also considered it helpful to explore the wider role that GIS can play in economic valuation studies. An analysis of the degree to which researchers have taken advantage of the possibilities GIS offers has been helpful in understanding both the different levels of sophistication of landscape valuation studies in general, but also the challenges faced in this project in seeking to generate landscape value maps relevant to policy. The existing literature (summarised briefly in **Appendix A**) reveals different levels of integration of GIS into economic valuation studies, as shown in **Figure 3.2**. In this figure the relative size of each of the layers represents roughly the number of studies reported in the literature. The bottom layer of the triangle represents the most basic use of GIS, whereas the most spatially integrated valuation analyses are shown in the top.

3.34 The most widespread use of GIS is simply to display information about the resource being valued. This has become common practice in valuation studies. GIS is also often used to calculate attribute data for the environmental good being valued, for example landscape characteristics in hedonic price studies or site characteristics in recreation studies. The use of GIS enables the researcher to take into account spatial patterns of the resource characteristics – such as linear features like hedgerows, spatial heterogeneity of individual land uses, topography and so on. In the approach to valuation that we propose GIS would have an important role to play in constructing the final spatial framework of agricultural landscape types using available GIS layers, and then characterising them using available datasets, such as those assembled in the Countryside Quality Counts project.

Figure 3.2 : Extent of use and role of GIS in published valuation studies



3.35 This use of GIS is also particularly relevant for judging the validity of benefit transfers as it allows the researcher to account for similarities/dissimilarities between policy and

study sites. Particularly relevant compounding factors are population size, accessibility and substitute resources. Furthermore, using GIS it is also possible to test for the linearity assumption of marginal values or whether evidence suggests decreasing marginal values with increasing amount of available resource (as economic theory would suggest). As we discuss further in Chapter 4 these are very difficult issues when applied to landscape, but they could not be explored without GIS to assemble the relevant information.

3.36 GIS can also have an important role to play in the aggregation of values. A major source of variability in valuation estimates can come about through alternative assumptions about the size of the population over which to aggregate. Often aggregation bias dominates variability in per person WTP estimates. GIS can play a role in two ways; firstly in helping to decide the size of the population to which the environmental good has value; and secondly in informing decisions about how to take into account the fact that people often place higher value on environmental resources that are spatially close, mainly due to the changing proportion of users and non-users with distance.

3.37 In terms of spatial interdependence an economic valuation of change in different agricultural landscapes would need to take into account that a landscape change could influence participation rates, recreational choices and possibly choice of residence. The literature gives some guidance how this can be done for recreational use values and to some extent through hedonic pricing methods. This poses very difficult problems for stated preference studies of landscape values since it is far from clear how landscape influences choices. Use of GIS in this area would be needed but there are few if any precedents so the work would need to break new ground.

3.38 In terms of data, GIS would allow census data at enumeration district level to be analysed in relation to the agricultural landscape types identified above, providing details on the characteristics of resident population in these areas. Information about recreation patterns and numbers of visitors is more difficult. We have reviewed the content of the most recent England Leisure Visits Survey (ELVIS)[66] and discussed the raw data with Natural England. There is a great wealth of information potentially available on both the origin of different types of trips to the countryside, all of it geo-referenced so that it can be plotted in GIS. There has, however, been no analysis to link individual points of origin with individual destinations. Such analysis would be very helpful in understanding the nature of trips to agricultural landscapes by visitors and would yield valuable information about travel time. We suggest that there should be discussion with Natural England about further analysis of this information.

APPLICATIONS, SCENARIOS AND COUNTERFACTUALS

3.39 The study brief asked us to review, together with Defra, the policy needs for different types of landscape value. We have done this by discussion with the Project Steering Group and with our project officer, who also supplied us with a note on the subject. Policy applications are very important because, as explained previously, values need to be determined in relation to one or more specific changes. The nature of these changes will determine the scenarios that are used to determine public preferences and associated values, and the accompanying counterfactuals. Counterfactual (primarily a word from psychology) is a term used in the economic valuation community broadly to describe the 'policy off' situation, addressing the question "what if we didn't do/hadn't done anything" (see below for further discussion) Both change scenarios and related counterfactuals therefore need to be designed to reflect some or all of the most likely policy applications where the valuations may be applied.

3.40 There are likely to be two broad areas of policy application where landscape valuation may have a role to play, namely those related to:

- the services and benefits offered by environmental assets and determination of their overall value. This includes the suite of ongoing projects relating to ecosystem services and the work on environmental accounts for agriculture;
- the design, implementation and monitoring of financial support mechanisms aimed at securing environmentally sensitive farming. This includes changes to agricultural support and, in particular, the development of the Environmental Stewardship schemes and the evolution of a new system for the support of upland farming.

The question of ecosystem services and benefits has already been dealt with to some extent in the earlier section of this Chapter. Here we concentrate firstly on application of landscape values in relation to environmental accounts for agriculture and secondly on those relating to environmentally sensitive farming.

Environmental accounts for agriculture

3.41 An interest has arisen in reflecting the contribution of non-market flows to macro measures of economic well-being – green net national product (NNP) - and adjusting these measures for changes in the value of natural capital, for instance in calculations of genuine savings. A report by EFTEC[67] shows how this can be done for the case of agriculture and indicates what kinds of adjustments are required. An on-going project by Jacobs and SAC seeks to update and extend this work and the theoretical background to this work is provided in a preliminary report[68]. This report repeats the four purposes for environmental accounts for agriculture introduced in the EFTEC report, namely:

- an economic measure of the sustainability of agriculture and a truer measure of the quality of life;
- an indication of the extent to which agriculture is a net contributor to the nation's well-being as well as how it affects the welfare generated by other sectors;
- information that can be used for priority setting within agricultural policy;
- an input to cost benefit analysis for agriculture and related environmental policies.

3.42 Unfortunately, much published work on this topic lacks a firm theoretical basis. Without this, adjustments are essentially meaningless in terms of measuring aggregate well-being, or in developing a sustainability indicator. This is because the way in which adjustments *should* be done to be consistent with economic theory turns out to be very difficult to do from the point of actual empirical work; and because the valuation database available with which to do it is also highly incomplete. The Eftec report (see Note [66]) recognised these two weaknesses. These two points are explained in more detail in **Box 6**.

3.43 Clearly a benefits transfer model such as the one we suggest in Chapter 4 would meet these requirements of environmental accounts for agriculture only to a very limited degree. The national accounting framework operates on the basis of a "no agriculture" counter-factual; this would be highly unrealistic in a landscape valuation scenario, a fact that Jacobs note in their report. The non-market benefit flows from landscape are only part of the non-market flows from agriculture in total, since recreation and wildlife

Box 6 : Theory relating to adjustments for environmental accounts for agriculture

Several papers[69] have all demonstrated what these adjustments should consist of from the point of view of economic theory. For green NNP, two kinds of adjustment are needed (taking the example of the agricultural sector):

- add the value of all non-market flows which directly impact on utility, valued at their correct shadow prices (for some authors, these are sustainability prices evaluated along a sustainable development path) for example, amenity benefits from farm landscapes.

- add any appreciation of natural capital (e.g. expansion of woodland) and deduct any depreciation in natural capital (e.g. soil erosion), valued using the difference between price and marginal cost on the optimal use programme (i.e. that pattern of natural capital use which optimises the net present value of utilisation).

Doing this will yield a one sided indicator of sustainability, and a better measure of aggregate well-being than un-adjusted GDP. Note that this relates to green *National* product – not some sectoral measure of performance such as DEFRA wishes to derive. Note also that the theoretical model presented by Jacobs in Box 1 of their "Draft Theoretical Base" report (see Note [66]) is wrong (expression for green NNP), since it excludes the adjustment shown in the first bullet point above. See Pezzey et al (Note [68]) for an attempt to derive green NNP in a theoretically-correct manner.

conservation also bring utility; yet, as discussed above with respect to ecosystem services and use values, it may be hard to separate these out. It also cannot be assumed that observed levels of public good provision from agriculture are optimal, yet that is what is assumed in national income accounting adjustments. It is not clear how changes in landscape quality impact on the natural capital value of farmland and all types of agricultural landscape are assumed to bring equal value. Ecosystem service flows could be added to green NNP, but again against the counterfactual of "no agriculture". Overall, it seems unlikely that a benefits transfer model for landscape would be of much help in building adjusted national accounts for agriculture which pass the test of consistency with economic theory.

3.44 We therefore have significant reservations, based on arguments from economic theory as outlined above, about the ability of a benefits transfer study, of the type proposed in Chapter 4, to generate appropriate data for use in environmental accounting exercises. This relates to both (i) problems in thinking about what costs and benefits would be in the absence of agricultural activity and (ii) the particular requirements on the values if they are to be included in theoretically-consistent environmental accounts which purport to measure trends in sustainable development. Nevertheless, with regard to the first of these points, we discuss possible scenarios and counterfactuals in more detail below. In this situation it would seem appropriate, from a broad policy perspective, to consider alternatives to landscapes that are predominantly agricultural, and to consider new land uses that might feasibly replace agriculture in each of the broad agricultural landscape types, reflecting what might happen for example if agricultural support were completely withdrawn".

Support for environmentally sensitive farming

3.45 The last 20 years have seen a number of agri-environment schemes introduced in the UK to provide support and incentives to encourage environmentally sensitive farming. Early schemes, notably the provisions for Environmentally Sensitive Areas, were focussed on specific areas and have been the target for economic evaluation studies in both England and Scotland (see database in Appendix B for details). More general and

extensive schemes, based on support for measures to protect and enhance specific landscape features, have not been extensively evaluated in this way, Current policy, in DEFRA, and its equivalents in Scotland, Wales and Northern Ireland, is centred on reform of the Common Agricultural Policy, as implemented from 2005, and the associated development of agri-environment schemes. The main scheme now operating in England is Environmental Stewardship with its Entry Level and Higher Level Schemes, as well as the separate organic option.

3.46 Linked to this are the new proposals for redirecting current support for upland farming (through the Hill Farming Allowance in the Less Favoured Areas) into a new form of upland stewardship scheme. The proposed uplands scheme has been informed by a recent (2006) study of the value that people attach to the individual landscape features that are components of upland landscapes in England[70]. New surveys were used to elicit values for most features, using choice experiments, combined with benefits transfer using values from previous studies specifically for hay meadows. As yet there have been no comparable valuation studies that focus specifically on Environmental Stewardship or the options within it.

3.47 From a policy perspective DEFRA and others in the policy community are likely to be particularly interested in the value that people attach to:

- the conservation or enhancement of different types of agricultural landscape as a result of Environmental Stewardship measures as a whole. This would allow the economic benefits of such a scheme to be compare with its overall cost, either before or after its implementation;

- the additional benefits accruing to agricultural landscapes as a result of increased funding and uptake of Higher Level Stewardship, as opposed to Entry Level Stewardship, to compare with the additional costs;

- individual measures related to specific landscape features, to assist in determining how financial resources might be targetted within the scheme.

Each of these would require a different survey design to elicit appropriate values from the public.

Policy scenarios and counterfactuals

3.48 Given the theoretical basis of economic evaluation as set out in Chapter 2, deciding what alternative or baseline situation to set against an option for a future landscape is fundamental to environmental valuation. There is a convention among some environmental economists to use the word 'counterfactual' to describe this alternative or baseline position. This can be used to describe the 'what if' position in relation to the scenario, either looking forward, that is 'what will happen if we don't pursue this policy scenario', or backwards, that is 'what would have happened if we hadn't pursued that policy'. In many forward looking valuation studies the counterfactual is the current situation, but this is not always the case as it can also be a prediction forward of the current situation under 'business-as-usual' conditions – that is, under current trends. For example, many early contingent valuation studies on the value of protecting wetlands or woodlands were based on a comparison between keeping what exists today (such as current area of woodland) and, often, a prospective total loss of this landscape feature. WTP was then defined as the most people would give up to keep the status quo, that is, to keep the current amount of that landscape feature. There are also, however, many

examples of projection-forward baseline counterfactuals, for example the "no ESA in place over the next 10 years" baseline employed in ESA valuation studies in Scotland[71].

3.49 In order to reflect the policy agenda outlined above we think that in broad terms a valuation framework is required that is based on the six agricultural landscape types described earlier and, for each type, construction of a pair of policy scenarios each with a related counterfactual which would vary according to the context, as discussed below. In each case the policy scenarios would consist broadly of:

- a conservation, restoration or enhancement scenario, designed to reflect policy interests in Environmental Stewardship, including differences between the effects of Entry Level Stewardship and Higher level Stewardship in different landscapes;

- a land use change scenario, designed to show feasible alternatives to agricultural land use, where maintenance of agriculture is the policy scenario and the alternative land use (eg housing, wind farms) is the counterfactual

3.50 In each case the policy scenario and related counterfactual should be tailored specifically to the broad agricultural landscape type in question. For example, in the uplands, counterfactual alternatives to agricultural land use could be re-wilding, or woodland and forest creation; in the eastern arable landscapes the alternatives might be biomass crops or urban development; and in the upland fringes it might be wind energy, urban development or woodland creation. Scenarios including this type of change are of course likely to provoke public responses, and hence values, that are based on attitudes to the new land use as much as to the loss of agriculture. It will therefore be difficult to draw out clear messages about people's willingness to pay to maintain agriculture, or willingness to accept compensation for a change to a different land use. This is especially the case because in designing survey materials it may be necessary to show exaggerated levels of conversion to the new land use and single, rather than combined land uses. Without such simplification drawing meaningful conclusions may be very difficult.

3.51 The nature of appropriate counterfactuals has been the subject of some comment, especially in relation to the theory underlying the creation of environmental accounts for agriculture. In this case, as discussed above, the counterfactual should in theory simply be 'no agriculture' but this cannot realistically be presented to the public, hence the need to construct counterfactuals that include alternative land uses. The situation is also complex for valuations relating to Environmental Stewardship, where the counterfactual could take several forms depending on the policy question to be addressed. Although the differences between the options are potentially significant it is important to bear in mind that their perceptible effects on the landscape may in reality be quite subtle and difficult to represent in survey materials. The options for counterfactuals include:

a) the current state of the agricultural landscape type with no predictions of change;

b) the predicted state of the landscape assuming no agri-environment measures and no cross compliance (requiring maintenance of good agricultural and environmental condition), but with predicted 'business as usual' trends appropriate to the landscape type;

c) the predicted state of the landscape assuming current 'business as usual' trends but also assuming that there is cross compliance;

d) the predicted state of the landscape assuming current 'business as usual' trends, cross compliance and widespread uptake of Entry Level Stewardship measures appropriate to the particular landscape type.

3.52 The most realistic scenario is probably (d) since this represents the current situation following the implementation of the 2005 CAP reforms. In a similar way, in the EFTEC study of upland landscape values[72] the baseline was predicted change in landscape features under the "no change in current policy" case, involving continuation of the existing Hill Farm Allowance. The alternative scenarios for which values were computed were predictions of future landscapes under a range of alternative policy scenarios, relating to different options for use of existing upland support funds and also withdrawal of support[73]. (In the language of the equation in Box 2, the Cumulus baseline determined V^0 and the policy alternatives determined alternative values for V^1).

3.53 It could, however, also be useful to test the effects of different baseline counterfactuals in different landscape types and in combination with different policy scenarios. In this case consideration of a range of agricultural landscape types, relevant policy scenarios and related counterfactuals could result in a table of combinations like the one illustrated in **Table 3.2**. It is not possible at this stage to say exactly what combinations of scenarios and counterfactuals would in reality be appropriate and so this table is purely illustrative. However it shows both changes in land uses as alternatives to agriculture and different aspects of Environmental Stewardship, both with possible counterfactuals. There are of course a number of possible variants on these combinations, which could only be agreed when DEFRA is clear about its specific policy interests. It has been suggested that bias towards the status quo might affect the outcome of surveys designed to populate this table but as the suggested approach is to use contingent valuation and not choice experiments, we do not anticipate this will be an issue.

3.54 If the use of valuation studies to contribute to environmental accounts for agriculture is considered inappropriate, or at least not a priority, the simple alternative would be to have just one counterfactual or baseline scenario for each landscape type, to be used as the baseline for all policy scenarios. As indicated above this would most realistically need to reflect the existing nature of the landscape type under 'business as usual' conditions, combined with the effects of the implementation of the 2005 CAP reforms including cross compliance and current levels of uptake of Entry Level Stewardship options under the current funding regime. This counterfactual could then be accompanied by a pair of scenarios. One would be focused on something like higher levels of uptake of both Entry Level Stewardship and, especially, Higher Level Stewardship resulting from higher levels of funding for the schemes and based on appropriate targeting statements for that landscape type. The other would focus on appropriate land use change out of agriculture.

Constructing and presenting the scenarios and counterfactuals

3.55 To develop scenarios and counterfactuals for use in valuation studies it will be necessary firstly to construct the appropriate range of scenarios and baselines, then to predict their effects on the different landscape types and then to prepare material that would allow these changes to be presented to the public in meaningful ways in valuation studies. Since landscape is mainly perceived visually, this is likely to require the preparation of some form of visual material showing the state of the landscape in question under different conditions. Both the construction and visualisation of scenarios are quite complex areas in their own right, each with a significant literature describing previous studies.

Table 3.2 : Possible combinations of scenarios and counterfactuals for broad agricultural landscape types (illustrative only)

Agricultural Landscape Type	Policy Theme 'Maintenance of Agriculture'		Policy Theme 'Investing in Environmental Stewardship'	
	Possible Scenario	Possible Counterfactual	Possible Scenario	Possible Counterfactual
Eastern arable agricultural landscapes	'Business as Usual'*	Biomass and/or Re-wilding of wetlands	Existing landscape with current trends	Increased take up of Entry Level Stewardship
South Eastern wooded mixed agricultural landscapes	'Business as Usual'	Development and/or New woodland	'Business as Usual'	Increased take up of Entry Level and Higher Level Stewardship
Chalk and limestone mixed agricultural landscapes	'Business as Usual'	Development and/or New woodland	'Business as Usual'	Increased take up of Higher Level Stewardship
Western dairying and mixed agricultural landscapes	'Business as Usual'	Biomass and/or Wind Energy Schemes and/or New Woodland	Existing landscape with current trends	Increased take up of Entry Level Stewardship
Upland fringe dairying and stock rearing agricultural landscapes	'Business as Usual'	Development and/or Wind Energy Schemes and/or New Woodland	'Business as Usual'	Increased take up of Entry Level and Higher Level Stewardship
Upland agricultural landscapes	'Business as Usual'	Re-wilding and/or New Woodland and forests	Upland Entry Level Stewardship	Upland Higher Level Stewardship

* Here 'Business as Usual' means a 'maintenance of agriculture' scenario based on the existing landscape with predicted 'business as usual' trends in agriculture plus implementation of the 2005 CAP reforms with cross compliance and existing levels of take-up of Entry Level Stewardship.

3.56 There has been a reasonable amount of work on developing scenarios for the future of rural areas, but with only some of it reflecting the impact of predicted change on the landscape. This work has been summarised in a recent review of literature relevant to understanding of the future function and character of England's rural landscapes[74]. This showed that future scenario work varies widely in terms of its policy focus and hence the type of change that it deals with. Key differences lie in whether such work:

- explores the effects of a single driver of change, for example agriculture, or climate change, or whether it seeks to look at several drivers of change either singly and/or in combination;

- either focuses broadly on the future of the countryside in general without translating this into impacts on future landscapes and without attempts to visualise such changes or focuses on the consequences of change for the landscape with attempts to visualise the effects

- seeks to examine public responses to change.

The previous studies that are most relevant to the valuation of agricultural landscapes are those that focus on landscape change. They are summarised below.

3.57 **Landscapes for Tomorrow** was an early study to create and visualise future landscape scenarios, in this case for the Yorkshire Dales, in work conducted by UEA in conjunction with the National Park[75]. This project aimed to create an educational tool for the public to help understanding and stimulate awareness of potential future landscape changes, primarily as a result of agricultural change and land management. It involved

extensive interviews with policy managers and practitioners to find out what possible changes in land management they envisaged over the next 20 years as a result of plausible policy measures. This established the influencing factors likely to affect the Dales. The future scenarios were created through analysis of the interview results. A word picture or 'storyline' was created for each of the scenarios developed which allowed further debate with some of the interviewees before an artist was commissioned to illustrate the scenarios. This work was later used as the basis for an early economic valuation study focussing on change in this upland agricultural landscape.

3.58 A number of recent projects have been conducted by the University of East Anglia which involve the production of visualisations of future landscapes. **Visualising Sustainable Agricultural Landscapes**[76] aimed to assess the scope for, and benefits of, a whole landscape approach to farm management in a study area centred on a National Trust estate in western Oxfordshire. The methodology used to construct the future landscape scenarios involved carrying out an ecological survey across the study area to establish the state of the existing environment, conducting interviews with local farmers and discussions with a range of stakeholder organisations. Through extensive consultation, plausible scenarios were developed which reflected each farmer's own plans for the future, stakeholder organisations' plans and the plans of both statutory and non-statutory organisations. These scenarios were then translated (via GIS data) into real-time landscape visualisations (created in VRML) which were used in a further round of discussions with farmers about the practicalities of achieving a whole landscape approach. Recent related work has examined the use of scenarios and visualisations to show potential impacts of climate change and agri-environment policies on agricultural landscapes using the Countryside Agency's Land Management Initiative (LMI) areas, especially the Norfolk Arable and the Humberhead Levels areas[77].

3.59 In the public perception component of the **New Map of England Pilot Study**[78] images of different landscape futures were created as part of the wider public perception component of the project. In this work hand drawn and rendered illustrations of change in a sample of six Regional (Countryside) Character Areas in South West England were used to elicit responses of local residents to possible future change in each area. The six areas were Penwith, Hensbarrow (the China Clay area of Cornwall), Dartmoor, Mid Devon (the Culm/Red Devon), the Somerset Levels and the Chew Valley (an area south of Bristol). In each case the illustrations showed a typical existing landscape with current trends causing change and two possible future scenarios - a 'conservation /restoration' scenario based on maintaining, enhancing and restoring valued key characteristics and demonstrating policy initiatives like agri-environment schemes, community forestry and access provision, and a change scenario which differed between the areas and had several components but a different emphasis in each case e.g. Dartmoor = re-wilding, Penwith = rural development, Somerset Levels = recreation development, Chew Valley = urbanising influences and gentrification.

3.60 Market researchers interviewed 70 residents in each area, who were asked, for each scenario what changes they could see between the original and the changed landscape (first unprompted then prompted). They were also asked to rank whether each change identified was for the better or the worse, on a 7 point scale and finally to express a preference between A and B, A and C and B and C, where A is the original landscape and B and C the two change scenarios. This quantitative work was linked to follow up focus group discussions in which the illustrations were also used, allowing the issues to be discussed in more detail with a smaller number of people (6 to 8). The aim in this work was to elicit people's reactions not just to the images overall but to the messages they contained about individual drivers of change.

3.61 More recently, similar work has been developed under the title **Landscape Change Scenarios**[79] to test approaches to visualising a range of possible drivers of landscape change in different landscapes in Scotland and assessing public attitudes to them. This project has reached the pilot stage following an earlier scoping study and a workshop, and the pilot work has been completed in Ayrshire. Instead of the manual illustrations of the New Map project, this work uses advanced photographic manipulation techniques to construct a series of images of both individual changes and combined multiple changes. The landscape changes that were used in the pilot were wind farms, biomass production, electricity pylons, agricultural crops, field boundaries and farm woodlands, forestry, mineral extraction and housing development, singly and together. The idea of constructing photo-manipulated images of typical, representative landscapes rather than actual places was also tested. Public responses were sought through pilot on street surveys and focus groups. Scottish Natural Heritage have been considering whether the work will be extended to other parts of Scotland.

3.62 While these studies provide interesting insights into approaches to scenario construction and visualisation, none are suitable, as they stand, to meet the needs of the current study by providing 'off the shelf' solutions. We have also looked at scenario work without visualisation of the effects on landscape but here too, while some studies are relevant, they do not generally match the likely range of DEFRA's policy interests as we understand them. Several, including DEFRA's own Rural Futures Project and the European PRELUDE project, are concerned with rural futures in the broadest sense and do not have a specific focus on agricultural landscapes. In terms of future scenarios for agricultural landscapes in particular, the uplands are relatively well covered, notably by the scenario work described above and carried out by Cumulus Consultants for use in the economic valuation study of uplands landscape features.

3.63 Other more lowland landscape types are much less well covered. One study[80] has looked at land management in three Countryside Character Areas in the South West region in the aftermath of Foot and Mouth disease and developed scenarios that take local foods, energy and alternative crops, and green tourism as key drivers of change. Two of the areas used fall within our suggested upland fringe agricultural landscape type (Cornish Killas and the Culm) and the other is in the chalk and limestone type (Cranborne Chase). These scenarios are again of interest but may not match exactly with either DEFRA's policy interests or the needs of economic valuation studies.

3.64 No similar work has been carried out specifically for the other lowland landscape types although there is a range of high-level national work on both agricultural futures and 'business as usual' trends which would be invaluable in developing such scenarios. Of greatest relevance is the work on agricultural futures and implications for the environment completed in 2005[81]. This study set out to inform Government policy on agriculture and the rural environment. The specific objectives were to identify and explain the identities, characteristics and outcomes of possible long term futures for agriculture in England and Wales, determine the implications of these outcomes for environmental objectives and identify possible policy interventions (and research priorities) to help promote sustainable agriculture. Four scenarios, representing the range of possible alternative futures, were constructed with reference to the UK Foresight Programme futures, which are themselves distinguished on twin axes of social values and governance. Each of the four resulting quadrants generates a distinct scenario, which in agricultural terms are labelled as:

- World Markets - Market driven, 'free trade' in agricultural commodities, limited intervention

- Global Sustainability - Internationally competitive agriculture, moderated by targeted compliance
- National Enterprise - Protected domestic markets promoting production and self sufficiency
- Local Stewardship - Community agriculture emphasising social and environmental objectives

3.65 Also relevant is the work on 'business as usual projections' for agriculture to 2015, carried out in the context of the Water Framework Directive[82],which includes all projected changes to farms, markets, and the environment in the intervening period. This work is based on identification and analysis of a number of representative farm types (Cereals, General Cropping, Mixed, Dairy, Upland and Lowland Livestock) that are considered to cover a significant proportion of the land area in England and Wales. It should therefore be possible to link the results to the broad agricultural landscape types, helping to construct suitable scenarios and counterfactuals (depending on the policy to be examined) for economic valuation. However, with both the 'business as usual' work and the agricultural futures study, the findings are too generalised to be immediately applicable to valuation studies. More work would be needed to interpret their implications at the level of the proposed agricultural landscape types and to work through the effects in terms of landscape change.

Visualising baseline landscapes and the effects of change

3.66 To elicit public responses to the scenarios and counterfactuals in each landscape type they will almost certainly need to be represented as visualisations, although these will almost certainly be accompanied by other explanatory visual material and text. There is a wealth of literature on the use of visualisation in public engagement and the details of methods that can be used. Application in non-economic studies are covered in the landscape literature and there are useful recent reviews in the Landscape Futures work for the Countryside Agency[83] and the Framework 5 European Research project 'Visulands'[84]. The use of such methods in economic valuation studies has been reviewed in an EFTEC report for the Department of Transport[85] which includes useful summaries of the type of visual and other material used in such surveys.

3.67 In studies of agricultural landscapes in the UK, contingent valuation approaches are often based on the use of photo-manipulation techniques to present before and after or policy on/policy off illustrations. Such techniques have largely replaced the hand drawn images more typical of earlier projects such as the Yorkshire Dales and the New Map of England studies referred to above, and the relative merits of different approaches are discussed in the reviews mentioned above. Some recent and pioneering studies have explored the use of virtual reality software to create images for public surveys[86] but the technical difficulties and cost of this work should not under-estimated.

3.68 The approach to presenting change could depend on the economic valuation technique adopted. Choice experiments have tended to focus on indicative illustration of individual landscape features rather than created or manipulated images of whole landscapes. Such approaches inevitably tend to oversimplify the message and mean that participants in surveys have to contemplate change to these features in the abstract, rather than being able to see how the feature occurs in the landscape in question and how it contributes to overall character. It may be that even in choice experiments visualisation of whole landscapes is to be preferred as the presentational technique since it can give a more realistic impression of change. There are though practical difficulties because of the range of combinations of levels of change in different features that may need to be created and the resulting number of images needed.

3.69 Future studies of agricultural landscape values are therefore likely to involve the creation of images of generalised landscapes that are representative of the range of broad agricultural landscape types. They may use manipulated images of real places or created images of 'typical' representative landscapes. Use of rendering software such as Visual Nature Studio alongside more conventional photo-manipulation software may be the key to preparing successful images but it is unlikely that full virtual reality approaches could be justified. It is also likely that any constructed and manipulated images will have to be accompanied by a portfolio of photographs representing the range of variation in each landscape type and text describing the nature of change. There is however a real danger of information overload for participants and so a balance will have to be struck in deciding how much information to provide and in what form. In this context, the valuation workshop approach may be particularly helpful.

3.70 The construction and visualisation of futures for rural landscapes is a topical area and similar work has been under consideration by Natural England as part of its Landscape Futures initiative, although this is not confined to agricultural change and there is a current focus on climate change. It is quite possible that there could be some collaboration in this area, thereby avoiding duplication of effort. This would, however, require that there are shared objectives in carrying out such work.

4.0 A SUGGESTED APPROACH TO EVALUATING AGRICULTURAL LANDSCAPES

INTRODUCTION

4.1 In this report Chapter 2 has summarised the theory and concepts relating to the evaluation of agricultural landscapes and Chapter 3 has discussed some of the main practical issues relating to valuation studies. This final chapter puts forward outline proposals for carrying out new valuation studies to address gaps in available data. In doing so it addresses the remaining research objectives and questions, namely:

- would it be easier/more appropriate to value these landscape types compositely or based on their component parts (Objective 4);
- for each landscape type/counterfactual combination, assess how values should be adjusted for transfer to account for issues like context, complementarity/ substitutability, accessibility/ number of users, etc (Objective 6);
- assess the feasibility of compiling a database of transferable landscape values that could, with adjustment, be used to assess the value of changes to landscapes. Assess the limitations to this approach and make any appropriate alternative suggestions (Objective 7);
- accounting for the findings of previous objectives, advise on the most cost-effective way to meet these needs (Objective 8).

THE NEED FOR NEW VALUATION STUDIES

4.2 Compiling a database of transferable landscape values that could be used to assess the value of changes to landscapes will, we conclude, require new valuation studies to provide meaningful values to meet DEFRA's policy needs. As Chapter 3 indicates, there have been a reasonable number of economic valuations of agricultural landscapes in Britain and Europe, but they are very varied in nature in terms of the landscapes that they examine, the valuation methods used, the survey populations and the details of survey design. As the literature shows, landscape is such a complex social and cultural construction and the estimation of landscape values is more sensitive to natural, cultural and social conditions of the original surveys than with other environmental goods. Moreover, there is huge variation in the counterfactual employed in these studies, even for the same landscape type. We have therefore concluded that use of these previous studies for benefits transfer is not likely to be meaningful, although this is not to say that previous studies are entirely unhelpful in populating and checking a database of values where they are relevant to specific landscape types and deal with related policy issues using similar methods.

4.3 New empirical work will therefore be required to build up a database of values for agricultural landscapes. Our suggestion is that the database should be based on the agricultural landscape typology that was discussed in Chapter 3. The values obtained from surveys can then be applied to all landscapes within the same type by a benefits transfer which handles main drivers of variations in value according, for example, to population characteristics of visitors and locals. Each landscape type will additionally be related to an agreed set of policy scenarios and related counterfactuals, broadly as discussed in Paragraphs 3.48 – 3.54 and illustrated in Table 3.2. The result will be a

database structured as in **Table 4.1** below. This is based on Table 3.2 and shows the agricultural landscape types arranged vertically and the policy scenarios and counterfactuals arranged horizontally. The aim of the new empirical work would be to "fill in the cells" in this table, replacing the letters with actual values. The shaded cells indicate landscape types and policy scenarios where there is recent and relevant data available. This refers to the results from the 2006 uplands study (see Note[69]), but it should be noted that this work uses choice experiments as the survey method and is therefore only comparable if the same method is used to fill the other cells.

Table 4.1 : Structure of a database of values based on agricultural landscape types and scenarios and counterfactuals

Agricultural Landscape Type	Policy Theme 'Maintenance of Agriculture'	Policy Theme 'Investing in Environmental Stewardship'
	WTP/WTA loss of farmland to alternative land use	WTP/WTA change in landscape quality of farmland
Eastern arable agricultural landscapes	Value = £ A	Value = £ C
South Eastern wooded mixed agricultural landscapes	Value = £ E	Value = £ G
Chalk and limestone mixed agricultural landscapes	Value = £ I	Value = £ K
Western dairying and mixed agricultural landscapes	Value = £ M	Value = £ O
Upland fringe dairying and stock rearing agricultural landscapes	Value = £ Q	Value = £ S
Upland agricultural landscapes	Value = £ U	Value = £ W

4.4 The structure of the database in Table 4.1 is by no means definitive. It is based on the discussion in Chapter 4 about policy applications and the range of scenarios and counterfactuals needed to address these. It assumes that DEFRA continues to have an interest in values related both to the maintenance of agriculture, linked to counterfactuals representing no agriculture through change of land use, as well as those related to agri-environment schemes. As a result the structure is quite complex with the cells containing 12 separate values relating to different combinations of landscape type, policy scenario and counterfactual. Note that these are "base values" – each would be adjusted using an underlying layer of data which represents shifters for WTP, such as substitute availability, nature of use etc. These shifters are discussed in more detail in paragraphs 4.24 - 4.28. Moreover, multiple counterfactuals would be used. For example in "policy theme – maintenance of agriculture", base values could be obtained for a range of alternative land uses as discussed earlier.

DESIGNING A DATABASE PRODUCTION STUDY

4.5 We have called the new empirical work required to populate this matrix the **Database Production Study**. The intention is that this database could then be used for benefits

transfer to apply the relevant values within, but not between, the different agricultural landscape types. As noted previously, values for landscape change are context-specific, so that use of the suggested database for policy analysis will be constrained not only by the need to use appropriate values only within the same landscape type but also by: a) the types of scenarios for change used to populate the data base and b) the type and quality of the benefits transfer models constructed from this database.

4.6 Two questions which emerge from this proposal are firstly how accurate a benefits transfer framework such as that proposed is likely to be; and secondly, and related to this, how reliable the "demand shifters" that will be used in such a model (see below) will be. The literature shows that benefits transfer errors vary to a considerable degree across models and according to the selection of study sites used to populate the data base. However, it can be concluded that the better the job that the transfer models do of handling the degree of variation in environmental conditions and in the socio-economic status of beneficiaries, the lower will be the resulting transfer error. Ultimately however, the transfer errors attached to any particular benefits transfer model can only be tested empirically on a case-by-case basis.

4.7 The database production study would consist of the application of a standard valuation protocol to each of the agricultural landscape types and each of the related scenarios and counterfactuals in the final table. It is not possible to design such a study in a definitive way at this point as there are too many uncertainties that need to be resolved. It is, however, possible to provide some pointers, to discuss alternatives and to consider their pros and cons, while also addressing some of the difficult theoretical issues that need to be addressed. The paragraphs below focus on choice of survey method, approaches to sampling in relation to topics such as substitution and complements , the types of values to be used and the approach to adjustments in benefits transfer.

Choice of survey method

4.8 We concluded in Chapter 2 that surveys of landscape value must rely predominantly on stated preference techniques, using either choice experiments or contingent valuation methods. We have also suggested that among revealed preference methods the travel cost approach may be worth further exploration The existence of the most recent England Leisure Visits Survey (ELVIS), as discussed in Paragraph 3.38, does open up the possibility of carrying out travel cost valuations of recreational uses, but this would reveal more about recreational value than landscape value alone and could not easily be related to DEFRA's policy interests in the context addressed in this report. While this may be worth exploring in its own right, this does not change the arguments that favour stated preference approaches.

4.9 Deciding on which stated preference method to use is complex. In making the choice it is helpful to repeat the essence of the two approaches. Choice experiments deal more explicitly with how landscape values relate to individual components, and combinations of components, and are not so concerned with the overall landscape context. Contingent valuation methods may show changes in landscape components but are more focussed on valuing the whole. The difference essentially lies in how the individual choices are organised and presented in the data collection and how the data is analysed. The way choice experiments are designed allows the researcher to break down the value into individual components while this cannot normally be achieved in a contingent valuation study. But this does not mean that the choices people make, and the thought processes they go through, are necessarily any different when the two methods are used.

4.10 At a broad level the choice of method depends both on the points made in Chapter 2 about the balance between 'whole landscape' and 'separate components' approaches, and on the eventual policy applications of the valuation study. We believe that from the point of view of landscape research and landscape planning there are very strong arguments for a 'whole landscape' approach since this undoubtedly is much more representative of the way that people actually view and value landscapes. This would favour use of contingent valuation methods where the emphasis is on the whole, rather than on different levels and combinations of the individual features. Such an approach is likely to be well suited to policy applications which are also concerned with the whole of a landscape rather than its parts. This is likely to be the case for applications relating to the maintenance of agriculture or change to alternative land uses, as well as to the overall costs and benefits of agri-environment schemes. If, however, the interest is in optimal allocation of financial resources to support for individual landscape features through such schemes, then contingent valuation will not provide the answers that are required and choice experiments are likely to be favoured.

4.11 To illustrate this in more detail we can use the Environmental Stewardship example from the conclusions to Chapter 2, and point out that:

- if the interest is in the whole policy package and providing values for landscapes conserved or enhanced through the implementation of Stewardship measures as a whole, for example to set against current or future global costs of the scheme, or if the question is how resources should be divided between different types of agricultural landscape at a broad level, then whole landscape valuation using contingent valuation is most likely to provide useful values;

- if on the other hand the interest is in informing the application of Stewardship funding to different features in different types of agricultural landscape, then valuation based on components or features using choice experiments would be preferred. For example, choice experiments would show which elements of the landscape people value most highly, and payments could be targeted at these features rather than less-valued ones.

- it is possible that the two approaches can be combined in one study, and there are examples of this, but it can make for more complex survey instruments, and risks confusing respondents.

4.12 There are also practical issues that need to be considered in choosing the best approach. The overall advantages and disadvantages of the two approaches are summarised in **Table 4.2**. It should be noted that aggregation issues are not dealt with in this table as both choice experiments and contingent valuation suffer from aggregation problems in the context of cost-benefit analysis, for example in terms of identifying the "size of the market", that is the number of people over which to aggregate a particular benefit.

4.13 A final decision on the preferred approach will of course rest with DEFRA and will reflect perceived policy needs and priorities at the time. We would not completely rule out a study that combines both methods, since as Chapter 2 demonstrates there are examples of this in other projects. But it is vital to stress that the survey design and analysis that would result could be extremely complex and the conduct of the survey somewhat daunting for the participants. Overall we think the balance of advantage, weighing up likely applications and the preference for looking at landscape as a whole, favours a contingent valuation approach. Assuming use of contingent valuation this would mean that the entry in each cell in Table 4.1 would be WTP per hectare, based on the

Table 4.2 : Advantages and disadvantages of alternative stated preference methods for landscape valuation.

Method Comparison of relative merits	Choice Experiment	Contingent Valuation
Advantages	• Requires choice between alternatives rather than direct statement of WTP/WTA • Gives participants experience in valuing landscape through repeating tasks • More economical in terms of sample sizes needed as participants can be shown several alternatives	• Reflects the importance of the whole landscape view • Closer to how people view landscape, putting components in context and allowing recognition of wider perceptual and aesthetic factors
Disadvantages	• Does not reflect the whole landscape view and the fact that values attached to features are context dependent • Choice of features is subjective and may not reflect people's perceptions • Features may not be exclusive and independent so may be double counting • Features often chosen for ecological/biodiversity reasons not for landscape reasons • Change in features not usually illustrated because numbers of combinations makes this difficult, but as landscape is largely perceived visually this is unrealistic	• Does require direct statement of WTP/WTA • Does not easily reveal what components of the landscape and what changes people are responding to • Greater problems of understanding complements and substitutes • Need larger sample sizes as participants should only be shown one pair of scenarios and counterfactuals each

aggregated total WTP for the relevant population, divided by the number of hectares of the particular landscape type that exist. Including per hectare or per household figures from choice experiments would be useful in thinking about which landscape characteristics of a reformed agri-environmental policy should be prioritized would also be useful, but we reiterate that we believe contingent valuation to be a better method for populating Table 4.2.

4.14 The survey would need to be designed to make clear to respondents that in each landscape type and each pair of scenario and counterfactual they are being asked to base their judgement on the same hypothetical amount of land – say for example 5km^2. The point here is not that there is some magic in this specific area – it could equally be 10km^2 or 20 km^2 – but rather that it bears some reasonable relationship to any visualisations that might be shown to participants and that all are nominally thinking about the same area.

4.15 Since we know that the value of a change in any of these landscape types depends on multiple factors, it will be important to control for as many of these as is practical. These are the "shifters" in WTP referred to above. These would include socio-economic factors for the relevant population to whom benefits are being transferred, and landscape type factors such as scale and the availability of substitutes. Parameters for the adjustment functions would be calculated in the database production study. We also suggest that a

calibration experiment should be undertaken, to calibrate stated WTP into real WTP; this would be likely to produce a calibration function which would become part of the benefits transfer system. Calibration in this case means comparing the hypothetical WTP bids from contingent valuation with either a laboratory or field experiment which offers the same good using the same survey design, so that people bid real money for real changes in the environmental good. Clearly this is difficult for something like landscape quality, since it is hard to design a real-payments experiment with actual changes in landscape. A few examples exist in the literature (for forest planting and wilderness improvements in the US), but no such calibration study has been attempted so far in the UK (although some studies have compared voluntary contributions in hypothetical and real settings In addition a benefits transfer test would be undertaken to compare predicted WTP (for example for agricultural landscape type X with the scenario/ counterfactual pair Y) with new sample data.

4.16 Given the large number of combinations of agricultural landscape types and scenario/ counterfactual pairs that are potentially to be studied, and our observations about the complexity and unfamiliarity of the valuation task, it would be worth investigating the use of valuation workshops to allow a group of participants to, say, work through a set of agricultural landscape types and scenario and counterfactual pairs for a selected region of the country. In these workshops the "budgeting decisions" of each group would be based on some maximum overall WTP for landscape conservation, elicited at the start of the session. This approach was used successfully in work on the Social and Economic Benefits of Forestry for estimating WTP for biodiversity conservation across a large range of forest types[87]. A large conventional one-on-one survey could be used to check the values produced from a workshop series, although there are conceptual problems here in comparing one-off survey values with considered, debated values such as result from a valuation workshop.

Average or marginal values and aggregation

4.17 DEFRA asked us to discuss whether a benefits transfer model should focus on average, marginal or aggregate values. The debate on "marginal versus absolute values" has two aspects. One is on what we typically measure; the other is on which we should use in policy analysis. In terms of what we typically measure, average values dominate the literature. Early contingent valuation studies on landscape quality looked at resources such as national parks, wetlands and forests and asked peoples' WTP to protect them. Given a measure of the area of such resources, one could them calculate an average or mean WTP per hectare. The resulting figures then went on to be used in benefits transfer models (including ELF).

4.18 However, Contingent Valuation studies can also measure marginal values. These can be arrived at by asking people their WTP for small increases/decreases in, say, area of a landscape protected or changes in species survival probabilities (also, in a related field of enquiry, in terms of small changes in health risks) while a WTP function can be estimated from multiple CV studies from which a marginal value could be calculated, assuming that the effects of variations in the area of landscape protected on WTP are statistically significant. Choice experiments, on the other hand, typically focus primarily on marginal values, or rather on incremental values. If attributes are described in quantitative terms (eg miles of hedgerows protected; hectares of wetland protected), then implicit prices derived from the choice model will show WTP for an increase in hectares or miles of the landscape feature protected. For qualitative attributes, choice experiments reveal WTP for a discrete change in this attribute, for example from heather moorland which is "degraded" to heather moorland which is "in good condition". So, summarising the above, Contingent Valuation typically generates average values,

but can generate marginal values too. Choice Experiments generate incremental values whose interpretation depends on how attributes are coded

4.19 But then the question is should we use average or marginal measures in policy analysis? The first point to make is that marginal and average WTP for landscape features are unlikely to be equal for a given individual unless WTP values are insensitive to how much is protected. Marginal values make more sense for use in policy analysis if the policy decision is whether we extend the environmental protection/enhancement of a given resource or feature, for example designate more protected hectares of a wetland). We would also like to know relative marginal values across landscape features if we wish to improve the efficiency of agri-environmental policy by maximising social benefits – this requires us to know whether a £ spent on improving hay meadows is more valuable than a £ spent on protecting farm wetlands. But average, and indeed absolute (that is total) values created by aggregation, are important if we wish to apply cost-benefit analysis to past decisions, for example on whether the decision to create an ESA gave benefits which were bigger than costs, or on whether investing in the protection of landscape type A yields a higher net present value than investing in the protection of landscape type B.

4.20 Most benefits transfer frameworks developed so far focus on average values, for example mean WTP per fishing day, or mean WTP per hectare of heather moorland. This is true both for landscape-based approaches such as the ELF model, and for water quality approaches such as the Environment Agency's Benefits Assessment Guidelines. Some allowance for the variability in average values can be made by (i) types of beneficiary and (ii) type of environmental change (iii) quantity of environmental change. For example, ELF allows for the increase in marginal values for WTP for a landscape type as a function of decreasing levels of that landscape type being present in an area (albeit in a very crude way); whilst the Benefits Assessment Guidelines differentiate between types of user and between classes of fishing (coarse versus trout/salmon).

4.21 This focus on average values is to some degree a pragmatic choice. First, many of the studies from which benefits transfer models are constructed focus on the estimation of mean (i.e. average) WTP from a sample. Second, if marginal utility declines as the quantity of an environmental good that is protected increases, then a benefits transfer model would need to control for this complex relationship. This is difficult partly because of the lack of original valuation studies which estimate value *functions* which would enable marginal WTP to be estimated across a range of quantities. We also have little data on the shape of marginal WTP by environmental type: is this a smoothly decreasing function, or is it kinked or even discontinuous?

4.22 Choice Experiment studies can, as indicated above, present information on the value of marginal changes in an environmental feature. This is, for example, what the EFTEC report on upland landscapes does for heather moorland, grassland, farm woodlands and other features in the uplands (WTP values are given per 1% change in these features). However, many choice experiments assume the existence of a linear deterministic component of utility – these marginal WTP values are thus constant within a sample (albeit that the researcher allows for variability in the marginal value between people). Using a qualitative description of landscape change moves us away from this "constant 1%" framework, and means we can show how WTP varies at the non-continuous margin between the different levels in the design: for example, it might show that people are WTP £3/year to go from "continual decline in woodlands" to "a slight improvement in woodland condition" and £7 to go from "continual decline" to "a major improvement". But making use of such qualitative descriptions in a benefits transfer model is difficult,

since what constitutes a "slight improvement" may vary across contexts, and is in any case subjective.

4.23 Whether based on choice experiment or contingent valuation data, the proposed database construction study will probably be "stuck" with a system based on average values, so that the cells in any final version of Table 4.1 will be mean WTP per hectare. However, this does not prevent such a system from being able to show how these average values are predicted to respond under a range of changing conditions, including "how much" of the environmental good is predicted to change under the policy being considered. In cost-benefit analysis, aggregate values for benefits are obviously needed. This means taking the (adjusted) mean WTP from the transfer model and then aggregating it up to the population level. This imposes further requirements on the proposed study, namely (i) a need to identify the relevant population and (ii) a need to know how to adjust mean values according to the characteristics of this population.

Factors in adjusting values

4.24 The brief required that, for each landscape type/counterfactual combination, we assess how values should be adjusted for transfer to account for issues like context, complementarity /substitutability, accessibility/ number of users and so on. The theory behind these issues was discussed in Paragraphs 2.49 to 2.55 which also indicated how these issues have been tackled in other studies.

4.25 The literature appears to throw little light on these issues in terms of the demand for landscape rather than for recreation. An important task of the new empirical work we suggest would therefore be to try to identify and then quantify what factors determine "substitutability" for landscape types. Indeed, this would be crucial to any benefits transfer system. According to demand theory, the price and availability of complements should also affect value. Yet, within environmental economics, we know very little about these complementary relationships for landscape: do they depend more on individual factors such as mobility than on cultural factors such as the built environment or the character and quality of the landscape itself? Finally, we know that a nesting or embedding effect exists for all environmental goods, in that their value (for instance, the value of a hectare of chalk downland) depends on the overall basket of goods which is changing in any before/after comparison (such as all chalk downland in Southern England versus only that in Sussex).

4.26 These are complex questions that will be difficult to resolve in relation to landscape especially as the landscape literature does not suggest that people necessarily think about landscape and their enjoyment of it in these terms. Opting to apply economic valuation techniques may mean that unrealistic decisions have to be made about such matters simply to satisfy the needs of the valuation technique, rather than because they necessarily offer a useful reflection of human behaviour in relation to landscape. Nevertheless in the database construction study it will be necessary to represent the sensitivity of each per ha value (assuming the use of contingent valuation for the study, given a 'whole landscape' focus) for each agricultural landscape type to a range of other factors in the benefits transfer system. These factors include:

- the nature and degree of use of the landscape type (since WTP will depend on type of user, and the distribution of these in the population of that region). This addresses the question of 'value to whom'. The population would need to be characterised in terms of the types of influencing factors identified in the landscape research and the environmental economics literature. We would not necessarily seek

to disaggregate values into different user groups at the top level of the benefits transfer model, but this could be run as a query at a lower level of the model;

- the extent of each landscape type in hectares (to represent diminishing marginal utility). This could be included in a GIS database;

- the distance from population centres to the agricultural landscape type, to reflect distance-decay relationships. This could also be included in a GIS database.

All these factors would be used to adjust WTP using formulae contained in a spreadsheet, based on relationships estimated (i) from the literature and , importantly, (ii) from the new database production study.

4.27 One recent emphasis in the UK has been on distance decay relationships – that is, allowing for the per-person benefit of a project or policy to depend inversely on how far they live from the environmental impact being appraised[88]. This was a feature of the AMP4 benefit-cost assessments done by the Environment Agency. Whilst it is desirable to test for and then control for this kind of effect in aggregation, one should point out that (i) the Agency based its distance decay calculations for *all* waterbodies on *one* distance decay relationship estimated for *one* river; and yet (ii) we have no idea how transferable distance-decay functions are, especially for pure non-use values. One suspects that they are highly context-dependent. The landscape perception literature has little if anything to say on this subject but there is a small amount of relevant work from the place literature, especially in North American studies, on landscape values and their variation with distance from the object being valued (for example work by Brown et al in Alaska, see Note[45]).

4.28 It is clear that GIS will have a very important role to play in addressing some of these factors. It would certainly be critical to any further analysis of travel cost as an indicator of value. In terms of stated preference surveys it will allow the extent and nature of the landscape types to be mapped and the demographics of the relevant populations to be compared, helping to inform judgements about the validity of benefits transfer. It will also assist in aggregation of values and help to address issues such as substitutability and complementarity. Many practical challenges would need to be overcome but the value of GIS in handling the large spatial datasets required in such a study should not be underestimated.

Approaches to defining sample populations

4.29 If contingent valuation is chosen as the preferred method to undertake the database production study then a split sample would need to be used to estimate mean WTP for each of the pairs of policy scenarios and transfer counterfactuals. We estimate that there would need to be a minimum sample size of 400 - 500 respondents for each pair of scenario and counterfactual to be valued. If all the cells illustrated in Table 4.1 are to be populated this would mean that there should be 800 – 1,000 participants in each landscape type and 4,800 – 6,000 to cover all landscape types. In contrast a choice experiment could be conducted with a sample of 400 for each landscape type.

4.30 There are choices to be made about exactly how a new survey might be structured in terms of the population from which the sample will be drawn for each of the six agricultural landscape types proposed here. The uplands study referred to previously adopted Government Office regions as the basis for sampling. This clearly has policy relevance as implementation of, for example, agri-environment policy is increasingly devolved to a regional level and scheme differentiation between regions may be an

issue. This could also be an option for the proposed study but an administrative region approach does not necessarily have any significance in terms of the way that people perceive and use landscapes. We have therefore considered three main alternative options, described below and illustrated schematically in **Figure 4.1** for the Eastern arable agricultural landscape type as an example of the approach.

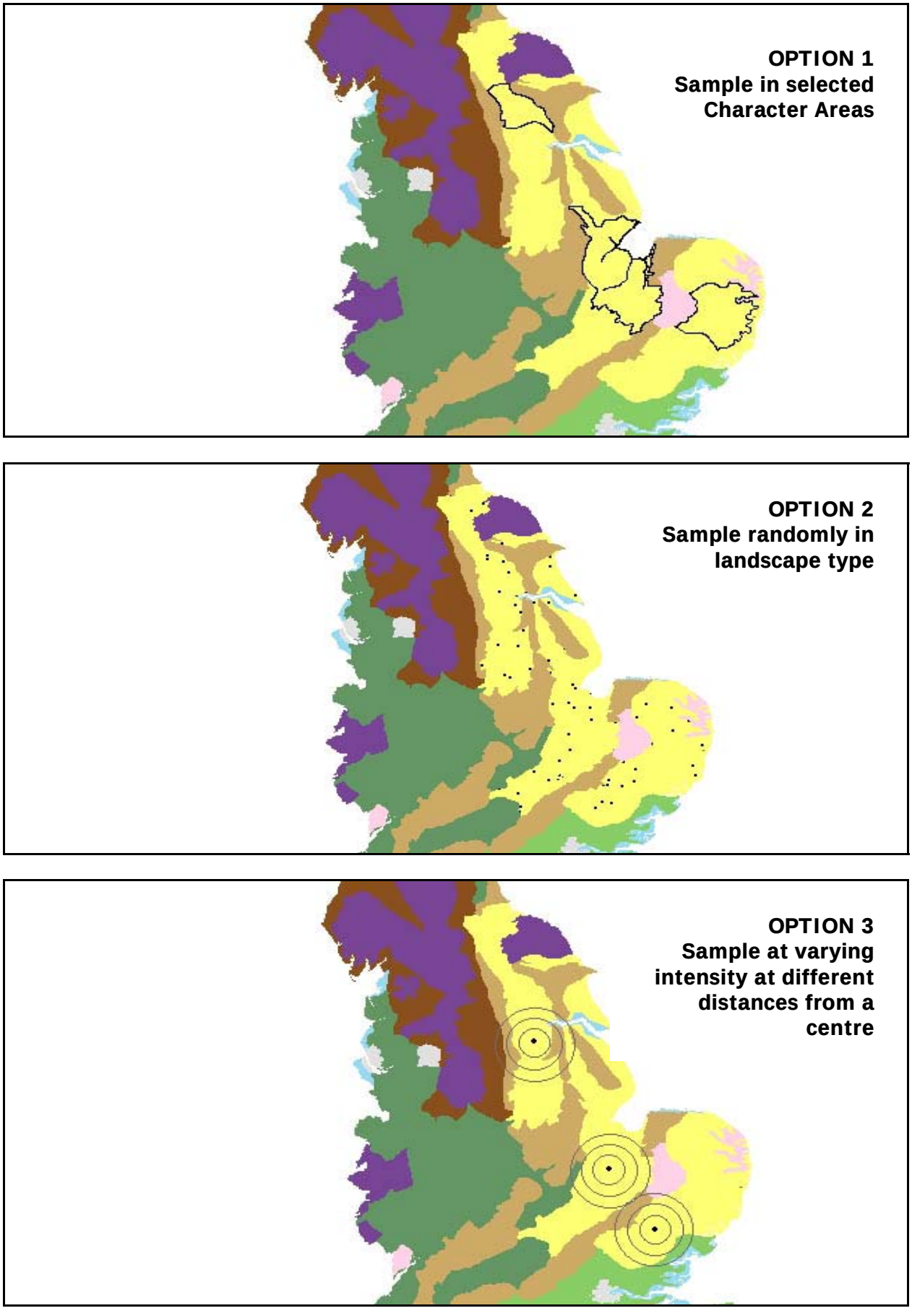
4.31 The first possibility is selection of two or three character areas in each landscape type, chosen to represent the range of internal variation within that type. So, in **Option 1** in Figure 4.1, for the Eastern arable agricultural landscape type we have illustrated the South Norfolk and High Suffolk Claylands, the Fens and the Vale of York. A sample of both residents and visitors would be selected in each area. Respondents would be interviewed about their WTP for the landscape in that character area, based on the appropriate pair of scenarios and counterfactuals. It is probable that the visualisation would be the same for each area since producing different ones for each would be prohibitively time consuming. Residents would be interviewed at home and visitors at some place where visitors congregate. This is a similar approach to sampling that was used in the studies by Willis and others on the Yorkshire Dales, the Somerset Levels and the South Downs, as well as the non-economic work on public perception in the New Map of England project.

4.32 The main disadvantage with this approach is that finding enough visitors may be almost impossible in some areas. Focus on limited areas will also make it more difficult to pick up evidence about non-use values. The approach does, however, have the advantage that if appropriately designed it would allow participants to consider valuation issues by thinking about a landscape which they are familiar with, even though this may not be specifically illustrated in the visualisations.

4.33 The two alternative approaches are variants on the regional sampling adopted in the uplands study where the sample is drawn from a wider area and the design of the research instrument and subsequent analysis reveal the types of respondents in the sample. **Option 2** in Figure 4.1 indicates stratified sampling, based on the make-up of the population, throughout the land area covered by the agricultural landscape type in question. Although we have shown the sample confined to the landscape type itself the fact that there is some correlation between the distribution of the types and government regions does mean that regions could be used instead. The link between agricultural landscape types and regions is broadly as follows:

- Eastern arable agricultural landscapes - Eastern and Yorkshire and the Humber regions;
- South eastern wooded mixed agricultural landscapes - South East region and Greater London;
- Chalk and limestone mixed agricultural landscapes – South East, South West, East Midlands, Eastern, and Yorkshire and the Humber regions;

Figure 4.1 : Alternative approaches to sampling - Eastern Arable Agricultural Landscapes



- Western dairying and mixed agricultural landscapes - West Midlands, South West and North West regions,
- Upland fringe dairying and stock rearing agricultural landscapes - North West, North East, East and West Midlands and South West regions;
- Upland agricultural landscapes - North West, North East, East and West Midlands and South West regions

4.34 This list demonstrates that while the regional approach has some attractions the relationship between agricultural landscape types and regions is quite complex. Neither this, nor the approach of sampling specifically within each landscape type explicitly take account of the effects of distance from the resource on 'consumption' of the landscape and hence on the value attached to it. The third option seeks to address this. It is based on the selection of perhaps three centres of population within the agricultural landscape type in question and the definition of catchment areas around this centre based on a distance/travel time zone drawn around it. This is illustrated in **Option 3** in Figure 4.1, which is roughly based on centres related to the three character areas referred to in Option 1. The England Leisure Visits Survey provides very useful information about the time that people travel to make visits to the countryside (average 47 miles round trip) and suggests that most 'users' would be picked up in a catchment of approximately 50 miles radius. Sampling intensity could vary with distance to reflect the increasing use of the landscape the nearer it is to home (according to ELVIS). However, it may equally be appropriate to sample over a much more extensive area, beyond this 50 mile radius, to maximise the probability of picking up 'non-users' of the landscape type in question, but also potentially addressing the questions of how different landscape types are substitutes for each other and how change I one landscape may cause people to switch to other areas.

4.35 Both Option 2 and Option 3 would potentially allow for both use and non-use values to be addressed. Both would also allow issues of substitution to be addressed as it is highly probable that participants will make use of a variety of different landscapes. Questions can therefore be asked about preferences and choices although here the issues of double counting discussed in Chapter 3 will be particularly relevant since most people will be thinking about the use of landscapes for recreation. Both approaches would also allow us to estimate willingness to pay functions which included (i) distance decay effects (ii) effects due to level of use and (iii) effects due to how much of the agricultural landscape type in question exists in the region.

4.36 On balance we favour Option 3 based on defined catchment areas around centres of population since this addresses most explicitly the distance decay issue. Given uncertainties about the application of this study and therefore the preferred method to be used we summarise in **Box 7** the possible form of a survey based on this third sampling option.

Design of survey instruments

4.37 As there are many uncertainties surrounding any future study it is not possible to be precise about the design of survey instruments. We can, however, provide some general pointers on the visualisation material and questionnaire. We envisage that, as in other studies, focus groups will be used in the first stages to help to test ideas about the survey and illicit indicators of values and the factors are likely to influence them. Given earlier comments, in Chapter 2, about the desirability of more qualitative approaches, a pilot survey might take the form of a valuation workshop, with a reasonably large number of participants, who would be able to examine a wide range of

material and explore the underlying issues more fully before arriving at values. Finally the main survey will provide the size of sample needed for quantitative, statistically valid analysis. The survey instruments will consist of:

- visual material and supplementary information which together will explain the policy scenarios and counterfactuals;
- focus group protocols and questionnaires for use in the survey.

Box 7 : Alternative survey formats based on sampling Option 3

a) Contingent Valuation
Three sample areas would be identified for each agricultural landscape type. A central point or centre of population would be located and a radius drawn around it covering areas up to 50 miles away. Residents would then be sampled within this catchment area for each of the three points within each of the types. Each sample would be split into two sub-samples, assuming two pairs of scenarios and counterfactuals for each type as in Table 4.1. Sub-sample (1) receive pair A and B, while sub-sample (2) receive pair C and D. For each respondent, we also ask them how many trips they have made to neighbouring agricultural landscape types and to the agricultural landscape type in which they live. The survey also obtains information on standard socio-economic variables and other potentially shifters of WTP. People state a maximum WTP for each of the two scenarios they receive, using a tax payment vehicle. Each agricultural landscape type has a sample equal to 1000 responses, being 500 for scenario pair A and B, and 500 for scenarios C and D. Based on regression analysis of this WTP data, relationships between (i) distance (ii) availability of substitutes (iii) income and (iv) visits to the countryside can be computed for each agricultural landscape type and incorporated into the benefits transfer model as adjustment factors on a worksheet underlying the main values database. A calibration exercise would be undertaken comparing real with hypothetical payments.

b) Choice Experiment
For each agricultural landscape type, a small set (say no more than 4) of landscape attributes would be selected which could be used to describe this type. Counterfactuals would then be reviewed in order to identify the range which each attribute could take, from minimum to maximum (so that any scenario and the related base counterfactual can be described by the attribute levels in the design). An experimental design would then be undertaken using these attributes and levels, along with a tax price. For each agricultural landscape type, a sample of 400 respondents would then be obtained, using the same sampling procedure as that noted above (3 locations, 50 miles radius from central sampling point in each, sampling of residents). The same countryside visit, location and socio-economic data mentioned above would also be collected. A calibration exercise comparing real and hypothetical payments would be undertaken. A choice model can then be estimated from which implicit prices can be calculated for each attribute, and compensating surplus estimates obtained for any of the 4 counterfactuals relative to the base case.

4.38 Preparation of visual material and supplementary information first of all requires decisions on policy applications and then the construction of relevant scenarios and related counterfactuals. This would depend on an exercise like that conducted by Cumulus Consultants for the uplands study, and would be based on literature review, policy analysis, consultation and expert interpretation to predict how each agricultural landscape type would appear in the counterfactual and may change under the selected

policy scenarios. Appropriate information packs will then be prepared. We envisage that, for a contingent valuation study, they might include:

- a range of photographs of named JCAs to illustrate the range of variation in that agricultural landscape type;
- prepared images, based on photo manipulation or digital image construction and rendering, showing a 'typical' landscape of the landscape type, under 'business as usual' conditions, or other appropriate counterfactual, and under relevant policy scenarios labelled to identify the significant changes;
- supporting explanatory information about the changes and their context and about potential forms and levels of payments for WTP or WTA.

4.39 In choice experiments the necessary information would be quite different in form as it would need to illustrate the different levels of the selected attributes in the business as usual and change scenarios. Ideally this should also involve some form of visualisation of the effects of change in the particular landscape context, but the time and cost involved in creating these images may mean that this would have to be illustrative of the general nature of change rather than particular to each of the attribute levels and combinations.

4.40 The focus groups, valuation workshop and final questionnaire survey would be designed to elicit information to underpin the analysis of value. Ideally it would need to cover:

- information on personal attributes, covering as many as possible of the factors listed in Paragraph 2.27 as potentially influencing landscape perception
- perceptions of the agricultural landscape types and recognition of their different attributes;
- ways in which people 'consume' the particular agricultural landscape type in question and also other alternative types;
- reasons why people attach value to the landscape in question, seeking to distinguish between values relating to aesthetics, inspiration, tranquillity, wildlife and cultural heritage;
- overall environmental value orientations
- value attached to the relevant scenario and counterfactual in contingent valuation or the different levels of attributes in choice experiments.

RESOURCE IMPLICATIONS AND NEXT STEPS

4.41 It will be apparent that studies of this type can incur significant costs, not only in the market research involved but also in the preparation of the scenarios and accompanying visualisations and related supporting material, and also in the analysis of the data. The uplands study in 2006 will have revealed to DEFRA the level of resources required to cover just one of the agricultural landscape types. It is also clear, however, that the other landscape types can be tackled individually, to reflect priorities, rather than necessarily having to complete new surveys for all of them at the same time. Although it would clearly be beneficial for the same methods and survey design to be used in

each case, so that the results are comparable and the database can be populated with figures of the same type, staged surveys could have additional value in allowing the suggested methods to be tested in relation to different policy requirements.

4.42 As a scoping study the purpose of this report is to explore key concepts and theories and to suggest possible answers to the questions addressed by the brief. It is not possible to make firm recommendations as to the way forward since there are many possible options and DEFRA itself will need to make decisions about its needs and priorities before going further. There are though some steps that we suggest could be taken to progress aspects of this work. We suggest that DEFRA should:

- in collaboration with Natural England consider the landscape typology that we have suggested and to carry out any additional work necessary to update and refine this, including review of the datasets underlying the typology, for example on dominant farm type, and discuss whether the simple heuristic approach that we have taken is acceptable or whether a more technical analytical approach is needed;

- also in conjunction with Natural England, explore the possible use that might be made of data from the English Leisure Visits Survey in a travel cost approach to the recreational use of agricultural landscapes, to complement the suggested emphasis on stated preference techniques;

- review the conclusions of its study on ecosystem goods and services in the English policy context .and decide what this means for the valuation of agricultural landscapes in terms, perhaps, of bundling all use values together in any future survey;

- to give further consideration to possible policy applications of any new valuation study and on this basis to decide on the preferred valuation technique and to firm up the range of scenarios and counterfactuals that should be included for each of the landscape types;

- on this basis to commission work to determine firstly the nature of the changes that will result from each of the agreed scenarios and counterfactuals in each landscape type and secondly the effect that these changes will have on the characteristics of each type of agricultural landscape. This should involve discussions with Natural England about possible links with their Landscape Futures initiative. Development of scenarios and counterfactuals could be progressive, taking each landscape type in turn rather than necessarily having to tackle all of them at the same time;

- when all this is in place, design and implement the database production study that we have broadly described. Again this does not necessarily need to cover all the landscape types simultaneously and there could be a phased programme of implementation. The order in which the landscape types are covered would be determined by policy priorities.

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