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ELICITING AND MAPPING THE ATTRIBUTES OF LANDSCAPE PERCEPTION:
An integration of Personal Construct Theory (PCT) with Geographic Information Systems (GIS)

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ABSTRACT

Scotland's tourist industry partly depends upon the quality of the Scottish landscape. However, despite demands for improved management of landscape resources, there is no standard method for the assessing landscape quality. This research takes a user-based approach to this problem and explores the use of Kelly's Personal Construct Theory (PCT) in eliciting underpinning attributes and dimensions of perception in a range of uses and across a range of Scottish landscapes. A novel aspect of the research is that it involves experimentation in mapping the resultant constructs through use of a Geographic Information System (GIS).

Sixteen key constructs were gained from one to one interviews and used in the preliminary mapping experiments. These showed that it was possible to express the constructs spatially. To evaluate between user group/landscape type responses a questionnaire was designed, piloted and applied. A total of 1286 responses were analyzed. Differences were found between landscape type but were stronger between user-groups.

The research has demonstrated that the application of PCT coupled to GIS is a valuable way of exploring landscape perception/landscape quality and their spatial expression.

CHAPTER 1 - INTRODUCTION

The rise of Scotland as a centre for tourism, and the financial dependency Scotland now has on tourism, brings to the fore the role of the Scottish landscape, and the sustainability of the landscape within that role. The qualities of Scotland's landscapes which encourage tourism are highly sensitive to many of the tourist activities they promote. Increasingly calls have been made for greater objectivity in landscape protection and development of land use policies with respect to tourism, agriculture and forestry (1).

For policies to be effective, operable and practical for both residents and tourists alike, policy makers require information which describe the attributes of landscape amenity value more precisely. There is a lack of research into the attitude of tourists in Scotland toward landscape as an amenity and how they view change within that landscape. Currently policy makers view only the opinion of "experts", what is unknown is how well expert opinion reflects the opinion of tourists.

The aim of this research was to evaluate a methodology for objectively describing attributes which contribute to an individuals perception of landscape quality; To develop an integrated system within a GIS framework, for better consideration of this information for land use management and policy development.

Although considerable research effort has been expended in exploring landscape assessment, the greater part of this deals with the more tangible physical nature of the landscape. Where perception studies have been carried out they have been

by experts for the purpose of landscape classification. These manage therefore to skirt the more subjective issues relating to the perception of landscape. Many techniques have been tried to elicit an understanding of perception of landscapes, but most have been found lacking a theoretical base and failing to specify the relationship between image and attitude. Despite the perceived value of Scotland's landscapes little research has been conducted into its perception by residents, tourists or indeed the 'expert'.

In this research, the problem of obtaining the underpinning attributes and dimensions of landscape perception has been explored through the use of Personal Construct Theory (PCT). PCT was developed in the 1950s by George Kelly as a tool for clinical psychologists. Its use has spread into many areas such as market research, quality control, attitude surveys, negotiation and counselling. It was first introduced into environmental cognition work in the early 1970s, with work on eliciting environmental images (see for example Harrison and Sarre (2)).

The notion behind its use for this research was as a tool for gaining, through one to one interviews, those constructs used by a range of people (expert and lay) to differentiate between stored mental representations of Scottish landscapes. Use of this approach allows interview survey to be efficient and focused, allows critical factors which underpin preferences to be identified, and structures perception into a quasi-objective form capable of further analysis. The constructs gained were to be used in two ways, firstly as a basis for developing a short questionnaire by which a larger sample study could be completed. Secondly, to attempt to map perception data through the use of GIS, and gain a geographic representation of

landscape preference for Scotland that may be used to target land management and policy development.

The technical ability and cost effectiveness of GIS have found favour with those responsible for planning and policy development in rural areas. At present GIS is seen as a tool for visual analysis within the development planning framework (3, 4), a useful innovation is seen to be a greater integration of GIS with traditional methods of landscape assessment. Landscape perceptions and preferences of various user groups incorporated within the GIS framework provide useful information for a variety of planning and landscape designation issues.

Published research into the use of GIS for landscape perception mapping is limited. Attempts have been made to map wilderness perceptions in Southern New Zealand (5), with some less specific exercises being completed in North America (6). No existing evidence of the use of GIS has been found for perception studies on Scottish landscapes.

The objectives that were set for this project were:

a To evaluate the use of PCT methodology for describing in more precise terms the attributes which contribute to an individuals perception of landscape quality.

b With respect to the use of GIS, to assess how this methodology may be used in consideration of the needs of landscape management and policy development.

c To explore relationships between the attributes of a landscape and the relationship to land use change.

CHAPTER 2 - REVIEW OF APPROACHES TO LANDSCAPE ASSESSMENT

2.1 Introduction

Landscape assessment has long been a subject of research. Recently inquiry has often focused on procedures whereby information can be obtained that is of use in, either, refining management procedures, or, in planning decisions on various scales. To be successful, management practices require a means to assess the visual character of the landscape, including both the natural and the cultural impositions of man. This must be related to the requirements of the area in terms of the local economic and community considerations and the wider environmental implications.

The last 25 years has seen an unprecedented amount of legislation concerning planning for development proposals and the protection of designated areas, both from development, and change associated with altered management practices. Although many agencies have attempted to classify landscapes, and many methods of assessing the impact development have been proposed, there has been little consensus as to the attributes to be considered in such assessments. Gobster and Chenoweth (7) reviewed 50 visual quality assessments; they found 1194 different terms used to refer to landscape attributes hypothesised to affect aesthetic value, Even when categorised by meaning there were still "114 readily distinguishable attributes common to three or more studies". It appears that some definition is required as to the dimensions people use to make preference judgements. When this problem has been overcome and the dimensions underpinning visual quality judgements are ascertained, there still remains the

issue of how to produce information which can be readily interpreted by management. It has been suggested that assessment procedures must be structured so that "it must be possible to translate the fruits of such analysis into a form compatible with the systems currently used in many larger scale landscape decisions. In other words, information about aesthetics need to be available in mappable form" (8).

Within the past fifteen years in Scotland, there has been a growing public awareness of environmental issues, the placing of rural issues high on the political agenda, designation of areas for their scenic and ecological worth, and demand for greater public participation in local level planning. These reasons have been put forward as to why there has been increasing emphasis on "land evaluation in relation to rural issues" (9). Mather (1) termed the 1980s "a period of change perhaps unprecedented since the 1940s. Old attitudes and old policies have increasingly come under new pressures. Policies have been radically altered, and all the time the way in which the land of Scotland is used and controlled has been gradually changing". Mather notes a change in the perception of the land, traditionally viewed in terms of production capability for food and fibre, this perception is changing to land as a resource of 'CARE' goods, Conservation, Amenity, and Rural Environment (10). "The productive value of the land as soil is declining relative to the amenity value of land as landscape" (1), Mather proceeds by noting that if the full benefits of the landscape are to be extracted, effective planning and control is necessary. For this an evaluation of the landscape for CARE purposes is required.

Following the introduction of legislation in the 1960s and 1970s which required the appraisal of landscapes, and the identification of areas of scenic beauty (11), a great deal of research effort went into the area of landscape perception and differences in preference for landscapes.

2.2 Theory Behind Landscape Assessment

The first methods employed (and those guidelines and policy documents developed from the results) have been subject to criticism for the lack of theory behind them, and the lack of empirical evidence they were based on. Two main areas of concern have been noted, the interdisciplinary nature of landscape assessment, and the perhaps consequent lack of theoretical base to environmental aesthetics. The area is of interest to a wide field of professions. Landscape architects, planners, geographers and psychologists have all brought their own theoretical background, intuitive methodology and ideological inclinations. (11, 12, 13). This has led to a situation where research effort is fragmented, and without a sound underlying uniting theory. (11, 12, 13, 14, 15 16).

The 1980s saw a host of articles trying to resolve the problems of landscape assessment theory, and trying to foster communication and understanding between the various disciplines. Zube (16) thought that a general theory would, "Provide a framework for encompassing and bridging the professional, behavioral, and humanistic paradigms - that is, contribute to the doing of landscape assessment and the understanding of human/landscape interactions. It was also necessary to recognise the need for and relationships between quantitative and qualitative information; encompass interests in both urban and natural landscapes;

encompass diverse geographic scales ranging from the site to the region"

Zube *et al* (11) reviewed over 160 articles on landscape assessment and found three main areas of research with four emergent paradigms.

Objective categorisation:

a Expert paradigm

The use of skilled and trained observers to pass judgment based on "wise resource management techniques assumed to have intrinsic aesthetic effects" (11).

b Psychophysical paradigm

Testing of the general public or selected populations to assess aesthetic qualities or specific properties of the landscape, - here properties are assumed to, "Bear a correlation or stimulus-response relationship to observer evaluations and behaviour" (11).

Meaning and the landscape:

c Cognitive paradigm

"The search for human meaning association with landscape or landscape properties" (11). This has many approaches from the psychobiological and evolutionary to culture and personality.

Human-landscape interaction:

d Experiential paradigm

Landscape values are based on both the landscape, and the meaning of that landscape to the person from the point of view of emotional experience and context.

2.3 Expert Judgement Techniques

These have mostly been used in classical landscape assessment. Penning-Rowsell (13) identified three stages in landscape assessment in his review. In chronological order they show the path of theory development in the early years of aesthetic appraisal.

Each of these stages can be associated with a difference in approach to the problem of landscape appraisal. Penning-Rowsell terms the first of these stages "Intuitive methods", the approach being followed from 1967 to 1971. He notes, "Landscape evaluation was seen as a useful tool leading to a more coordinated policy for better protection and enjoyment of the landscape"; Others noted that landscape evaluation had the potential to guide landscape change, and assess absorption capacities before development decisions had taken place. This insight was "largely ignored" (13).

The techniques used were the intuitive classifications of planners and landscape architects to determine relative landscape values or qualities. This could be seen as a two stage method, firstly an inventory to describe and classify the characteristics, secondly a qualitative approach to assessment on the relative impacts of the factors identified by the inventory. This technique proved unreliable. Needham (17) found different workers obtained different results with the same method, and that different methods gave different results for the same tract of land. Lack of public participation also hampered the corroboration of research results and those views held by people concerned with the landscape. Penning-Rowsell's second approach he termed "Statistical sophistication". In an attempt to

compensate for the subjective nature of the early methods, researchers sought to find more objective techniques. Field surveys were replaced by methods predicting landscape quality from secondary sources. A selected part of the region would be visited by a panel of observers and assessed. Factor analysis was used to aggregate intercorrelated elements, and enabled "Exploration of fundamental dimensions rather than dealing only with single measured variables..., and to ensure that the measured variables were mutually independent." As Penning-Rowsell sums up, the methods developed in this period were "Too complex, too abstract and too expensive."

Penning-Rowsell's third approach he termed "Landscape Preference" and has been used mainly since 1973. This approach assesses the landscape as a whole rather than its constituent parts. This also allows public participation,and has thus allowed comparison of professional opinion with that of lay people. Most techniques used photographic simulation of sites, though this has not been without criticism, Shuttleworth (18) and Dunn (19) have found ratings of photographs to correspond to site evaluations. A fourth approach can be seen to be the assessment of landscapes due to the attachments and attitudes of groups, subgroups, and individuals.

From this summary it can be seen that research in the area has been a direct response to legislation and public demand for environmental protection. However, as Zube *et al* (11) state, "basic research needs to concentrate on the assumptions - behind landscape assessment - and assess their validity. Applied research needs to develop those techniques of most value to management decisions, but it must

be emphasised that basic and applied research cannot be separated, the empirical work must have a solid, rational theory behind it."

One of the first proposed themes in the field of landscape assessment were related to Appleton's 'Prospect-Refuge' theory (20, 21). This attempted to analyze and identify relationships between the works of poets, philosophers, painters, landscape designers and behavioral scientists. Zube (16) notes of Appleton's work, "The findings have to be taken with a great deal of caution. Additional information research is necessary before the utility of this theoretical framework can be determined empirically."

The work on visual models of forest aesthetics by Litton formed the base of models used by the US Forest Service and US Bureau of Land Management, two of the pioneers of practical landscape assessment. Here landscapes are evaluated by a number of criteria such as line, colour, texture, harmony, axis dominance, enframement, variety and the susceptibility to being seen.

Zube *et al* (11) drew on the work of environmental psychologist Ittelson. They adapted his work for landscape perception to provide a set of 'minimum considerations' for the structuring of a theoretical framework. These considerations were:

"a Landscapes surround. Landscapes permit movement and exploration of the situation and force the observer to become a participant.

b Landscapes are multimodal. Landscapes provide information that is received through multiple sense and that is processed simultaneously.

c Landscapes provide peripheral as well as central information. Information that is received from behind the participant as well as in front, from outside the focus of attention as well as within.

d Landscapes provide more information than can be used. They can simultaneously provide redundant, inadequate, ambiguous, conflicting and contradictory information.

e Landscape perception always involves action. Landscapes cannot be passively observed; they provide opportunities for action, control and manipulation.

f Landscapes call forth actions. They provide symbolic meanings and motivational messages that can call forth purposeful actions.

g Landscapes always have an ambience. They are almost always encountered as part of a social activity, they have a definite aesthetic quality and they have systematic quality (various components and events are related)."

They go on to stress that, "Investigation of the connections and relationships between and among the elements already found to be important in previous research is an important first step towards understanding interactions and towards developing a theory of landscape perception."

The work of Kaplan claims to be a "Program of research that has been over the past 15 years both coherent and theoretically guided." (14) Although the work has been labelled as cognitive in reviews of the area (11) Kaplan argues this is incomplete, "While it indeed does look at information processing patterns, it is also

concerned with two other domains .... the first is the issue of how cognition and affect are related, ... the second is its concern for the possibility of a biological structure underlying what people prefer" (14).

From early work Kaplan (22) developed a search for better predictors of preference, the stimulus "Complexity" (used in early aesthetic preference research (eg.) Day (23), Vitz (24) had proven an incomplete preference predictor. From the 1972 study (22) came the term "Mystery" - "The promise that more information could be gained by moving deeper into the depicted setting". Further practical research led to another possible predictor "Coherence" - "The capacity to predict within the scene". A fourth predictor proposed was "Legibility" - "The inference that being able to predict and maintain orientation will be possible as one wanders more deeply into the scene".

A matrix of the four predictors was advanced. One dimension of the matrix concerns 'informational outcomes': Understanding (comprehending a scene) and Exploration (being held by the setting or being attracted by sources of additional information. The second dimension involves the timing of the information within the scene which may be immediately available or predicted or inferred by the scene.

Figure 1 Matrix of predictors proposed by Kaplan

	Understanding	Exploration
Immediate	Coherence	Complexity
Inferred/Predicted	Legibility	Mystery

(After S Kaplan 1987)

This framework has provided numerous testable hypotheses which have been studied, (eg reactions to various scenes by different groups (25), length of presentation period, familiarity, (26) and types of environments (27, 28)). Of the four predictors Mystery has gained the most support, while there is less support for Coherence and little support for Complexity. Though Legibility was studied latterly, it fared the worst though Kaplan notes Ellsworth (29) who comments "Spatial definition appears to be an important factor in preference. Since spatial definition is implicitly an aspect of legibility, there is indication that further work is needed developing this concept.

Recently Bourassa (30) has tried to go beyond the biological basis with which theoretical research has concerned itself. He goes beyond even the inclusion of cultural factors to consider, "The role of personal idiosyncrasies and particularly personal creativity, both of which seem to have a certain degree of autonomy from biological and cultural factors". He seeks "A framework that would admit the importance of biological motivation while at the same time respecting the uniqueness of culture and the significance of personal creativity and idiosyncrasy".

Bourassa draws on the work of Vygotsky (31) - "He argued that in order to comprehend human behaviour, it is necessary to understand biological evolution, the historical development of culture, and the processes by which individuals develop - this resulted in a tripartite scheme combining phylogenesis (biological evolution), sociogenesis (cultural evolution) and ontogenesis (individual development)", Vygotsky asserted that the personal mode was underpinned by the biological and cultural modes, but as Bourassa notes this leaves us with the

question of whether these two modes are "inextricably entwined". Bourassa cites evidence to suggest that biological responses to landscape based on innate patterns of emotional behaviour could occur quite separately from cultural responses based on learned cognitive patterns of behaviour".

Bourassa develops the ideas of Meyer (32) on the theory of style. Meyer defined 3 levels of style involving constraints of, laws, rules and strategies. Laws were defined as transcultural constraints, rules are transpersonal but intracultural. Strategies are compositional choices made within the possibilities established by the rules of style. Bourassa believes the task of landscape theory is therefore "One of identifying and comprehending aesthetic laws and identifying the general types of aesthetic rules and strategies. This tripartite paradigm he suggests will "help researchers to avoid certain methodological errors in the design of experiments" and be useful "in posing a number of important research questions."

2.4 Turning Theory Into Policy For Land Use Management

Brown *et al* (8) point to the fact that though much scholarly endeavour has been put into research of aesthetic analysis, to be useful this research must translate "into a form compatible with the other systems currently used in making larger scale landscape decisions". Since the majority of existing strategic and designatory planning instruments are map based, it is logical that the output of aesthetic analysis should be available in map form as well as being perceived by the landscape manager to be of merit.

The traditional study of aesthetics has focused on response to the landscape be this a functionalist approach such as Appleton's Prospect-Refuge theory or a more information orientated approach such as that of the Kaplans'. Traditional agency (eg US Bureau of Land Management and Forestry (for example, 33)) approaches to visual management of the landscape tend to classify the dominant landscape character and then attempt to assess areas of varying quality within these types. Brown *et al* contrast these two approaches to give three key points,

a The agencies seek to determine scenic quality in terms of certain human needs which, on theoretical grounds, would be likely to play a role in what makes a landscape aesthetic.

b The agency approach is based on professional judgment, whereas the traditional approach is based on a long history of human needs and human nature.

c Many of the underlying principles or assumptions of the agency approach have not been well tested to determine how accurately they predict what the public finds aesthetically pleasing.

In 1979, Brown and Itami (34) proposed an approach developed from the works of Anderson (35) in which the landscape was conceptualised in two ways, the 'natural' which encompasses the physical landform of the area, and the 'cultural', in which aspects of land use are considered. This was combined with ideas from the work of Kaplan to select qualities of the landscape, both landform and landuse, which contribute to aesthetic quality. Brown and Itami thought that the aspects of 'slope' (steepness of landform) and 'relative relief' (change in elevation within the landform unit) characterised the "understanding" predictors. The "exploration"

aspect of landform being characterised by 'spatial diversity' (the variety or complexity of spaces created by landform) and 'relief contrast' (the difference in relief between adjacent landform units). For landuse, "understanding" was hypothesised to be enhanced by 'naturalism' (the degree to which a landcover type is affected by man) and 'compatibility' (the visual congruence of adjacent landuse as a consequence of culturally acquired associations). "Exploration" aspects of landcover were thought to be 'height contrast' (the difference in average height of adjacent landuses) and 'internal variety' (the differences in visual pattern within land uses). This is summarised in Figure 2.

Figure 2 Matrix of predictors proposed by Brown and Itami

	Understanding	Exploration
Landform	slope	spatial diversity
	relative relief	relief contrast
Land use	naturalism	height contrast
	compatibility	internal variety

These dimensions formed the basis of a procedure for evaluating scenic resource values. This was attempted by Herbert (36). Scenes were rated for preference then thematically clustered. This gave four well-defined groupings - 'predominantly vegetation', 'pastoral', 'residential' and 'manicured'. Some attempt was made to find the relationship between expert predicted preference scores and lay person preference. An identical ranking was found for the four groups by the two procedures.

Steinitz (6) used a GIS to test 5 theoretical models, (the US Bureau of Land Management Model, and those of the Kaplan's, Appleton, Steinitz, and Brush and Shafer) for their ability to predict patterns of response found in a visitor preference survey. All the models tested were found to have some predictive powers, yet none stood out for adoption as a predictive model for a landscape management project on the Loop Road in Acadia National Park USA. In developing a more predictive model, Steinitz established eight variables which would have an influence on landscape planning. In decreasing order of importance they are:

a Dislike evidence of urbanisation, development or crowded use.

b Like a sense of Mystery.

c Like coastal development generic to local landscape, and development with an historical character.

d Like to see water.

e Dislike tourist-orientated commercial development.

f Like long distance views.

g Like a "folded" landscape (mountains and islands).

h Like a diverse and well maintained vegetation distribution in the fore and middle-ground.

The predictive power of variable a 'Cultural Modification' was greater by itself than any of the five models tested.

Steinitz survey in Acadia National Park also probed attitudes to change. Respondents were asked to select from 48 photos, 5 they thought represented what they had expected to see, 5 to represent what they had seen, and 5 each to represent what they would like to see more of and what they would like to see less

of. It was found that respondents expected to see scenes conforming to their highest rank visual preferences, with high ecological integrity, water/land scenes and undeveloped. The 5 "actually seen" photos were more mixed, some high preference scenes and some scenes rated ugly. Respondents wanted to see more of views in the high preference rating and less of those they rated ugly. Using these considerations and GIS technology, Steinitz proceeds to develop a landscape management strategy for the Loop Road of Acadia National Park.

2.5 Techniques That Have Been Employed In The Assessment Of Landscapes

There are two main approaches to landscape assessment, objective methods and subjective methods each has generated various techniques. As Fenton and Reser (12) note, "the physical environment has typically been defined in terms that are independent of the perceiving individual, or in terms of individual perception and construction of the environment". They term these approaches 'Objective' an instrumentalist view that, "asserts that nature's objects and events have inherent aesthetic value as causes of the aesthetic experience of people, but that only those experiences themselves posses intrinsic value". The second approach is termed the 'Perceptual' approach. It "asserts that although there obviously exists an objective external environment, it is the individual's perception and construct of the environment that determines aesthetic value". This can be seen to be broadly parallel to the ideas of Craik (37) who developed the idea of "observational" and "technical" assessment, and Magnusson (38) who considered the "actual" environment and the "perceived" environment.

2.5.1 Objective methods

Much reference has been made to the pioneering work done in the US by the US bureau of land management and US Forest Management service. Little attention has been focused on strategies developed and used in the UK for objective assessment.

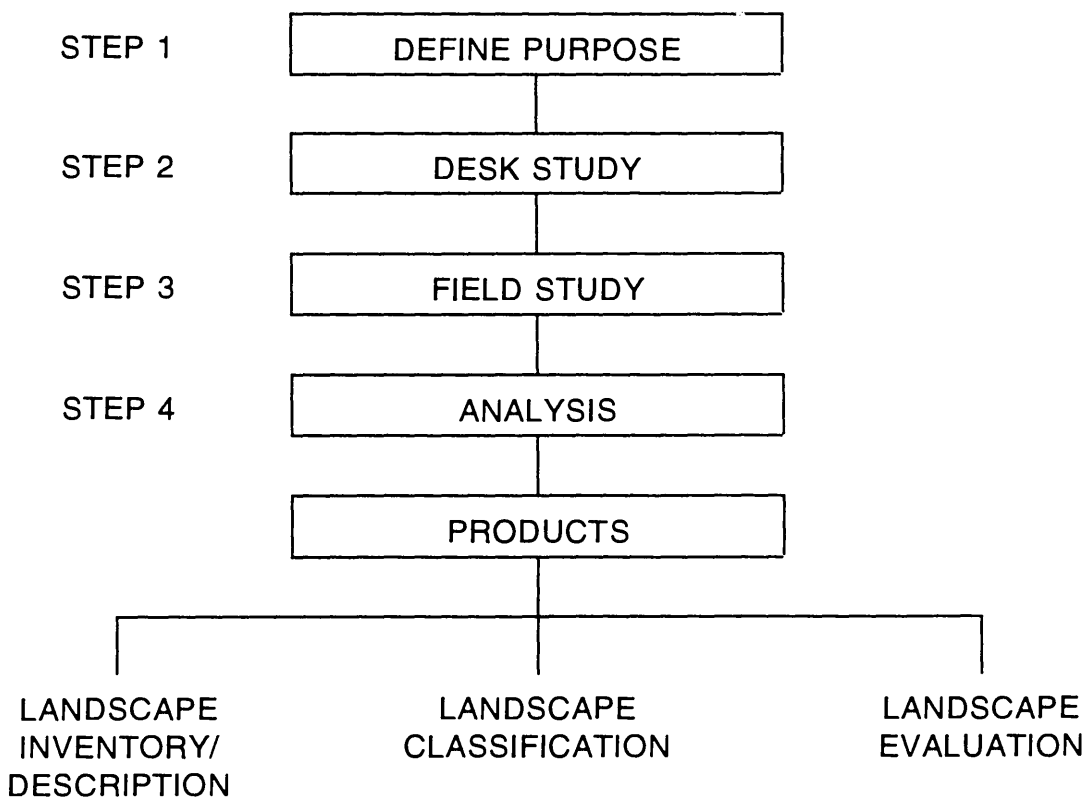
Landscape assessment in Scotland:

The majority of landscape assessment research in Scotland has been effected by the Countryside Commission for Scotland (CCS) now incorporated into Scottish Natural Heritage (SNH). The remit of CCS meant that landscape assessment was fundamental to much of their work. In 1971, CCS published a report (prepared by Land Use Consultants, (39)), "A planning Classification of Scottish Landscape resources". This report, though not wholly adopted, formed the basis of survey work completed for the 1978 report, "Scotland's Scenic Heritage" (40). Here judgements were based on both objective and subjective evaluations, objective analysis onto which subjective response was superimposed. This type of approach was documented by the Countryside Commission in England (41). 1988 saw Sidaway's (42) report to CCS on "Public Opinion on Scotland's Scenery", which reviewed research options for study of public opinion, preferences and attitudes to Scottish landscape change. By 1989, with landscape designation procedures under scrutiny (43, 44), and close attention being paid to the evaluation proposals for skiing and other developments, a document was required to clearly state procedures for assessment of landscapes for any organization which had to undertake landscape quality studies. The task was given to Carys Swanwick from Land Use Consultants. The resulting document "Landscape Assessment -

Principles and Practice" (45) is the clearest explanation to the state of the art in assessment methods for Scottish Landscapes yet published. It is for this reason that the approach is summarised here.

Swanwick proposes a four step approach, aimed to give, "an approach which is structured, which can be repeated and which is likely to be understandable both to those carrying out the work, and to those who may use the results" .

Figure 3 Diagram showing approach proposed by Swanwick



After Swanwick 1991

The first step is to clearly define the purpose of the study; Methods must be tailored to the purpose, the size of area under assessment and the time and resources available. The second step is a desk study. This is said to "contribute to understanding of the 'birds eye' view of the landscape. Map scale should be set according to the size of the area. From this an idea of slope, elevation, ridge lines, watersheds and general landform types should be gained. It is also possible to collect some information on land use, land cover and field pattern from sources such as photographs, land use surveys and historical records. Map information could be prepared by use of GIS to and with analysis of landform and landscape types.

Step three is a field study. This could be a combination of two approaches:

a General familiarisation by the surveyor, to build up a "greater familiarity and a more lasting appreciation of the nature of the landscape and variation within it".

b Structured survey - formal observations "to record a fixed range of information consistently at each point". Methods of recording this information should include:

i Map annotation (-viewlines, eye-catching features, edges, dead ground boundaries between area of different character).

ii Check lists (-presence or absence of landscape elements, their conspicuousness and contribution to the landscape. Subjective factors can also be recorded -"aesthetic characteristics which can be judged rationally if not objectively and perceptions or impressions which are largely subjective judgements by the surveyor".

iii Written descriptions (-to record the overall impression).

iv Annotated sketches (-to convey information about the way different aspects of the landscape interact at ground level).

v Photographs (-a supplementary record).

The final step is that of analysis. This is of course dependent on purpose, but is either, inventory and description, classification into landscape types, evaluation or combination of the three.

a Inventory and description -"should seek to provide a rational document of the landscape and should be in large part objective-it must also seek to convey a clear picture of what a landscape is like and must therefore include a more subjective element which is aimed at conveying an impression of overall character. of aesthetic characteristics and of 'sense of place'".

b Classification -"Is the process of dividing landscape into areas of distinct, recognisable and consistent landscape character, the grouping of areas of similar character into classes, and mapping of the distribution of those classes". Classification can be simply by eye, or for large areas use of GIS may help.

c Evaluation - is dependent on the reason for assessment.

Whatever the reason for assessment, Swanwick asserts, "In all cases the emphasis should be on conveying a clear and evocative impression of the nature and character of a landscape and providing a rational, well justified statement

about the conclusions of any evaluation. Both objective and subjective information should be woven together in the final assessment".

Other landscape assessment strategies that are in use today are the Multivariate land classification technique developed by Bunce *et al* (46). This method "classifies sample kilometre grid squares, using map attributes related to climatic, geological and physical variables. Bunce and Smith (47) found land classes to relate to visual information on landscape character; Cooper and Murray (48) developed a structured method of landscape assessment based on the ideas of Bunce *et al.* Working in the Sperrins and North Derry regions of Northern Ireland, they divided the study area into units with similar land class characteristics. Field study defined unit evaluation using landscape elements that could be defined as physical attributes. A stratified sample of the units was then subject to a resource survey, this culminated in a database of information which, "can be used for baseline monitoring and countryside management prescription..and..provides a practical summary of the distribution and management of resources in specific localities" (48).

2.5.2 Subjective methods

Many techniques have been tried within the more perceptive approaches. From the methods encountered ten basic techniques can be seen. The work of Chokor (49) is a good guide to the subjective methods that have been employed, most of the categories used here are taken from those of Chokor.

a Specific Techniques:

i Historical reconstructions:

This technique Chokor (49) describes "By analysing materials from written documents, historical sources, or literature (rather than straightforward direct surveys of peoples attitudes) it is hoped that bonds of relationships between man and the environment may be more empathetically captured and more accurately described." Lowenthal (50) notes that from those who have been, "Inspired to create, protect, and improve such places, write about them, paint them, or publicise them" we have the option to trace change in landscape attitude through time and between different cultures. This view is contested by others who feel that the technique is elitist, and provides inadequate information to assess the nature of environmental experience (49, 50).

ii Space preference techniques:

Here environments are "grouped into different geographical or spatial components or districts and numbers are assigned to them by a respondent to reflect their appeal to the person; For example, in terms of preference, desirability, personal dispositions, like or dislike to the individual" (49). After factor analysis a preference surface map based on isolines can be compiled. This method therefore allows areas to be assessed holistically against each other; With rank-ordering employed, areas may be ordered for different aspects for example residence, work and recreation.

This is seen as a simple method, a starting point for producing an

information base, and being cross-cultural and inexpensive is seen as being useful in the Third World (49). Its drawback is however that it is unable to deal with specifics and is therefore of limited value in complex localised settings. However as a starting point its use has been seen as valuable (52, 53).

iii Cognitive mapping:

This technique uses personal sketch maps of a geographical area; these are then collated to gain some sense of the structure or regularity. These personal maps are rich in information and thought to be effective in expressing the spatial structure of environmental perceptions. (49)

This procedure has a major weakness in that by its nature it excludes non-visual attributes that may be culturally or socially significant. Many authors have noted that images are made not only of visual and structural elements, but also include identity, meaning and context. Another disadvantage with this method concerns the aggregation and analysis of individual maps, the validity of which is subject to question. Other problems that have been encountered, are the variation in ability for the drawing of maps (54) and the education level required (49). These disadvantages have meant that this method has generally been passed over in favour of the more flexible verbal techniques.

b General Techniques:

The following methodologies can be termed psychometric methods. Generally these can be seen to be some form of transformation of verbal response into

numerical values. They are also cross-cultural, have a solid theoretical base and can profit from some sort of statistical analysis. Three techniques have been favoured in this basic approach.

i Semantic differential technique:

This method involves the use of a set of bipolar adjectives (environmental descriptors) on which environments can be rated. The technique has been widely used throughout environmental perception work, (see Downs (55), and Calvin (56) for example). The basic technique relies upon value judgements through a range of environmental descriptors. The procedure for obtaining relevant scales for the scenes is documented in Calvin (56). The preliminary work required can be heavy, as standard checklists are not always suitable.

The method is not without its problems; by its nature it relies heavily on language which gives an incomplete picture of environmental perception, as semantic associations can vary from individual to individual, group to group, and culture to culture. The respondents completing the test must themselves be able to differentiate between the bipolar concepts. The method limits the information gained to that which is obtained from the pre-selected rating scales, leading to a situation of "circular explorations" (57)

ii Preference rating:

A procedure has been advocated by R Kaplan (58) for removing some of the aspects of the semantic differential approach found to be arduous to the

respondent, and unenlightening to the researcher. This consists of viewing pictures and indicating for each one how much it is liked or preferred, using a 5 point rating scale. The advantages are the inexpensive nature and easy administration of the exercise, permitting the completion at the respondents own pace and at a convenient location. The disadvantage is that care must be taken in the selection of the photographs for the technique to be successful in teasing out the respondents preference and perception.

iii Multi-dimensional scaling (MDS):

MDS has been used for "an exploration and evaluation of place attributes and environmental character. MDS can be used to represent effectively the variation in attributes between people or environments in a spatial or geometrical configuration of points as on a map" (49). It encompasses numerous analytical and data elicitation procedures which have certain similarities. The basic assumption is that the data expresses an association between people and place. If a data set has been obtained (for example through preference rating or repertory grid test procedures) and input into an MDS program, "MDS provides for a number of judgements, a spatial configuration of points, so that the interpoint distances in the configuration represent the real variation in attributes between the environments, in a specified space" (49). The use of MDS has been great over the past 15 years, the main advantage being noted over other techniques is that the character of underlying dimensions of differentiation are not designated beforehand, MDS is designed to elicit the important dimensions used in judgement without imposing *a priori* characteristics. It tends to produce

fewer independent dimensions than is found with factor analytic methods.

The sophistication of the technique can be seen to be its main drawback, Chokor notes "the sophistication of the technique means that only researchers that are knowledgable and highly skilled in the procedure, and have ready access to the computer programs, can utilize it and interpret the results".

iv Repertory grid test (RGT):

Formed from the work of Kelly (59), RGT is discussed more fully in Chapter 3.3. This reviews the test and its underlying theory, Personal Construct Theory.

v Multiple Sorting Tasks:

A free sorting technique is carried out in which subjects are invited to group elements together in a number of different ways. The criteria for judgement will be anything the individual feels and provides an important distinction between elements. No restriction is imposed on the number of groups or the number of items per group the subject chooses. As subjects carry out the task they are asked what the elements in any one group have in common and how these differ from elements in other groups (60).

Critique of psychometric methods:

Chokor (49) provides a good critique of the psychometric methods. To summarise he notes that:

"a Methods abstract - explanation emerges from statistical relationships which are far more removed from the behaviour or experiences.

b Too sophisticated - scaling techniques require a level of sophistication beyond many ordinary people and they also inhibit communication between respondent and researcher.

c Gap between researchers and planners - Research methods may have been too specialised and dry, to the point of unwittingly diverting researchers from their real intended aims. Psychometric research methods do not provide professional planners with usable environmental variables, and the scope of research findings is often too specialised to translate to complex environmental problems.

d No grounds for theoretical understanding - The techniques do provide grounds for the theoretical understanding of specific domains of perception, but tend to neglect significant dimensions such as the complexity or elaboration of attitudes, their centrality or importance to the person who holds them and their closeness to awareness.

Summary:

Psychometric techniques do not present environmental images and experiences as a whole. Each method focuses on one set of belief, emotions, or behaviour, and each technique involves subjects in indirect judgement tasks, which are abstract in conception and causal in cognitive terms."

c Investigative Techniques:

i Participant observation:

Has been used for many years in anthropological and sociological studies, people are able to express themselves without interference and manipulation by the researcher. This technique allows the researcher in at the roots but it has been argued that their very presence intrudes into the subjects life.

ii Projective techniques:

This involves the completion of tasks designed to elicit information, this may comprise, for example, sentence completion, stories, drawing tasks, cartoons or picture reminders. The advantage of the approach is that it is completely unpremeditated, though again analysis of the results is subject to much question.

iii Questionnaires:

Although the traditional approach for social science research, Chokor notes that this technique "has been significantly neglected in Environment-Behaviour-Design research" due to the movement for "borrowing or development of highly sophisticated techniques that are peculiar to the field, and the general recent orientation towards phenomenological/humanistic systems of enquiry".

2.6 The Design Of Landscape Assessment Experiments

2.6.1 Introduction

The previous section has discussed the techniques available for landscape

assessment studies, this section reviews the design of landscape assessment experiments, and the factors which must be considered, especially where surrogate experiential methodology is required.

Once the choice of technique has been decided, it must be decided exactly how the experiment is to be completed. In all cases the factors to be considered in landscape assessment are, which landscapes are to be studied, what the sample of respondents is going to be, and how these respondents are to experience the chosen landscapes.

2.6.2 Choice of site

The geographical area for study is likely to be predetermined, but, given a landscape to study, how is that landscape best sampled. This subject is discussed by Hull and Revell (61) who in a review of literature established four categories of selection of vantage points, none of which explicitly consider where the visitor stops to view the landscape:

a Points located randomly within a given geographic area.

b Points located randomly along a commonly used access.

c Points which are thought representative of the landscape.

d Points which are appropriate for testing specific, prespecified research hypotheses and/or build statistical models.

Hull and Revell note that once the sample site has been established, it is still important to have some rationale for choice of scene at the site. Again they feel that "factors likely to influence observers view selection have not been adequately addressed". They point to the following factors for consideration,

a Purpose - the purpose of being in the area.

b Meaning - special meaning associated with events, memories etc may attract special attention.

c Use levels - intensity and location of use.

d Sequence - the order in which views were experienced.

e Locomotion - the speed of travel influences where traveller's look and what they can see.

f Emotion - emotional state may influence selection of views.

g Distractions - if a scene contains attention attracting features these are more likely to be seen by visitors.

h Temporal - representing a temporal range in the landscape if the landscape is to be generalised.

2.6.3 Choice of sample/Surveyor bias

This will generally be determined by the specifications of the project. Where objective techniques are being used certain surveyors will be asked to rate purely on what they see and disregard personal preferences (see for example Fines (62)). Craik (63) notes "surveyors making field appraisals should clearly be instructed to distinguish between evaluative and preferential judgements."

Pearce and Moscardo (64) provide a good review of studies using tourist/visitor samples. Little theoretical research appears to have been completed as to their unique perception of the landscapes they see.

2.6.4 Experiencing the landscape

There is not a fool-proof method of answering the questions posed by this problem. Many different means have been adopted from field observation through an impressive array of photographic and representative approaches to computer graphic aided methods. Research on visual assessment has relied on no single, agreed method, but rather on a wide variety of methods. This diversity no doubt reflects the lack of any general paradigm for studying environmental perception (Trent *et al* (65)). Some research has been devoted to the effectiveness and appropriateness of these techniques.

2.6.5 Field observation

Field observation of the landscape in question would appear to be the best way of assessing environments as this has been seen as providing the most "realistic exposure to the environment" (66), it does however have many problems associated with it.

The main problem is its impracticability. Most studies that have been completed involve more than one location (in some as many as 60), respondents would have to visit all sites and thus the travel and time costs would be prohibitive (to say nothing of such problems in cases where, for example, a tourist sample is required, of gaining cooperation over this length of time: Or in cases where many sites are to be studied it is likely that a case of battle fatigue (experimental weariness!!) would occur.) Exceptions to this would be assessments along 'scenic drives' or organised walking trails, where research has been conducted in this manner (6). Another factor weighing against the use of field observation is the weather. This

is an unpredictable factor which could have the effect of distorting the views of the respondent sample.

Although site visits have been upheld as being the ultimate in experiencing the environment, several authors have conducted studies with simulation techniques (see Shuttleworth (18) for a review of eight such studies) and found them to be adequate surrogates for actual site visits. Indeed Shelby and Harris (66) note that in certain circumstances, such as if the aim is to assess a specific environmental condition such as the extent of bare ground, then other methods may "allow respondents to better focus on that characteristic, without being influenced by other features such as the quality of the view or the proximity to water". In this way extraneous aspects, that would be a problem with a field visit, can be controlled.

Shuttleworth (18) in his review of studies used both field visits and photographs and found a good correspondence between judgements; he did however find each study lacking in a consistent sample across the two methods. He reports his own study which does not have this additional problem, and concludes with a cautious acceptance of photographs as surrogates. This has been treated with scepticism by others, Stewart *et al* (67) note this 'nomothetic' approach hides "potentially important individual differences". Though group judgements may show strong correlation, individual correlation may be very weak.

Stewart reports a study by Middleton *et al* (68), who contrast the nomothetic approach with a more idiographic method, analysing individual differences, and finds the two methods likely to yield different results. Stewart also notes the lack

of consideration of causal texture ("the pattern of regular dependence of events in the environment upon one another") in the surrogate/field observation studies. He criticises the lack of relationships between different dimensions found with the Semantic Differential technique and proposes a multi-variate approach. His own study concluded that the "validity of photographs as surrogates depends on the judgements that are being studied; Though he noted that "extensive experience in making field observations increases the reliability of an observers judgements", though it does not change the systematic content. Nassauer (69) notes that many of the comparative studies have typically used subjects who lived within the region depicted by the photographs and notes that it is possible that the photo is merely a trigger to memory of field experience. She reports a suggestion by Canter (70) that correlation between field and photographic response may occur because simulations are recognized as the object they simulate, hence correlations between photos and site visits will be high.

2.6.6 Photographic simulation

This has been the main method employed as a surrogate to field visits. It has a number of points in its favour, its comparative inexpense and convenience often being the deciding factors in its use. There are however a number of shortcomings. Only the visual characteristics displayed within the photograph can directly influence assessments, and there might be a difference in purpose and criteria in the evaluation of photographs compared with field visits, respondents may also be asked "to evaluate landscapes in ways that are unfamiliar or inappropriate" (61).

a Photographic prints or slides

The photographic medium has evolved from use of black and white prints in the 1960s to colour prints and slides today. The selection of photographs for simulation purposes is a complex matter, with little research to aid the choice - "the investigator who presents photographic simulations has made a number of decisions affecting what the viewers see, but has had little research to guide those decisions" (69). Nassauer points to the following variables for consideration.

i Use of colour or black and white film

Shuttleworth (18) has shown that colour images give the viewer more information about the landscape than a black and white image, have a higher correlation with field response and elicit less extreme responses than black and white photographs.

ii Vertical direction of view

Photographs have almost universally been taken on the ground and at eyelevel. It is possible to gain some uniformity with a constant placement of the horizon within the frame.

iii Presentation media

It has been shown (69) that slides have a higher predictive relationship with field response than prints. Prints have a more portable advantage, and so even though it can be seen that slides could give more accurate responses, they are used in about equal proportions within research in the area.

iv Horizontal angle

The horizontal angle of view is partly defined by the choice of lens and by the photographic format used. A 360° panoramic view can be obtained by other media such as moving pictures (video/movie).

Most studies have reported their photographic procedure as using either 50mm or 35mm lenses. Nassauer reports the work of Zube *et al* (71) who suggest that a panoramic photomontage simulates field experience more closely than a wide angle horizontal format. Nassauer notes her own study where it was found that "a photographic format which is compatible with the dominant compositional orientation, horizontal or vertical, of a scenic landscape is likely to increase preference ratings of that landscape while format has little effect on ratings of landscapes that are not scenic", she also found preference rankings were similar between panoramic and wide angle sets, with each format being approximate with the field assessment.

v Selection of landscape elements

The elements included in the photograph are also affected by the horizontal range available, but are mainly the selection of the photographer. Much debate has occurred into whether images should be 'professionally composed' to "display the full range of variety visible in the field" or be a random sample to try to "avoid the artificial effects of photographic composition".

b Video/Movie film

The only research found describing the use of this technique was by Bannerjee and Gollub (72) and Brown and Daniel (73). Bannerjee and Gollub used 16mm sound film to record a 360° panoramic view of the landscape, a routine of "scan" and "hold" shots were used due to dizziness and disorientation found by pre-test subjects exposed to 360° panoramic shots. Brown and Daniel used video sequences in their study of the aesthetics of riparian environments; Video was seen to offer a unique advantage over still photography by allowing water movement to be depicted.

Fenton (74) proposes a methodology to give a better sampling of the environment by the use of video scanning of proposed sites (as well as still photography) to ensure when photographs are compiled for assessment that a more representative sampling of the environment occurs.

2.6.7 Still video images / Computer aided graphics

Vining and Orland (75) assessed the role of video technology by comparing it directly with colour slide photography. They took a series of slides, scanned them by video camera, these were then digitized to produce static video images of the slides. In the study three different environments were used and the two techniques were found to be highly comparable. Vining and Orland promote the used of computer based image capture and editing systems due to the numerous advantages that can be found. For example, it would be possible to produce quickly and inexpensively the consequences of any proposed development or change in management practices. This may be useful in public participation exercises as a televised image is very familiar to the general public.

The role of computer generated drawings has been considered by Killeen and Buhyoff (76) and Tips and Savisdisara (77) in studies of abstract topography preference. Killeen and Buhyoff used a combination of colour slides, artists sketches and computer graphics to study the effects of landscape stimulus abstraction on preference. Their results "indicated that the preference metrics for the 35mm slides and computer line drawings were significantly correlated with the preference metric for the artist renditions...no association was found between preference for the slides and the computer generated drawings".

Tips and Savisdisara were concerned that Killeen and Buhyoff's experiment, by using novel graphics, introduced a 'play element' giving different responses to those for other media. To avoid this in their research they plotted a series of three progressively more abstract types of scene and then used black and white photography to present them. Their conclusions, that landscape preference sampled by level of abstraction can significantly alter the views on ranking a series of abstract representations, serves to caution the use of such techniques so that the abstraction occurs along dimensions that do not interact strongly with the factor being studied.

2.6.8 Written descriptions

The only research located where this method has been employed is that of Shelby and Harris (66). They found this technique had considerable potential, and though slightly less effective in their study than other methods, it could be improved with further development and testing; This would allow for inexpensive self-administered surveys.

2.6.9 Artist's sketches

Again this is a rarely employed technique. It has been used in studies where assessment is required on the outcome of proposed development or changes in management practices. The use of artist sketches has been discussed in relation to the work of Killeen and Buhyoff (76) in their work on abstract topography. The technique has also been employed by Schomaker (78) who compared slides and artist's sketches and Zube (79) who evaluated slides and black and white drawings of the same areas.

2.6.10 Models

A technique used mainly in the more forward planning assessment of proposed development/change in management practices. No literature has been found using this technique in landscape evaluation.

2.6.11 Surrogate viewers

Hull and Revell (61) propose an alternative to using surrogates of landscapes for assessment, they use surrogate viewers in the real landscape. They report, "participant photography facilitates sampling both vantage points and directions of view. It lets persons who visit and use the landscape identify views relevant to them". This technique has several advantages. People are familiar with the landscape, environmental meaning for the person is more likely to be included in their own view selection, it emphasises the most visited landscapes and those that draw most attention, a sequential sequence should reflect the influences of previously visited landscapes on viewer attention, and results can be interpreted along objective lines. Disadvantages are the temporal characteristics, which are not

available for sampling, the procedure is not appropriate for many situations, e.g. photographs cannot always be taken due to extreme weather and lighting conditions, and it is a time consuming and expensive.

2.7 Landscape Typology And Consensus Of Opinion In Scotland

Consensus in landscape evaluation:

Intuitively, consensus is an important issue in any methodology for landscape evaluation. Some consideration was given to this issue in the early 1980s (Jacques (80) and Dearden (81) for example). This concern arose from the requirements of planning legislation to provide assessment of landscape value, and the consequent rise of objective evaluation. It is when we consider the subjective viewpoint, that this evaluation technique fails. Jacques (80) notes that the "statement that a landscape has an intrinsic quality of beauty is highly questionable - and it appears more likely that aesthetic satisfaction is an entirely emotional reaction to thought processes which have proceeded satisfactorily". It can be seen, therefore, when we consider landscape amenity values, we are referring to the satisfaction gained by the comparison of the landscape in question to the idealised mental landscape. Jacques notes, "Such comparison can give satisfaction which need not necessarily be equated with beauty - the sensations of well being or astonishment can also be satisfying. The mixture and intensity of tastes are unique to each person." From this it can be seen that we must consider landscapes not only in terms of their "quality" but in terms of their function.

Landscape typology:

When the possible range of landscape types are considered the issue becomes

further complicated. "There is no reason why a single person may not have a number of idealised landscapes in his mind which will be appropriate to a greater or lesser extent in different landscape types." (80) From this we can see that it is possible each and every distinctive landscape will have its admirers, thus making consensus on value unlikely. Jacques noted that an interesting area of research would be the degree of consensus on `ugly' landscapes which he proposed would be higher than for attractive landscapes, "the obvious case when consensus might be suspected is a landscape such as an urban fringe, that does not measure up to anybody's idealised landscape images" (80).

Research completed on public preference of Scottish landscapes is limited. Indeed Swanwick notes, "It would be helpful to carry out specific surveys of the preferences of the general public for the range of landscape types found in Scotland, comparing preference both within and between landscape types" (44). Swanwick does note the 1987 SOS survey by System Three for CCS. In which respondents were asked to state their first and second choice preferences from a list of landscape types. The most preferred were lochs surrounded by hills (first choice for 35%), the other types being fairly evenly split. This would seem to indicate some consensus of opinion, but Sidaway (42) is sceptical; "Even among the stereotypes, there are some slight variations in the rank ordering suggesting that markedly different views may be masked at this level of aggregation. But at this broad level the responses are difficult to interpret given that the question is posed out of any context."

When considering landscape typology in Scotland, we should also note the work

of Dearden. He views landscape response as a combination of both the objective and the subjective, and that the relative importance is subject to the conditions under which the experience takes place. "Objective is taken to be factors existing external (E) to the observer, subjective, those factors that are internal (I) to the observer. In any given landscape evaluation there will be a mixture of these factors internal and external to the observer - in some circumstances beauty will reside more in landscape (E>I), and in others the eye of the beholder will be more critical in influencing landscape judgements (I>E)" (81).

Dearden continues by hypothesising that; " The potential for societal consensus on landscape quality is directly proportional to the ratio of external to internal influences on the observer. Thus if E>I consensus will be high,if I>E consensus will be low". Dearden notes this hypothesis is not directly testable, however indirect evidence appears to support it. He also hypothesises that there "is an inverse relationship between the size of area under evaluation and the potential for observer consensus". The size being the degree of variation in the landscape, low diversity (biophysical and cultural) producing higher levels of consensus.

If this is applied to Scotland, which could be said to have extremes of both biophysical and cultural diversity within a relatively small area, it can be seen that the degree of consensus is likely to be very low. This also ties in with Dearden's third hypothesis; "An inverse relationship exists between the complexity of an area under evaluation, and the potential for observer consensus". Dearden continues to note the affect of, perceived quality, presence of water, perceived degree of naturalness, age of observer, familiarity, extent of formal training, the use of

surrogates, the looking time and the type of evaluation on the potential for consensus.

Conclusions:

Work of Kliskey and Kearsley (5) seems to suggest that even within one type of landscape, "wilderness" perceptual differences are notable. This could be seen to be beneficial to the management of a sensitive region, in that to define an area as wilderness appears to get the same reaction as taking the lid off the honey pot. A growing demand for areas where modern daily routine can be left behind will cause a swarm of visitors. Kliskey and Kearsley state, "that what wilderness might comprise is quite variable - defining wilderness in strict and unidimensional terms might well be self defeating and, because there appear to be variety of acceptable wilderness states, based upon individual perceptions, a variety of wildernesses could be defined and managed in such a way as to minimise environmental impact while maximizing visitor satisfaction".

2.8 Landscape Assessment And Schema Discrepancy

The reason this research project has been completed has been a perceived need for some methodology whereby the more subjective elements of landscape perception can be represented in mappable form. A body of the research literature concerned with the study of those subjective elements explores the ways in which information about the environment is stored in the mind, and how this affects our experience, perception, interest and preferences. See for example, Amedeo and York (82) and the work of Purcell (83, 84, 85, 86, and 87). This is summarised by discussion of the most recent work.

Purcell (87) proposes the argument that "our experience of a particular landscape is not simply a function of the physical attributes of that example, but results from the interaction of these attributes with mental models or knowledge structures representing past experience". Knowledge structures contain two types of knowledge, the first concerns the overlap in attributes between all previously experienced instances of this particular knowledge structure, thus these structures are based on regularities in the environment. In addition, the structure also contains the typical ranges of values these attributes take, and the relationships between attributes that most frequently occur. Purcell terms these the 'default values', the knowledge structures "are considered to be prototypically organised with the default values characterizing the most typical or the best examples of the knowledge structure". It can be seen that this first part of our knowledge can be termed 'generic', general knowledge about particular groups of objects or scenes. The second type of knowledge organises memory of particular instances and events. As it is extremely unlikely that any individual instance will match the default values, these structures represent the differences between the instance and the generic knowledge structure values.

A third important property of the knowledge structure is the abstraction or specificity of the knowledge contained. "At the perceptual level, a landscape might be represented in terms of colours, shapes and textures at a number of scales; At more abstract levels information about topography, naturalness or degree of man-induced change could be represented, while at the most abstract level meanings associated with the word landscape or the types of activities that could occur in landscapes would be represented".

We have therefore a model proposing two types of knowledge structure the generic and the specific, and that mismatches between an individual instance and the generic structure form the basis of the specific structure. This mismatch is of interest as it is this incongruity that is thought to trigger arousal. Autonomic nervous system (ANS) arousal results "from the interruption or blocking of ongoing action sequences or cognitive and perceptual processing relating to existing knowledge structures, and establishes the conditions necessary for the experience of emotion" (87). The strength of the emotion is thus determined by the extent of the discrepancy between the current instance and the generic prototype. The type of emotion that is experienced will depend on additional cognitive processing.

Purcell reports hypotheses put forward by Gaver and Mandler (88) who proposed that "fit to a knowledge structure will be associated with familiarity and low levels of positive affective experience such as preference". This is the "warm glow of recognition factor". Low levels of discrepancy increase emotional response, but remain positive, with higher levels of discrepancy the response is intense but becomes negative, "in aesthetic terms, the experience associated with these levels of discrepancy is that of dislike and ugliness".

Two experiments are reported, the first assesses landscape typicality judgments for outdoor scenes from within and outside the respondents home environment. Results indicated that ranges of typicality from the home and external environments are similar. The second experiment built on the hypothesis that this similarity in typicality ranges is "associated with abstract, higher level attributes and affect is generated by discrepancies at this level, then would also be expected the

affective/aesthetic experiences would be similar for the two sets of landscapes. However, if affective experience is associated with discrepancies at less abstract levels in the knowledge structure, then affective experience should differ between landscapes from within and outside the home environment". Typicality was found to vary across the range for both landscape sets, the unfamiliar set was judged more interesting and results indicated an overall preference for the landscapes outside the home environment.

These experiments therefore provide some evidence that fit to a prototype is linked to interest and preference. This fit to prototype was found to be associated to interest rather than familiarity. High preference could therefore result for landscapes seen as most typical from outside as well as those within the home environment. It also highlights an area requiring more research, to identify the ways in which we segregate the environment into types and how changes in typicality within these types are related to familiarity and affective experience. Some indications that different groups may evaluate landscape types differently have been found by Buhyoff *et al* (89).

The research conducted here has tried, in a limited way, to explore both the role of landscape types in Scotland and any group effects that may be found. One area of concern in the design of such an experiment was the role that prior information would have on perception of landscape and attitudes to landscape change. With the rise in media attention on environmental matters a huge amount of information is available on landscape issues. To this end a small experiment was completed to investigate the role of different types of information on landscape decisions.

2.9 The Role Of Different Types Of Information On Landscape Decisions

Introduction:

Evidence has emerged that perception is action related, so that general preference questions will be less informative than questions dealing with specific references and actions. The following experiment was carried out to examine the role of visual imagery and information about the landscape, on determining agreement levels for different types of typical intervention. Incorporated in the information given were three different factors, which, in earlier interviews had distinguished high quality from low quality landscapes. The methodology used was part of a family of techniques available for this kind of study, and was seen as a useful technique for further studies of this kind.

Materials:

Subjects:

Groups of students of Landscape Architecture were used for the experiment. While their results cannot be reported as representative of a wider general population, the focus of this experiment was on the way provided information influenced their judgement.

Landscapes:

Four types of landscape were chosen from Scottish examples. These were:

a Highland Mountains

b Lowland man influenced

c Highland mountains and water

d Open vistas.

Three photographic examples of each type were chosen.

Information:

Four short paragraphs were composed to be read to subjects while viewing the photographs. Subjects were also given cards which displayed the text on the tape. Each paragraph had five pieces of information, two common elements and three variables. The common elements were:

Level of employment

Distance from towns.

The three variables were:

Ecological diversity and wildlife significance

Typicality of attributes

Access to the area.

Each variable took two levels, so that ecology was described as either:

High → "the area is noted for its ecological diversity and wildlife." or

Low → "the area has no particular ecological and wildlife significance."

Area was described as either:

High → "a unique type of landscape" or

Low → "a typical example of landscapes of this type".

Access was described as either:

High → "part of the country allowing easy access from neighbouring districts" or

Low → "in a remote area making access from neighbouring areas difficult.

The combination of variables were therefore:

Ecology	HIGH				LOW			
Area	Typical		Unique		Typical		Unique	
	/	\	/	\	/	\	/	\
Access	Rem	Acc	Rem	Acc	Rem	Acc	Rem	Acc
	A	B	B	A	B	A	A	B

Ecology	High (0)	Low (1)
Area	Unique (0)	Typical (1)
Access	Access (0)	Remote (1)

The two orthogonal designs are therefore:

	A			B	
0	0	0	1	0	0
0	1	1	0	1	0
1	1	0	0	0	1
1	0	1	1	1	1

"A" was chosen for the information dissemination in this experiment. This was because of its more practical combination of variables. The four passages of information were:

T1:

This area is part of a larger landscape in this part of the country. The local residents are mainly employed in the area with the nearest town some distance away. The area is noted for its ecological diversity and wildlife, and is a unique landscape of its type. It is easily accessible from nearby districts.

T2:

These slides show part of a wider landscape in this area. Most local people work in the area while the nearest town is some distance away. The area has no particular ecological or wildlife significance and is a typical example of landscapes of this type. It is in a part of the country which allows easy access from neighbouring districts.

T3:

On the following slides there are three views showing the area under consideration. The nearest town is some distance away and most locals find work within the area. The area is noted for its ecological diversity and wildlife, and it is a typical example of landscapes in this part of the Country. It is a remote area which makes access from neighbouring areas difficult.

T4:

In the following set of slides you are looking at a landscape where the employment pattern is made up of most local people finding work in the area with the neighbouring town some distance away. The area has no particular ecological or wildlife significance, but is a unique type of landscape. It is in a remote part of the country which makes access from neighbouring areas difficult.

Procedure:

A split plot design was used in which four groups of five subjects (G) were presented with different combinations of landscape slides (L) and information (T). Embedding two latin squares the experimental design can be seen in Table 1.

Table 1 Experimental Design for Information Experiment

	LANDSCAPES			
	L1	L2	L3	L4
T1	G1 O2	G2 O4	G3 O3	G4 O1
T2	G4 O2	G1 O1	G2 O3	G3 O4
T3	G3 O2	G4 O4	G1 O3	G2 O1
T4	G2 O2	G3 O1	G4 O3	G1 O4

Four groups of five subjects were presented with propositional statements in which they expressed their level of agreement or disagreement about the suitability of the area for the development of:

a Tourism

b Forestry

c Housing

d Light industry.

In addition subjects indicated:

How familiar they are with landscapes of this type,

How typical they thought the landscapes were of the Highland Region of Scotland,

How much they enjoyed visiting landscapes of this type.

Subjects were randomised into groups and presented with the appropriate tape/slide combination as shown in Table 1. The form used can be seen in Appendix 1.

Results:

In brief, examining the influence of factors on judgements of agreement, gave the following results.

Main effects:

No group effect

No landscape effect

Significant tape effect

Significant intervention effect

First order interactions:

(Landscape x Intervention) = Significant

(Landscape x Tape) = Not significant

(Tape x Intervention) = Significant

(Landscape x Group) = Significant

(Intervention x Group) = Not significant

(Tape x Group) = Significant

Tape analysis:

(Unique/typical) = Significant

(Ecology) = Significant

(Access/remote) = Not significant

Conclusions:

The results confirmed that the propositions were purpose driven. Do you like the

landscape?, becomes, Do you like it for what? Not surprisingly the type of intervention was crucial to acceptability.

Information about the landscape appeared a stronger determinant of judgement than visual landscape scenes.

There are several significant interaction effects between landscape features and information about the landscape. This implies that landscape features interact in different ways, for different groups, with information provided about the landscape. This provides a strong argument for local context effects on choice and would operate against landscape attributes being used in isolation in an evaluative way.

The strongest effect on judgement was related to proposed action, ie, type of intervention.

Of the variables incorporated in the information provided, the unique/typical dimension had the strongest effect. Ecology was also significant but less so, and ease of access was not significant.

CHAPTER 3 - THE USE OF PERSONAL CONSTRUCT THEORY IN LANDSCAPE PERCEPTION

3.1 Introduction

A possible solution to the problem of obtaining the underpinning attributes and dimensions of landscape perception was seen as the use of Personal Construct Theory (PCT). This section reviews the history of PCT, the ways it has been used in past environmental research, and the way it was developed for use in this research.

From its beginnings in the domain of clinical psychology the use of PCT has spread into many areas, "market research, quality control, design, attitude surveys, training-needs analysis, negotiation, counselling, team building and more" (90). Environmental cognition work using PCT and its associated Repertory Grid test began in the early Seventies with work on eliciting environmental images (91), Rowles (92) study on construction of the ideal University choice, and Hudson's (93) work on images of shopping facilities. The adoption of Kelly's theory by geographers for the study of environmental images followed the failure of previous methods to specify the relationship between image and behaviour, "there was little explicit demonstration of the links between image and behaviour at either theoretical or empirical level." (94). The Repertory Grid Test provided a, "flexible valid and individually sensitive method" (94) with an interrelated theory. This combination seemed to answer some of the questions previous methods had been left asking.

3.2 Personal Construct Theory (PCT)

Kelly believed that "man looks through transparent patterns or templates which he creates and then attempts to fit over the realities of which the world is composed" (59). The patterns Kelly called constructs as they are ways of construing the world. Although constructs do not always have a very good fit over reality, Kelly thought that "without such patterns the world appears to be such an undifferentiated homogeneity that man is unable to make any sense of it-even a poor fit is more help to him than nothing at all" (59). To improve his fit, man increases his repertory of constructs, either altering them to provide a better fit, or by subsuming them with superordinate constructs or systems. This philosophical assumption Kelly called Constructive Alternativism, "all of our present interpretations of the universe are subject to revision or replacement" (59).

The fundamental postulate on which PCT is based is that "a persons processes are psychologically channelized by the ways in which he anticipates events" (59) this was given not as an ultimate statement of truth, but in an attempt to make "our theoretical position provocative, and hence fertile rather than legalistic" (59). To this postulate Kelly added eleven corollaries. These in part followed on from the postulate and partly elaborated on it.

Construction corollary:

"A person anticipates events by construing their replications"

This shows that in our attempts to understand the world we can detect patterns of repetition and we are able thus to categorize them, even though we may not attach verbal labels to this discriminatory factor.

Individuality corollary:

"Persons differ from each other in their construction of events"

People can be seen to differ from each other in their construing of events as each will perceive himself as the central figure in the event. Common ground between people can be sought "through construing the experiences of their neighbours along with their own".

Organization corollary:

"Each person characteristically evolves, for his convenience in anticipating events, a construction system embracing ordinal relationships between constructs"

Each person develops "ways of anticipating events which transcend contradictions". This system may, for example, by means of a view of self-preservation or perhaps an ethical system, switch between the two, dependent on the person's perspective of events.

Dichotomy corollary:

"A person's construction system is composed of a finite number of dichotomous constructs"

Kelly believed that within a context we never affirm without implicitly denying. Within the range of convenience, (comprises all those things to which the user would find its application useful), a construct denotes an aspect of all the elements within, "once this aspect is noted it is meaningful because it forms the basis of similarity and contrast".

Choice corollary:

"A person chooses for himself that alternative in a dichotomised construct through which he anticipates the greater possibility for extension and definition of his system."

It has been said that a person's processes are psychologically channelized by the ways in which he anticipates events, and these ways are presented in dichotomous form. Choice between the poles must therefore be predicted by his anticipations. "We assume, therefore, that whenever a person is confronted with the opportunity for making a choice, he will tend to make that choice in favour of the alternative which seems to provide the best basis for anticipating ensuing events".

Range corollary:

"A construct is convenient for the anticipation of a finite range of events only".

As there are few (if any) constructs applicable to everything, Kelly noted both a range and focus of convenience. The range of convenience being defined as comprising all those things to which the user would find its application useful; The focus of convenience comprising those particular things to which the user would find its application maximally useful. These are the elements upon which the construct is likely to have been formed originally.

Experience corollary:

"A person's construction system varies as he successfully construes the replications of events"

It can be seen that constructions, being subject to change following the revelation of events, should be seen as "working hypotheses which are about to be put to the

test of experience", thus the construction system undergoes progressive evolution.

Modulation corollary:

"The variation in a person's construction system is limited by the permeability of the constructs within whose range of convenience the variants lie."

This is to say that this progressive evolution, noted above, is itself occurring within a system. "A person's constructions system is composed of superordinate and subordinate relationships. The subordinate systems are determined by the superordinate systems into whose jurisdiction they are placed. The superordinate systems, in turn, are free to invoke new arrangements among the systems which are subordinate to them".

Fragmentation corollary:

"A person may successively employ a variety of construction subsystems which are inferentially compatible with each other."

Kelly noted here that successive constructs are not necessarily derivable from each other, or special cases within the old construct, all that can be said is that the changes take place within a larger system.

Commonality corollary:

"To the extent that one person employs a construction of experience which is similar to that employed by another, his psychological processes are similar to those of other person's"

Here Kelly is saying that it is possible for two people exposed to the same events not to have the same psychological processes, and that people with similar

psychological processes to have been exposed to different stimuli. "It is in the similarity in the construction of events that we find the basis for similar action, and not in the identity of the events".

Sociality corollary:

"To the extent that one person construes the construction processes of another, he may play a role in a social process involving the other person"

Cultural background has been shown to be a factor in perception and behavioural patterns, but this does not guarantee cultural progress. "The person who is to play a constructive role in a social process with another person need not so much construe things as the other person does as he must effectively construe the other person's outlook".

3.3 The Repertory Grid Test (RGT)

To make use of the information stored in an individuals personal construct system, a way must be found of establishing the relationships between the constructs. "Repertory grid technique is, in its multitude of forms, a way of exploring the structure and content of such implicit theories" (95). The purpose of the grid is to inform about the evolution of the construct system and the limitations and possibilities it has. The results are often seen as a map of the construct system. In practice, the grid can be seen as a structured interview, it is a way of formalising conversation. When talking we can understand what is important to the person, his assessment of people, places, events and the relationships between them. The test assigns mathematical values to the relationships between constructs.

The information gained in this manner has one great advantage, "data gained from a single individual can be subjected to many of the kinds of group statistics we have hitherto reserved for populations of subjects" (95). These allow the establishment of meaning, as the random production can be disproved. Downs (96) noted that the grid test has "the virtue of combining "personal detail" with the production of "quantifiable" data-while imposing-the least number of constraints on the person as he or she tries to communicate his or her understanding of some part of the world."

The Standard Interview:

Elicitation of elements:

Elements selected will be examples from the field of study. As Kelly used this technique for his work in Clinical psychology, he suggests possible role titles for studying interpersonal relationships. It is possible to use elements for any particular situation as long as two factors are kept in mind; First, the elements must be within the range of convenience of the constructs used, this will require the subject to say whether the element is relevant to all constructs. Second, elements must be representative of the general pool from which they are drawn (95). Elements should be as specific as possible, well known to the subject, should not be sub-sets of other elements and should not contain evaluative terms (97).

There are three main approaches to the procedure for obtaining elements.

a The interviewee can be supplied with a set devised by the researcher for their research strategy.

b The interviewee can provide their own element set, or

c A set can be established in discussion. This is achieved by asking for pairs which are appropriate - an element you like and one you don't like, a typical element and an atypical one, a successful element and an unsuccessful one (97).

Elicitation of constructs:

Kelly gave six assumptions that underlie the Repertory Grid Test:

a Constructs elicited should be permeable (applicable to more than one triad of elements).

b There is a good degree of permanence to the constructs (they existed before the test began).

c Verbal labels are communicable (subject and researcher understand what is meant by the labels).

d Constructs should be explicitly bipolar.

The remaining two assumptions refer explicitly to clinical work:

e Constructs should be role constructs (when considering interpersonal relationships it is important to represent the subjects understanding of other people).

f Again, studying interpersonal relationships, the subject should be able to place himself somewhere on the construct dimensions.(95)

The standard approach to construct elicitation is by the use of triads of elements. Three elements are considered and the question asked is, "In what important way are two of them alike and thereby different from the third", this way is then recorded, and the subject is asked in what way the third element differs from the

other two, and thus a bipolar construct is gained. As many triads can be presented as is thought appropriate. Again certain points should be remembered during construct elicitation.

a Constructs should be used which are applicable to the entire element set.

b Constructs which place nearly all elements at one pole should be avoided as they are not very discriminating.

c Constructs should be applicable to the task in hand, this can be ensured by the use of a qualifying statement added to the standard question - "In what way are any of these two similar to each other and different to the third - from the point of or in terms of.....the purpose of the study (97).

Laddering:

The laddering procedure was first described by Hinkle (98) as a method for establishing position in the construct hierarchy by the elicitation of either superordinate (constructs of a higher order of abstraction) or subordinate constructs. To obtain superordinate constructs, the subject is asked why they prefer one particular end. This gives rise to a further construct, to which the same question can be asked, thus ascending the hierarchy. To gain subordinate constructs, the contrast between the two poles of the construct must be explored. Details should not be specific examples, as these would constitute new elements, but specific characteristics which represent new constructs (97).

It is customary to ask the subject to rank constructs for their importance prior to laddering, those which are deemed most important are subject to the laddering process.

Rating:

Although there are many ways in which data can be gained for analysis, (see Fransella and Bannister (95) for discussion of methods), the technique used most in environmental cognition is that of rating. Here each element is rated on a scale, the two ends of which are formed from the construct poles. (Eg)

	1	2	3	4	5	6	7	
wild					✓			farmed
mountainous						✓		flatter
beautiful		✓						ugly

The resulting data matrix can easily be analyzed by a variety of computer packages.

The Repertory Grid Test in its many forms has been used in many areas of psychology, market research, business research and personnel management. (see Stewart and Stewart (90) for a good discussion of the areas in which Repertory Grid has been used). What, however, concerns this study is its applicability to environmental cognition.

3.4 PCT And Environmental Cognition

Personal Construct Theory (PCT) and the Repertory Grid Test (RGT) was first used in the early 1970s when many researchers saw its potential. Honikman (99) reports Stringer (100) who saw Kelly's 'man the scientist' in an environmental context as 'man the architect', Honikman drew the following conclusion; "If I were able to examine how people construed an environment then I would be able to see how its various characteristics were themselves construed. I should be therefore be able to see which of the physical characteristics were significant to the person

and how his assessment of them contributed to his overall environmental evaluation".

Hudson (94) notes of PCT that "not only did this theory place individuals' personal constructions (images) of environments in a pivotal role in the understanding of human behaviour, it proposed a flexible, valid and individually sensitive method of measuring those personal constructions, the Repertory Grid." Hudson believes it was the interrelationship of theory and method that was so appealing "the fusion of theory and method, if not quite a panacea to all methodological and theoretical ills, seemed to offer considerable advance on existing functions."

Stringer (101) also believes that it is the underlying theory that puts RGT above its nearest colleague Semantic Differential technique, RGT allows a more idiographic technique which can be completed without "any need to sacrifice the goals of obsessive quantification".

The roles PCT has played in environmental cognition studies has been varied. The following table shows some instances where PCT has been used in an environmental context.

Table 2 Case studies using PCT techniques

Author	Year	Study
Environmental Images		
Harrison and Sarre	1971 (91) 1975 (2)	Studied the general image of the urban environment held by a group of female city residents and measured Shopkeepers images of their business environment. Seen as the main breakthrough of RGT in the environmental context. A thorough study examining the role that PCT can play in the area.
Hudson	1974 (93)	Measured images of the retailing environment.
Hudson	1980 (94)	Review paper of work completed using PCT in the study of environmental images.
Landscape evaluation		
Mathews and Ilbery	1983 (102)	Carried out landscape evaluation using photographs, and a study of agricultural decision making.
Pearce and Waters	1983 (103)	Tried to investigate attributes that influence public preference for various landscape scenes.
Pomeroy, Green and Fitzgibbon	1983 (104)	Measured non-spectacular urban riverscapes, identified three definite dimensions.
Fitzgibbon, Pomeroy and Green	1985 (105)	Used photos of a townscape, found strong relationships relating to both perception and preference.
Unwin	1985 (106)	Studied farmers perceptions of agrarian change in NW Portugal.
Participation in planning		
Stringer	1976 (101)	Noted PCT "particularly suitable for exploring situations involving change and the anticipation of alternative futures". Review paper of the area.
Ilbery and Hornby	1983 (107)	Exploratory survey of 35 farmers in Mid-Warwickshire into agricultural decision making.
Jackson	1986 (108)	Studied planning examination revealing great variation between the constructs of the planners, developers and the public.
Aitken	1990 (109)	RG used to give insight into how individuals respond to specific neighbourhood changes.

Author	Year	Study
		Destination choice
Preston and Taylor	1981 (110)	Showed with reference to residential cognition and choice that the corollaries of PCT can be the basis for deriving testable propositions.
Timmermans *et al*	1982 (111)	Uses RG methodology to identify factors influencing consumer choice of shopping centres.
Hendriks	1985 (112)	Used RGT to measure the attraction of various places to study geography in relation to their physical attributes.
Embacher and Buttle	1989 (113)	Uses RG methodology to research the image of Austria as a holiday destination.
		Uses in the Third World
Chokor	1991 (114)	Case study of environmental assessment in Nigeria to point out the implications of problems of use of PCT in the Third World.
Potter	1984 (115)	Discusses hand analysis of RG's as being appropriate to the Third World.
		Methods of analysis and interpretation
Palmer	1978 (116)	Assessment of countryside locations by MDS, with use of RGT to interpret the dimensions found.
Coshall	1991 (117)	Discusses and describes a non-parametric factor analysis procedure with reference to European holiday destinations.
		Miscellaneous
Leff and Deutsch	1973 (118)	Studied the difference in constructions of the environment for two groups, environmental professionals and lay persons.
Honikman	1973 (99)	Used colour slides to depict constructions of rooms.
O'Hare and Gordon	1976 (119)	RGT was used to measure response to photos of landscape paintings.
Wysor	1983 (120)	Examined environmental awareness between different groups of College students.
Pearce	1987 (121)	Studied tourist behaviour and experience.
Scherl	1988 (122)	Used RGT in a natural setting to gain constructions of the 'Wilderness experience'. Good discussion of eliciting grids in the Wilderness.

3.5 Methodology Used In One To One Interviews

Aims:

a To evaluate the use of Personal Construct Psychology (PCP) in the context of describing the attributes that an individual uses in their perception of landscape quality.

b To assess any differences that occur in the perception of landscape quality between three different populations, professionals in the landscape field, tourists visiting an area, and the residents of the area concerned.

Preliminary objectives:

a To develop a working format for the use of Kelly's Repertory Grid test in the field of Landscape studies.

b By use of a small study to appraise the constructs used. These are to be found by in depth study of small samples from each population.

c To devise a simple way of using PCP for large scale samples of the three populations.

d To consider the possibility of using PCP to obtain information about attitudes to land use change, which could then be used in future policies for land use management.

e To elicit data for use in mapping in a GIS framework.

Method:

During the course of this experiment three different means of eliciting both elements and constructs were attempted, for this reason methodology will be discussed chronologically.

Pre study trials:

Sample:

A group of six lay people were tested. They were all between 24 and 28 years of age, and had completed University education. It was a condition of the trial that a reasonable knowledge of Scotland was held.

Interview:

Interviews were completed using the CARL program. This was an Edinburgh College of Art/Heriot-Watt University 'in house' program developed for the analysis of Repertory Grids. It provides a feedback loop and a laddering phase both which offer the possibility of further clarification and differentiation of the element-construct matrix.

Element elicitation:

The first requirement of the program is an element set. It was decided that a starting set of ten elements would provide an adequate, manageable element set to work through the early sections of CARL. Instead of merely asking ambiguously for ten landscapes that the respondent knew, to get a variety in landscape type the following questions were asked.

a Can you think of a landscape that you particularly like?

b Can you think of a landscape that you don't like?

c Can you think of another landscape that you particularly like?

d Can you think of another landscape that you don't like?

e Can you think of a landscape where you would like to go on holiday?

f Can you think of a landscape where you would not like to go on holiday?

g Where do you live?

h Can you think of a landscape where you would like to live?

i Can you think of a landscape that you like to look at?

j Can you think of a landscape that you do not like to look at?

Construct elicitation and rating:

Following the input of elicited elements, CARL was set to the construct elicitation mode. This follows the Kelly Repertory Grid Test formula of presenting groups of three elements (triads) and asking the respondent why two are similar and dissimilar to the third, this differentiation is taken as the first construct and a rating sequence begins. A seven point scale was used, the poles being the two poles of the construct. All landscapes in the element set are rated in this way before the sequence comes full loop and begins with a different triad. This process was repeated until the respondent was unable to find a new differentiating factor or ten constructs had been obtained, a minimum of six constructs was required for any meaningful analysis to take place.

On line analysis:

Laddering:

This first requires importance ranking of the constructs gained. The program then starts at the construct given the highest ranking. The respondent is asked which pole is preferred and why. The reason why is given as the first pole of a new construct, the respondent being asked to complete the second pole. They are then asked to rate all the elements on the new construct before being asked for this new construct which pole they prefer and the sequence starting again. When the

respondent is unable to answer the question 'why' they prefer one end, and would merely be reiterating previous constructs, the process starts afresh with the construct ranked second most important. In this experiment only the two constructs ranked most important were used for laddering.

Analysis:

CARL correlates ratings for both constructs and elements. For constructs, it will pull out the two most similarly rated and ask for a further element (landscape) that would differentiate between the two constructs. For the elements, it asks you to differentiate between the two landscapes rated most alike, if this is possible this provides a further construct. In both cases you are then asked to rate either the new element on all the constructs, or each element on the new construct.

If you are unable to discriminate between the elements/constructs, CARL gives you the option to merge constructs/elements, this option was ignored in this experiment as the purpose was to gain as many constructs as possible. This procedure was continued until either the correlations were below 80%, the subjects cooperation was wavering, or the time available had been exhausted.

Pre study discussion:

The pre study tests indicated a few problems with the methodology. As the one to one interview survey was to be completed mainly by Professional people during working hours, it had been decided that an interview length of about 60 minutes would suffice. Each pre study test took a minimum of about 100 minutes rising in one case to nearly 250 minutes. Problems were also encountered in the elicitation

of the element set. Respondents had problems with several of the categories of landscapes, particularly those with a more negative bias (don't like, would not wish to visit, etc). For this reason some alteration was made to the methodology used for the one to one survey.

One to One Interviews:

Sample:

The initial aim of this study was to assess three different sample populations, professionals within the landscape field, tourists visiting an area and the residents of the area concerned. This was subsequently modified mainly due to difficulties in obtaining interviewees and time limitations.

When the experiment was first considered it was decided to use Badenoch and Strathspey District in Highland Region as the focus for the tourism and resident sections of the sample. However the length of time involved per interview created a seemingly insurmountable problem. Despite the consideration of various methods of obtaining interested tourists for this length of time, it was eventually decided to drop this section for this stage. It was intended to use representatives from the Community Councils within Badenoch and Strathspey District for the local resident section. This was found to be a reasonably easy way into the local communities. After the first section of interviews (tests 1 -> 12), and the dropping of the tourism element, the emphasis of the study was shifted. For convenience some later interviews were completed using lay people from outside this district. This gave a wide age range (22 to 65+) with a variety of occupations. The only common element being that none of them had any formal landscape training.

The 'expert' section proved to be by far the easiest for which to obtain willing interviewees. The group that was finally interviewed consists of individuals from The Macaulay Land Use Research Institute, Scottish Natural Heritage, The Forestry Commission, Highland Regional Council, The National Trust for Scotland, academics and freelance consultants. All worked in areas relating to landscapes and had a good knowledge of a variety of Scottish landscapes.

The final sample comprised of:

Tests 1 -> 12: 8 experts and 4 lay people

Tests 14 -> 25: 8 experts and 4 lay people

Tests 1 -> 12:

Elicitation and Rating:

In an attempt to cut down on the time taken and eliminate the problems with element elicitation, it was decided to begin the interview with a 'dyad discussion', the idea being that landscapes were generated by contrasting attributes, thus eliciting a number of constructs as well as the element set. An example of this would be:

a Can you think of a landscape region that you like.....(Element 1)

b Can you think of a landscape region that is different from the first in some way important to you.....(Element 2)

c So when you describe element 1 as... ??, you would describe element 2 as ...?? (Construct 1)

d Can you think of another landscape region that you can describe on the dimension ??...??? (Construct 1).....(Element 3)

e Can you think of a landscape region that is different to element 3 in some way important to you.....(Element 4)

f So when you describe element 3 as... ??, you would describe element 4 as ...?? (Construct 2)

In this way ten elements and four constructs were obtained. To gain the rest of the constructs the triad procedure resident within CARL was used. It was also decided to have three 'given constructs', these were to be included in each interview if they were not elicited by the interviewee themselves. They were:

Like to visit....do not like to visit

Would like to live there....would not like to live there

Would tolerate change in....would not tolerate change in

Analysis:

Before on line analysis commenced it was decided to introduce some discussion over the landscape change construct. This was by asking for the advantages and disadvantages of change to the landscape nearest the poles for the construct "Would tolerate change in....would not tolerate change in".

On line analysis was completed with the same procedure as in the pre study tests.

Discussion:

Some problems were encountered with the dyad elicitation procedure. It was found to be too complex and difficult for the interviewee to grasp the concepts of elements and constructs. The total time taken for the procedure was still far too long, the average time being 105 minutes, this meant that the latter sections had a tendency to be left out due to time constraints.

To try and cut the time down even further, a new method of elicitation was required, tests 14 to 25 were therefore completed with the new method.

(NB: Test 13 was the first test to be completed with the following method, but computer failure caused the loss of the information gained, and this interview has subsequently been dropped from any further consideration.)

Tests 14 -> 25:

Elicitation and Rating:

An element set was generated from the elements generated from the first dozen interviews. Areas which had been chosen more than once were picked, and some other areas to give a Scotland wide geographical spread. This gave an initial set of 30 landscapes. Interviewees were asked first to separate them into areas they knew and areas with which they were not familiar (these were then discarded). They were then asked to select 3 areas they particularly liked, and 3 that they did not like as much as the others; From the remaining set they were asked to pick 2 that they would not have liked to see changed in anyway and 2 in which they would not mind change as much. It must be pointed out that the interviewees used different landscapes within these areas as the basis of their answers to the following CARL analysis.

This seemed to be a simple way of gaining elements quickly and of starting the interview and focusing the interviewee on the matter in hand.

Constructs:

It was decided to add to the three given constructs that were used throughout. A given set of twelve comprised the original three plus nine culled from the results of the first dozen interviews. Many similarities were seen in the constructs gained, and from these the following group was decided on:

Mountainous ....Flat

Water....No water

Trees....No trees

Intensive agriculture....Wild

High population....Low population

Scenic....Not scenic

High human impact....Low human impact

Comfortable....Hostile

Colourful....Bland

Original group

Like to visit....Do not like to visit

Would like to live there....Would not like to live there

Would tolerate change in....Would not tolerate change

Analysis:

This was completed with exactly the same procedure as in the first twelve tests.

Discussion:

This method enabled, in most cases, for the analysis section within the hour available. It did however create some problems of its own - size variation within the element set and lack of knowledge of position in the construct hierarchy. It was

also found that certain individuals were unable to use certain of the given constructs in a useful manner. Difficulties over provided constructs would be predicted from the theoretical assumptions underlying the technique (see section on theory). In such cases the construct in question was dropped.

3.6 Results For One To One Interviews

Introduction:

The differences in elicitation procedures used between Tests 1 to 12 and Tests 14 to 25 encouraged separate analysis in the first instance.

Tests 1 to 12

This group contained 8 Experts and 4 Lay. A total of 108 freely elicited constructs emerged. Table 3 shows the constructs divided between the expert and lay groups. It was possible to place all constructs into one of three categories:

Attributes of the landscape

Human impact

General Evaluations.

The Attribute category covers the more natural physical attributes of the landscape. It was found possible to further subdivide this category into 4 groups covering attributes of topography, water, vegetation and scale. Human impact covers those aspects of the landscape which are subject to cultural modification. It was not found possible to easily subdivide this category, though a loose grouping dealing with aspects of agricultural practices was found. Human evaluation covers the perceived characteristics used to evaluate the landscape experience.

It was hypothesised that professional training would result in a higher number of constructs used to discriminate between landscapes. With this small sample this was indicated but not found statistically significant. Table 4 shows constructs showing high variance. Kelly (59) believed that constructs showing high variance (and therefore highest discrimination between elements), would be the most useful to the individual. Chi squared analysis in Table 4 indicates that:

a the Experts tended to use more attribute constructs

b the higher variance constructs were mainly in the attribute group for experts

c the constructs for tolerating change appeared more often in the high variance group.

These findings concur with those of Leff and Deutsch (118), and Pennartz and Elsinga (123).

Principal Component Analysis:

In almost all cases of experts and lay, 4 dimensions were sufficient to account for over 85% of the variance. Average variances for the Expert group before and after rotation can be seen in Table 5.

Although 4 dimensions were sufficient for each individual there were considerable variations between individuals in the associated constructs of each dimension. Nonetheless typical patterns were:-

(E12)	natural cultivated	rolling hilly	compact extensive	islands water
(E3)	cultivated farmed	flat mountains	visit look at change	water

(L2)	enclosed	wild	unconventional	familiar
	restricted	dynamic	not change	live in
	hills	dour		look at
	visit			

The general evaluations were scattered across the 4 dimensions. The dimensions found are compatible with those of Purcell for

a Studies of scenic value (124)

b What makes a landscape typical (86)

"Multi-dimensional scaling analyses of these judgements revealed that the relationships between a set of landscapes involves four dimensions:

- scale or extent of the scene
- naturalness or the amount of man-made intervention
- the presence and distinctiveness of topographic features
- the presence and amount of water" (87)

Landscape change:

The constructs which were found to be linked to the change construct can be seen in Table 6. Intuitively and from the literature on landscape preferences, the results gained were those which might be anticipated. (See 125, 126 and 6 for example). The nature of the Evaluation category does however highlight some discriminators not normally elicited by more conventional perception assessments; Eg Unconventional-ordinary and Isolated-constraining.

Speyside was a given element for the first 12 tests. It is interesting to note that for this area expert opinion is divided whereas lay opinion suggests no change. This is shown in Table 7 which shows the position given to the elements for the change construct. The divided opinion pattern is indicated with other elements, but as

elements were freely elicited and sample size small, only Speyside was used frequently enough to highlight this point.

Element elicitation for Tests 1 to 12:

In all 86 different areas were elicited with only 17 of these chosen more than once. Table 8) shows the elements gained in the first 12 tests.

Frequency of construct elicitation:

A simple frequency tally of constructs gained in the freely elicited section is shown in Table 9. Fifteen constructs appear more than once, those appearing only once are subdivided into the three sections attributes, human impact and evaluation.

Tests 14 to 25:

Elements elicited:

As the second twelve tests had elements elicited by a different procedure, it can be seen (in Table 10) that the total number elicited is smaller, (ie. 44 as opposed to 86) and 30 of those were chosen more than once as opposed to 17 in the first twelve tests. All 33 of the areas in the card system were chosen, with only 4 out of the 33 being chosen only once. (The rest of this section is the product of the analysis section and thus effectively freely elicited.)

This cumulates in Table 11 showing the elements elicited for all tests. Speyside has been removed where it was a given element. This gives a total of 96 elements, 36 of which were chosen more than once.

Elements chosen in elicitation:

It is possible to see once more the divided opinion within the expert group, even by their choices to the eliciting questions, 3 landscapes you like, 3 you dislike, 2 you would tolerate change in, and 2 you would not like to see changed. All 3 of those landscapes appearing 3 times in answer to the 'like' question also appeared in the 'dislike' column. (See Table 12.) Individual differences can also be seen in the answers to the change question, for example Rannoch Moor appearing 3 times in the tolerate change column as well as in the like and dislike columns, and Cairngorm in the tolerate change and not change columns.

Principal Components Analysis:

Preliminary analysis has indicated that the data seems to replicate the four dimensions found in the first twelve tests. The relationship was examined between distance from pole and the resistance to change scale. The "distance" measure was summed across all scales involving landscape attributes. The resulting correlation was 0.67 indicating that resistance to change was significantly related to the degree to which an element was close to the construct pole. This finding was very much in line with work on Goodness-of-Example which Purcell has carried out in his work on landscape typology.

Conclusions from One to One Interviews:

a Two different forms of interview were explored with essentially similar results.

b The results identified a number of salient constructs related to peoples images of the landscape. These images are, of course, at a general level

as a consequence of landscape naming in the interviews. Four dimensions appear to be sufficient to account for the perceptual judgements underlying these general images. In addition specific constructs related to change have been identified. These can now be used as fuzzy parameters towards perceptual mapping within GIS.

c The results are similar to Purcell's work on landscape typology, which provides support for the schema discrepancy hypothesis. In brief this is the hypothesis that our affective emotional responses to landscapes may depend on the discrepancies that exist in an internal match we make between incoming information and some stored representation in memory of the gist of previous similar experiences. Our reaction and emotional response seem to depend upon:

i Our dispositional liking/disliking for the category to which we see the particular landscapes belonging.

ii Momentary comparisons between the particular landscape we are looking at and the best example (ie. most representative member) of a particular category which is stored as a default value in memory. The best example is seen as a prototype sharing most attributes in common with other category members and least with members of other categories.

There is some evidence that prototypes are reasonably stable within a culture - ie most people agree on what constitutes a "best example", although there is no direct result of this using landscapes of Scotland as elements. Where individual difference occurs is in how we handle different types and extents of discrepancy. The similarity between the dimensions in this study and the further finding of a

relationship between degrees of likeness to the pole and resistance to change, suggest a development of the work towards landscape typology and goodness of example.

Further research could examine evidence of prototypical structuring of landscape. If this exists then we need to explore whether landscapes amenable to change are related to dispositional dislike or to discrepancy from prototype. That is liked categories or best examples might be perceived as least amenable to change whereas disliked categories or those sitting on fuzzy category boundaries might allow change. In pursuing this it would be important to examine the way landscape attributes contributed towards category membership.

CHAPTER 4 - ATTEMPTS TO INTEGRATE PERSONAL CONSTRUCT THEORY WITH GEOGRAPHIC INFORMATION SYSTEMS

4.1 The Role of Geographic Information Systems in Landscape Studies

History of Development:

The use of maps for the storage of spatial data has a history even longer than that of the first alphabet (127). By the use of a map and some standard coordinate system most societies have been able to measure, store and portray spatial attributes. The process of storage and retrieval is a simple matter with small amounts of data; however, the retrieval of large amounts of data and the determination of relationships between elements is more complex. Conventionally the integration of data sets has involved the transformation of all data sets to a common scale and the creation of transparent overlays for each set. A composite overlay of the required information can then be created. This is a time consuming, highly complex process subject to a high rate of error. The information stored may need to be frequently updated, this creates further expense, time consumption and possibility of error as the updating takes place on each overlay.

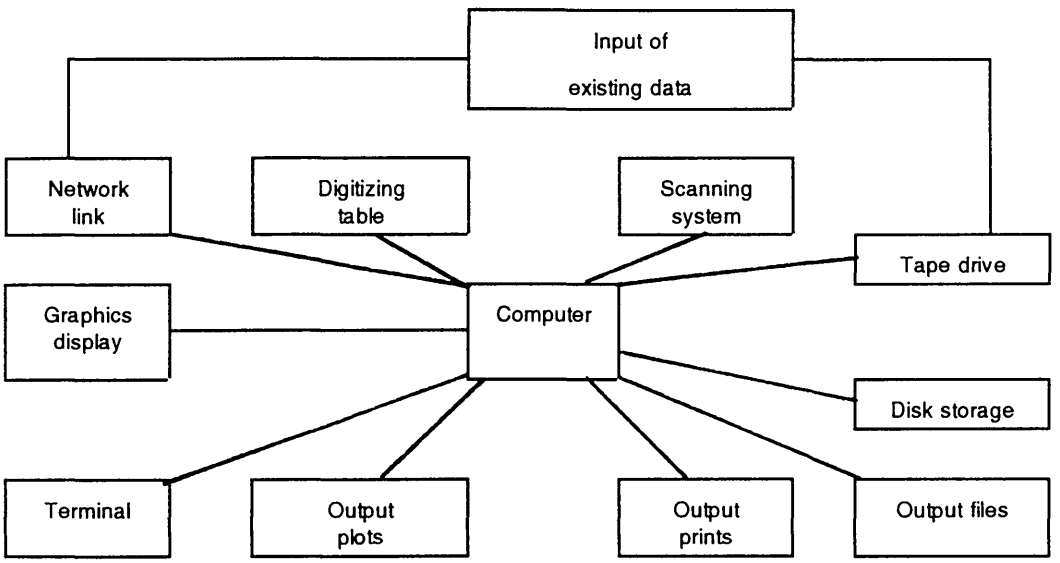
As early as the late 1950s the development of computer technology to a level capable of the speedy handling and storage of digitised data, raised questions as to possible applications in the manipulation of spatial data. In the early 1960s the first major trial in handling large amounts of spatial data was made in Canada (Canadian Geographic Information System `CGIS'), though this system was largely successful and cost effective, other trial systems were found wanting through poor design and the "failure to anticipate the special technical problems encountered in

handling spatial data in large volumes" (127). As time and technology have progressed, Geographic Information Systems (GIS) have in general moved away from the unique custom built systems originally used to a state where most systems are general purpose, `turnkey' systems.

What is a Geographic Information System ?:

A Geographic Information System is a collection of tools which permit the various functions required in the "collection, storage, retrieval, transformation and display of spatially referenced data" (3). It is however the modelling and thus predictive capacity of GIS which has been most widely used in the environmental field.

Figure 4 Hardware components of a GIS (After Davidson (3))



The hardware tools of a GIS can be seen in Figure 4.

Input:

There are various methods of data input.

a Digitizing "A map is traced with a cursor over a digitizing table in order to produce digital data" (3). This method leaves data with four attributes, "a

location within a coordinate system, codes to indicate the feature type, an associated value and information on the topology of the features".

b Scanning "Maps can be scanned automatically, the features coded accordingly with type, value and topology". (3)

c Data from Network links uses digitized data from other sources such as remote sensing or organizations dealing with this commodity.

Output:

In line with other computer systems, this can take the form of plots and prints, the quality of which depends on the actual hardware used. Output files suitable for importing into other systems are another useful output product. It is, however, the quality of the initial data which is of paramount importance in the processing and consequent results derived through any GIS.

GIS have been applied to a wide range of tasks, (for examples see 4). The Chorley report into the `Handling of Geographic Information' (4), suggested there is "Considerable potential for growth in a large number of applications areas". They cautioned that the "rate and nature of growth" would be influenced by four major factors:

a The cost of adopting the new techniques.

b The availability of the data in the required form.

c The development of better and easy to use techniques for handling digitised spatial data.

d How quickly people become aware of the benefits of geographic information technology and develop the skills to exploit them (4).

This review will now look specifically at the areas for consideration in this research project, those of land evaluation and landuse planning, with special note to Scotland.

Davidson (128) notes that the "major technological advance relevant to land evaluation during the last 10 years..must be the development of geographical information systems". Davidson continues to promote the use of GIS for land evaluation by considering the range of processing capabilities available to the GIS user, that of digital terrain models, polygon processing, spatial interpolation of land resource attributes and integration with data derived from remote sensing. This promotion is however tempered by a caution; "The whole analysis must be issue driven and a potential user or purchaser of a GIS must have clear objectives. The key aim must be the production of spatial data in forms most appropriate to the issues being addressed. There is the potential danger in using a GIS of information overload; the operators can become over concerned with the output capabilities of such systems and the users will be swamped with maps of different types..this multiplicity proving..counterproductive and encouraging confusion rather than clarity" (128).

Table 13 highlights some of the attempts that have been made in incorporating GIS in landscape evaluation in Scotland.

Table 13 Research incorporating GIS in landscape evaluation in Scotland

Researchers	Year	Study
Scottish Development Department (Robinson)	1979 (129)	A pilot project in Fife investigated feasibility and costs of developing a system for processing of information relating to rural planning in Scotland. Proved too expensive with the technology available at the time and was suspended.
MLURI (Aspinall *et al*)	1990, 1993 (130, 131, 132)	Aim was a baseline for monitoring present and future changes in the countryside of Scotland, allowing rates of land transfer between major land uses to be established accurately.
University of Stirling (Selman *et al*)	1991 (133)	Tinto Hills Project - Use of Digital Terrain Models (DTM) in assessing impact of proposed Forestry.
MLURI (Aspinall and Miller)	1990, 1993 (130, 131, 134)	Indicative Forestry Strategies - information presented in mapped format showing simple categories of land and their sensitivity for forestry.
University of Stirling (Selman *et al*)	1991 (133)	Aonach Mor Skiing Development - Creation of a detailed DTM to assess visual impact of proposed Skiing development.
University of Stirling (Selman *et al*)	1991 (133)	Skye Power Line Project - Creation of A DTM to assess visual impact of power pylons and cabling.
MLURI (Aspinall)	1990 (130)	Predicted the habitat suitability for Red Deer in Grampian Region. Linked spatial modelling and GIS to develop predictive maps.
MLURI (Miller *et al*)	1994 (136)	Scenery analysis in the Cairngorm Mountains. Two types of analysis was completed: Point analysis whereby the visual impact of a point in a particular direction can be assessed. Wide area analysis where it was possible to calculate viewsheds for tourist viewpoints and identify zones of particular importance to visitors from this.

Conclusions:

This review has shown that the introduction of Geographical Information Systems

has delivered a powerful tool to anyone concerned in the management of spatially referenced data. Perhaps the greatest impact the establishment of GIS has had is in the Utilities. There is scope for GIS in land use planning. Never before has such data management been easily available, storage, retrieval and updation facilities combined with an increase in remotely sensed data collection has enabled all relevant data to be literally at the planners fingertips. Analysis and dataset overlaying capabilities allow speedy results to be gained where once years of work would have been the only way to achieve an answer to the questions posed. DTM's allow an insight into the visibility of future developments, and can be quickly altered to allow for changes in development plans, or scenarios such as changes in surrounding land use. DTM's can even be said to allow for the vagaries of the Scottish weather, as it is possible to simulate the effect of sunshine as well as cloud. The use of GIS as a tool for modelling opens up new avenues for anyone concerned with the environment and the implications of land use change.

As a tool in land management, GIS provides many answers for planners and policy makers alike. At a time when there are more pressures than ever before on the Scottish landscape, and a consequent unprecedented level of legislation to try and mediate between competing interests, GIS allows for the storage of data, models the data to provide useful answers, and produces output in mappable formats which are required. However, one factor that must be remembered when contemplating the use of GIS, or considering the results that have been gained is that of data quality. It cannot be stressed too strongly that the results gained through GIS are only as good as the data that was input and the models used in analysis.

Error is a complex subject. It is not only the raw data quality that should be subject to scrutiny, but it must also be remembered that digitisation can give false precision to previously fuzzy boundaries, a "false understanding of the accuracy and precision of the data" (131) may be gained. Error can be caused in the analysis due to the manner in which numbers are represented by computers. These problems must be recognized when output is produced. Error estimates associated with output may be one way to acknowledge that it is known that, for example, where data on different scales have been transformed, that error is present, but that some calculation has enabled an error estimate to be derived.

4.2 Preliminary Attempts at Mapping Results

The objectives of the project state that assessment must be made of how this methodology may be used in consideration of the landuse management and policy development. This question was tackled in the previous section. Geographic Information Systems were seen as a tool which was finding favour amongst both planners and policy makers, and it appeared likely that future developments within the field would see a greater integration with the more traditional methods of landscape assessment. Landscape perception and preference of various user groups (residents, tourists and various recreation groups, walkers, canoeists, and mountain bikers, for example) incorporated within the GIS framework would provide useful information for a variety of planning and landscape designation issues.

For the methodology we have used to be useful in the context above, it must be possible to successfully map peoples perception within a GIS. This section charts the preliminary attempts that were made in perceptual mapping using data gained.

4.2.1 Building the database

Choice of constructs:

Through the PCT one to one interviews, 108 freely elicited constructs were available. As this was very much a preliminary development of methodology, it was decided, in the first instance, to concentrate on the more biophysical tangible constructs than the more evaluative constructs.

The first criteria for choice was that the construct had been linked to resistance to change. This gave twelve constructs (see Table 14). The second criteria was if the construct had been frequently freely elicited, this gave seven constructs.

A total of sixteen individual constructs resulted, these were divided by the dimensions found (see Table 15). Due to the end requirements of the database it was felt that constructs used in the second phase of CARL interviewing should also be included. Though most of these had already been chosen for mapping, three others were also included, wild-intensive agriculture, scenic-not scenic, and low human impact-high human impact, these have been included in Table 15, and brought the initial number of constructs to be mapped to nineteen.

4.2.2 Development of datasets

Scale:

The three constructs in this dimension were considered to be very similar in their cognitive derivation. Due to this they were combined to form one construct enclosed-open. Preparatory thoughts were that three measures were required:

distance that can be seen

whether this view/distance is available through 360°

some measure of exposure.

In conjunction with Dr D Miller of MLURI it was decided to develop an intervisibilty map based from the 5KM OS points. It was thought that this should highlight those areas which were broadly open or enclosed. If this data proves useful a possibility of further refinement to a resolution of 100m would give a greater amount of information on a local scale, as opposed to the current broad scale. Intuition points to the fact that a finer resolution would give more possibilities for exploring this dimension accurately. Unfortunately this dataset was unavailable for use in this attempt at mapping

Human intervention:

Although some of the constructs in this dimension are quite similar it was decided to map them all before making any decisions as to their future usefulness.

Wild-intensive agriculture:

The data for this construct was taken from the Land Cover of Scotland dataset (137). The data were categorised as either wild land, land under intensive agriculture, or land not applicable to the construct. This was intended to show the extremes of agricultural impact therefore land not applicable to the construct consists of not only land taken out of agricultural land use but farmed land not at the extremes, for example areas of mixed farming. When first elicited this construct was used to differentiate between levels of agriculture, the impact that more intensive farming methods have on the Scottish landscape.

Hill farm-arable farm:

As this is a very similar construct to wild-intensive agriculture, it was originally hoped to use an alternative data source. This would have enabled some measure of the affect the input data had on the output. Unfortunately no other digitized data was found, the data has therefore been taken again from the Land Cover of Scotland dataset. The classes have however been refined to show the level of agricultural impact in more detail. The classes are, arable farming, mixed farming, hill farming, and land not applicable to the construct, in this case land taken out of agricultural production.

Recreation-intensive farming:

In mapping this construct the primary consideration was the original meaning of the pole "recreation". This word was used by the interviewee to differentiate between those areas which were suitable for leisure activity (in this case walking) and those areas deemed unsuitable, - the example in the construct being areas where land is intensively farmed. Taking this into account, recreation was taken to be land not "intensive". This was too similar to 'hill farms-arable' and 'wild-intensive' to be useful and was therefore dropped from further consideration.

Crofting-agriculture:

The last construct dealing with agriculture, considers the difference between the impact crofting and larger scale farming have on the landscape. No recent data has been found to indicate areas where crofting is being practised. It was therefore necessary to drop this construct from further consideration.

Trees-no trees:

This construct was taken to mean the amount of tree cover in the landscape. Data was taken from the Land Cover of Scotland dataset, and was categorized as; tree cover, partial tree cover, no trees. It is therefore possible to have specimen trees in the 'no trees' class, as the available data deals only with stands of trees.

Natural-afforested:

The tree cover was then crudely identified as being natural or planted. Again this was possible using the Land Cover of Scotland dataset. Four classes were identified, natural tree cover, semi-natural tree cover, afforested, and no tree cover. It is hoped this identifies those landscapes which are associated with large scale afforestation.

Non industrial-industrial:

A measure of development in the landscape. Data from the Land Cover dataset enabled three classes to be used; non industrial, industrial and built-up. The differentiation between industrial and built-up can be used in cases where a term like 'developed' is required, as opposed to just pure industrial sites.

Low human impact-high human impact:

This is one of the given constructs from the second phase of interviewing. It is closely linked with industrial construct above, and indeed low human impact has been taken to be the definition used for non-industrial before, with high human impact being both those areas deemed to be built-up as well as industrial areas. It was decided to leave areas such as those intensively farmed in the 'low'

category as it was felt this construct was more a measure of the demarcation of rural and urban areas, than levels of agricultural impact. One area for further study would be the sensitivity of preference if areas such as those intensively farmed are included in the high impact class.

Low population-high population:

Though some digitized measures of population have been tried, it has not been possible to procure a useful data source for this construct. As this has been proven to be a good discriminator in the past, it is hoped some measure of population or an appropriate surrogate will be found for use in further research.

Prosperous-rundown:

It has not been possible to find a dataset to encompass the thought behind this construct. The original construct being used to differentiate between areas which on the surface appeared to be prosperous, prosperity being more synonymous with the notion of well kempt than of fiscal affluence. This construct was, therefore, also dropped from further consideration.

Wildlife-no wildlife:

It was hoped to combine the known habitats of those animals thought to epitomise 'Scottish Wildlife'. If this is taken as those used in Scottish tourism marketing the selection will include, Deer, Golden eagles, the Osprey, the Haggis and certain deep loch Monsters. Unfortunately appropriate digitized data was not available during the course of this research.

Scenic-not scenic:

It was hoped to find some measure of scenic beauty. One possibility was to use designated areas, National Scenic Areas, and other protected landscapes. Again due to a lack of digitized data this has not been possible and this construct was dropped from consideration.

Water:

It has been possible to include both constructs in the database, but only in a limited way. Preliminary thoughts were that as water was such an important feature in the landscape, different measures were required for,

the presence or absence of water

the proportion of the view water comprises

whether the water is in one mass or in differentiated areas

Water-no water:

This has been mapped as a simple presence or absence of water, taken from the Land Cover of Scotland dataset. It is important, and would be interesting, to consider the effects the other, more complex, measures would have on landscape value. It is hoped this research may be considered for the future.

Coastal-inland:

The coastline has been included in the database, though again only the primary present/absence measure has been fully completed. It has been possible to include a 1km buffer zone, this gives a 'coastal zone' as opposed to merely the physical line of the coast.

Topographic features:

It was decided to include all measures of topography, under the one to one study second phase interview construct, mountainous-flat. Data was taken from the landform features section of the Soil Survey of Scotland (138). The landform data has been reclassified into the following classes:

mountainous

rugged

rolling

undulating

flat.

This was completed by firstly defining each class in relation to the landform data.

Mountainous:

Any landform entry that specifies mountains, this can be 'mountains' or 'mountain summits'. This was the most straightforward category to classify.

Rugged:

A class that should include:

a Any landscape that is described as "rugged" (Eg Map unit 30, "Rugged hills with strong and steep slopes; Very rocky").

b Any entry that specifies very steep slopes which are moderately to very rocky (Eg Map unit 31, "Hill sides with steep and very steep slopes, moderately and very rocky".

c Uplands which are moderately to very rocky.

Rolling:

Very much used as the middle class to describe everything which was not "rugged" enough to be in the rugged class, but was not "undulating". This class therefore covered everything from, "Hills and valley sides with gentle and strong slopes; non-rocky" (Map unit 6), to, "Lowlands with gentle and strong complex slopes; slightly to moderately rocky." (Map unit 207). The emphasis being more on lowlands and valley's which are non or slightly rock, and with gentle, complex or strong slopes, but not rocky or very steep slopes.

Undulating:

Covers all classes that begin with the words "Undulating lowlands..." though not undulating uplands which are in either the rolling or rugged class depending on their further characteristics. This class also covers valley bottom features, and lowland features such as "Mounds and terraces with gentle slopes" (Map unit 580).

Flat:

The simplest category - Map units 1 & 2, "Flood plains, river terraces and former lake beds" (Map unit 1) & "Saltings" (Map unit 2).

These definitions were then applied to each entry. The classifications are extremely subjective. It may be interesting in further attempts at mapping to test the reproducibility and replicability of these categories.

This method also leaves 1.9% of Scotland unaccounted for. This is because the map does not give landform data for areas that are built up or areas of rock and

scree. This is particularly noticeable on Skye where the Cuillins are lost due to being classified as rock and scree. Error is also noticeable on Lewis and the north-west of Galloway due to error in the digitized map; for this project this type of error is fairly unavoidable.

4.2.3 Future needs for the database

It is important that data is available, and in a useful format, for those constructs recognized as landscape discriminators. To this extent it is important that attention is paid to the requirements for the constructs,

low population-high population

wildlife-no wildlife

scenic-not scenic.

To improve the end product of this methodology, and to explore in more detail important concepts, it is felt important that the scale and water maps have some of the more complex notions included in them.

4.3 Preliminary Results Gained

4.3.1 Mapping for an individual

Method:

In the first instance it was decided to use the data from a single interview. The individual, (Test 16), was identified which used the greatest number of constructs for which data was available.

In the absence of information on landscape preference, it was decided that information gained for the construct 'tolerate change-not tolerate change' would be a useful surrogate. Those constructs most significantly related (>0.7) were identified. Three constructs were found, (the preferred pole has been underlined), mountainous-flat, wild-intensive agriculture, and, low human impact-high human impact.

The mapping procedure selected those areas classified in the database as being mountainous, wild and of low human impact. These areas were then mapped on top of each other and coloured according to whether none, one, two, or all of the criteria were present.

Results:

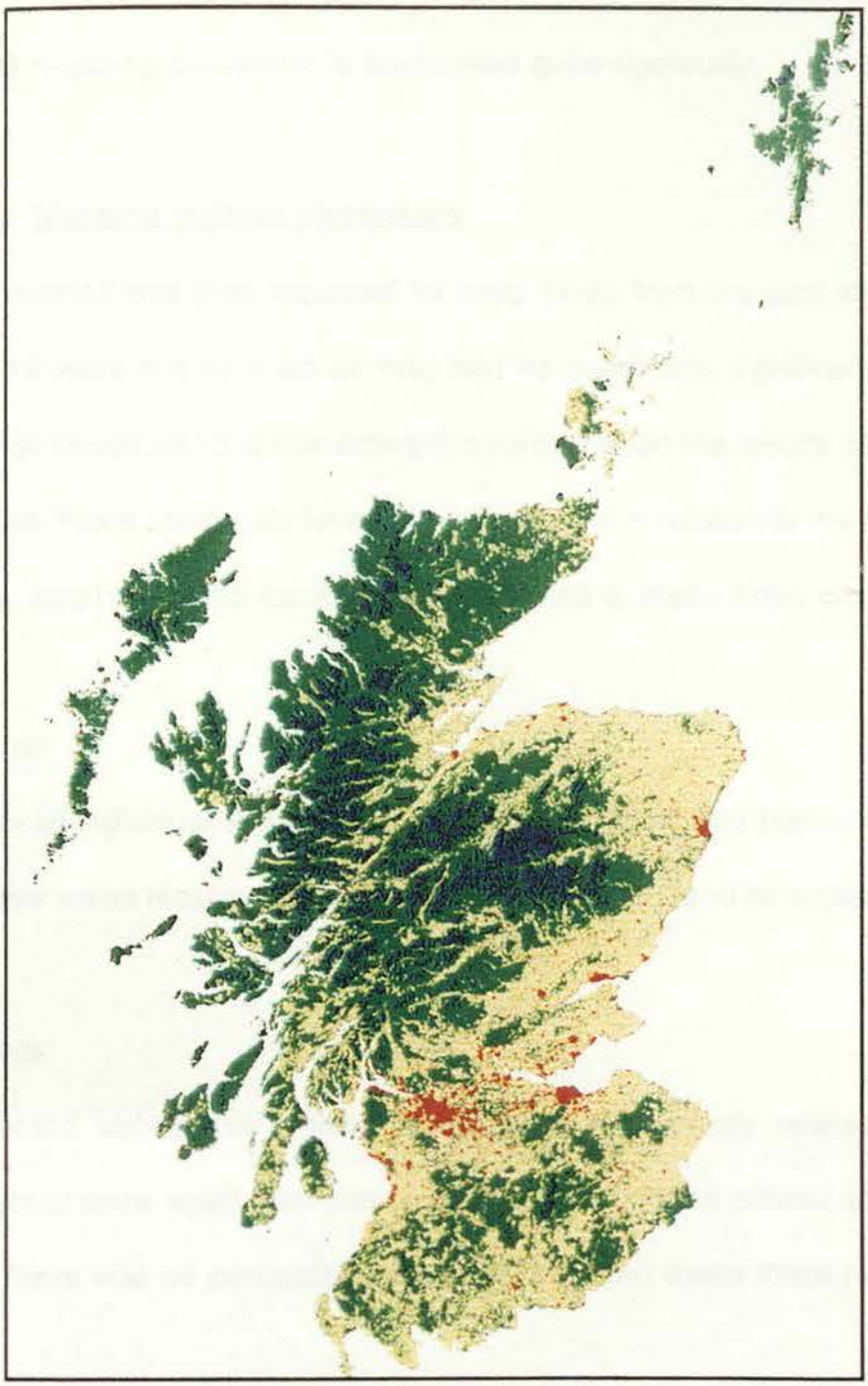
The resulting map (see Map 1) shows where the preferred end of the constructs are present. From red where none of the preferred criteria are met, to dark blue where all criteria are met.

Discussion:

Due to the nature of the three criteria used for this map, only small areas of Scotland fulfil all three criteria. This is due to the mountainous pole being used, the map for Test 16 can be seen to be a relief map of Scotland. The most preferred areas being mountainous - the other criteria wild and low human impact are generally associated with mountainous topography. It can be seen therefore that this map is topographically driven.

Map 1

Number of criteria met in Scotland for preferences of Test 16



Preference

- No preference
- meets 1 of criteria
- meets 2 criteria
- meets all criteria

Criteria:
1. wild
2. low human impact
3. mountains

In the future it would be interesting to consider the effect of slightly broadening the criteria which is dominating the mapping procedure. In this instance including the category "rugged" would increase the area (covered by the category where all criteria are fulfilled) quite dramatically. It is important therefore that the sensitivity of the mapping procedure is questioned quite rigorously.

4.3.2 Mapping multiple perceptions

The method was then repeated for tests 14-25 from the pilot study (Tests 17,18 and 19 were not mapped as they had no constructs significantly related to the change construct.) It is interesting to note that when the results of these tests were viewed, those constructs found to be significant in relation to the change construct were, apart from one case (water), restricted to these three constructs.

Method:

When all individual test results had been mapped it was possible to create maps to show areas most preferred for all tests combined, and for expert and lay groups.

Results:

As noted above, the criteria found to be significantly related to the change construct were, apart from one case, restricted to three criteria. It is due to this fact that there was no perceptible difference between these three maps.

Discussion:

Again it can be seen that these maps are being driven by the topographical construct mountainous-flat. It can be seen therefore that this method, although a

reasonably successful preliminary attempt at perceptual mapping, is by no means covering the entire story. The procedure was failing to identify any landscape type but mountainous. A method must be derived which accounts for differences in landscape type and the purpose of the visit. It is important therefore that the more subjective constructs are mapped, as these should allow for some of the differences in landscape type and purpose of visit for the perceiving individual.

4.4 The Parish Datamap

Why this map was developed:

As it had been possible to reasonably successfully map the more obvious physical characteristics of the landscape - topography and the presence or absence of tangible properties, the next stage was to try and map the more subjective evaluative constructs. Here the problem is the building of the dataset. Instead of seeking attributes from other datasets we were required to build up a map of Scotland from the fuzzy data available.

It can be seen that the data from the one to one interviews could not supply the coverage for the entirety of Scotland, as each interview only gave data for named area images, for which there was no spatial reference. It was decided to map the evaluative ratings of one person for the whole of Scotland. Due to time and resource limitations, a method was required which could draw on ready digitized area information. The Parish map was the obvious choice given these circumstances. The Parish map is simply a map of all Parish boundaries in Scotland. Although some limitations were found, for example Shetland is not included in this map, the use of the Parish boundary data did allow an attempt at this exercise.

4.4.1 Mapping subjective constructs

Method:

As one person was to evaluate their images of Scotland for certain constructs, it was possible to resolve one of the main problems and criticisms of the one to one interviews. The method used in these interviews did not allow the spatial referencing of the named areas each individual was rating. In using the Parish map, it was possible for the person rating to identify those Parishes which they thought had different landscapes.

This grouping of Parishes into landscape areas yielded 58 landscape areas from the 890 Parishes. When any rating for these areas was completed, it was known for certain that the area being rated was that area equivalently named after division of the Parishes. It must be noted that the names given to these landscape areas are not necessarily equal to the area generally recognized as that particular name. These are simply reference names for that individual for their particular image of a group of Parishes which to that person is a distinct landscape area.

Having developed a map of Scotland comprising 58 landscape areas, the same person was given a list of seventeen constructs to rate the landscape areas on. These constructs were:

Tolerate change in-not tolerate change in

Isolated-constraining

Attractive-unattractive

Interesting-ordinary

Like-dislike

Experience of-little experience of

Information on-little information on

Mountainous-flat

Trees-no trees

Natural trees-afforested

Industrial-nonindustrial

Hill farm-arable farm

Wild-intensive agriculture

Water-no water

Wildlife-no wildlife

Coastal-inland

Enclosed-open.

As in the CARL one to one interviews, the ratings were on a seven point scale. The poles of the construct being the limits of the scale. The resulting data was used both in its raw form and was analyzed in the same manner as previous data.

Results:

This method supplied a wealth of data which could be mapped in many ways. The ratings for the three subjective constructs were used, isolated-constraining, attractive-unattractive and interesting-ordinary. The preferred end of the construct (underlined) was taken.

For this preliminary map, the preference was taken to be a 1, 2 or 3 on the construct rating scale, (ie)

attractive	1	2	3	4	5	6	7	unattractive
	✓	✓	✓					
	Rating here indicates preference							

The map subsequently produced, (see Map 2) shows those areas where all three of the constructs have been rated at 1, 2 or 3.

Discussion:

When mapped, if the sensitivity on the ratings is increased, so that only those areas rated 1 or 2 are included, the number of areas that are classified as preferred drops from 19 to 7. This can be seen by the areas shown in red on Map 3. No areas have been rated 1 for all three constructs. It can be seen, therefore, that the results gained are quite sensitive to the classification of the ratings. This simple mapping exercise indicates that, in further work, time must be devoted to sensitivity testing.

These results compare quite favourably with those gained in the construct like-dislike. Twelve areas were rated either 1 or 2 for this construct, only two of these "liked" areas are not included in the subjective construct preference map. (These being areas with higher resident and tourist populations which have been given a rating higher than 3 for the construct isolated-constraining.) Only two of the seven highly preferred areas (given 1 or 2 on the subjective constructs preference map) have not been given a 1 or 2 for the like-dislike construct, and they were given ratings of 3 and 4!

Map 2

Subjective construct preferences for parish datamap

Preference

No preference

prefered

Constructs:
1. isolated
2. attractive
3. interesting

Map 3

Subjective construct preferences for parish datamap
showing effects of sensitivity testing

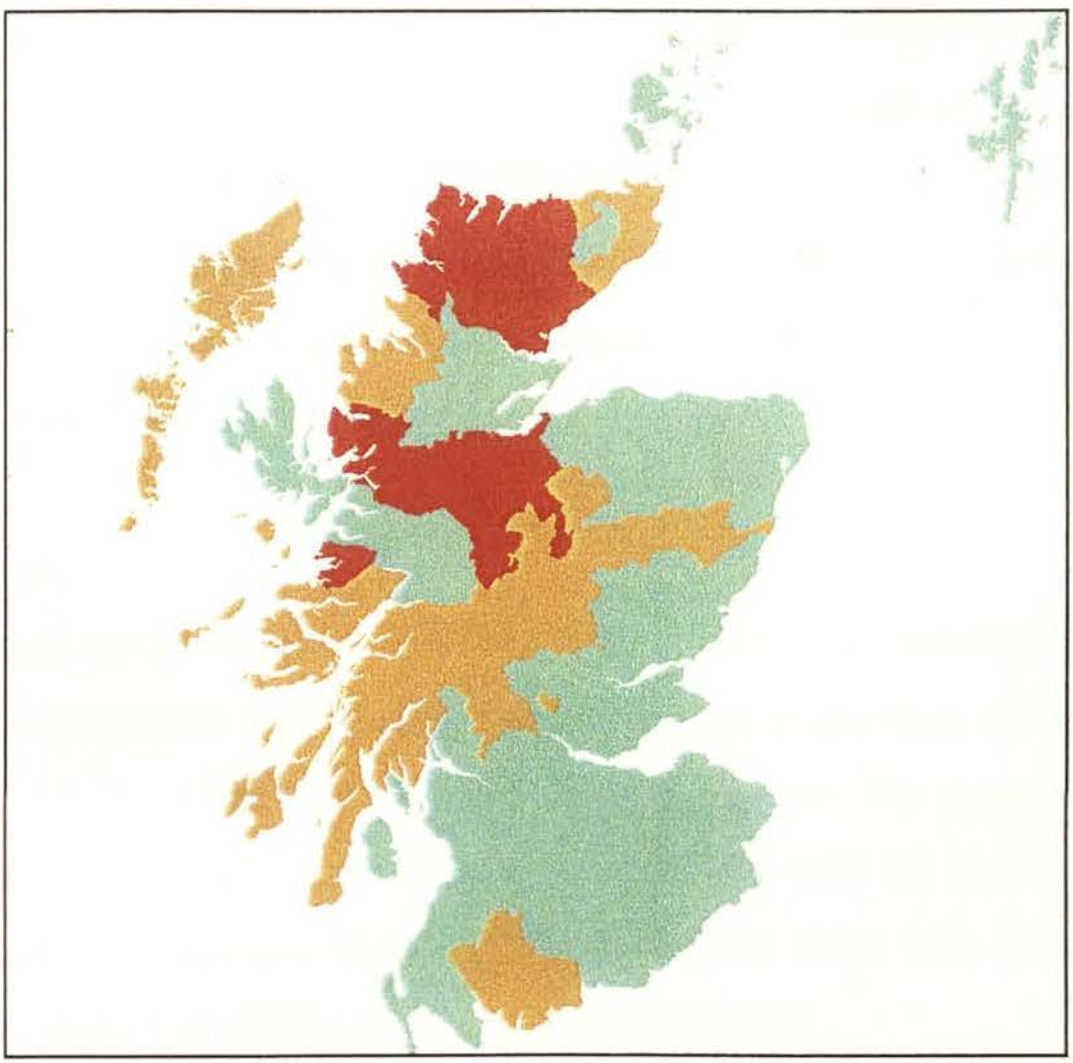
Preference

No preference

preference using ratings
1, 2 & 3

preference using ratings
1 & 2

Constructs:
1. isolated
2. attractive
3. interesting



From this we can see that even though these were *given* constructs, and would therefore not elucidate preference as well as the individuals own elicited constructs, the subjective constructs do appear to have a positive relationship with the like-dislike preference construct. This indicates that use of subjective constructs should have a role to play in future public perception and preference exercises.

4.4.2 Mapping both physical and subjective constructs

A similar methodology was adopted as when mapping the more subjective constructs. The result of mapping those areas rated 1, 2 or 3 for the preferred end of all the rated constructs, was that none of the 58 areas were preferred. Map 4 shows the results if the constructs natural-afforested, industrial-nonindustrial, and coastal-inland are taken out of the analysis. It can be seen in this exercise that physical (objective) assessment is more complex than subjective assessment, and does not yield useful alternatives to the preference construct.

Discussion:

It is thought that one reason for this result is that the methodology used does not allow for differences in landscape type. This typology of landscape would indicate that certain landscape attributes are clustered together. For example, 'mountainous' topography is not generally found with tree cover, but would be found with 'wild' landscapes (those not intensively farmed). In turn these arable areas would be more associated with 'undulating' landscapes.

The method, as used here, does not allow for differences in landscape type - and that people may "prefer" examples of all landscapes equally. For example, it would

Map 4

Objective and subjective construct preferences for Parish datamap

Preference

No preference

prefered

Constructs:

1. isolated
2. attractive
3. interesting
4. like
5. wildlife
6. mountains
7. trees
8. non industrial
9. not tolerate change
10. hill farms
11. wild
12. water
13. experience of
14. information on

be conceivable to like 'mountain' landscapes, as well as liking rolling more valley landscapes. This preference may well be orientated to factors associated with the landscapes, - purpose of visit, accessibility and familiarity for instance. This does not preclude the fact that overall these landscapes would be equally preferred.

4.4.3 Using Principal components analysis with the Parish datamap

Method:

All the ratings were processed through a Principal Components Analysis package. As with the pilot data, the preferred ends of those constructs significantly related (>0.7) to the change construct were mapped. The constructs mapped were:

Nonindustrial-industrial

Wildlife-no wildlife

Like-dislike

Tolerate change-not change

Isolated-constraining

Attractive-unattractive

Interesting-ordinary.

If only those landscape areas rated 1 or 2, for these constructs, are mapped this gives five areas, if areas rated at 3 are included this rises to thirteen. This can be seen on Map 5.

Discussion:

This section has used a different analytical technique, but has arrived at a similar answer to earlier attempts. This is in no small part due to the effect of subjective

Map 5

Objective and subjective construct preferences for Parish datamap showing effects of sensitivity testing

Preference

- No preference
- preference using ratings 1, 2 & 3
- preference using ratings 1 & 2

Constructs:

1. isolated
2. attractive
3. interesting
4. like
5. wildlife
6. non industrial
7. not tolerate change

data. Indeed, even the more tangible properties that are found to be significant related to the tolerance to change construct (nonindustrial-industrial and wildlife-no wildlife) are more subjective in nature than some of the others. This would appear to reinforce the idea that subjective decisions better support preference bias than do objective decisions.

4.4.4 Conclusions drawn from Parish Datamap Exercise

It is felt this was a most worthwhile exercise. It enabled mapping of subjective data over known spatially referenced areas, and allowed this data to be combined with more objective ratings, so for the first time a combined perceptual map could be produced. It highlighted both the sensitivity of the raw data to the processing stage, something that must be taken on board in the future. This exercise also enabled analysis of the subjective data and demonstrated its robustness in indicating where preferences lie.

The methodology, though seemingly quite effective, is long winded and cumbersome. The division of Scotland into landscape areas through the Parish map itself taking some hours. Each area was then rated on seventeen scales, itself a long and somewhat mind fatiguing task, which itself may lead to inaccuracies through fatigue and boredom of the respondent. These problems are added to by the method requiring the respondent to have a fairly detailed knowledge of the whole of Scotland, this alone would rule out most lay people and tourists, making the method only usable by experienced experts.

The use of the Parish boundaries is not the most ideal choice, they vary in size and may not allow the respondent to mark the boundaries of what they feel is a distinct landscape area. This combined with the limits of the dataset make this basis for reference inadequate for further perusal.

What is required is, therefore, a method of mapping subjective data. This requires the data when elicited by the respondent to clearly state the area they are thinking of when rating. This will allow some analysis through GIS, and given enough respondents may allow a map of Scotland to be pieced together. This would, however, require a large sample to ensure that no one result could skew the resulting map

This exercise has also emphasised that care must be taken over the sensitivity of the methodology. This must be explored further as each stage of development progresses.

CHAPTER 5 - METHODOLOGY AND RESULTS FOR QUESTIONNAIRE SURVEY

5.1 Introduction

The use of personal constructs in earlier exercises allowed identification of constructs which people use to differentiate between Scottish landscapes. These constructs at different levels of generality represent a set of dimensions underpinning landscape perception. The use of a Repertory Grid type method, even in the most reduced time format, took about an hour to complete for each respondent, and made large sample work impractical. A technique was required to use the constructs, found by the one to one interviews to be important, in a more standard, short questionnaire. It was hoped in this manner that useful data would be gained over a larger sample.

Aims and Objectives of the survey exercise:

This exercise had twin aims:

a To further explore the constructs identified previously and evaluate their usefulness in a larger scale exercise using a short questionnaire.

b To gain further data for any future mapping exercise.

Objectives of the questionnaire:

a To identify any perceptual and attitude differences to land use change between respondents in areas of varying landscape type.

b To identify any differences in this perception between user groups.

c To identify any differences in perception of suitability for land use change between the area the respondent is in and Scotland in general.

d To allow the development of a scale of tolerance to land use change for

respondents.

e To gain further data for perceptual mapping exercises.

5.2 Design Of The Questionnaire

The questionnaire was designed to be as quick to complete as possible. It was thought a questionnaire which was short and succinct would have a better completion rate. The layout and questions asked were required to be simple as it was conceived to be of a self-completion type. The assumed scenario was that the respondent would take the questionnaire, complete it within 5 to 10 minutes and move on. The time factor was important not only due to completion rates, but to "sell" the idea of placing the questionnaire within a tourist facility to the managers of that facility. Managers were adamant that a throughflow of customers was their priority, a bottleneck caused by the questionnaire would have quickly seen the removal of support by facility managers.

The questionnaire design was divided into four sections:

(i) Demographic and user context questions

(ii) Land use change questions for Scotland in general

(iii) Land use change questions for the area visited

(iv) Liking for particular land form attributes.

Demographic and User Context Questions

The demographic and user context questions were required to elicit both straight forward data (age, sex, resident or visitor to the area) as well as the reason for visit, familiarity with the area and which, if any, environmental organisations the

respondent was a member of.

It was decided that as far as possible the questionnaire was to be of a multiple choice format, requiring only a 'tick' in the option of choice. The only questions where this was not possible were those demographic questions where not all the options could be predetermined, for example, method of transport and reason for visit. Here the most obvious answers were given as options, plus a catch all "other" option.

It was decided to put only three age brackets, Under 30, 30 - 54, and 55+. Similarly, it was decided to put only four options for familiarity, resident, first visit, been before and regular visitor. It was hoped this would ascertain any differences in the simplest of manner.

It was found possible both to introduce the questionnaire and to have all the questions in this section laid out neatly on one A4 sheet. It was hoped that this would provide a simple way to start the questionnaire and would lead easily into the more complex perceptual questions.

5.2.1 Land use change questions

Questions on attitude to various land use changes were to be asked on both Scotland in general and in the particular area that the questionnaire was completed. The interventions were to be derived from those constructs identified as useful for mapping in the preliminary attempts at mapping - it was hoped from this to provide some continuity for possible further mapping exercises.

It was hoped to be able to base some of the overall design on methods developed by Kliskey and Kearsley (2), on mapping multiple perceptions of wilderness in Southern New Zealand. Here respondents were asked to rate the desirability of 16 features in a wilderness landscape (for example developed campsites and maintained tracks). Respondents were given 5 options from 'Strongly desirable' to 'Strongly Undesirable', each option being assigned a score of 1 to 5. Using a Likert scale it was possible to form a wilderness purism scale of 16 to 80 for cumulative scores from the 16 attributes. The scores provide an indication of the respondents attitude toward wilderness and the wilderness setting. Mapping of multiple perceptions were based on groupings derived from the cumulative score scale.

Within the context of this exercise it was hoped to be able to derive a cumulative scale of attitudes to land use change. With this in mind, indicators were required for the appropriate interventions.

Indicators for interventions:

Following preliminary attempts at mapping, there were nineteen constructs to which mapping attempts had been made (see Table 15). Due to resource and practical constraints it was decided to concentrate efforts in the questionnaire on those constructs which had already been mapped, or to which attempts could be made in future research.

Table 16 shows the nineteen constructs, on which questions were to be asked. From these indicators questions were derived to which a 5 point scale could be developed, for example:

Table 16 Constructs to be used in survey

19 Constructs chosen for mapping	Constructs mapped so far	Constructs to ask questions on	Indicators for interventions	Indicators for preference questions
LAND USE INTERVENTION QUESTIONS				
wild-intensive agric	wild-intensive agric	hill farm-intensive agriculture	Sheep farming Arable farming Rolling fields Smaller fenced fields	
recreation-intensive farming				
crofting-agriculture				
hillfarm-arable farm	hillfarm-arable farm			
scenic-not scenic				
low human imp-high hum imp	lo hum imp-hi hum imp	low human imp-high human imp	Community development Infrastructure Tourism development	
wildlife-no wildlife	***	***	Diverse wildlife Restricted diversity Lots of wildlife No wildlife	
low pop-high pop	***	***	High population Low population Lots of communities Isolated dwellings	
prosperous-rundown				
trees-no trees	trees-no trees	trees-no trees	Lots of woodland Little woodland	

19 Constructs chosen for mapping	Constructs mapped so far	Constructs to ask questions on	Indicators for interventions	Indicators for preference questions
natural-afforested	natural-afforested	natural-afforested	Natural woodland Planted woodland Native tree species Foreign tree species	
nonindustrial-industrial	nonindustrial-industrial	nonindustrial-industrial	Industry present No industry Industrial buildings No industrial buildings	
LANDFORM QUESTIONS				
Vista-closed in Enclosed-open Vista-restricted views	open-enclosed	open-enclosed		Panoramic views Views only down glen
water-no water	water-no water	water-no water		Water important in landscape Water incidental in landscape
coastal-inland	coastal-inland	coastal-inland		Coastline Inland
mountainous-rolling rugged-flat	mountainous-flat	mountainous-flat		High rugged topog Low rolling topog

More roads are needed to reach less accessible parts of Scotland ?

Agree strongly, Agree, Neutral, Disagree, Disagree strongly, Undecided.

As little information was given on the questions and the background knowledge of the respondents was unknown, it was decided to include an "undecided" category. Those respondents who used this option were removed before cumulative scoring analysis was completed. It was decided to ask for response to at least two intervention indicators for each construct on Scotland in general, and at least one for each construct for the area questions. As the subject area was repetitive between the two sections, questions were formulated to read as differently as possible. The questions were also designed to be both negative and positive in expected response. It was hoped this would remove any possibility of habitual response, i.e. it made it unlikely that one respondent would "agree" with all interventions. It also makes sure that the respondent reads the questions thoroughly as ticking one column indicates very confused response.

5.2.2 Landform attribute questions

As landform had been found to be a major feature of the perceptual response in earlier exercises, these questions sought to follow through from the preliminary attempts to allow more ordered mapping to be completed. It also allowed for early preference indications to be tested over a large sample.

Indicators for preference questions:

Due to the non-interventionist nature of the more physical/landform attributes of some of the mapped constructs, a question had to be developed that allowed

opinion to be given on which landforms were found the most desirable to visit. Table 16 shows four groups of constructs on which questions were to be asked, a group of three constructs which have been aggregated to form one construct, open-enclosed. The indicators here being panoramic views and the more enclosed views you would gain in a situation where the view was only down a single glen. This theme of openness is reiterated by the construct mountainous - flat, which is indicated by high rugged topography and low rolling topography. The second two constructs deal with water, either where water forms an important part of the landscape, or coastline.

Here questions were asked on a 7 point desirability to visit scale. Again a multiple choice layout was chosen, eg:

Indicate your wish to visit areas with panoramic views

Slightly desirable 1 2 3 4 5 6 7 Very desirable

5.2.3 Testing the questionnaire

The draft questionnaire was tested on a sample of 34. Although no major problems were identified, it resulted in an alteration to the position of the man-made intervention questions. This allowed the perceived "simpler" questions to be placed at the beginning of the section to permit an easing into the more probing sections of the questionnaire. From the testing procedure it was found that respondents were able to answer the questionnaire by themselves. It was possible from this to develop a simple system for self completion of questionnaires.

The questionnaires (for example see Appendix one) were placed within an identified site, a simple notice was intended to attract the eye to the questionnaires. A pen and box for completed questionnaires was provided. This system allowed for the maximum number of responses to be collected with a minimum amount of time being spent. No one to one interviews were required so resource costs were minimised.

5.2.4 Locating the questionnaire

One of the objectives for the questionnaire was to determine any differences in attitude to land use change by visitors to different landscape types. The simplest of landscape types was chosen for study, those of the 'Highland type' versus the 'Lowland type'.

Criteria for choice of area, involved both the characteristics of the area, the likely numbers of responses that could be gained, and the ease with which the areas could be serviced, (replenishment of questionnaires and emptying of completed questionnaire boxes).

Area 1: Atholl

Atholl was chosen for the first Highland site. It is a mountainous area, but with no major body of water. It is a prime tourist area, and provided many opportunities for sites for questionnaire placement.

Site 1: Blair Castle

The Castle is the major tourist attraction in the area, having about 1300 people through the doors on a summers day. Tourists come both on organized tours, as

well as private parties. Communications to the Castle are excellent, being situated very near the main road to the Highlands the A9.

Site 2: Pitlochry Tourist Information Centre

This is the main TIC in the area, being the headquarters for the local Tourist Board. Situated in Pitlochry, itself a recognized tourist town, as well as serving a large catchment area. It is a large TIC with a large number of visitors per year.

Site 3: Killiecrankie Visitor Centre

The Killiecrankie site is owned by the National Trust for Scotland, and attracts visitors not only as a walking base along the River Garry, but also for the Historical events associated with the Battle of Killiecrankie and the Soldiers Leap. Though not as busy as the previous two sites it has a reasonable number of visitors per year.

Area 2: Cupar and the Howe of Fife

This is the first of the Lowland Areas, it was chosen as a recognized tourist area with a variety of tourist attractions, but no large body of water.

Site 1: Falkland Youth Hostel

This hostel is used for a variety of people for walking and also as a stopping point on the Edinburgh to St Andrews Cycle Route. Falkland itself has a Royal Palace and attracts many visitors.

Site 2: Lomond Hills Hotel, Freuchie

One of the largest hotels in the area being both important for tourist accommodation and also for local functions.

Site 3: Cupar TIC

A small newly opened Tourist Information Centre, this is the main Information

Centre for the area, in the busy market town of Cupar.

Site 4: The Scottish Deer Centre

The main Visitor attraction in the area, attracting not only long stay tourists but also day visitors from the surrounding conurbations of Glasgow, Edinburgh and Dundee. The Centre also has function facilities.

Area 3: Loch Leven and Kinross

A rolling lowland landscape with a large water body, this area is served by the main communication route the M90, which passes right through. It is also the most developed of the four areas, partly due to the communications available.

Site 1: Green Hotel, Kinross

One of the largest Hotels in the area, catering for tourists to the area, businessmen passing through and local functions.

Site 2: Kinross TIC

Located within a service area on the M90, this Tourist Information Centre caters mainly for travellers who are en route, but also serves those tourists on longer visits to the area.

Site 3: Vane Farm Nature Reserve

Owned by the RSPB, this Centre caters for those wishing to discover more about the wildlife of the area, having facilities to view most of the considerable birdlife on Loch Leven. It attracts visitors to the area as well as repeat visits not only from locals but people from the surrounding conurbations.

Area 4: Loch Ness

The second of the Highland areas, having a mountainous landscape, but also a

large water feature in the shape of Loch Ness. Sites were on the Southern and Western sides of the Loch following the main tourist and monster spotting route of the A82.

Site 1: Loch Ness Lodge Hotel

A Hotel within the heart of the village of Drumnadrochit, serving both as visitor accommodation and as a stopping point due to its large cafe/tearoom.

Site 2: Fort Augustus TIC

Situated within the Car park of the major tourist town of Fort Augustus, this is a small but busy Information Office.

Site 3: The Official Loch Ness Monster Exhibition Centre

This caters for a large number of visitors both to the exhibition and a range of associated shopping facilities. It is a major tourist attraction in the area.

5.2.5 Administration of the survey

In general the system was successful. Facility managers were found, on the whole, to be fairly willing to make space available for the questionnaires and box, as long as the running of the facility was not hindered. Siting within the facility was crucial. A situation that was seen by the majority of visitors, and in which they felt comfortable to answer, yet did not hinder facility operations was not always easy to find.

Although some wastage of questionnaires was experienced, about one questionnaire was completed for three left on site, this was not as high as had been anticipated for a system of this nature. The box for completed questionnaires kept responses tidy, and as long as each site was visited every 5 to 10 days

(depending on the number of responses), a constant flow of responses was maintained. From this point of view the system was extremely successful it allowed one person to gain nearly 1300 responses in about 8 weeks from 11 sites in 4 areas.

Initial site choice was found to be critical, the larger the facility and throughflow of visitors the better the response. Yet to provide data on different types of user group, site choice had to allow for variation in facility preference by user group. Tourist Information Centres were found to be used by a variety of Users, and were used in all areas.

Overall therefore the system can be said to have worked efficiently. It is however acknowledged that some visitors will have avoided the questionnaires, by the variety of responses gained an assumption could be made that this does not apply to any group in particular, and that all visitor groups have, to some extent, been accounted for.

The system did, to a degree, preclude the response of residents of the four areas. It was hoped initially that a system would be developed which would allow for resident responses to be gained. Unfortunately this was not possible due to resource costs involved. It is hoped that further research into resident perception could be completed in the future to give a clearer impression of their perceptions.

5.3 Results Of The Survey

5.3.1 The sample

The survey yielded a total of 1286 responses. Within this there was an uneven number of responses between the four areas. (See Table 17) The Highland areas generated more responses (948) than the Lowland areas (338), this may have been caused by better sites (sites with a higher volume of tourists per day) being available for the two Highland areas. Site One within the Atholl area generated more responses than both Lowland areas together. This indicates the importance of siting within this type of questionnaire.

Resident/ Visitor Distribution:

This effect can also be seen in reference to the visitor/resident split. Throughout the Highland areas the percentage response from visitors was steady around 95 to 97%. In Lowland areas the average was much lower at 73.1%, but varied between sites by a large margin (18.2 to 92.5%). (See Table 18)

Reason for Visit Distribution:

The majority of respondents stated that their main reason for visit was "Touring/sightseeing". (See Table 19) although 13 different reasons for visit were given (the catch all "Other" option yielding 9 of these). It has been found possible to divide the respondents into three groups - residents, those touring/sightseeing or similar activity, and those whose reason was to participate in an outdoor activity. (see Table 20).

These figures show an interesting feature that of the high outdoor activity level for Kinross. This is partly due to the classification of Bird watching as an Outdoor activity (Kinross being the site of the RSPB Reserve). Kinross does have however the highest figure for "walking" within the survey, which has contributed to this high Outdoor figure. The figure for Loch Ness is slightly high which can be accounted for by the numbers of respondents who were there to sail.

Means of Transport:

The high "touring" figure is reflected in the transport figures. The "Car/Motorbike" option accounting for most of the respondents. Residents were not required to answer this question, if they are removed, there is a fairly even split across the four areas. (See Table 21) Loch Ness had a higher figure both for Coach passengers, and due to its situation was the only area that had respondents arriving by boat!

As could be expected Outdoor people were found to be less reliant on cars than were those who were "Touring", 91.9% of tourers arrived by car as opposed to 68.5% of those pursuing outdoor activities. All age groups favoured the car, 74.5 - 84.4%, Coach figures were highest for the over 55 group (8.8%). The Under 30 group being highest in its use of Public Transport.

Age Distribution:

Throughout all responses, 49% of the sample were under 30 years of age. This varied between areas, but the under 30 group was the largest in Highland and Lowland areas, but by a greater margin in the Highland areas. (See Table 22)

Sex distribution:

The response which was most even across the areas and types, was the sex distribution. Female responses accounted for just under 60% of the total number across all areas. (see Table 23) By age it can be seen that the older the age group, progressively more men answer the questionnaire. (See Table 24)

Familiarity with Scotland:

This changed with landscape type. 33% of respondents in Highland areas were on their first visit, compared to only 11.2 % in Lowland areas. More striking is that over half of respondents in Lowland areas were residents in Scotland, compared to 16.9% in Highland areas. (See Table 25) As may be expected, those pursuing Outdoor activities were more likely to be returning to or resident in Scotland than those engaged in Touring/Sightseeing. (See Table 26)

Familiarity with Scotland was also found to be related to age, the 55+ age group having its highest category as 'Regular Visitor' (29.2%), the 30-54 age group high being 'Been before' (31.0%), whereas the highest for the Under 30's being First Visit (33.6%).

Familiarity with the area:

Familiarity with the area the respondent was in gave "First visit" as the highest percentage in both landscape types, but with a greater margin in Highland areas, 57.5% as opposed to 29.6% for Lowland areas. Lowland areas had nearly double the amount of "regular visitors" that Highland areas received. (See Table 27)

Membership of an Environmental Organisation:

37.2 % of respondents were members of an environmental organisation, this figure rose to 56.3% in Kinross. This may be due to one site being an RSPB Reserve (70.9% members) which attracts RSPB Members and/or those people who are more likely to join such organisations. A similar effect was seen as the NTS site in Atholl (50.7%). (See Table 28)

It was also seen that age effects the proportion of membership, a greater proportion of under 30's were non-members, with almost 49% of members being in the 30-54 age group. (See Table 29)

5.3.2 Preliminary Results From Question 8 - Land Use Change In Scotland

Question 8a:

There should be further improvements to the main road network within rural Scotland

(See also Table 30 and Figure 5)

Over all areas opinion was divided on the subject of road improvements, with the modal class being neutral (25% of response), slightly more respondents opted for the no change options (disagree strongly 11.4%, disagree 24.3) than did the positive option (22.2% and 12.2%). Response between areas varied, Cupar in particular gave a very strong positive response, 44.4% agreeing change was required.

This response followed through to give Lowland areas a more positive response than Highland areas, the Lowland modal class being 'agree' as opposed to 'neutral' in Highland areas. Residents believed change was required to a greater extent than Visitors, through all areas this amounted to a positive vote of 51.7% for Residents, as opposed to 32.6% for Visitors. Those pursuing outdoor activities (Outdoor group) were more inclined to disagree with the proposition than those touring or sightseeing (Tourer group), Outdoor group was 46.6% against, Tourers 35.7% against, but these are still high when compared to the Residents 21.6% against.

More men were pro change than women, but opinion was divided (31.3% pro and 36.5% anti the proposition). Age groups also showed a strong division of opinion, but only the 55+ age group results gave the pro change side slightly larger than the anti change lobby. Members of an environmental organization (Members group) were slightly less likely to want this change than Non-members, 32.6% as opposed to 35.4%.

Question 8b:

More roads are needed to reach the less accessible parts of Scotland

(See also Table 31 and Figure 6)

This proved to be a proposition on which opinion was less divided. All areas gave 'Disagree' as the modal class. Opinion tended to be more divided in Lowland areas with a low 'neutral' figure (12.4%) and both pro and anti classes yielding higher figures than for the Highland areas. Residents were slightly more for the

proposition than Visitors, but 46.7% of Residents disagreed with it. Although Tourers and Resident results were similar, those for the Outdoor group gave strong negative results, 60.2% against more roads.

Women were found to be slightly more in favour than men, but the majority still disagreed with the proposition (47.1%). All age groups disagreed with the statement, though opinion was strongest in the 30-54 age group. Again Non-members were slightly more inclined toward the change than Members, but still overall not giving a positive result.

Question 8c:

Facilities for tourists should be improved in rural areas

(See also Table 32 and Figure 7)

Again through all responses the modal class was 'Disagree' (28.2%), however 24.7% of the respondents gave the proposition a neutral vote. Highland areas came out against the proposition (39.6%), but Lowland areas came in favour of the change with 42.0% of the vote, 14.5% of which 'Agreed strongly'. 55.0% of Residents agreed with the statement, as opposed to only 29.9% of Visitors, who overall came out against the change (39.2%). Both the Outdoor group and Tourers disagreed with the proposition, though opinion was stronger with the Outdoor group (45.9%). Opinion between the sexes was very similar. Through the age groups, only the 55+ age group came out just in favour, but opinion against was strongest for the Under 30's (39.4%). Members of environmental organizations came out more against the proposal than did Non-members.

Question 8d:

The number of way marked paths (Forest trails, long distance paths etc) should be increased

(See also Table 33 and Figure 8)

This proposition received a fairly strong positive response, overall 56.7% in favour only 14.0% against. Agreement being equal across areas, though Kinross had a positive vote of 67.4%. This is reflected in the results for landscape types, Highland areas gave a 53.3% positive response as opposed to the Lowland 66.3%, and a higher negative vote than Lowland areas (23.9%). It would appear from this that more organized walking areas are preferred in Lowland areas to the remote ruggedness of the Highlands.

Residents were more pro paths than visitors (72.5% as opposed to 55.2%), and although more Outdoor seekers voted for the proposition (60.2%) than did Tourers (54.2%), the negative vote for the Outdoor group was nearly 20.0% indicating a difference of opinion within this group.

Results between the sexes were even, with the Under 30 age group being more in favour of the proposition (57.2%) than the older age groups. Similar results were found between Members and Non-members of environmental organizations.

Question 8e:

There should be a policy to encourage the expansion of arable farming

(See also Table 34 and Figure 9)

This question was given a 'neutral' response both overall and being the modal class in each area, though more positive votes were seen than negative. Results across landscape types were similar, though a stronger negative response was gained in Lowland areas, where arable farming is already more prevalent. In this question 10% of the respondents gave their answer as undecided, which implies that on this proposition in particular more information is required.

The neutral option is dominant through all groups, but Residents were found to be slightly more in favour than Visitors, Tourers being more in favour than the Outdoor group. The sex distribution was broadly even, the age groups finding the Under 30's least positive, but most neutral in response. Membership of an environmental organization did not seem to have an effect here, though a slightly higher disagree figure was found for the Members.

Question 8f:

There should be a policy not to allow changes in the size of fields

(See also Table 35 and Figure 10)

Again a neutral modal class was found overall, with only one area Cupar bucking the trend, the modal class here being 'agree'. On the whole, a positive response was seen (41.9% positive, 34.4% neutral and 10.5% negative) over all areas. A more positive vote for the proposition was seen in Lowland areas (49.1%) as opposed to Highland areas (39.3%). Results for Residents and Visitors were very similar, with the Outdoor group slightly more pro than the tourers. Little difference was found between the sexes, similar results to the previous question were found

for the age groups, the Under 30 group being least pro and most neutral. A low figure is seen against the proposition by the 55+ age group. Members were more in favour than Non-members (51.2% compared to 36.4%) and have the lowest neutral score of any group.

Question 8g:

The further development of small communities is desirable within rural Scotland

(See also Table 36 and Figure 11)

There is broad agreement with this proposition 'agree' being the modal class in all areas. Overall a positive 49.5% was found, 16.1% against. A less neutral opinion was found in Lowland areas with higher positive and negative results than the Highland areas. Residents were found to be slightly more in favour of further developing small communities than Visitors, but only slightly and with no real difference between the tourers and the outdoor group.

Men were found to be more pro the proposition than women, the Under 30 age group the least positive in their pro vote, 39.6% as opposed to 58.1 and 62.8% for the older age groups. Members were also more enthusiastic about this statement, with a pro vote of 56.5% whereas Non-members vote was 45.3%.

Question 8h:

A change in land use that would increase the diversity of wildlife would be desirable

(See also Table 37 and Figure 12)

As expected this proposition got a positive response, overall 68.9% with just 7.6% in disagreement. There were more positive responses in Lowland areas (76.7%) than Highland (66.3%). Residents results also came out more in favour (75%, Visitors 68.3%) with, again, little difference between the Visitor groups.

Few inequalities were found between the sexes, the Under 30 age group being less positive in their agreement than the older age groups. Members were more in favour (74.4%) than Non-members (65.8%).

Question 8i:

A change in land use that would increase the numbers of, but not diversity of, wildlife would be desirable

(See also Table 38 and Figure 13)

Here we see a much more neutral response with the overall, Atholl and Kinross modal class being 'neutral'. A positive response was given overall (42.2%), though not the high figures seen in the previous question. Highland areas were slightly less positive in their agreement than Lowland areas, with Residents being more in agreement with the statement then Visitors. The Outdoor group were the least in favour giving a higher neutral score than positive one.

Women were slightly more in agreement with the proposition than were men, the Under 30's being more in favour than the older age groups. Similar results were gained from Members and Non-members of environmental organizations.

Question 8j:

There should be provision of financial incentives to encourage the indigenous population to remain in rural areas

(See also Table 39 and Figure 14)

As might have been expected this statement was given broad agreement, 64.5% in favour only 6.6% against. The 'agree' class was the modal class across all areas. Lowland areas had a slightly more positive vote (69.8%) than Highland ones (62.7%), with, once more, Residents voting slightly more pro than the Visitors (between whom broad agreement was found).

Sex differences were minimal, but large variation was seen, not in the direction, but in the strength of opinion between age groups. The Under 30 group gave a positive vote of 53.8%, the older age groups being more forthright with results of 75.8 and 72.2% respectively. Members of environmental organisations were found to be slightly more in favour of financial incentives for this purpose than were Non-members.

Question 8k:

Planning policy should prevent the construction of new houses in rural areas

(See also Table 40 and Figure 15)

Although there was broad agreement here it was not as strong as has been seen with other propositions. Overall 46.8% positive, 21.2% neutral and 22.6% against. Agreement was higher in the Lowland areas (54.8%) than the Highlands (44.0%),

perhaps indicating the carrying capacity of the landscape for housing has nearly been reached in the Lowlands. Residents also came out more in favour of preventing more construction (57.5%) than did Visitors (45.7%). No difference was found between the various visiting groups.

Women were slightly more in agreement with the statement than men, the Under 30's being more in agreement than the older age groups, perhaps surprisingly the Members group is less in favour of policy preventing new houses than are Non-members.

Question 8l:

There should be policy to increase the amount of woodland

(See also Table 41 and Figure 16)

Woodland found favour amongst the respondents to this survey with 64.9% voting in favour of an increase in the amount of Woodland. The 'agree' category was the modal class in all areas, though 36.1% of Cupar respondents agreed strongly with the statement. This resulted in the Lowland area response being more positive (74.9%) than Highland (61.3%), Residents being slightly higher than Visitors. Opinion was divided in the Outdoor group with higher positive and negative results than the Touring group.

Little difference could be seen between the sexes, between the age groups or between Members/Non-members of an environmental group.

Question 8m:

There should be a policy to increase the amount of woodland, but only if this is native mixed woodland

(See also Table 42 and Figure 17)

Agreement with the proposition was stronger here than in the previous question. The modal class was again 'agree', overall the agreement being 69.3%, against only 4.1% disagree. With Lowland areas slightly more forthright in their positive opinion, once again Resident figures were more positive than Visitor. Tourers were in agreement with the statement (67.6%), but not to the extent of the Outdoor group, 77.4% of which voted positively. Little differences was found between the results for the sexes. The 30-54 age group was the most in favour 76.2%, the under 30's taking slightly more convincing at 63.9%. Members were also more in favour than Non-members.

Question 8n:

It should be policy not to allow an increase in the number of industrial buildings in rural areas

(See also Table 43 and Figure 18)

As was expected agreement to this statement was high, giving an overall modal class of 'Agree strongly' (32.9%). Only Kinross, the most developed of the four areas, had a lower modal class, 'agree', though there were little differences between landscape types. Residents were very slightly more in favour of the statement than Visitors, the Tourers of which were slightly more in favour than the

Outdoor seekers.

Women were slightly more pro restricting industrial buildings than men, as were the Under 30 age group than older age groups, the 55+ group having only 57.7% agreement with this statement. Non-members were slightly more in favour of the proposition than Members.

Question 8o:

Industrial activity that has a lasting effect on the landscape should not be allowed in rural Scotland

(See also Table 44 and Figure 19)

Again there was strong agreement with the statement, 62.9% of responses being positive. The modal class was again 'Strongly agree'. Kinross respondents are once more slightly at odds with the other areas, giving a 20.2% disagreement result. Little difference is seen between the landscape types, though residents are less in favour (55%) of restrictions than Visitors (63.7%), between whom little difference was found. Women gave the proposition more favour (62.5%) than men (59.5%), few differences were seen between age groups or environmental organization membership groups.

5.3.3 t-Test results for Question 8 - Land use change in Scotland

t-Tests were performed on the results gained from Question 8. The relationships between areas, landscape types, Residents and Visitors, Resident and reason for visit groups, Tourers and Outdoor groups, age groups, sex and membership of an

environmental organization, were examined.

Table 45 shows significant results gained at the 0.05 and 0.01 probability levels.

The most striking result is the significant differences found between the Under 30 age group and the two older age groups, between whom there were no significant differences. It would appear from this that the Under 30's opinions on interventions in land use are very different to those of the older age groups. This may be due to many reasons such as the more idealistic nature of youth, or perhaps a difference in the level of awareness of environmental matters.

Few differences are seen within the landscape types, especially the Highland areas, whereas slightly greater differences can be seen between Cupar and Kinross. This may be due to inter site differences reported earlier. A number of differences are seen between the two landscape types, indicating that Visitors due view these matters from different perspectives. Although there are expected differences between Residents and Visitors, the results between the two types of Visitor are fewer than might have been expected. Sex differences are minimal only one results being significant to the 0.01 level. Membership of an environmental organization shows several differences.

This highlights, therefore, those divisions of the sample where significantly different results have been gained, this information could then be taken forward for more analysis and used as a basis for mapping exercises.

The results of the t-Tests were then considered in terms of their underlying constructs to see if any patterns or trends emerged between the groups on specific land use interest areas. From Table 46 it could be seen that there were differences of opinion between the landscape types, in five of the six subject areas. This appeared to be strongest when considering woodland issues and human impact measures, but was weakest for the population questions.

Resident/Visitor differences show up very strongly for human impact questions, yet are weak or non-existent elsewhere. The two visitor group results again highlight divergent opinion on human impact issues, but are weak elsewhere. The uniqueness of the Under 30 age group is seen through all constructs, except that of industry. However, it is weakest on the human impact questions and strongest on farming and population. Sex differences are few. Differences were found between Members and Non-Members of an environmental organization in all but one of the subject areas, most being significant to the 0.01 probability level.

From these tests a clearer image of those areas of potential conflict and areas of similar opinion continued emerging, as well as more information on perception and attitudes to land use change between the highlighted groups.

5.3.4 Preliminary Results From Question 9 - Land form attributes

(See Tables 47 to 54 and t-Test results on Table 55)

Question 9a:

Please indicate your wish to visit....areas with panoramic views, (where 1 = slightly

desirable and 7 = very desirable)

Through all areas and divisions the modal class was unsurprisingly 7. Over all the areas 49.8% of respondents indicated that to visit areas with panoramic views was very desirable. t-Test results indicate some variation in the strength of opinion, these include results significant to the 0.01 probability level between landscape types, Residents and Visitors, and between the Under 30 age group and the two older age groups.

Question 9b:

Please indicate your wish to visit....areas where the main view is down the glen you are in, (where 1 = slightly desirable and 7 = very desirable)

Although 7 was once again the modal class, the strength here was much diminished (all areas = 28.5%). t-Test results showed more agreement between groups, though once again significant variations were found between the two landscape types and also between the Under 30 age group and the two older age groups.

Question 9c:

Please indicate your wish to visit....areas where water forms an important part of the landscape, (where 1 = slightly desirable and 7 = very desirable)

Water was very popular with all groups, the overall modal class being 7 (43.0%). Weak significant t-Test results were found both between Highland and Lowland

landscape types and between Residents and Visitors, with once again highly significant results between the Under 30 age groups and the two older age groups.

Question 9d:

Please indicate your wish to visit....areas where there are few water features, (where 1 = slightly desirable and 7 = very desirable)

Areas of few water features proved to be the least popular of the options given. Overall the modal class was 4 (19.9%) with only 25.5% of respondents scoring 5 and above. t-Test results showed no significant variations in sample.

Question 9e:

Please indicate your wish to visit....areas which are rugged and mountainous, (where 1 = slightly desirable and 7 = very desirable)

Rugged mountainous areas were more popular, the modal class returning to 7 (36.5%). Kinross respondents were less enthralled with mountains, only 29.9% of respondents scoring 7. This was highlighted by t-Test results, as were differences between residents and Visitors, and as usual between the age groups. A significant variation was also seen here between Members and Non-members.

Question 9f:

Please indicate your wish to visit....areas which are more gentle and rolling, (where 1 = slightly desirable and 7 = very desirable)

More rolling areas were less popular, overall modal class was 5 (17.9%) this was not the case through all areas, as in Cupar a modal class was 7 (20.1%), Atholl and Kinross 4, 18.3 and 19.4%, and in Loch Ness 5 (20.1%). Significant t-Test results were found between Visitor groups, the sexes and Members/Non-members.

Question 9g:

Please indicate your wish to visit....areas on the coastline of Scotland, (where 1 = slightly desirable and 7 = very desirable)

The coastline also proved to be popular, modal class being 7 (35.1%), this rose to 48.5% in Cupar (the area closest to the coast!) t-Test differences were seen between Residents and Visitors age groups and the sexes, where women scored higher than men.

Question 9h:

Please indicate your wish to visit....areas away from the coast, (where 1 = slightly desirable and 7 = very desirable)

Here there was a modal class of 7 (19.4%). Significant t-Test results were found between age groups, with the older age groups giving a higher response.

Further analysis of these results took place before further attempts at mapping. See Chapter 9.

5.3.5 Question 10 land use questions for a particular area

These questions were designed to uncover any NIMBY (Not in my back yard) tendencies amongst the respondents, that is a particular change would be tolerated in Scotland in general, but not in the particular area the respondent was in. The results reported here outline the results between areas, they are discussed in relation to the findings of construct subject areas in Question 8, land use interventions in Scotland in general. Particular emphasis is placed on the roles of Visitor and Resident groups.

Question 10a:

More tourist facilities should be developed in this area

(See Table 56)

Through all areas an overall disagreement to the proposition was seen, the modal class being disagree (30.7%), figures for pro change being 23.8%, 40.2% against. This shows a movement further against the proposition than in question 8, where 32.2% of respondents voted for the change. There has also been movement in the areas, with Atholl, Loch Ness and Cupar becoming more strongly anti development, Kinross actually shows a slight rise in favour of more tourist facilities, this may be due to the more industrial/developed nature of the area in comparison with the other three areas.

Large differences are seen between the results of the Resident and Visitor groups, with in all areas but Loch Ness, Residents seeing a greater need for more tourist facilities than the tourists. Through all areas, 48.3% of residents voted for the

proposition, but only 21.4% of Visitors, this is marginally greater than the differences between the groups in the earlier question.

Question 10b:

No more houses should be built in this area

(See Table 57)

This proposition was given a neutral result with 'neutral' being the modal class in all areas. Kinross, again had the highest pro results (40.2%), the Highland areas tending to more neutral responses than the Lowland areas.

In comparison with question 8, there has been a definite shift to neutral in all areas, over all areas increasing from 21.2% to 30.6%, pro figures have reduced from 46.8 to 37.0%, (although it must be remembered that the 'No answer' figures have risen in this section compared to those for Question 8, accounting for some of the changes seen here).

Results appear to indicate that Residents although still overall agreeing with the statement have reduced the strength of feeling to a more negative/neutral stance, whereas Visitors have opted for a more neutral approach, both pro and anti figures having dropped.

Question 10c:

This area is suitable for the development of light industry

(See Table 58)

Large variation was found between the areas for this question, though in all areas the majority voted against the statement. The two Highland areas were much stronger in their disagreement than the two Lowland areas, (Loch Ness 58.4% against Cupar only 37.6% against). Loch Ness was seen as least suitable for light industry 10.7%, Kinross already the most developed, deemed by 25.0% of it's respondents as suitable.

Although this question does not have a direct comparison in Question 8, the two industry questions asked came out strongly against any industrial development, this is repeated in this question.

In the Highland areas Residents appear to be even more anti industry than Visitors, though in the Lowland areas this is reversed, with Residents giving the idea more favour than Visitors, 34.0% of Kinross Residents agreeing with the proposition as opposed to 19.8% of Visitors.

Question 10d:
Additional forestry development should not be allowed in this area
(See Table 59)

Over all areas respondents voted in disagreement with the statement. This feeling was stronger in Lowland areas than the Highlands where forestry development is already greater. This is in accordance with Question 8 results with the exception of the Loch Ness area where the perceived need for woodland has fallen. As there are large areas of afforestation in the area already, this may account for this reaction.

Broad agreement is seen between Visitor and Resident groups for this issue.

Question 10e:

The main road network in this area does not require any improvement

(See Table 60)

Agreement with this statement was high in all areas (results between 49.9 and 54.7%), these scores are much higher than those received when the question was asked for Scotland in general, where a more mixed reaction was gained, the pro result being 36.4%.

Results indicate that Residents in general agree with the statement, but so not have the conviction in this that Visitors gave, for example, in Kinross 60.5% of Visitors agreed with the statement, yet only 39.6% of residents followed suit. This variation may be the result of better knowledge by Residents, or of a difference in purpose of road use.

Question 10f:

A change in land use that brought about an increase in the wildlife diversity would be desirable

(See Table 61)

As could be expected this question provoked a strong positive response, with reaction similar in all areas (pro responses varying from 58.1% to 64.9%). Highland area scores were slightly lower than those of Lowland areas, perhaps due to a

perceived high incidence of wildlife already in these areas. These results gained are, however, not as high as those achieved for Scotland as a whole, indicating either a greater reluctance to change in the area, or the perception of all four areas as being of already relatively high wildlife value.

In all areas Resident scores were higher than those of Visitors, perhaps showing a greater willingness to allow change than Visitors.

Question 10g:

Financial support should be available to encourage the indigenous population to stay in this area

(See Table 62)

Agreement was also strong for this proposition, all areas having over 58% of responses positive, though Kinross was delivered more neutral and negative votes than the other three areas. Results were similar to those gained for Scotland in general, as were results between Resident and Visitor groups, accordance being seen all round on this subject.

Question 10h:

There should be no change to the balance of arable/mixed/sheep farming in this area

(See Table 63)

Although more neutral responses were gained here than for or against in all areas but Kinross, the majority agreed with the proposition (43.1 to 44.3%). In Kinross 45.8% of respondents gave a neutral response. Although this question did not have a direct correspondent in Question 8, this 'neutral' theme was repeated in the questions asked on farming issues. Resident and Visitor scores were in general agreement.

Question 10i:

There should not be changes to field sizes in this area

(See Table 64)

Results here to a great extent mirror those found in the previous question, agreement except for Kinross where a more neutral stance is taken. Results also repeat those seen for this question for Scotland in general. Resident and Visitor results were also similar.

CHAPTER 6 - FURTHER ANALYSIS OF THE SURVEY DATA

6.1 Introduction

This chapter covers three further forms of analysis which were performed on the data gained from the survey. The first follows on from the work of Kliskey and Kearsley (5). The questionnaire was designed to enable a Likert scale cumulative score analysis to be completed. The results of this are reported here. The second analysis briefly examines factor analysis of the data matrix, exploring the dimensions found. The third analysis follows earlier GIS mapping exercises. It attempts to develop the method to account for the different sample groupings found in the survey. Mapping of the areas in Scotland where preferred attributes of the landscape are present, was completed.

6.2 Cumulative Score (Likert scale) Analysis

The design of the questionnaire used for the survey, in part, developed the work of Kliskey and Kearsley (5). Questions were designed to allow a Likert scale to be derived from the scores respondents gave each part of the question. The scale in this case was the tolerance to land use change.

Initial amendments to the data matrix were required. Some questions had been phrased in the negative sense and some in the positive sense as far as the notion of tolerance to land use change was concerned. It was also necessary to remove any cases where respondents had either not answered one or more parts of the question, or where an 'undecided' answer had been given to any part of the question. This reduced the number of cases analyzed from n=1286 to n=785 for results from all areas.

Question 8:

It can be seen that within the tolerance range for Question 8, with 15 parts and scores from 1 to 5, the minimum score would be 15 and the maximum 75. The scale could be depicted:

15 <----------> 75

Tolerate Change Not change

Scores were, however, only found between 26 and 61, the extremes not being used. This can be seen by Figure 20 and Table 65. Modal value was 44, with 7.8% of all scores. This can be seen to be very close to the median point of the scale (45). 60.7% of respondents scored below this mid mark. Quartile percentages for Scotland as a whole being:

15-29:	11	1.4%
30-44:	466	59.4%
45-59:	307	39.1%
60-75:	1	0.1%

It can be seen therefore that the sample was erring on the side of tolerance to land use change. This is not surprising due to the nature of the questions concerning matters such as increasing the level of wildlife and woodland, to which only those concerned about the knock on effect of changing one single habitat voted against the proposition.

The results gained here were subjected to t-tests by Resident/Visitor split, age groups and Membership of an Environmental Organisation for the different landscape types. Significantly different results to the 0.05 level were found between

Highland and Lowland Residents, between all age groups in the Highland and Lowland areas and between Highland and Lowland Non-Members. (See Table 66)

Question 10:

A similar procedure was followed for Question 10. The amended sample was however higher for this question (n=885). The scale here was:

9	<---------->	45
Tolerate Change		Not change

(See Figure 21 and Table 67)

The modal value was 28 (11.8%). This was slightly higher than the mid mark for the scale. The range found was between 15 and 37. Quartile scores being:

9-17:	5	0.6%
18-26:	306	34.6%
27-35:	559	63.2%
36-45:	15	1.7%

This reverses the trend found in Question 8. This may be evidence of a NIMBY effect. Change is alright in Scotland in general, but not in the area you happen to be visiting.

Following the work of Kliskey and Kearsley (5) who divided their sample into four levels of purism by the cumulative scores found attempts were made to find appropriate groupings through factor analysis.

Factor analysis including sample groups:

The t-test results shown in Table 67, indicate difference in response to the

questionnaire from different types of respondent, (eg resident versus visitor; age group; member of an environmental organisation etc). An attempt was made to see if the total response pattern across all items was related to different groups of respondents. In other words, was the resistance to change construct found in the one to one interviews apparent from the summed response across all questionnaire items. This in effect treats the questions as a Likert scale and assumes a unidimensional "resistance to change" construct made up from the individual items of the questionnaire.

A distribution of the responses is shown in Table 65. This table shows a good response range across the questions, but no obvious groupings within the frequency distribution. Following the work of Kliskey and Kearsley (5) the distribution was divided into four groups. A discriminant analysis was carried out using the summed score as dependent variable and the respondent type variables as predictors. Two canonical discriminant functions were significant, from which it was inferred that the distribution contained 3 basic subgroups. The distribution in Table 65 was therefore divided into three groups and the discriminant analysis re-run. The main results are shown in Table 70. Two canonical discriminant functions are again significant. This summary table shows that significant predictors of the summed "resistance to change score" are familiarity with the area or with Scotland, membership of environmental organisations, age groups, landscape type, resident or visitor status and reason for visit.

The discriminant coefficients shown in Table 71 suggest the best predictors from the group are resident/visitor, familiarity, and membership of environmental

organisation and landscape type, with familiarity for function 2. Finally a classification (see Table 72). 44.7% of respondents were correctly classified from these predictors, against a baseline random prediction of 33%. Interestingly, however, the stronger conservationist view (category 3) is more correctly classified (54.7% correct, 15% very wrong). Not surprisingly therefore conservationists would appear to be more easily identifiable from the responses than those less resistant to change.

6.3 Factor Analysis on survey data

Two parts of the questionnaire were separately factor analyzed to examine the underlying structure of the responses.

Analysis of questions on Scotland in general (Question 8):

From the initial list of 15 questions there were 4 factors with eigen values above the usual default limit of 1, (ie accounting for the variance expected for each question on a random basis). A variance rotation produced the factor loadings for each of the 15 questions as shown in Table 68.

The 3 questions with high loadings on factor 1 (Questions 8a, 8b and 8c) are associated with human impact on the landscape - roads and tourist facilities. Factor 2 is associated with buildings in the landscape - housing and industrial development. The highest loading on factor 3 is a question related to encouraging the indigenous population to remain and a question on increasing the diversity of wildlife. Both seem to tap the desire for appropriateness or naturalness of the area. Finally on factor 4 are questions specific to woodland in the landscape. The 4 factor account for around 55% of variance in the data. In summary, therefore the

general questions about change to the Scottish landscape have been answered in 4 principal ways which relate to tourist needs, housing and industrial development, naturalness/appropriateness of people and wildlife and woodland.

Analysis of location specific questions (Question 10):

From the initial set of 9 questions, 4 factors again emerged with eigen values grater than 1. These 4 factors accounted for 63% of the total variance in the data. A variance rotated solution produced the factor loadings shown in Table 69.

The factor structure is similar to that emerging from the general questions. Factor 1 is relate to housing development and the impact of farming. Factor 2 is related to tourist facilities and the road network. Factor 3 links encouragement to the indigenous population to remain in the area and wildlife diversity. Factor 4 is exclusively linked to forestry. There is a considerable similarity therefore in the factor structure for general questions and questions specific to the area the respondent was in.

6.4 Discriminant analysis on survey data

A number of discriminant analyses were run to see if responses to the questions on Scotland in general or the particular location were predictive of the characteristics of the respondent. In other words, for example, was it possible to predict whether someone was a resident or a visitor from their answers to the questions? Table 73 summarises the results found.

Table 73 Summary of results for prediction of group membership by discriminant anlaysis

Predicting	Dependent variables	Overall classification
For Scotland in general (Question 8)		
Age	8g 8j 8e 8k 8f	57.0%
Member/non member of environmental organisation	8f 8m 8b 8k 8j 8i	64.8%
Resident/visitor	8c 8h	90.2%
Area specific questions (Question 10)		
Age	10g 10b	50.7%
Member/non member of environmental orgainsation	10f 10d 10h 10e	62.0%
Resident/visitor	10a 10h 10c	90.2%

It is likely that the high predictive values seen for resident/visitor are biassed by the low number of residents contained within the sample.

6.5 Mapping The Survey Data

6.5.1 Datasets required

Following preliminary attempts at mapping the data gained through the one to one interviews, a similar system was adopted for mapping data gained through the main survey. The aim of this mapping exercise was to assess the possible usefulness of this method for displaying the landscape preferences of different sample groups. Due to practical resource constraints, including the limited availability of relevant digitized data, mapping efforts were made for only Question 9. This question asked for ratings on the desirability of visiting an area in Scotland with the following

sample groups. Due to practical resource constraints, including the limited availability of relevant digitized data, mapping efforts were made for only Question 9. This question asked for ratings on the desirability of visiting an area in Scotland with the following attributes: panoramic views (open landscape), narrow views (enclosed landscape), water features, few water features, mountainous and rugged, more rolling and coastline.

From this it can be seen that four datasets were required:

Open-enclosed

Water-no water

Mountainous-flat

Coastline-no coastline

Open-enclosed:

Designed by Dr D Miller (MLURI, Aberdeen), this dataset was designed to show the degree of enclosure by the number of set points that can be seen from any location. In brief a grid of 5km spaced points was draped over a map of Scotland. By the use of a digital terrain model an intervisibility map was created. The number of the 5km points that could be seen from the location points (themselves at 100m intervals) being the end product. This number varies between 0 and 36, enclosed and open.

The use of a 5km grid does not give the fine resolution that is required to map this construct effectively. It is intuitively obvious that 5 x 5km units cannot locate an object less than this scale. For studying this construct in future a finer resolution

would be required, as 25km² can hide local landform features, and so will not be adequate on a more regional or local scale. However when looking at a more national scale as in this exercise it is basically adequate as it highlights those areas which are broadly open and those which are broadly enclosed.

The point of 'cut-off' between enclosed and open was subject to much scrutiny, and was made by subjective arbitration. Factors such as the nature of creation of the dataset, the topography of Scotland, and relative land areas covered were included in the decision to place the cut off points between classes 1 and 2. That is a location where 0 or 1 5km point can be seen has been deemed to be enclosed, those where 2 or more points can be seen has been deemed to be more open. This treats the dataset very simply, but does allow indication of this effect to be brought into the mapping procedure.

Water-no water:

This construct was not altered in any way from previous mapping endeavours. It remains therefore to be limited merely to presence and absence of large bodies of water. Again efforts should be made to improve the range of features mapped within this construct for future mapping exercises.

Mountainous-flat:

This dataset was divided into five classes for the earlier mapping. Here these five classes were split into two groups, mountainous and rugged and more rolling landscapes, to correspond with the questions initially asked. No alterations were made to the dataset apart from this reclassification.

Coastline-no coastline:

Results from this question, as discussed in Chapter 5, were mixed. This gave doubts as to the worth of the data gained. Resulting from this the construct was dropped from this mapping exercise.

6.5.2 The sample group

Due to the resource constraints placed on this part of the project, it was decided to map one sample set of groups. The nature of the exercise being methodological, it was thought that one example of the possible output of such an exercise would be sufficient to give further indications of its practicability and use to potential users of the information. The three age groups were chosen for the mapping exercise due to the highly significant results that had been found between these groups in the earlier analysis.(See Chapter 5.)

Modal analysis of Questions 9a to 9f was undertaken for these three groups. A modal value of 7 (very desirable) was taken to be a positive indication, a value of 4 or 5 (the minimum values found), being taken as a negative indication.

Here ✓ is a positive indication

X is a negative indication

	Panorama	Enclosed	Water	No water	Mountains	Rolling
<30	✓	X	✓	X	✓	X
30-54	✓	✓	✓	X	✓	X
55+	✓	✓	✓	X	✓	✓

As can be seen this analysis gave three different combinations of preferences to be mapped. Desirability to visit an area whatever its attributes seems to increase

with age, the Under 30 age group being the most finicky in their choice of area to visit.

6.5.3 Results

See Map 6 - Under 30 Age group:

The Under 30 age group as stated above had the least number of preferred attributes. This has caused a situation where, to have a high number of constructs fulfilled, very specific circumstances are required. This is shown by the predominance of yellow and green areas on Map 6. The mountainous/rugged areas of the Highlands are shown by the blue areas, where two of the three constructs are fulfilled. Similarly the Southern Highlands can be seen to fulfil these criteria. The areas where all three criteria can be found are minimal, and do not show up clearly on this map. To this end, Map 7 was produced to try and highlight these areas.They can be seen on Lewis, Harris and the far North-West Coast. Isolated areas can be seen elsewhere.

Map 8 - 30-54 Age group:

Due to the indifference of this age group to the construct open-enclosed, a preference was found for both poles, the whole of Scotland fulfils at least this construct. This is seen by the dominant yellow colour. Again the rugged North West landscape can be seen as preferred. Areas where all three constructs are fulfilled are the same as the Under 30 age group. This is due to a lack of significant water bodies found in mountainous areas.

Map showing areas in Scotland where landscape attribute preferences are fulfilled for the under 30 age group

Number of constructs fulfilled:

- none
- one
- two
- three

Construct poles preferred:

- mountainous
- water
- open

Map 7

Map showing areas in Scotland where landscape attribute preferences are fulfilled for the under 30 age group

Number of constructs fulfilled:

two or less

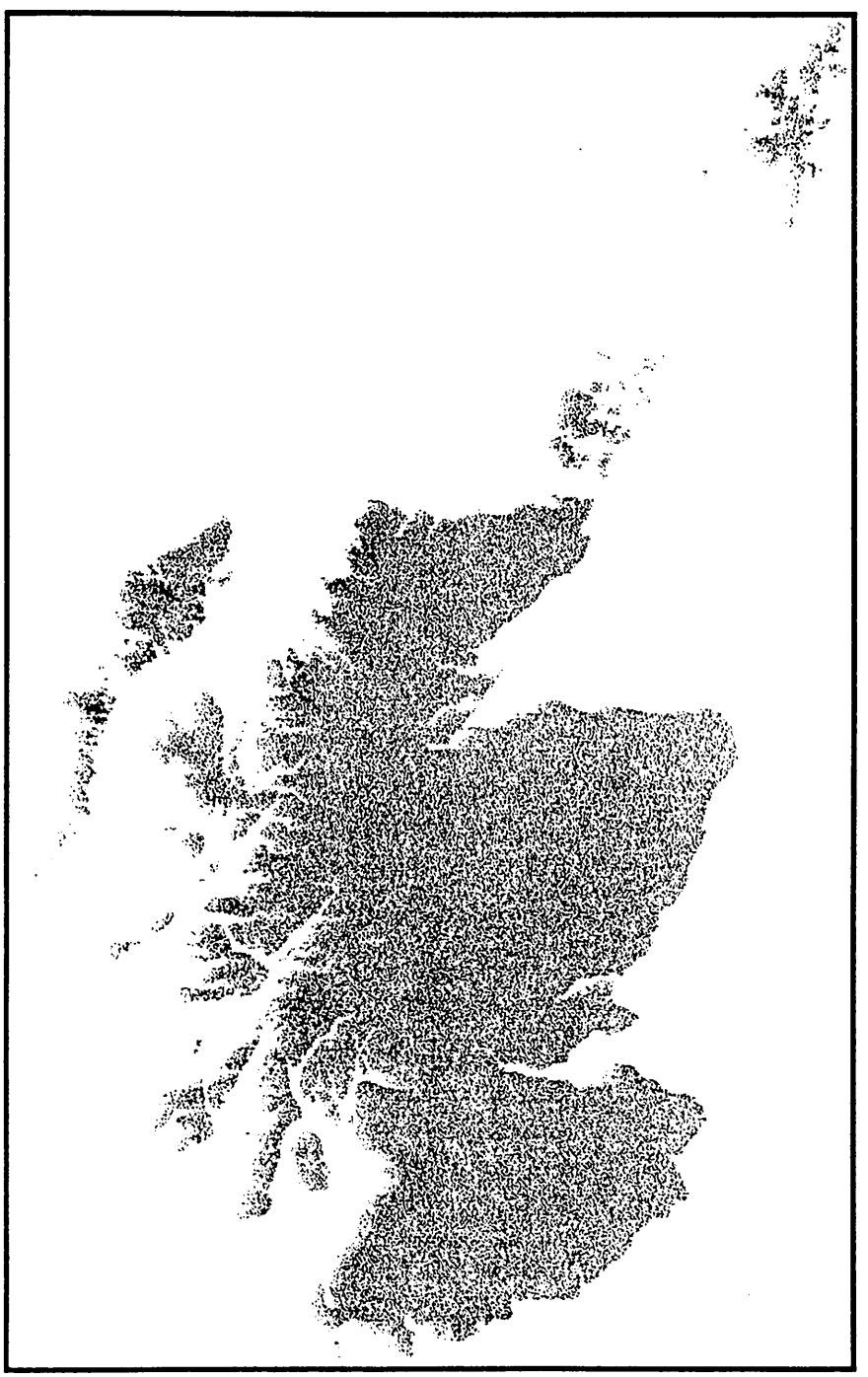
three

Construct poles preferred:

mountainous

water

open



Map showing areas in Scotland where landscape attribute preferences are fulfilled for the 30-54 age group

Number of constructs fulfilled:

- none
- one
- two
- three

Construct poles preferred:

- mountainous
- water
- open or enclosed

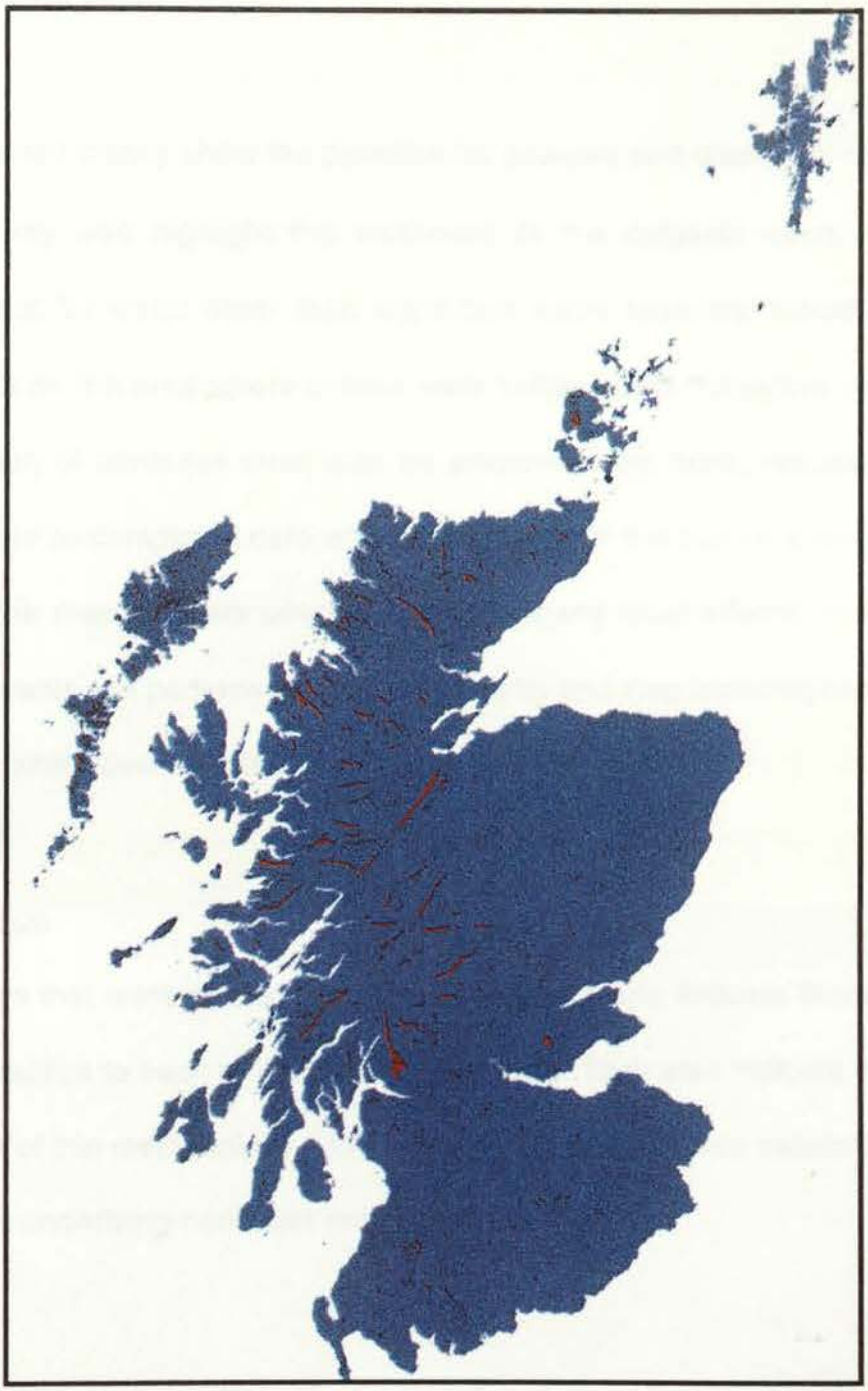
Map showing areas in Scotland where landscape attribute preferences are fulfilled for the 55+ age group

Number of constructs fulfilled:

- none
- one
- two
- three

Construct poles preferred:

- mountainous or rolling
- water
- open or enclosed



Map 9 - 55+ Age group:

This group is the most relaxed in their attribute preferences. They prefer both open and enclosed landscapes, rugged or rolling landscapes, their only preference being for areas of significant water features rather than few water features. This is clearly shown by Map 9, the overall blue results from no preferred poles for two of the constructs, water features such as the lochs of the Great Glen and Loch Lomond clearly showing up in red.

The results gained clearly show the potential for analysis and display of results in this format. They also highlight the weakness of the datasets used. A more complex dataset for water other than significant water features, would have a profound effect on the area where criteria were fulfilled. The subjective nature of the classification of attributes must also be acknowledged here, reclassification exercises should be completed before further mapping of this nature is completed. The scale of the map/datasets used also masks many local effects. In future it would be preferable and perhaps more practical to try and map local/regional areas to elicit the smaller scale effects.

6.5.4 Discussion

The three maps that were gained from this exercise clearly indicate those areas likely to be attractive to each of the three age groups. They also indicate that use could be made of this methodology if the datasets used were more detailed and/or highlighted the underlying construct more precisely.

Even with the limits placed on this exercise some valuable indications have been gained which point to the role this methodology could play in the future. Improvement of the datasets would allow the design of a more focused questionnaire to link the needs of the client/user with those of the technical framework. These links must be made clear from the beginning if useful output is to be gained.

Research must also be conducted generally into the way in which land use planners/policy makers would view and use such maps, as well as their needs to each specific project. It is only in this scenario that such a method of display would be of use. It must not be allowed to distract from the standard statistical analysis of the data which underlies the mapping procedure.

Spatially referenced perception and preference data will, undoubtedly, have a role to play in future exercises of this nature. However, they must be viewed at this time as primarily an aid to displaying information gained. It is expected that as the technology becomes more advanced, and data in a digital format becomes more widely available, this role will expand.

CHAPTER 7- SUMMARY AND IMPLICATIONS

7.1 Summary

Scottish landscapes are now valued highly, their worth being valued from ecological, environmental and cultural heritage perspectives.They are also a magnet for tourist and leisure activities which gives a financial return from the land greater than that of agriculture for the Scottish economy. Planning and land use policy development can only be as worthwhile as the criteria which it was based upon. For sustainable policies to be developed, these criteria must involve perceptions not only by experts, but the views of those who 'use' the landscape, either for the various outdoor activities or merely from a car/coach window.

The opinions of these groups may not be similar in all respects, they have different requirements, but a balance must be gained which requires input from all sectors. All viewpoints must be taken into consideration both to protect the landscape from their activities and to protect the income they generate for the rural economy.

This research sought to evaluate a methodology for describing in more precise terms the attributes which contribute to an individuals perception of landscape quality, and how that knowledge may be used in consideration of land use management and policy development.

Personal Construct Theory and its associated Repertory Grid Test (RGT) was used to obtain underpinning attributes and dimensions of landscape perception. The first exercise completed was to develop a working format for the use of the RGT with the intention to gather information on the constructs used by two different

populations (expert and lay) to differentiate between Scottish landscapes. Two different forms of one to one interview were completed using a computerised version of the RGT. Over one hundred freely elicited constructs were gained and were divided into three main categories - attributes of the landscape, human impact on the landscape and more general evaluations. For a majority of subjects in the sample four dimensions emerged to account for most of the variance in the data. The dimensions found were the scale of the landscape, the amount of human impact on the landscape, the presence and distinctiveness of the topographic features and the presence/amount of water. These dimensions are compatible with other research findings in landscape perception studies. These findings, and the findings of research into the relationship between prototypes and resistance to change, suggest a need for future research into landscape typology and the goodness of example of a landscape within that type. That is, investigation is required on whether landscapes amenable to change are related to dispositional dislike, or, a discrepancy from prototype.

In this first exercise the data gained was based solely on memory recall of landscapes, the use of visual imagery being specifically avoided. To further investigate the role of visual stimulus an experiment was conducted to examine the role of visual imagery and information about the landscape in determining agreement levels for different types of typical intervention. This comprised an examination of the variance in evaluative response to a combination of different landscapes and different information about landscapes. The results confirmed that the propositions were purpose driven and that information about the landscape appeared a stronger determinant of judgement than visual landscape scenes. The

strongest effect on judgement was related to the proposed intervention. This reinforced the importance of local context information on decisions regarding the landscape.

For the methodology used in the first exercise to be useful in the context of GIS, it must be possible to map peoples perception. Some attempts were made in conjunction with Diane Pearson (Macaulay Land Use Research Institute, Aberdeen) to develop a database that would incorporate the required landscape attributes on which data had been gained. Within the limits of this database, mapping was completed for both an individuals perception and multiple perceptions. These attempts were reasonably successful, however the method used and database limits imposed resulted in a topographically driven end product. To allow for data of a more subjective nature to be mapped a further exploratory experiment was conducted where an individual evaluated their images of Scotland. This also allowed known spatial referencing of the data, this was unavailable for the results of the one to one interviews, a direct consequence of the use of images of the areas. Mapping for the individual was completed over seventeen constructs.

The results highlighted the importance of the landscape type within assessment, typology would indicate that certain landscape attributes cluster together - for an extreme example, intensive farming is rarely seen in association with mountains. The method does not allow for the fact that people "prefer" examples of all types equally - the same person may like equally mountainous landscapes and more rolling valley landscapes. Preference here is orientated to factors associated with the occasion of the visit, the purpose of visit, accessibility and familiarity for example.

The results of the first exercise were used to drive a larger scale (n=1286) tourist based questionnaire. This was to test the use of the constructs over a larger sample and in as little time for the respondent as possible, one to one interviews taking at least one hour! The survey was completed in four areas in Scotland. It aimed to gain further information into perception of landuse change within Scotland in general and within each of the four areas. Previously elicited constructs were used to gain the subject areas, with questioning specific to intervention indicators. Data was also gained on desire to visit areas with specific landform attributes.

Results indicate variation in attitude between intervention and between user groups by age, reason for visit, resident/visitor status, area visited and membership of an environmental organisation. Preferences for visiting areas with the attributes of significant water features and mountainous/rugged were found over areas of few significant water features and more rolling landscapes, this again varied between the groups previously identified. The data gained on preference for areas with certain attributes, was subject to the mapping procedure first used. This enabled different user group preferences to be identified.

It can be seen by the results gained from the methodology used in this project that perception of Scotlands landscape is dependent upon many factors of differing levels of importance for different individuals. Broad patterns can be seen in terms of landscape attribute preference and in the user group context. Geographic Information Systems seem to be one way of presenting the end product of landscape assessment work of this nature, however, there are a number of practical problems associated with the use of multiple databases which have been

found to be of critical importance. Availability of the information required should be thoroughly investigated before this method is included in further research. If the data is available it provides informative and readily identifiable results. It is possible as the Geographic Information movement matures and more spatially referenced data becomes available that its use in this type of research will be greater; this was not found to be the case during this project.

The use of Personal Construct Psychology appears to be an effective means of discriminating between landscapes. The attributes that are used to value landscape have been identified, yet an acknowledgement is made that further investigation in typology of landscapes and goodness of example within type is essential to the progression of research within the field. As a preliminary attempt at research using this method, valuable results have been gained, but this is tempered by an understanding that there is still more to be investigated before any certainty can be given to the reliability of the results gained.

7.2 Implications for future research

The research conducted has been largely developmental. The use of Personal Construct Theory in environmental cognition exercises is well documented (see Table 2 for examples), though no research was found for perception of Scottish landscapes. The integration of the results of perception studies with GIS technology would appear to be more unusual. Only two published instances of work of this nature have been found (5, 6).

This section reports on the relationship of this study with previous research, and considers the implications of the findings for future research.

7.2.1 The use of Personal Construct Theory in landscape perception exercises

PCT was used in this exercise due to its ability to link a persons image and attitude toward a landscape. This had been highlighted in previous research as a weakness of many perception exercises (see Chapter 2). The Repertory Grid Test provides a flexible method of integrating PCT with perception exercises, the use of a computerised version of the RGT enabled on line analysis which elicited further constructs efficiently. However, one issue which is strongly associated with the choice of PCT in further studies of this nature is that of the time limit to be imposed on an individual attempt to work through the RGT.

In this research it was found in preliminary testing that RGT may take considerable time. For practical reasons a time limit of one hour was given for one to one interviews. It must be acknowledged that it is likely some pertinent constructs remained unelicited due to this time limit. However it is likely most important constructs used in landscape perception will have been elicited within an exercise of this nature.

Although no previous study of Scottish landscape perception has used PCT, the research found relating to aspects of this project seem to corroborate the results found here. For example, the liking for physical landforms of mountains and water was also found by Sidaway (42).

No examples of the use of PCT in eliciting attitudes to land use change were found. From this research it would appear that PCT is useful in this context. It would appear that respondents found it reasonably easy to assess areas on the construct "Tolerate change - not change", and further analysis on why areas were so rated highlighted both the importance of some areas of human intervention in the landscape, and the importance of personal evaluation in this issue.

For future research this study has developed what appears to be a practical methodology for incorporating PCT into perception exercises. The use of a small number of in depth one to one interviews to drive a larger sample short questionnaire was useful in eliciting a large amount of relevant data on the perception and attitude to land use change. However, further research into the possibility of submerged constructs due to the one hour time constraint should be conducted.

7.2.2 Integrating GIS into landscape perception exercises

GIS technology affords the opportunity for researchers, planners and policy makers to store and model data and produce output in mappable format. No previous research was found using Scottish landscape perception data in a GIS framework, though two examples were found of work elsewhere.

Steinitz (6) used the modelling capability of GIS to test 5 theoretical models of landscape perception for their ability to predict patterns of response in a visitor survey in Acadia National Park, USA. Though all five had some predictive power

none stood out as being a "good" predictor. Steinitz went on to establish eight variables which would have had an influence on landscape planning. These variables (in Steinitz decreasing order of importance) are considered here with the implications for this work.

a Dislike evidence of urbanisation development or crowded use:

Results from this study would concur with this variable. Constructs elicited dealt with human impact, population, the amount of industry and the construct "escapism-urban".

b Like a sense of mystery:

The term mystery is itself subjective and open to interpretation. The term mystery may be correlated with the unusual, atypical/exploration and associated emotions of, for example, "bleak-exciting" and "exciting-dull".

c Like coastal development generic to local landscape, and development with an historical character:

Coastline proved to be important for many respondents, though it was not explored fully in this exercise.

d Like to see water:

This was true of respondents to the questionnaire survey, 43% of respondents gave areas where water forms an important part of the landscape the maximum desirability to visit rating.

e Dislike tourist orientated commercial development:

This variable was not clearly addressed within this study. Though indications would be an agreement with the statement. The construct "touristy-not touristy" was elicited.

f Like long distance views:

This variable was established in this study by the construct "panoramic-enclosed". 49% of all respondents voted a maximum 7 for desirability to visit areas with panoramic views.

g Like folded landscapes (mountains and islands):

Although, again, not clearly addressed, indications would be that this variable is important. Emphasis in elicitation was placed on topography of the landscape, with water/coastline also being preferred features.

h Like diverse vegetation in the fore-middle ground.

Diversity of vegetation was not considered in this study.

Steinitz (6) stated that the predictive power of 'cultural modification' was greater by itself than all of the five models he first tested. The influence of human impact has also been found to be of critical importance in this study.

The second piece of research found utilising GIS in perception research was the work of Kliskey and Kearsley (5) on Wilderness perception in South Island, New Zealand. They used quantifiable indicators for properties of the wilderness concept. Results of a survey were plotted by the degree of purism to the concept of wilderness. Multiple perception maps were developed through a GIS approach.

These studies were influential on the research completed here. The idea of using quantifiable indicators for perceptive evaluations was adopted for the translation of constructs into questions for the main survey. This approach was found to be effective for this purpose. Attempts were made to further develop the research ideas

ideas of Kliskey and Kearsley by use of a 'purism class system' for the tolerance to land use change (see section 6.2). This was not found to be as successful as they found it, but did provide an additional analytical technique of linking sample group divisions with tolerance to land use change. Further research specifically exploring one area of land use change may yield more definitive results for this type of analysis than the more general 'tolerance to land use change' concept used here.

In this study, the use of GIS has underlined the need for greater availability of digitized data on subjects pertinent to perception studies. In this case, for example, data for population and wildlife was unavailable. The limits of the database imposed on this work, reduced the analytical role of GIS. Further research must be aware of dataset limitations in the initial design of experimentation. In initial research it will be imperative not only to address the problems of data unavailable to this study, but to enhance the datasets which were used. For example, the dataset used for "water-no water" was inadequate to portray the more complex features water plays in the landscape other than merely being a large water feature.

This study has also been developmental in its use of GIS in that the study area has been national rather than regional and, arguably, incorporates a more complex and diverse both physical and cultural landscape than either of the two studies previously mentioned. Further research in Scotland might focus on one particular area or landscape type. This project was designed to be of a general developmental nature. The results gained should therefore be regarded in this

context.

The benefits of using GIS in presenting the results of perception exercises can be easily seen in both this study and the works of Steinitz and Kliskey and Kearsley. Clear indications of established results, and the power to model on the basis of rules developed in survey exercises all emphasize the potential role GIS could play in future research of this nature.

APPENDIX ONE - MATERIALS USED IN EXPERIMENTS

LANDSCAPE EXPERIMENT RESPONSE SHEET

(Group ...)

Landscape a:

The area is suitable for the development of:

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Tourism	.....	.....	.....	.....	.....
Forestry	.....	.....	.....	.....	.....
Housing	.....	.....	.....	.....	.....
Light industry	.....	.....	.....	.....	.....

Landscape b:

The area is suitable for the development of:

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Tourism	.....	.....	.....	.....	.....
Forestry	.....	.....	.....	.....	.....
Housing	.....	.....	.....	.....	.....
Light industry	.....	.....	.....	.....	.....

Landscape c:

The area is suitable for the development of:

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Tourism	.....	.....	.....	.....	.....
Forestry	.....	.....	.....	.....	.....
Housing	.....	.....	.....	.....	.....
Light industry	.....	.....	.....	.....	.....

Landscape D:

The area is suitable for the development of:

	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
Tourism	.....	.....	.....	.....	.....
Forestry	.....	.....	.....	.....	.....
Housing	.....	.....	.....	.....	.....
Light industry	.....	.....	.....	.....	.....

How familiar are you with landscapes of this type?

FAMILIAR 1 2 3 4 5 6 7 UNFAMILIAR

How typical do you think the landscapes are of the Highland Region of Scotland?

TYPICAL 1 2 3 4 5 6 7 UNTYPICAL

How much do you enjoy visiting landscapes of this type?

ENJOY 1 2 3 4 5 6 7 DO NOT ENJOY

QUESTIONNAIRE

This survey forms part of a project researching the perception of Scottish landscapes. It is being conducted in the Department of Landscape Architecture, Edinburgh College of Art/Heriot-Watt University. We would be grateful if you would complete this questionnaire and where available, please place in the box provided or return it to:

Landscape Questionnaire, Landscape Research Unit, Edinburgh College of Art/Heriot-Watt University, Lauriston Place, Edinburgh, EH3 9DF. Thank you.

1 **Are you**

○ A resident of this area ? (If so, please go to question 4)
○ A visitor to the area ?

2 **What is the main reason for your visit ?**

○ Touring the area/sightseeing ○ Walking in the area
○ Mountaineering/climbing ○ Canoeing
○ Other (please specify) .....

3 **What is your method of transport**

○ Car/Motorbike ○ Coach
○ Bicycle ○ Walking
○ Other (please specify).....

4 **What age group do you fit into ?**

○ Under 30 years ○ 30 - 54 ○ 55+

5 **What sex are you ?**

○ Male ○ Female

6 **How familiar are you with ?**

	Regular visitor	Been before	First visit	Resident
Scotland	.....	.....	.....	.....
This particular area	.....	.....	.....	.....

7 **Are you a member of any Environmental organisation ?**

Yes ○ No ○
If yes, which:

Scottish or Local Organisations:

National Trust for Scotland ○ Scottish Ornithological Club ○
John Muir Trust ○ Scottish Wildlife Trust ○
Other Scottish Organisation (Please specify.....)

UK or International Organisations:

National Trust ○ RSPB ○
World Wildlife Fund ○
Other Environmental Organisation (Please specify.....)

Please turn over.....

8 **Answer with reference to Scotlands rural landscapes in general**

Land use change has an effect on the appearance of the landscape. Please indicate to what extent you agree with the following propositions, consider the effect on rural Scottish landscapes in general.

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided
There should be further improvements to the main road network within rural Scotland						
More roads are needed to reach less accessible parts of Scotland						
Facilities for tourists should be improved in rural areas						
The number of way marked paths (Forest trails,long distance paths etc) should be increased						
There should be a policy to encourage the expansion of arable farming						
There should be a policy not to allow changes in the size of fields						
The further development of small communities is desirable within rural Scotland						
A change in land use that would increase the diversity of wildlife would be desirable						
A change in land use that would increase the numbers of, but not diversity of, wildlife would be desirable						
There should be provision of financial incentives to encourage the indigenous population to remain in rural areas						

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided
Planning policy should prevent the construction of new houses in rural areas						
There should be a policy to increase the amount of woodland						
There should be a policy to increase the amount of woodland, but only if this is native mixed woodland						
It should be policy not to allow an increase in the number of industrial buildings in rural areas						
Industrial activity that has a lasting effect on the landscape (Eg Quarrying, opencast mining etc) should not be allowed in rural Scotland						

9 **Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit each of these types of area in Scotland**

	Rating Slightly desirable.....Very desirable						
	1	2	3	4	5	6	7
Areas with panoramic views							
Areas where the main view is down the glen you are in							
Areas where water forms an important part of the landscape							
Areas where there are few water features							
Areas which are rugged and mountainous							
Areas which are more gentle and rolling							
Areas on the coastline of Scotland							
Areas away from the coast							

Please turn over.....

10 **Answer this question for the particular area you are in**

Please indicate to what extent you agree with the following statements, please note these statements are about this particular area

	Agree strongly	Agree	Neutral	Disagree	Strongly disagree	Undecided
More tourist facilities should be developed in this area						
No more houses should be built in this area						
This area is suitable for the development of light industry						
Additional forestry development should not be allowed in this area						
The main road network in this area does not require any improvement						
A change in land use that brought about an increase in wildlife diversity would be desirable						
Financial support should be available to encourage the indigenous population to stay in this area						
There should be no change to the balance of arable/mixed/sheep farming in this area						
There should not be changes to field sizes in this area						

APPENDIX TWO - TABLES AND ILLUSTRATIVE MATERIAL

Figure 5 Results for Question 8a

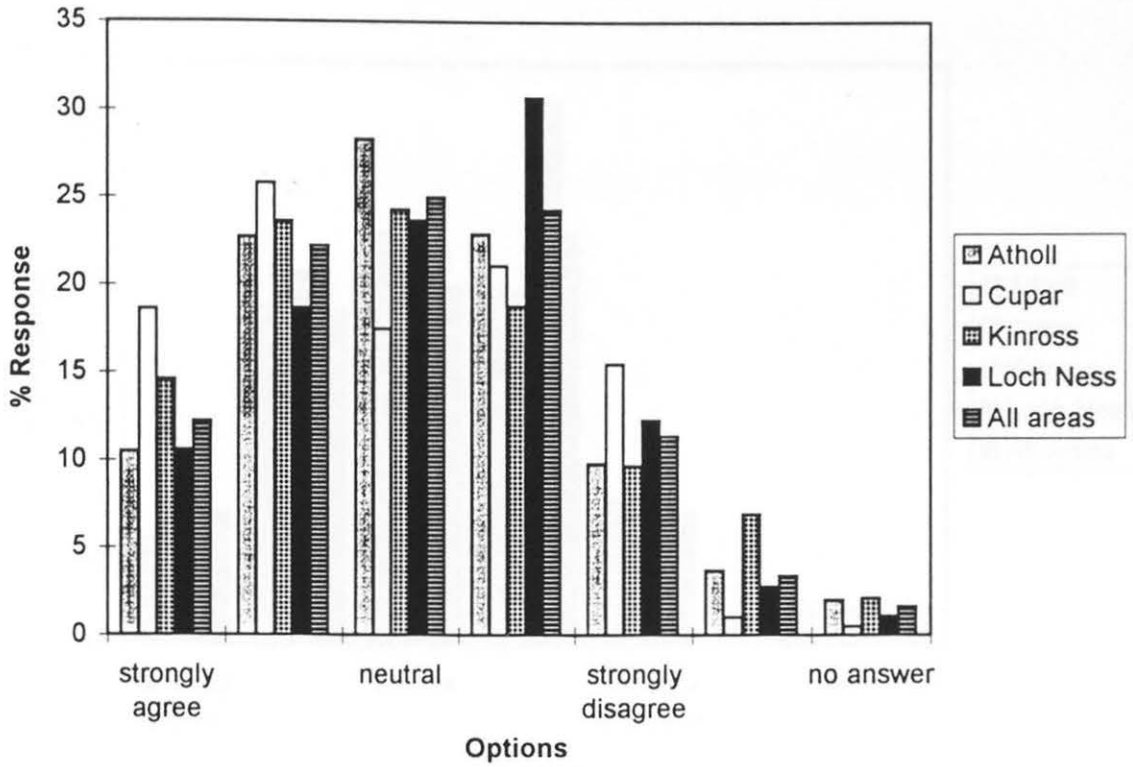


Figure 6 Results for Question 8b

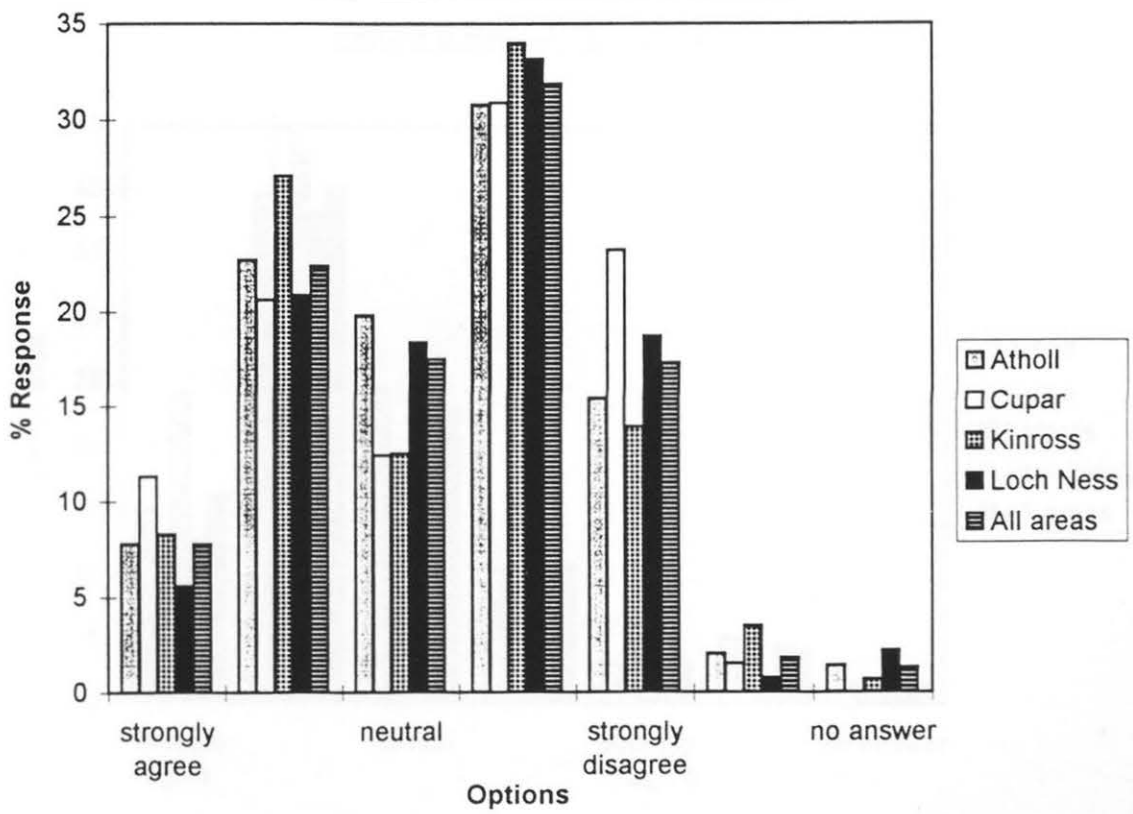


Figure 7 Results for Question 8c

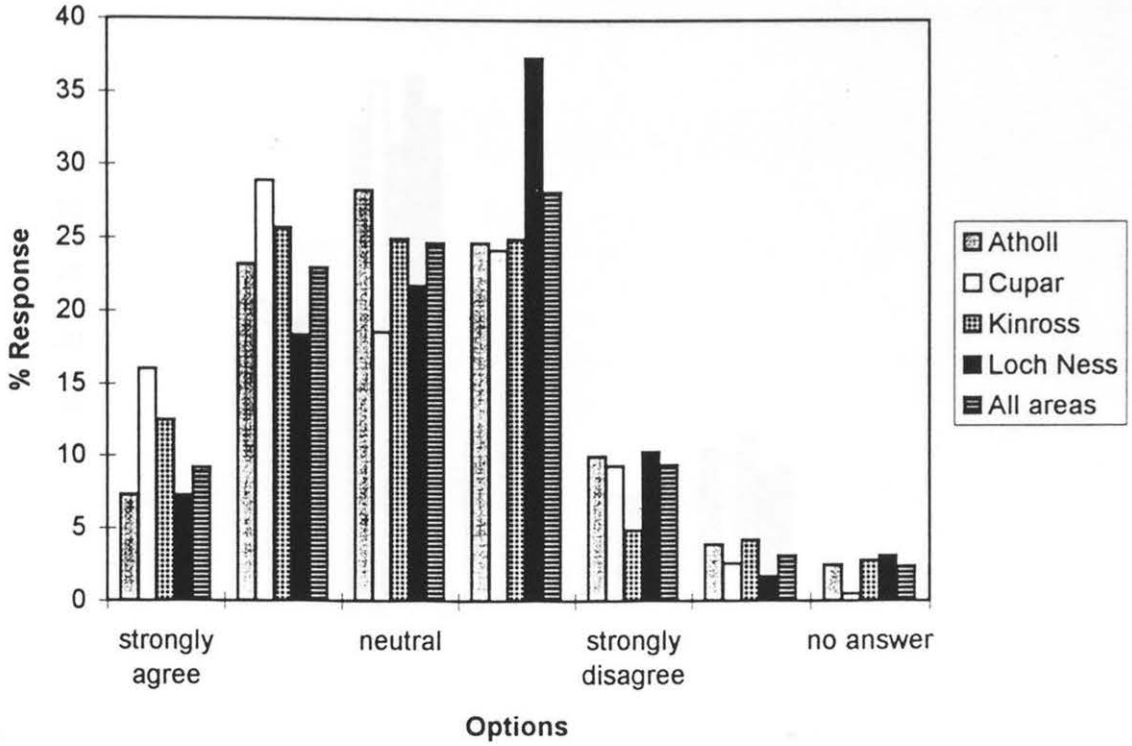


Figure 8 Results for Question 8d

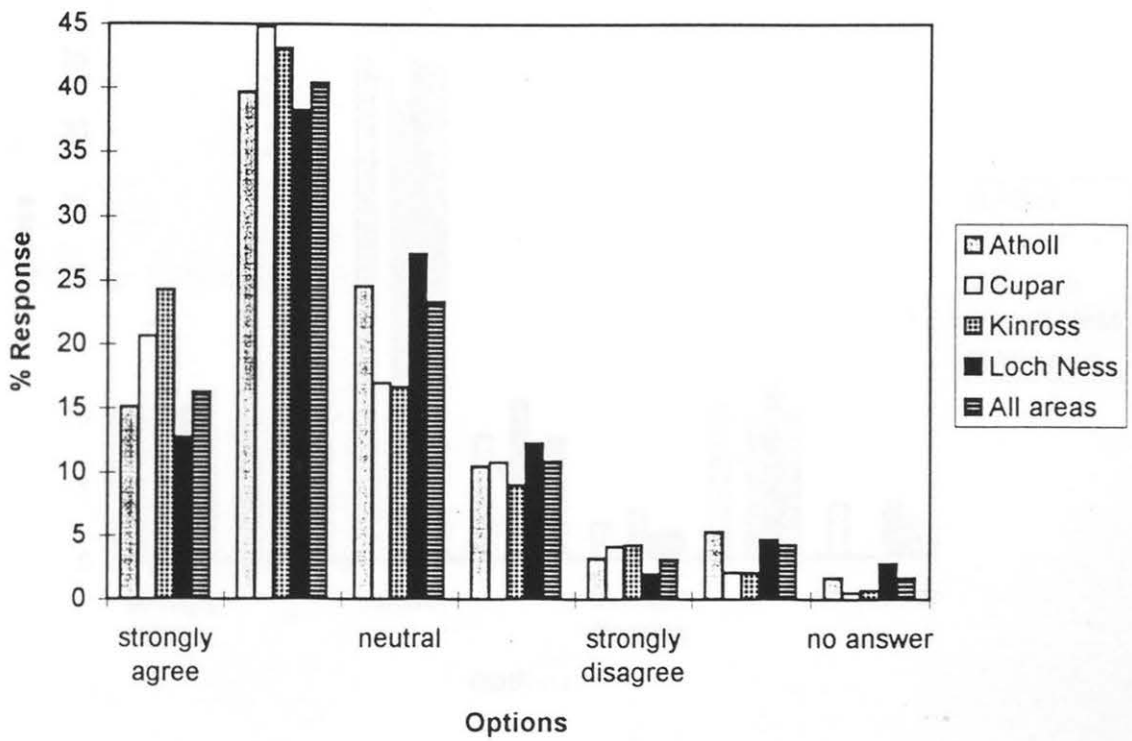


Figure 9 Results for Question 8e

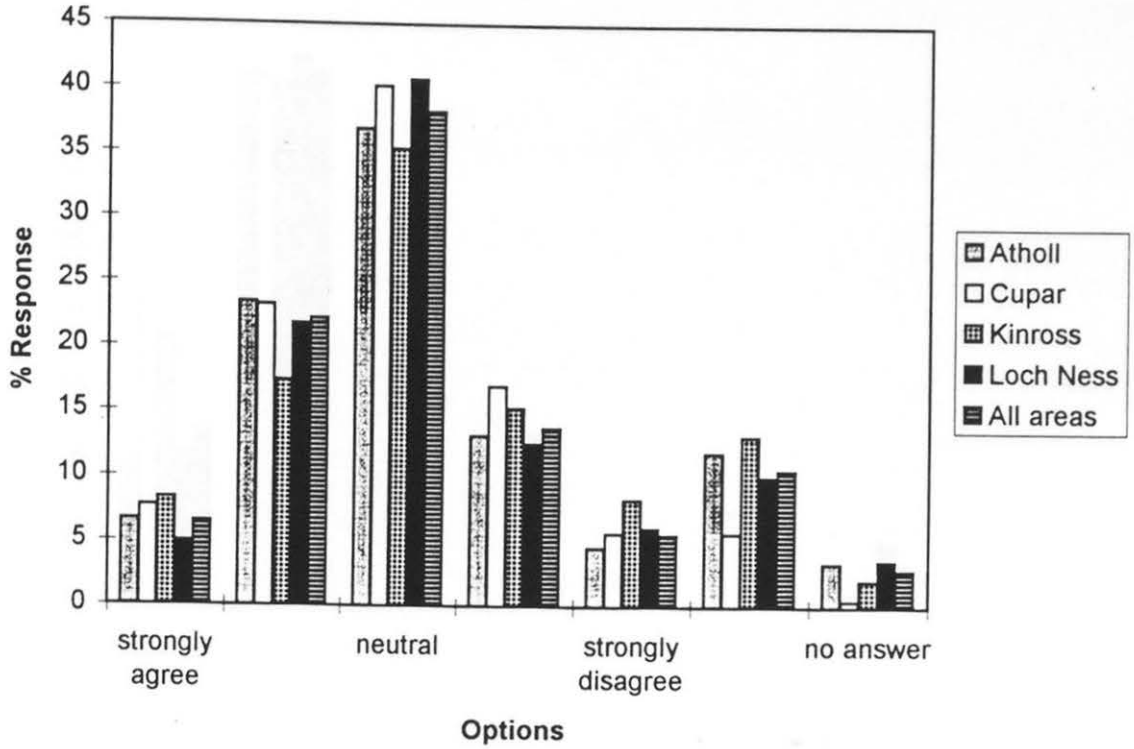


Figure 10 Results for Question 8f

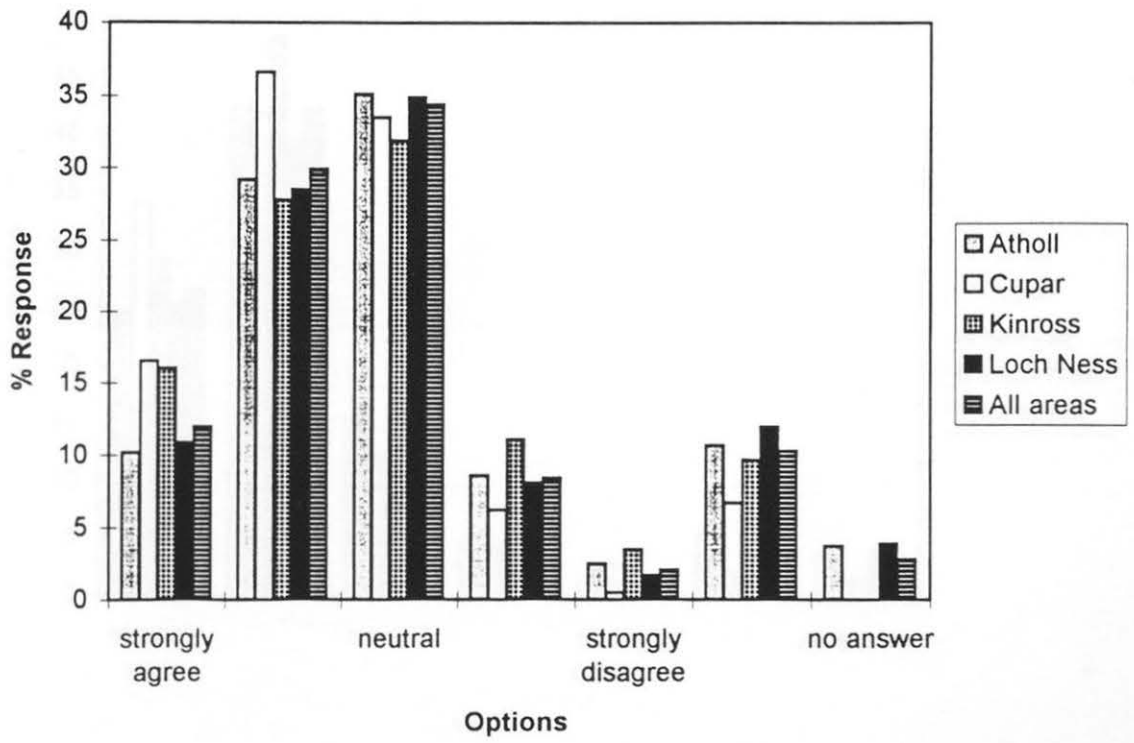


Figure 11 Results for Question 8g

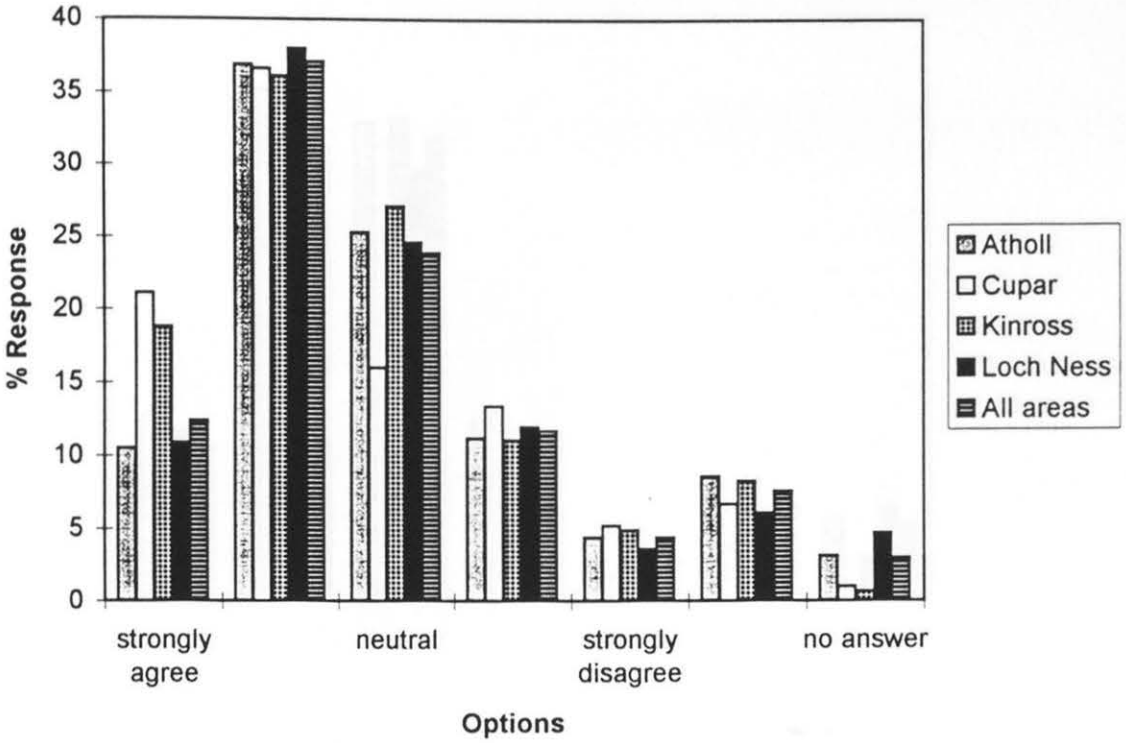


Figure 12 Results for Question 8h

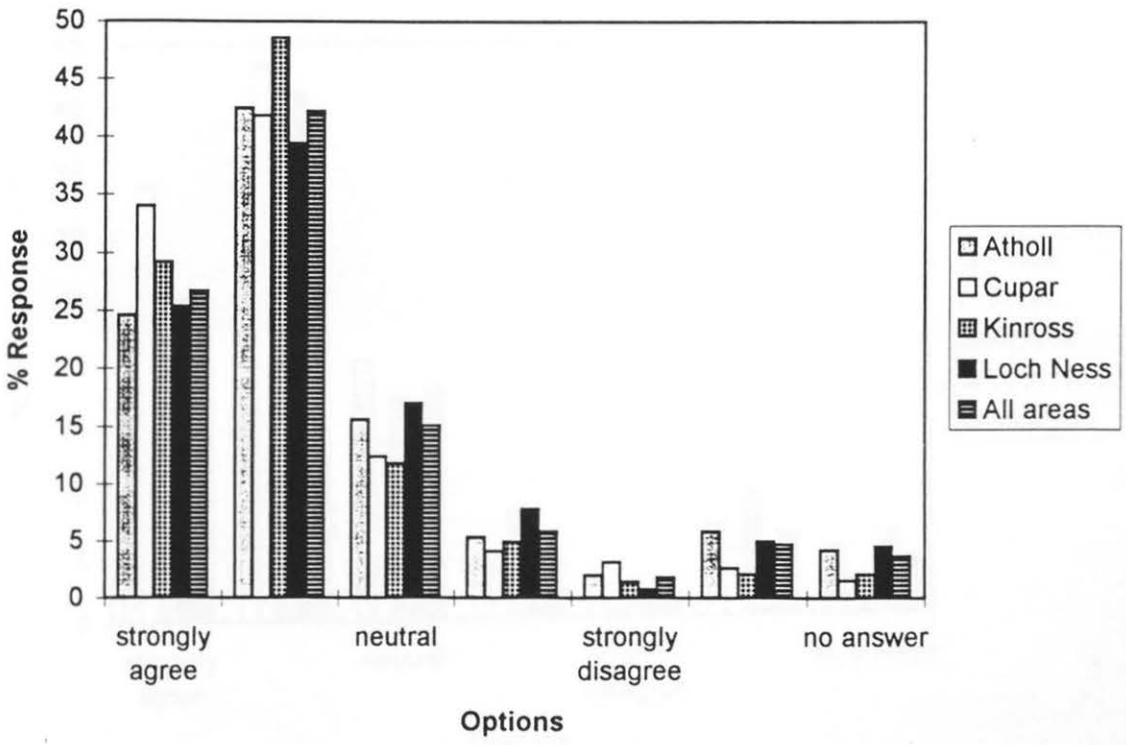


Figure 13 Results for Question 8i

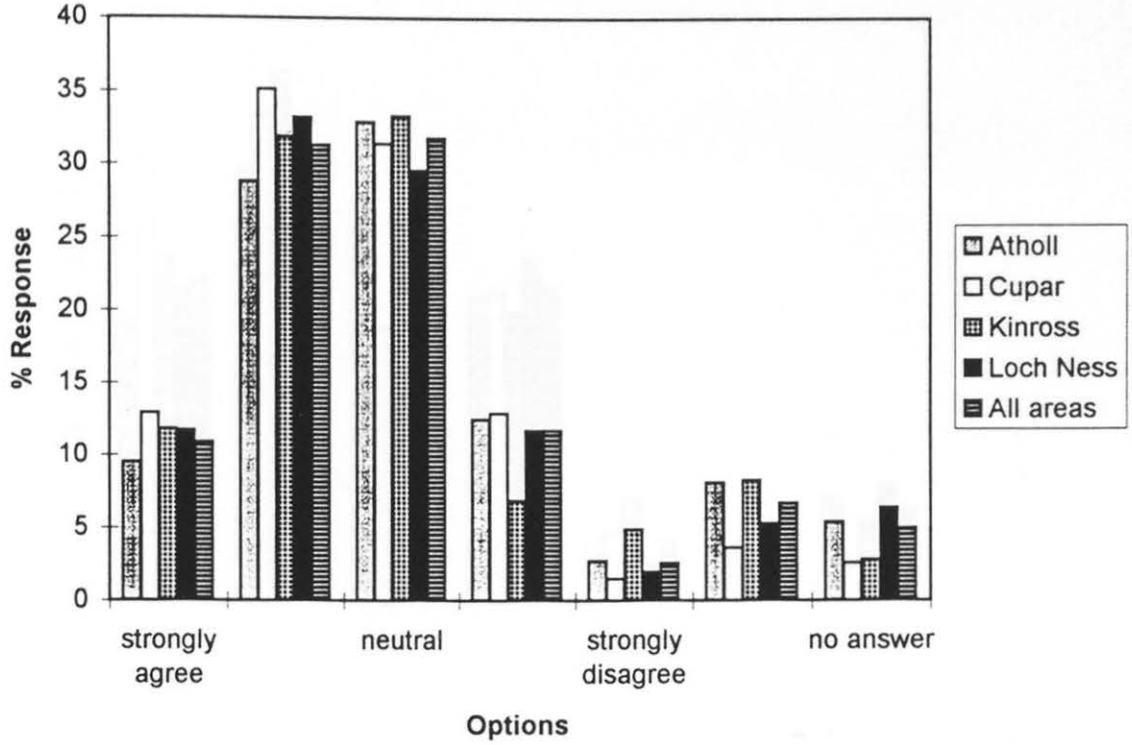


Figure 14 Results for Question 8j

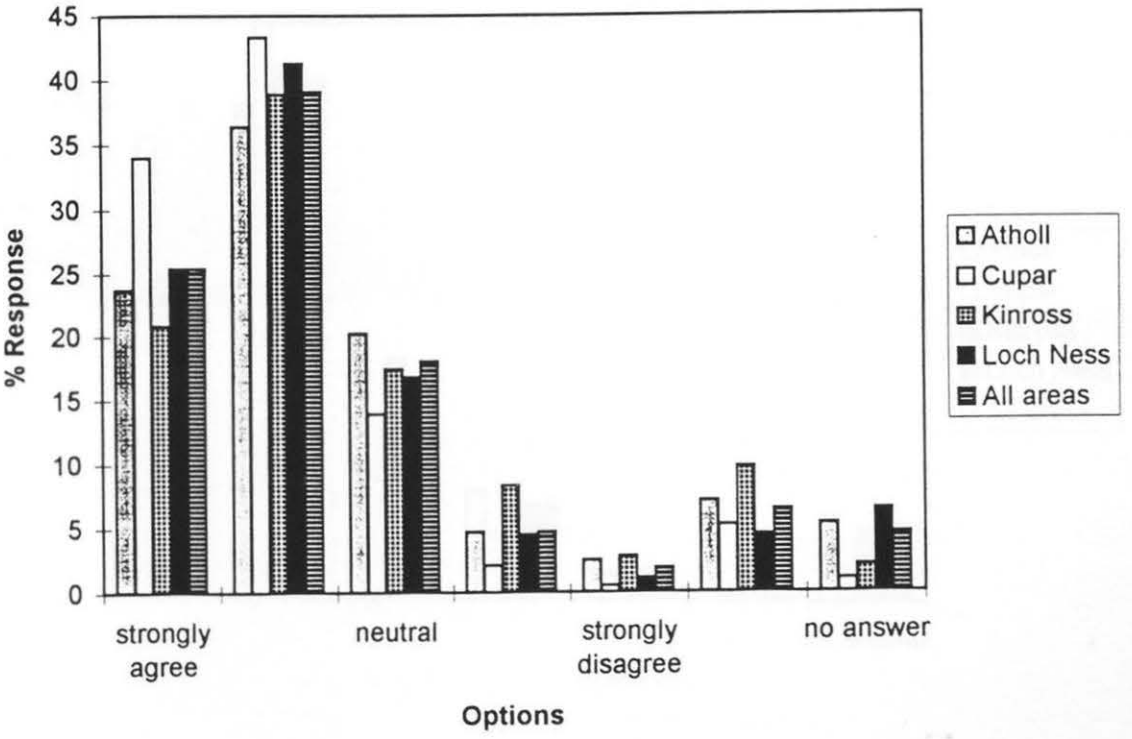


Figure 15 Results for Question 8k

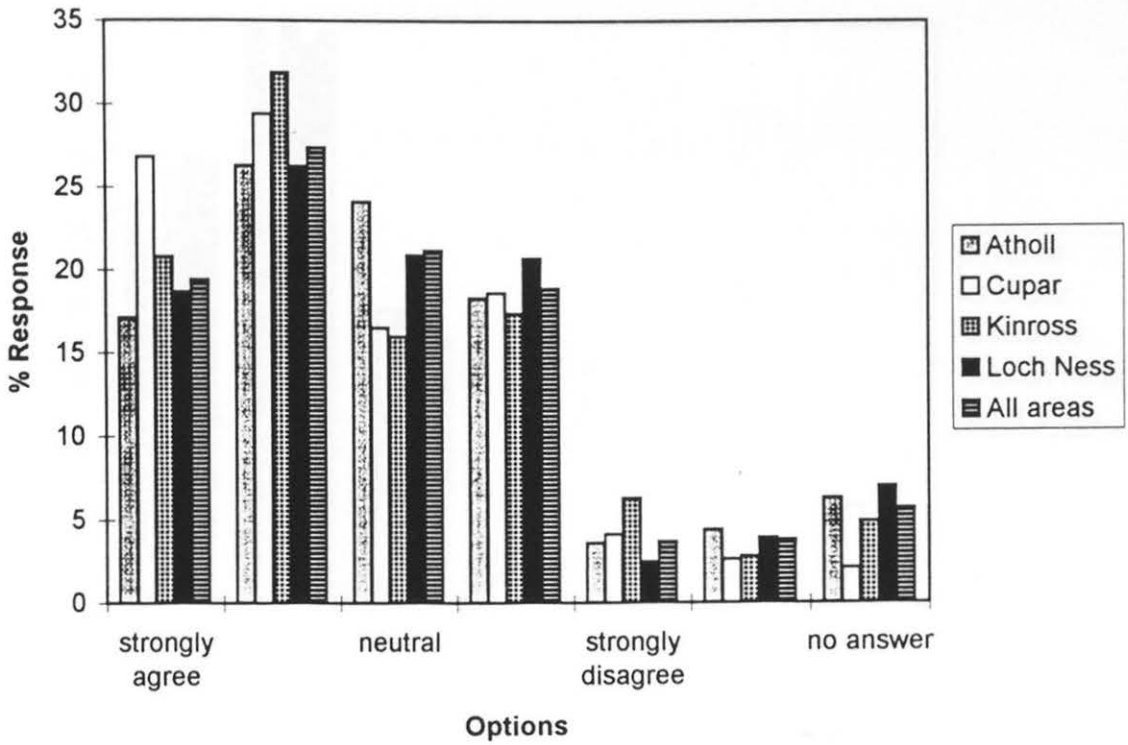


Figure 16 Results for Question 8l

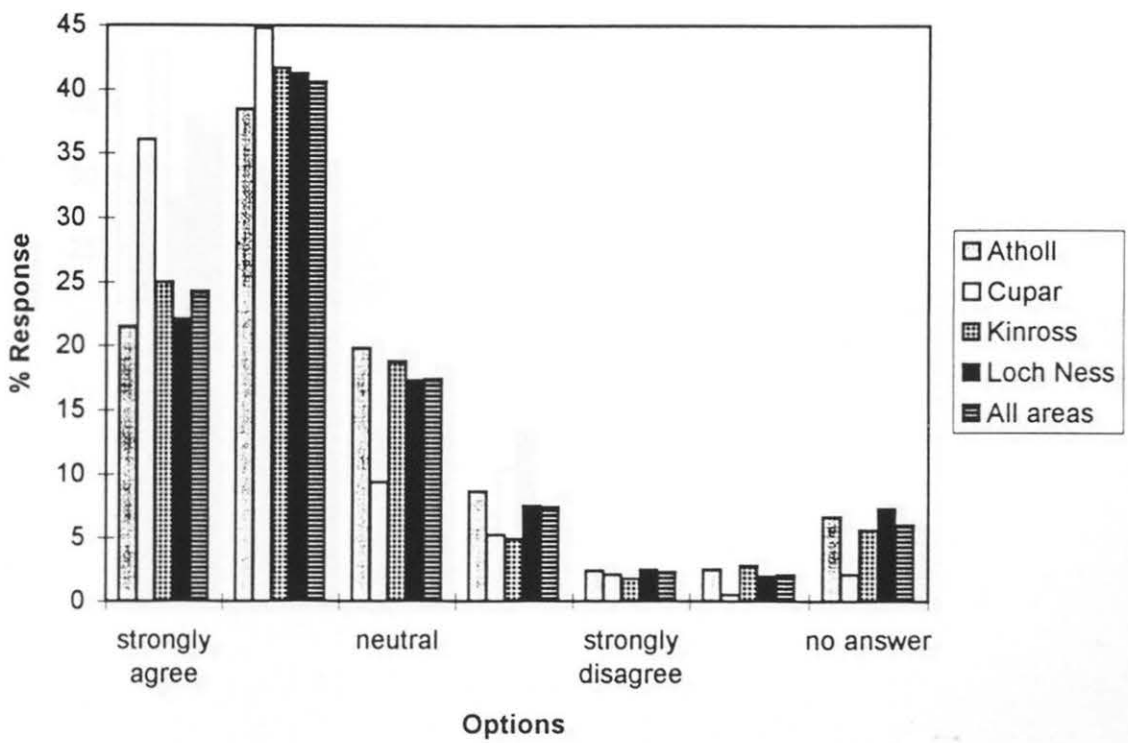


Figure 17 Results for Question 8m

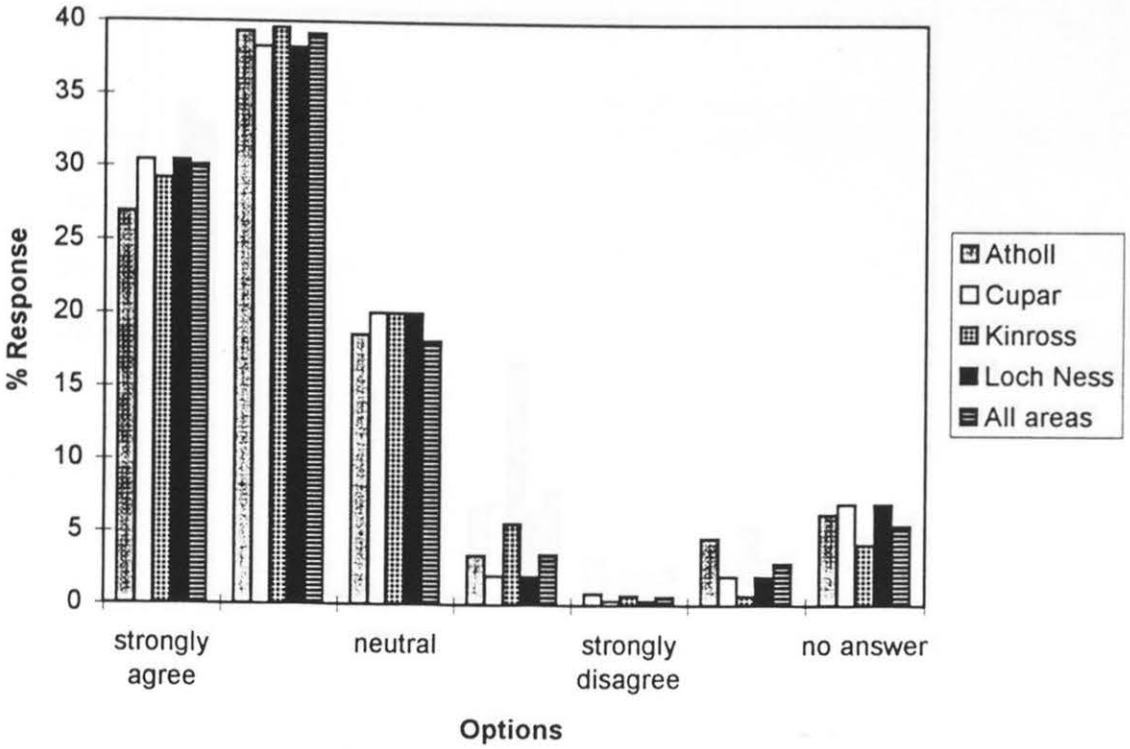


Figure 18 Results for Question 8n

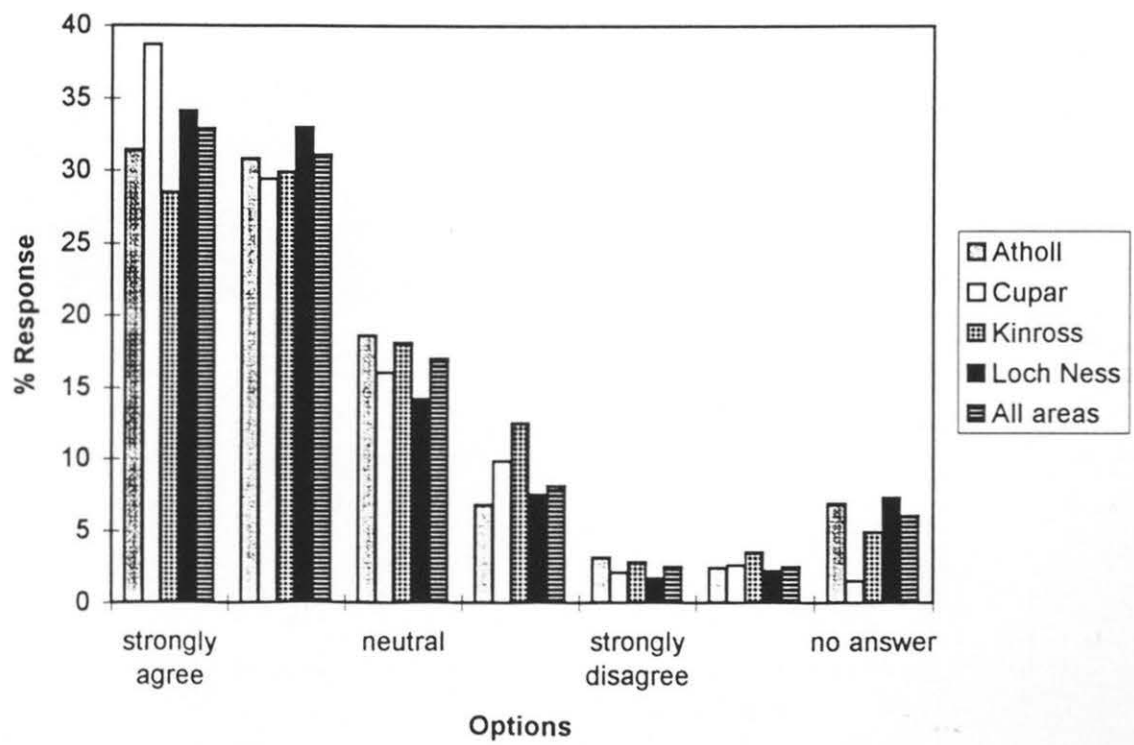


Figure 19 Results for Question 8o

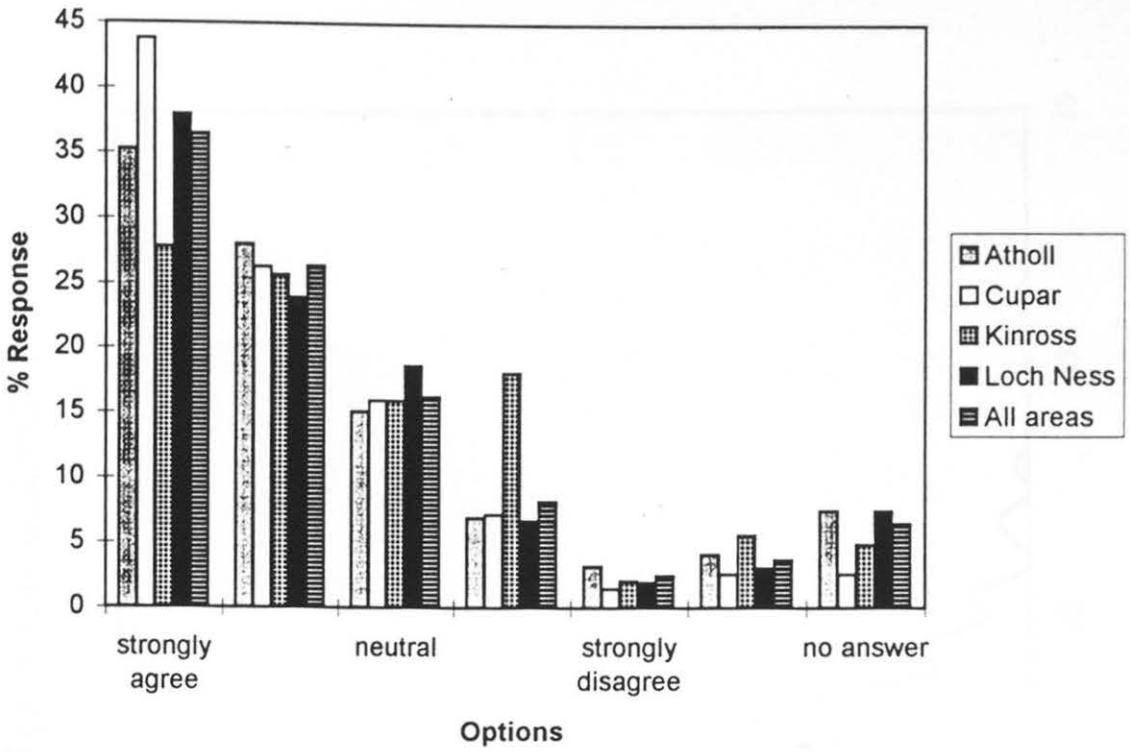


Figure 20 Showing histogram for tolerate change scale for Question 8 (tolerate change 15, not change 75)

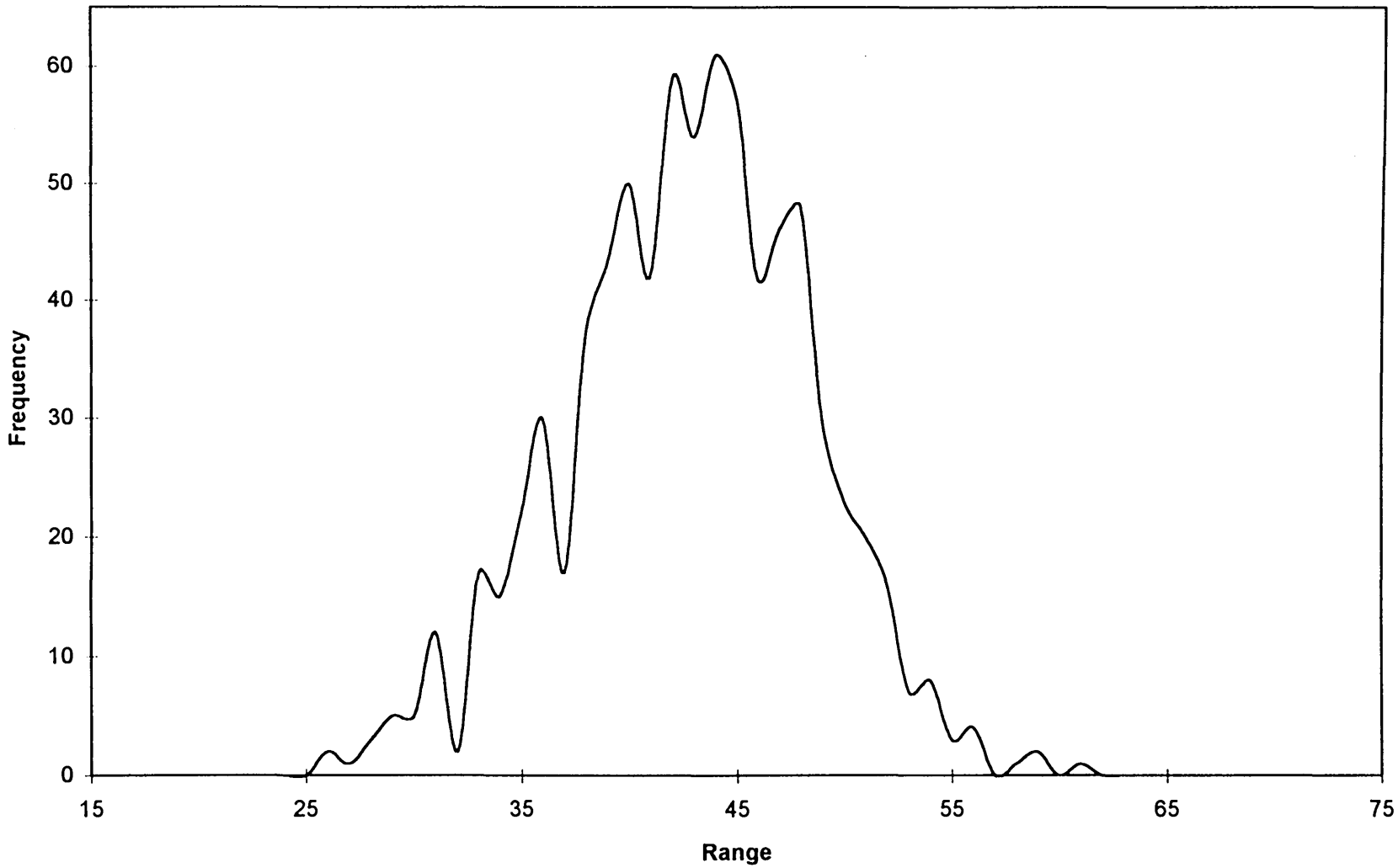


Figure 21 Showing histogram for tolerate change scale for Question 10 (tolerate change 9, not change 45)

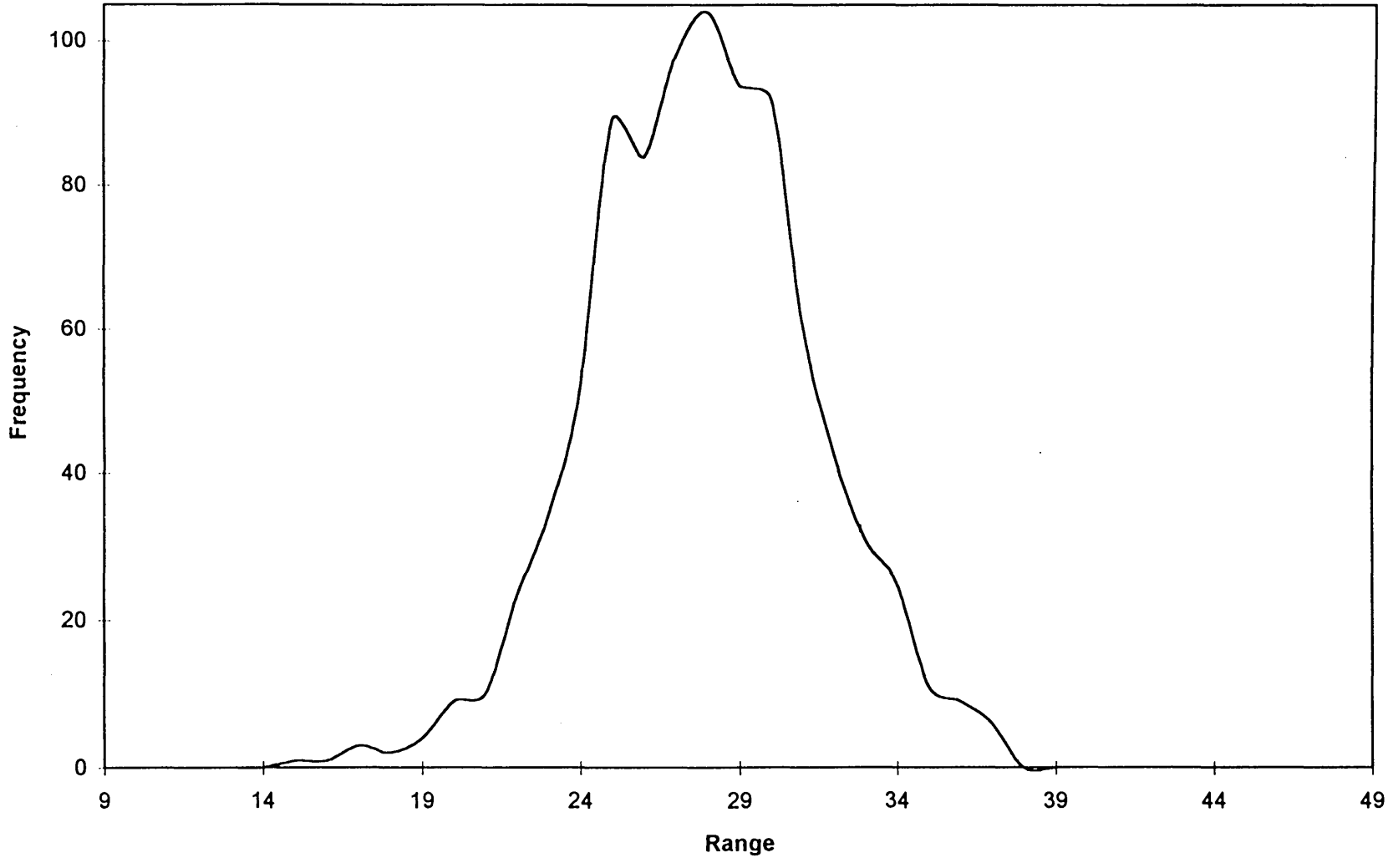


Table 3 Subdivision of elicited constructs by Expert/Lay and appropriate categories

LANDSCAPE ATTRIBUTES		
EXPERT		LAY
plain - undulating mountains present -absent rolling - hilly flat - high steeper - gentler horizontal - vertical emphasis smooth - rough rugged - soft	Topography	mountainous -rolling height difference - uniform hilly - flat
water present - absent coastal - inland cliffscape - island wet env - dry env	water	coastal - inland water - no water
trees - no trees wooded - no trees diverse vegetation - not diverse heather - grass green - not green fertile - infertile	vegetation	open wood - dense wood conifer - mixed wood (wildlife - no wildlife)
compact - extensive open views - restricted views enclosed - open	scale	enclosed - open vista - closed in

HUMAN IMPACT		
low pop - high pop		low pop - high pop
accessible - inaccessible		remote - accessible
touristy - not touristy		open moor - cultivated
rural - urban		natural - afforested
industrial - not industrial		haphazard - planned
primitive - humanised		hill farm - arable farm
natural - created		
managed - unmanaged		
tamed - wild		
cultivated - bare		
urban - escapism		
farmland - well farmed		
rolling farm - arable farm		
crofting - agriculture		
recreation - intensive farming		
rundown - prosperous		
EVALUATIONS		
scenic - not scenic		dynamic - calm
stimulating - depressing		dour - pleasing
oneness - artificial		familiar - unfamiliar
isolation - constrained		restricted - freedom
boring - dramatic		ordinary - unconventional
attractive - unattractive		varied - uninteresting
bleak - exciting		colourful - bland
similar - awesome		ordinary - interesting
hazard - safe		wild - less wild
comfortable - challenging		
exciting - dull		
drama - harmony		
boring - colourful		
grandeur - insignificant		

Table 4 Showing high variance in the three categories and showing the differences between expert and lay

CATEGORIES				
High Variance		Landscape Attribute	Human Impact	General Evaluation
	Experts	13	6	1
	Lay	9	4	6

Table 5 Average variances for Experts before and after rotation

PRINCIPAL COMPONENTS				
	1	2	3	4
BEFORE ROTATION	52	23	11	8
AFTER ROTATION	35	26	18	17

Table 6 Constructs and Elements linked to change

Resistance to change associated with the left hand pole	
Landscape Attributes	water - no water mountainous - rolling diverse vegetation - not diverse vegetation wildlife - no wildlife vista - closed in rugged - flat
Human Impact	low population - high population escapism - urban prosperous - rundown recreation - intensive farming natural - afforested crofting - agriculture non-industrial - industrial primitive - humanised haphazard - planned hill farm - arable
Evaluations	oneness - artificial isolated - constraining attractive - unattractive varied - uninteresting interesting - ordinary unconventional - ordinary familiar - unfamiliar
Given Constructs	like to look at - not like to look at like to visit - not like to visit

Table 7 Position of elements linked to change construct

	not change ----------> tolerate change						
	1	2	3	4	5	6	7
Expert 1		Torridon	Knoydart	Kintail Rannoch Moor	Cairngorm Trossachs Speyside	Loch Leven	Buchan Central Valley
Expert 3	Loch Maree Loch Ness Coast N of Aberdeen	Galloway Cairngorm Loch Lomond Wester-ross		Upper Deeside	Glenshee Breadalbane	Speyside	Aberdeen-shire
Expert 4	Kintail	Tweed Valley Assynt East Perthshire	E Fife Buchan Speyside			S Uplands Central Valley Lanarkshire	
Expert 5	Loch Tay Borders	Speyside Glensaugh	Sutherland Poolewe	Beauly	Laurencekirk	W Lothian Ailsa Craig	Glen Sanda
Expert 6	East Perthshire	Wester-ross Deeside Nith Estuary Morven			Glen Tilt	S Uplands Rannoch Moor	

	not change ----------> tolerate change						
	1	2	3	4	5	6	7
Expert 7	Cuillins Orkney Cliffs	Lower Tweed Flow Country	Up Forth Valley Cree Estuary S Uplands	Loch Leven Arrochar Alps Speyside	Hillfoots Erskine Bridge	Slammanan	
Expert 10		Trossachs Mull Flow Country Kilmartin	Uist	Fife Ross / Cromarty Barhill Calder Glen		Firth of Tay Speyside	M8 Corridor

For the Lay:

Lay 2	Bennachie Colliston Loch Muick Cairngorms	Speyside		Trossachs West Coast		Deeside	
Lay 8	N Coast Skye	Spey Valley		Howe of Fife Edinburgh	Galloway		Glenrothes
Lay 9	Monadhliaths Spey Valley	Western Isles Cairngorms			Ullapool Nairn		
Lay 11 (no data)							

Table 8 Elements elicited for Tests 1 to 12

10	4	3	2
Speyside (given element)	Cairngorms	S Uplands Trossachs	Buchan Caithness Central Val Deeside E Perthshire Fife Flow Country Galloway Kintail Loch Leven Orkney Rannoch Moor Skye Wester-Ross

Chosen once:

Aberdeenshire, Achiltibuie, Ailsa Craig, Ardverickie, Arrochar Alps, Assynt, Atholl Estate, Ayrshire, Barhill, Beauly, Bennachie, Borders, Breadalbane, Calvine, Calder Glen, Colliston, Comrie, Cree estuary, Cuillins, Drumochter, Duncansby Head, E Fife, E Lothian, Edinburgh, Erskine Bridge, Firth of Tay, Glen Sanda, Glen Tilt, Glenrothes, Glensaugh, Glenshee, Hillfoots, Howe of Fife, Kilmartin, Knoydart, Lanarkshire, Laurencekirk, Loch Laggan, Loch Lomond, Loch Maree, Loch Muick, Loch Ness, Loch Tay, Lower Tweed, M8 Corridor, Monadhliaths, Morven, Mull, N Abdn Coast, N Coast, Nairn, Nith Estuary, Poolewe, Ross and Cromarty, Scourie, Slammanan, Sutherland, Torridon, Tweed Valley, Uist, Ullapool, Unst, Upper Deeside, Upper Forth Valley, W Coast, W Isles, W Lothian, W Pilton

Table 9 Frequency tally of freely elicited constructs

FREQUENCY OF CONSTRUCTS FOR TESTS 1 -> 12			
Occurring 5 times	Occurring 4 times	Occurring 3 times	Occurring 2 times
low pop-high pop	coastal-inland	enclosed-open	colour-bland
water-no water	hill farm-arable farm	trees-no trees	diverse veg-not diverse veg
		vista-restricted views	fertile-less fertile
			mountainous-flat
			mountainous-rolling
			remote-accessible
			touristy-not touristy
			variety-dull

Occurred once:		
Attributes	Human Impact	Evaluations
cliffscape-island	crofting-agriculture	dynamic-calm
coastal-hills	cultivated-bare	tamed-wilder
compact-extensive	farmland-not farmed	wild-less wild
flatness-contrast	open moor-cultivated	
flatter-high	recreation-intensive farming	alien-relate
flatter-hilly		bleak-exciting
heather-grass	conifer-mixed woods	boring-dramatic
height difference-uniform	natural-afforested	challenge-comfortable
horizontal-vertical		contrast in light-no contrast in light
islands-no islands	green-not green	dour-pleasing
lochs-no lochs		drama-harmony
mountains-no mountains	managed-unmanaged	escapism-urban
open woods-dense woods	natural-created	exciting-dull
peaks-massif	natural-mans impact	friendly-hostile

Occurred once:		
Attributes	Human Impact	Evaluations
plain-undulating	nonindustrial-industrial	grandeur-insignificance
rolling-hilly	primitive-humanised	haphazard-planned
rugged-flat	rural-urban	harsher-softer
rugged-soft	unattractive villages-attractive villages	hazard-safe
smooth-rough		interesting-ordinary
steeper-gentler		isolation-constrained
wet env-dry env		isolation-crowded
wildlife-no wildlife		oneness-artificial
		restricted-unrestricted
		rundown-prosperous
		scenic-not scenic
		similar-awesome
		stimulating-depressing
		unconventional-ordinary
		unfamiliar-familiar

Table 10 Elements chosen in Tests 14 to 25

9	8	7	6
Fife	Cairngorms Rannoch Moor	Central Valley Skye Speyside	Orkney Torridon W Lothian
5	4	3	2
Deeside Great Glen Trossachs	Ayrshire E Lothian E Perthshire Galloway Orkney Wester-Ross	Argyll Borders Buchan Cromarty Drumochter Firth of Tay Flow Country Upper Forth Val Upper Tweed Val	Black Isle Caithness Sutherland
Chosen once:			
Aberdeenshire, Clatteringshaws, E Lothian Coast, Glasgow, Glen Trool, Kintail, Lower Tweed, Morayshire, N Coast, S Fife, S Uplands, Shetland, Watten, W S Uplands			

Table 11 Elements chosen in Tests 1 to 25

12	11	10	9	8	7
Cairngorm	Fife	Rannoch Moor	Central Val Skye	Trossachs	Speyside Torridon W Lothian
6	5	4	3	2	1
Galloway Westeross Deeside E Perthshire	Ayrshire Buchan E Lothian Gt Glen Orkney	Borders Caithness Cromarty Drumochter Firth of Tay Flow Country S Uplands Up Tweed Val Up Forth Val	Argyll Kintail Sutherland	Aberdeen- shire Black Isle Howe of Fife Loch Leven Lower Tweed N Coast	See below
Chosen once:					
Achiltibuie, Ailsa Craig, Ardverickie, Arrochar Alps, Assynt, Atholl Estate Barhill, Beauly, Bennachie, Breadalbane, Calder Glen, Calvine, Clatteringshaws, Colliston, Comrie, Cree Estuary, Cuillins, Duncansby Head, E Lothian Coast, E Fife, Edinburgh, Erskine Bridge, Glasgow, Glen Tilt, Glen Sanda, Glenrothes, Glensaugh, GlenTrool, Hillfoots, Kilmartin, Knoydart, Lanarkshire, Laurencekirk, Loch Laggan, Loch Tay, Loch Lomond, Loch Maree, Loch Muick, Loch Ness, M8 Corridor, Monadhliaths, Morayshire, Morven, Mull, N A'deen coast, Nairn, Nith Estuary, Poolewe, S Fife, Scourie, Shetland, Slammanan, Uist, Ullapool, Unst, Upper Deeside, W S Uplands, W Pilton, Watten, West Coast					

Table 12 Elements chosen in Tests 14 -> 25 by EXPERTS

	LIKE	DISLIKE	TOLERATE CHANGE	NOT CHANGE
APPEARED 3 TIMES	Deeside Skye Trossachs	Speyside	Central Val Rannoch Moor	Cairngorm
APPEARED 2 TIMES	Cairngorm Caithness E Perthshire Fife		Ayrshire	Fife Speyside Torridon
APPEARED ONCE	Gt Glen Orkney Rannoch Moor Torridon Wester-ross W Lothian Up Forth Val	Argyll Ayrshire Borders Buchan Central Val Cromarty Deeside Drumochter E Lothian E Perthshire Gt Glen Lower Tweed Orkney S Uplands S Fife Skye Torridon Trossachs Up Tweed Val W Lothian Westeross	Argyll E Perthshire E Lothian Fife Galloway N Coast Sutherland Torridon	Buchan Drumochter Firth of Tay Flow Country Rannoch Moor Skye Wester-ross

Elements chosen in tests 14 -> 25 for LAY

	LIKE	DISLIKE	TOLERATE CHANGE	NOT CHANGE
APPEARED 3 TIMES			W Lothian	
APPEARED 2 TIMES	Fife Spey Valley	Borders Central Val		Cairngorm Rannoch Moor

APPEARED ONCE	Ayrshire Black Isle Firth of Tay Galloway Gt Glen Orkney Skye Up Tweed Val	Argyll Deeside Fife Rannoch Moor Torridon Up Forth Val Up Tweed Val W Lothian	Black Isle Cairngorm Central Val E Lothian Firth of Tay	Cromarty Drumochter Gt Glen Skye

Table 14 Constructs chosen with criteria of choice

Criteria: linked to resistance to change	Criteria: Frequently freely elicited
Water-no water	low pop-high pop
mountainous-rolling	water-no water
wildlife-no wildlife	hill farm-arable farm
vista-closed in	enclosed-open
rugged-flat	trees-no trees
low pop-high pop	vista-restricted views
prosperous-rundown	coastal-inland
recreation-intensive farming	
natural-afforested	
crofting-agriculture	
nonindustrial-industrial	
hill farm-arable farm	

Table15 Chosen constructs divided by dimensions

Dimension	Chosen construct
Scale	Vista-closed in enclosed-open vista-restricted views
Human intervention	Wild-intensive agriculture scenic-not scenic low hum imp-high hum imp wildlife-no wildlife low pop-high pop prosperous-rundown recreation-intensive farming natural-afforested crofting-agriculture nonindustrial-industrial hill farm-arable farm trees-no trees
Water	Water-no water coastal-inland
Topographic features	Mountainous-rolling rugged-flat

Table 17 Responses per area

	All areas	Atholl	Cupar	Kinross	Loch Ness
Number of responses	1286	590	194	144	358

Table 18 Resident/Visitor split for individual sites

	Atholl			Loch Ness			Cupar				Kinross		
Sites	1	2	3	1	2	3	1	2	3	4	1	2	3
Resid - no	10	4	3	1	3	8	3	2	8	25	18	4	31
Resid - %	2.6	3.0	4.1	2.3	3.6	3.5	7.5	20.0	61.5	19.1	81.8	11.1	36.0
Visitor - no	375	128	70	43	81	222	37	8	5	106	4	32	55
Visitor - %	97.4	97.0	95.9	97.7	96.4	96.5	92.5	80.0	38.5	80.9	18.2	88.9	54.0
No answer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 19 Reason for Visit by Area

	Atholl	Loch Ness	Cupar	Kinross	All areas
Resident	2.9	3.4	19.6	36.8	9.3
Touring/Sight	79.3	79.6	55.2	34.0	70.6
Walking	8.0	7.8	5.2	12.5	8.0
Mountaineering	0.7	1.1	1.0	0.7	0.9
Canoeing	0.2	0.0	0.0	1.4	0.2
On Holiday	2.9	1.4	2.6	0.0	2.1
Camping	0.2	0.0	0.0	0.0	0.07
Visiting Friends /Relatives	1.4	0.3	5.7	0.7	2.1
A particular event	2.2	0.8	4.1	2.1	2.1
On business	1.0	0.6	3.1	0.7	1.2
Bird Watching	0.2	0.0	0.0	4.9	0.6
Sailing	0.2	3.4	1.5	0.0	1.2
Cycling	0.2	0.0	1.0	0.0	0.2
Fishing	0.0	0.3	0.0	0.0	0.07
No answer	0.8	1.4	1.0	2.1	1.2

Table 20 Percentage Response by reason for visit groupings

	All areas	Atholl	Cupar	Kinross	Loch Ness
Residents	9.4	2.9	19.8	37.6	3.4
Touring/Sightseeing	79.1	87.5	71.4	42.6	83.9
Outdoor Activity	11.5	9.6	8.9	19.9	12.7

Table 21 Means of Transport amongst respondents

	Atholl	Loch Bess	Cupar	Kinross	All Areas
Resident	2.9	3.4	19.6	36.8	9.3
Car/Motorbike	88.1	81.0	71.1	56.9	80.0
Coach	3.9	7.0	3.6	2.8	4.6
Bicycle	0.5	1.1	1.0	0.7	0.8
Walking	2.0	1.1	3.1	1.4	1.9
Train	1.5	0.8	1.0	0.0	1.1
Other Public Transport	0.5	0.3	0.0	0.0	0.4
Boat	0.0	3.6	0.0	0.0	1.0
No answer	0.5	1.7	0.5	1.4	0.9

Table 22 Percentage response for age between Highland and Lowland Landscape types

	Highland Areas	Lowland Areas	All Areas
Under 30	50.6	44.7	49.0
30-54	38.7	43.2	39.9
55+	10.4	11.2	10.6
No answer	0.2	0.9	0.4

Table 23 Percentage response by sex between Highland and Lowland Landscape types

	Highland Areas	Lowland Areas	All Areas
Male	40.8	40.2	40.6
Female	59.0	59.5	59.1
No answer	0.2	0.3	0.2

Table 24 Percentage response for sex by age

	Age Under 30	Age 30-54	Age 55+
Male	36.5	42.5	54.7
Female	63.4	57.5	45.3
No answer	0.2	0.0	0.0

Table 25 Familiarity with Scotland by Landscape Type

	Highland Areas	Lowland Areas	All areas
Regular visitor	16.2	21.0	17.5
Been before	32.9	15.7	28.4
First visit	33.0	11.2	27.3
Resident	16.9	51.8	26.0
No answer	0.9	0.3	0.8

Table 26 Familiarity with Scotland by Reason for Visit

	Touring/Sightseeing	Outdoor activities
Regular Visitor	18.5	24.7
Been Before	31.2	32.9
First Visit	31.9	18.5
Resident	17.5	23.3
No Answer	0.8	0.7

Table 27 Familiarity with the area by Landscape type

	Highland Areas	Lowland Areas	All areas
Regular visitor	8.8	16.6	10.8
Been before	23.2	20.4	22.5
First visit	57.5	29.6	50.1
Resident	3.1	26.9	9.3
No answer	7.5	6.5	7.2

Table 28 Percentage environmental organisation membership by area

	Atholl	Loch Ness	Cupar	Kinross	All areas
Member	34.9	33.2	37.6	56.3	37.2
Non-Member	65.9	66.5	61.9	42.4	62.5
No answer	0.0	0.3	0.5	0.7	0.2

Table 29 Percentage environmental organisation membership by age

	Age Under 30	Age 30-54	Age 55+
Yes	27.7	45.6	50.4
No	72.3	54.4	48.9
No answer	0.0	0.0	0.7

Table 30 Results for all Divisions for Question 8a

Question 8a:

There should be further improvements to the main road nework within rural Scotland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	12.2	22.2	25.0	24.3	11.4	3.4	1.6
Atholl	10.5	22.7	28.3	22.9	9.8	3.7	2.0
Cupar	18.6	25.8	17.5	21.1	15.5	1.0	0.5
Kinross	14.6	23.6	24.3	18.8	9.7	6.9	2.1
Loch Ness	10.6	18.7	23.7	30.7	12.3	2.8	1.1
Highland	10.5	21.2	26.6	25.8	10.8	3.4	1.7
Lowland	16.9	24.9	20.4	20.1	13.0	3.6	1.2
Resident	21.7	30.0	20.0	13.3	8.3	5.8	0.8
Visitor	11.2	21.4	25.5	25.5	11.7	3.2	1.6
Tourer	11.4	22.2	26.0	25.1	10.6	3.4	1.3
Outdoor	9.6	15.8	23.3	27.4	19.2	2.1	2.7
Male	13.0	24.3	21.8	23.3	13.2	3.1	1.3
Female	11.7	20.7	27.1	25.1	10.1	3.7	1.6
Under 30	10.5	22.8	28.5	22.8	10.0	4.6	0.8
30 - 54	12.9	21.6	21.8	26.7	13.5	1.9	1.6
55+	17.5	21.2	20.4	22.6	10.2	3.6	4.4
Member	11.9	20.7	22.8	26.7	12.7	2.7	2.5
Non-member	12.4	23.0	26.2	23.0	10.6	3.9	0.9

Table 31 Results for all Divisions for Question 8b

Question 8b:

More roads are needed to reach less accessible parts of Scotland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	7.8	22.4	17.5	31.9	17.3	1.8	1.3
Atholl	7.8	22.7	19.8	30.8	15.4	2.0	1.4
Cupar	11.3	20.6	12.4	30.9	23.2	1.5	0.0
Kinross	8.3	27.1	12.5	34.0	13.9	3.5	0.7
Loch Ness	5.6	20.9	18.4	33.2	18.7	0.8	2.2
Highland	7.0	22.0	19.3	31.8	16.7	1.6	1.7
Lowland	10.1	23.4	12.4	32.2	19.2	2.4	0.3
Resident	11.7	27.5	12.5	27.5	19.2	0.8	0.8
Visitor	7.4	21.9	18.0	32.3	17.2	1.9	1.4
Tourer	7.8	22.7	18.5	31.9	15.8	2.0	1.3
Outdoor	4.8	17.1	15.1	34.2	26.0	1.4	1.4
Male	9.0	19.7	15.9	30.8	21.4	2.1	1.1
Female	7.0	24.3	18.7	32.6	14.5	1.6	1.3
Under 30	7.6	24.2	20.1	29.5	16.0	1.9	0.6
30 - 54	6.4	20.3	16.2	35.1	18.9	1.8	1.4
55+	13.9	21.9	10.9	30.7	17.5	1.5	3.6
Member	7.1	19.0	12.7	35.7	22.1	1.5	1.9
Non-Member	8.2	24.4	20.4	29.6	14.6	2.0	0.9

Table 32 Results for all Divisions for Question 8c

Question 8c:

Facilities for Tourists should be improved in rural areas

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	9.2	23.0	24.7	28.2	9.4	3.1	2.4
Atholl	7.3	23.2	28.3	24.7	10.0	3.9	2.5
Cupar	16.0	28.9	18.6	24.2	9.3	2.6	0.5
Kinross	12.5	25.7	25.0	25.0	4.9	4.2	2.8
Loch Ness	7.3	18.4	21.8	37.4	10.3	1.7	3.1
Highland	7.3	21.4	25.8	29.5	10.1	3.1	2.7
Lowland	14.5	27.5	21.3	24.6	7.4	3.3	1.5
Resident	20.8	34.2	20.8	17.5	4.2	2.5	0.0
Visitor	8.0	21.9	25.0	29.3	9.9	3.2	2.7
Tourer	7.8	22.6	25.4	28.9	9.6	3.5	2.4
Outdoor	8.9	17.1	22.6	33.6	12.3	1.4	4.1
Male	10.9	21.0	27.2	26.0	10.1	2.1	2.7
Female	8.0	24.5	22.9	29.9	8.8	3.8	2.1
Under 30	9.7	22.3	23.8	29.3	10.1	3.5	1.3
30 - 54	7.6	23.6	26.3	28.7	8.6	2.5	2.7
55+	12.4	24.1	22.6	22.6	8.8	3.6	5.8
Member	8.6	20.3	24.0	31.3	9.4	2.9	3.5
Non-member	9.6	24.6	25.0	26.5	9.5	3.2	1.6

Table 33 Results for all Divisions for Question 8d

Question 8d:

The number of way marked paths (Forst trails, long distance paths etc) should be increased

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	16.3	40.4	23.3	10.9	3.1	4.3	1.7
Atholl	15.1	39.7	24.6	10.5	3.2	5.3	1.7
Cupar	20.6	44.8	17.0	10.8	4.1	2.1	0.5
Kinross	24.3	43.1	16.7	9.0	4.2	2.1	0.7
Loch Ness	12.8	38.3	27.1	12.3	2.0	4.7	2.8
Highland	14.2	39.1	25.5	11.2	2.7	5.1	2.1
Lowland	22.2	44.1	16.9	10.1	4.1	2.1	0.6
Resident	26.7	45.8	13.3	8.3	5.0	0.8	0.0
Visitor	15.3	39.9	24.3	11.1	2.9	4.6	1.9
Tourer	14.4	39.8	25.7	10.5	2.6	5.1	1.9
Outdoor	20.5	39.7	16.4	14.4	5.5	2.1	1.4
Male	18.0	38.8	24.5	10.1	2.9	4.4	1.3
Female	15.3	41.6	22.5	11.3	3.3	4.2	1.8
Under 30	15.8	41.4	25.8	9.2	2.5	3.6	1.6
30 - 54	17.0	40.5	21.2	13.3	3.7	3.5	0.8
55+	16.8	37.2	18.2	8.8	3.6	10.2	5.1
Member	17.3	39.5	22.3	10.9	5.0	3.3	1.7
Non-member	15.8	41.2	23.6	10.9	2.0	4.9	1.6

Table 34 Results for all Divisions for Question 8e

Question 8e:

There should be a policy to encourage the expansion of arable farming

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	6.5	22.2	38.3	13.8	5.6	10.6	2.9
Atholl	6.6	23.4	36.9	13.2	4.6	11.9	3.4
Cupar	7.7	23.2	40.2	17.0	5.7	5.7	0.5
Kinross	8.3	17.4	35.4	15.3	8.3	13.2	2.1
Loch Ness	5.0	21.8	40.8	12.6	6.1	10.1	3.6
Highland	6.0	22.8	38.4	13.0	5.2	11.2	3.5
Lowland	8.0	20.7	38.2	16.3	6.8	8.9	1.2
Resident	7.5	27.5	34.2	15.0	4.2	10.0	1.7
Visitor	6.4	21.7	38.8	13.7	5.7	10.6	3.0
Tourer	6.6	22.5	38.6	12.9	5.3	11.2	2.9
Outdoor	5.5	17.1	40.4	17.8	8.9	6.8	3.4
Male	7.6	20.7	37.5	12.8	7.6	11.1	2.7
Female	5.8	23.3	38.9	14.6	4.2	10.3	2.9
Under 30	6.0	20.3	40.9	13.2	4.4	13.2	2.1
30 - 54	5.8	23.6	36.3	16.2	7.4	7.8	2.9
55+	11.7	24.8	35.8	8.0	4.4	9.5	5.8
Member	8.6	20.3	36.7	15.9	6.7	8.8	3.1
Non-member	5.2	23.4	39.4	12.7	5.0	11.7	2.6

Table 35 Results for all Divisions for Question 8f

Question 8f:

There should be a policy not to allow changes in the size of fields

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	12.0	29.9	34.4	8.4	2.1	10.3	2.8
Atholl	10.2	29.2	35.1	8.6	2.5	10.7	3.7
Cupar	16.5	36.6	33.5	6.2	0.5	6.7	0.0
Kinross	16.0	27.8	31.9	11.1	3.5	9.7	0.0
Loch Ness	10.9	28.5	34.9	8.1	1.7	12.0	3.9
Highland	10.4	28.9	35.0	8.4	2.2	11.2	3.8
Lowland	16.3	32.8	32.8	8.3	1.8	8.0	0.0
Resident	11.7	31.7	34.2	10.0	2.5	10.0	0.0
Visitor	12.0	29.8	34.5	8.2	2.1	10.4	3.1
Tourer	11.8	29.4	35.0	8.2	2.0	10.5	3.1
Outdoor	12.3	33.6	31.5	7.5	2.1	10.3	2.7
Male	14.9	28.5	34.6	8.0	2.9	9.0	2.1
Female	10.0	30.9	34.5	8.6	1.6	11.3	3.2
Under 30	8.2	27.6	38.2	9.0	1.4	13.2	2.4
30 - 54	15.4	32.2	30.4	9.2	3.1	7.4	2.3
55+	16.1	32.8	32.8	2.2	1.5	8.8	5.8
Member	16.5	34.7	26.9	7.5	2.1	9.4	2.9
Non-member	9.2	27.2	38.9	9.0	2.1	10.9	2.6

Table 36 Results for all Divisions for Question 8g

Question 8g:

The further development of small communities is desirable within rural Scotland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	12.4	37.1	23.9	11.7	4.4	7.6	3.0
Atholl	10.5	36.9	25.3	11.2	4.4	8.6	3.1
Cupar	21.1	36.6	16.0	13.4	5.2	6.7	1.0
Kinross	18.8	36.1	27.1	11.1	4.9	8.3	0.7
Loch Ness	10.9	38.0	24.6	12.0	3.6	6.1	4.7
Highland	10.7	38.3	25.0	11.5	4.1	7.7	3.7
Lowland	17.2	36.4	20.7	12.4	5.0	7.4	0.9
Resident	19.2	33.3	23.3	10.0	5.8	7.5	0.8
Visitor	11.7	37.5	23.9	11.9	4.2	7.6	3.2
Tourer	11.3	37.5	24.0	11.8	4.0	8.1	3.3
Outdoor	13.7	37.0	24.7	11.6	6.2	4.8	2.1
Male	15.9	36.5	24.1	10.1	4.6	5.9	2.9
Female	10.0	37.4	23.8	12.9	4.2	8.8	2.9
Under 30	8.7	30.9	27.4	14.3	5.1	10.8	2.9
30 - 54	15.2	42.9	21.2	10.1	3.5	4.5	2.5
55+	19.0	43.8	17.5	5.8	4.4	5.1	4.4
Member	15.4	41.1	21.1	10.6	4.0	5.2	2.5
Non-member	10.6	34.7	25.6	12.3	4.6	9.1	3.1

Table 37 Results for all Divisions for Question 8h

Question 8h:

A change in land use that would increase the diversity of wildlife would be desirable

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	26.7	42.2	15.1	5.8	1.8	4.7	3.7
Atholl	24.6	42.5	15.6	5.3	2.0	5.8	4.2
Cupar	34.0	41.8	12.4	4.1	3.1	2.6	1.5
Kinross	29.2	48.6	11.8	4.9	1.4	2.1	2.1
Loch Ness	25.4	39.4	17.0	7.8	0.8	5.0	4.5
Highland	24.9	41.4	16.1	6.2	1.6	5.5	4.3
Lowland	32.0	44.7	12.1	4.4	2.4	2.4	1.8
Resident	25.8	49.2	14.2	1.7	2.5	5.8	0.8
Visitor	26.8	41.5	15.2	6.2	1.7	4.5	3.9
Tourer	26.7	41.7	14.8	6.0	1.7	5.3	3.9
Outdoor	28.1	39.7	17.8	7.5	2.1	0.0	4.1
Male	28.5	40.3	17.6	5.4	1.1	3.3	3.6
Female	25.7	43.6	13.4	5.9	2.2	5.7	3.6
Under 30	26.1	38.8	16.5	6.0	2.2	6.5	3.8
30 - 54	27.7	45.6	13.3	5.7	1.6	3.3	2.7
55+	26.3	45.3	16.1	4.4	0.7	1.5	5.8
Member	32.6	41.8	12.3	4.4	1.3	3.8	3.8
Non-member	23.3	42.5	16.8	6.6	2.1	5.2	3.5

Table 38 Results for all Divisions for Question 8i

Question 8i:

A change in land use that would increase the numbers of, but not diversity of wildlife would be desirable

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	10.9	31.3	31.8	11.7	2.6	6.7	5.0
Atholl	9.5	28.8	32.9	12.5	2.7	8.1	5.4
Cupar	12.9	35.1	31.4	12.9	1.5	3.6	2.6
Kinross	11.8	31.9	33.3	6.9	4.9	8.3	2.8
Loch Ness	11.7	33.2	29.6	11.7	2.0	5.3	6.4
Highland	10.3	30.5	31.6	12.2	2.4	7.1	5.8
Lowland	12.4	33.7	32.2	10.4	3.0	5.6	2.7
Resident	12.5	35.8	35.0	6.7	2.5	5.0	2.5
Visitor	10.7	30.9	31.5	12.3	2.6	6.9	5.2
Tourer	10.5	31.7	30.6	12.3	2.3	7.3	5.2
Outdoor	11.6	25.3	37.0	12.3	4.8	4.1	4.8
Male	10.7	30.0	33.5	12.2	2.7	5.7	5.2
Female	11.1	32.2	30.7	11.4	2.5	7.4	4.7
Under 30	13.2	31.9	30.0	10.0	2.4	8.2	4.4
30 - 54	8.6	31.8	33.7	13.8	2.7	5.5	3.9
55+	9.5	27.7	33.6	11.7	2.9	3.6	10.9
Member	10.9	27.6	34.7	12.7	2.7	6.3	5.2
Non-member	10.9	33.7	30.0	11.2	2.5	7.0	4.7

Table 39 Results for all Divisions for Question 8j

Question 8j:

There should be provision of financial incentives to encourage the indigenous population to remain in rural areas

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	25.4	39.1	18.0	4.7	1.9	6.4	4.6
Atholl	23.7	36.4	20.2	4.7	2.5	7.1	5.3
Cupar	34.0	43.3	13.9	2.1	0.5	5.2	1.0
Kinross	20.8	38.9	17.4	8.3	2.8	9.7	2.1
Loch Ness	25.4	41.3	16.8	4.5	1.1	4.5	6.4
Highland	24.4	38.3	18.9	4.6	2.0	6.1	5.7
Lowland	28.4	41.4	15.4	4.7	1.5	7.1	1.5
Resident	28.3	39.2	12.5	5.8	5.0	6.7	2.5
Visitor	25.1	39.1	18.5	4.5	1.5	6.3	4.8
Tourer	25.1	38.9	18.6	4.5	1.5	6.7	4.8
Outdoor	24.7	41.1	18.5	4.1	2.1	4.8	4.8
Male	24.1	40.3	18.9	4.4	1.9	5.7	4.6
Female	26.3	38.3	17.4	4.9	1.8	6.8	4.5
Under 30	17.7	36.1	21.9	5.9	2.1	10.5	5.9
30 - 54	33.7	42.1	14.0	3.7	1.9	2.3	2.1
55+	29.9	42.3	14.6	2.9	0.0	2.9	7.3
Member	30.3	37.8	16.3	4.0	2.3	5.6	3.8
Non-member	22.3	39.9	18.9	5.1	1.6	6.8	5.0

Table 40 Results for all Divisions for Question 8k

Question 8k:

Planning policy should prevent the construction of new houses in rural areas

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	19.4	27.4	21.2	18.9	3.7	3.8	5.7
Atholl	17.1	26.3	24.1	18.3	3.6	4.4	6.3
Cupar	26.8	29.4	16.5	18.6	4.1	2.6	2.1
Kinross	20.8	31.9	16.0	17.4	6.3	2.8	4.9
Loch Ness	18.7	26.3	20.9	20.7	2.5	3.9	7.0
Highland	17.7	26.3	22.9	19.2	3.2	4.2	6.5
Lowland	24.3	30.5	16.3	18.0	5.0	2.7	3.3
Resident	25.0	32.5	14.2	17.5	5.8	1.7	3.3
Visitor	18.9	26.8	21.9	19.0	3.4	4.0	5.9
Tourer	19.1	26.8	21.6	18.8	3.4	4.3	6.1
Outdoor	18.5	27.4	24.0	19.2	3.4	2.7	4.8
Male	18.2	26.6	20.8	21.0	4.6	3.3	5.5
Female	20.4	28.0	21.3	17.4	3.0	4.2	5.7
Under 30	22.5	28.1	19.8	14.6	3.5	4.8	6.8
30 - 54	16.2	27.7	21.4	24.2	4.1	2.9	3.5
55+	18.2	22.6	26.3	19.0	2.9	2.9	8.0
Member	17.7	28.0	21.3	20.9	3.5	3.3	5.2
Non-member	20.5	27.0	21.0	17.8	3.7	4.1	5.8

Table 41 Results for all Divisions for Question 8l

Question 8l:

There should be a policy to increase the amount of woodland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	24.3	40.6	17.4	7.4	2.3	2.1	6.0
Atholl	21.5	38.5	19.8	8.6	2.4	2.5	6.6
Cupar	36.1	44.8	9.3	5.2	2.1	0.5	2.1
Kinross	25.0	41.7	18.8	4.9	1.4	2.8	5.6
Loch Ness	22.1	41.3	17.3	7.5	2.5	2.0	7.3
Highland	21.7	39.6	18.9	8.2	2.4	2.3	6.9
Lowland	31.4	43.5	13.3	5.0	1.8	1.5	3.6
Resident	30.0	44.2	14.2	3.3	2.5	0.8	5.0
Visitor	23.7	40.2	17.8	7.8	2.2	2.2	6.1
Tourer	24.7	38.8	18.3	7.7	2.0	2.3	6.3
Outdoor	16.4	50.0	15.8	8.9	3.4	1.4	4.1
Male	24.5	39.8	17.0	7.5	3.3	2.3	5.7
Female	24.2	41.1	17.8	7.4	1.6	2.0	6.1
Under 30	27.1	39.9	16.3	5.9	1.3	1.9	7.6
30 - 54	20.7	42.1	17.9	8.6	3.9	2.7	4.1
55+	24.8	38.7	20.4	9.5	0.7	0.7	5.1
Member	25.9	42.0	14.2	8.6	2.1	1.7	5.6
Non-member	23.4	39.8	19.3	6.7	2.4	2.4	6.1

Table 42 Results for all Divisions for Question 8m

Question 8m:

There should be a policy to increase the amount of woodland, but only if this is native mixed woodland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	30.1	39.2	18.2	3.5	0.6	2.9	5.5
Atholl	26.9	39.3	18.6	3.4	0.8	4.6	6.3
Cupar	30.4	38.3	20.1	2.0	0.3	2.0	7.0
Kinross	29.2	39.6	20.1	5.6	0.7	0.7	4.2
Loch Ness	30.4	38.3	20.1	2.0	0.3	2.0	7.0
Highland	28.3	38.9	19.2	2.8	0.6	3.6	6.5
Lowland	35.2	39.9	15.4	5.3	0.6	0.9	2.7
Resident	38.3	34.2	17.5	5.0	0.8	0.8	3.3
Visitor	29.2	39.7	18.3	3.3	0.6	3.1	5.7
Tourer	28.2	39.4	18.9	3.3	0.6	3.5	6.2
Outdoor	37.7	39.7	15.8	4.1	0.0	0.0	2.7
Male	33.5	37.1	17.2	3.4	1.1	3.1	4.6
Female	27.8	40.8	18.8	3.6	0.3	2.8	6.1
Under 30	26.8	37.1	20.0	4.1	0.3	3.8	7.9
30 - 54	33.7	42.5	15.0	2.5	1.2	2.5	2.5
55+	32.1	37.2	21.9	3.6	0.0	0.0	5.1
Member	38.0	38.4	13.4	2.9	0.2	2.7	4.4
Non-member	25.4	39.8	21.0	3.9	0.9	3.0	6.1

Table 43 Results for all Divisions for Question 8n

Question 8n:

It should be policy not to allow an increase in the number of industrial buildings in rural areas

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	32.9	31.1	17.0	8.1	2.5	2.5	6.0
Atholl	31.4	30.8	18.6	6.8	3.1	2.4	6.9
Cupar	38.7	29.4	16.0	9.8	2.1	2.6	1.5
Kinross	28.5	29.9	18.1	12.5	2.8	3.5	4.9
Loch Ness	34.1	33.0	14.2	7.5	1.7	2.2	7.3
Highland	32.4	31.6	17.0	7.1	2.5	2.3	7.1
Lowland	34.3	29.6	16.9	10.9	2.4	3.0	3.0
Resident	29.2	37.5	11.7	13.3	2.5	2.5	3.3
Visitor	33.3	30.4	17.5	7.5	2.5	2.5	6.3
Tourer	33.2	30.9	16.7	7.8	2.4	2.5	6.5
Outdoor	35.6	25.3	23.3	5.5	2.7	2.7	4.8
Male	30.8	31.0	18.5	8.4	3.3	2.5	5.5
Female	34.5	31.2	15.8	7.9	2.0	2.5	6.2
Under 30	37.9	27.6	15.1	5.5	3.3	3.0	7.6
30 - 54	30.0	33.9	18.5	10.5	1.6	2.1	3.3
55+	21.9	35.8	19.7	10.9	2.2	1.5	8.0
Member	30.9	31.7	17.5	10.2	2.3	2.1	5.2
Non-member	34.2	30.7	16.5	6.8	2.6	2.7	6.3

Table 44 Results for all Divisions for Question 8o

Question 8o:

Industrial activity that has a lasting effect on the landscape (Eg Quarrying, opencast mining etc) should not be allowed in rural Scotland

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Undecided	No answer
All areas	36.5	26.4	16.3	8.2	2.5	3.7	6.5
Atholl	35.3	28.0	15.1	6.9	3.2	4.1	7.5
Cupar	43.8	26.3	16.0	7.2	1.5	2.6	2.6
Kinross	27.8	25.7	16.0	18.1	2.1	5.6	4.9
Loch Ness	38.0	24.0	18.7	6.7	2.0	3.1	7.5
Highland	36.3	26.5	16.5	6.9	2.7	3.7	7.5
Lowland	37.0	26.0	16.0	11.8	1.8	3.8	3.6
Resident	32.5	22.5	16.7	17.5	2.5	4.2	4.2
Visitor	36.9	26.8	16.3	7.2	2.5	3.7	6.7
Tourer	36.9	26.8	15.8	7.3	2.4	3.8	7.1
Outdoor	38.4	26.0	19.2	6.8	2.7	2.7	4.1
Male	36.7	22.8	18.0	9.9	3.8	2.3	6.5
Female	36.3	28.9	15.1	7.0	1.6	4.7	6.3
Under 30	37.6	22.0	17.4	7.4	2.7	5.2	7.6
30 - 54	33.9	32.7	15.45	9.2	1.9	2.5	4.3
55+	40.9	22.6	15.3	8.0	3.6	0.7	8.8
Member	35.9	28.2	15.9	8.6	1.9	4.4	5.2
Non-member	36.7	25.4	16.7	8.0	2.9	3.4	7.1

Table 45 Significant T-Test results for Question 8

Yes = Significant to 0.05 level

	Atholl v Cupar	Atholl v Kinross	Atholl v Loch N	Cupar v Kinross	Cupar v Loch N	Kinross v Loch N	Hiland v Loland	Res v Vis	Res v Tou/sig	Res v Outdoor	Tou/sig v Outdoor	<30 v 30-54	<30 v 55+	30-54 v 55+	Sex	Env Org mem
8A					YES		YES	YES	YES	YES	YES					
8B										YES	YES	YES			YES	YES
8C					YES	YES	YES	YES	YES	YES						
8D	YES	YES			YES	YES	YES	YES	YES							
8E				YES									YES			
8F	YES			YES	YES		YES					YES	YES			YES
8G	YES											YES	YES		YES	YES
8H	YES	YES			YES	YES	YES					YES	YES			YES
8I	YES		YES													
8J	YES		YES	YES		YES						YES	YES			YES
8K	YES						YES					YES				
8L	YES			YES	YES		YES	YES	YES	YES		YES				
8M	YES		YES				YES				YES	YES	YES			YES
8N						YES										
8O		YES		YES		YES		YES	YES							

Table 46 Results of T-Tests by group division and underlying construct

Yes = Significant to 0.05 level
Yes = Significant to 0.01 level

	HUMAN IMPACT				FARMING		POPULATION			WILDLIFE		WOODLAND		INDUSTRY	
	8a	8b	8c	8d	8E	8F	8G	8J	8K	8H	8I	8L	8M	8N	8O
Highland v Lowland	Yes		Yes	Yes		Yes			Yes	Yes		Yes	Yes		
Atholl v Loch Ness								Yes			Yes		Yes		
Cupar v Kinross					Yes	Yes		Yes				Yes			Yes
Resident v Visitor	Yes		Yes	Yes								Yes			Yes
Tourer v Outdoor	Yes	Yes											Yes		
Under 30 v 30-54		Yes				Yes	Yes	Yes	Yes	Yes		Yes	Yes		
Under 30 v 55+					Yes	Yes	Yes	Yes		Yes			Yes		
30-54 v 55+															
Male v Female		Yes					Yes								
Member v Non Member		Yes				Yes	Yes	Yes		Yes			Yes		

Table 47 Results for all Divisions for Question 9a

Question 9a:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas with panoramic views

	1	2	3	4	5	6	7	No answer
All areas	3.0	1.2	3.0	8.2	12.5	14.9	49.8	7.6
Atholl	2.9	0.8	3.9	6.9	13.6	14.9	47.1	9.8
Cupar	3.1	3.1	2.1	11.9	12.9	9.8	54.1	3.1
Kinross	5.6	0.7	5.6	13.2	11.8	13.2	43.1	6.9
Loch Ness	2.0	0.8	0.8	6.1	10.9	18.2	54.5	6.7
Highland	2.5	0.8	2.7	6.6	12.6	16.1	49.9	8.6
Lowland	4.1	2.1	3.6	12.4	12.4	11.2	49.4	4.7
Resident	6.7	2.5	5.8	15.0	10.8	14.2	39.2	5.8
Visitor	2.6	1.0	2.7	7.5	12.7	14.9	50.9	7.8
Tourer	2.6	1.0	2.9	7.9	12.5	14.9	50.2	8.0
Outdoor	2.1	1.4	1.4	4.1	13.7	15.8	55.5	6.2
Male	3.1	1.5	2.5	8.2	11.9	17.0	47.6	8.2
Female	2.9	0.9	3.3	8.2	13.0	13.2	51.4	7.1
Under 30	4.1	1.4	4.8	10.6	14.6	15.5	39.5	9.5
30 - 54	1.2	0.6	1.2	6.2	11.5	13.6	61.0	4.7
55+	2.9	2.2	0.7	4.4	7.3	16.1	56.9	9.5
Member	2.7	1.7	3.1	8.6	12.1	16.3	50.1	5.4
Non-member	3.1	0.9	2.7	8.0	12.8	14.4	49.6	8.8

Table 48 Results for all Divisions for Question 9b

Question 9b:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas where the main view is down the glen you are in.

	1	2	3	4	5	6	7	No answer
All areas	2.7	3.6	5.1	16.0	19.1	15.6	28.5	9.4
Atholl	2.2	3.6	5.4	14.4	19.5	15.9	28.0	11.0
Cupar	2.6	4.6	7.2	21.1	17.0	16.0	26.3	5.2
Kinross	4.9	6.9	5.6	17.4	15.3	15.3	26.4	8.3
Loch Ness	2.8	1.7	3.1	15.4	21.2	14.8	31.6	9.5
Highland	2.4	2.8	4.5	14.8	20.1	15.5	29.3	10.4
Lowland	3.6	5.6	6.5	19.5	16.3	15.7	26.3	6.5
Resident	2.5	7.5	9.2	17.5	13.3	15.8	28.3	5.8
Visitor	2.7	3.2	4.6	15.9	19.7	15.5	28.6	9.8
Tourer	2.7	3.1	5.1	16.0	19.9	15.6	27.9	9.8
Outdoor	3.4	3.4	1.2	15.1	17.8	16.4	32.9	9.6
Male	2.9	4.0	3.8	18.2	18.2	14.9	27.7	10.3
Female	2.6	3.3	5.9	14.6	19.7	15.9	29.2	8.7
Under 30	3.8	4.4	7.1	18.1	21.4	14.4	20.8	10.3
30 - 54	1.6	2.7	2.5	14.8	18.3	16.6	36.6	6.8
55+	2.2	2.2	4.4	10.9	11.7	19.0	35.0	14.6
Member	3.1	5.8	4.2	16.3	18.0	16.9	27.3	8.4
Non-member	2.5	2.2	5.5	15.9	19.9	14.8	29.2	10.0

Table 49 Results for all Divisions for Question 9c

Question 9c:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas where water forms an important part of the landscape

	1	2	3	4	5	6	7	No answer
All areas	2.1	1.2	2.6	7.8	14.7	20.1	43.0	8.6
Atholl	2.2	1.0	2.2	7.6	14.6	19.7	42.0	10.7
Cupar	2.1	2.6	2.1	8.8	16.5	20.6	43.3	4.1
Kinross	2.1	0.7	6.3	11.1	12.5	22.9	36.1	8.3
Loch Ness	2.0	0.8	2.0	6.1	14.8	19.6	47.2	7.5
Highland	2.1	0.9	2.1	7.1	14.7	19.6	44.0	9.5
Lowland	2.1	1.8	3.8	9.8	14.8	21.6	40.2	5.9
Resident	1.7	1.7	5.8	13.3	11.7	22.5	36.7	6.7
Visitor	2.1	1.1	2.2	7.2	15.0	19.9	43.7	8.7
Tourer	2.1	1.0	2.2	7.3	14.7	20.3	43.5	9.0
Outdoor	2.7	2.1	1.4	6.8	17.1	18.5	44.5	6.8
Male	2.1	1.1	2.7	9.4	15.7	20.8	38.6	9.6
Female	2.1	1.2	2.5	6.7	13.9	19.6	46.2	7.8
Under 30	2.9	1.6	3.3	9.2	14.7	22.2	36.0	10.1
30 - 54	1.0	1.0	1.2	7.2	16.6	20.1	47.8	5.3
55+	2.9	0.0	2.2	3.6	7.3	11.7	59.1	13.1
Member	2.1	1.3	2.1	7.1	14.6	21.1	44.9	6.9
Non-member	2.1	1.1	2.7	8.2	14.8	19.7	41.9	9.5

Table 50 Results for all Divisions for Question 9d

Question 9d:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas where there are few water features

	1	2	3	4	5	6	7	No answer
All areas	14.6	14.1	15.8	19.9	11.8	5.7	8.0	10.1
Atholl	14.2	15.3	13.6	18.5	11.9	6.1	7.5	13.1
Cupar	17.5	13.4	18.0	18.0	12.9	5.2	9.8	5.2
Kinross	16.0	11.8	18.8	25.0	5.6	4.2	9.7	9.0
Loch Ness	13.1	13.4	17.0	21.2	13.7	5.9	7.3	8.4
Highland	13.8	14.6	14.9	19.5	12.6	6.0	7.4	11.3
Lowland	16.9	12.7	18.3	21.0	9.8	4.7	9.8	6.8
Resident	14.2	15.8	13.3	24.2	13.3	5.0	7.5	6.7
Visitor	14.7	13.9	16.0	19.5	11.7	5.7	8.1	10.5
Tourer	15.2	13.8	16.5	18.6	12.3	5.6	7.5	10.4
Outdoor	11.6	13.7	13.0	26.0	7.5	6.2	11.6	10.3
Male	14.5	14.3	15.7	18.2	13.0	6.3	7.8	10.1
Female	14.6	13.9	15.9	21.2	10.9	5.3	8.2	10.0
Under 30	13.9	14.9	16.3	22.0	10.6	6.7	4.8	10.8
30 - 54	15.6	14.0	16.0	18.3	13.1	4.7	11.3	7.0
55+	13.9	10.9	13.1	16.1	11.7	5.1	10.9	18.2
Member	16.5	13.8	18.8	18.8	10.2	4.6	7.9	9.4
Non-member	13.6	14.3	14.1	20.6	12.7	6.3	8.0	10.4

Table 51 Results for all Divisions for Question 9e

Question 9e:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas which are rugged and mountainous

	1	2	3	4	5	6	7	No answer
All areas	2.9	3.2	4.0	10.1	14.3	20.5	36.5	8.5
Atholl	2.7	3.9	3.2	10.8	14.4	18.6	36.3	10.0
Cupar	3.1	2.1	5.7	9.8	12.4	24.7	38.7	3.6
Kinross	6.3	5.6	8.3	7.6	18.1	14.6	29.9	9.7
Loch Ness	1.7	1.7	2.5	10.1	13.7	23.7	38.5	8.1
Highland	2.3	3.1	3.0	10.5	14.1	20.6	37.1	9.3
Lowland	4.4	3.6	6.8	8.9	14.8	20.4	34.9	6.2
Resident	4.2	2.5	10.0	12.5	17.5	15.8	30.0	7.5
Visitor	2.7	3.3	3.3	9.9	14.0	21.0	37.2	8.6
Tourer	2.8	3.1	3.4	10.5	13.6	21.8	35.9	8.9
Outdoor	2.7	4.8	3.4	5.5	15.1	15.8	46.6	6.2
Male	3.6	3.3	3.4	9.4	13.8	22.9	34.6	9.0
Female	2.4	3.2	4.3	10.7	14.7	18.8	37.9	8.0
Under 30	3.8	4.3	5.4	11.9	15.8	19.8	28.7	10.3
30 - 54	1.4	2.1	1.6	9.6	13.8	21.2	45.0	5.3
55+	4.4	2.2	5.8	4.4	8.8	20.4	42.3	11.7
Member	2.5	4.0	3.5	8.4	12.9	20.7	41.8	6.3
Non-member	3.1	2.7	4.2	11.2	15.2	20.4	33.5	9.7

Table 52 Results for all Divisions for Question 9f

Question 9f:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas which are more gentle and rolling

	1	2	3	4	5	6	7	No answer
All areas	7.0	8.4	11.1	17.7	17.9	12.4	15.1	10.4
Atholl	6.3	7.6	9.7	18.3	17.8	12.0	15.3	13.1
Cupar	5.2	11.9	11.9	17.0	15.5	12.9	20.1	5.7
Kinross	9.7	6.9	10.4	19.4	16.0	16.7	12.5	8.3
Loch Ness	8.1	8.4	13.4	16.2	20.1	11.2	13.1	9.5
Highland	7.0	7.9	11.1	17.5	18.7	11.7	14.5	11.7
Lowland	7.1	9.8	11.2	18.0	15.7	14.5	16.9	6.8
Resident	10.0	10.8	13.3	17.5	15.8	12.5	11.7	8.36.7
Visitor	6.7	8.1	10.9	17.7	18.1	12.4	15.4	10.6
Tourer	6.4	8.0	10.5	17.8	17.7	13.1	15.8	10.6
Outdoor	8.9	9.6	13.7	17.1	20.5	7.5	12.3	10.3
Male	7.5	9.6	14.0	21.4	16.8	8.2	11.9	10.7
Female	6.7	7.6	9.2	15.1	18.7	15.1	17.4	10.1
Under 30	6.3	7.8	10.8	19.5	18.5	14.4	11.6	11.1
30 - 54	7.6	9.2	11.9	16.4	19.3	9.9	17.9	7.8
55+	8.0	8.8	9.5	14.6	9.5	11.7	21.2	16.8
Member	9.4	9.8	12.5	18.6	15.4	11.5	14.2	8.6
Non-member	5.6	7.6	10.3	17.2	19.3	13.1	15.5	11.4

Table 53 Results for all Divisions for Question 9g

Question 9g:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas on the coastline of Scotland

	1	2	3	4	5	6	7	No answer
All areas	7.0	8.4	11.1	17.7	17.9	12.4	15.1	10.4
Atholl	6.3	7.6	9.7	18.3	17.8	12.0	15.3	13.1
Cupar	5.2	11.9	11.9	17.0	15.5	12.9	20.1	5.7
Kinross	9.7	6.9	10.4	19.4	16.0	16.7	12.5	8.3
Loch Ness	8.1	8.4	13.4	16.2	20.1	11.2	13.1	9.5
Highland	2.4	2.7	5.0	11.8	15.8	19.4	32.8	10.0
Lowland	3.6	2.7	5.0	9.5	14.2	17.5	41.4	6.2
Resident	5.8	3.3	5.8	11.7	20.8	14.2	31.7	6.7
Visitor	2.4	2.7	4.9	11.1	14.8	19.4	35.4	9.3
Tourer	2.4	2.5	4.9	11.1	14.5	20.2	34.9	9.5
Outdoor	2.7	3.4	5.5	11.0	16.4	15.1	38.4	7.5
Male	3.6	3.1	5.5	12.2	17.0	19.9	29.1	9.6
Female	2.1	2.5	4.6	10.5	14.3	18.0	39.3	8.6
Under 30	3.3	3.5	5.5	13.0	16.3	18.2	30.0	10.1
30 - 54	1.2	2.3	4.9	10.1	15.6	19.1	40.2	6.6
55+	5.1	0.7	2.2	7.3	10.9	21.2	40.1	12.4
Member	3.3	1.5	4.8	10.9	17.5	19.2	36.1	6.7
Non-member	2.4	3.5	5.0	11.4	14.2	18.8	34.5	10.3

Table 54 Results for all Divisions for Question 9h

Question 9h:

Please indicate on a scale of 1 to 7 (where 7 is very desirable) your wish to visit areas away from the coast

	1	2	3	4	5	6	7	No answer
All areas	5.1	6.1	8.5	18.4	18.8	14.3	19.4	9.5
Atholl	3.7	5.6	9.5	15.8	17.8	14.9	20.3	12.4
Cupar	6.2	5.7	8.8	23.2	14.4	15.5	22.7	3.6
Kinross	10.4	6.9	8.3	18.1	20.8	9.7	16.7	9.0
Loch Ness	4.5	6.7	6.7	20.1	22.1	14.5	17.3	8.1
Highland	4.0	6.0	8.4	17.4	19.4	14.8	19.2	10.8
Lowland	8.0	6.2	8.6	21.0	17.2	13.0	20.1	5.9
Resident	5.0	5.8	15.8	20.0	18.3	10.8	17.5	6.7
Visitor	5.1	6.1	7.7	18.2	18.9	14.7	19.6	9.8
Tourer	5.0	6.5	7.6	18.3	18.9	14.8	19.2	9.8
Outdoor	5.5	4.1	9.6	16.4	19.2	14.4	21.9	8.9
Male	3.6	7.1	8.2	19.7	19.9	14.3	17.2	9.9
Female	5.9	5.4	8.7	17.5	18.0	14.3	21.1	9.1
Under 30	5.4	7.4	10.6	20.6	18.5	13.0	14.1	10.3
30 - 54	4.1	4.7	6.2	17.0	20.7	15.8	24.8	6.8
55+	5.8	5.1	7.3	13.9	12.4	15.3	24.8	15.3
Member	4.6	5.4	9.4	17.5	19.8	14.8	20.7	7.7
Non-member	5.3	6.5	8.0	18.9	18.2	14.4	18.7	10.4

Table 55 Significant T-Test Results for Question 9

Yes = Significant to < 0.05
Yes = Significant to < 0.01

	Atholl v Cupar	Atholl v Kinross	Atholl v Loch N	Cupar v Kinross	Cupar v Loch N	Kinross v Loch N	Hiland v Loland	Resident v Visitors	Resident v Tou/Sig	Resident v Outdoor	Tou/Sig v Outdoor	<30 v 30-54	<30 v 55+	30-54 v 55+	Male v Female	Member v Non-Mem
9A		Yes			Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes			
9B					Yes	Yes	Yes					Yes	Yes			
9C						Yes		Yes	Yes			Yes	Yes		Yes	
9D																
9E		Yes	Yes			Yes	Yes	Yes	Yes	Yes		Yes	Yes			Yes
9F									Yes		Yes				Yes	Yes
9G	Yes			Yes	Yes			Yes	Yes			Yes	Yes		Yes	
9H		Yes										Yes	Yes			

Table 56 Results for Question 10a
Question 10a:
More tourist facilities should be developed in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	6.1	15.1	28.0	29.2	9.5	1.4	10.8
- Residents	5.9	23.5	29.4	11.8	17.6	0.0	11.8
- Visitors	6.1	14.8	27.9	29.7	9.2	1.4	10.8
Cupar	12.9	21.1	20.1	28.9	5.7	4.1	7.2
- Residents	21.1	39.5	10.5	13.2	7.9	2.6	5.3
- Visitors	10.9	16.7	22.4	32.7	5.1	4.5	7.7
Kinross	12.5	26.4	22.2	23.6	2.1	2.8	10.4
- Residents	17.0	32.1	22.6	15.1	1.9	1.9	9.4
- Visitors	9.9	23.1	22.0	28.6	2.2	3.3	11.0
Loch Ness	5.0	11.7	21.5	37.2	14.5	1.1	8.9
- Residents	8.3	25.0	8.3	33.3	25.0	0.0	0.0
- Visitors	4.9	11.3	22.0	37.3	14.2	1.2	9.2

Table 57 Results for Question 10b
Question 10b:

No more houses should be built in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	13.1	22.4	30.3	16.9	3.6	3.6	10.2
- Residents	29.4	17.6	11.8	17.6	17.6	0.0	5.9
- Visitors	12.6	22.5	30.9	16.9	3.1	3.7	10.3
Cupar	14.4	24.7	29.9	16.0	2.1	6.2	6.7
- Residents	21.1	21.1	15.8	31.6	0.0	5.3	5.3
- Visitors	12.8	25.6	33.3	12.2	2.6	6.4	7.1
Kinross	19.4	20.8	28.5	16.0	3.5	2.8	9.0
- Residents	24.5	17.0	20.8	22.6	7.5	1.9	5.7
- Visitors	16.5	23.1	33.0	12.1	1.1	3.3	11.0
Loch Ness	12.0	25.1	32.4	16.8	0.8	3.1	9.8
- Residents	25.0	8.3	41.7	25.0	0.0	0.0	0.0
- Visitors	11.6	25.1	32.1	16.5	0.9	3.2	10.1

Table 58 Results for Question 10c
Question 10c:

This area is suitable for the development of light industry

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	2.7	12.9	21.5	26.9	21.0	4.7	10.5
- Residents	5.9	11.8	5.9	41.2	23.5	5.9	5.9
- Visitors	2.6	12.9	21.8	26.5	20.9	4.7	10.5
Cupar	2.6	20.6	24.2	22.7	14.9	7.7	7.2
- Residents	7.9	28.9	34.2	15.8	2.6	5.3	5.3
- Visitors	1.3	18.6	21.8	24.4	17.9	8.3	7.7
Kinross	3.5	21.5	22.2	29.2	11.1	3.5	9.0
- Residents	3.8	30.2	24.5	24.5	7.5	3.8	5.7
- Visitors	3.3	16.5	20.9	31.9	13.2	3.3	11.0
Loch Ness	2.0	8.7	18.7	33.8	24.6	2.2	10.1
- Residents	0.0	8.3	8.3	50.0	33.3	0.0	0.0
- Visitors	2.0	8.7	19.1	33.2	24.3	2.3	10.4

Table 59 Results for Question 10d
Question 10d:

Additional forestry development should not be allowed in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	6.6	16.6	28.5	21.2	11.2	4.6	11.4
- Residents	0.0	41.2	35.3	5.9	11.8	0.0	5.9
- Visitors	6.8	15.9	28.3	21.6	11.2	4.7	11.5
Cupar	13.2	18.0	22.2	26.8	11.9	7.2	6.7
- Residents	2.6	18.4	21.1	34.2	15.8	2.6	5.3
- Visitors	8.3	17.9	22.4	25.0	10.9	8.3	7.1
Kinross	4.2	17.4	24.3	28.5	12.5	4.2	9.0
- Residents	5.7	17.0	17.0	28.3	20.8	5.7	5.7
- Visitors	3.3	17.6	28.6	28.6	7.7	3.3	11.0
Loch Ness	7.3	16.2	29.1	25.9	7.8	3.6	10.1
- Residents	16.7	25.0	8.3	25.0	25.0	0.0	0.0
- Visitors	6.9	15.9	29.8	26.0	7.2	3.8	10.4

Table 60 Results for Question 10e
Question 10e:

The main road network in this area does not require any improvement

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	15.9	38.8	14.7	13.2	3.7	2.9	10.7
- Residents	35.3	17.6	5.9	17.6	5.9	5.9	11.8
- Visitors	15.4	39.4	15.0	13.1	3.7	2.8	10.6
Cupar	12.4	39.7	14.4	17.0	3.6	6.2	6.7
- Residents	5.3	34.2	15.8	31.6	5.3	2.6	5.3
- Visitors	14.1	41.0	14.1	13.5	3.2	7.1	7.1
Kinross	13.2	39.6	18.1	12.5	4.9	2.8	9.0
- Residents	9.4	30.2	24.5	18.9	7.5	3.8	5.7
- Visitors	15.4	45.1	14.3	8.8	3.3	2.2	11.0
Loch Ness	9.7	40.2	18.2	15.6	3.6	2.5	10.1
- Residents	16.7	16.7	25.0	16.7	25.0	0.0	0.0
- Visitors	9.5	41.0	17.9	15.6	2.9	2.6	10.4

Table 61 Results for Question 10f
Question 10f:

A change in land use that brought about an increase in the diversity of wildlife would be desirable

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	19.3	40.0	19.0	3.7	1.4	5.1	11.5
- Residents	23.5	41.2	11.8	0.0	0.0	17.6	5.9
- Visitors	19.2	40.0	19.2	3.8	1.4	4.7	11.7
Cupar	23.7	41.2	18.0	4.1	0.5	5.2	7.2
- Residents	18.4	57.9	10.5	5.3	0.0	2.6	5.3
- Visitors	25.0	37.2	19.9	3.8	0.6	5.8	7.7
Kinross	25.0	36.8	22.9	2.1	0.7	3.5	9.0
- Residents	28.3	34.0	26.4	0.0	1.9	3.8	5.7
- Visitors	23.1	38.5	20.9	3.3	0.0	3.3	11.0
Loch Ness	19.6	38.5	21.5	7.5	0.6	2.5	9.8
- Residents	50.0	16.7	16.7	16.7	0.0	0.0	0.0
- Visitors	18.5	39.3	21.7	7.2	0.6	2.6	10.1

Table 62 Results for Question 10g
Question 10g:

Financial support should be available to encourage the indigenous population to stay in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	25.4	36.9	15.3	5.3	2.7	3.6	10.8
- Residents	35.3	41.2	11.8	5.9	0.0	0.0	5.9
- Visitors	25.1	36.8	15.4	5.2	2.8	3.7	11.0
Cupar	30.9	38.7	13.4	5.2	1.0	4.6	6.2
- Residents	42.1	23.7	18.4	7.9	0.0	2.6	5.3
- Visitors	28.2	42.3	12.2	4.5	1.3	5.1	6.4
Kinross	23.6	34.7	18.8	5.6	3.5	3.5	10.4
- Residents	20.8	32.1	20.8	9.4	5.7	3.8	7.5
- Visitors	25.3	36.3	17.6	3.3	2.2	3.3	12.1
Loch Ness	24.0	41.6	16.2	4.5	1.1	2.8	9.8
- Residents	41.7	16.7	16.7	0.0	8.3	0.0	0.0
- Visitors	23.4	42.2	15.9	4.6	0.9	2.9	10.1

Table 63 Results for Question 10h
Question 10h:
There should be no change to the balance of arable/mixed/sheep farming in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	11.4	31.7	31.7	5.3	1.7	7.5	10.8
- Residents	0.0	41.2	23.5	17.6	0.0	11.8	5.9
- Visitors	11.7	31.4	31.9	4.9	1.7	7.3	11.0
Cupar	12.9	31.4	34.5	5.7	1.0	7.7	6.7
- Residents	13.2	31.6	39.5	2.6	2.6	5.3	5.3
- Visitors	12.8	31.4	33.3	6.4	0.6	8.3	7.1
Kinross	9.0	23.6	45.8	4.2	2.1	4.9	10.4
- Residents	3.8	18.9	50.9	7.5	3.8	7.5	7.5
- Visitors	12.1	26.4	42.9	2.2	1.1	3.3	12.1
Loch Ness	11.2	32.4	34.9	3.4	1.7	6.1	10.3
- Residents	0.0	50.0	25.0	8.3	16.7	0.0	0.0
- Visitors	11.6	31.8	35.3	3.2	1.2	6.4	10.7

Table 64 Results for Question 10i

Question 10i:

There should not be changes to field sizes in this area

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly	Undecided	No answer
Atholl	13.9	28.6	32.7	4.6	1.2	7.8	11.2
- Residents	17.6	29.4	17.6	17.6	0.0	11.8	5.9
- Visitors	13.8	28.6	33.2	4.2	1.2	7.7	11.3
Cupar	14.9	37.1	27.8	3.6	1.0	8.2	7.2
- Residents	15.8	26.3	39.5	2.6	2.6	7.9	5.3
- Visitors	14.7	39.7	25.0	3.8	0.6	8.3	7.7
Kinross	13.9	22.2	41.7	5.6	2.8	4.2	9.7
- Residents	13.2	18.9	45.3	5.7	5.7	5.7	5.7
- Visitors	14.3	24.2	39.6	5.5	1.1	3.3	12.1
Loch Ness	12.8	27.9	37.2	4.7	0.3	6.1	10.9
- Residents	33.3	25.0	41.7	0.0	0.0	0.0	0.0
- Visitors	12.1	28.0	37.0	4.9	0.3	6.4	11.3

Table 65 Showing Likert type scale for tolerance to land use change in all areas

Scale	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Number of Respondents	0	0	0	0	0	0	0	0	0	0	0	2	1	3	5

Scale	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Number of Respondents	5	12	2	17	15	22	30	17	37	43	50	42	59	54	61

Scale	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Number of Respondents	57	42	46	48	30	23	20	16	7	8	3	4	0	1	2

Scale	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Number of Respondents	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 66 Showing T-Test results for Likert tolerate change scale

Residents / Visitors		
Highland Res v Lowland Res	Atholl Res v Loch N Res	Cupar Res v Kinross Res
0.014	0.96	0.48
Highland Vis v Lowland Vis	Atholl Vis v Loch N Vis	Cupar Vis v Kinross Vis
0.052	0.32	0.63
Age		
Highland <30 v Lowland <30	Atholl <30 v Loch N <30	Cupar <30 v Kinross <30
0.005	0.59	0.59
Highland 30-54 v Lowland 30-54	Atholl 30-54 v Loch N 30-54	Cupar 30-54 v Kinross 30-54
0.033	0.25	0.76
Highland 55+ v Lowland 55+	Atholl 55+ v Loch N 55+	Cupar 55+ v Kinross 55+
0.016	0.061	0.045
Member / Non Member		
Highland Member v Lowland Member	Atholl Member v Loch N Member	Cupar Member v Kinross Member
0.214	0.067	0.652
Highland Non M v Lowland Non M	Atholl Non M v Loch N Non M	Cupar Non M v Kinross Non M
2.33E-05	0.897	0.844

Table 67 Showing Likert type scale for tolerance to land use change in all areas for Question 10

Scale	9	10	11	12	13	14	15	16	17	18	19	20	21
Number of respondents	0	0	0	0	0	0	1	1	3	2	4	9	10

Scale	22	23	24	25	26	27	28	29	30	31	32	33
Number of respondents	23	34	51	89	84	98	104	94	92	61	43	31

Scale	34	35	36	37	38	39	40	41	42	43	44	45
Number of respondents	25	11	9	6	0	0	0	0	0	0	0	0

Table 68 Rotated factor matrix for Question 8

	Factor 1	Factor 2	Factor 3	Factor 4
8a	0.77403	0.11109	0.04068	0.02604
8b	0.80980	0.03106	0.06840	0.01985
8c	0.77540	0.03518	0.05062	0.09194
8d	0.48370	0.01289	0.23459	0.01397
8e	0.42801	0.16950	0.22293	0.39551
8f	0.08767	0.31310	0.56843	0.06877
8g	0.16566	0.19379	0.67942	0.02525
8h	0.00386	0.01502	0.60511	0.28613
8i	0.15879	0.46687	0.24773	0.19682
8j	0.09397	0.12375	0.64677	0.11184
8k	0.00855	0.72483	0.04888	0.10946
8l	0.18797	0.22047	0.05905	0.72051
8m	0.04182	0.16489	0.35380	0.69864
8n	0.08922	0.77136	0.03609	0.14333
8o	0.12778	0.67783	0.10158	0.16414

Table 69 Rotated factor matrix for Question 10

	Factor 1	Factor 2	Factor 3	Factor 4
10a	0.06759	0.81138	0.02490	0.07120
10b	0.60139	0.20508	0.12550	0.04716
10c	0.46155	0.52514	0.27881	0.31504
10d	0.10514	0.00546	0.05848	0.90630
10e	0.12319	0.63010	0.26699	0.37323
10f	0.02705	0.16031	0.78065	0.09750
10g	0.29716	0.6118	0.62050	0.08245
10h	0.70553	0.11893	0.27505	0.05404
10i	0.70059	0.03477	0.39393	0.12337

Table 70 Summary Table for Discrimant Analysis

Step	Variable entered	Wilks' Lambda
1	Familiarity with area	0.96079
2	Familiarity with Scotland	0.94688
3	Resident/Visitor	0.92936
4	Landscape type	0.92299
5	Age	0.91770
6	Reason for Visit	0.91300
7	Membership of an environmental organisation	0.91028

Table 71 Standardized Canonical Discriminant Function Coefficients

	Function 1	Function 2
Landscape type	0.04467	0.61090
Resident/Visitor	0.65902	0.08898
Reason for Visit	0.15614	0.39532
Age	0.14958	0.46259
Familiarity with area	0.74601	0.16313
Familiarity with Scotland	0.74415	0.79319
Membership of an environmental organisation	0.18633	0.19068

Table 72 Classification of Discriminant Analysis Results

Actual group	No. of cases	Predicted group membership		
		1	2	3
1	232	100 (43.1%)	56 (24.1%)	76 (32.8%)
2	250	60 (24.0%)	92 (36.8%)	98 (39.2%)
3	234	35 (15.0%)	71 (30.3%)	128 (54.7%)

APPENDIX THREE - REFERENCES

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