Tranquillity Mapping: Developing a Robust Methodology for Planning Support

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1 Summary

Introduction
Tranquillity is a valuable and seemingly elusive resource. It is promoted by visual, aural and to a lesser extent other sensory stimuli either as a direct response or a cue to memory. It is aspired to, as it induces or increases feelings of calm and well being and therefore has positive effects on health and quality of life. This has both benefits to the individual and to the economics of the country. Finding the qualities of places which generate tranquil feelings and protecting those locations and attributes can be considered important as a reserve for a country pressured by development.

Context
In summer of 2004 CPRE commissioned a report to carry out a pilot study to develop a methodology to map tranquillity for Northumberland national park and the West Durham Coalfield. Until 2004, previous attempts to map tranquillity had suffered from expert driven definitions of tranquillity and a sole focus on factors that detract from tranquillity. It was recognised in this work that judgements about tranquillity are ultimately personal and rejected expert-led decisions in favour of using Participatory Appraisal (PA) consultation. It was established in this study that the public expressed their feelings about tranquillity in many ways but the findings developed broad, qualitative and more inclusive understanding of what tranquillity is, is not and why it is important. Linking the wide ranging responses of the public to data that can be mapped was explored in this pilot study and a methodology was developed to produce a map of tranquillity. The spatial footprint or location of characteristics or themes identified in the PA work (using Geographical Information Systems) is combined with the relative importance given to each characteristic based on the number of people that identified it. Both positive factors that contribute to and negative factors that detract from tranquillity are combined to give a score that represents tranquillity as a resource. The public has identified what factors to map. The relative importance of each factor, out of all factors that have been identified, has been identified by the number of times it was stated by the public as a percentage of the number of people asked. The result of this was a map that represented relative tranquillity for the two study areas.

Also in 2004 further PA work carried out in the Chilterns AONB investigated the general transferability of the consultation approach. It also allowed for further methodological developments and an exploration of how people experience and value tranquillity in a second area of England. This work identified similarities in perceptions of tranquillity across space and different types of landscape in England. It was found that the higher level themes or groupings of responses previously identified in the 2004 Tranquillity Mapping project were repeated. This provided a firm basis for the use of these findings to map tranquillity at a national scale.

National Tranquillity Mapping
In 2006 CPRE commissioned a project to map tranquillity on a national scale. This report details the research carried out during the spring and summer of 2006 by:

- Centre for Environment and Spatial Analysis (CESA).
- PEANuT (Participatory Evaluation and Appraisal in Newcastle upon Tyne).
- Collaboration with Bluespace environments, Durham.
- Newcastle University.

Drawing extensively on the 2004 Tranquillity Mapping project and the 2004 Chiltern study this report details the method and findings of the national exercise mapping tranquillity. The approach adopted combines three key streams of data collection and integration:

1. Public consultation.
2. Threshold analysis or method development.
3. The GIS model in order to map tranquillity.

Public Consultation

Study areas where public consultation would be carried out were identified. From the wide range of themes which are of deep relevance to how people experience tranquillity a series of factors (not perceptual) were identified and incorporated into a quantitative-orientated approach. This approach gave the public a number of option choices that were split into what could be seen and heard and were categorised as either positive or negative contributors to, or detractors from, tranquillity. The surveys required a member of the public to select three positive and three negative characteristics that most contributed to or detracted from an experience of tranquillity. With over 4000 responses it was then possible to produce a weighting of all 44 option choices that represented not what the public liked or disliked, but what of all of the choices available contributed to, or detracted from, feelings of tranquillity. Seeing a natural landscape, hearing birdsong and seeing the stars at night scored highly in enhancing feelings of tranquillity. Hearing constant noise from traffic, seeing lots of people and urban development were the top three detracting from tranquillity. The number of responses for each option choice was converted into a percentage which provided a way of weighting each option choice in order of relevance.

Threshold Analysis

In the 2004 Mapping Tranquillity project a recommendation for a method development was to remove expert-led judgements of parameters used to model the perceived naturalness of a landscape and a distance weighting that was applied when modelling the visibility of certain features in the landscape.

Research was undertaken to determine whether predictable patterns in relation to distance existed and whether spatial thresholds could be established for features in the broad themes of land cover, people and urban development. In addition, illustrations of a variety of land cover types were chosen to obtained quantitative information on the public's 'perceived naturalness' rather than an expert-led scoring system.

GIS methodology

Geographical Information System (GIS) was used to provide a spatial footprint of the 44 option choices used in the public consultation. In the national model these option choices have been disaggregated into 'what you can see' and 'what you hear'. In doing so the link between digital datasets and the ability to model 'visibility' and 'noise' is more readily transparent. The bulk of the methodology presented sets out for each option choice how the data was generated from the raw data to the final representation of the relative contribution to or from tranquillity using the results from the threshold analysis and the public consultation.

Relative Tranquillity

The findings of this research are the results of an independent study[1]. The results of this study provide a value of relative tranquillity for each individual 500m x 500m grid square for the whole of England at a snapshot of time in 2006. The figure for each individual cell is subjective and should not be taken and interpreted out of context for two clear reasons:

- A cell with the same value can have different combinations of the 44 option choices resulting in the same figure – raw scores of tranquillity.
- The value is produced using extremes in the raw data for national datasets, a maximum and minimum range of noise levels for hearing or seeing each of the option choices identified. This therefore allows a comparison of tranquillity relative to anywhere else in England only – relative tranquillity.

Therefore, the results of this study should not be used without an understanding of the methodology used and its caveats.

This research builds significantly on the 2004 studies which developed a robust framework of approach with the potential to support land use and landscape planning. This was complemented

[1] The conclusions presented are of the researchers only and are independent of CPRE.

by specific additional research to consider public perception of perceived naturalness of land cover and establish thresholds of nuisance. The GIS methodology has developed significantly, where possible within the national scale of the project, in its detail and complexity to provide this cutting edge current study.

2 Introduction

Tranquillity is a valuable and seemingly elusive resource.
It is important to people as a state of mind which may be induced by physical manifestation. It is promoted by visual, aural and to a lesser extent other sensory stimuli either as a direct response or a cue to memory. It is aspired to, as it induces or increases feelings of calm and well being and therefore has positive effects on health and quality of life. This has both benefits to the individual and to the economics of the country. Finding the qualities of places which generate tranquil feelings and protecting those locations and attributes can be considered important as a reserve for a country pressured by development.

This report details the research carried out during 2006 by the Centre for Environmental and Spatial Analysis (CESA) and PEANuT (Participatory Evaluation and Appraisal in Newcastle upon Tyne) project at Northumbria University, in collaboration with Bluespace environments, Durham and Newcastle University, for the project commissioners the Campaign to Protect Rural England.

It extends the methodology of and the findings from the previous work, Tranquillity Mapping 2004, carried out by CESA and PEANuT at Northumbria University in the North East of England (see MacFarlane *et al*, 2004) and the Chilterns Area of Outstanding Natural Beauty (see The Countryside Agency, 2005).

The work conducted for the 2004 Tranquillity Mapping project accepted that judgements about tranquillity are ultimately personal and rejected expert-led decisions in favour of using Participatory Appraisal (PA) consultation in order to establish the many ways in which individuals expressed their feelings about tranquillity. It therefore developed broad, qualitative and more inclusive understandings of what tranquillity is, is not and why it is important.

Drawing extensively upon this work, the exploration of tranquillity has now been extended beyond these previously-targeted areas to generate, through a necessarily less qualitative, simpler quantitative consultation approach, a 'national' understanding of the concept of tranquillity. The products of this extensive research are illustrated in the National Relative Tranquillity Map 2006.

This report is divided into two parts, Sections A and B.
Section A includes the literature review and all the aforementioned background research in 2004, which provided the basis for this national study. The current project is detailed and discussed in Section B.

3 Section A, Tranquillity Mapping, Background

3.1 Tranquillity

'Tranquillity' is a widely used term. It is considered to be a state of calm, quietude and is associated with peace; a state of mind that promotes mental well being. It is considered to be a significant asset of landscape, appearing as an objective attribute in a range of strategies, policies and plans. However until 2004, previous attempts to map tranquillity had suffered from expert-driven definitions and a sole focus on factors that detract from tranquillity.

Tranquillity appears to be a holistic sensory experience and there are many variables which input into an individual's feelings of tranquillity. Consultation for the research carried out in 2004 included definitions of tranquillity as a 'state of mind when in nice surroundings' and 'areas you can visit to leave all your troubles behind [to] escape life's hustle and bustle'. The link between the experience and the environment is clear.

It seemingly has something in common with terms such as wildness, remoteness and naturalness but it is distinctively different from and more than all of these. This research has established that tranquillity is highly valued, and has prioritised the factors which promote and detract from tranquillity. It is something that contributes to quality of life, but defining it effectively remains difficult as tranquillity is ultimately a state of mind rather than a specific environmental characteristic, or quality, per se.

In some of its uses in the media to sell product or place, people are invited to reflect on what tranquillity is, what it means to them and where it can be found. It is presented as something hard to find and therefore valuable. In a 2001 survey reported by DEFRA[2] the most commonly mentioned reasons for visiting the countryside were tranquillity (58 per cent), scenery (46 per cent), open space (40 per cent), fresh air (40 per cent) and plants and wildlife (36 per cent). Yet all of these terms are relatively vague, unscientific and as such there is a risk that a poorly defined definition may lead to weak frameworks and policies to protect and enhance them.

In the recently adopted Landscape Policy Framework[3], Scottish Natural Heritage recognises the value of upholding the tangible and intangible qualities that contribute to the landscape being recognisable as distinctive of Scotland. Through various proposals, one of which is safeguarding the rural character of Scotland's countryside from the effects of urban influences, the policy document recognises the quality of tranquillity as the crucial asset.

Tranquil areas are perhaps best defined in experiential terms as areas with the characteristics most likely to induce a state of tranquillity for people who are there. The problem with this approach, however, is that just as beauty is in the eye of the beholder, people will find tranquillity in ways and places that may be more or less specific to or hold associations for them, for example, their own gardens.

There is a widely held feeling that tranquillity is getting harder to find. The comparative work by CPRE (1995) establishes evidence for this over a thirty year period from the 1960s. Scottish Natural Heritage (SNH) (2003) note that many of the features which people seek have been made more accessible through transport infrastructure developments, as well as the broader social changes of the past half century which have left many people with more time for recreation. Therein lies a paradox - as access to environments that promise a relatively tranquil experience has been made easier there is an increase in the pressures in these areas to the point that the landscape has apparently lost many of its valued characteristics, including the sense of isolation and remoteness. This includes tranquillity and wild land, the subject of SNH's policy paper.

[2] Quality of life counts (2004)
http://www.sustainable-development.gov.uk/sustainable/quality04/maind/04s.htm

[3] SNH Landscape Policy Framework: Policy Statement No. 05/01

This project was commissioned because the project commissioners value tranquillity and wished to develop the 2004 assessment of relative tranquillity from the local pilot areas into a national project covering the whole of England. Tranquillity assessments are in demand in development processes. Tranquillity is a pervasive concept in the field of environment, countryside and landscape and this project will assist to inform environmental forward planning and decision making.

3.1.1 Qualities, Quality and Indicators

This section establishes a context for tranquillity assessment. Tranquillity is defined as an environmental quality, but it is accepted that it is but one of many different qualities, or aspects and dimensions of overall quality. It is a quality that is engaged with and accessed through personal values and all of these are terms that need defining.

"Quality" is a pervasive concept in modern society. Public and private providers of goods and services alike are judged on performance and quality. However, assessing performance and quality is far from simple (Audit Commission, 2000) and heavy use is made of indicators. Such indicators provide a measure against which quality, performance and progress may be measured. Such measures may be direct (e.g. Biological Oxygen Demand in relation to freshwater quality), indirect (e.g. length of hedgerows per km2 in relation to farmland birds) or even surrogate measures (e.g. proportion of children walking to school in relation to childhood obesity). They may also be input, output or outcome related. Input-related measures (e.g. government spending on the police) are now rarely used outside of political circles, output-based measures (e.g. number of police on the beat in a given area) remain relatively unsatisfactory, yet outcome-based measures (e.g. reductions in burglary) have their own problems of cause and effect, quantification and reporting. So, indicators in general are relatively problematic and there is a need to define what their role is and to what limitations they are subject.

Environmental indicators typically show the quality and/or availability of desirable environmental characteristics that relate to sustainability and/or quality of life. The definition of indicators is a technique to identify changes over time and contingent upon policies, plans and interventions and to establish objectives for policy and management. Indicators are selected on a variety of criteria, including how representative they are of the variable or process, meaningfulness to a range of stakeholders and their manageability. In the absence of indicators that are truly representative, indicators may be selected on the basis that they are available at limited effort. This point is not made to undermine valuable work that has had to be pragmatic for reasons of brief, resources or time, but to identify how this work is different. Figure 1 simply represents the way in which various dimensions of quality and progress interrelate.

Quality…	a holistic term for the accumulated benefits that are experienced from a particular state of affairs.
Qualities…	specific aspects or attributes which have utility and / or meaning to communities and / or individuals.
Value…	values are social and individual judgements about relative worth.
Character…	specifically used here in relation to landscape, is a description of what comprises, defines and distinguishes a particular area.
Indicator…	a precise and technical term for a measure by which changes, developments, progress, gains and losses may be identified. When used precisely, indicators are independent of evaluations or judgements of significance; this is the process by which changes are accepted or defined as unacceptable and new actions are implemented to achieve existing targets or the selection of indicators and their relationship to targets is revised.

Figure 1: The semantics of environmental, countryside and landscape quality: some definitions

Therefore, environmental quality is the aggregate of a whole series of more specific qualities, including for instance air and water, soils, landscape, biodiversity, waste, energy and climate. Some of these qualities may be managed at a relatively local scale (e.g. nature conservation sites), others are more regional (e.g. landscape management of Areas of Outstanding Natural Beauty), others are regional to international (e.g. air and water quality) and others are global (e.g. climatic change). Quality of life has significant overlap with environmental quality and many of the individual qualities have a significant bearing on people's day to day lives, such as attractive and accessible landscapes. Countryside quality then is largely a sub-set of environmental quality, although it must necessarily include non-environmental factors such as employment prospects and provision of services. Landscape quality is a sub-set of countryside quality and environmental quality (see Figure 2).

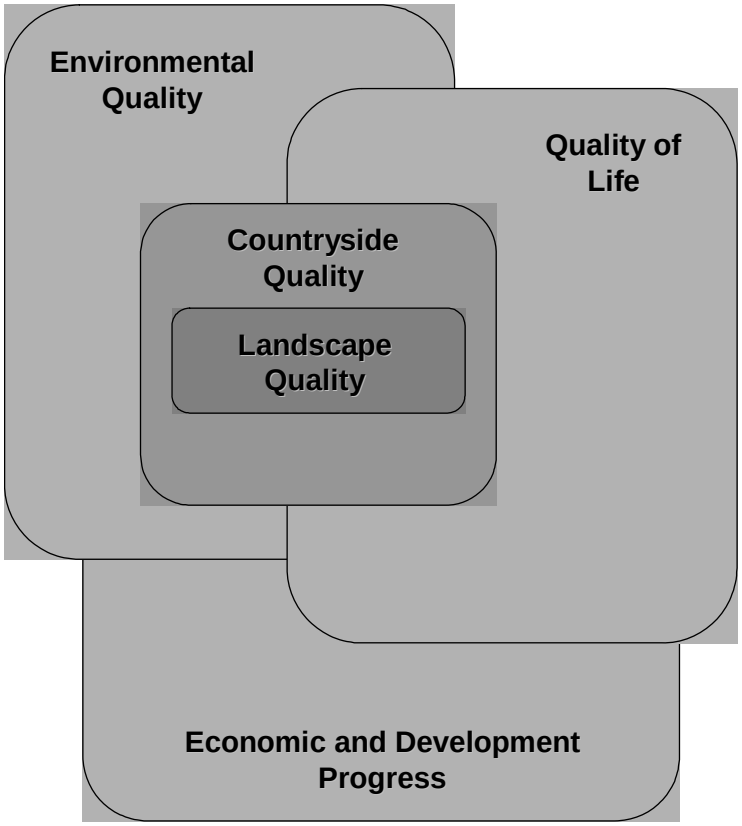


Figure 2: Overlapping measures of quality, development and progress

Tranquillity is perhaps conspicuous by its absence in Figure 2. Previous research (MacFarlane, *et al*., 2004) established its significance for quality of life, that it is demonstrably significant as an environmental and a countryside quality and it has the potential to enhance people's experience of landscape. As such indicators of one dimension may be partial or otherwise weak indicators of progress in another dimension. A reduction in noise for instance is, in broad terms , an environmental gain and something that contributes to countryside quality and also quality of life, although it is not relevant to landscape quality. The experience of landscape however, may be positively affected by a reduction in noise. Noise control (for instance through rejecting a planning application for a quarry) may, in turn, impose economic costs that are counter to conventionally defined development and associated indicators.

Goosen and Langers (2000), in their assessment of the quality of rural areas (for recreational users) in the Netherlands, define tranquillity in terms of low noise and limited traffic. They use externally defined (i.e. by the researchers) indicators relating to fitness for use and perceptual qualities of the landscape. 'Fitness for use' covers those indicators which are functional and

practical. The category of perceptual quality includes those indicators which give an experiential quality (p.242). Tranquillity emerged as one of the most significant quality indicators.

In respect of economic and development progress, one example of a potential conflict between planning to enhance tranquillity and 'economic progress' is mentioned above. However, there are other ways in which tranquillity as a resource has the potential to boost the economic fortunes of certain areas. For instance, if a sub-region or a designated area was able to make a claim to be the most tranquil area in a given region then this could attract more visitors. This is however a potentially dangerous application as this and the 2004 research has established that one of the key factors that detracts from people's sense of tranquillity is other people and associated traffic, noise and related disturbance. Clearly careful thought is needed about how tranquillity indicators, assessments and maps are to be applied.

Tranquillity is one facet of what the Countryside Agency (CA) has termed 'Countryside Quality'. It is an indicator of what may be termed countryside quality, but it is not the quality indicator. The Rural White paper (DEFRA, 2000) envisaged a countryside quality indicator that 'should include issues such as biodiversity, **tranquillity**, heritage and landscape character' (Haines-Young *et al.,* 2004, p.i) (our emphasis). The Countryside Quality Counts (CQC) process highlights knowledge gaps that hamper the development of indicators to support national policies for sustainable development. It is important of course to remember that sustainable development as a concept is now accepted to have environmental, economic and socio-cultural components; quality of life, equity of opportunity and environmental sustainability are intrinsically linked.

The CQC process focuses primarily on existing data sources relating to landscape elements such as woodland and settlement and development patterns and recorded qualitative data on their condition. A range of experiential aspects such as remoteness, wilderness, welcoming feel, appropriate wildlife and tranquillity are identified as being relevant to the countryside experience, which offers a series of benefits and services to countryside residents and users. The distinction between 'factual' and 'judgemental' indicators was identified, but a single, integrated indicator of quality remains the objective of the CQC project. However, data relating to the experiential aspects of landscape and the countryside are generally unavailable at the requisite spatial and temporal scale required. The CQC final report (Haines-Young *et al*, 2004) recommends that more robust ways be developed to map changes in tranquillity, which presupposes the existence of a methodology for assessing tranquillity.

In Scotland a tranquillity study[4] informed SNH's Landscape Policy Framework and gave a commitment to work to develop indicators that monitor the condition of the Scottish landscape.

In the 2004 project, existing approaches were subject to a detailed critique and the need to look again at how to approach this problem was tackled. This was done through techniques of Participatory Appraisal, taking public rather than researcher led definitions, an approach which is more comprehensively detailed in Sections 5.3 and 5.4. The current research developed from and extended this earlier project into a national study quantifying previously determined criteria that could be mapped using GIS.

A range of environmental, countryside and landscape qualities and indicators exist in government, local government and stakeholder groups' visions, strategies, policies and plans. Tranquillity however has remained more elusive as a defined quality and a specific indicator. Table 1 summarises some important indicators that appear in a range of central and local government documents, broken down into experiential and performance indicators. Table 1 necessarily generalises from the huge amount of work with which each of the named bundles of indicators is involved. The terminology is not consistent across the bundles and there are ongoing debates about terms such as 'quality' that some of the projects have progressed, while others have not. Each of the approaches is intended to achieve different things, to highlight specific areas of concern and they are very variable in respect of how precise and prescriptive the approach is.

[4] Ash Consulting Group, A96 Aberdeen – Inverness Tranquil Areas Study 1998 (Unpublished Report)

Some make reference to the need to consider a factor such as noise, others set targets and mechanisms to achieve them. So, the figure is not intended to be taken as a definitive statement on how different agencies perceive and promote quality of life, environmental and sustainability indicators. It is, however, intended to identify the relative paucity of perceptual qualities that make it into such bundles and in particular the very limited inclusion of tranquillity, even where it is externally defined.

	Experiential Indicators				**'Performance' Indicators**						
	Tranquillity	Remoteness	Perceived Naturalness[5]	Landscape quality	Noise	Light Pollution	Access to the Countryside	Air Quality	Cleanliness of public spaces	Water quality (rivers and canals)	Biodiversity
UK Govt Quality of Life Counts [6]	✗	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓
UK Govt Local Quality of Life Counts	✗	✗	✗	✗	✓	✗	✗	✓	✓	✓	✓
Local Govt Environmental BVPIs[7]	✗	✗	✓	✗	✗	✗	✗	✓	✓	✓	✓
Countryside Quality Counts	✗	✗	✗	✓	✗	✗	✗[8]	✗	✗	✓	✓
State of the Environment (North East)	✓	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓
State of the Countryside (England)	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	✓
SNH Wild land	✗	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
CCW Wildness	✓	✓	✓	✗	✓	✗	✗	✗	✗	✗	✗

Table 1: Some of the primary bundles of UK environmental indicators and their range of variables

5 As described in this report 'naturalness' has been defined in many different ways. It is used here to signify limited overt evidence of intensive human use of the land and a relative lack of modern artefacts and structures.

6 http://www.sustainable-development.gov.uk/indicators/index.htm

7 Audit Commission (2002) http://www.local-pi-library.gov.uk/library.asp

8 To be assessed in 2006

3.2 Literature Review

> "Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into the trees. The winds blow their freshness into you and the storms their energy, while cares drop off you like autumn leaves." John Muir (cited in Hartig *et al*, 1991)

This review draws together the previous studies relevant to this project. There are two key areas of research: on how people react to and feel about aspects of the environment; and on how these can be assessed and mapped. For the first time, this project incorporates both of these elements in mapping tranquillity.

Firstly therefore, this review will outline the previous work on tranquillity mapping. It will then consider the subjective nature of the concept and how this has been addressed. As there is only a limited amount of work on tranquillity, this will draw on research that has mapped other concepts such as 'wilderness' and 'naturalness' to illustrate some of the difficulties, challenges and potential solutions to doing so. It will then discuss the importance of developing an approach that addresses peoples' values, perceptions and experiences, by considering the literature on how people feel about and are affected by their environment. Finally, this review will outline how this project builds on some of this previous research to bring together mapping techniques in a real attempt to map the essential subjectivity of the concept of 'tranquillity'.

3.2.1 The Work of Simon Rendel

It is important to acknowledge the innovative and groundbreaking work by Simon Rendel of ASH Consulting who originally developed the concept of tranquillity mapping. This was for a Department of Transport study in 1991 to examine the effect of a new transport corridor in Hertfordshire and Bedfordshire. The work was devised because although much of the countryside local to the proposed scheme was designated for landscape quality, significant tracts remained undesignated and were therefore vulnerable to development. The decision was made to therefore map all undisturbed countryside as a resource in itself. Commenting later on this work, Rendel (1996) states that it was remarkable that such a study had not been attempted previously, and that it produced maps which were markedly different from those obtained by plotting landscape quality.

This original study led to the production of a set of Tranquil Area maps, produced by Rendel and ASH Consulting and published by CPRE and the Countryside Commission (1995). In these maps, 'Tranquil Areas' were defined as 'places which are sufficiently far away from the visual or noise intrusion of development or traffic to be considered unspoilt by urban influences'

Such places were determined by calculating the distances from various disruptive factors and it was decided that a 'Tranquil Area' lay:

- 4km from the largest power stations.
- 3km from the most highly trafficked roads such as the M1/M6; from large towns (the size of Leicester and larger); and from major industrial areas.
- 2km from most other motorways and major trunk roads such as the M4 and A1 and from the edge of smaller towns.
- 1km from medium disturbance roads, i.e. roads which are difficult to cross in peak hours (taken to be roughly equivalent to greater than 10,000 vehicles per day) and some main line railways.
- beyond military and civil airfield/airport noise lozenges as defined by published noise data (where available) and beyond very extensive opencast mining.

The maps of Tranquil Areas were drawn with a minimum radius of 1km. Within the Tranquil Areas, the following linear elements were shown as creating a lower level of disturbance 1km wide:

- Low disturbance roads,
- 400kV and 275kV power lines.

- Some well trafficked railways.

The report on this work (1995) notes that various other sites also fell within this lower level of disturbance category, such as large mining or processing operations, groups or pylons or masts, settlements with populations greater than 2,500 people, some half abandoned airfields and most wind power developments. The maps were drawn at a regional level and the report states that they ignore local effects, providing instead a "broad brush picture" of areas in the countryside which are free from urban intrusion. Drawing the maps with a minimum radius of 1km also eliminates local effects. Rendel (1996) notes that this approach makes "no claim to complete objectivity" but that it can be demonstrated that the maps are not radically altered by adjustments to the criteria.

3.2.2 Developing the Methodology for Wales and Scotland

This original work was developed and applied in other areas and the ASH Consulting Group was commissioned by the Countryside Council for Wales to carry out regional mapping for Wales (1997). While the scale for the regional maps of England was 1:250,000m and with a minimum unit of 1km, the mapping in Wales used a scale of 1:50,000 and a minimum unit of 100m. The report states that the reason for this was a need for greater detail in Wales where the expectation of tranquillity was higher than in England. The mapping also included an extra upper zone of tranquillity above that used in England. This 'very remote' zone represented complete removal from human activities and was defined as an absence of all skyglow effects. A further degree of remoteness was incorporated by showing areas of semi-natural vegetation within the higher zones and noisy sports, quarries and military training areas were plotted on the map.

In 2000, the Association for the Protection of Rural Scotland (APRS) applied the concept of tranquillity mapping to areas of Scotland (from Inverness to Aberdeen). The study was a evaluation of the potential of the concept and used the same factors and methodology as the original (1995) study by Rendel for ASH. SNH is committed in its Landscape Policy Framework 2005 to develop indicators that monitor the condition of Scotland's landscape and some limited work has been undertaken to assess changes on the extent to which the qualities of tranquillity and wilderness are found in the landscape.

3.2.3 Bell's Tranquillity Mapping for Forests

While Rendel for ASH consulting defined tranquillity in terms of absence of noise and visual impacts, Bell (1999) introduced the element of 'naturalness in the countryside' into the definition and stated that tranquillity could be summed up as "the quality that allows us to feel that we have 'got away from it all'" in his study. He carried out tranquillity mapping for the Forestry Commission at Sherwood Forest in Nottinghamshire and demonstrated the differing degrees of tranquillity and the effect of woodland.

The approach used by Bell was in many ways similar to that devised by Rendel. Bell used a number of factors to assess impacts on tranquillity:

- Noise from roads, railways, airports, low-flying aircraft, powerboats, blasting and industrial sites;
- Visual intrusion from built-up areas, holiday/caravan parks, industrial sites, power stations, grid stations, overhead lines, mineral extraction activities, decommissioned airfields, derelict land, windfarms, glasshouses, dish aerials and masts;
- Recreational use: numbers of visitors, effects of facilities, car parking and associated noise and visual intrusion.

Having defined these, Bell calibrated their effects and created buffers around them that represented the relative cover of their influence, which were then mapped. He notes that the cumulative effects of several lesser disturbances could be added together, which requires both professional judgement and local adjustment. Further, woodland is assumed in his work to have a positive effect by screening visual intrusion and baffling and masking some noise.

3.2.4 Levett's Critique

The conceptualisation of tranquillity mapping and the development of it was novel, hugely influential and demonstrated the value of such a concept. However, Levett from CAG Consultants for CPRE (2000) gives a detailed critique of this approach; his comments are directed at the original ASH work, but they largely apply to the developments of it as well.

Levett states that while basing the methodology on the notion of features that are sources of disturbance and producing defined zones of intrusion has the great advantage of simplicity; it neglects various potential effects that may influence the perception of tranquillity. These are various and were useful in terms of developing the 2004 project methodology. Levett's limitations and the ways in which the 2004 project addressed these are discussed fully in Section 3.3.5.1.

3.2.5 Definitions and Perceptions of a Subjective Experience

We are therefore interested in assessing and understanding people's values, meanings and experiences of tranquillity. This project has been designed to acknowledge and incorporate the subjectivity of the concept and the factors that are associated with it. Because this has not previously been done in relation to tranquillity, we are drawing on other studies that have attempted to do this with other factors. From these it becomes clear firstly that it is important to incorporate this subjective element; but secondly that doing so is challenging and complex.

To start with, the need to take account of the subjective is clear. Other studies have attempted to do so with concepts that, like tranquillity, are not definable in strictly objective terms; it will therefore be useful to briefly detail these.

Firstly for example, work has pointed to the effect of cultural values on descriptions. For instance, Habron (1996:46) points to the differences in definitions of wild land between the USA and New Zealand and argues that "these and other countries have defined wilderness in their own terms and for their own purposes, showing the differences between cultures in the perception of 'wild land' ".. He points out for example that a Scottish version of the concept of wild land would have to take account of the long and complex cultural and ecological history of the Highlands landscape, areas of which have been occupied for thousands of years (1996:46). Macnaghten and Urry (2000:166) give another example of the importance of cultural values and state that while there is the perception that "there is something natural about trees", this perception "varies from society to society".

'Trees' however come in all species, shapes and sizes, some of which are more acceptable to individuals, local communities and interest groups than others. One way in which the appropriateness of given forms of land cover, land use and land management has been judged is through reference to judgements about 'alien' and 'native' (Barker, 1996; Kendle and Rose, 2000; MacFarlane, 2001). Lines have been drawn in different places at different times and places by various groups to define (only) certain groups of plants and animals (and people) as 'belonging' in a given landscape. Causes célèbres in the British Isles include the Sycamore and a whole raft of commercially grown coniferous species. This debate is not progressed here in pursuit of a definitive judgement of belonging, echoing Kendle & Rose (2000) who argue that 'in a complex environment superimposed with equally complex human history, culture, values and aspirations, it is impossible to characterise one group of plants as 'superior' to others. This is especially true when the classification system is as nebulous and as value-laden as our definition of native' (p.28).

Secondly, research has described the way that certain conditions may create an experience for individuals – but that what these are may differ. Much work in this area has focused on the experience of 'wilderness'. Kliskey and Kearsley state that "while the environments in which wilderness might be found have an objective ecological reality [...] what makes that reality explicitly 'wilderness' rests very much with the individual and her or his personal cognition, emotions, values and experiences" (1993:203); this is a point echoed by Knopf (1983) in his work. There are examples of how and why experiences might differ. Olds (1989:28) believes that how people are affected by and experience natural surroundings is dependant on the contact they have with nature during childhood. Tarrant *et al.* (1994) highlight the importance of visitor characteristics –

recreation motives, past experience, attitudes – in determining their tolerance of aircraft overflights in wilderness areas and Graefe *et al*. (1996) found that visitors to a wilderness area with greater past experience of it prefer to see fewer people during a wilderness trip. Further, Virden and Schreyer (1988) showed that greater past experience leads to a preference for environments that are primitive and natural, with minimal evidence of human impacts.

Carver *et al.* (2002:24) build on this notion of differential experiences to describe the difficulties of defining the places that can be designated as 'wilderness' - and cite Nash's (1982:1) call "to accept as wilderness those places people call wilderness". They go on to state that wilderness "has more to do with perceptions than it does with ecological conditions" (Carver *et al.*, 2002:24). Habron (1996:45) concurs with this and argues that wilderness "means different things to different people" and Kliskey (1998:80) takes this a stage further to argue that "a wilderness experience is a state of mind". Further, Shankey and Schreyer (1987) contend that it is not so much the case that the natural world 'gives' a wilderness experience, but that it is the catalyst for the expression of fundamental and inherent emotional states.

Qualities	
(Physical qualities) Wildlands should be:	
Remoteness and inaccessibility	5km from major roads above 10,000 vehicles/day 2km from A roads [say around 5,000-10,000 vehicles/day] 1km from B roads [say around 2,000-5,000 vehicles/day Very lightly travelled minor roads- no buffer 2km from mainline railway 1km from local railway
Lack of evidence of human use of the land	Grade 5 or similar, unenclosed open land, no intensive agricultural practices e.g. moorland, heathland. Forestry reduces wildness of an area but it can still feel remote.
Lack of modern artefacts or structures	No modern structures such as fences, buildings or masts- wildland is unlikely to run up to the mountain fence as at this point more settled areas will be visible and the area will not be perceived as wild.
Perceived naturalness	Evidence of natural processes, natural vegetation cover and wildlife. Forestry will reduce sense of wildness because of its planted nature.
(Perceptual qualities) Wildlands should be:	
Solitude	Evidence of human activity should not be visible and few people should be seen over a prolonged period of time which give a feeling of remoteness.
Tranquillity	No noise of human related activity
Inspiration/Awe	Natural beauty or scale of the area may lead to feelings of inspiration, awe or spiritual awareness.
Threat	Perceived danger posed by terrain and or weather

Table 2: Criteria for defining Wildlands in Wales (WAG, 2004)

Both the Welsh Assembly and Scottish Executive have recognised the significance of 'wild lands' as an environmental resource. Scottish National Planning Policy Guidance (NPPG) 14 on Natural

Heritage[9] states that "Scotland's remoter mountain and coastal areas possess an elemental quality from which many people derive psychological and spiritual benefits. Such areas are very sensitive to any form of development or intrusive human activity and planning authorities should take great care to safeguard their wildland character. This care should extend to the assessment of proposals for development out with these areas which might adversely affect their wildland character" (para.16). Scottish Natural Heritage (SNH) has published a policy statement on 'Wildness in Scotland's Countryside'[10] which makes a distinction between 'wildness', which is an experiential quality which can be enjoyed irrespective of other factors, and 'wildlands', which are places where the factors that underpin that experiential quality are most concentrated. In their Landscape Policy Framework 2005 tranquillity is noted as a recognised quality of the rural character of a Scotland. Arup, working for the Welsh Assembly (WAG, 2004)[11], have set out the criteria defined as being relevant to identifying wildlands (Table 2).

Naturalness is also a concept that has an essential perceptual quality. An interesting example of this comes from Mace *et al*. (1999:236). They found that noise in natural environments had an effect beyond annoyance, with a derogatory impact on tranquillity and solitude, but also affects visual landscape quality. Technical noises impact on the perceived naturalness of a landscape and the louder the noise is, the less a landscape is perceived as natural. It is not just about the volume of the noise, or the impact on peace and quiet that affects experience. Similar results were found by Tarrant *et al*. (1994) when they studied the aural and visual impact of the noise of aircraft overflights. The work of Pheasant *et al*. 2006 on the developing project; 'noise and tranquillity in urban environments' provides an initial characterisation of the contribution and interaction of visual and auditory elements to the perception of tranquillity.

This is clearly relevant for considerations of tranquillity, which may be said to have even less of an 'ecological reality' than wilderness. Tranquillity might be found in 'natural' environments, but it may equally be found in urban areas – in a church, a library, a city centre park. Tranquillity is even more about the experience and the state of the individual. The point is that previous studies have not deemed that subjective concepts are rendered impossible to map; but that criteria can be developed that allow this.

Human relations with nature are the subject of a complex and extensive literature that is not reviewed here (but see Macnaghten and Urry, 1998). 'Nature' and 'natural areas' as terms have always been used by landscape researchers in a much less precise sense than by ecologists and allied sciences where semantic precision has been of greater concern. Kaplan and Austin (2004) for instance note that "there is a sizeable literature that documents the desire for and benefits of having access to nearby natural areas… There is also indication that knowledge of the availability of nature plays an important role whether or not residents actively engage with it… and that having natural elements in the view from the window is a source of psychological benefits "(p.236, our emphasis).

Peterken (1996), writing with specific reference to woodland management, discusses the way in which the term 'natural' is associated with a range of different meanings, but critically that it can be applied in ways that are both absolute and relative. Peterken sets out that his "preferred route out of the dilemma [of defining what is and is not, natural] is to retain the idea of 'natural' as separate from people, but to regard 'naturalness' as a continuous variable' Thus ' 'natural' is precise as a concept, but imprecise as a descriptor…" (p.12). Tranquillity is more problematic than naturalness as it is not a single environmental characteristic that is identifiable in both absolute and relative forms on 'objective' criteria, but rather it is an experience that is more likely to be achieved or found where a number of different environmental characteristics are, to a greater or less degree, present.

[9] Scottish Executive (revised 2000) National Planning Policy Guidelines 14 – Scottish Natural Heritage

[10] Scottish Natural Heritage (2002) Policy Statement No. 02/03 – Wildness in Scotland's Countryside

[11] Welsh Assembly Government Facilitating Planning for Renewable Energy in Wales: Meeting the Target Final Report - Research Contracts 105/2002 and 269/200, ARUP

3.2.6 Mapping the Subjective

Some studies have therefore attempted to take account of the subjective element to experiences. Again, the area on which there has been most work is on mapping wilderness. This has focused on 'breaking down' the concept and developing a set of criteria, the presence or absence of which lead to a wilderness experience. For example, Kliskey and Kearsley (1993:203) state that they aim to show in their study of wilderness that "what might be regarded as very personal imagery can, in fact, be collected and used as a potential management tool". They outline how wilderness can be measured in terms of the artefacts of remoteness, naturalness and solitude and argue that quantifiable indicators for each of these wilderness properties can be devised.

A similar approach has been adopted in a number of other studies. For example, Carver *et al*. (2002:25) devised a list criteria for wilderness: the natural state of the environment, the absence of human habitation and the lack of other human-related influences and impacts. Lesslie (1994) and Miller (1995) also assessed wilderness on the basis of four factors: remoteness from settlement; remoteness from access; apparent naturalness; and biophysical naturalness. And while Kliskey (1998:80) emphasises the experiential quality of wilderness, he outlines the common characteristics that have emerged from studies of wilderness attributes. He argues that while there is detailed variation of personal interpretation, patterns of consistency do exist between different groups' perceptions of wilderness. Kliskey states that these common properties can be developed into a methodology whereby they can be mapped. He does this by giving each property of wilderness a number of indicators (for example, the property 'remoteness' was given the indicators of road access, maintained tracks, motorised travel). These indicators were then expressed in spatial terms for each of the different groups studied, allowing them to be mapped using GIS.

Further, Fritz and Carver (1998:2) describe the way they addressed the subjectivity behind some of these factors. The wilderness indicators they defined were remoteness from settlement, remoteness from access, apparent naturalness and biophysical naturalness. They argue that in order to take the subjective nature of the wilderness concept into account, multicriteria evaluation techniques can be used to weight the wilderness indicators differently. This means using a simple weighted linear summation model to give different weightings to the data sets being used, to represent that they are not of equal weight and allow individual preferences to shape the model outcome. As well as being an improvement on previous work because of this, Fritz and Carver argue that this approach also produces a wilderness continuum that is relative and does not define the presence or absence of wilderness in terms of any threshold value.

Additionally, studies have addressed the subjective nature of their topics by asking people about them. For example, in developing wilderness criteria, Mace *et al*.(1999:236) highlight the difficulty of doing so, given that definitions of wilderness for some mean a total absence of any human influence, but for others includes an acceptance or even requirement of certain basic facilities. Their method for studying this was to devise a wilderness purism scale. This was a list of criteria, such as 'maintained huts and shelters', 'commercial mining', 'remote from towns and cities'. People were then asked to rank the presence of these criteria in a wilderness setting on a five point scale from 'strongly desirable' to 'strongly undesirable'. Similar approaches have been adopted, for example by Purcell and Lamb (1998) in their study of preference and naturalness, where respondents selected from predetermined options and Tarrant *et al*. (1994), who used a postal questionnaire to assess annoyance of aircraft overflights in wilderness areas. Hallikainen (2000) describes the need to determine what features of wilderness are used and appreciated by people; and his methodology was to devise questionnaires and landscape rankings to assess this. However, while these are valid approaches, they do not address the quality of the experience, or allow respondents to express their understandings in their own terms. In this way, such studies may be based on very limited input from people and while stressing the importance of the subjective nature of the concepts, may do little to actually address this. Shultis (1999) does attempt to overcome some of these issues in his study. He used a postal questionnaire to assess attitudes towards the popular and political conceptions of wilderness. The first three questions addressed the public's unprompted conception of wilderness, as respondents were specifically asked to use their own personal definition of wilderness when answering the questions. Other questions in the survey assessed attitudes on a 12-item wilderness scale. Shultis concludes that the results from

the survey "indicate that utilizing unprompted and prompted perceptions and attitudes to wilderness may prove to be a fruitful means of assessing public orientation towards the cultural construct of wilderness" (1999:402) – but he only carried out a limited part of his study addressing this.

To attend to some of these sorts of issues, Carver *et al.* (2002) set up a simple and easy to use website to survey public perceptions of wilderness in Britain. Their aim with their web mapping system was to allow users to explore their perceptions of wilderness in the British landscape. They did this by displaying a series of attribute maps and descriptions and allowing the user to experiment with weights applied to these maps, by moving simple slider bars. They could then draw their own wilderness continuum on screen. However, the participants still defined wilderness in the terms specified for them by the researcher.

3.2.7 Experts, Perceptions and People

As has been indicated, what is lacking with many of these studies is any real engagement with the subjective nature of the issues. If people are consulted, this may be to ask them about expert-devised indicators. The important point to be made about the development of criteria is that what is natural or wilderness of course varies between people and crucially, between 'experts' and 'non-experts'; so what may seem a reasonable list of criteria to ask people about may not have much relevance for them. For example, Carver (2003:3) draws on the work of the Council for National Parks (1998:3) to describe the difference between 'semi-natural' and 'near-natural' areas. The former are "areas which appear natural but are in fact influenced by management for agriculture or forestry", while the latter are areas where "the land is totally divorced from agricultural or forestry use – in which natural processes are encouraged to maintain the diversity of habitats and vegetation is free to vary naturally with variation in the physical environment". One of the key phrases here is that semi-natural areas may "appear" natural. Indeed, Lesslie *et al*. (1988) point out that naturalness is complicated because it has both this perceptual and an objective content; what may seem natural due to the perceived absence of any intrusion may be significantly influenced, for example, by the introduction of exotic plants and animals. And an area that seems disturbed by structures such as tracks and power lines need not have suffered any significant biophysical damage. Coeterier (1996) therefore makes the important point that "how inhabitants perceive naturalness differs greatly from the ideas of biologists and other experts". He goes on to argue that "naturalness is not only or even primarily based on the presence of vegetation, but rather the way a landscape has grown organically, as a living organism. In this respect, old farms and sandy roads are seen as 'natural' too" (1996:27).

Furthermore, neither Patterson (1977), nor Kaplan (1985) found much correspondence between the ideas of experts concerning landscape qualities and the ideas of non-experts and Ingold and Kurttila (2000) point to the differences in perceptions of the environment between experts and local people. Shultis (1999) notes that there may be a distinction between the popular conception of wilderness embraced by the public and the political conception created by special interest groups, bureaucrats and politicians and which manifests in policy and legislation. Finally, Hendee *et al*. (1990:4), referring to the United States, draw a stark comparison and note that "at one extreme, wilderness can be defined in a narrow legal perspective as an area possessing qualities defined in Section 2(c) of the Wilderness Act of 1964. At the other extreme, it is whatever people think it is, potentially the entire universe, the terra incognita of people's minds". The point about all of this is that the definitions used by 'experts' may not be appropriate or applicable for 'non-experts', even if these non-experts are invited to be part of the research.

Four interesting studies that attempt to address these problems are worth noting here. Firstly, Fredrickson and Anderson (1999:22) point out that the preference scales frequently used to capture expressions of individuals' preferences for particular landscapes are "somewhat limited and unsophisticated with regard to capturing fully the more affective responses individuals have to particular landscapes". In their study, they asked participants to keep journals and make a running account of their wilderness experience over a number of days, but the intensive nature of the research meant that they had only a very small sample of participants.

Secondly, Coeterier (1996:29) describes the need to use a method which provides respondents with the opportunity to express their ideas and feelings about the landscape. He used semi structured interviews with photographs as prompts as a way of achieving this and describes how the interviews were structured around the 'why?' question, which was frequently asked of participants as they gave their views. This was to try and understand not only what landscapes people prefer, but what it is about them that they valued.

Thirdly, Habron (1996:46) states that his work is attempting to provide a perceptual definition of wilderness, considering how particular areas are interpreted and classified by different sub-cultural groups. He argues that using this approach is a way of assessing "the value people attach to the range of landscape elements" (1996:46). Habron describes the need to move beyond sole reliance on written questionnaire answers to assess wilderness and landscape features and he developed a method of defining the concept of wild land using a perceptual definition of wild land based on landscape features taken from photographs. While he asked respondents to rate the photographs in terms of wildness, beauty and naturalness, the definitions of these terms were left up to the participants.

Fourthly, Pheasant *et al*. (2006) asked respondents to rate still and recorded images for their perceived level of tranquillity, the sorting process for which was left to the individual respondents and the influence on tranquillity of natural and man-made sounds.

3.2.8 People and their Environment

What becomes clear from this is the importance of considering the subjective nature of the concepts being mapped, of assessing and understanding what makes up a tranquil experience, why people seek them out and what elements are required for an experience to be tranquil. A key area of research to draw on here is from environmental psychology. A vast body of research has looked at the impacts on people of being in different environments and the experiences they have in them - and have described how tranquillity can be found in natural places. For example, Mace *et al*. (1999:228) point to over 100 studies that have uncovered convincing evidence of the importance of the natural environment in facilitating recovery from stress and they highlight the research that points out that "the primary reasons for visiting natural environments include escape from the stress of urban areas and the attainment of tranquillity and solitude".

Indeed, as Morris (2003) points out, the benefits of viewing greenspace or other nature goes beyond aesthetic enjoyment to include enhance emotional well-being, reduced stress and, in certain situations, improved health. She goes on to describe that her review of the literature on health, well-being and open space suggests that there are five key ways in which exposure to the natural environment is beneficial to human health:

- Enhanced personal and social communication skills
- Increased physical health
- Enhanced mental and spiritual health
- Enhanced spiritual, sensory and aesthetic awareness
- Ability to assert personal control and increased sensitivity to one's own well-being

Theories from environmental psychology help to explain why this might be. Kaplan (2001:481) describes 'attention restoration theory' (ART). He goes on to describe the four features of ART that create a restorative environment (2001:482). These are:

1. 'Being away' – being distinct, either physically or conceptually, from the everyday environment
2. 'Fascination' – being in a place that hold one's attention effortlessly
3. 'Extent'– being in a place that has the scope and coherence that allow one to remain engaged
4. 'Compatibility' – everything in the environment fitting with and supporting what one wants or is inclined to do

It may be therefore that the restorative experience is enjoyed somewhere that is different to the everyday; and it is this difference, rather than the distance, that is the key factor. Kaplan and

Kaplan (1988) for example point out that the distinctiveness and separateness of the natural environment from the everyday may be as important as the literal distance. Hartig *et al.* (2001:593) build on this to argue that these four factors of ART are the "qualities of person-environment interactions: they do not exist in the environment or in the person in isolation" - it is therefore the experience of being in a place that is the important consideration here. Kaplan and Talbot (1983) go on to point out that all four factors are necessary for an environment to be restorative, a point reiterated by Hartig *et al.* in their earlier study (1991). They highlight the empirical research which "provides strong evidence that experiences in natural settings have restorative outcomes" (1991:21).

Research has built on this work to emphasise that tranquillity is an important part of the experience of being in a natural environment. As Herzog and Chernick (2000) describe, the settings which engage effortless attention, or fascination, allow directed attention to rest. They state that "the phrase 'soft fascination' was coined to refer to the combination of moderate fascination and aesthetic pleasure that characterises the most effective restorative environments" and that others (such as Herzog and Bosley, 1992) have used the term 'tranquillity' to refer to the same theoretical combination. Herzog and Barnes (1999) argue that the two components of tranquillity – aesthetic pleasure and moderate fascination – make it an essential feature of optimally restorative environments and from their study, Herzog and Chernick (2000) note that tranquillity was more prevalent in natural than in urban settings. Furthermore, sociological research has reached similar conclusions. Macnaghten and Urry found that the countryside was a used a space to escape to and provided much-needed relaxation from the pressures of work. They also noted that the "desire for tranquillity" was very much a part of this (2000:172).

Taking this a stage further, Kaplan and Kaplan (1988) focus on what nature does, for whom, under what circumstances. They show that vegetation and nature reinforce our spontaneous attention, allow our sensory apparatus to relax and infuse us with fresh energy. Other work has highlighted particular aspects of a natural environment that aid this and the factors of a landscape that are more or less preferred, such as that by Balling and Falk (1982); Purcell and Lamb (1984); Purcell (1987) and Jackson (2005). Fredrickson and Anderson (1999) highlighted the participants in their study who described the expansiveness of the landscape and an awareness of the sheer power of nature as contributing to a meaningful wilderness experience. Herzog and Bosley (1992) found that tranquillity had higher ratings in field and forest landscapes, large-waterscapes and misty-mountains categories of landscape and they suggest that the physical features of mistiness, unstructured openness and surface calmness (such as the smooth surface texture of a large waterscape) help account for assessments of tranquillity. Interestingly, Powe and Shaw (2003) carried out a study of visitors to the Northumberland National Park and asked visitors to select the top three reasons for their visit. Tranquillity was the most popular response.

3.2.9 From the NE to the National

Against this background, the 2004 Mapping Tranquillity work aimed to take the methodology and the underpinning definition of tranquillity substantially forward. In so doing it did not provide an update to the CPRE maps of 1995 as the methodology is not precisely comparable. However it significantly advanced an appreciation of what comprises tranquillity, what detracts from it and how to identify relatively tranquil areas within a given region. The emphasis of the work was to identify tranquillity on a relative scale rather than in more absolute terms. However, the shift from an absolute to a relative measure of tranquillity raised a series of conceptual issues around the identification and use of 'local' resources and a series of application issues around how the results were to be interpreted and used. To explain the background to this present project in the development of the approach to the national study and illustrate the importance of the responses to the PA consultation in the derivation of the questionnaire option choices, the following section is included which is an edited version of the Tranquillity Mapping Summary Report 2004 and the study in the Chilterns. The full findings from both these studies can be found in Appendix 8.

3.3 Tranquillity Mapping: The 2004 North East Pilot Study

The Tranquillity Mapping 2004 project was carried out in two study areas in North East England, the Northumberland National Park and the West Durham Coalfield in County Durham (Figure 3). The consultation work was conducted in both areas and the results collated so that the same factors were taken into account for both. Maps of relative tranquillity were then produced for both areas. The study areas were to a large degree determined before the start of the research through the inclusion of the Northumberland National Park Authority and Durham County Council as project commissioners.

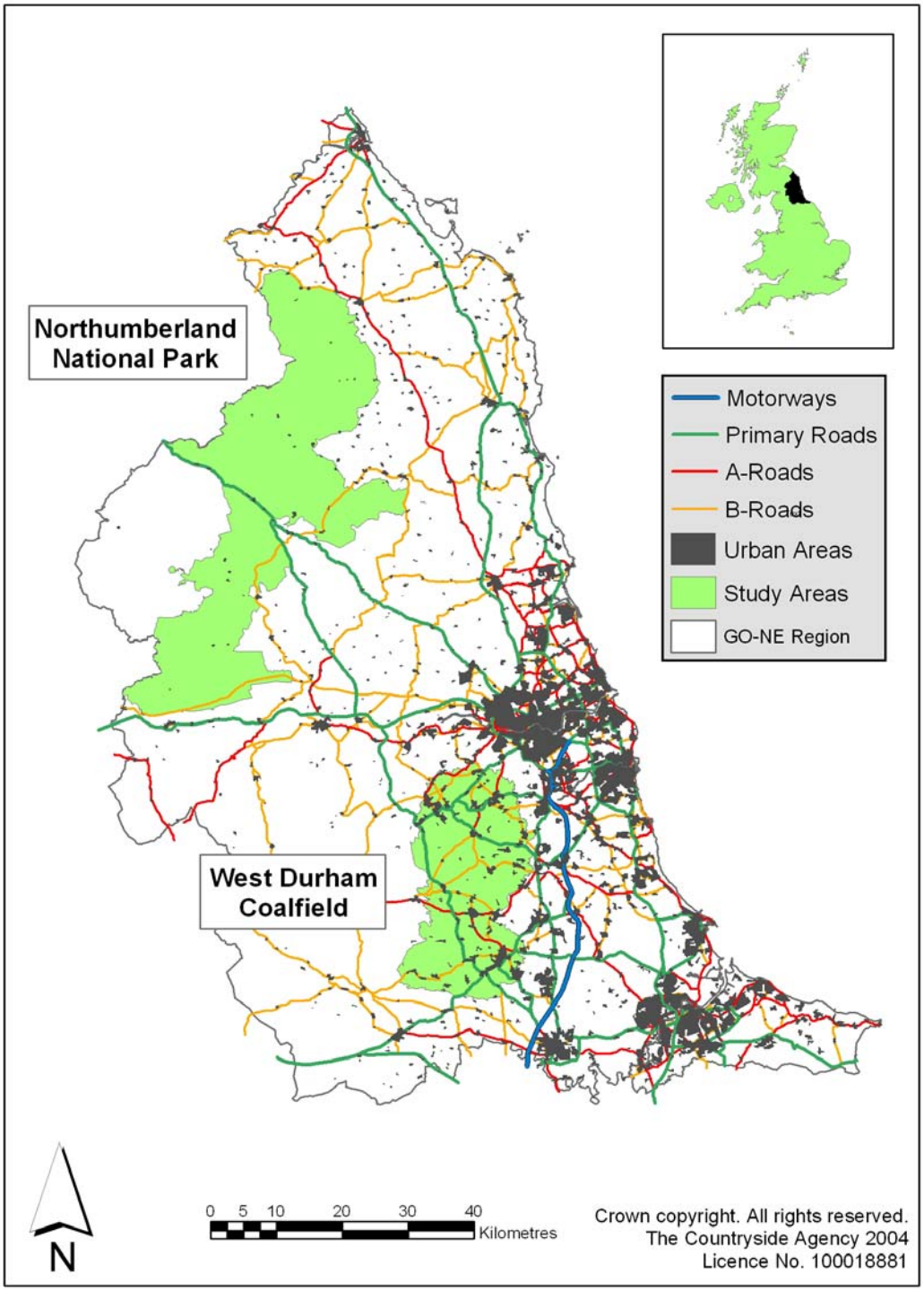


Figure 3: The North East Region - Northumberland National Park and the West Durham Coalfield

The Northumberland National Park is England and Wales' least visited national park and in recent years has been promoted as a place that offers solitude, wildness and high landscape quality. It is sparsely populated and not severely fragmented by transport corridors, although few areas are more than 5 km from any road. The Northumberland National Park broadly breaks down into the Cheviot Hills to the north, the Simonside Hills to the east, the Upper Tyne Valley leading up to Kielder Water and Forest in the west and the Hadrian's Wall World Heritage Site in the south. Extensive areas are managed by the Forestry Commission. One of the most historically contentious aspects of the national park is the dominance of the Ministry of Defence's Otterburn Training Area, located in its central reaches. There has been military training here for over 90 years, but recent developments to facilitate training using more sophisticated and powerful weapons, especially self-propelled artillery and rocket systems, have highlighted what is at times an uncomfortable relationship between the Ministry of Defence, the Northumberland National Park Authority, local residents and countryside users.

Whilst being much smaller in area than the national park, the West Durham Coalfield study area is far more densely populated, is dissected by numerous roads and a railway and exhibits some differing landscape character areas. Many of the settlements are of a significant population size, for instance Bishop Auckland (~25,000), Consett (~25,000) and Stanley (~29,000). Much of the area thus exhibits typical characteristics of an urban fringe environment, with intense levels of pressure on a limited space. It is a relatively deprived former coalfield area, although land reclamation has usually been to a high standard. Access to the countryside is generally good, with a dense network of rights of way and different types of woodland distributed through the area. To the east of the West Durham Coalfield the land falls away to the densely populated coastal plain and the City of Durham itself. To the west it rises quite sharply to the North Pennines and the density of population and related infrastructure declines.

3.3.1 The Participatory Consultation Exercise – 2004 Pilot Study

The Mapping Tranquillity 2004 project produced tranquillity maps based on an in-depth exploration of what tranquillity means to people, why it is considered to be important and where it is perceived to be found. This exploration was based around the use of 'participatory appraisal' (PA), an approach to consultation focused on exploring people's perceptions, values and beliefs and designed to allow participants to express these in their own words. In participatory appraisal non-directive questions are used to encourage people to discuss their attitudes in ways that do not impose external opinions on them. Participants are encouraged to think through and express what is important to them, in whatever way they want to. PA treats everyone who is consulted as an 'expert' in the situation – as people who 'know how things really are' – and allows their voices to be heard. It was noted, however, that PA is understood and applied in different ways by different practitioners and that the approach adopted during the 2004 study was that espoused by the Participatory Evaluation and Appraisal in Newcastle-upon-Tyne (PEANuT) project at Northumbria University. The main questions explored during the PA consultation were as follows:

- **What is 'tranquillity'?**
    - What makes an area 'tranquil'?
    - What does 'tranquillity' mean to you?
    - If an area were described as being 'tranquil', what features would it have?
    - Where are 'tranquil' areas you know of?
- **What factors cause 'tranquillity'?**
    - What makes an area more 'tranquil'?
    - What makes an area less 'tranquil'?
- **What impacts do 'tranquil' areas have?**
    - When you are in what you consider to be a 'tranquil' area, how do you feel?
- **What does a 'tranquil' area look like?**
- **Do places become more/less 'tranquil' over time? (**day/night, weeks, months, seasons, years…)

For each of these questions, a range of tools was identified as potentially being the most fruitful for generating discussion (Table 3). These are presented in the table below, in their preferred order of use within any session, along with the 'notes for facilitators' that were produced prior to the first PA session:

Question (theme)	Tool	Notes for facilitators
▪ What is 'tranquillity'?	Graffiti wall	- does whatever the participants want to do with it – maximises space for supporting details, either on the sheet or via post-its…
▪ What is 'tranquillity'? ▪ Where are 'tranquil' areas you know of and what makes them 'tranquil'? ▪ What does a 'tranquil' area look like?	Visual interpretation	-may be more appropriate/useful/user-friendly in some circumstances, though preference is probably for graffiti wall initially…and of course participants could visually represent 'tranquillity' using the graffiti wall.
▪ What is 'tranquillity'? ▪ Where are 'tranquil' areas you know of and what ▪ makes them 'tranquil'? ▪ What does a 'tranquil' area look like? ▪ Who uses 'tranquil' areas? ▪ What are barriers to using 'tranquil' areas?	Mapping	-'draw a map outlining where areas you consider to be 'tranquil' are (at whatever scale)' / 'Map 'tranquil' areas you know of' / 'on this map of X, please identify where tranquil areas you know of are'. Participants should then be asked to identify details regarding what makes these areas tranquil, who uses them, barriers to their use… Tool only to be used after first exploring perceptions of 'tranquillity' via Brainstorm (participant can then draw on this to help with mapping)
▪ What is 'tranquillity'? ▪ What factors cause 'tranquillity'?	Force field analysis	-positive and negative impacts on tranquillity and tranquil areas – size of connecting lines highlighting some form of ranking…
▪ What is 'tranquillity'? ▪ What factors cause 'tranquillity'? ▪ What impacts do 'tranquil' areas have?	Causal impact diagram	- causes and impacts of tranquillity – could be generic, or linked to specific places identified by the participant (with the diagram divided up accordingly)
▪ What is 'tranquillity'? ▪ How does respondent background affect perceptions of 'tranquillity'? ▪ How do perceptions of 'tranquillity' change over the life course? ▪ How do perceptions of 'tranquillity' differ between different respondents?	Timelines	Exploring how notions of tranquillity may vary over time (during the life course) and between respondents (and maybe their contexts)
▪ What is 'tranquillity'? ▪ Do places become more/less 'tranquil' over time? (day/night, weeks, months, seasons, years…)? ▪ How does seasonality affect perceptions of 'tranquillity'? ▪ How does respondent background affect perceptions of 'tranquillity'? ▪ How do perceptions of 'tranquillity' change over the life course? ▪ How do perceptions of 'tranquillity' differ between different respondents?	Yearly / seasonal / daily 'tranquillity' and activity charts	For areas predefined as 'tranquil', explore how their degree of tranquillity changes over time… For areas predefined as 'tranquil', when are they used and by whom?

Table 3: Summary of PA Tools employed in the Consultation – 2004 Pilot Study

In discussion with the GIS team, it was also noted that each entry made by a participant would also need to be 'interrogated' so as to maximise any potential linkage (and degree of detail) to available GIS datasets. For example:

- Nice views – 'what's in them?'
- Trees – type, movement, leaves, size…?
- Rivers – size, speed, features (rocks, waterfalls), fish…?
- Wildlife – types?

- Noise/peace – any noise at all, loudness, proximity…?
- Roads – visibility, noise, distance…

The study progressed with two different forms of PA session, distinguished here as 'field' and 'non-field'-based sessions. In general terms the field-based work involved users of the study areas accessed at suggested (by other participants and members of the steering group) outdoor locations within the two main project areas. These participants were unlikely to be aware of the project beforehand (although awareness clearly grew during the project timespan). The non-field-based sessions (involving participants with a 'professional' interest in the notion of tranquillity) were invited to a formal meeting/PA session.

3.3.1.1 Field-based Participation – 2004 Pilot Study

In sum, there were a total of 14 field-based PA sessions undertaken during the study period:

Date	Place	No. of Facilitators	No. of Teams	Team Sessions undertaken
11th April	Alwinton	6	1	1
11th April	Housesteads	6	2	2
29th April	Bamburgh am	4	1	1
29th April	Bamburgh pm	4	1	1
1st May	Gibside (2 sessions)	2	1	2
2nd May	Ingram Valley	2	1	1
2nd May	College Valley	2	1	1
4th May	Northumberland	2	1	1
31st May	Northumberland Show	5	1	2
2nd June	Causey Arch	5	1	1
2nd June	Hamsterley	5	1	1

Table 4: Field Based PA Sessions during the Consultation – 2004 Pilot Study

As noted in the above table, the first two sessions took place on the same day, at Alwinton and Housesteads in Northumberland National Park (Table 4). The project steering group had recommended these two locations, suggesting that the PA team base their work at the main car park in Alwinton, to catch users as they set off/returned to their vehicles and outside the visitor's centre at Housesteads (Hadrian's Wall) to question visitors as they passed through the centre (Figure 4).

Figure 4: Field-based consultation (Photographer: Michelle Allen) – 2004 Pilot Study

As these were the first two sessions undertaken by the team, they explored the use of the PA tools and the appropriateness of potential questions. Two graffiti walls were used at each of Alwinton and Housesteads, both asking the same question – 'what is tranquillity?' Two were used to ensure that as many users as possible were given the opportunity to participate. At Housesteads the second wall was used for younger participants. In both cases, they proved very successful in generating interest from potential participants. A spider diagram and a mapping tool were also used, but these proved less successful. This is unsurprising given the nature of the sites, with people passing through with limited time, as both these tools are more time intensive and demanding of participants than graffiti walls. Following these first two sessions and in recognition of the differences in success between some of the planned tools in the field locations (and contexts) being used, a considerably pared down series of questions and tools was identified for all of the subsequent field-based sessions – all subsequent sessions relied solely on the use of the graffiti wall. The questions and the way in which they were asked, became the most important distinguishing feature during these sessions. For all of the sessions, participants were asked what added to and detracted from tranquillity. In addition, participants were asked to identify a place that they considered tranquil. As expected some of the sessions were more successful, in terms of participant numbers, than others. In particular, the Causey Arch session within the Durham Coalfield did not have as great a number of potential participants as others.

3.3.1.2 Non-Field Based Participation – 2004 Pilot Study

Three non-field-based sessions took place:

Date	Place	Participants
21-April-04	Hexham	NNP Board Members – NNP Head Office
28-April-04	Newcastle	Project Steering Group – Countryside Agency Offices
30-April-04	Durham	Representatives from Durham County Council, DEFRA, North East Community Forests and North Pennines AONB

Table 5: Non-field based PA sessions during the consultation – 2004 Pilot Study

As a consequence of participants having some prior knowledge of the study (and its aims) in advance of these meetings and with a potentially longer time scale available for discussion, the sessions provided an opportunity to use a greater number of PA tools in greater depth. The general approach employed was as follows, listed in the order they were explored in the sessions:

Question (theme)	Tool	Notes
▪ What is tranquillity?	Graffiti wall	- Participants were asked to comment and discuss as the session started….
▪ What is tranquillity? Where are tranquil areas you know of and what makes them tranquil? ▪ What does a tranquil area look like?	Mapping/Visual interpretation	- Draw somewhere you consider to be tranquil. And add on Post-It notes: • What makes it tranquil? • What detracts from its tranquillity? - What would make it more tranquil?
▪ What is tranquillity? Where are tranquil areas you know of and what makes them tranquil? What does a tranquil area look like?	Mapping	- Identify tranquil places on map of NNP/WDC. Again with post-it notes: What makes it tranquil? What detracts from tranquillity?

Table 6: In-depth PA tools employed during the Consultation – 2004 Pilot Study

These sessions allowed for both individual and group based work. In addition and prior to the verification events, they presented an opportunity to rank answers using the bean voter, primarily to inform the report writing process. An unplanned tool was also trialled at the first two sessions which contributed to the ranking/writing up process. Consisting of a number of concentric circles equal to the number of responses, each participant was asked to move any response one step closer to the centre circle if it was felt to be important - the closer a response ended up to the central circle, the higher its perceived level of importance. The level of participation, both as groups and individuals was high and all sessions worked well, generating much discussion.

From the outset of the consultation period a reporting procedure was put in place to ensure that all responses made during the PA sessions were recorded as wholly and accurately as possible. During the PA sessions themselves, comments associated with any response were also noted by the PA facilitators and coded to allow them to be matched to their responses at a later stage. Codes consisted of an alphanumeric, letters representing the researcher and number recording consecutive participants. In addition, reporting sheets were developed for session facilitators to provide an overview of the session and to enable them to formalise their comment notes. Where necessary, a session overview was also produced which included appropriate information including, session details, its purpose, a description of tools used and any difficulties or successes encountered. In addition to information related to the questions/responses, additional data about respondents was obtained, where possible. This included:

- Gender – male or female.
- Age group - kept intentionally broad (<20, >20<30, >30<50, 50+) and developed as the process continued. Age categorisation should be considered and set prior to work starting
- Participants home location - essentially to give some indication of the distance travelled to the area and whether from urban or rural area.
- Mode of transport used in accessing the site - some of the locations were isolated and in order to ascertain some idea of accessibility participants were asked how they had reached the site.

The two verification events took place at:

- 21/22-June-04 University of Northumbria (Newcastle upon Tyne)
- 17-July-04 Durham County Show (Penshaw)

The two verification events were based on responses gathered during the previous field and non-field based sessions. All data was collated, in spreadsheet form, alongside any additional comments and/or demographic data. Prior to the verification event, these responses were coded using a hierarchy of themes from the general to the specific. Four levels of coding were used. At the most general level each response was linked to whether it was broadly related to ‘nature’ or ‘humans’. Below this (level 2) the responses were coded according to whether they were something ‘you see’, ‘you hear’, ‘doing’, ‘of the mind’, ‘do not see’, ‘do not hear’ and so on (loosely based on human senses, reflecting the positioning of humans at the centre of experiencing tranquillity). They were then coded again (level 3) according to more specific information (for example, as ‘activity’ or ‘landscape’) and finally, for level 4 (if necessary) a more specific scale again (for example, ‘walking’, or ‘river’). Following the coding, the spreadsheet was subdivided into the responses derived from the ‘positive’ questions (those that asked respondents to identify what tranquillity is) on the one hand and those derived from the ‘negative’ responses on the other. The project manager then went through each spreadsheet and transferred all the main themes and choice quotes onto flip chart paper, with these being presented at the venue within their relevant ‘sense’ category. In addition all named tranquil places were presented, as were any pictorial representations produced during the consultation period. This process produced over 70 sheets of flip chart.

Category	What is tranquillity?	What is not tranquillity?
You hear…	19	16
You do not hear…	20	
Of the mind…	59	

Doing…	38	
You see…	120	82
You do not see…	38	
Experiencing…	18	

Table 7: Number of Responses from PA Sessions – 2004 Pilot Study

At each event, the participants were asked to move around the room and look at the comments. In most cases they were accompanied by a PA facilitator, to allow him/her to explain any points if necessary and/or note any verbal comments. Participants were also asked to choose their top three responses within each sense category, according to their perceived level importance to tranquillity. The most important response was given a score of three sticky dots, the second most important two dots and the third a score of one dot. This particular system was chosen due to the large number of responses available overall and the potential difficulty participants would have faced in identifying three top issues from over 500 possible choices. Participants also had the opportunity to provide additional responses to the comments via post-it notes. Following the events, all the responses (dots or notes) were collated on a spreadsheet and sorted according to score. It should be noted that there were not an equal number of responses in each sense category. The number of responses in each category from which participants were asked to identify their top three choices are shown in Table 7.

In very general terms, this means there was a much lower probability of a response being chosen from some categories (such as 'you see') compared to others (such as 'you hear'). It also became clear that the extent to which participants had adhered to the instructions regarding allocations of dots (3-2-1) also varied.

3.3.2 Findings: What is tranquillity? - 2004 Pilot Study

As noted above, the full findings from this work can be found in Appendix 8.

Perceived links to 'nature' and 'natural' features

A large proportion and a wide range of the responses made during the research linked tranquillity to hearing, seeing and/or experiencing various aspects of perceived 'nature'. They noted the importance of 'being among nature' (which received strong support at verification) and amongst others:

'nothing, just nature'; 'natural countryside'; 'natural places'; 'close to nature'

These links to 'nature' had aural and visual aspects. Aurally, respondents noted the specific importance of 'natural sounds', which received the second highest verification score. Participants suggested that 'hearing wildlife' was important and 'wind though leaves' was also a popular response.

- **Landscape**

For many experiencing (particularly in visual terms) 'the landscape' (which was strongly supported at verification), a 'natural landscape', or elements of it, was a key idea, with a wide range of related aspects being suggested. Some respondents focused on general, or large scale features, suggesting 'beautiful scenery' and 'wild landscapes'. Others focused on elements of a 'rolling countryside' as being key to their perceptions of tranquillity and tranquil places, while some picked out a range of additional landscape 'types' or key characteristics, such as field, glades and moors. For others, the responses focused on smaller scaled features, such as 'beautiful flora and fauna'.

The importance of 'water' and related aspects was emphasised by many respondents. The 'sound of water, rivers, waves' was the highest ranked response at verification. 'The sea' was strongly supported at verification as something 'you hear' in a tranquil place *and* as something 'you see' in a tranquil place.

Many respondents focused on greenery (or other perceived 'natural' related colours) and noted the importance of 'natural colours' and 'plenty of greenery'. Linked to this, participants described the role of 'woodlands', 'deciduous trees not firs' and the 'movement of trees'.

Others focused on the importance of views, far horizons and open landscape. Respondents described the importance of space, remoteness and 'lots of space for people to spread out'. Within notions of 'landscape', some also respondents commented on more human-related aspects, suggesting tranquil places would be safe and well maintained.

The importance of wildlife

Aspects of 'wildlife' were perceived by many respondents to be very important to their notions of tranquillity, with 'the sight of wildlife behaving naturally (animal and plant)' receiving strong support at verification. Specific animals and birds were mentioned, as well as a general category of 'wildlife' and the ability to be close to it. In particular, people commented on the positive effects of 'hearing bird song'.

Peace, quiet and calm – tranquillity of the mind

Tranquillity was also considered to be extremely important by many respondents for a range of personal/internal reasons – many of which were well supported at verification. Responses emphasised that it was necessary to 'restore personal balance', 'to de-stress' and that tranquillity was a 'feeling of well being'.

Over and over again, people told us that tranquillity is about peace, calm and quietness, incorporating the notion of peace as an absence of noise and about being 'at peace'. As one respondent argued, 'it's a place where you feel at peace i.e. a 'feeling' rather than absolute peace'; another described it as a 'state of mind when in nice surroundings'. Others equated tranquillity with 'getting away from it all' (well-supported at verification), 'feeling like miles away from anywhere' and that tranquil places are 'areas you can visit to leave all your troubles behind - escape life's hustle and bustle'. The importance of 'solitude' in having a tranquil experience was also noted.

Doing things

Finally, many respondents identified particular activities that added to their experience of tranquillity. Of these, a particular focus emerged around 'walking' (widely supported at verification) – 'somewhere you have to walk to but when you get there, the rewards are tremendous' was how one respondent described it. A range of other activities was also suggested. 'Things I enjoy with friends and family', and 'enjoying the landscape' both received firm support during the verification process.

What is not *tranquillity?*

Whereas many of the responses to what is perceived to be tranquillity focused either on natural factors and characteristics, or the role of the mind, a large majority of the responses to the question 'what is *not* tranquillity' (and some responses to being asked what is) focused on the impact of humans in a variety of different forms.

At a general level, it was the mere presence of humans that detracted from tranquillity for many respondents, particularly 'too many' people. Certain types of behaviour and/or activities undertaken by people were considered as detracting from tranquillity, much of which revolved around the issue of unwanted noise and/or disturbance (both visual and aural). At verification 'mobile phones' was an extremely popular response, as were 'ghetto blasters/radios' and 'noisy people'. Participants commented on the negative impacts of people 'not respecting an area', such as 'drunken teenagers' and 'loutish behaviour'. These comments also included reference to rubbish and litter.

The negative impacts of various forms of transport and vehicles were commented upon by a number of respondents, with 'traffic' receiving strong support at verification as being something not

seen in a tranquil place. Car noise received support as something you do not hear in a tranquil place. Motorbikes, quad bikes, aeroplanes and military aircraft were also often mentioned.

A more general form of negative impact concerned various forms of 'development' in the landscape, particularly any that was perceived to be 'too commercialised' and 'industrial sounds'.

3.3.3 GIS – 2004 Pilot Study

The PA research gave a wealth of responses that facilitate development of the concept of tranquillity in terms of factors that contribute to and detract from it. This enabled our mapping of tranquillity to be based on widespread consultation, rather than a relatively narrow, 'expert'-based view. It ultimately provided information that could be grouped under the following headings:

- Whether tranquillity is important;
- Why tranquillity is important;
- What state of mind and experiences tranquillity is associated with;
- What activities tranquillity is most associated with;
- What visual things contribute to tranquillity;
- What visual things damage or detract from tranquillity;
- What noises contribute to tranquillity; and
- What noises damage or detract from tranquillity.

The consultation data was then linked with mapping techniques to produce tranquillity maps for the two study areas.

Positive factors Weight	Weight
Openness of the landscape	24%
Perceived naturalness of the landscape	30%
Rivers in the landscape	21%
Areas of low noise	20%
Visibility of the sea	6%
Total of positive factors	100%
Positive Scores as a percentage of the overall scores	44%

Table 8: Positive Scores – 2004 Pilot Study

Negative factors Weight	Weight
Presence of other people	60%
Visibility of roads	12%
General signs of overt human impact	10%
Visibility of urban development	8%
Road, train and urban area noise	7%
Night time light pollution	3%
Aircraft noise	1.5%
Military training noise	<1%
Total of negative factors	100%
Negative Scores as a percentage of the overall scores	56%

Table 9: Negative Scores – 2004 Pilot Study

The two tables (Table 8, Table 9) above summarise the PA information as used to inform the GIS model. There has been some aggregation of the categories for the sake of clarity in this summary report; please consult the 2004 report for the full description. In essence, the positive and negative factors – things that add to or detract from tranquillity – were separated. The weight percentages describe the relative significance of the PA responses for each factor when compared to the other positive or negative factors with which it is grouped. The weights within the positive and negative factors therefore each total 100%. The bottom rows of the two tables indicate the relative balance of all the positive and negative datasets when they are combined. The proportion of the total responses that were positive and negative was 44% and 56% respectively. One way of simplifying this is to say that people appear to be slightly more aware of, or concerned about, the factors that damage the experience of tranquillity rather than the factors that create tranquillity. These data were then organised around three categories. These categories were directly developed from the PA data and were envisaged as useful conceptual categories for the various elements from the data. The categories, ranked in terms of their significance, are:

- People and tranquillity;
- Landscape and tranquillity; and
- Noise and tranquillity.

Geographical Information System (GIS) was used to derive maps from the PA data. This is a computer-based system for the integration, analysis and mapping of geographically referenced datasets. All the relevant information is fed into the GIS to produce a 'model': a method of 'representing a complex state of affairs by reducing it to something simpler which embodies as many as possible of what the modeller sees as its most important characteristics'. All GIS models are driven by the data sets that are applied, the operations that are performed on them and the parameters that are set for those operations. In this research, decisions about what these 'important characteristics' are has been determined, as far as possible, by the PA and not by us as 'modellers'. The PA data were very varied and extremely qualitative and this necessarily meant that we had to make some judgements about how to group and categorise responses, in order for them to inform the mapping process. Our response to the need to decide how best to 'operationalise' the data was transparent – setting out exactly what was done, thereby permitting a debate about the methods that we adopted and the decisions that were taken. This is again in contrast to previous work that has been 'expert' driven. The processes of our research was readily transparent and no assumptions were made that all the questions would be answered.

Our decisions about how to interpret the data and apply them to the GIS model were based on consultation with the project steering group and published best practice.

The linkage between the PA results and the GIS model was twofold.

1. The PA results identified what issues were important to people and these issues were then associated with nationally available datasets such as land cover (vegetation), terrain, urban areas and other human infrastructure to represent the different dimensions of tranquillity.
2. The PA results identified the relative significance of these issues. This allowed the datasets to be differentially weighted in the analysis, which then enabled us to draw maps of relative tranquillity. 'Expert' decisions about what to include and what relative weightings to allocate were kept to an absolute minimum. The results of the PA work were used to define the parameters of the model wherever possible.

3.3.3.1 The Framework for Mapping – 2004 Pilot Study

To be able to map tranquillity, a geographical framework was required. For the GIS model, this was a grid made up of a large number of cells, or squares, each of which measured 250 metres by 250 metres. All calculations relating to people, landscape and noise were carried out for each one of these squares, to assess the relative tranquillity within each of them. The next stage of the work was to link the results to datasets that could be used in the model. This is elaborated in the main report, but in summary GIS techniques were used to model the variables as follows.

People: in the consultation 'people' were associated with many kinds of behaviours (e.g. loud noise, litter, barking dogs and noisy children) and in some cases the very presence of any people detracted from tranquillity. A modelling approach that identified the relative likelihood of people being in a given square was used to calculate scores that are essentially a measure of remoteness from other people.

Landscape: things that could be seen (both attractive and unattractive) from and within each individual square in each of the study areas, were identified. Thus the relative amount of visual exposure to sights both positive (for example rivers, wide open views, the sea or broadleaved woodland) and negative (for example pylons, industry, or light pollution) were combined with expert based weightings of perceived naturalness of each individual square and the presence of rivers to score each individual square.

Noise: maps of noise are limited to local and very detailed studies so GIS techniques were used to model the attenuation (dissipation) of noise away from sources such as roads, urban areas, railways and military training areas on a regional scale. For each 250 m x 250 m grid square the maximum noise at any time and time-averaged noise exposure was estimated. This was done to take into account the effect of intermittent but very loud noise and low but constant 'background' noise on the experience of tranquillity.

'Other' responses: Some of the responses from the PA results did not readily fit into our three categories concerning people, landscape and noise. The categories do not, in themselves, deal with the range of feelings people have about tranquillity or the importance they attach to it. The previous tranquillity mapping work was criticised for not taking such values – that are not directly mappable – into account. In our research, the responses that we received establish the importance of the concept of tranquillity and the use of PA techniques means that information about people's perceptions of tranquillity can be presented alongside the maps.

Moreover, while tranquillity may be a deeply personal and complex experience, there are clearly types of places where it is more likely to be experienced. Our maps show places where the probability of being in the right 'state of mind' to have a tranquil experience is maximised.

3.3.3.2 Remoteness from People – 2004 Pilot Study

Ultimately, people and their activities are the source of almost all the factors that detract from tranquillity, or the potential to achieve tranquillity.

The term 'remoteness' is not one that was heavily used by respondents in the PA session but, what they did say was that other people – and the things they do and are associated with – detract from tranquillity and that an absence of others added to tranquillity. Some of the responses did not lend themselves to being related to specific data sets that could be used in the model. For example, respondents stated that rubbish, 'ghetto blasters', people on mobile phones, dog dirt, plastic bags and vandalism all detracted from tranquillity. It was judged that what these responses had in common was that the perceived nuisance was likely to increase with the number of people in view, earshot and proximity. While this is an assumption and will not capture the specific nature of all of the responses, it was calculated the probability of seeing, hearing, or being in close proximity to other people in different parts of the study areas as a measure of how 'other people and the things they do' detract from tranquillity.

Working from the assumption that people-related nuisance declines with a reduction in the concentration of people, the model was designed to calculate the probability of people being present in any part of the study area. The results are therefore expressed as a graded level of likelihood of being close to other people. They also excluded people working on the land, consistent with the PA results.

To calculate the probability of people being present, two elements of data are required.

1. The 'source' from which the diffusion of people is to start; for example, a car park in the national park. This may be a concentrated source of people, who will then spread out in different directions. The following were defined as 'sources' of people:
    a. Urban areas;
    b. Buildings outside of urban areas;
    c. Roads; and
    d. 'Honeypot' sites, comprising: car parks; caravan and camping sites, picnic sites and visitor centres.
2. The relative 'friction' of the landscape over which the movement of people is to be calculated. Friction refers to the ease of travel. For example, private, enclosed land was allocated a high frictional value in the model. Open access areas and linear countryside routes were allocated lower levels. Areas of woodland, even where access through forest rides is facilitated, were allocated a relatively high frictional value to represent the relatively high ability for woodlands to visually and orally 'absorb' visitors, compared to open countryside.

To model the effect of these two factors, every square with a 'source' of people in it was identified and the 'friction' of leaving it and travelling in other directions away from 'honey pot' sites was calculated.

Each of the sources listed above has a different likelihood of distributing people into the countryside. For example, a large urban town is likely to distribute more people than a car park in a remote rural area. The sources of people were weighted differently, making judgements about the relative significance of these different sources and drawing on data such as the Office for National Statistics' population figures for different urban areas in order to do so. These judgements can be debated and refined and possibly improved by actual observation. However, this was outside the remit of this particular study.

The outcome of our 'remoteness from people' model was to assign each 250m x 250m square one of six different levels of probability for a visitor encountering other people, ranging from most to least likely.

3.3.3.3 Landscape and Tranquillity – 2004 Pilot Study

Landscape is a broad term, used here to capture a range of visual factors that were judged to have either a positive or a negative effect on the experience of tranquillity. The PA results under this heading were highly diverse. The overall category was broken down into a number of factors and associated with a series of datasets which were then used to structure this component of the GIS model.

There was a wide range of responses in the PA results. People talked about 'greenery', 'babbling brooks' and 'lots of trees' as adding to tranquillity and 'over management', 'pylons' and 'high rise buildings' as detracting from it. From the responses we were able to define several key characteristics:

- The perceived naturalness of the landscape within each square, or the visitor's immediate surroundings (modelled using the type of land cover in each adjacent square);
- The presence and visibility of rivers (those squares that contained or had a view of a river were weighted higher than those that did not);
- The presence and visibility of woodland, both coniferous (negative) and broadleaved/mixed species (positive);
- Few overt signs of human interference (the relative visibility of features perceived as relatively natural or unnatural from each of the grid squares);
- Openness of the landscape: the ability to see 'the long view' (the relative visibility of all squares out to a limit of 35 km from each of the grid squares); and
- Light pollution (modelled overhead skyglow, as distinct from skyglow at the horizon).

We incorporated these responses to landscape in our mapping as follows.

3.3.3.4 Mapping Land Cover – 2004 Pilot Study

The Landcover Survey 2000 dataset from the Centre for Ecology and Hydrology divides the whole of England's surface into small squares and assigns each of these to one of 27 different categories of land cover. Each of these land cover types was given a score for perceived naturalness from 1 to 6. The scoring system was based on the PA data, but because a direct quantitative basis for scoring was not available from the PA results a system was devised by referring to the literature and using our professional judgement in contrast to this study which devises a system let by public consultation. Broad-leaved woodland and bog were judged to have the highest level of perceived naturalness, which then descended through grassland, improved pasture, arable land and coniferous forest to urbanised areas. We gave higher scores to the land cover types perceived to be more natural and lower scores to those perceived to be less natural.

What is in a square is important, but so are the squares around it. We therefore took account of the relative naturalness of the surrounding landscape as well. The score for each of the eight squares surrounding every square was also calculated. This highlights larger areas within the landscape with similar scores of perceived naturalness (both high and low).

3.3.3.5 Mapping Visibility of Negative Features – 2004 Pilot Study

The PA results highlighted that the visibility of perceived non-natural features in the landscape detracted from tranquillity. The non-natural features identified in the PA were:

- Roads: motorways, primary roads, A roads, B roads and minor roads
- Railways
- Urban areas
- Isolated properties
- Caravan parks
- Quarries
- Vertical structures such as pylons
- and telecommunications masts
- Windfarms

The visibility of each of these features within the landscape was calculated for each individual square using a digital terrain model of the north of England.

The key variables were:

- The terrain model itself, which determined intervisibility between points;
- Subject height – the height of the object being observed (e.g. 45 m for power pylons);
- Viewing height – the height of the person observing – an average of 1.85 m is used for this;
- The distance limit beyond which visibility is no longer calculated, termed the Zone of Theoretical Visibility (ZTV), which is different for objects of different height (for instance the ZTV for 45 m tall power pylons is 15 km and it is 6 km for railways); and
- A distance-related scoring system which means that an object which could be seen and was close was considered as more significant than the same object at a greater distance.

3.3.3.6 Mapping Presence and Visibility of Rivers and the Sea – 2004 Pilot Study

Water emerged from the PA results as being a significant landscape element associated very positively with tranquillity. This encompassed being able to see and hear rivers, doing things near them such as walking or picnicking and the ability to see the sea, whether over a long distance or in closer proximity. To account for hearing flowing water and activities near rivers and streams, all squares containing a river or stream were allocated a positive score. To represent the visibility of rivers, a distance weighted calculation allocated higher scores to squares which were close to rivers and from which rivers could be seen. To represent visibility of the North Sea, a distance weighted calculation allocated higher scores to squares which were close to the sea and from which the sea could be seen.

3.3.3.7 Modelling Openness – 2004 Pilot Study

Our PA survey found that the openness of the landscape and environmental characteristics that were judged to be captured by this term, were strongly associated with the experience of tranquillity. Respondents talked about rolling countryside, lots of space and distant mountains. We classified these responses as being related to openness. But of course this is a double-edged characteristic; the ability to view a wide area is more likely, all other things being equal, to include views of features such as roads, urban areas and power lines, which detract from tranquillity.

Technically, the foundations of modelling openness are very similar to those described in the previous section, relating to the visibility of specific features. Openness is calculated in essentially the same way but instead of the question being 'How many relatively non-natural features can be seen from this square?', the question is 'How many other grid squares can be seen from this one?'. This process was applied for each grid square within the study areas. The result gives a measure to each individual grid square of how much land can be seen from it, equating to openness of the landscape it is set in.

3.3.3.8 Modelling Skyglow – 2004 Pilot Study

Large quantities of artificial light spilt upwards and sideways from the ground are reflected off tiny particles of dust and water droplets, causing the sky over and around urban areas to glow at night. Across large areas of the UK this skyglow is strong enough to obscure the great majority of stars otherwise visible to the naked eye.

CPRE has published a report on the problem including simple light pollution maps based on satellite data, but existing methodological research on quantifying overhead skyglow is limited. Albers and Duriscoe (2001) quantitatively define skyglow as a function of distance from urban areas and size of urban area. The research underpinning this is drawn from the USA where cities are much larger and the population density of rural areas is generally far lower than in the UK. No account is taken of sparsely distributed light sources because skyglow results from the cumulative effects of major concentrations of light sources. Seeing isolated lights or concentrations of lights in the distance may detract from people's experience of otherwise tranquil areas, but only overhead skyglow was considered in this report. This type of light pollution emerged from the PA data as being of limited significance as a factor detracting from the tranquillity of landscape.

3.3.3.9 Modelling the Impact of Noise – 2004 Pilot Study

Tranquillity is… 'silence so that you can hear natural sounds'. This quote from one of the PA sessions came to represent one of the variables that people most valued when they identified a tranquil area: not necessarily absolute silence but something different from the urban experience, somewhere with an opportunity to hear non-human sounds that would be drowned out, or unavailable, where most people spend most of their lives.

Noise as a term is used to define unwanted sound and as such it depends upon human perception. The selection of what sounds constitute noise was made on the basis of the PA data. From this, the noise sources that were identified as being most significant in detracting from tranquillity were:

- Road noise;
- Aircraft noise;
- Urban noise;
- Military training; and
- Other human associated noise such as explosions or railways.

After identifying these key sources from the PA data, the noise levels at source were identified from a wide review of the literature. For example, at source, traffic on A roads measures on average 70 (dB) and explosions 180 (dB).

However, noise is not simply about the level at source but the diffusion of that noise over a distance. Noise diffusion, or the rate of attenuation away from its source, is a complex function of several variables, many of which are not constant. One important consideration is whether sound

can travel in a straight line from the noise source to the person hearing it rather than having to go over an obstacle such as a hill. Accounting for this in a GIS model is relatively straightforward. However, accounting for the effect of wind on noise attenuation, for example, is extremely complex.

No model, however carefully constructed, finely grained or tightly calibrated can hope to accommodate the full range of acoustic, atmospheric, environmental and human variables.

What was done took take account of the significant variables that affect noise attenuation from the range of sources that were identified as important in the PA research. Following the accepted procedures in the literature, our model has taken account of attenuation of noise resulting from:

- Geometrical divergence over distance;
- Air absorption;
- Absorption by the ground; and
- Other effects including reflection from surfaces, foliage and buildings.

The formulae in the literature were applied modelling how noise diffuses under different conditions of terrain, weather and vegetation, to determine the level of noise that could be expected in each of the grid squares. This took into account the noise sources within each square and the noises that could be heard from surrounding squares. These calculations gave us the maximum potential decibel level that might be experienced in each square. Differentiation between these maximum levels of noise and cumulative exposure to noise over time was carried out, or 'time-weighted noise exposure'. For instance, artillery firing is extremely loud, but when taken over a period of a year, relatively infrequent. A busy road by contrast is much less noisy in absolute volume terms, but exposure to that noise level is constant for those within earshot through all of the day and much of the night. The methodology needed to deal with both the absolute loudness of a relevant source of noise and how much of the time it was being heard.

Furthermore, any attempt to produce a single, composite map of relative tranquillity ought to take into account that the overall noise 'picture' will change as time passes – at weekends there are more motorbikes in the Northumberland National Park but usually no artillery firing, whilst late at night the West Durham Coalfield is quieter because there is much less road traffic. Therefore, to take account of time-weighted noise exposure, we made calculations on the basis of the temporal regularity of each noise source – the percentage of time when each noise can be heard between 7 am and 7 pm. A noise that was constant between these times would therefore have a 100% regularity rating. In this study, we drew on the existing data to determine that main roads generate noise 90% of the time, while for military explosions, this is less than 2%. These calculations therefore take account of both the level of a noise and the likelihood of a person hearing it at any one time.

It was judged that the time-weighted exposure to noise map to be a better reflection of the impact of noise on the experience of tranquillity than the maximum noise map.

Aircraft noise was a relatively minor element of the GIS model, reflecting its fairly low ranking in the PA results. However, it was not possible to differentiate between different parts of the study areas on the basis of the relative intensity of overflights. Commercial aircraft tend to be restricted to high altitude flight over the Northumberland National Park and West Durham Coalfield and as such their noise contribution is low volume and diffuse over a wide area, although low-flying private aircraft, glider towing aircraft, helicopters and microlites are present and subject to some local concentrations. Low-flying military aircraft cause a much louder 'burst' or 'spike' of noise. Although the Ministry of Defence and Defence Estates cooperated with this study, no geographically disaggregated data on military low-flying was available, in contrast to ground-based training at Otterburn which was set out in some detail.

3.3.3.10 Putting it all Together – 2004 Pilot Study

So far, the modelling of the three different themes that arose from the PA data has been described – remoteness from people, landscapes and noise. To produce overall maps of relative tranquillity, these were combined. There were five stages in putting together the final, appropriately weighted GIS model:

- The PA data were associated with a specific map-based dataset where possible, for example, visibility of roads or low noise areas;
- The input datasets were classified as being either positive or negative – contributing to or detracting from the experience of tranquillity. For example, the ability to see the sea was positive and the ability to hear constant traffic noise was negative;
- All of the input datasets were classified and weighted to establish their relative significance. For example, remoteness from people was far more quantitatively significant in the model than overhead light pollution;
- These positive and negative weighted component datasets were then added together to give total scores. There were two total scores, one positive, one negative for the positive and negative components for each 250 m x 250 m grid square; and
- The resulting positive and negative layers were then combined for each grid square, but they were first weighted (total positive x 0.44, total negative x 0.56) in accordance with the relative significance of positive and negative factors from the PA data.

3.3.4 Results – 2004 Pilot Study

The methodology produces a spectrum of more or less tranquil areas, rather than identifying absolutely 'tranquil areas'. One of the findings was that people value tranquillity and tranquil places because of their experience of being in places that are not tranquil for much of their lives. Respondents told us that perceptions of tranquillity and tolerance levels depend on what they are used to and that it is a relative concept. Drawing a line on a map and stating that the area inside is tranquil and the area outside is not, is not justified on the basis of the Participatory Appraisal findings; indeed, most people would readily understand that such a line would not reflect their experiences of tranquillity. It also fails to reflect the fact that many environmental qualities, such as tranquillity, vary in time as well as space and do not exist within neatly defined and geographically limited areas.

The term 'relative tranquillity' is described more fully in section 5.4.2 . The tranquillity at any one locality (or grid square measuring 250 m by 250 m) is given by its score on a tranquillity scale or spectrum. Our method does not provide a quantified 'answer' to the question of what is tranquillity, but provides a basis for identifying the relatively most and least tranquil areas of a defined study area. Relatively tranquil areas are those where the physical and experiential characteristics of the landscape are more likely to provide countryside users with the space and conditions to relax, achieve mental balance and a sense of distance from stress. Relatively tranquil areas are characterised by a low density of people, minimal levels of artificial noise and a landscape that is perceived as relatively natural, with few overt signs of human influence.

The original maps for CPRE/Countryside Commission were produced at a more crude spatial scale than this study and they tended to eliminate local effects. One consequence of this can be to 'overlook' small areas which have a relatively tranquil character, even though their surroundings prevent them attaining higher tranquillity scores. Our approach therefore has both regional and local applications, identifying areas which have the relatively greatest or least amount of this particular environmental resource within that specific context.

3.3.5 Discussion – 2004 Pilot Study

3.3.5.1 Reflections on Levett's Critique – 2004 Pilot Study

It is appropriate to reflect back on Levett's (2000) critique of previous approaches to Tranquillity Mapping and gauge the level of progress of the 2004 research.

In summary, Levett (2000) argued that the limitations are as follows. The degree to which the 2004 project addressed these shortcomings is noted.

a. *the mapping uses a single threshold rather than a variation of levels of disturbance from distance from a source*. This project addressed this in full but utilising a continuum of relative degrees of tranquillity rather than a sharply bounded or binary set of high/medium/low or tranquil/non-tranquil areas.
b. *the mapping does not take account of varying conditions, notably topography, vegetation and prevailing weather*. Topography and vegetation are explicitly considered in some of the variables modelled. Weather is relevant to many people's experience of tranquillity and the PA results are evidence of this. However considering weather in a spatial sense would be highly complex and variables such as visibility in different weather conditions were simplified through the assumption of high levels of atmospheric visibility
c. *there is insufficient consideration of factors that may/may not occur on maps or where maps provide insufficient information to estimate effects*. This is a very significant issue and one where the use of PA techniques permits information about people's perception of tranquillity to be presented alongside the maps of tranquillity. Levett is entirely correct that many indicators are too complex to model spatially or are essentially non spatial, but this does not mean that they should be sidelined or overlooked.
d. *there is a lack of detailed discussion of data sources and their limitations*. The report aimed to be as full and transparent as possible in relation to both data and the processes that were carried out.
e. *the mapping does not take account of cumulative effects*. Accumulation of visible, noise and people-related nuisance was included in the study.
f. *there is limited consideration of intermittent and variable sources of disturbance*. This is a very complex area and reconciling variable levels of nuisance with a single composite map would require a set of additional scoring and weighting which there was no PA data to directly support. However, this or an alternative approach which is to produce a set of separate maps for different scenarios (e.g. night time, weekend of winter) is possible through development of this methodology.
g. *no account is taken of interactions between factors and how they may affect the perception of tranquillity*. The use of PA results to underpin the GIS model means that the model was structured to represent held perceptions of tranquillity. The relative significance of factors is thus accommodated. However the interaction between factors is a step beyond this and testing people's responses to interacting factors such as a certain landscape with or without people, quarry blasting noise and a chilly North wind would require a different approach.
h. *the selection of sources of disturbance seems to have been based solely on expert judgement, with little discussion or explanation*. No empirical evidence is presented that they represent either the most significant factors or a sufficient set of sources to be (reasonably) comprehensive or representative. Basing the model not on expert judgements but on more widely held perceptions of tranquillity was a key point of principle and practice in this project.

These factors were confirmed and developed in the national study.

3.3.5.2 Defining and Weighting the Variables – 2004 Pilot Study

As briefly mentioned in response to Levett's critique and as elaborated elsewhere this approach to the methodology is rooted in non-expert judgements about the nature of tranquillity. However, just as previous researchers have made judgements about distance thresholds (for instance Rendell's definition of areas > 4km from the largest power stations and > 1km from medium disturbance roads) we have had to make a series of judgements for instance about what datasets may be represent specific variables or the scale over which to reclassify data ranges. This is unavoidable in a GIS model that is based on survey data as distinct from a GIS that is on-line and available for people to interact with directly (Kingston, 2002), although even then the system designer has made a series of choices about how and between what, the system user will make their choices. The emphasis must be on transparency.

3.3.5.3 Tranquillity, Local Areas and Local People – 2004 Pilot Study

Tranquillity as a resource has a complicated relationship with people. It is a quality of local environments that has the potential to contribute to people's quality of life. It is an experiential aspect of landscape that is interpreted and valued by individuals. However, too many people and other human imprints on the landscape have a significant effect in detracting from that experiential quality. As a consequence of this it follows that more highly developed, urbanised, intensively managed and densely populated landscapes are, all other things being equal, less likely to have that experiential quality.

Rendell's work was done at a more crude spatial scale than this study. The approach tended, as has been discussed in the literature review, to eliminate local effects. One consequence of this however can be to 'overlook' small areas which have a relatively tranquil character, even through they are set in a context which militates against the attainment of higher tranquillity scores.

3.3.5.4 Tranquillity Maps – 2004 Pilot Study

The ideas of the potential application of maps have already been introduced as:

- a campaigning tool
- a regional image / promotional tool
- a map on the wall
- a series of unpacked component maps which identify things that can be planned and managed to improve the situation as distinct from things that cannot
- an environmental assessment application

Maps have a clear value in campaigning, having the potential to be visually impressive, attractive and attention-grabbing and to communicate a great deal of information through a graphical medium. However, maps are the end product of a process. Critically the 2004 research developed a process for tranquillity assessment and mapping and, although the maps are in no way incidental to the project, any application of the process must be careful and rigorous, or the map product could be erroneous, misleading or simply unimpressive. The maps from the 2004 project are more visually impressive that the ASH consulting maps of the 1990s, but the main progress has been with the process. That said, where the process was sound, robust and applied for the right reasons, the maps could have real significance as an informational and promotional tool. Underpinning planning applications are decisions about whether concentration of negative effects or their diffusion over space is most desirable. This is a social judgement and the application of an approach such as this in an environmental assessment mode could at present identify the relatively most and least, tranquil areas on a spectrum for a defined study area. However, many decisions require more information than this and typically a planner or a planning inspector may want to know about the tranquillity of a given area when compared with other areas and indeed on a national scale. This is discussed in Section B, Mapping Tranquillity, 2006 National Study.

3.3.5.5 Benefits of the 2004 Approach – 2004 Pilot Study

This research was commissioned to take forward previous work in Tranquillity Mapping and develop a methodology that was sufficiently robust that its results (tranquillity maps) would have credibility among relevant practitioners. The methodology should also be usable in an environmental assessment mode and as a planning tool to allow planners and developers to assess the impacts of proposed developments (visual, noise and perception related) on areas that are judged to be tranquil and worth protecting for that reason.

3.4 Mapping Tranquillity, 2004 Chilterns Study

Following the NE work and underpinned by a conviction that, in essence, 'geography matters' with regards to perceptions of tranquillity, the project team were fortunate in being able to extend the investigation of understanding of tranquillity beyond the initial project area.

This was for three main reasons:

- to investigate the general 'transferability' of the consultation approach;
- to allow for any further methodological developments that emanated form the northeast work to be explored
- in exploring how people experience and value tranquillity in the countryside in a second area of Britain, to provide a firm basis for the examination of similarities or differences in perceptions of 'tranquillity' across space (and, in particular, across different 'types' of landscape in Britain).

The Chilterns work therefore represents a further important development point in the approach adopted for the national study.

3.4.1 Study Area - 2004 Chilterns Study

The Chilterns AONB (one of 40 AONBs across England and Wales) web-site notes that despite lying relatively close to the north-west extremities of London it is, 'an unspoilt area of rolling chalk hills, magnificent beech woods, quiet valleys and charming brick and flint villages. A wonderful mosaic of woods, fields, hedges, sunken lanes and clear streams' (Figure 5).

Figure 5: Map showing the Chilterns AONB (source: http//www.chilternsaonb.org)

The web-site continues: 'The gently rolling hills are swathed in beech woodland and chalk downlands, providing a haven for wildlife. Wildflowers found on the downland in summer include abundant orchids and the rare Chilterns gentian. In the southern Chilterns the spectacular red kite, a reintroduced bird of prey, is very visible for most of the year. In the valleys attractive villages with their traditional brick and flint cottages nestle around medieval churches. Prehistoric trackways such as the Ridgeway and the Iron Age hill forts scattered along the Hills give a sense of the ancient history of the Chilterns. Today, the area continues to provide a living for farmers and foresters and is home to 100,000 people'.

3.4.2 The Participatory Consultation Exercise - 2004 Chilterns Study

As with the northeast work the consultation exercise drew upon the expertise of actual users of the Chilterns AONB (alongside the various stakeholders who attended the AONB Planning conference) and the approach used was virtually identical aside from one important difference during the 'verification' stage.

The study subsequently progressed with two different forms of PA session, distinguished here as 'field' and 'non-field'-based sessions. In general terms the field-based work involved users of the study areas accessed at suggested (by other participants and members of the steering group) outdoor locations within the two main project areas. It was important that similar, if not the same questions were asked during the Chilterns work as had been used during the consultations in the northeast (or at least that no new, or radically different questions were introduced). As such, the facilitators focused discussion around features and/or factors that make an area more or less 'tranquil', general perceptions of 'tranquillity', perceived meanings of 'tranquillity', what a 'tranquil' area looks like and the impacts of perceived 'tranquil' areas.

For each of these questions, a range of tools was identified as potentially being the most fruitful for generating discussion. As with the north east work these included 'graffiti walls', mapping tools and various forms of pictorial representation. In sum, there were a total of 14 field-based PA sessions undertaken during the study period and one non-field-based session, which took place at the Chilterns AONB Planning conference held on the 22nd September 2004.

From the outset of the consultation period a reporting procedure was put in place to ensure that all responses made during the PA sessions were recorded as wholly and accurately as possible and which mirrored that used in the northeast work. However, a key difference in approach was employed at verification.

For the Chilterns verification, rather than one person 'theming' all the responses made during the PA sessions (cutting stuff out, deciding what is 'interesting' etc) prior to verification, only repeat responses were removed (with, for example, six 'peace and quiets' becoming one, whilst 'peace and quiet' and 'peace' were both included). One obvious result of this approach was that a lot of information (with some very marginal differences between the responses) was presented at verification (and hence for people to look at and choose between). However, the argument could be made that the original PA session respondents had chosen to express their responses in their own ways and at least in this way of working we are seen to respect that and recognise that very subtle differences can be very important. This wealth of data effectively meant that the verification event had to run in a slightly different way too - most of those attending were not going to Ashridge to go to the verification and the team estimated it would take about 45 minutes to go through the 350+ sheets of A4....!

Due to the large number of responses each participant was greeted and presented with a list of the main sub-themes ('you see', 'you hear' and so on) and allowed to choose one of these to use their votes on. As a result, conclusions could now be drawn from what sub-theme they chose and after that, where their dots went. The number of responses in each category from which participants were asked to identify their top three choices was as follows (Table 10):

Category	What is tranquillity?	What is not tranquillity?

You hear…	39	132
You do not hear…	14	
Of the mind…	299	21
Doing…	97	11
You see…	361	272
You do not see…	115	
Experiencing…	51	8

Table 10: Number of Responses from PA Sessions - 2004 Chilterns Study

In very general terms, this means there was a much lower probability of a response being chosen from some categories (such as 'you see') compared to others (such as 'you hear'). It also became clear that the extent to which participants had adhered to the instructions regarding allocations of dots (3-2-1) also varied.

3.4.3 Findings - 2004 Chilterns Study

As noted above, the full findings from this work can be found in Appendix 8.
A wide range of responses was made to the question 'what is tranquillity' and these are detailed below.

3.4.3.1 Perceived Links to 'Nature' - 2004 Chilterns Study

A large proportion and a wide range, of the responses made during the research linked 'tranquillity' to hearing, seeing and/or experiencing various aspects of perceived 'nature' and 'landscape'. These links to 'nature' had aural and visual aspects. Aurally, respondents noted the specific importance of a variety of 'natural sounds', of being 'able to hear nature'. For many experiencing the 'countryside', a 'natural environment', or 'beautiful' elements of it was a key idea, with a wide range of related aspects being suggested such as the setting, scenery and/or shape of the land. Some respondents focused on elements of the 'English countryside', including beaches, hills, valleys and mountains. The importance of 'water' and related aspects was emphasised by many respondents. Within a range of comments, respondents suggested that tranquillity is enhanced by seeing calm water, running water, streams, fountains, rivers and the sea. Other responses focused on related aural aspects of water - 'Running water –noise', 'sound of sea or streams', 'sound of the sea', 'sound of water', 'sound of waves', 'sounds of running water' and 'sounds of sea'.

Many respondents focused on 'greenery' (or other perceived 'natural' related 'colours') as central to their understanding of tranquillity, such as blues, bright colours and various greens. Linked to this many participants in the research noted the importance of 'trees', 'woodlands', 'forests' and other vegetation of various types and forms. Another range of comments related to the importance of 'views' and 'wide vistas' and, seemingly linked to this, the notion of 'open space', the sky and 'remoteness'. '[E]ncounters with wildlife other unexpected things' were perceived by many respondents to also be very important to their notions of tranquillity, with respondents specifying a range of creatures from cows and deer, to kingfishers and vultures. Finally, in relation to perceived 'natural' elements, a focus for some respondents was the weather and the difference it can make to a tranquil experience.

3.4.3.2 Tranquillity 'of the Mind…' - 2004 Chilterns Study

Whilst the many interrelated aspects of 'nature' were highly valued by many respondents during the research, another key aspect of tranquillity related to 'internal' as opposed to 'external' influences. Much of this reasoning was seemingly related to the ambiguous notion of (achieving) 'peace'. As was noted in the northeast work, 'peace' can be used to refer to a complete lack of noise; alternatively, it could mean a lack of noise so that 'natural sounds can be heard', or and moving beyond simple aural aspects, the notion of being 'at peace' – a mental or psychological feeling of well-being. Many respondents noted the importance of 'no noise', stressing the need for 'peaceful quiet spacious and natural surroundings'. However, a large number and range of other responses were made that could be considered to infer meaning beyond an absence of noise – as something 'in the mind', as being 'good for the soul', of being 'in balance', or being related to a 'state of being'. Other responses linked tranquillity to a sense of 'calm', to the ability to 'de-stress',

'forget about your troubles' and 'get away from hassles', to 'happiness' and 'mental health'. For some respondents 'peace of mind' and 'peacefulness' was key to 'relaxation' and/or spiritual renewal'.

3.4.3.3 Doing Things - 2004 Chilterns Study

Many respondents identified a wide range of activities that they considered added to their experiencing of tranquillity – as 'Doing something you like doing'. These included 'a day at the museum', 'a newspaper', 'a nice place to drink and eat with no smokers', the 'Ability to walk where you want - freedom to roam', 'Meditating on a beach next to the sea' and 'sleeping'.

3.4.3.4 Perceived Human Related Benefits - 2004 Chilterns Study

Whilst much of the focus of participants' comments concerned perceived 'natural' factors, some respondents suggested certain human-related aspects could also be important in heightening the experiencing of tranquillity. These included human-related noises (such as music), human-related (urban) developments (such as bright lights), or the mere presence of people.

3.4.3.5 What is not Tranquillity? - 2004 Chilterns Study

A large majority of the many responses to the question 'what is not tranquillity' (and some responses to being asked what is) focused on the impact of humans in a variety of different forms. On a general level, it was the mere presence of humans that detracted from tranquillity for many respondents. Participants suggested their sense of tranquillity is reduced when there is 'a lot of us around', by 'closely crowded people', by intrusion' and simply 'too many people'. Other responses focused on 'noisy children', 'screaming children' and 'large groups of noisy teenagers'.

Beyond simply being present, certain types of behaviour and/or activities undertaken by humans were considered as detracting from tranquillity, much of which revolved around the issue of unwanted noise and/or disturbance (both visual and aural) – indeed, 'anti-social behaviour' and 'ill mannered people -no respect for surroundings' were the two highest scoring responses at verification, with 22 and 15 votes respectively. Participants highlighted the negative impacts of a large range of behaviours and issues, including 'Bad manners', 'crime', 'inconsiderate behaviour', 'mobile phones' 'noise - man-made, not birds', 'people that shout' and 'The beat of modern music'. A key issue concerned the perceived spoiling of tranquillity through 'eyesore –litter', 'dogs, dog mess' and 'rubbish and untidiness' and/or noise (of many forms). Some respondents identified a range of negative impacts relating to how being in the wrong frame of mind can detract from perceived tranquillity. They noted the potential importance of 'anything that breaks concentration e.g. noise, rubbish, showing people have been 'disrespectful', 'hustle bustle' and 'worrying fretful state of being'. The negative impacts of various forms of transport and vehicles were commented upon by many respondents, both in terms of their visual and aural presence. Other responses focused more overtly on transport-related noise. A more general form of negative impact concerned various forms of 'development' in the landscape, again in both visual and aural terms, including various forms of 'pollution'.

3.4.4 Conclusion - 2004 Chilterns Study

Much has been learnt in conducting both the pilot Mapping Tranquillity studies. The Chilterns work had major resonances with the range and depth of qualitative findings identified by respondents in the northeast work, with the key differences being in terms of the depth of feeling espoused in relation to them, expressed by the weight of feeling surrounding a theme or term/issue (that is, the number of times the same or similar issues, terms or expressions were mentioned). A key learning point was that whilst removing the 'subjectivity' of the researcher, the Chilterns verification approach left too many options to choose from and meant that participants were bewildered, bored or did not have the time to vote on more than one section. Reflections on both these approaches pointed towards a need for the combination of a final event and more rigorous theming of responses by research participants themselves during the consultation phase in any future local explorations of perceptions of tranquillity.

In relation to the national work the Chilterns consultation was extremely beneficial in generating confidence in the higher level themes/groupings that had initially been identified in the northeast work – it essentially laid the ground to a large degree for the approach adopted in the national study (as well as future local work). Most importantly, for this work, it also highlighted that if comparability (of perceptions of tranquillity) across time and space is the goal, rather than in-depth, complex, analytical, or operational explorations (such as those undertaken in the North East or Chilterns) the approach to consultation must be far simpler than that employed previously.

The recommendations in the Tranquillity Mapping 2004 Technical report had to be amended owing to the scale, time and financial commitments of repeating the PA exercise in different regions of the country. What emerged will now be described and linked to the desire for a national project based on the PA consultation exercise with the extension to consider public perceptions of spatial thresholds to detractors and contributors of tranquillity.

4 Section B, Mapping Tranquillity, 2006 National Study

Following the success of the 2004 work, the project commissioners wished to extend the research in NE and Chilterns into a national study for the whole of England. Given the project timescale and resources available for the consultation stage of the national project important decisions had to be taken at an early stage concerning how, and to what extent, the public would be consulted.

4.1 The public consultation

In essence, the key question for the national study was how to compensate for the inability to conduct the consultation with 'everybody', 'everywhere'. As with the previous studies the national study has largely retained its focus on countryside users, with consultations being focused on 'countryside' locations. The main discussion, therefore, centred around the method of consultation and location of areas given the available resources and time constraints. Indeed it became clear that a maximum of five 'areas' could be visited.

4.1.1 Study area identification

4.1.1.1 Approach One: Spatially Randomised Selection

In the first instance a spatially randomized approach was explored to identify local authority areas for consultation. This approach was premised on the need to select areas in a 'non-targeted' way. However, a risk with this approach was that the selected areas could be spatially clustered and/or not representative of the different landscape types and intensity of issues related to tranquillity that are experienced across England as a whole.

The approach undertaken was in four main stages:

- Five random numbers between 1 and 360 (degrees of the compass) were generated;
- For each number, a line was drawn at this bearing from North until the coast of England or Scottish or Welsh border was reached;
- The length of each of the five lines was then measured and a random number between 0 and the length of each line was generated in order to determine the position along each line at which the consultation should take place; and finally
- The local authority within which each identified point lay was then identified.

It was determined at the outset of this approach that there could be only one 'attempt' at this; if the results were somehow unacceptable, it would undermine the randomized approach to simply re-run the approach until more 'suitable' results were generated.

In the event, the results yielded five areas which were reasonably well distributed in a spatial sense, but where there was considerable overlap in their 'landscape type' and the kinds of issues of relevance to tranquillity (such as air traffic, urban expansion and so on) faced. For this reason, a purposive sampling approach was undertaken.

4.1.1.2 Approach Two: Purposive Selection

The requirement underpinning the purposive selection was for five study areas that were well distributed across England and where different kinds of issues of relevance to tranquillity were prevalent. They were selected on both the basis of differentiated landscape character, but more importantly the range of issues which are of relevance to tranquillity as an experiential quality of the countryside (for instance, air traffic, urban expansion, recreational pressures and busy roads).

The five selected areas are illustrated below and a brief rationale for each was as follows:

- Harrogate (North Yorkshire): located to the fringe of a major metropolitan area, but in a broadly affluent zone characterised by a diverse landscape and significant recreational pressures.
- West Lindsey (Lincolnshire): relatively remote from pressures associated with major metropolitan areas, but an intensive agricultural landscape.
- Stratford upon Avon (Warwickshire): at the 'heart of England' and a diverse and quite densely populated landscape, subject to pressures associated with its position close to major metropolitan centres of central England.
- Swale (Kent): subject to intense development pressures and affected by transportation developments, including aircraft noise.
- Mid Devon (Devon): a relatively remote rural area with a low resident population, but one where tourism and recreation related pressures are very high.

4.1.2 The Approach to Consultation

As has already been noted, the consultations undertaken during the northeast and Chilterns studies established a wide range of variables which are of deep relevance to how people experience tranquillity. In the national project there has been no attempt to re-run the primary PA research, as the factors identified from the NE and Chilterns' studies have already been consulted upon in depth. Instead a simpler, more quantitative-oriented approach was necessary in order to facilitate comparison of responses across time and space. As such, the approach used in this work has drawn heavily on the findings from the previous work. As the consultation work was undertaken in the Chilterns it became increasingly clear that the 'main issues', the 'higher-level' themes, identified at previous verification (and earlier) in the northeast work were arising again. The project team concluded that it would be surprising if many indeed all of these themes were not to appear in any local exploration of tranquillity. This was important in informing the approach to consultation within this project - in essence the previous work suggested that there are key aspects of what is or is not tranquillity that, whilst differing in the extent to which they inform local perceptions of tranquillity, tend to be repeated to some degree across time and space. As such, the project team decided to draw upon the main higher level repeated themes from the previous work in compiling the options available for participants in the national study to choose from (see Section 5.3.1 for a fuller discussion of this process and its implications).

As such, the final option choices can be seen below in Figure 6.

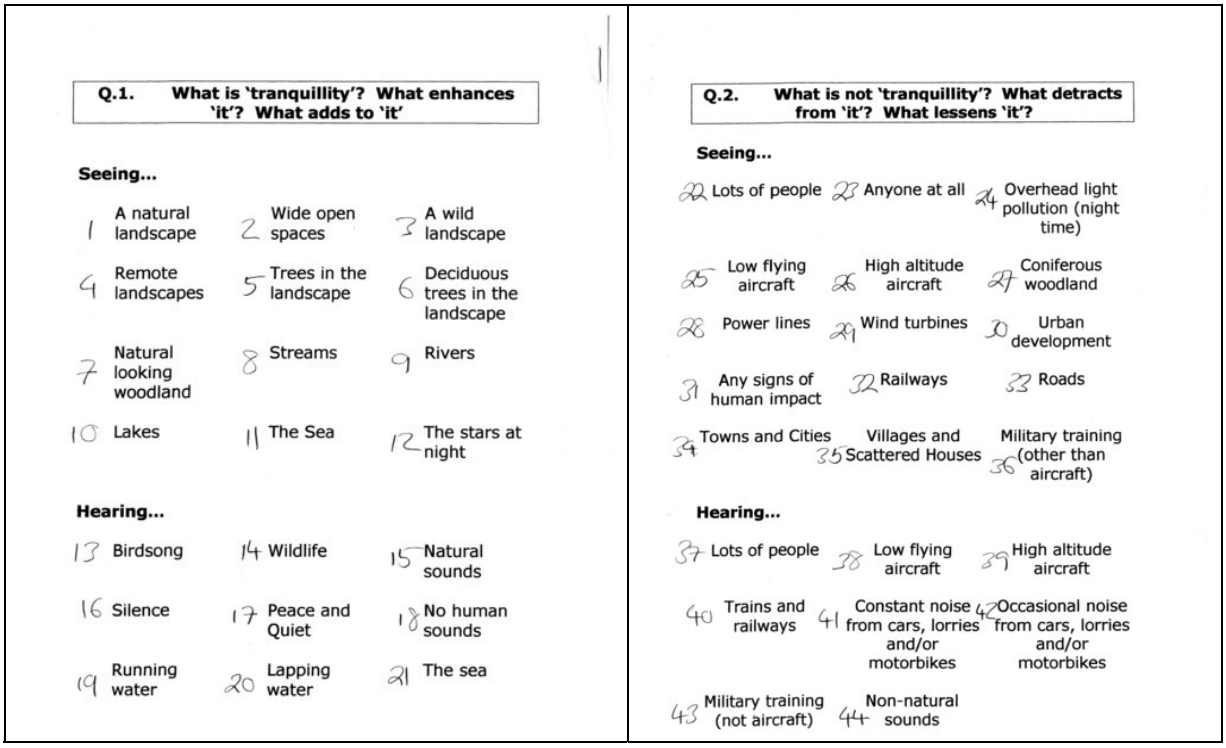


Figure 6: Questionnaire options

4.1.3 The Consultation Work

Within each of the five areas identified above, the survey and research was carried out over a two-day period. Four different locations were chosen within each with the expectation that the consultation teams would spend half a day in each. The locations chosen were based on a desk survey and local specialist and professional knowledge, primarily from local authority officers.

Map based surveys were conducted to locate a range of types of sites at which large numbers of countryside users might be expected. These included visitor attractions, Areas of Outstanding Natural Beauty, Country Parks, Greenways, National Trust properties and privately owned houses and gardens, wildlife reserves and car parks and other sites linked with countryside use (for example those owned by the Forestry Commission). These were then used as a basis for discussion (in both email and verbal form) with contacts in the local areas. Through this process, proposed sites were included with the assistance of visitor information centres, planning officers, rights of way officers, county countryside officers, the Forestry Commission, Water Authorities, Wildlife Trusts, the National Trust and CPRE local contacts.

The discussions led to additional or alternative sites occasionally suggested to those identified through the desk survey (for example, the use of a Garden Centre car park rather than a Forestry Commission car park in the same area). Wet weather/low uptake alternatives were also identified either at a dry weather location which provided cover or by sourcing other venues. However, the weather for the fieldwork was dry and the main venues were used in all cases except where there were low numbers of people at the first choice locations, when alternative sites were used.

To limit any local anomalies that may have been produced by choosing locations that were spatially clustered within the individual consultation areas, an objective of the location setting was to spread the sites proposed for the survey work geographically across the districts/boroughs as far as possible. This was achieved except where the alternative location for wet weather or low rates of survey take-up was not in the same locality but was in the same district as the preferred site, owing to the isolation of the preferred site from suitable wet weather alternatives. Permission was sought and granted at each location that was identified as a potential consultation site and confirmation was sent to the owner or manager of the site providing information on the background to the project, the proposed timing and the names and training details of the researchers. All the researchers involved in the consultation were Associates of the PEANuT project at Northumbria University.

The research took place in the east and west locations, using 2 research teams, over the Easter Bank Holiday weekend (14th – 17th April 2006) to make maximum use of the increased volume of countryside users over that period. The research in Harrogate district took place the following weekend. The teams spent half a day in each of four locations and at each location the teams adopted a similar approach. Contact was made with the site owners/managers where available to ascertain the location most physically suitable (in terms of safety, flows of pedestrians etc) and likely to elicit the maximum assistance from the public for the project. There was signage to indicate the nature of the work, the organisation to which the researchers belonged (the PEANuT project based at Northumbria University) and the client for the project (CPRE).

Individuals were each approached by one of four researchers with the intention of gaining approval to participate in the study and subsequently complete the survey. Each participant was supplied with a survey sheet, clipboard and a pen and the instructions for completion were given. This was done both with people individually and in groups. When in groups each person was encouraged to complete their own sheet without reference to anyone else.

Participants were then asked either by the team of survey researchers or the spatial threshold researcher to participate in the more detailed and time-consuming threshold research. If there was agreement, the individual was guided to the posters which were displayed on easels or over gates, fences, propped on boulders etc. Each individual was issued with a set of answer sheets stapled together on a clipboard and provided with a pen. The researcher took the participants through the

poster sheets as described in Section 4.2 encouraging continued participation should interest start to waiver due to the time commitment needed.

Participation.
In all 1347 people participated in the study across all areas, giving a total number of options chosen of 8082 (1347 X 6) choices.

Session	Date	Location Name	ID	Participants	%
Central 1	14.04.06, am	Stratford Greenway Car Park	1	81	6.01
Central 2	14.04.06, pm	Charlecote	2	90	6.68
Central 3	15.04.06, am	Butterfly Farm	3	81	6.01
Central 4	15.04.06, pm	Ilmington	4	78	5.79
			Total	**330**	**24.50**
Devon, 1	16.04.06, am	Wallace's Farm Shop	5	77	5.72
Devon, 2	16.04.06, pm	Bickleigh	6	79	5.86
Devon, 3	17.04.06, am	Eggersford Garden Centre	7	107	7.94
Devon, 4	17.04.06, pm	Eggersford	8	52	3.86
			Total	**315**	**23.39**
West Lindsey, 1	14.04.06, am	Nettleton Car Park	9	38	2.82
West Lindsey, 2	14.04.06, pm	Willingham Woods Car Park	10	60	4.45
West Lindsey, 3	15.04.06, am	Tuetoes Car Park	11	34	2.52
West Lindsey, 4	15.04.06, pm	Chambers Farm Car Park	12	59	4.38
			Total	**191**	**14.18**
Swale, 1	16.04.06, am	Elmley Bird Sanctuary Car Park	13	18	1.34
Swale, 2	16.04.06, pm	Doddington Place Car Park	14	46	3.41
Swale, 3	17.04.06, am	Oare Nature Reserve Car Park	15	44	3.27
Swale, 4	17.04.06, pm	Perry Wood Car Park	16	73	5.42
			Total	**181**	**13.44**
Yorkshire, 1	22.04.06, am	Fewstone Reservoirs Car Park	17	85	6.31
Yorkshire, 2	22.04.06, pm	Fountains Abbey	18	90	6.68
Yorkshire, 3	23.04.06, am	Brimham Rocks	19	85	6.31
Yorkshire, 4	23.04.06, pm	How Stean Gorge	20	70	5.20
			Total	**330**	**24.50**
			Total	**1347**	**100**

Table 11: Participants per session

Table 11 shows the breakdown of people participating at each of the five locations. For the three locations Central, Devon and Yorkshire, the percentage of participants was about equal, at around the 25% of total participants. Participation at the two remaining locations (West Lindsay and Swale) was somewhat lower at about 15% of total participants.

When collating the information, IDs were used to represent certain data including demographic data. The IDs for the demographic data are shown in Table 12.

Local?	Gender	Age	ID	Total	%	Local?	Gender	Age	ID	Total	%
local	male	<20	1	28	2.08	local	female	60+	12	89	6.61
local	male	20-30	2	24	1.78	local	female	31-40	9	79	5.86
local	male	31-40	3	56	4.16	local	male	60+	6	74	5.49
local	male	41-50	4	55	4.08	visitor	male	60+	18	72	5.35
local	male	51-60	5	68	5.05	local	female	51-60	11	70	5.20
local	male	60+	6	74	5.49	local	male	51-60	5	68	5.05
local	female	<20	7	33	2.45	visitor	female	41-50	22	68	5.05
local	female	20-30	8	42	3.12	visitor	female	31-40	21	66	4.90
local	female	31-40	9	79	5.86	visitor	female	60+	24	66	4.90
local	female	41-50	10	56	4.16	visitor	male	41-50	16	63	4.68
local	female	51-60	11	70	5.20	visitor	male	51-60	17	61	4.53
local	female	60+	12	89	6.61	visitor	male	31-40	15	60	4.45
visitor	male	<20	13	39	2.90	visitor	female	51-60	23	60	4.45
visitor	male	20-30	14	35	2.60	local	male	31-40	3	56	4.16
visitor	male	31-40	15	60	4.45	local	female	41-50	10	56	4.16
visitor	male	41-50	16	63	4.68	local	male	41-50	4	55	4.08
visitor	male	51-60	17	61	4.53	visitor	female	<20	19	44	3.27
visitor	male	60+	18	72	5.35	local	female	20-30	8	42	3.12
visitor	female	<20	19	44	3.27	visitor	male	<20	13	39	2.90
visitor	female	20-30	20	39	2.90	visitor	female	20-30	20	39	2.90
visitor	female	31-40	21	66	4.90	visitor	male	20-30	14	35	2.60
visitor	female	41-50	22	68	5.05	local	female	<20	7	33	2.45
visitor	female	51-60	23	60	4.45	local	male	<20	1	28	2.08
visitor	female	60+	24	66	4.90	local	male	20-30	2	24	1.78
				1347						1347	

Table 12: Participant's Demographic (By ID and Sorted)

The table shows the demographic makeup of participants across all five locations listed according to their ID and in the right-hand section the same data sorted in descending order according to the number of participants attending each session. The table shows that the number of participants vary from 89 local, 60+ and female (6.61% of total participants) to 24 local, 20-30 and male (1.78% of total participants). The average number of each demographic attending all sessions is about 56.

Across all areas the number of local people participating is almost identical to the number of visitors (674 local participants and 673 visitor participants), see Table 13.

Gender	Age	Local	Visitor	Total Female	Total Male	% Female	% Male
female	<20	33	44	77		5.72	
male	<20	28	39		67		4.97
female	20-30	42	39	81		6.01	
male	20-30	24	35		59		4.38
female	31-40	79	66	145		10.76	
male	31-40	56	60		116		8.61
female	41-50	56	68	124		9.21	
male	41-50	55	63		118		8.76
female	51-60	70	60	130		9.65	
male	51-60	68	61		129		9.58
female	60+	89	66	155		11.51	
male	60+	74	72		146		10.84
	Total	674	673	712	635	53	47
				Total	1347.00	**Total**	100.00

Table 13: Demographic results by gender

Table 13 compares the number of males and the number of females participating across all locations. The difference in total numbers is 77 (more females participating) of all ages whether local or visiting, a six percent difference overall. Although the difference in numbers is small, it is almost exclusive to more participation by females under the age of forty compared with males of an equivalent age. The most noticeable contributions are that 18 more females in the local, 20-30 group and 23 more females in the local, 31-40 group participated.

Age	Total
<20	144
20-30	140
31-40	261
41-50	242
51-60	259
60+	301
Total	1347

Table 14: Participation by age

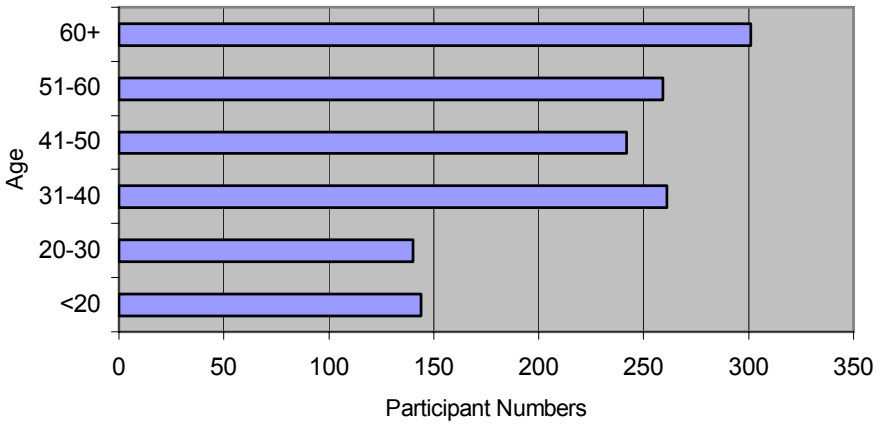


Figure 7: Participants numbers by age

Table 14 sums columns 5 and 6 of Table 13. Table 14 and Figure 7 shows participation within of the six age groups, whether local or visiting, male or female. Again it shows the older groups participating in greater numbers. Thus of note here is the relative lack of availability (of younger participants) at these locations.

	Local Male						Local Female						Visitor Male						Visitor Female						
Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**Total**
1	2	1	4	7	3	8	1	1	4	2	6	7	3	1	2	2	4	3	4	0	3	4	5	4	81
2	0	0	1	3	2	2	1	3	8	4	3	3	3	4	4	4	7	6	6	4	3	4	7	8	90
3	0	0	0	3	0	1	1	0	1	0	0	1	5	5	13	3	0	5	7	7	13	4	7	5	81
4	2	0	2	3	7	2	6	2	2	1	3	11	0	7	3	1	2	7	0	4	4	1	3	5	78
5	2	1	4	4	1	4	8	4	5	5	3	9	3	0	2	6	2	0	3	2	3	4	2	0	77
6	0	3	2	3	2	5	0	3	3	2	2	4	3	3	3	5	5	3	4	3	7	7	4	3	79
7	3	1	0	1	14	15	2	1	1	8	14	19	2	0	0	4	3	7	2	1	0	3	1	5	107
8	1	0	1	1	5	2	1	2	1	5	3	3	2	1	1	2	3	2	2	1	3	3	2	5	52
9	0	1	2	1	3	7	0	2	2	0	2	6	0	0	3	0	0	2	0	1	3	2	0	1	38
10	1	0	4	4	5	3	2	3	5	2	2	2	3	0	5	1	4	1	1	0	2	5	3	2	60
11	6	0	4	5	0	1	4	2	8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	34
12	0	2	6	2	2	2	0	3	4	0	2	3	3	1	3	4	1	4	3	3	5	1	3	2	59
13	0	1	1	2	2	0	0	1	0	2	2	0	0	0	1	2	2	0	0	0	1	0	0	1	18
14	0	1	6	2	2	3	1	3	5	6	3	4	0	0	1	0	3	1	0	0	2	1	2	0	46
15	3	0	7	4	3	2	0	1	6	2	1	2	1	2	0	3	2	0	0	1	3	0	1	0	44
16	2	4	3	7	8	3	0	2	7	7	6	4	0	0	2	4	3	0	1	0	0	5	4	1	73
17	3	2	4	2	6	3	2	1	7	4	9	4	0	3	1	6	1	9	0	2	0	5	4	7	85
18	2	2	1	1	0	4	1	4	7	2	3	4	0	3	3	5	8	10	3	5	3	6	5	8	90
19	1	3	4	0	0	3	2	3	3	2	1	1	7	2	10	3	5	5	5	4	6	7	4	4	85
20	0	2	0	0	3	4	1	1	0	0	4	2	4	3	3	8	6	7	3	1	5	6	3	4	70
	28	24	56	55	68	74	33	42	79	56	70	89	39	35	60	63	61	72	44	39	66	68	60	66	1347
			108			**197**			**154**			**215**			**134**			**196**			**149**			**194**	

Table 15: Participation by demography at each location

Table 15 shows the numbers of participants at each location by their demographic. Although the total number of local people participating is almost equal to visitor numbers (see above) there are notable variations when gender and age are considered. The columns in grey are the three younger groups shown to be under represented above.

At some locations local, males and females of the younger age groups are almost entirely unrepresented (Session 3, 3 participants in total) whilst visitor male and females of the same age group are well represented (Session 3, 50 participants in total). In session 3 all local participants are generally under represented, only 7 of the total (83) are local.

At other locations the number of younger people is relatively lower in comparison to three older age groups across both genders (session 7, 13 younger than 40 and 94 older than 40) whilst for the majority of all age groups people are local (a ratio of 79 to 28).

Of note is not necessarily that certain groups were under represented but whether different groups at different locations gave differing responses.

4.1.4 Consultation Findings

For the purposes of collation answers were split into the two sections of the questionnaire, 'positive' things that contribute to tranquillity (with respondents being asked 'what is tranquillity?') and 'negative' things that detract from tranquillity (with respondents subsequently being asked 'what is not tranquillity?'). Each these were option choice was given an ID numbered 1-21 for the ('positive') responses to the question 'what is tranquillity?' and 22-44 for negative responses.

Table 16 and Table 17 show the overall number of times each option was chosen. The results are listed in descending order.

ID	Response	Total
a01	Seeing, A natural landscape	533
a13	Hearing, Birdsong	396
a17	Hearing, Peace and Quiet	271
a07	Seeing, Natural looking woodland	256
a12	Seeing, The stars at night	245
a08	Seeing, Streams	225
a11	Seeing, The Sea	221
a15	Hearing, Natural Sounds	212
a14	Hearing, Wildlife	183
a19	Hearing, Running water	180
a09	Seeing, Rivers	176
a02	Seeing, Wide open spaces	174
a03	Seeing, A wild landscape	171
a05	Seeing, Trees in the landscape	146
a10	Seeing, Lakes	118
a04	Seeing, Remote landscapes	113
a18	Hearing, No human sounds	109
a20	Hearing, Lapping water	109
a21	Hearing, The sea	84
a06	Seeing, Deciduous trees in the landscape	72
a16	Hearing, Silence	47
	Total	**4041**

Table 16: What is tranquillity?

ID	Response	Total
a41	Hearing, Constant noise from cars, lorries and/or motorbikes	886
a22	Seeing, Lots of people	627
a30	Seeing, Urban development	373
a24	Seeing, Overhead light pollution (night time)	270
a37	Hearing, Lots of people	266
a25	Seeing, Low flying aircraft	228
a38	Hearing, Low flying aircraft	225
a28	Seeing, Power lines	221
a34	Seeing, Towns and Cities	202
a33	Seeing, Roads	139
a44	Hearing, Non-natural sounds	107
a31	Seeing, Any signs of human impact	102
a36	Seeing, Military training (other than aircraft)	101
a29	Seeing, Wind turbines	88
a42	Hearing, Occasional noise from cars, lorries and/or motorbikes	44
a43	Hearing, Military training (not aircraft)	32
a32	Seeing, Railways	30
a26	Seeing, High altitude aircraft	25
a40	Hearing, Trains and Railways	24
a23	Seeing, Anyone at all	18
a27	Seeing, Coniferous woodland	17
a39	Hearing, High altitude aircraft	11
a35	Seeing, Villages and Scattered Houses	5
	Total	4041

Table 17: What is not tranquillity?

In very general terms, therefore, the results resemble views uncovered in the previous, more detailed consultations, with positive perceptions of a range of 'natural' features and negative perceptions of the presence of lots of people and aspects of the urban environment. It is important to note that people were not being asked how they felt about any of the options. The results are an indication of what the public chose as factors that most contributed to or detracted from their feelings of tranquillity.

Tranquil Places

Participants were also asked to name a tranquil place. The tranquil places named are considered, in brief, here, and listed in full in Appendix 9. The tranquil places were compiled alongside the 6 responses and demographic data, providing a link between the three data types. The limited analysis here of the tranquil places named used TextSTAT, a freely downloaded text analysis software application. The analysis required three stages: collation of the tranquil places, ranking words according to their occurrence and finally, looking at the word's context. The Appendix is therefore spit into three. Firstly tranquil places are listed alphabetically and according to the session they were named. The number of times that each tranquil place was mentioned are listed (but only those that occurred more than ten times) and finally their context.

The tranquil places named varied considerably between sessions and at the same session. The lists show a clear correlation between the locality and the tranquil place named. The majority of places are relatively local to the area in which the consultation occurred. Fewer responses name places more distant and these tend to be larger, designated areas and even countries (or parts of them) e.g. 'Lake District' 'Haweswater Lake District' 'Scotland' 'Scotland - Mallaig area'. Places also vary from general, descriptive types of landscape to very specific locations and times.

The table showing the number of times words occur omits those that are mentioned less than ten times. Clearly this excludes the vast majority of words mentioned, but to include them would only be useful if they were to be considered individually. The list includes all words mentioned, so many will not refer to a place (such as and, in, on, the). At this level of analysis the Lake District (or some variation of it i.e. the Lakes) is mentioned often, as is Yorkshire, in its different forms. Sessions took place in Yorkshire and Devon (which was also mentioned often) but not in the North West. Although tranquil places tended to be more rural a small number of more urban areas (and locations within them) were mentioned e.g. 'Stratford' 'Jesmond Dean' 'Swansea'. Aside from places named, people also mentioned landscape types or features such as Forest, Woods, Moors, Park, Valley, Beach and Coast, although these were often related to a place. Looking at the information at this level might skew the data, in particular as specific places within areas less likely to be mentioned are themselves less likely to be listed.

The lists that show examples of a word's context help to clarify this. 'District' was the most mentioned word; by itself it could mean several things. The context however shows that it applies to two specific areas: the Lake District and the Peak District. Likewise, 'lakes' might refer to different lakes, the Lakes, or lakes as a generic term. In fact it applies to all three. Devon is mentioned a number of times and often alongside specific locations within Devon. The data can be seen at a different levels from the geographically large to specific locations and from a landscape type to its associated place e.g. 'coast' and 'Dorset Coast'

Some of the words that were not listed (less than 10 occurrences) include:

- action words e.g. 'sitting'
- non-geographical locations e.g. 'home'
- organisations e.g. RSPB
- man-made features in the landscape e.g. 'bridge'
- sense related e.g. 'quiet'
- time related e.g. 'day'

4.2 Threshold Analysis

4.2.1 Introduction

In parallel to the survey in the five differing districts, research was undertaken to measure, quantitatively perceived naturalness and key detractors to perceptions of tranquillity which had been identified as important in the 2004 study.

These detractors were classified as land cover types, numbers of people and their activities and urban development.

The latter was carried out, to determine whether predictable patterns in relation to distance exist and whether spatial thresholds can be established, by assessing if there is consensus within the population as to a level at which a named detractor appears to become stable in terms of its effect on the measurements of feelings of tranquillity. This information was used to inform the GIS mapping process (see Section 4.3).

The three major groups of responses from the initial study were considered in greater depth in this research.

4.2.1.1 Land cover

There are many factors which affect the character of a particular landscape and landscape character assessments facilitate the describing and classification of landscape based on multi-factorial analysis.

One of these factors which may change over time is land cover. This may be caused by natural succession as a result of time or meteorological events, agricultural and silviculture practice in a market and research based economy and changes in land management practices encouraged through European subsidies. Changing practices have a visual effect on the vegetation covering the land and affects perceptions of 'naturalness'.
Illustrations of a variety of land cover types was chosen to elucidate quantitative information on 'perceived naturalness', through the viewing of sixteen photographed rural scenes. This information was used:

1. To develop, from consideration of these results, a scoring system, to crosscheck the results against the Perceived Naturalness Scores allocated by researchers, to Land Cover Survey Sub-Classes in the 2004 report.
2. To input data from this study into the GIS model.

4.2.1.2 People

The presence of people, the effects of their concentration, activities and the settings for these were quantitatively assessed for their effects on perceptions of tranquillity. This information was used:

1. To provide detailed scores on the comparative effects of the content of the images chosen.
2. To input data from this study into the GIS national maps.

4.2.1.3 Urban Development

The effect of human interventions in the landscape in the form of a variety of built development, roads, vertical structures and buildings were found previously to be detractors to tranquillity.

The research attempted to quantify the effect of distance on people's perception of some of these previously identified detractors in the landscape, to provide information for spatial threshold analysis.

In each of the four sets of urban development images the viewer is moved away from the detractor by known distances, close range, 500m, 1km, 2km and 5km.

4.2.2 Selection of the Study Subjects

All the individuals asked by the researchers to participate in this study were countryside users. Following the completion of the three-question tranquillity survey sheets (see Figure 6), individuals were asked to participate in further research, which was introduced to them by the researcher as the development of the main findings from the previous 2004 study. Taking part in this research project involved additional participant time and further engaging the interest of individuals in the theme of tranquillity. Each person was requested to complete their own form. All age groups were asked to take part and the ages ranged from seven to older people. No demographic data was collected.

The research involved greater time than some of the participants had envisaged and it was important to encourage completion, which was done successfully, no-one refusing to finish the task. When there were groups completing the spatial threshold research, there was often a variety of speeds of completion and this had to be managed sensitively.

4.2.3 Images and their Presentation

The images for the threshold analysis consultation were taken on a Canon 35mm SLR and transferred to CD when the film was processed. A 50mm lens was used throughout and the aperture setting was either f 8 or f 11. All were taken at head height avoiding dramatic lighting or viewpoints.

These criteria create the sense of looking without any distortion from depth of field or strange angles and as much as possible use ‘neutral’ compositions and are in line with guidance pertaining to images for environmental impact assessment.

The images were shown to the participants as A1 laminated and spiral bound presentation posters and are presented in Appendix 10. Each poster presented a minimum number of five and a maximum number of eight colour images sized 21.5x14 cms. The posters corresponded directly to the A4 answer sheets where images were replaced by empty boxes for the participants to enter a score for each of the individual images observed on the display boards.

All the images were shown to every participant in a prescribed order:

1. Perceived naturalness images 1-16 (2 sheets of images)
2. People and Tranquillity images 1-8
3. Signs of human development – Roads images 1-5
4. Signs of human development – Urban 1 images 1-5
5. Signs of human development – Urban 2 images 1-5
6. Signs of human development - Pylons images 1-6

The guidance given to participants when completing the answer sheets was:

1. To complete each box with an individual score. This was to be independent for each image. They were not to be rated.
2. A reiteration of the information in the written instructions on the posters and answer sheets with emphasis on the scoring.
3. To emphasise the different scoring scheme between the completion of ‘People and Tranquillity’ and the start of ‘Signs of Human Development’.

There was a change in the perception of the scoring system between posters representing ‘People and tranquillity’ and those representing ‘Urban development and tranquillity’. In the former, the question asked for a high score to illustrate feelings of tranquillity, in the latter a high score was to be given if the scene detracted from a sense of tranquillity. It was important for the researcher to watch that this change had been perceived. The reasoning behind the change was the needs of the weighting in the GIS methodology.

No guidance was given, views offered or discussion entered into during the completion of the scoring sheets.

4.2.3.1 Perceived Naturalness

Herzog and Chernick (2000) note that tranquillity was more prevalent in natural than in urban settings and it was with 'natural scenes' that this research was concerned.
Coeterier (1996) therefore makes the important point that "how inhabitants perceive naturalness differs greatly from the ideas of biologists and other experts". He goes on to argue that "naturalness is not only or even primarily based on the presence of vegetation, but rather the way a landscape has grown organically, as a living organism. In this respect, old farms and sandy road are seen as 'natural' too" (1996:27).

Images of sixteen land cover types were selected from existing source images. A farm house was included in one of the images (5) and a stone hay barn and walls were included in image 4. Individual, dual and mixed land cover types were illustrated. The images excluded prominent built environment.

The majority of images contained one land cover category type (1,2,3,4,6,9,11,12,14 and15). Other images, while containing the one land cover type as the majority of the image also contained at least one other land cover type in a more minimal form (5,7 and 8) and three images (10,13 and16) illustrated examples of two or more land cover types in equal proportions. These were included because land cover types for arable, heath and grassland, by virtue of the height of the sward and the ocular viewing angle, naturally may contain other land cover types in their views.

Participants were asked 'How natural do you think each scene is?' and were requested to score 0 and10 where:

- 0 is completely non-natural and
- 10 is extremely natural.

4.2.3.2 People and Tranquillity

Eight diverse images of the countryside illustrated recreational and agricultural activities with the inclusion of varying numbers of people, a rural car park and a rural empty road.
These images (1-8) illustrated contrasting activities and numbers of people and in the countryside.
Participants were asked 'How much does what is going on in each of the scenes take away from your feelings of tranquillity?' and were requested to score between 0 and10 where:

- 0 indicates that what you see would make it impossible for you to feel tranquil and
- 10 indicates that what you see would make you feel extremely tranquil.

4.2.4 Spatial Threshold Analysis

The images illustrated different distances from some 'signs of human impact' which are known from previous work Tranquillity Mapping 2004 as detractors to tranquillity.
These are roads, urban development – two sets- and pylons.

- Signs of human development – Roads 1-5
  Roads at increasing distances from the viewer.
- Signs of human development – Urban 1 1-5
  An urban conurbation was viewed in all images and in each case filled the width of the photo.
- Signs of human development – Urban 2 1-5
  Rural settlements illustrating a variety of topography at increasing distances from the viewer.
- Signs of human development - Pylons 1-6
  Pylons, all on the skyline and at increasing distances from the viewer.

Participants were asked
'How much does (do) the road/development/pylon in the photo take away from your feelings of tranquillity?' and were requested to score between 0 and10 where:

- 0 represents 'it would not in any way take away from my feelings of tranquillity' and
- 10 'it would take away totally from my feelings of tranquillity'

4.2.5 Results

Discussion follows the tables below which show the results and include the image used, the count, average score and standard deviation to two decimal points. Please see Appendix 10 for larger scale images included in the tables below.

4.2.5.1 Perceived Naturalness

	Image						
	1	2	3	4	5	6	7
							
Count	192	192	192	192	192	192	192
Average	5	7	9	7	7	8	5
Standard Deviation	2.75	2.35	1.62	2.34	2.21	1.71	2.34

Table 18: Results for Perceived Naturalness

	Image								
	8	9	10	11	12	13	14	15	16
									
Count	192	192	192	192	192	192	192	192	192
Average	7	7	8	9	8	7	8	9	7
Standard Deviation	2.89	2.15	2.084	1.43	1.60	2.25	1.86	1.67	2.07

Table 19: Results for perceived naturalness

Image no.	Land cover description	Average score (max 10)	St. devn	Expert derived score (max 6)
1	Arable	5	2.75	3
2	Mixed woodland	7	2.35	6/3
3	Bracken	9	1.61	5
4	Improved pasture	7	2.34	5
5	Grass + bracken +improved grassland	7	2.21	5
6	Broad leaved woodland	8	1.71	6
7	Arable	5	2.34	3
8	Coniferous woodland + acid grassland	7	2.89	3/6
9	Neutral grassland	7	2.15	5
10	Heath+ arable	8	2.08	6/3
11	Coast	9	1.43	n/a
12	Acidic grassland	8	1.60	5
13	Improved grassland+ arable	7	2.25	4/3
14	Heath	8	1.86	6
15	Bog	9	1.67	6
16	Mixed woodland+ arable+ grassland	7	2.07	6/3/5

Table 20: Results for Land Cover Types

Where there are high scores for land cover there is greater consistency of scoring within the sample study group.

4.2.5.2 People and Tranquillity

	Image							
	1	2	3	4	5	6	7	8
								
Count	192	192	192	192	192	192	192	192
Average	7	9	6	1	1	4	6	8
Standard Deviation	2.41	1.49	2.31	2.02	1.99	2.22	2.28	1.82

Table 21: Results for People and Tranquillity

The scores confirm that large groups of people, car parks and settlements are detractors to tranquillity as detailed in the previous report. The images of a lone walker on the fells, closely followed by a rural broad leaved tree-lined road with no cars or people visible are perceived to be the most tranquil scenes.

4.2.5.3 Signs of Human Development

Roads. The impact of the visual presence of roads on feelings of tranquillity in general decreases with distance, but the prominence of the road in the view may also have an impact and may provide an explanation for similarity in impact at 1km and 2km.

	Image				
	1	2	3	4	5
					
Count	192	192	192	192	192
Average	9	6	4	4	3
Standard Deviation	1.84	2.50	2.52	2.70	3.01

Table 22: Results for the Signs of Human Impact

Urban development – 1 (an urban conurbation). The impact of the visual presence of urban development on feelings of tranquillity in general decreases with distance. However the increase in impact at 5km compared with 2km may be explained by an analysis of differences in the images. In the image at 2km there is a belt of trees in the mid foreground which provides some mitigation to a view of the urban conurbation, which is also in cloud shadow. Image 5 at 5km does not have this visual mitigation and the built development is lit by the sun, increasing its visibility to the viewer.

	Image				
	1	2	3	4	5
					
Count	192	192	192	192	192
Average	9	9	8	6	7
Standard Deviation	1.42	1.78	1.99	2.45	2.35

Table 23: Results for Urban Development - 1

Urban development –2 (rural settlements). The impact of the visual presence of rural development on feelings of tranquillity in general decreases with distance and is lower in each specified distance than the urban conurbation. The average for the 5km of the urban development is the same as the nearest view for the rural development. The impact on feelings of tranquillity is seen to be very similar for 1km and 2 km. The settlement at 1km in a valley and sits within natural

element, whereas the 2km image is a settlement on a slope and up to the ridgeline of a hill increasing its visibility (and therefore the impact) to the viewer).

	Image				
	1	2	3	4	5
					
Count	192	192	192	192	192
Average	7	7	4	4	1
Standard Deviation	2.26	2.19	2.29	2.41	2.13

Table 24: Results for Urban Development - 2

Pylons. The impact of the visual presence of pylons on feelings of tranquillity decreases with distance and it might be anticipated that at even greater viewer-pylon distances, the impact would decrease further.

	Image					
	1	2	3	4	5	6
						
Count	192	192	192	192	192	192
Average	8	6	4	4	3	2
Standard Deviation	2.69	2.88	3.06	2.76	2.81	2.81

Table 25: Results for Pylons

4.3 GIS Model

4.3.1 Introduction

Tranquillity is, as has been referred to previously, a complex concept. The 2004 study and subsequent verification exercises have provided invaluable qualitative research findings that have ultimately led to being able to use quantitative digital datasets to model relative tranquillity. This process has deconstructed qualitative and highly personal judgements about what is perceived as contributing to or detracting from an experience of tranquillity. The broad themes of the 2004 pilot study (Section 4.1.2) are disaggregated into 'what you can see' and 'what you hear' and how different characteristics positively or negatively contribute to an experience of tranquillity. In doing so the link between digital datasets and the ability to model 'visibility' and 'noise' is more readily transparent.

4.3.2 Overview of the GIS Model

4.3.2.1 Some Comments on GIS Modelling in this Context

Theory building and model building necessarily require a level of abstraction and generalisation from the complexity and the diversity of the real world.

> *A model may be thought of as a simplified conceptualised representation of reality. In its simplest form, a model may be considered a classification system… Scientific investigation, however, usually requires the use of more elaborate model concepts, the aim of which is to develop a structural representation of reality of sufficient accuracy to allow experimentation and a more penetrating analysis of the relevant variables in any real life situation (Harvey, 1966, p.373).*

Flowerdew (1989), reviewing a number of definitions of the term 'model', concludes that the most fundamental characteristic of a model is selectivity. 'Modelling is therefore a method of representing a complex state of affairs by reducing it to something simpler which embodies as many as possible of what the modeller sees as its most important characteristics' (p.245). The significance of what Flowerdew terms 'the modeller' is all-important in making decisions about how to interpret, classify and apply data in a model. This runs counter to one of the underpinnings of PA as a consultation approach, that individuals' 'voices' should be treated as they are recorded and be subjected to a minimum of external interpretation.

When the subject of the model is human interpretation of, or behaviour in, the landscape, the difficulties are more acute. Writing nearly 40 years ago, with specific reference to models of economic and transportation behaviour, Haggett suggested that 'perhaps the biggest barrier that model builders… will have to face in the immediate future is an emotional one. It is difficult to accept that… as individuals we suffer the indignity of following mathematical patterns in our behaviour' (1965, p.109). This model is not predictive, so the problems are not those of trying to abstract diverse behaviours into robust and reliable models of aggregate behaviour. However, it experiences the same essential difficulty that of deciding how to classify diverse responses into a more general set of abstracted judgements about environmental qualities. This process, carried out in mapping tranquillity (2004), however, identified a set of themes and indicators of tranquillity that have been used and developed in this study.

Datasets, their use and availability, often drive the construction and implementation of GIS model. The construction of datasets, decision support and expert judgement, are user driven and there is an extensive literature on the political aspects of GIS applications. Prior to the Tranquillity mapping project (2004) a criticism of previous work in this area is the predominant use of expert judgement that drives the choice of data, their use (thresholds and weightings applied) to map tranquillity. It has been proven by the Tranquillity mapping project (2004) that it is possible to construct conceptual models of tranquillity using PA consultation work, wherever possible, to directly inform

the parameters of the model. The development of the methodology for this project tries to remove the reliance on expert judgement where possible (Section 4.2.4). As in the previous report this report aims to set out precisely what we did. This transparency allows interpretation and use of the results within known limits.

It is important to recognise that this methodology does not identify tranquil areas, but rather a spectrum or continuum of more or less tranquil areas, in common with previous research in related areas (Fritz and Carver, 1998). It identifies areas which have relatively more or less of the important characteristics that are associated with tranquillity. So, drawing a line on the maps and stating that the area inside is tranquil and the area outside is not, is not justified by the consultation data on which the GIS model is based. It may be that there is pressure to identify such areas and there are a range of reasons why this may be the case, as has led to the identification of 'wild land' elsewhere in the UK (Carver *et al*., 2002), but this methodology does not provide a quantified 'answer' to the question of what is tranquillity. It does however establish a basis for identifying the most tranquil areas in England. A boundary effect with Scotland and Wales is taken into account wherever possible, relevant factors from outside of the study area boundaries; for instance visibility of artificial structures, distance to urban areas or noise from railways.

4.3.2.2 General Structure of the GIS Model

The two key themes, the ability to 'see' and 'hear' a given factor, shape the construction of the GIS model. Both what 'you can see' and what 'you can hear' can detract from or enhance tranquillity. All of the 44 options choices identified fall into these two categories. The GIS model, using and adapting that developed for Mapping Tranquillity (2004), is outlined in Figure 8.

Data has been compiled separately for both positive and negative option choices; this process ends up with two datasets representing positive and negative contributions to tranquillity. High scores in both datasets represent areas with the greatest contribution to or detraction from tranquillity. These two datasets are then combined by simply taking the negative scores away from the positive – providing a relative tranquillity score (Figure 8).

All raw data in the GIS model was reclassified on a scale zero to ten. Consequently the scoring system adopted here needs parity for the weights obtained to be included. Datasets needed to be scored on a scale from one to ten[12]. Ten always represents the strongest feeling as to what contributes to tranquillity or detracts from it, as the scores for negative tranquillity will always be taken away from the scores compiled for positive factors, giving an overall score for how' tranquil' a given 500mx500m cell will be.

[12] A score of zero (0) is only applied if a 500m x 500m cell does not have data relating to a given option choice

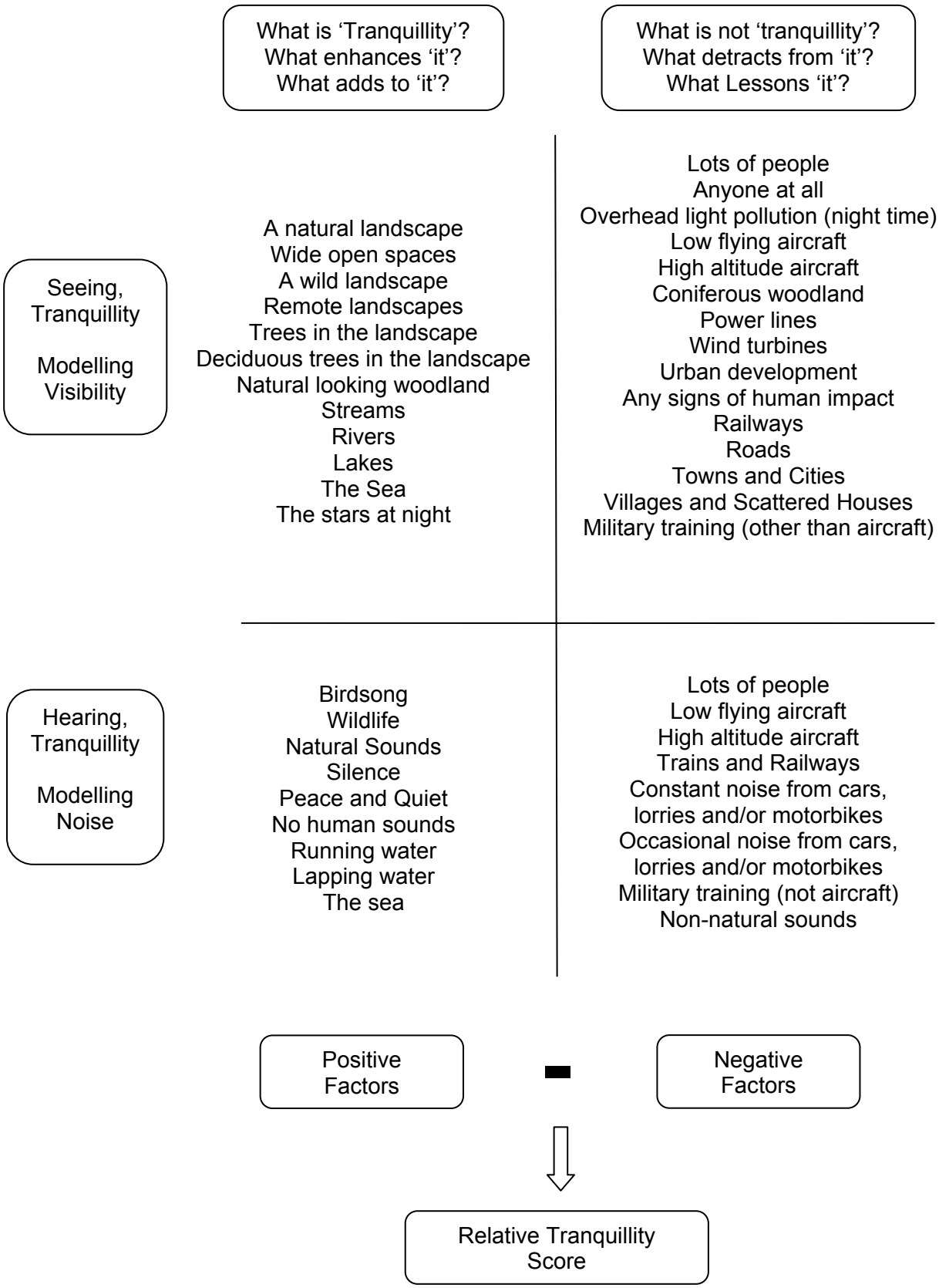


Figure 8: General Overview of the GIS model

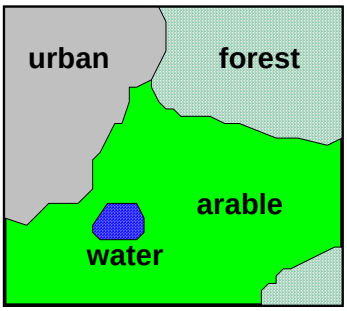
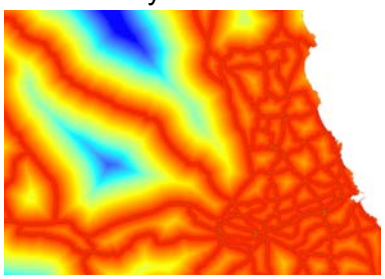
4.3.2.3 Datasets, Techniques and Analysis

GIS are tools for the management, analysis and mapping of quantitative or categorical data. Most of the data used in this research fall comfortably within this description, for instance terrain, land cover, population and infrastructure datasets. Table 26 summarises the main and most recent raw datasets used in this study. However, these are just the source data for the model. The next stage is to model visual and noise impact of each option choice.

Name	Description
Land Cover Map (LCM) 2000	A thematic classification of satellite imagery (year 2000) into types of land cover, provided by the Centre for Ecology and Hydrology (CEH).
Digital Elevation Model (DEM)	A raster dataset providing elevation data OS Panorama 50m resolution
OS Strategi	1:250,000 scale OS dataset of urban areas, transportation infrastructure and key environmental features such as rivers and woodland.
OS Points of interest data	A point dataset providing location details of features, business and leisure sites throughout Great Britain.
OS 250k and 500k Raster Maps	Raster dataset of OS 1:250,000 and 1:500,000 maps for the UK
Urban Settlement Boundaries	Urban settlement boundaries and population information from the last census provided by the Office of national statistics, in polygon format, http://www.statistics.gov.uk/geography/urban_settlement_boundaries.asp
National Rail Network maps and Train time tables	National Rail Network maps of Service Operators per line, Rail Network and Station Locations and Mainline and None Principle Routes. Time tables (journey planner). Obtained from http://www.nationalrail.co.uk/times_fares/download_tt.htm
Military Low Fly zones	Latitude and longitude data of the point location of low fly boundaries provided in MS excel format from the MOD (Ministry of Defence) No. of hours flown etcetera obtained from www.mod.uk/issues/low/flying RAF Boulmer ¼ million aviation maps for UK
Aeronautical maps for the UK both Civil and military data	Aeronautical maps in paper format with military and civil information, showing all airports, radar control zones and aircraft flight levels, en-route corridors, danger areas, low fly areas and structure height information etcetera. Provided by MOD
Traffic flow data	Motor Vehicle flow for England, by road class, obtained from the Department of works and transport, www.dft,gov.uk/transtat/roadtraff
Powerlines	The location of our transmission assets within England and Wales – National Grid
Wind Farms	BWEA website (http://www.bwea.com/).

Table 26: Datasets used in the GIS Model

Behind each component of the model there were a range of datasets and a series of techniques and operations that were applied to the data using the ArcGIS 8.3 and 9.1 systems with the Spatial Analyst extension. The key GIS terms and tools that were used in the model are set out below and they are explained more fully in the text where it is appropriate (Table 27). However, readers are encouraged to consult a GIS text such as Longley *et al*. (2001) if further details are required.

<table>
<tr><td>Vector</td><td>A data format in which spatial features are represented by points, lines and areas (see right). Each feature (e.g. a section of road, a power pylon or an area of woodland) can be associated with a range of attributes such a length, class, usage level, age or species mix.
 
</td></tr>
<tr><td>Raster</td><td>A data format in which spatial features are represented through values on a regular grid framework. The grid is made up of grid cells, or pixels, which have a defined spatial resolution or size. In this study the pixel size for all data was 500m x 500m. Raster data tend to be less geographically precise (see right) than vector data, but they have the key advantage of being able to support a range of continuous values rather than sharply bounded binary or multiple classifications.
<table>
<tr><td>U</td><td>U</td><td>F</td><td>F</td></tr>
<tr><td>U</td><td>U</td><td>A</td><td>F</td></tr>
<tr><td>U</td><td>W</td><td>A</td><td>A</td></tr>
<tr><td>A</td><td>A</td><td>A</td><td>F</td></tr>
</table></td></tr>
<tr><td>Reclassification</td><td>Reclassification is a technique whereby one set of values can be replaced by another set of values. It was extensively used in this project to convert a spread of raster cell values (say from 1 to 19,076) to a standard data range of one to ten. Equal interval classification was used throughout this project.</td></tr>
<tr><td>Distance Calculations</td><td>Distance calculations using the raster format calculate values for each grid cell which represent the distance that grid cell is away from the nearest of the defined start layers. For instance the map below shows a distance calculation away from primary and A roads in Tyne and Wear and South Northumberland.
  </td></tr>
<tr><td>Inter-Visibility Analysis</td><td>IVA is described in Section 4.3.3.2. It is a technique which uses a Digital Terrain (or Elevation) Model to calculate whether cells can be seen from each other. This can be extended to calculate the relative visibility of features such as roads or urban areas in the surrounding landscape or indeed the relative openness of the landscape as a whole.</td></tr>
<tr><td>Weighting</td><td>Not all factors are considered as equal in determining the final tranquillity map and a process of weighting was used to indicate their relative priority in the GIS model. A simple example of weighting is if two variables were scored from one to ten but the second variable was judged to be twice as important, the values would be reclassified as follows:
1 reclass as 2
2 reclass as 4
3 reclass as 6
4 reclass as 8
5 reclass as 10
6 reclass as 12
7 reclass as 14
8 reclass as 16
9 reclass as 18
10 reclass as 20
This could be achieved by simply multiplying the originally scaled factor by two in the raster calculator (see below).</td></tr>
</table>

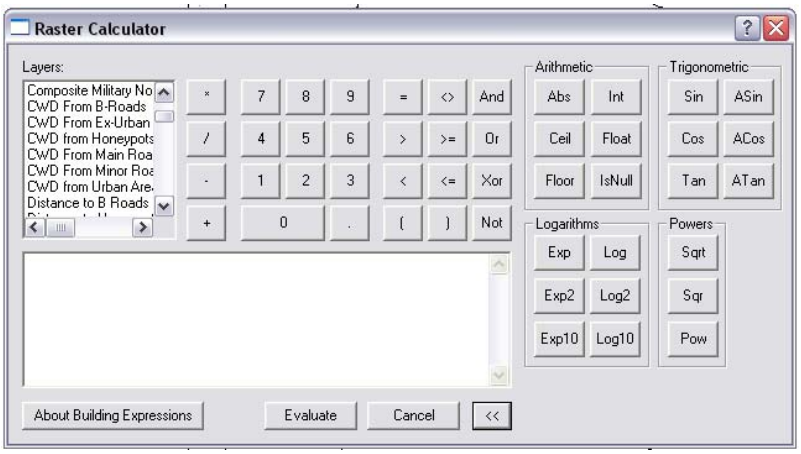
Raster Calculator	The Raster Calculator is a tool within Spatial Analyst and ArcGIS 8.3 that permits individual raster layers to be operated on mathematically (e.g. multiplied by a given number) or combined (e.g. layer one plus layer two). This process is sometimes termed 'mapematics' and when a series of such combination and/or mathematical operations are combined in a structured format the process is termed a cartographic model. The interface for the ArcGIS 8.3 Raster Calculator appears below. 

Table 27: Key GIS terms and techniques used in the report

The raster cell resolution adopted for this study was 500m x 500m. This was judged to be a trade-off between a higher level of spatial resolution which would have given rise to more finely grained results and the computing demands of carrying out all of the component calculations and classifications that result in the final model. Although 500m x 500m is a significant size on the ground it is worth bearing in mind that there are four such cells in a 1km x 1km cell, the spatial resolution of previous research in this area. The study area boundary is taken out to the limits of the low water mark around England.

4.3.2.4 Linking the PA Results and GIS Model

In mapping tranquillity in 2004 a detailed and extensive exercise associated qualitative and highly personal judgements about what is perceived as contributing to or detracting from an experience of tranquillity to quantitative digital datasets, that could then be used to map relative tranquillity. Based on the results and recommendations of that exercise the use and selection of options for the PA work, as explained in Section 4.1.2, have simplified the process of linking option choices to the digital data.

The bulk of the methodology presented here sets out for each individual option choice how the data was generated from the initial raw data to the final representation of relative contribution to or from tranquillity. The methodology has moved on from defining what GIS datasets and derived datasets can be linked to the PA work (although there is some element of that still involved but on a national scale) to minimising as far as possible use of expert judgement in the following steps in GIS model construction:

- the relative importance of components of digital datasets - their perceived contribution to an experience of tranquillity
- the choice and availability of datasets
- the choice of GIS tools and methods applied
- thresholds of distance upon perceived impact
- public perceptions of relative impact of features

	ID	Question	Total	Percentage Weighting
Positive	a01	Seeing, A natural landscape	533	6.59
	a13	Hearing, Birdsong	396	4.90
	a17	Hearing, Peace and Quiet	271	3.35
	a07	Seeing, Natural looking woodland	256	3.17
	a12	Seeing, The stars at night	245	3.03
	a08	Seeing, Streams	225	2.78
	a11	Seeing, The Sea	221	2.73
	a15	Hearing, Natural Sounds	212	2.62
	a14	Hearing, Wildlife	183	2.26
	a19	Hearing, Running water	180	2.23
	a09	Seeing, Rivers	176	2.18
	a02	Seeing, Wide open spaces	174	2.15
	a03	Seeing, A wild landscape	171	2.12
	a05	Seeing, Trees in the landscape	146	1.81
	a10	Seeing, Lakes	118	1.46
	a04	Seeing, Remote landscapes	113	1.40
	a18	Hearing, No human sounds	109	1.35
	a20	Hearing, Lapping water	109	1.35
	a21	Hearing, The sea	84	1.04
	a06	Seeing, Deciduous trees in the landscape	72	0.89
	a16	Hearing, Silence	47	0.58
		Sub-total	**4041**	**50**
Negative	a41	Hearing, Constant noise from cars, lorries and/or motorbikes	886	10.96
	a22	Seeing, Lots of people	627	7.76
	a30	Seeing, Urban development	373	4.62
	a24	Seeing, Overhead light pollution (night time)	270	3.34
	a37	Hearing, Lots of people	266	3.29
	a25	Seeing, Low flying aircraft	228	2.82
	a38	Hearing, Low flying aircraft	225	2.78
	a28	Seeing, Power lines	221	2.73
	a34	Seeing, Towns and Cities	202	2.50
	a33	Seeing, Roads	139	1.72
	a44	Hearing, Non-natural sounds	107	1.32
	a31	Seeing, Any signs of human impact	102	1.26
	a36[13]	Seeing, Military training (not aircraft)	101	1.25
	a29	Seeing, Wind turbines	88	1.09
	a42	Hearing, Occasional noise from cars, lorries and/or motorbikes	44	0.54
	a43	Hearing, Military training (not aircraft)	32	0.40
	a32	Seeing, Railways	30	0.37
	a26	Seeing, High altitude aircraft	25	0.31
	a40	Hearing, Trains and Railways	24	0.30
	a23	Seeing, Anyone at all	18	0.22
	a27	Seeing, Coniferous woodland	17	0.21
	a39	Hearing, High altitude aircraft	11	0.14
	a35	Seeing, Villages and Scattered Houses	5	0.06
		Sub-total	**4041**	**50**
		Total	**8082**	**100**

Table 28: PA weighting coefficients for option choices

[13] Data was not available in time for the completion of the project for option choice a36 and a43

The results of the PA work directly derived the weightings of the relative importance of options choices to their contribution to an experience of tranquillity. Table 28 presents a figure, for each option choice, as a percentage of its relative contribution to or from tranquillity. The option choices have been ranked for both positive and negative categories by those that received the highest scores (number of dots). It is important to note that the range in percentages for both positive and negative is significant, for example, for the negative option choices it ranges from 0.06 to 10.96. This range in values will significantly weight the option choice 'hearing constant noise…' in comparison to the option choice seeing, villages and scattered houses. The results of the public consultation are consequently reflected in the final outcome of the map of tranquillity. Each option choice is effectively ranked in terms of its relative contribution to or detraction from tranquillity as the number of responses available was limited to three for both positive and negative option choices (see Section 4.1.3).

Expert judgements are limited where possible to the use of tools within GIS to generate data that represents the relative contribution of each option choice. This process, in addition, is constrained by the availability of datasets. Option choices vary greatly in terms of their (technically defined) precision. For example, while being able to see power cables is very specific and precise, being able to see "a natural landscape" is less specific and leaves questions about species and proportions and public bias unanswered. Further along this spectrum are option choices such as 'seeing, a wild landscape', 'seeing, remote landscapes' and 'seeing, lots of people'.

Modelling the impact of 'seeing, High altitude aircraft', 'hearing streams and rivers', is constrained by the lack of data on the frequency of traffic along main flight paths and data on noise levels at source for rivers and stream, without which their relative contribution is difficult to model. This disparity in the precision of an option choice and available data has inevitably let to some restrictions upon the selection of method used to model relative contribution of an option choice to tranquillity. Unfortunately, due to restraints on being able to obtain data, the option choices 'Seeing..' and 'Hearing military training (not aircraft)' have not been included in the final GIS model. In addition, it has not been possible to distinguish between streams and rivers, so these two option choices and the PA coefficient have been combined (Section 4.3.3.3.4).

The use of Threshold Analysis has removed the previous reliance on expert judgements in assigning relative weightings of importance, as confirmed by responders, to 'indicators' of tranquillity. In addition, it has provided data on the perceived impact of features relative to distance – removing the use of theoretical zones of visibility that simply relates to what 'you can see' as opposed to perceived impact. The literature review has identified previous research into the recurrent themes from the PA work, primarily noise, (remoteness from other) people, perceived naturalness and landscape character.

Linking qualitative data with GIS is fraught with difficulties. As in the previous report, our response to both the conceptual and the technical problems has been one of transparency about why decisions were taken or how they were carried through. Through reference to published sources imprecise terms such as a "natural landscape" have been connected with specific datasets and this process is documented and referenced as appropriate. It is important to note that use of this frame of reference (published work) is used as a complement to the PA data only where additional guidance was needed in moving from the general to the specific. Where a direct association between PA data and GIS datasets could be made no external frame of reference was needed. For instance, the case of traffic directly led to a need for visibility analysis of roads.

As a point of principle, 'expert' decisions about what to include and what relative weightings to allocate have been kept to an absolute minimum and the results of the consultation work are used to define the parameters of the model wherever possible in the following steps:

- Identification of available datasets
- Selection of method to model relative contribution to tranquillity
- Application of thresholds (if applicable) to model perceived impact

The option choices are very clearly separated into two overarching categories discussed below:

- Seeing, Tranquillity
- Hearing, Tranquillity

The positive and negative contribution of each option choice can be modelled by establishing the visual intrusion or enhancement of an option choice and deriving the impact of noise or the ability to hear an option choice.

4.3.3 Seeing, Tranquillity

The incorporation of what you can 'see' and its effects on a person's experience of tranquillity has been well established by the PA in the 2004 study and by the verification exercise as being essential in terms of modelling relative tranquillity; this is reflected in the twenty-six option choices devoted to what you can see - contributing to or detracting from an experience of tranquillity in this study.

Method	What is 'Tranquillity'? What enhances 'it'? What adds to 'it'?	What is not 'tranquillity'? What detracts from 'it'? What Lessons 'it'?
	Positive Attributes	Negative Attributes
Visibility/Distance weighted	Seeing, Trees in the Landscape Seeing, Deciduous trees in the Landscape Seeing, Natural Looking Woodland Seeing, Streams and Rivers[14] Seeing, Lakes Seeing, The Sea	Seeing, Wind turbines Seeing, Power lines Seeing, Roads Seeing, Railways Seeing, Towns and Cities Seeing, Villages and Scattered Houses Seeing, Coniferous woodland
Visibility: Context Specific Presence/absence		Seeing, High Altitude aircraft Seeing, Low flying aircraft
Visibility at night	Seeing, The Stars at Night	Seeing, Overhead pollution (night time)
Openness	Seeing, Wide open spaces	
Perceived Naturalness	Seeing, A Natural Landscape	
Combined Datasets	Seeing, A wild Landscape Seeing, Remote Landscapes	Seeing, Lots of people Seeing, Urban Development Seeing, Any signs of human impact Seeing, Anyone at all

Table 29: Categories of modelling

The methodology developed to account for the effect of visibility of features upon relative tranquillity in the 2004 study applied straightforward visibility analysis to obvious features in the landscape. This relative 'score' of visibility was then weighted so that the closer the feature is to a person the more impact it is likely to have. The weighting scores were derived by the researchers based on Theoretical Zones of visibility (Benson, *et al*. 2002) and the relative height of the feature for which visibility is being modelled. Based on recommendations from the 2004 study an exercise examining public perceptions of distance using images of Roads, Power Pylons and Deciduous trees was carried out. These results have been used in two key ways: using perceptions of distance to establish the relative intrusion or contribution of both positive and negative features; and to gain an understanding of public perceptions of relative importance of a given feature in its contribution to or detraction from an experience of tranquillity. This improves the results of the visibility analysis as it reflects public perceptions of the effect of features which add value to what can be physically seen.

[14] The two separate options of 'Seeing, Streams and Seeing, Rivers' have been combined as it is impossible to separate out streams and rivers from Strategi™

The same methodology has been adopted in this study but within the restrictions of data availability at a national scale and with the addition of the Spatial Threshold Analysis. Reflecting these limitations and advances, the methodology has been separated into six categories of modelling the relative effects of what you can 'see' upon an experience of tranquillity (Table 29):

- Visibility/Distance weighted
- Visibility: Context Specific Presence/absence
- Visibility at night
- Openness
- Perceived Naturalness
- Combined Datasets

All six categories draw upon techniques developed in the 2004 study, in some cases actually improve upon it, but also reflect necessary compromises - where data is restricted or not available at a national scale.

4.3.3.1 Visibility/Distance Weighted - Visibility of Features in Surrounding Landscape

Out of the twenty-six option choices identified in the 'seeing' category, the visibility of sixteen of the options can be derived directly using visibility analysis. The visibility of these features has been calculated individually using standard visibility analysis. The results of the visibility analysis have then been distance weighted to reflect the greater visual impact of features close to the viewer than those further away as described in the following sections – drawing heavily upon the results of the Spatial Threshold Analysis. Section 4.3.3.3 describes how the requirements of the project are reflected in the specification of parameters for the GIS dataset associated to each option choice. The method of data capture is also described.

4.3.3.2 Visibility Analysis - Technical Information

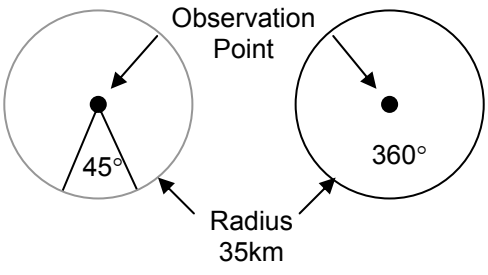
Visibility Analysis identifies those areas on a map that can see a single or many specified objects, for example, pylons. In this study the in-built viewshed function, part of the Spatial Analyst extension in ArcGIS v8.3/9.1, has been used to carry out the visibility analysis. Viewshed is one of many in-built functions within GIS software that are available for this type of analysis. There is no single description of visibility analysis, as various software packages implement it differently. The type of datasets required in a visibility analysis and parameters that can be applied to them are summarised below:

- A Digital Elevation Model (DEM), that describes height over a topographic surface.

- A data set of predefined observation points can be used in the analysis. Observation points can take the form of any feature such as pylons or wind turbines or the whole land surface. For an area, a grid of observer points that covers the surface has to be created.

- For each observation point it is possible to set the field of view or azimuth, i.e. complete at 360º or at a defined azimuth of 45º.

Azimuth and Radius:



In any visibility analysis, it is possible to set a distance limit beyond which visibility is no longer calculated. This radius can be set at any specified distance or is not set i.e. limitless. This brings in the issue of zones of theoretical limits of visibility (ZTV), which is the maximum distance over which research indicates objects of different sizes can be seen in clear conditions. ZTVs are therefore specific to different objects.

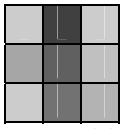
Height of turbines (total including rotors)(m)	Recommended ZVI distance (km)
50	15
70	20
85	25
100	30

Source: Benson *et al*. (2002)

Table 30: Theoretical limits of visibility: visibility assessment of windfarms – best practice

- Heights are then chosen above the height given by the DEM for the observation points being analysed. This is the subject height, for instance, the height of pylons. This is known as a height offset.
- An offset height for the observer is also essential and is known as a viewing height – for instance, an individual standing within a National Park. The output or results of the analysis, a visibility surface, are usually recorded in Raster format.

Raster Format:



1	5	1
2	4	1
1	3	2

Uses a grid structure to store geographic information.

- Calculating visibility identifies those cells in an input DEM that can be seen from one or more than one observation point subject to predefined parameters. Using one observation point as an example the output visibility map would contain cells that are classed as:
    - A cell that can see the given observer point = 1
    - A cell that cannot see the given observer point = 0

For each observation point the calculation is repeated individually. Each grid cell accumulates the cumulative score of visibility and it is equal to the number of observation points that that grid cell can 'see'. This number is controlled by the parameters set for the subject height, viewing height, location and number of observation points and resolution (grid size) of the output visibility surface. The higher the number of observation points a grid cell can 'see', the more visible that given grid cell is.

To summarise there are five key parameters that can be defined:
- subject height: the object being observed
- viewing height: the observer
- radius: distance limit of visibility calculations
- azimuth: field of view
- output grid: resolution of the visibility surface

By changing the five parameters listed above it is possible to compile detailed and specific analysis of visibility to match GIS datasets to the option choices identified and provide a relative indicator of the visibility of these features within the landscape.

4.3.3.3 Visibility Analysis – Parameters

4.3.3.3.1 Seeing, trees in the landscape

Using the LCS 2000 dataset, all areas that fall into the sub-class of 1.1 Broad Leafed woodland and 2.1 Coniferous Forest were covered in a blanket grid of observation points. These woodland areas were overlaid by grid squares 200m by 200m. Each grid square is then converted to a central point - the centroid - which forms that cells observation point. The parameters given below were applied. Cumulative visibility is then calculated for LCS 2000 1.1 and 2.1 sub-classes within 6km of the boundary of England.

Criteria	Parameter	Description
Subject Height[15]	25m 30m	Average height of mature deciduous woodland Average height of mature coniferous woodland
Viewing Height	1.72m	Average height of a person
Radius (ZTV)[16]	6km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 31: Parameters – 'seeing, trees in the landscape'

4.3.3.3.2 Seeing, deciduous trees in the landscape

Using the points generated for 'Seeing, Trees in the Landscape' visibility was calculated for all observation points covering sub-class 1.1 broad leafed woodland areas within 6km of the boundary of England.

Criteria	Parameter	Description
Subject Height	25m	Average height of mature deciduous woodland
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 32: Parameters – 'seeing, deciduous trees in the landscape'

4.3.3.3.3 Seeing, natural looking woodland

This option choice is very similar to 'Seeing, trees in the landscape'. However, it has an element of personal preference attached to it – more than other options - and it implies a judgement of what is natural. Therefore visibility for the two sub-classes of 1.1 broad leafed woodland and 2.1 coniferous forests were calculated separately, using the observation points generated for 'Seeing, Trees in the Landscape. The scores applied to differing images of trees, both coniferous (7) and deciduous (8) in the spatial threshold analysis (perceived Naturalness Table 18) were used to separate the influence of preference for different types of woodland in this category the method used is outlined in Figure 9.

Criteria	Parameter	Description
Subject Height	25m 30m	Average height of mature deciduous woodland Average height of mature coniferous woodland
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid	500m	The output visibility surface is the same as the 500m grid used

[15] National Forest study Graham Bull Woodlands Survey Unit

[16] Benson et al. (2002) see Table 30– applies to all applications of ZTV

Size		throughout this study.

Table 33: Parameters – 'seeing, natural looking woodland'

4.3.3.3.4 Seeing, streams and rivers

A point has been generated every 200m along all streams and rivers within a 6km radius of the boundary of the England. The parameters below were applied.

Criteria	Parameter	Description
Subject Height	0m	Stream and river Level
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 34: Parameters – 'seeing, streams and rivers'

4.3.3.3.5 Seeing, lakes

All polyline lake features from the Strategi™ data set were selected out and converted to polygon features. These features were covered in a blanket grid of points. These points were generated by first overlaying 200m grid squares over each polygon. Each grid square is then converted to a central point - the centroid - which forms that cells observation point. The parameters given below were applied.

Criteria	Parameter	Description
Subject Height	0m	Lake Level
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	35km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 35: Parameters – 'seeing, lakes'

4.3.3.3.6 Seeing, the sea

The sea is covered in a blanket grid of points. These points were generated by first overlaying 200m grid squares over all areas not land outside the England boundary out to 35km. Each grid square is then converted to a central point - the centroid - which forms that cells observation point. The parameters given below were applied.

Criteria	Parameter	Description
Subject Height	0m	Sea Level
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	35km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 36: Parameters – 'seeing, the sea'

4.3.3.3.7 Seeing, wind turbines

The point location and rotor height of all wind farms and their turbines were obtained from the BWEA website (http://www.bwea.com/). The grid reference obtained is accurate to within 100m. The parameters given below were applied.

Criteria	Parameter	Description
Subject Height	Height	Rotor height of turbine
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	20km	Theoretical limit of visibility for structures between 50 and 100m in height[15]
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 37: Parameters – 'seeing, wind turbines'

4.3.3.3.8 Seeing, power lines

The visibility of point locations of pylons (greater than 475volts) that lie within 15km of the study area boundary was calculated using the parameters given below.

Criteria	Parameter	Description
Pylons	45m	Height of vertical structures.
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	15km	Theoretical limit of visibility for structures between 15 and 50m in height
Azimuth	15º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 38: Parameters – 'seeing, power lines'

4.3.3.3.9 Seeing, roads

A point has been generated every 200m along all motorways, primary roads, A roads, B roads and minor roads that lie within a 6km radius of the boundary of the England. The parameters below were applied.

Criteria	Parameter	Description
Subject Height	3m	Worst case scenario representing the height of a lorry on a road
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility for an object less then 15m in height
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 39: Parameters – 'seeing, roads'

Cumulative visibility is then calculated for each separate road type. The visibility score represents the relative visibility of, in a worst-case scenario, lorries up to a height of 3m at any point along any road within the study area.

4.3.3.3.10 Seeing, trains and railways

A point has been generated every 200m along all types of railway that lie within a 6km radius of the boundary of England. The parameters given below were applied.

Criteria	Parameter	Description
Subject Height	3m	Average height of trains
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility for an object less then 15m in height
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 40: Parameters – 'seeing, trains and railways'

4.3.3.3.11 Seeing, towns and cities

Urban areas (population above 10,000)[17] were covered in a blanket grid of points. These points were generated by first overlaying all large urban areas with 200m grid squares. Each grid square is then converted to a central point - the centroid - which forms that cell's observation point. The parameters given below were applied. Cumulative visibility is then calculated for all large urban areas within 6km of the boundary of England.

Criteria	Parameter	Description
Subject Height	5m	Average height of buildings in built up areas
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility for an object less then 15m in height
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 41: Parameters – 'seeing, towns and cities'

4.3.3.3.12 Seeing, villages and scattered houses

Rural areas (population below 10,000) were covered in a blanket grid of points. These points were generated by first overlaying all large urban areas with 200m grid squares. Each grid square is then converted to a central point - the centroid - which forms that cells observation point. The parameters given below were applied. Cumulative visibility is then calculated for all isolated properties that lie within 6km of the boundary of England.

Criteria	Parameter	Description
Subject Height	5m	Average height of buildings in built up areas
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility for an object less then 15m in height[15]
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 42: Parameters – 'seeing, villages and scattered houses'

4.3.3.3.13 Seeing, coniferous woodland

Using the points generated for 'Seeing, Trees in the Landscape' visibility was calculated for all observation points covering sub-class 2.1 coniferous forest areas within 6km of the boundary of England.

[17] Note: The office of national statistics1 states that "to produce consistency in statistical reporting a cut off population of 10,000 is recommended for general purpose use…. Using this standard, all settlements of over 10,000 are treated as urban areas. All smaller settlements, together with all other land, are treated as rural areas."

Criteria	Parameter	Description
Subject Height	30m	Average height of mature coniferous woodland
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	6km	Theoretical limit of visibility
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 43: Parameters – 'seeing, coniferous woodland'

4.3.3.4 Distance Weighting

The visibility calculations were distance-weighted to reflect the greater visual impact of features close to the viewer than those further away.

4.3.3.4.1 Distance Weighting - Spatial Threshold Analysis

There were four sets of images, representing roads, power pylons, large urban areas and small urban areas in a rural environment. Each series of images were declining in distance. Each participant was asked to rate a series of images on how much the feature (i.e. road/pylon/urban area) takes away from their feelings of tranquillity (ratings between 1 and 10). The median values for all the participants' results per image were used to establish the weighting for the visibility of roads, urban areas and power pylons.

	Distance weightings				
Option Choice	**500m**	**500m – 1km**	**1km – 2km**	**2km – 5km**	**5km+**
Seeing, Roads	10	6	4	4	2
Seeing, Towns and Cities (Urban Areas)	10	9	8	7[18]	7
Seeing Villages and scattered houses (Rural Areas)	7	7	4	4	0
Seeing, Power Lines (Pylons)	9	6	3	2	1

Table 44: Distance weightings (median score values) taken from the PA data[19]

4.3.3.4.2 Distance Weighting Non-Spatial – Threshold Analysis

Using distance weighting identified using the spatial threshold analysis, in combination with the judgement of the researchers and reference to good practice in the landscape field, similar weightings were created for the other features and categories.

	Distance Weightings				
Option Choice	**500m**	**500m – 1km**	**1km – 2km**	**2km – 5km**	**5km+**
Seeing, Railways	10	6	4	4	2
Seeing, Wind farms	7	5	3	2	1
Seeing, Streams and Rivers	10	10	8	8	9
Seeing, Lakes	10	10	8	8	9
Seeing, The Sea	10	10	10	10	10
Seeing, Trees	10	10	10	10	10
Seeing, Natural Looking woodland	10	9	9	9	9
Seeing, Deciduous Trees	10	9	9	9	9

[19] In the PA results the median value for 2km away from large urban area image was lower than for the image of urban areas 5km away. This anomaly was deemed to have occurred due to the urban area in the 2km image being obscured more by trees and poorly lit in comparison to the 5km image, which created a sense that the urban area in the 5km image was closer than in the 2km image. It was therefore decided to give the same weighting to both.

Seeing, Coniferous woodland	10	9	9	9	9
Seeing, Lots of people	10	8	7	7	6
Seeing, Military Training (other than aircraft)	10	9	8	7	7
Seeing, Low flying aircraft	N/A	N/A	N/A	N/A	N/A
Seeing, High altitude aircraft	N/A	N/A	N/A	N/A	N/A

Table 45: Distance weightings based on PA and researchers judgement

4.3.3.5 Visibility/Distance Weighted Methodology

The results of the visibility analysis are multiplied by the distance weighting, as described in the above two sections. The methods and steps involved are illustrated in Figure 9.

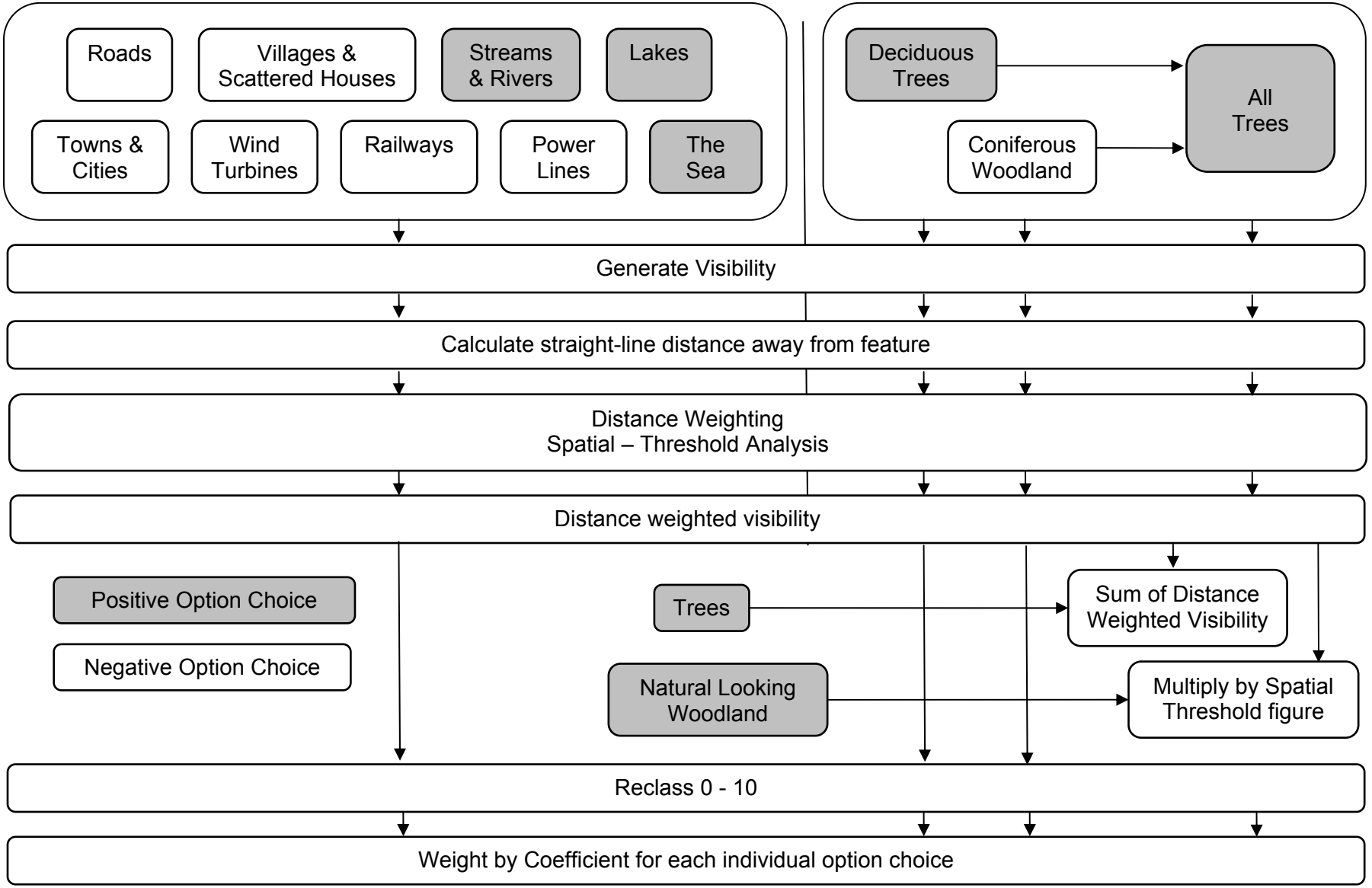


Figure 9: Summary of data generation for Visibility Distance weighted visibility calculations

4.3.3.6 Visibility - Context Specific Presence/Absence

As modelling the visibility of both high and low flying aircraft is not possible proxy datasets of where someone is more likely to see these aircraft have been used to model the following option choices:

- Seeing, high altitude aircraft
- Seeing, low flying aircraft

Main flight paths of the UK, Low Flying Areas and Civil Control Zones have been used to determine the relative likelihood of seeing both high and low flying aircraft.

4.3.3.6.1 Seeing, high altitude aircraft

Variations in the relative contribution of visual intrusion upon tranquillity by high altitude aircraft, has been crudely related to the percentage area of each 500m x 500m grid covered by the major flight paths across England. The presence or absence within a given 500m x 500m grid is used as a proxy of the relative contribution to and detraction of high altitude aircraft from an experience of tranquillity (Figure 10).

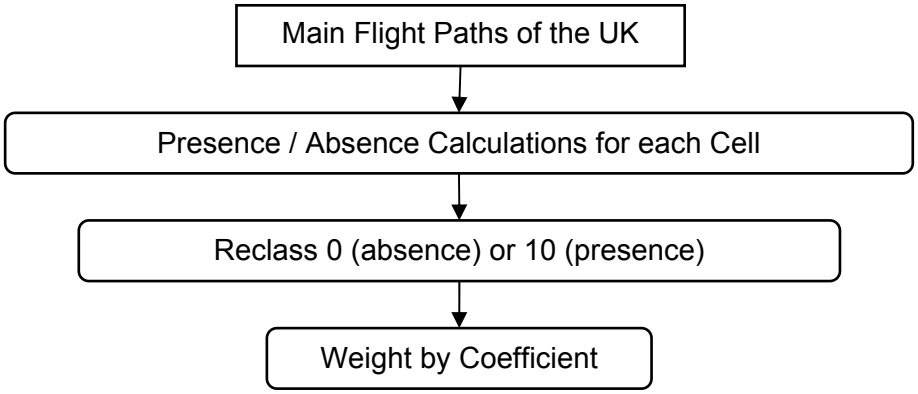


Figure 10: Summary of data generation for 'seeing, high altitude aircraft'

4.3.3.6.2 Seeing, low flying aircraft

Variations in the relative contribution of visual intrusion upon tranquillity by low flying aircraft, has been crudely related to the percentage time someone is likely to see low flying aircraft (within a 12 hour period) for each 500m x 500m grid covered by the Low Flying Areas and Civil Control Zones England. The method used to generate the data for this option choice is summarised in (Figure 11).

Military low flying areas and the hours flown within each area for a year were obtained. The time weighting was calculated by dividing the hours flown by the useable area in m^2 times by 500; this gave the maximum potential hours flown within a 500m grid square. This was then divided by the number of hours in a year to represent the likelihood of someone seeing a low flying aircraft within a 12 hour period if standing within a given 500m grid square within a LFA.

Time weightings for airports were calculated by dividing the aircraft traffic number for a year per airport by 365, this was then halved to represent a 12hour period (day). This figure was then multiplied by 2 minutes to give an estimated amount of time aircraft could possibly be seen within a control zone in a day. This was then divided by the amount of minutes in a 12 hour period, to give the percentage time an aircraft could be seen.

It was assumed that on average it takes 2 minutes for an aircraft within a control area to pass a person's line of sight. This is obviously highly variable as an aircraft speed, type, direction and activity (i.e. taking off, landing and holding) can greatly affect the length of time it is seen. A general

assumption has been made that on average there is only ever one aircraft passing, taking off or landing at any time.

As can be seen from the method and the assumptions outlined above, this time weighted method and time weighted calculation of the chance of seeing a low flying aircraft is only an estimate of the maximum visual disturbance which could possibly occur due to low flying aircraft within an area relative to England as a whole.

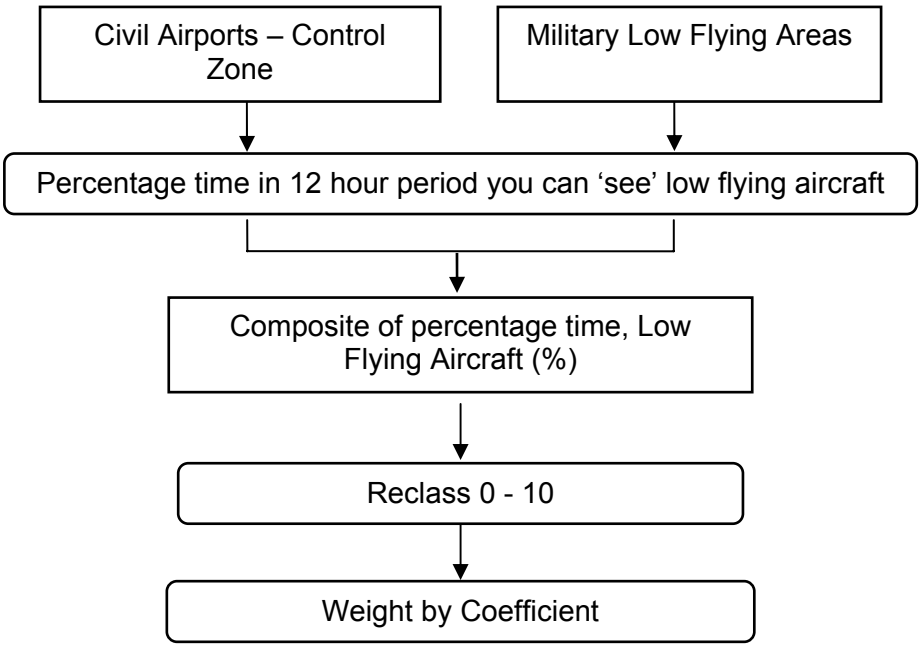


Figure 11: Summary of data generation for 'seeing, low flying aircraft'

4.3.3.7 Visibility at night

As detailed in the technical report for the NE study of tranquillity "Light pollution is a negative externality, that is an unwelcome side effect from one person / group/ area's private use of light that affects wider public interests that may be better served by an absence of light" (MacFarlane *et al.* 2004:114). Based on the PA work two option choices were included in the survey that relate to night time light pollution that:

- Detracts from tranquillity - Seeing, overhead pollution (night time)
- Contributes to tranquillity - Seeing, the stars at night.

It has been established in the technical report of the North East that 'skyglow', defined as the brightness of the night sky as a function of distance from varying sizes of urban areas, can be used as a proxy for light pollution. Skyglow calculated using the method defined below is therefore a proxy for 'Seeing, Overhead Pollution' and consequently, an inverse of the dataset is a proxy for areas where someone is more likely to see the stars at night (Figure 12).

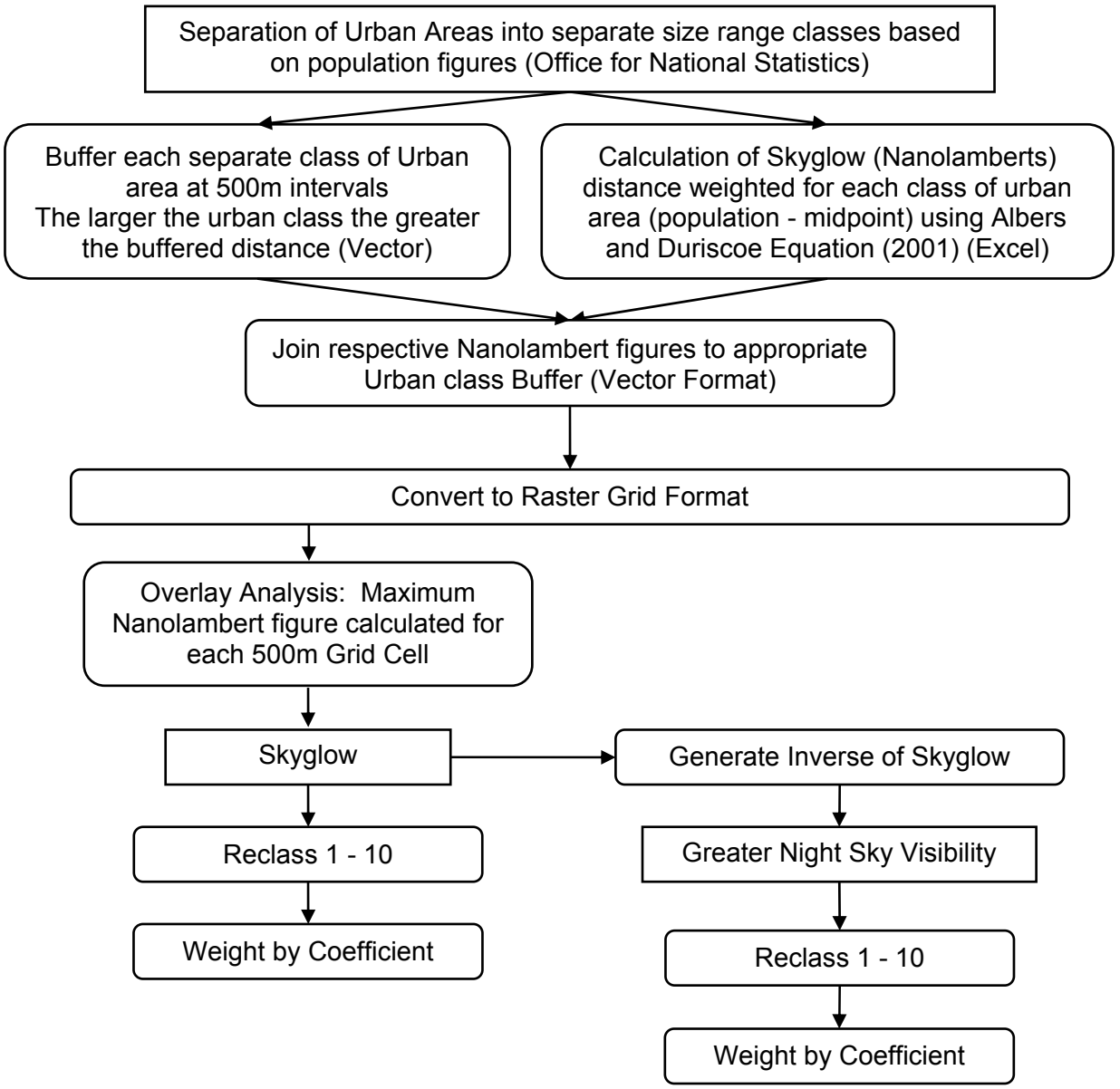


Figure 12: Summary of data generation for 'seeing, overhead pollution (night time)' and 'seeing, the stars at night'

The following caveats however apply:

- The research underpinning the calculation of skyglow is drawn from the USA where cities are much larger and the population density of rural areas is generally far lower (Albers and Duriscoe, 2001).
- No account is taken of sparsely distributed light sources as skyglow results from the cumulative effect of concentrations of light sources.
- Only skyglow is considered here; from an experiential point of view visibility of isolated lights or concentrations of lights in the distance may also have a negative impact
- For more information on problems associated with skyglow see CPRE report[20].

[20] http://www.cpre.org.uk/resources/pub/pdfs/landscape/light-pollution/night-blight-leaflet-a3.pdf

Eight population classes for urban areas (of a population greater than 1000) were taken from an Office of National Statistics[21] dataset and from this midpoints were generated (Table 46).

Population classes for urban areas	Midpoint used for skyglow modelling
1,000-2,999	2000
3,000-9,999	6500
10,000-24,999	17500
25,000-49,999	37500
50,000-99,999	75000
100,000-249,999	175000
250,000-749,999	500000
750,000+ (965928)	857964

Table 46: Median values of population classes used in skyglow calculations

The mid-point of each range was then used in the equation (in Excel) to calculate the skyglow in Nanolamberts per distance in 500m bands:

Skyglow in Nanolamberts = 11300000 x (population x distance -2.5)

The above equation, derived by Albers and Duriscoe (2001), quantitatively defines skyglow as a function of distance from urban area and size of urban area.

Distance (metres)	Population							
	2000	6500	17500	37500	75000	175000	500000	857964
	Skyglow in Nanolamberts							
500	4042	13138	35374	75802	151604	353745	1010702	1734293
1000	714	2323	6253	13400	26800	62534	178669	306583
1500	259	843	2269	4863	9725	22693	64837	111255
2000	126	411	1105	2369	4738	11055	31584	54197
2500	72	235	633	1356	2712	6328	18080	31024
3000	46	149	401	860	1719	4012	11462	19667
3500	31	101	273	585	1169	2729	7796	13378
4000	22	73	195	419	838	1954	5583	9581
4500	17	54	146	312	624	1456	4159	7137
5000	13	42	112	240	479	1119	3196	5484
5500	10	33	88	189	378	881	2518	4322
6000	8	26	71	152	304	709	2026	3477
6500	7	22	58	124	249	581	1659	2846
7000	6	18	48	103	207	482	1378	2365
8000	4	13	35	74	148	345	987	1694
8500	3	11	30	64	127	297	848	1455
9000	3	10	26	55	110	257	735	1262
9500	3	8	22	48	96	225	642	1102
10000	2	7	20	42	85	198	565	969

Table 47: Distance, population and skyglow in Nanolamberts

A cut-off of 1000 Nanolamberts was used as the lower limit of the calculations (Table 47). The exponential nature of the unit of measurements is clear, as is the relatively localised effect of skyglow from urban settlements.

[21] Office of National Statistics *Summary for Urban Settlements (1,000+) by size of population: England and Wales Urban and Rural Area Definitions A User Guide*, Office of the Deputy Prime Minister, Last accessed 07/07/06 http://www.statistics.gov.uk/geography/downloads/User%20Guide%20_27AugONS.pdf

4.3.3.8 Openness

The option choice 'Seeing, Wide open spaces', is a factor that contributes to tranquillity. The 'perceived' openness of the landscape was modelled in the NE study. This methodology has been adapted and applied for the whole of England using the steps outlined in Figure 13.

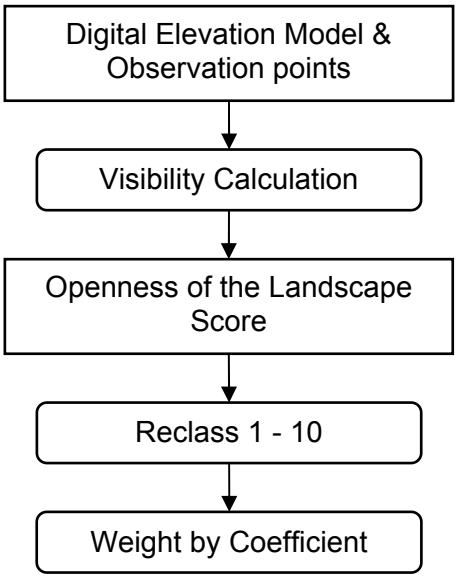


Figure 13: Summary of data generation for 'seeing, wide open spaces'

However, the same caveats and assumptions apply:

- The ability to view a wide area is more likely, all other things being equal, to include views of features such as roads, urban areas and power lines, which are not positively associated with tranquillity.
- Greater scores of calculated openness and associated increased ability to see other features that impact upon perceived openness are complemented by other option choices (Seeing, Roads; Seeing Powerlines; Seeing, Trees; Seeing Lakes).
- Openness is a simple function of terrain – it does not incorporate what is built or growing on it.
- Instead of modelling the visibility of obvious static features such as pylons and wind turbines or trees, modelling this option involves determining the visibility of the whole of the land surface relative to the nature of the surrounding topography. Wide open spaces will have a relative higher modelled visibility in comparison to deeply incised valley floors. By covering the whole of the land surface in a blanket grid of 500m x 500m grid cells the results of an iterative calculation for each individual grid cell represent how many other grid cells can be seen from that grid cell. The result gives a measure of how much land can be seen, which equates to openness of the landscape, for each individual grid cell.

Using the basic principles of visibility analysis outlined in Section 4.3.3.2 it was possible to derive a score of relative openness. This is achieved by covering the whole of England (and 30km inside the Welsh and Scottish Borders) in a blanket grid of points. The points were generated by overlaying the areas with 500m grid squares and generating a central point – the centroid – which forms the cells observation point. The parameters given below were applied.

Criteria	Parameter	Description
Subject Height	0m	Ground surface
Viewing Height	1.72m	Average height of a person
Radius (ZTV)	30km	Theoretical limit of visibility[15]
Azimuth	360º	Complete field of view
Output Grid Size	500m	The output visibility surface is the same as the 500m grid used throughout this study.

Table 48: Parameters – 'seeing, wide open spaces'

Cumulative visibility is then calculated for each individual point (Figure 14).

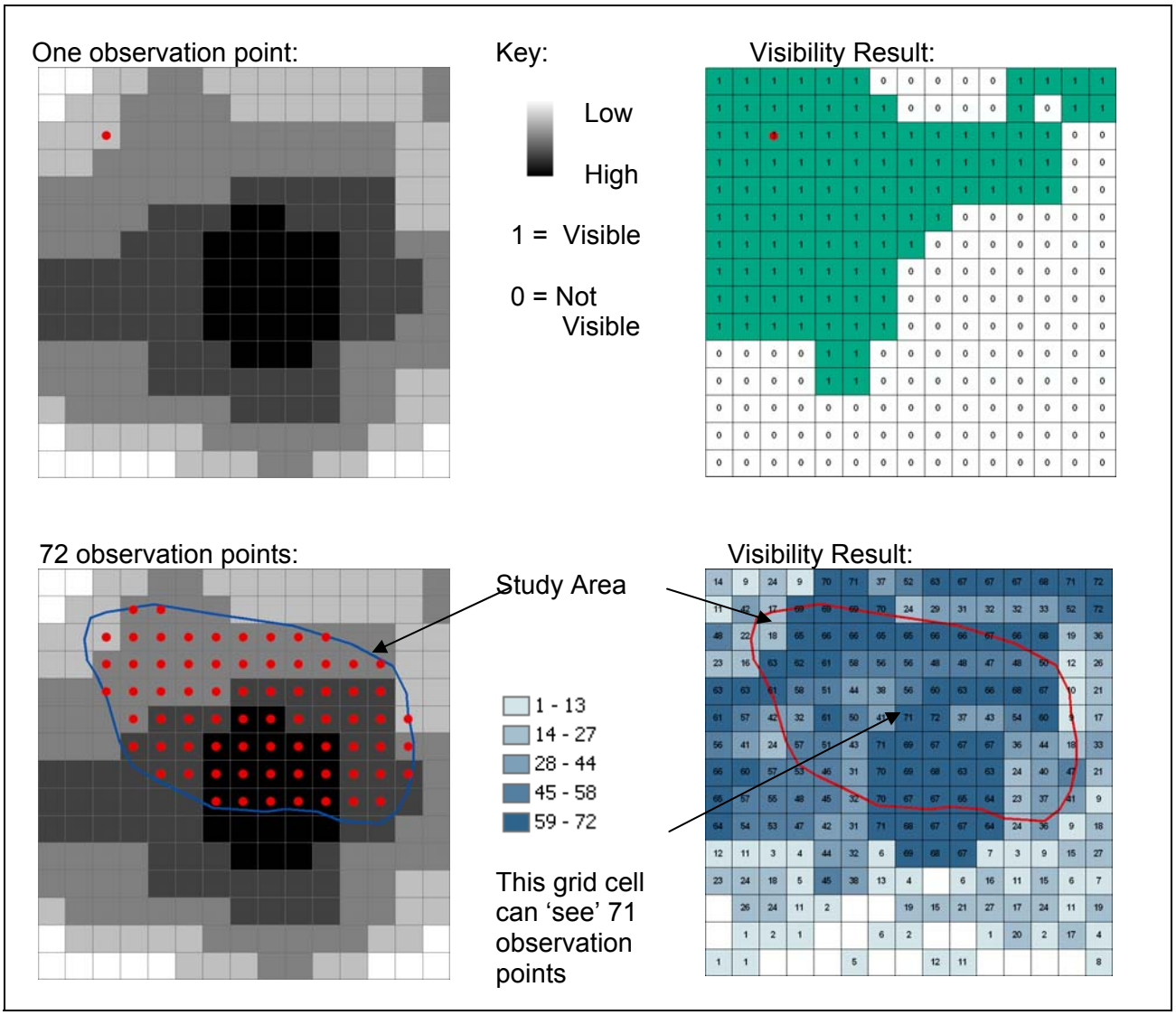


Figure 14: Single and multiple observation points in inter-visibility analysis

The resulting visibility score acts as a relative proxy for openness – the higher the visibility the more 'open' an area is perceived to be.

4.3.3.9 Naturalness

The option choice 'Seeing, A natural landscape', is a factor that contributes to tranquillity. The 'perceived' naturalness of land cover was modelled in the 2004 pilot study. This methodology has been adapted and applied for the whole of England using the methodology outlined in Figure 15.

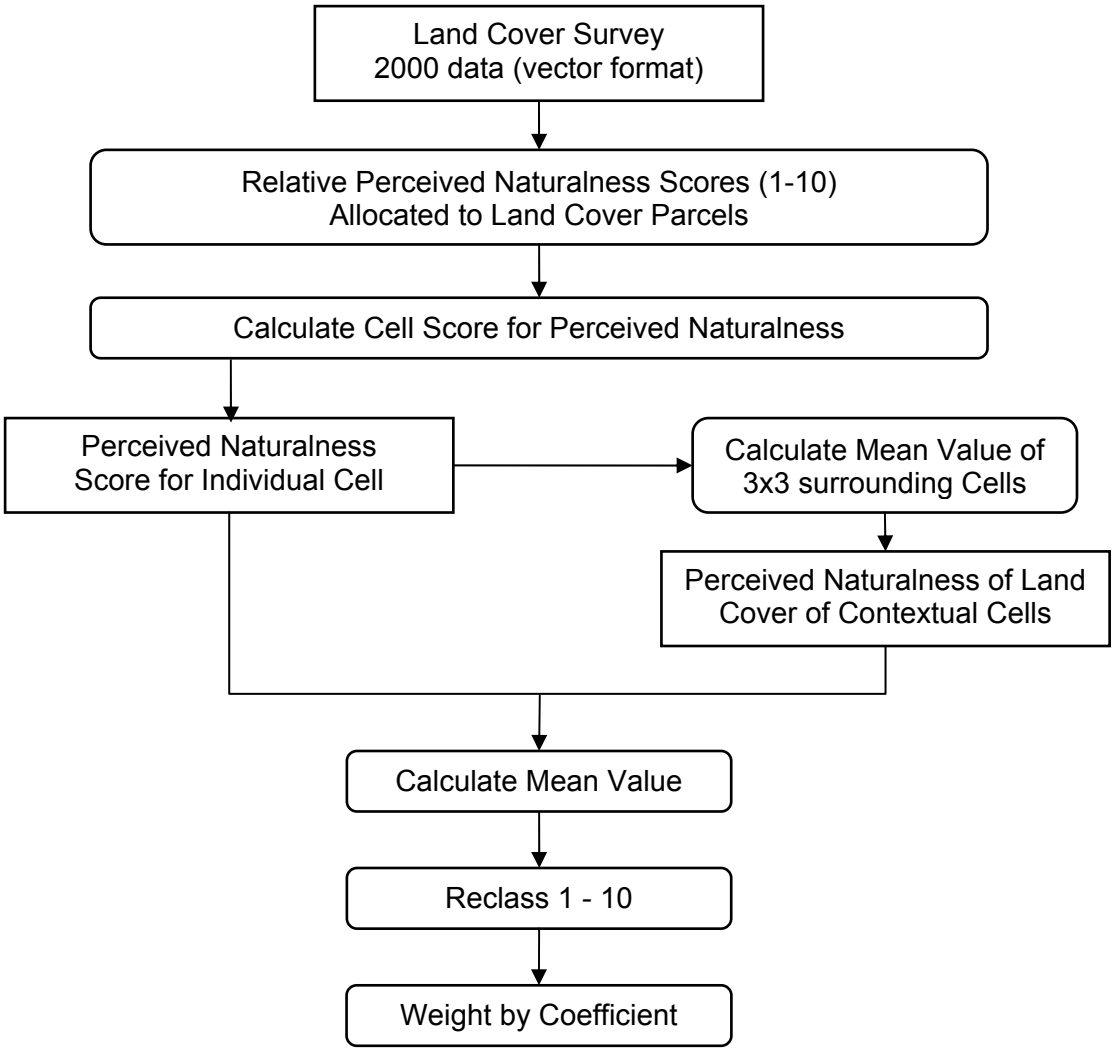


Figure 15: Summary of data generation for 'seeing, a natural landscape'

As in the 2004 study the following caveats apply:

- Geographical and cultural determinants – the PA work as yet does not take into account expectations of what is a natural landscape and therefore cannot be accounted for in the dataset.
- An individual's response, the potential bias of their ecological knowledge and the ability to discriminate and appreciate the significance of different species and their patterning in the landscape are variable.
- Individuals' responses to the type and intensity of both vegetation and human artefacts are very variable.
- "Previous research has shown that a major factor in preference for landscape appears to be the naturalness of a scene with naturalness being associated with vegetation and the type and amount of human-induced change present in a scene." (Purcell and Lamb, 1998:57-58). However, greater scores of calculated naturalness and the effect of the presence of human-induced change that has an impact upon perceived naturalness are complemented by other option choices (such as Seeing, Roads; Seeing, Power lines and Seeing, Towns and Cities).

The approach adopted is not to be taken as an absolute definition of naturalness (Peterken, 1996) but rather a relative one that is more aesthetic than ecological in its interpretation of particular landscapes. Relative scores of naturalness calculated are also complemented in the model by visibility calculations of positive options choices: 'Seeing, Natural looking woodland', 'Seeing, Trees in the Landscape' and 'Seeing Deciduous trees in the landscape'.

There are two elements to this component of the model that are calculated separately:

- the perceived naturalness of individual cells;
- the perceived naturalness of the immediate context.

The method adopted is presented in the following two sections.

4.3.3.9.1 Perceived naturalness of land cover of individual cells

Land cover is defined in the Centre for Ecology and Hydrology Land Cover Survey 2000 dataset, using improved grassland broad habitat as an example, with the hierarchy illustrated in Figure 16.

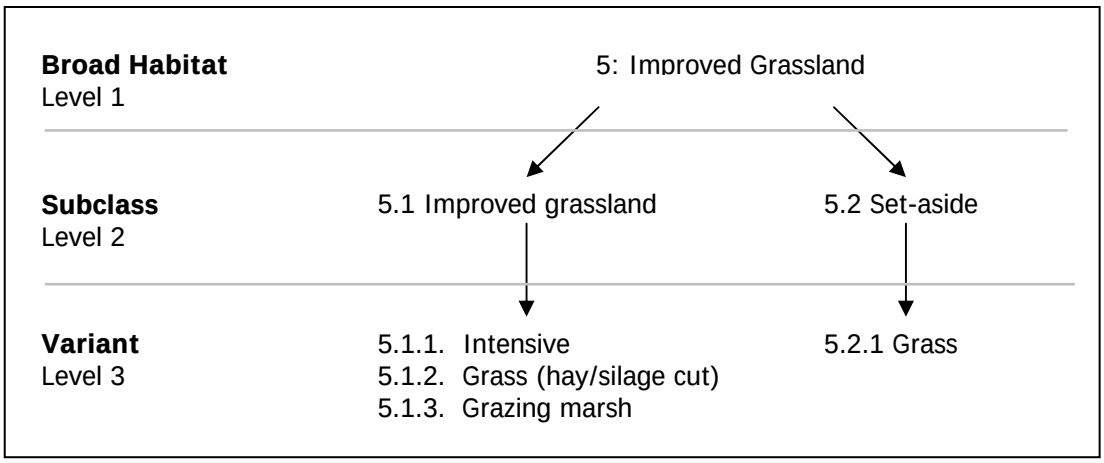


Figure 16: The basic structure of the LCS 2000 dataset

A score of relative naturalness was assigned at the subclass level, to all subclasses. This was based on results from the spatial threshold analysis (4.2.4). Transferring the weighting identified onto the LCS 2000 Broad Habitats was carried out where there was an obvious match of the datasets and images used. Where there is no direct link the researcher has used professional judgement and knowledge of landscape character. Weighting land cover to take into account public perception of the perceived naturalness is a marked improvement.

Using the resulting scores (Table 49) a score of relative naturalness for each 500 grid cell was calculated by:

- Obtaining the relative area of each land cover type that lies within it as a percentage of the whole grid 500m grid cell
- Multiplying the percentage area by the score to give an area weighted figure of relative naturalness
- Obtaining a total for each 500m grid cell.

	Broad Habitats[22]	Name	Sub-class	Score	
13	Standing open water and canals	Water (inland)	13.1	9	
22	Inshore sublittoral sediment.	Sea / Estuary	22.1	9	
9	Bracken	Bracken	9.1	9	
12	Bog	Bog	12.1	9	
11	Fen, marsh and swamp	Fen, marsh, swamp	11.1	9	
21	Littoral sediment	Littoral sediment	21.1	9	
		Saltmarsh	21.2	9	
21	Littoral rock	Littoral rock	20.1	9	
19	Supra-littoral sediment	Supra-littoral sediment	19.1	9	
10	Dwarf shrub heath	Dwarf shrub heath	10.1	8	
		Open dwarf shrub heath	10.2	8	
15	Montane Habitats	Montane habitats	15.1	8	
1	Broad-leaved, mixed and yew woodland	Broad-leaved woodland	1.1	7.5	
8	Acid grassland	Acid grass	8.1	7	
2	Coniferous woodland	Coniferous woodland	2.1	7	
5	Improved grassland	Improved grassland	5.1	7	
		Setaside grass	5.2	7	
6	Neutral grassland	Neutral grass	6.1	7	
7	Calcareous grassland	Calcareous grass	7.1	7	
16	Inland rock	Inland Bare Ground	16.1	5	
4	Arable and horticulture	Arable cereals	4.1	5	
		Arable horticulture	4.2	5	
		Non-rotational horticulture	4.3	5	
17	Built-up areas and gardens	Suburban/rural developed	17.1	3.3	
		Continuous Urban	17.2	1.6	

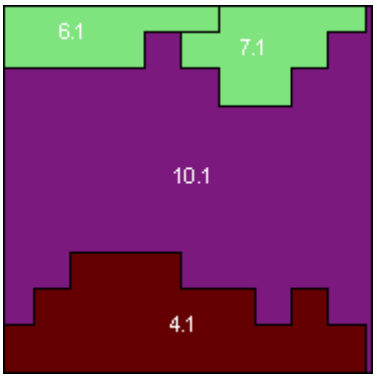
Increasing perceived naturalness

Table 49: the Perceived naturalness scores allocated to LCS sub-classes

An example of this process for two 500m grid cells is given below (Table 50).

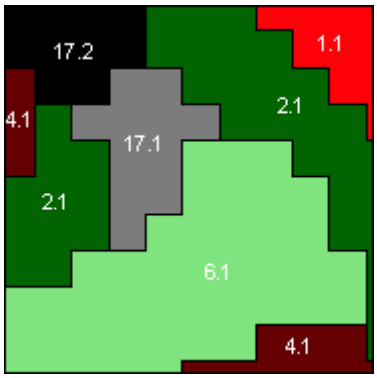
[22] Fuller et al., (2002) Land cover map 2000. A guide to the classification system. Centre For Ecology And Hydrology (Natural Environment Research Council) Project. T02083j5/C00878

Grid Cell A



500m by 500m

Grid Cell B



500m by 500m

Grid cell A

Subclass	LCM Subclasses	Score	Percentage Area	Relative Naturalness
4.1	Arable Cereals	3	22.85	68.55
6.1	Rough Grass / Grass	5	7.86	39.3
7.1	Calcareous grass	5	8.77	43.85
10.1	Dwarf shrub heath	6	60.52	363.12
			Total =	514.82

Grid cell B

Subclass	LCM Subclasses	Score	Percentage Area	Relative Naturalness
4.1	Arable Cereals	3	4.59	13.77
6.1	Rough Grass / Grass	5	38.13	190.67
2.1	Coniferous woodland	3	10.48	31.43
4.1	Arable Cereals	3	2.48	7.43
17.1	Built up areas, suburban /rural developed	2	11	22.00
17.2	Built up areas, suburban /rural developed	1	8.47	8.47
2.1	Coniferous woodland	3	19.13	57.38
1.1	Broad-leaved woodland	6	5.72	34.34
			Total =	365.49

Table 50: Example calculation of perceived naturalness score for raster grid cells

Please note the analysis was carried out to 10km beyond the Scottish and Welsh Borders to take into account boundary effects upon mapping tranquillity along the English Border.

4.3.3.9.2 Perceived Naturalness of Land Cover of Contextual Cells

Through the process described above each 500 grid cell was allocated a score of relative perceived naturalness. However, this value does not take into account the score of its surroundings cells – the relative naturalness of the surrounding landscape. The mean score of the eight surrounding cells in all directions was calculated for each individual 500m grid cell (Table 51).

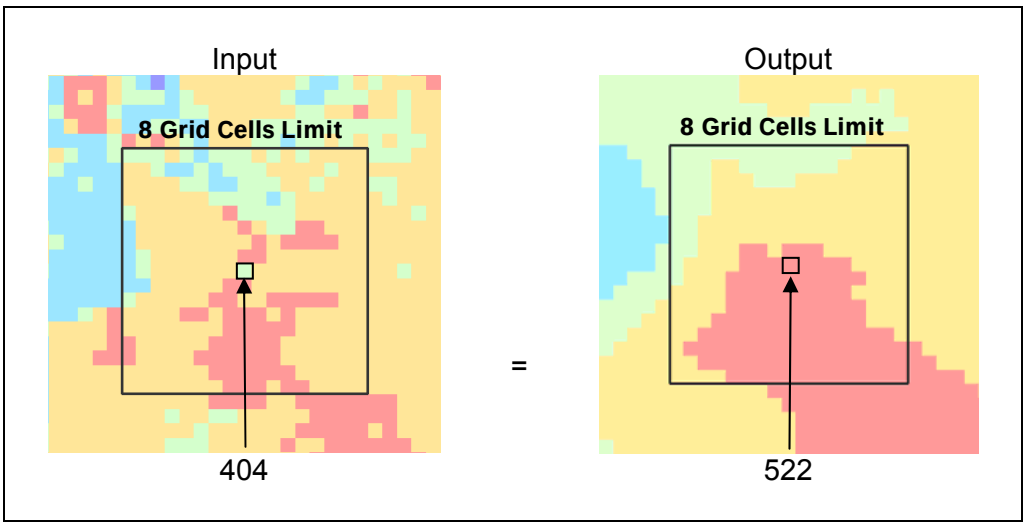


Table 51: Calculating the mean score for a 8 x 8 context of raster grid cells

The resulting output draws attention to those 'areas' within the landscape with similar scores of perceived naturalness, both high and low.

4.3.3.10 Combined Datasets

The following option choices represent a series of relatively wide-ranging statements about what 'you can see' in general, that cannot be readily categorised as obvious structures or features in the landscape.

- Seeing, lots of people
- Seeing, any signs of human impact
- Seeing, anyone at all
- Seeing, urban development
- Seeing, a wild landscape
- Seeing, remote landscapes

However, using a combination of other datasets generated for other option choices a relative proxy can be used. This combination of datasets does not involve double counting of those option choices re-used, as the final re-classed dataset represents a combination of datasets which is subsequently multiplied by the PA weighted coefficient. What follows is a justification of combined combinations for each option choice and presentation of methodology.

4.3.3.10.1 Seeing, lots of people

Modelling the visibility of people at specific locations or honey pot sites, due to the volume of data and differing levels of dispersal around various attractions, are outside the capacity of this project. Instead to calculate seeing lots of people, the factors and features which influence the chance of seeing a person have to be assessed. The Points of Interests (POI) was used in combination with the raw datasets generated for the following option choices:

- Seeing, towns and cities (urban)
- Seeing, villages and isolated properties (rural)
- Seeing, roads (B roads and minor roads only)

The datasets collated for the above option choices were identified as sources of people. The raw data for each option choice, as shown in Figure 19 were re-classed and weighted to take into account the likely chance of seeing lots of people for each dataset.

Establishing the number of honey pot sites that lie within each 500m x 500m grid cell provides a relative indicator of potential concentration of people at more than one attraction - a proxy indicator of the number of people someone is likely to see. The POI data set was used to create a count of

'honey-pot' sites that fall within each 500m x 500m grid square (Table 52). This data was then re-classed from 1 to 10. Visibility analysis proved to be too time consuming due to the scale of project and size of the national dataset (Figure 17).

Locations defined as urban were re-classed between values of 5 and 10, the higher weighting reflecting the greater chance of seeing people in comparison to rural areas which were re-classed as 4. Using the same reclassification the length of B road and minor road within a 500m grid cell was reclassed at 5 and used to represent the likelihood of seeing people along roads in rural areas. The methodology adopted for this option choice represents a much simplified version of the method used in the 2004 study due to scaling up to a national scale and limitations in the availability of datasets.

Group	Categories
Attractions	Botanical and zoological Historical and cultural Recreational Scenic features Tourism
Sport and entertainment	Outdoor Pursuits
Transport	Walking, riding and cycling

Table 52: List of POI categories included in analysis

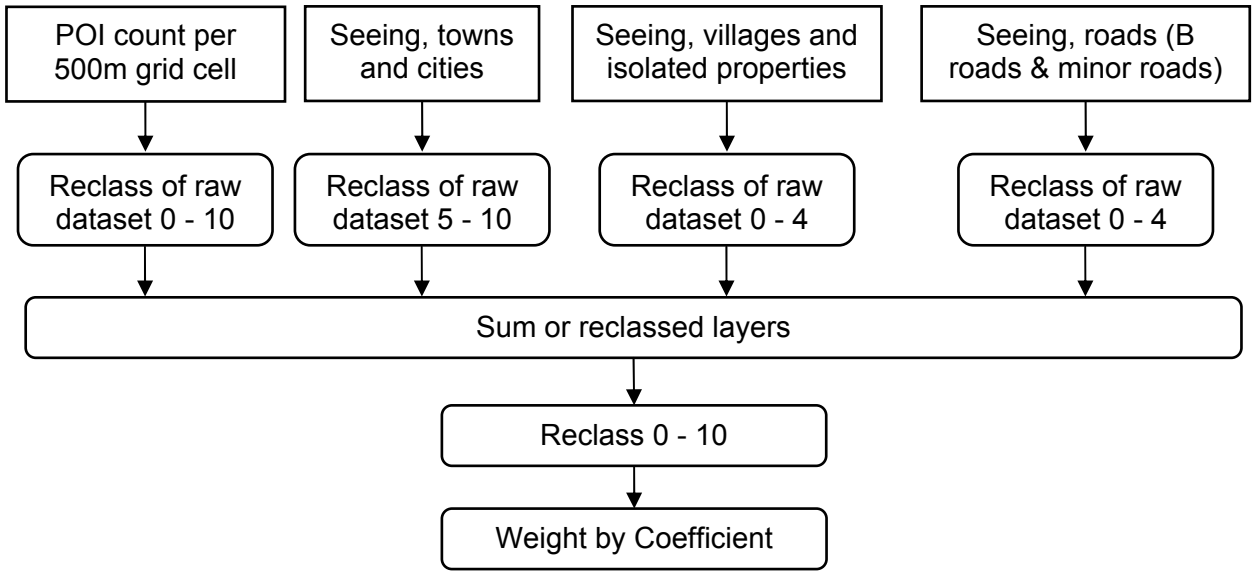


Figure 17: Summary of data generation for 'seeing, lots of people'

4.3.3.10.2 Seeing, any signs of human impact

Distance-weighted visibility for the following option choices were combined into a single map layer to model visible human impact:

Seeing, towns and cities
Seeing, wind turbines
Seeing, power lines
Seeing, villages and scattered houses
Seeing, roads
Seeing, trains and railways

This option choice was included to capture responses, from the PA work in the 2004 study, which were relatively non-specific, yet clearly related to visibility of such negatively classed features, for instance 'signs of man's interference', 'man made structures' and 'anything unnatural' and is the equivalent of 'overt human impact' modelled in the 2004 study. The resulting composite layer of distance-weighted visibility was re-classed from 0 – 10 and multiplied by the PA weighted coefficient (Figure 18).

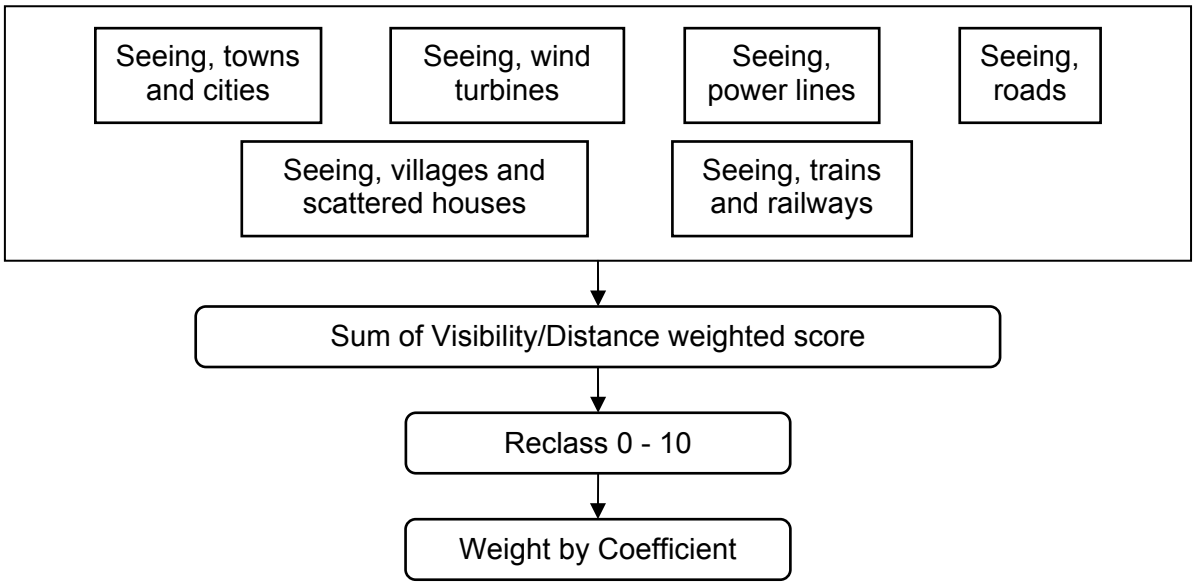


Figure 18: Summary of data generation for 'seeing, any signs of human impact'

4.3.3.10.3 Seeing, anyone at all

To calculate seeing anyone at all, the factors and features which influence the chance of seeing a person have to be assessed. Information for this option choice was collated using the Points of Interests (POI) dataset in combination with the raw datasets generated for the following option choices:

- Seeing, towns and cities (urban)
- Seeing, villages and isolated properties (rural)
- Seeing, roads (B roads and minor roads only)

The datasets collated for the above option choices were identified as sources of people. The raw data for each option choice, as shown in Figure 19 were re-classed and weighted to take into account the likely chance of seeing anyone at all for each dataset. For example, locations defined as urban were re-classed between values of 7 and 10, the higher weighting reflecting the greater chance of seeing people in comparison to rural areas which were re-classed between 4 and 6. Using the same reclassification the length of B road and minor road within a 500m grid cell was used to represent the likelihood of seeing people along roads in rural areas. The number of honey-pot sites that lie within each 500m grid cell from the POI dataset was reclassified from 0 – 10 to reflect the variation in number of visitor attractions and thus chance of seeing people (see Section 4.3.3.10.1 for more information on the POI dataset). The methodology adopted for this option choice represents a much simplified version of the method used in the 2004 study due to working at a national scale and limitations in the availability of datasets. This methodology differs from the option choice seeing lots of people in that the reclassification of the raw data reflects the importance of seeing anyone at all.

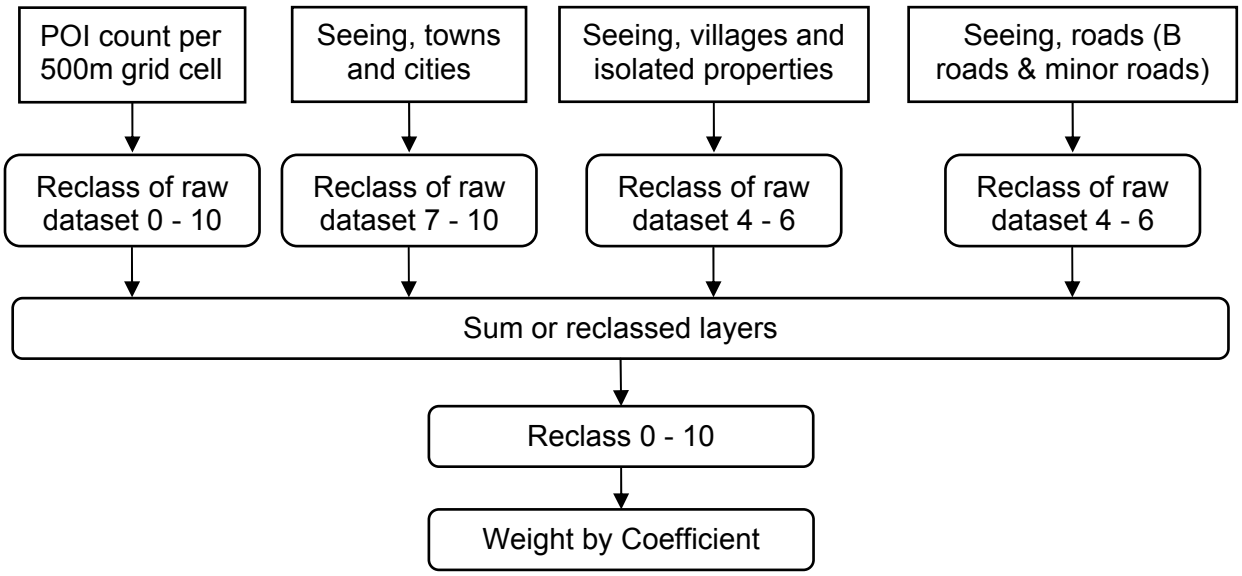


Figure 19: Summary of data generation for 'seeing, anyone at all'

4.3.3.10.4 Seeing, urban development

This option choice represents all building structures in the landscape. The distance-weighted visibility was used to model urban development.

- Seeing, towns and cities
- Seeing, villages and isolated properties.

The distance weighted visibility datasets were added together and re-classed on a scale of 0-10. The PA weighted coefficient for this option choice was then applied (Figure 20).

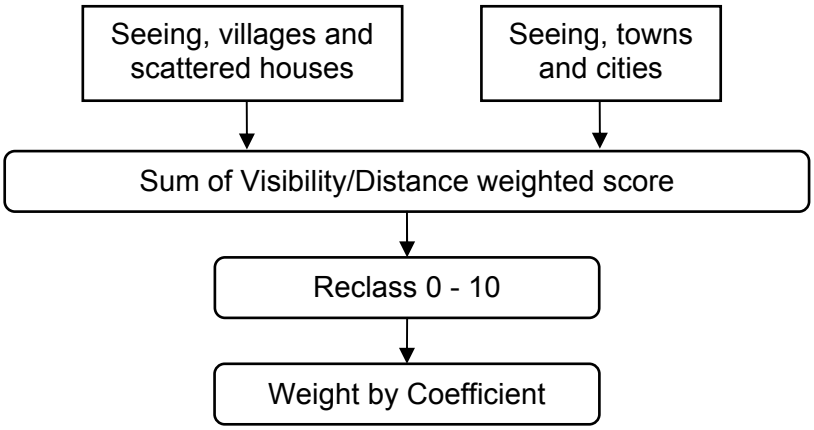


Figure 20: Summary of data generation for 'seeing, urban development'

4.3.3.10.5 Seeing, a wild landscape

This option choice was bought forward from the original PA work in the 2004 study as representing some impact on tranquillity, with a higher weighted score for 'What is tranquillity, you see…' over seeing a natural landscape but was incorporated into the 'Perceived Naturalness' dataset. In this study 'Seeing, A wild landscape' was included as a separate option choice. Based upon recommendations and the methodology used by Carver *et al*., (2002) to map 'wildness' for the whole of the UK the following option choices were combined:

- Seeing, anyone at all
- Seeing, any signs of human impact
- Seeing, a natural landscape.

See Figure 21 below.

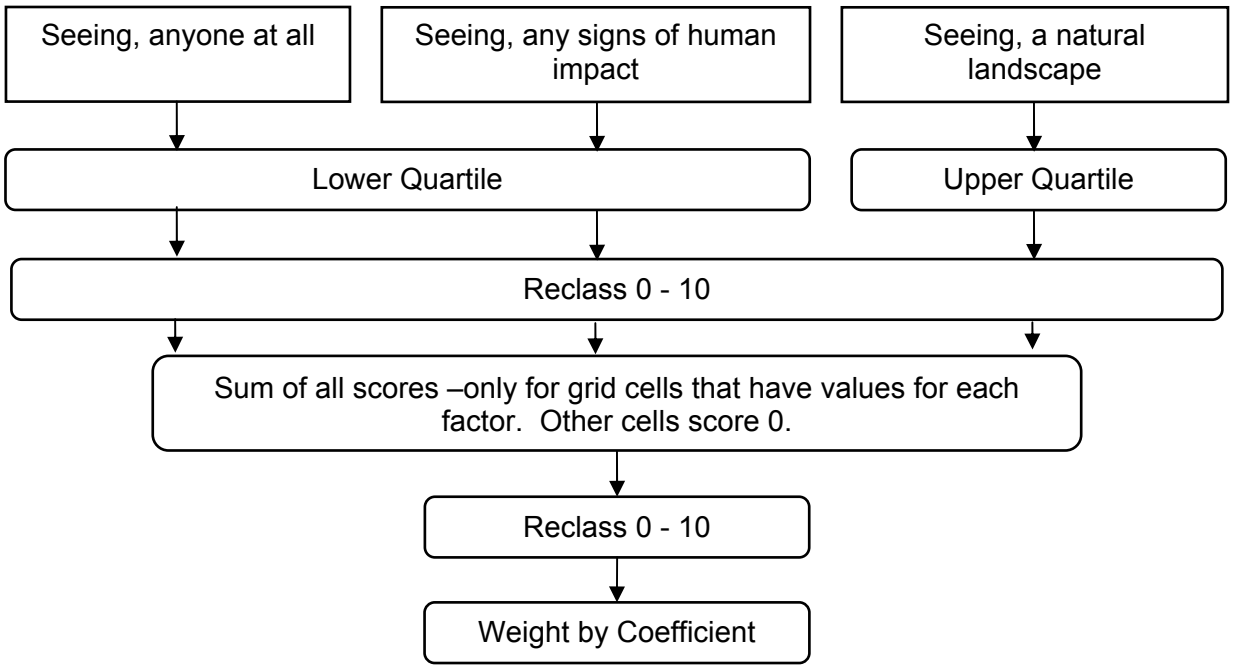


Figure 21: Summary of data generation for 'seeing, a wild landscape'

4.3.3.10.6 Seeing, remote landscapes

What is considered to be a remote landscape is inherently related to a wild landscape (Carver *et. al.,* 2002). It implies being away from human influence. The relative naturalness of the environment does not necessarily contribute to feelings of remoteness.

Datasets were used from the following option choices:

- Seeing, anyone at all
- Seeing, any signs of human impact.

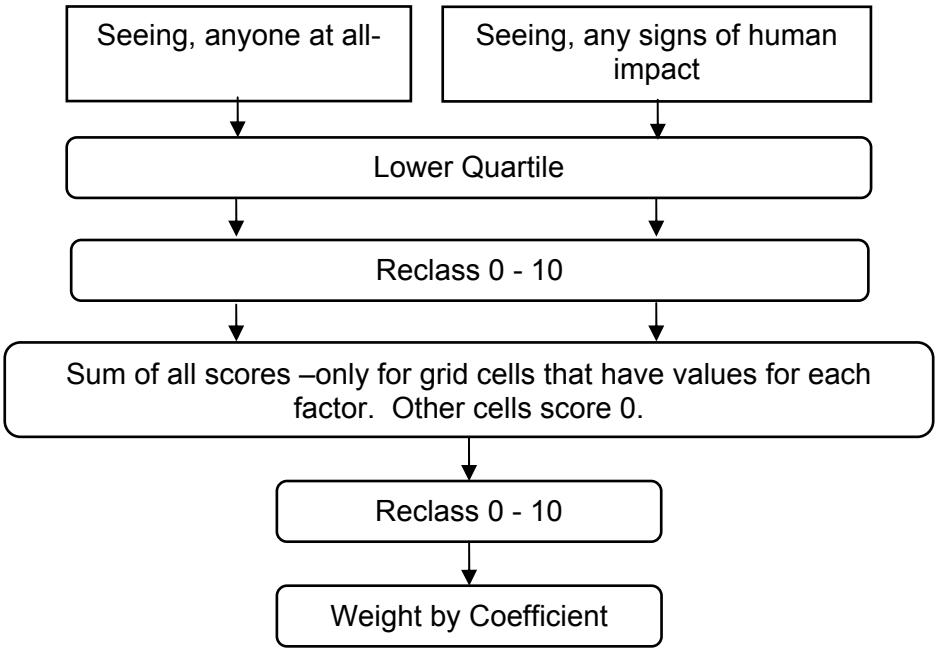


Figure 22: Summary of data generation for 'seeing, remote landscapes'

4.3.4 Hearing, 'Tranquillity'

4.3.4.1 Introduction: Sound, Noise and Tranquillity

The incorporation of sound and its effects on people have been well established by PA in the 2004 study and by the verification exercise as being essential in terms of modelling relative tranquillity; this is reflected in the seventeen option choices devoted to 'what you can hear' - contributing to or detracting from an experience of tranquillity in this study (Table 53).

Method	What is 'Tranquillity'? What enhances 'it'? What adds to 'it'?	What is not 'tranquillity'? What detracts from 'it'? What Lessons 'it'?
	Positive Attributes	**Negative Attributes**
Modelling Noise - L_{Aeq}		Hearing, Occasional noise from cars, lorries and/or motorbikes Hearing, Constant noise from cars, lorries and/or motorbikes
Modelling Noise – Time weighted		Hearing, Trains and railways Hearing, Low flying aircraft
Modelling Noise - Context Specific Presence/absence	Hearing, Running water Hearing, Lapping water Hearing, The sea	Hearing, High altitude aircraft
Combined Datasets – High or Low noise areas	Hearing, Birdsong Hearing, Wildlife Hearing, Natural sounds Hearing, Silence Hearing, Peace and Quiet Hearing, No human sounds	Hearing, Lots of people Hearing, Non-natural sounds

Table 53: Summary of methodology and option choices and relationship to modelling tranquillity

The methodology developed to account for the effect of noise upon relative tranquillity in the 2004 study modelled the diffusion of sound away from identified point sources; the selection of a point source was derived from the consultation data. This was then time-weighted to take into account how likely a person was to hear a given noise between the hours of 7am and 7pm. The same methodology has been adopted in this study but within the restrictions of data availability at a national scale. Reflecting these limitations and advances, the methodology has been separated into three categories of modelling noise:

- Modelling noise – L_{aeq} (dB)
- Modelling noise – time weighted (dB)
- Modelling noise - context specific presence/absence

All three categories draw upon techniques developed in the 2004 study, in some cases actually improve upon it, but also reflect necessary compromises - where data is restricted or not available at a national scale. For this project noise diffusion is being modelled for the whole of England at a 500m x 500m resolution and by definition the level of uncertainty and contingency of a range of ephemeral environmental conditions (such as humidity, precipitation, wind direction and strength) is considerable, so precise predictions are hard to make. Indeed precision is unhelpful as the range of possible noise levels is high especially when compared to detailed studies that model noise. For instance those associated with planning applications for roads and airports tend to focus on a single noise source or multiple sources within a relatively small area and have extremely accurate and detailed datasets to draw upon.

Einstein's maxim that 'things should be kept as simple as possible, though no simpler' was observed; the use of a 500m x 500m grid cell to model noise is relatively crude and variability

within a cell this size may be significant, so a level of generalisation was accepted while working within the parameters defined in the literature.

The methods applied in this study are explained using the following definitions of key terms:

- Sound - physical energy in an audible form, although it exists within and outside of the human ability to perceive it as sound.
- Noise - defines unwanted sound and as such it depends upon human perception.
- Affective impact - the non-physical, emotional and mental impact of noise. This is related to people's perception of the noise and its associations and acceptability to them as individuals;
- Ability to perceive sound – acuteness of hearing.
- Sensitivity to sound – desensitisation to sounds through repeated exposure.
- Emotional response – interpretation of sounds that contribute to or detract from tranquillity.
- Ambient Noise - the all-encompassing noise associated with a given environment at a specified time. Ambient noise is usually taken to be a composite of many different noise sources with no single noise source being dominant.
- dB - A measurement unit for sound that identifies relative power. It is a logarithmic (to base ten) scale.
- L_{eq} - equivalent Continuous Noise Level: a measurement of noise energy over a given time period. A constant level of noise over ten seconds would be the same as a single second's burst of noise that was ten times as loud, when measured over the same ten seconds. Accurate time-series data are required to calculate L_{eq}.
- L_{Aeq} - the A – weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound (L_{eq}) Data on frequency.

The methods used also apply well established theories and concepts of noise modelling which are described below.

Concepts/assumptions:
- Noise volume is measured in Decibels (dB).
- The human ear is capable of measuring a huge range, in the order of a billion-fold range, of noise levels. A logarithmic scale of measurement (log10) is employed. Table 54 provides sound level in dB associated with a recognisable activity and provides a context for figures (dB) that are used later.
- The ability of a person with normally sensitive hearing to discern relative differences in volume (Figure 23).
- Noise modelling is a highly complex area and a level of generalisation has to be adopted due to the level of spatial resolution and the wide variety of noise sources involved.
- The cut off figure for noise attenuation is 25 (dB), when noise diffusion of a given source has reached ambient noise levels, giving the maximum distance away from which the original noise cannot be heard.

Activity	Sound Level (dB)
Jet aircraft taking off nearby	150
Rock concert	120
Busy building site	110
Accelerating motorcycle nearby	110
Ambulance siren	95
Loud shout	90
Pneumatic drill	80
Vacuum cleaner	75
Normal conversation	60
Quiet office	50
Whispered speech	40
Average rural sound level at night	35
Library	30
Broadcasting studio	20
Normal breathing	10
Threshold of human hearing	0

Table 54: examples of decibel levels of commonly experienced sounds

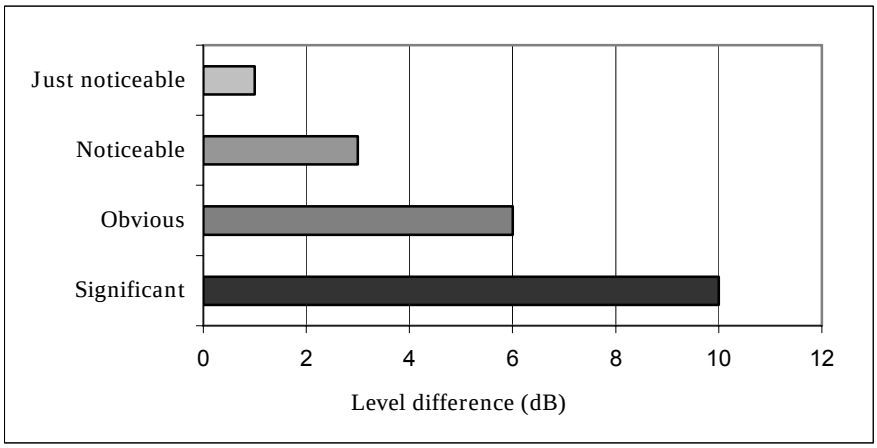


Figure 23: The ability of a person with normally sensitive hearing to discern relative differences in volume

4.3.4.2 Modelling the Attenuation of Noise

The data needed to model noise diffusion using GIS on a grid basis are:

- Decibels at source – what someone can hear
- Noise Attenuation over distance – what someone can hear at a given distance away from the point source.
- Frequency - time-weighting or how frequently someone is likely to hear a noise over a given time period.
- Actual figures of traffic flow and volume (24hr).
- A generated proxy dataset of flow and volume (7am – 7pm).

The availability of the above data for each of the primary noise sources identified in this project are summarised in Table 55.

Noise Source	Option Choice	Decibels at Source	Noise Attenuation	Frequency - Traffic flow and volume - L_{Aeq}	Frequency - A Proxy of flow and volume - L_{eq}
Roads	Hearing, Occasional noise from cars, lorries and/or motorbikes Hearing, Constant noise from cars, lorries and/or motorbikes	✓	✓	✓	✓
Railways	Hearing, Trains and railways	✓	✓	×	✓
Helicopters Fixed wing Civil Aircraft – Airport control Zones	Hearing, Low flying aircraft	✓	×	×	✓
Rivers and Streams	Hearing, Running water	×	×	×	×
Lakes and reservoirs	Hearing, Lapping water	×	×	×	×
The sea	Hearing, The sea	×	×	×	×
People	Hearing, Lots of people	×	×	×	×
Main Flight Paths over the UK for Civil Aircraft	Hearing, High altitude aircraft	✓	×	×	×

Table 55: Data availability for modelling the diffusion of noise

As recognized in the recommendations from the 2004 study, an improvement in modelling the attenuation of noise would be to take into account the temporal frequency of a noise, its frequency and duration. It has been possible to obtain traffic flows and volume for different road types and consequently the method used to model noise in the 2004 study has been adapted accordingly. It has been possible to calculate the L_{eq}, A-weighted equivalent of continuous sound pressure level (dB), for all roads in England.

Comparable datasets for the remaining noise sources however are not readily available. Nevertheless, a proxy can be derived using the method developed in the 2004 study for Hearing, Trains and railways, Low flying aircraft and Military training (not aircraft). From Table 53 it can be seen that the remaining datasets do not have all the required data to use the 2004 methodology. Noise in this instance has been modelled purely by accounting for the presence or absence of the noise source within a given 500m x 500m cell.

Only 10 of the seventeen 'hearing' options are included in Table 55; the other option choices fall into the category of either high or low noise. These option choices represent a series of relatively wide-ranging statements about noise in general, that were not specific to readily identifiable noise sources. To accommodate these option choices, for instance the ability to hear 'natural sounds', 'peace and quiet', 'silence' and 'no human sounds' and other noise sources such as birdsong and wildlife there is a need to identify those areas where people are more likely to hear and experience these qualities: Low noise areas. Only one general option choice is negative in its detraction from an experience of tranquillity, hearing non-natural sounds or in general terms high noise areas. The method used in the 2004 study to identify low noise areas has been adapted for this study to model both high and low noise.

4.3.4.3 Modelling Noise - L_{Aeq}

Out of the seventeen option choices identified in the 'hearing' category, the noise of two of the options can be modelled using L_{eq}.

- Hearing, constant noise from cars, lorries and/or motorbikes
- Hearing, occasional noise from cars, lorries and/or motorbikes.

For traffic on roads, average traffic flows have been obtained from the Department of Works and Transport (Table 56).

Motor vehicle flows (Thousand vehicles per day) by road class: 2004[1]				
England[23]	**Major Roads**		**Minor roads (B roads and Minor Roads)**	
	Motorway	**All Major Roads (A roads and Primary Routes)**	**Rural**	**Urban**
	79.7	21.4	1.0	2.4
1. The calculation for the average daily flow is estimated by dividing the annual traffic estimate by the road length and the number of days in the year.				

Table 56: Motor vehicle flows by road class

The distinction between the two option choices, hearing constant or occasional noise on roads has been made by category of road. Hearing constant noise has been modelled using L_{Aeq} for Motorways, Primary Roads and A roads. Hearing occasional noise uses data for B roads and Minor roads only. Using figures given in Table 56 and by categorising roads as either rural or urban using Strategi™ it has been possible to account for (albeit making using a basic distinction between rural and urban areas) the inevitable difference in traffic flow between a B road within an urban area and a B road in a remote rural area. All roads in England, including 30km inside the Welsh and Scottish border, were split into the following categories:

- Motorways

[23] Source: National Road Traffic Survey, DfT. http://www.dft.gov.uk/transtat/roadtraff

- Primary Roads
- A-Road - Rural
- A-Road -Urban
- Minor Roads - Rural
- Minor Roads - Urban

Noise attenuation was modelled separately using the method outlined in Figure 24 and in detail in the following sub-sections.

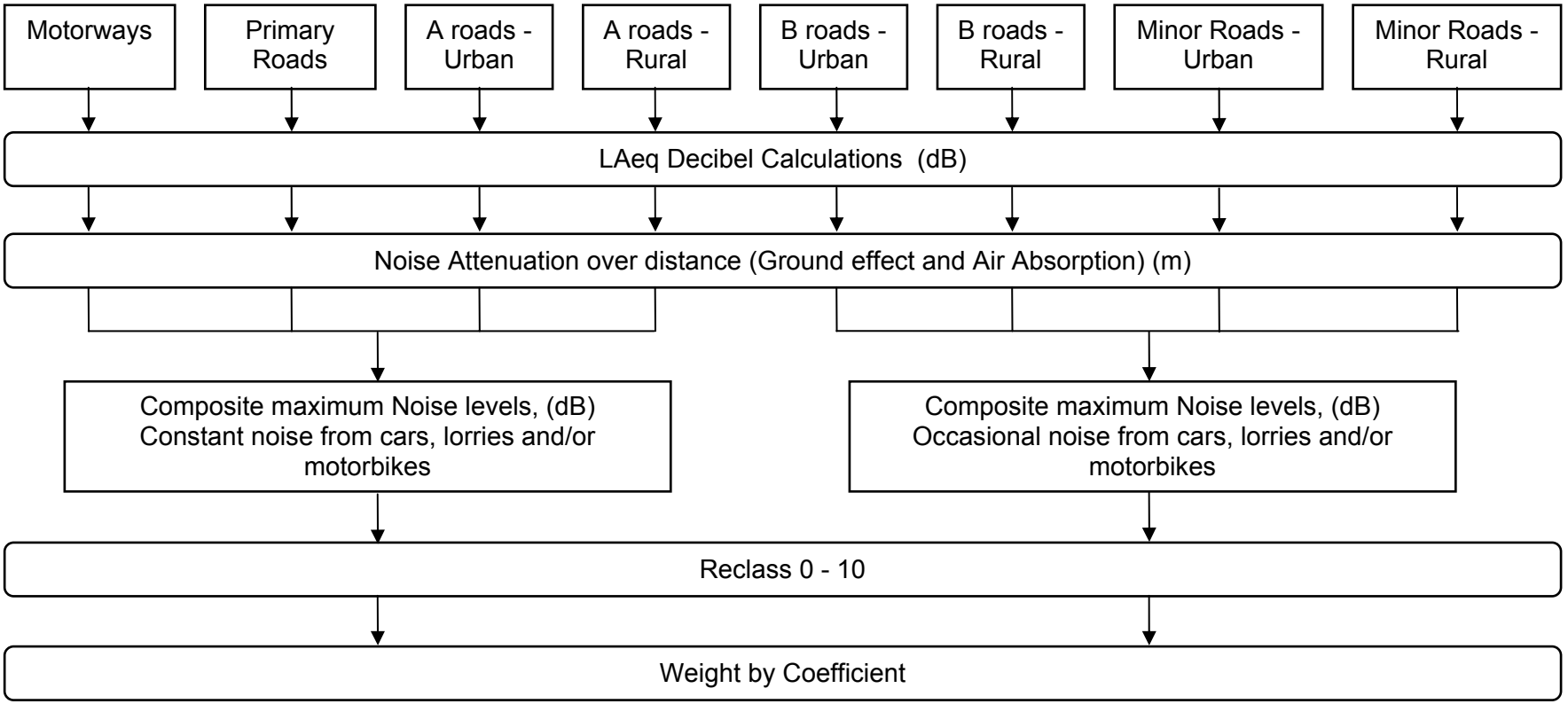


Figure 24: Summary of data generation for 'hearing, constant noise from cars, lorries and/or motorbikes' and 'hearing, occasional noise from cars, lorries and/or motorbikes'

4.3.4.3.1 L_{Aeq} Decibel Calculations

It has been possible to calculate an L_{eq} figure in decibels for all roads in England. The nature of the data however only represents an average L_{eq} estimate or L_{Aeq} for different road types. To calculate this; the following input parameters were used:

- Average Traffic Flow Volume (obtained from the Department of Works and Transport (Table 56)
- Average assumed speed for road type (Motorways and Primary routes were given an average speed of 70mph and all others a speed of 60mph; however this does over-estimate the speed and therefore the L_{Aeq} level for most A-roads, B-roads and minor roads, especially in urban areas)
- The equivalent sound exposure level for light vehicles.

From work conducted by Peippo, M., Hakkala, M. and Heikkinen, M. (2000) the following equation to calculate L_{Aeq} was used:

$$L_{AE}, 10m(light) = 73,5 + 25 \lg(v/50) \; ; \; v \geq 40 \text{ km/h}$$

$$L_{Aeq},10m(light) = LAE, 10m(light) + 10 \lg(N(light)/T)$$

Notation:
L_{Aeq} = A-weighed equivalent continuous sound pressure level (dB)
L_{Aeq},10m = LAeq at 10 m calculated from L_{AE} for a specified number of vehicles per 24 h (dB)
L_{AE} = sound exposure level (dB)
N = number of vehicles (light or heavy) during time period
T = time span, 24 h in this examination[24]
v = speed (km/h)

Data is not available to distinguish between types of traffic, cars, lorries and motorbikes. An assumption has been made that the majority of traffic are cars. In addition, this assumption will counter-act some of the inevitable overestimation in sound levels due to the average speeds associated with each road type. The results of the calculations are presented in Table 57.

Road and Speed	Flow (1000 per day)	L_{AE}, 10m (light)	L_{Aeq}, 10m (light)
Motorway at 70mph (112.62Km/H)	79	82.31613797	87.49029646
A-Road (Rural) at 60 mph (96.54 km/h)	13.9	80.64343225	78.27146784
A-Road (Urban) at 60 mph (96.54 km/h)	20.9	80.64343225	80.0427827
All Primary Roads at 60 mph (96.54 km/h)	21.4	80.64343225	80.14545757
Minor Roads (Rural) at 60 mph (96.54 km/h)	1	80.64343225	66.84131984
Minor Roads (Urban) at 60 mph (96.54 km/h)	2.4	80.64343225	70.64343225

Table 57 : Results of L_{Aeq} calculations for different categories of road

A more accurate L_{Aeq} could be calculated if the following data was available:
- Flow of traffic type i.e. light (cars) and heavy (HGV); however, the data available in average traffic flows per road type for England does not distinguish between the two.
- Distance from the road centreline. For this study the distance was assumed to be 10m to account for dual carriageways.
- Height of road surface relative to the surrounding ground and the location of any barriers; these two factors will be taken into account in the attenuation and are not applicable when calculating the A-weighted L_{eq} value for sound level at the source.

[24] The calculation for average daily flow is estimated by dividing the annual traffic estimate by the road length and number of days in the year. Source of flow data adapted from the National Road Traffic Survey.

4.3.4.3.2 Noise Attenuation Over Distance

Noise diffusion or the rate of attenuation away from its source is a complex function of a number of variables, including:

- Whether the sound is generated in the air or on the ground.
- The volume (measured in dB) of the sound.
- the frequency (Hz) of the sound
- The distance between receptor and source which gives a predictable level of reduction with geometrical divergence.
- The characteristics of the ground between the source and the receptor, including:
    - whether there is line of sight between the source and receptor
    - whether the ground is hard (e.g. tarmac, concrete or compacted earth) or soft (e.g. un-compacted soil, crops) or very soft (e.g. wet vegetation or snow)
    - whether there is an extensive belt of high vegetation such as trees in place between source and receptor
- The existence of any structures or surfaces which may reflect, deflect or absorb sound energy.
- Atmospheric variables such as temperature and humidity, which affects atmospheric absorption of sound energy in different ways for different frequencies.
- Weather conditions such as rain or wind strength and direction.

It should be clear from the above that modelling sound is contingent on a great many variables. Accounting for inter-visibility (i.e. line of sight) between source and receptor is relatively straightforward and will not change over time unless engineering, tree planting or similar works are carried out. However, accounting for the effect of wind, for example, is extremely complex. Wind can 'carry' sound further under certain conditions and orientations of source and receptor, or it can accelerate the rate of attenuation. Further to this, wind generates sound around structures, vegetation and even around people that can be louder than other sounds. No model, however carefully constructed, finely grained or tightly calibrated can hope to accommodate the full range of acoustic, environmental and human variables.

A model of sound attenuation is given by Piercy and Daigle (1991) as:

$$A_{total} = A_{div} + A_{air} + A_{ground} + A_{misc}$$

Where:
A_{total} is the total attenuation for the defined set of parameters
A_{div} is the attenuation from geometrical divergence over distance
A_{air} is attenuation resulting from air absorption
A_{ground} is attenuation by the ground
A_{misc} is attenuation from other effects including reflection from surfaces, foliage and buildings.

In the 2004 study it was only possible to model A_{div} and A_{air}. It was not possible to model attenuation due to trees or terrain, as carried out for the NE. Just using these two variables does not take into account the level of sound diffusion which is experienced as terrain, vegetation, built environment and some weather related factors serve to absorb and otherwise attenuate the theoretical distribution of energy (Appendix 11). Methods used to calculate A_{div} and A_{air} are given below to the level of detail sufficient to establish the methodology for this study. For more detailed information and theory on modelling noise attenuation refer to Appendix 11.

(a) Calculate attenuation from geometrical divergence over distance (A_{div}) in Excel:
Point sources - sounds from point sources that are generated in the free field, or in the air and not in contact with the earth (e.g. aircraft) attenuate by between 6dB and 7.5 with each doubling of distance.

Linear surfaces - sounds from linear sources that are generated in contact with the earth (e.g. traffic on roads or railways) attenuate at a more gradual rate of 3dB with each doubling of distance, unless over soft surfaces in which case the rate is 4.5dB per doubling of distance.

For roads the attenuation from geometrical divergence over distance was calculated for 500m increments in Excel using the equation below.

$$14.3 + 4.5 \times \left(Log_2 \times \frac{dis\tan ce}{125} \right)$$

Where:
- 14.3, is the sound attenuation at 75 metres from source
- 4.5, is the attenuation in dB per doubling of distance
- distance, is distance from the sound source
- 125, is a constant

This was based on the assumption that noise attenuation occurs over soft rather than hard ground.

(b) Calculate Attenuation resulting from air absorption (A_{air}) in Excel:
The rate at which the atmosphere attenuates sound energy is variable and depends upon the frequency of the sound, the temperature and the humidity of the air. Within approximately 700m of a sound's source, atmospheric attenuation is insignificant, although it can be extremely significant at increasing distances and especially for higher frequencies (>2000Hz). Three sets of information are required to calculated attenuation resulting from air absorption:

- Frequency of car noise – central modal of range of frequencies that comprise 'road noise' – tyre noise, engine noise, size of vehicle
- Average Temperature for England
- Average Relative Humidity for England

The frequency of car noise is ~1000 (Hz)[25], the average temperature for the UK is 10ºC[26] and the relative humidity for England is 70%[27].

Table 58 illustrates the atmospheric attenuation levels for a temperature of 15ºC and a relative humidity of 75%, which are judged to be representative of the study area, for sounds at variable frequency levels.

	Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Example Sound Source (Central Frequency)		Large calibre weapons		Road traffic		
Air Attenuation (dB/km)	0.41	1	1.9	3.7	9.7	33

Table 58: Air Attenuation Coefficients (dB/km) at a sea level ambient pressure for a temperature of 10ºC and a relative humidity of 70%

The rate of attenuation per kilometre of 3.7 (dB) was disaggregated (per km attenuation x 0.5) to the level of 500m cells and a value calculated in Excel for each ring of 500m at an increasing distance away from the source.

(c) Calculating distance away from source of noise in buffers of 500m:
The 500m increments away from each respective noise source were spatially represented through buffers developed around each road type. These were set to merge where they overlapped.

(d) Append the table of the buffer file with the modelled noise attenuation:
The attenuation from geometrical divergence over distance at increments of 500m was added to the attenuation resulting from air absorption in Excel. Then the total attenuation resulting from

[25] See Appendix 11

[26] Taken from Met Office web site data

[27] Presumed to be similar to the North East data (Appendix 11)

distance and atmosphere was then deducted from the L_{Aeq} estimate level for each road type per distance. These were then attached to the respective distance buffers for each road type. The cut off figure for noise attenuation is 25 (dB), when noise diffusion of a given source has reached ambient noise levels, giving the maximum distance away from which the original noise cannot be heard.

(e) Convert the vector buffers into raster grid format:
The vector file representing total attenuation from each noise source from stages (b) and (c) was then converted into raster format at a cell resolution of 500m x 500m.

4.3.4.3.3 Composite time weighted maximum Noise levels, reclassification and weighting

The raster layers of modelled noise attenuation for each road category were then added together to give the maximum decibel level that may be experienced in each individual cell.

Data modelled for Motorways, Primary routes and A Roads provided composite time weighted maximum Noise levels for Hearing, Constant noise from cars, lorries and/or motorbikes
Data modelled for B Roads and Minor roads provided composite time weighted maximum noise levels for Hearing, Occasional noise from cars, lorries and/or motorbikes.

Each dataset was then re-classed from 0-10 and multiplied by the weighting coefficient for each option choice as given in Table 28.

4.3.4.4 Modelling Noise – Time Weighted L_{eq} (dB)

In this method of modelling noise, L_{Aeq} figures are replaced by maximum noise that is noise levels likely to be heard (where possible) attenuated over a given distance. This figure in dB is then time-weighted using a much simpler measure of L_{eq} that represents the temporal frequency or likelihood of how frequently and for how long someone would hear a given noise. The method developed in the 2004 study has been followed. For more background information on how to quantitatively represent the effect of temporal frequency please see Appendix 12. The following option choices have been modelled using this method:

- Hearing, trains and railways
- Hearing, low flying aircraft

To represent the 'temporal averaging' effect, a simple L_{eq} measure is constructed by applying a coefficient to areas where noise diffuses down to 25dB from each of the feature classes. As the various noise sources vary a great deal in respect of the temporal frequency of the noise at the modelled volume (for instance civil airport traffic compared with occasional aircraft low flights) the coefficient is an estimate, for each noise source, of the percentage of the day (7am to 7pm) for which the noise can be heard at the predicted volume. Thus a constant noise would get a coefficient of 1 (equating to 100%) and a noise than can only be heard 2-3 times a day for periods of a few seconds would get a coefficient of 0.001 (equating to 1%). There is clearly a high level of estimation in this and it also takes no account of the affective impact of different types of noise, only quantifying the temporal frequency of their occurrence.

The methods and steps used to model noise attenuation using this approach are given below:

1. Noise level at source (dB)[28]
2. Noise Attenuation over distance:
    (a) Calculate attenuation from geometrical divergence over distance (A_{div}) in Excel
    (b) Calculate attenuation resulting from air absorption (A_{air}) in Excel
    (c) Calculating distance away from source of noise in buffers of 500m
    (d) Append the table of the buffer file with the modelled noise attenuation

[28] These are obtained from the North East Study see Appendix 8.

(e) Convert the vector buffers into raster grid format

3. Apply time-weighted coefficient (%)
4. Generate composite time weighted maximum noise levels (dB).

Only Step 1 and step 3 differ from the methodology applied to model noise using L_{Aeq} data. Step 1 represents noise level at source which has been identified from a wide review of the literature and on-line resources. Data generated using Step 2 now represents the maximum possible noise attenuation over distance from each individual point source; airport control zones, Military Low Flying Areas, railway tracks and military training sites. Step three is additional. A time-weighted coefficient is generated using available data. Maximum noise for each source of noise is multiplied by its respective temporal frequency as a percentage. This data represents the number of decibels someone is likely to hear between 7am and 7pm if standing within a given 500m grid cell at a given distance away from source. This composite maximum noise level is, as for the previous methodology, re-classed and then multiplied by the respective PA derived coefficient as shown in Figure 25.

The following sections provide information on how noise attenuation was modelled within the limitations of the data for each option choice. In addition, for steps 2 and 4, any differences in how data was generated are highlighted.

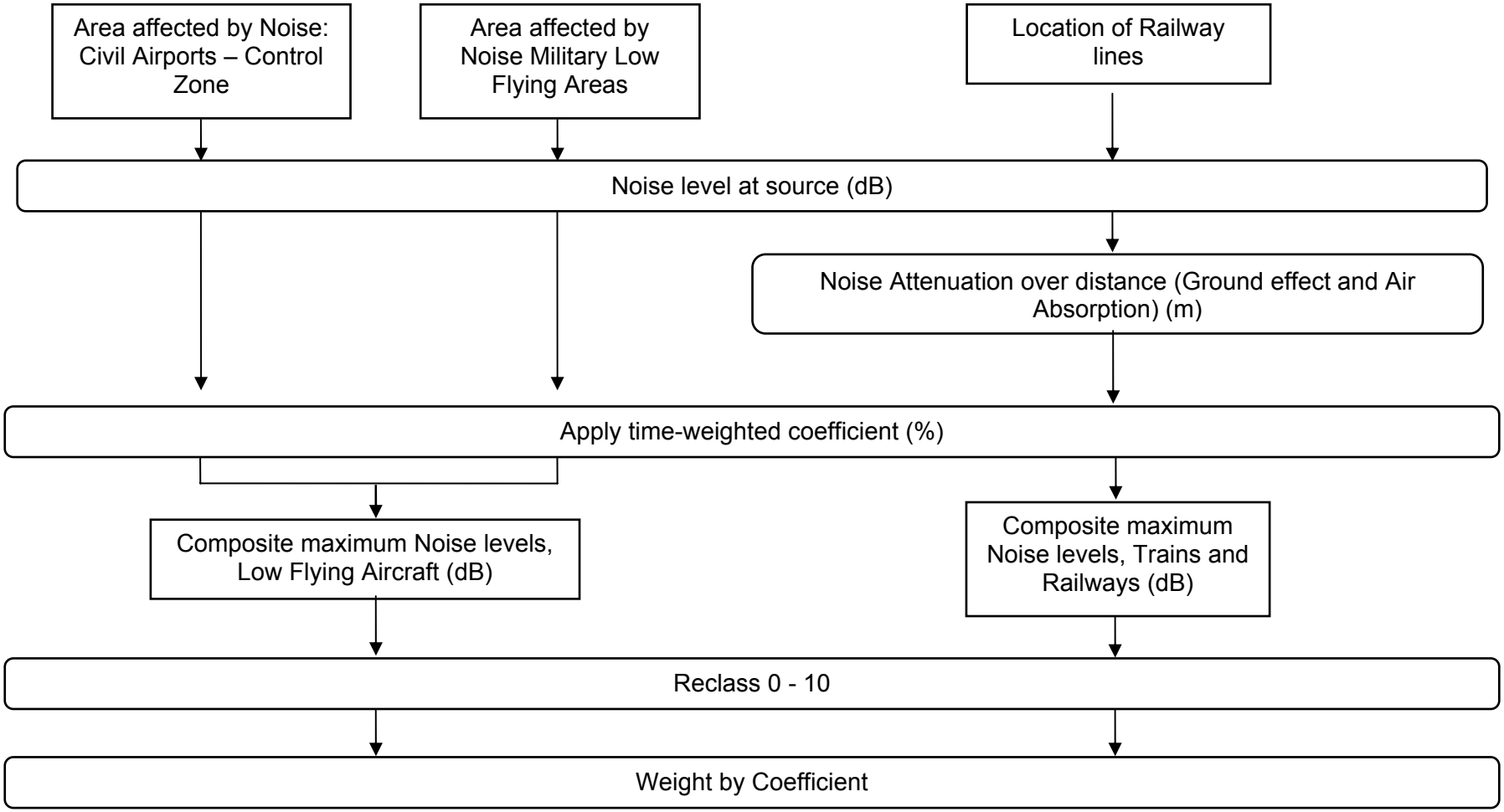


Figure 25: Summary of data generation for 'hearing, trains and railways' and 'hearing, low flying aircraft'

4.3.4.4.1 Hearing, trains and railways

For all railways the noise level at source has been taken at 87 (dB). The entire railway track highlighted in the Strategi™ dataset has been categorised by type of track. This was achieved by using a National Rail Schematic map[29]. Primary lines and none principal lines were identified; then using a National Rail Operators map for 2006 the number of service providers per rail line was identified and the rail lines categorized:

- Primary routes: 1, 2, 3 and 4+ service providers
- Non-principal routes: 1 and 2 service providers only.

Working out traffic flows of trains for the whole of England was outside the remit of this study and data was not readily available therefore a sample has been taken at random to provide a proxy figure. From the categorised rail network four railway routes within each category, where possible, were randomly selected. Using time table information the number of trains departing a station (i.e. number of trains leaving Newcastle for York direct) between 7am and 7pm for a midweek day in August, September and October were calculated and doubled to take into account outbound and inbound travel. These figures were then averaged to give an average estimate of trains for that line per day (12 hour period). Each category was then averaged to give an average estimate of the amount of trains per line type, per number of service providers per day (12 hours).

An assumption was made that it takes on average 30 seconds for a train to travel through a platform, or in and out of a person's hearing range (Mapping Tranquillity 2004). The number of trains per line, per service provider, per day was then multiplied by 30 seconds. This gave an estimate of how long train noise can be heard from any given point. This estimate of noise period was then calculated into a percentage, giving an estimated percentage of time (12 hours) a train can be heard (Table 59). To estimate the percentage time of noise for steam railway a similar method was used[30]. However, to calculate average number of trains per day, the number of days the trains ran on a line and the number of services to and from a station was used.

Railway		
Line Type	**Service provides**	**Temporal Frequency (%)**
Mainline	1	2.05
	2	2.08
	3	5.56
	4	8.44
None Principle	1	1.39
	2	2.15
Steam Lines	N/A	0.45
Note: an assumption that all outbound trains will return to station of departure		

Table 59: Temporal frequency per rail type and service provider

This time weighted coefficient was used as shown in Figure 27 to calculate noise attenuation.

4.3.4.4.2 Hearing, low flying aircraft

Control Zones of civil airports in England and Military Low Flying Areas (LFAs) have been digitised for the whole of England[31]. The level of noise at source used is 150 dB which is a jet aircraft taking

[29] National Rail: http://www.nationalrail.co.uk last accessed on 21/07/06

[30] The steam railway lines were identified by using OS points of Interest data overlaid on to the Strategi data

[31] Source: see Table 26. Please note control zones are used as the threshold for heights of low flying aircraft. Outside of control zones heights vary dramatically and consequently it is difficult to establish a spatial boundary that readily distinguishes between high and low flying aircraft

off. Please note that this figure over-estimates the noise effect on areas (Appendix 12). Time weightings for airports were calculated by dividing the aircraft traffic number for a year per airport by 365, this was then halved to represent a 12 hour period (day). This figure was then multiplied by 2 minutes to give an estimated amount of time aircraft could possibly be heard within a control zone in a day. This was then divided by the amount of minutes in a 12 hour period, to give the percentage time an aircraft could be heard.

It was assumed that on average it takes 2 minutes for an aircraft within a control area to pass a person's zone of hearing. This is obviously highly variable as an aircraft speed, type, direction and activity (i.e. taking off, landing, holding) can greatly affect the length of time it is heard. A general assumption has been made that on average there is only ever one aircraft passing, taking off or landing at any time.

As can be seen from the method and the assumptions outlined above this time weighted method and noise calculation for low flying aircraft is only an estimate of the maximum disturbance which could possibly occur due to low flying aircraft noise within an area relative to England as a whole. This was carried out so that low flying aircraft noise, which was highlighted as a detraction factor in the PA work, could be incorporated into the tranquillity mapping. The use of L_{eq} contour data for airports and military low fly routes (flight paths), type of craft and time taken to fly the route, would dramatically increase the accuracy and precision of this method. However, at such time this data is not available for all airports on a national scale. Also due to lack of data and complexity of modelling, light aircraft have not been taken into account in this method. Light aircraft also were not flagged up as a major detractor from tranquillity in the original PA work.

Military low flying areas and the hours flown within each area for a year were obtained. The time weighting was calculated by dividing the hours flown by the useable area in m^2 times by 500; this gave the maximum potential hours flown within a 500m grid square. This was then divided by the number of hours in a year to represent an estimate for the noise level someone is likely to hear within a 12 hour period if standing within a given 500m grid square within a LFA.

The time weighting and the noise effect of low flying military aircraft would be much greater around military airfield. However, as there is no L_{eq} data, aircraft traffic, flight paths and aircraft type data available at this time on a national scale, this wider general assumption has been made. Military data has been included into the tranquillity mapping as it was highlighted as a detraction factor in the PA work. Further research into the effect of passing low flying military aircraft on route and during landing/takeoff for all military LFAs and airports within and just outside England would be needed to increase the accuracy and precision of the data.

Low flying aircraft noise has been calculated in the same way in which railway noise has been calculated, in that noise decibels at source have been applied and then attenuated out over distances of 500m intervals until noise reached below 25dB. Noise at source level has been applied to low fly areas as a whole and airport control zones, as without flight path information we are unable to estimate average low flying aircraft locations on a larger scale. Also, as previously mentioned, this method could be improved via the use of L_{eq}.

Once the attenuation of noise decibels at source was calculated and applied in 500m intervals away from airport control zones and LFAs the data was time weighted for each LFA and Airport was applied, this data was then joined together and then reclassified from 0 - 10 (Figure 25).

4.3.4.5 Modelling Noise - Context Specific Presence/Absence

The following option choices do not have data relating to noise at source. This precludes any attempt at modelling the attenuation of noise.

- Hearing, running water – rivers and streams
- Hearing, lapping water – lakes and reservoirs
- Hearing, the sea – length of coastlines
- Hearing, high altitude aircraft – main flight paths across England

Consequently, the presence or absence within a given 500m x 500m grid is used as a proxy of their relative contribution to and detraction from an experience of tranquillity. Variations in the relative contribution of each noise source, as indicated above, have been crudely related to the length of a linear feature (stream, river, coastline and lake boundary), area covered (lake or reservoir), or number of concentration of honey-pot sites that fall within each 500m x 500m grid cell as shown in Figure 26.

4.3.4.5.1 Hearing, running water

The length of a river or stream in the Strategi™ dataset that lies within an individual 500m x 500m grid cell is used as a proxy for noise for this option choice (Figure 26).

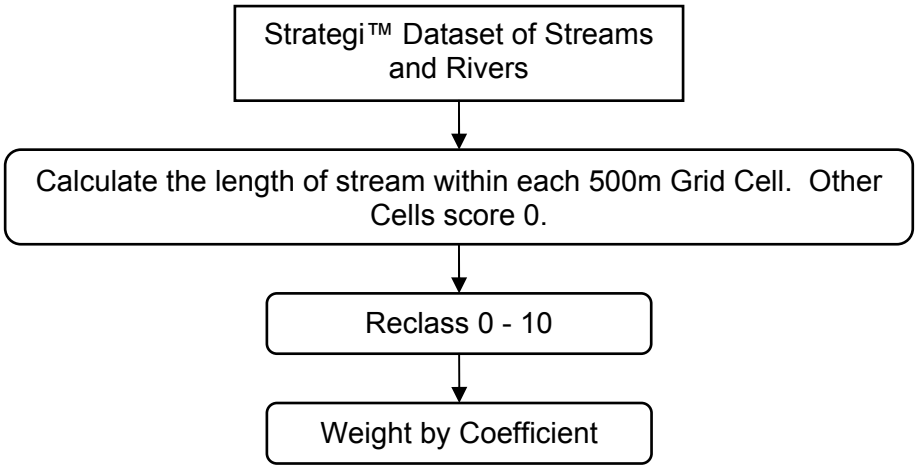


Figure 26: Summary of data generation for 'hearing, running water'

4.3.4.5.2 Hearing, lapping water

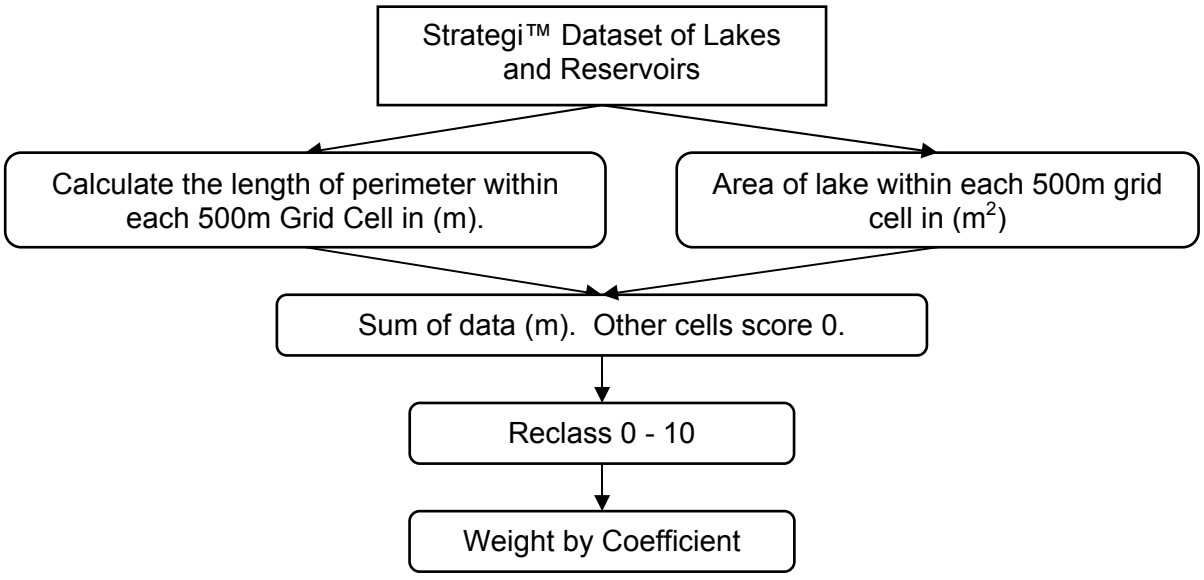


Figure 27: Summary of data generation for 'hearing, lapping water'

As shown in Figure 27 both the length of the boundaries of lakes and reservoirs in the Strategi and the total area of lake that lies within a 500m x 500m grid cell is used as a proxy for hearing lapping water. The area of water bodies are used as water can lap against the side of a boat as well as the shore.

4.3.4.5.3 Hearing, the sea

The length of the English coastline in the Strategi™ dataset that lies within an individual 500m x 500m grid cell is used as a proxy for noise for this option choice (Figure 28).

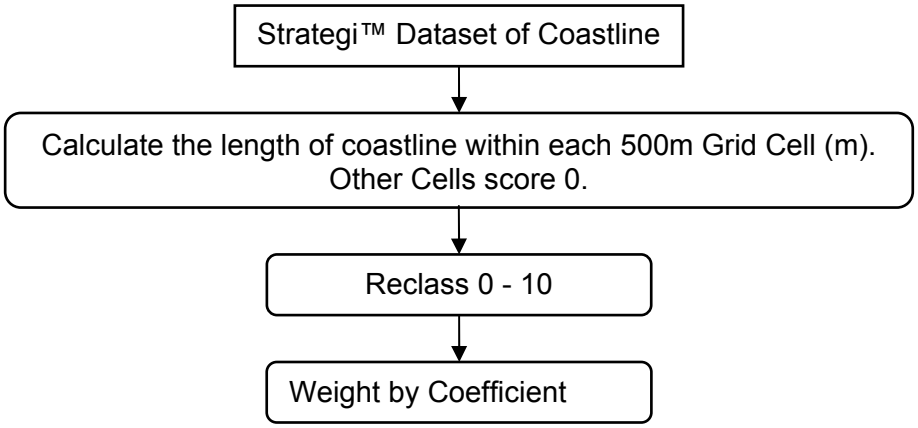


Figure 28: Summary of data generation for 'hearing, the sea'

4.3.4.5.4 Hearing, high altitude aircraft

Areas that lie underneath the main flight paths of England and that lie within each individual 500m x 500m grid cell are used as a proxy for noise for this option choice (Figure 29).

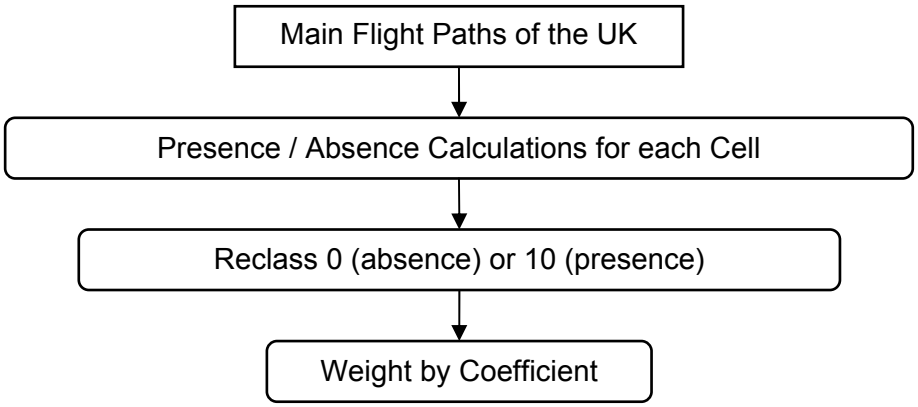


Figure 29: Summary of data generation for 'hearing, high altitude aircraft'

4.3.4.6 Combined Datasets –High v Low noise areas

Low noise areas, where there is an opportunity to hear non-human sounds that would otherwise be drowned out, represents one of the variables that people most valued in identifying tranquil areas. At an early stage of the NE PA work one respondent, speaking of what is important in making an area tranquil, answered:

'Silence so you can hear natural sounds'

The ability to hear, birdsong, wildlife, natural sounds, or to experience 'silence', 'peace and quiet' and 'no human sounds' is related to the likelihood of any given area being less prone to combined noise that is either generated naturally (a waterfall) or artificially (roads, trains or aircraft). A proxy of areas that experience low noise is needed to locate spatially where someone is more likely to experience peace and quiet or to hear birdsong. Those areas identified as experiencing low noise will be used to represent these option choices:

- Hearing, Birdsong
- Hearing, Wildlife
- Hearing, Natural sounds

- Hearing, Silence
- Hearing, Peace and Quiet
- Hearing, No human sounds

All of the PA coefficients for each of the options given above have been added together and will be used to generate the data. The option choice, Hearing, Non-Natural sounds is the direct inverse of 'Low Noise Areas' and a comparable proxy for identifying relative High Noise areas will be used to account for this detraction from an experience of tranquillity.

4.3.4.6.1 Hearing, non-natural sounds

Nowhere in England is entirely free from noise, sometimes at high volume. To model hearing non-natural sounds, out of the three methods (see table 53) and data available, a composite of the following option choices can be used to provide time-weighted noise levels:

- Hearing, Constant noise from cars, lorries and/or motorbikes
- Hearing, Occasional noise from cars, lorries and/or motorbikes
- Hearing, Trains and Railways
- Hearing, Low flying aircraft

All composite maximum noise levels calculated for the option choices given above have been combined – again obtaining the maximum time-weighted noise level likely to experienced for a given 500m x 500m grid cell of non-natural sounds modelled in this study. The time-weighted calculations were then classified into quartiles, with the following qualitative descriptors being attached to each quartile (Table 60). The option choice, 'Hearing, Non-natural sounds' is the opposite of low noise. For the four datasets used to account for negative noise effects it could be argued that in any grid cell with a value over 25 dB it is possible to either hear cars, trains or low flying aircraft. However, this covers nearly the whole of England and it is not feasible to use the dataset in this manner. Consequently, the 1st and 2nd quartile (Table 60) of the composite of maximum noise have been re-classed on a scale of 1 – 10 and used as a proxy for hearing non-natural sounds (Figure 30).

Quartile	Qualitative Descriptor
1 (highest level of time weighted noise)	Constant to Highly Frequent Noise
2	Frequent Noise
3	Infrequent, but may be high volume noise
4 (lowest level of time weighted noise)	Infrequent Noise

Table 60: Qualitative descriptions for time-weighted noise bands

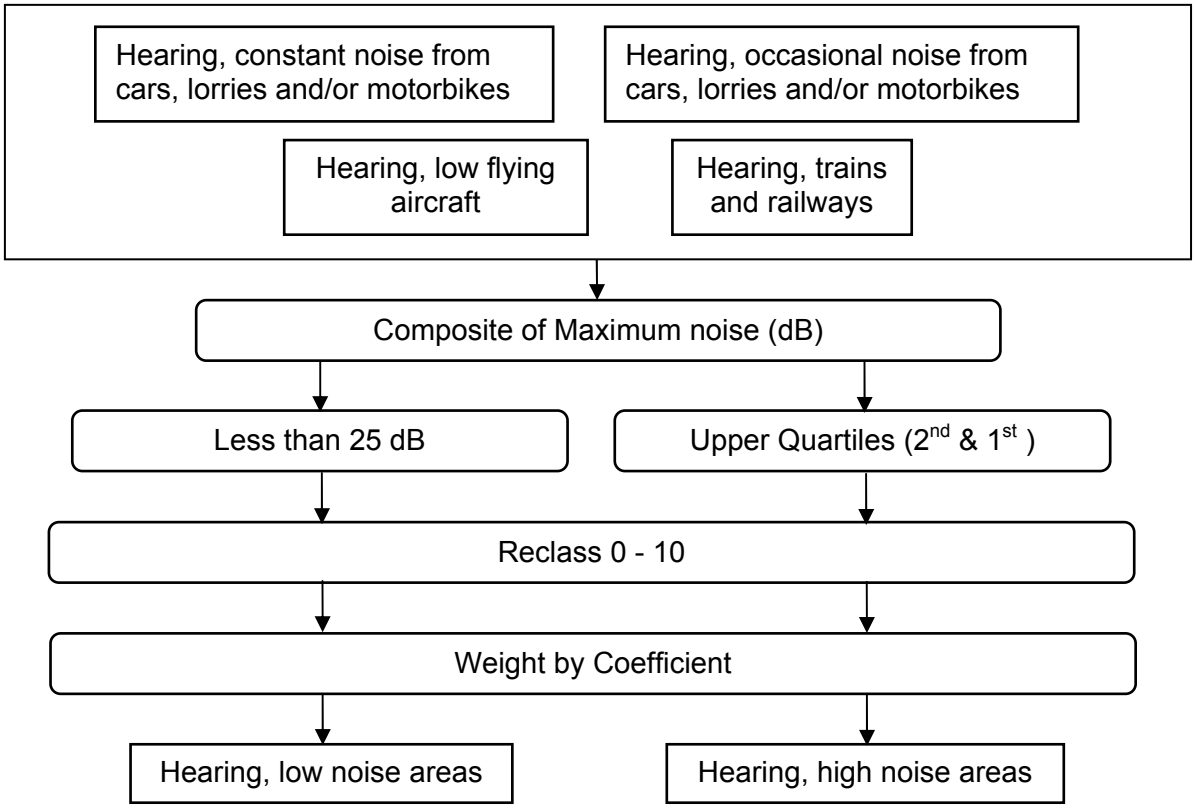


Figure 30: Summary of data generation for 'hearing, low noise areas' and 'hearing, high noise areas'

4.3.4.6.2 Hearing, low noise areas

The option choice, 'Hearing, low noise areas' is the opposite of high noise. For the four datasets used to account for negative noise effects it could be argued that for any grid cell with a value under 25 dB it is possible to hear birdsong, wildlife, natural sounds, silence, peace and quiet or no human sounds. Consequently, all grid squares at less than or equal to 25 dB have been extracted and re-classed on a scale of 1 – 10 and used as a proxy for hearing low noise areas (Figure 30).

4.3.4.6.3 Hearing, lots of people

Obtaining figures for noise associated with the presence of people, number, age for all sites where people are likely to be, honey pot sites, are outside the capacity of this project. Instead data generated for the option choice 'seeing, lots of people' will be used as a relative indicator of presence and absence. The method of data generation is shown in Figure 31.

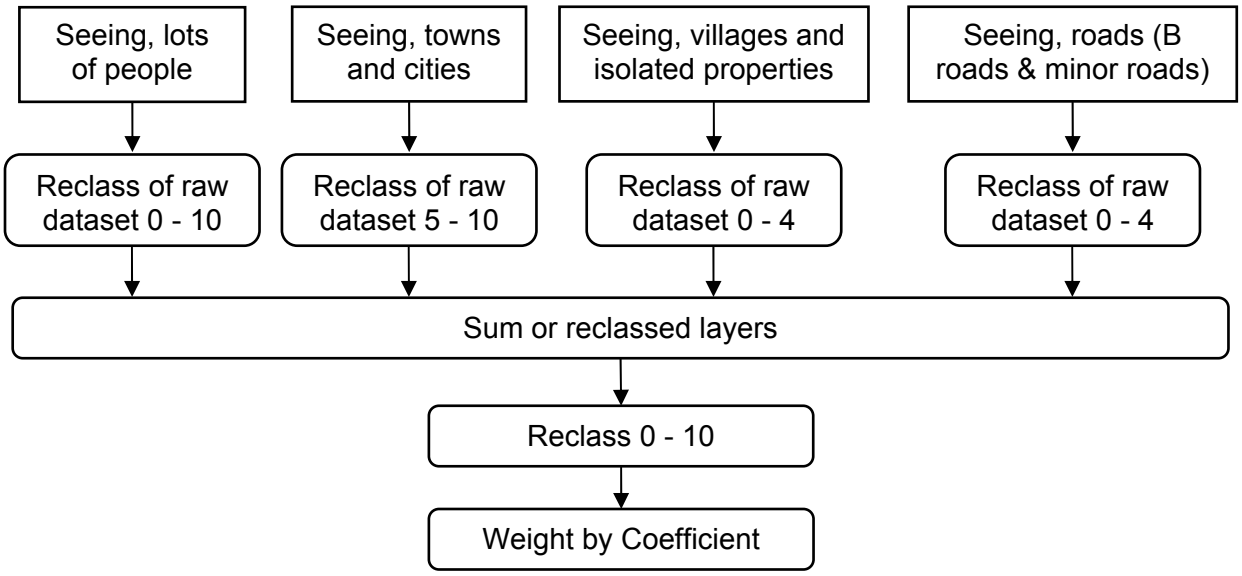


Figure 31: Summary of data generation for 'hearing, lots of people'

4.3.5 Combining the individual components of the Model

Each individual option choice has been compiled using the methodologies outlined above but it is useful here to summarise this process graphically. Figure 32 presents a schematic representation of how one option choice, 'seeing, the sea', has gone through the data processing in the GIS model.

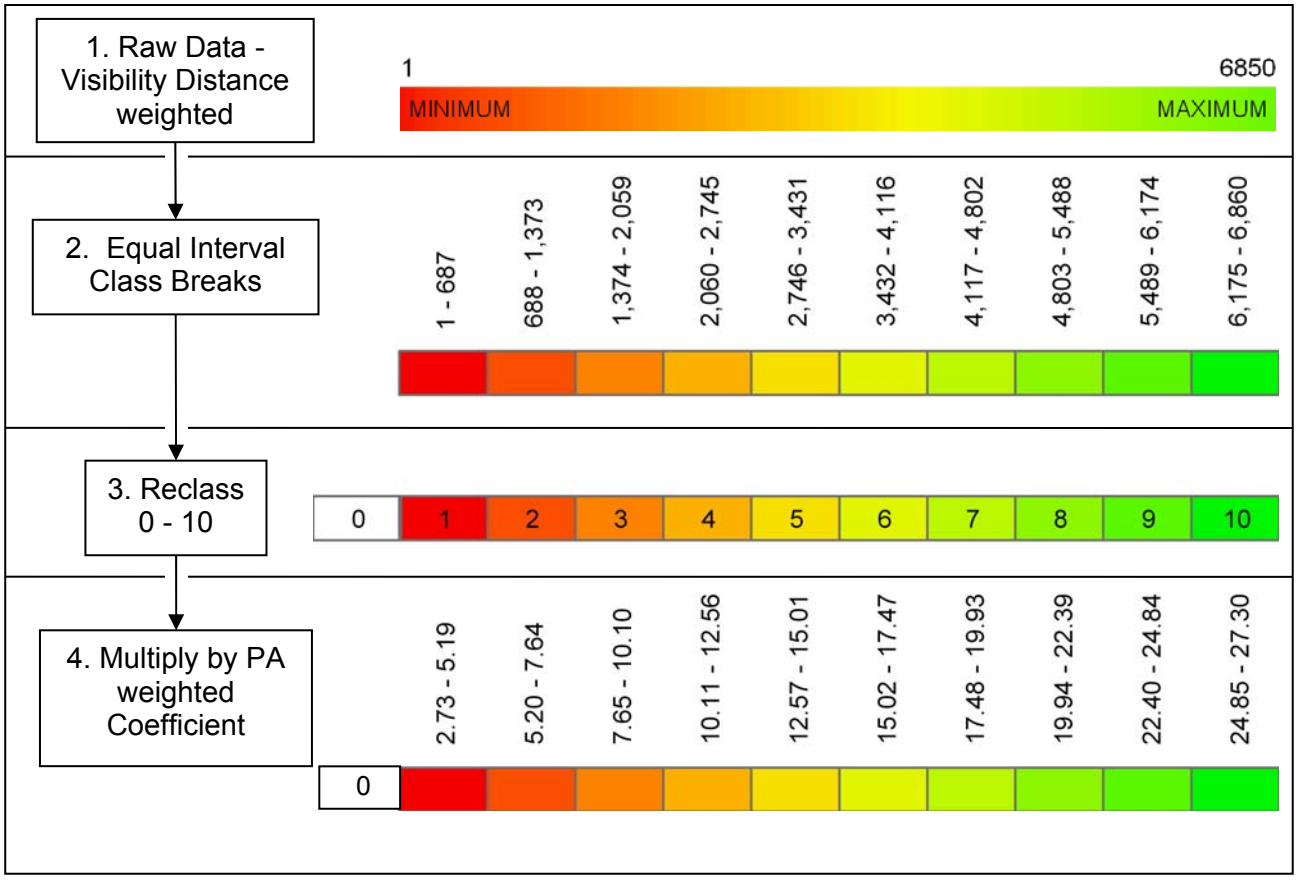


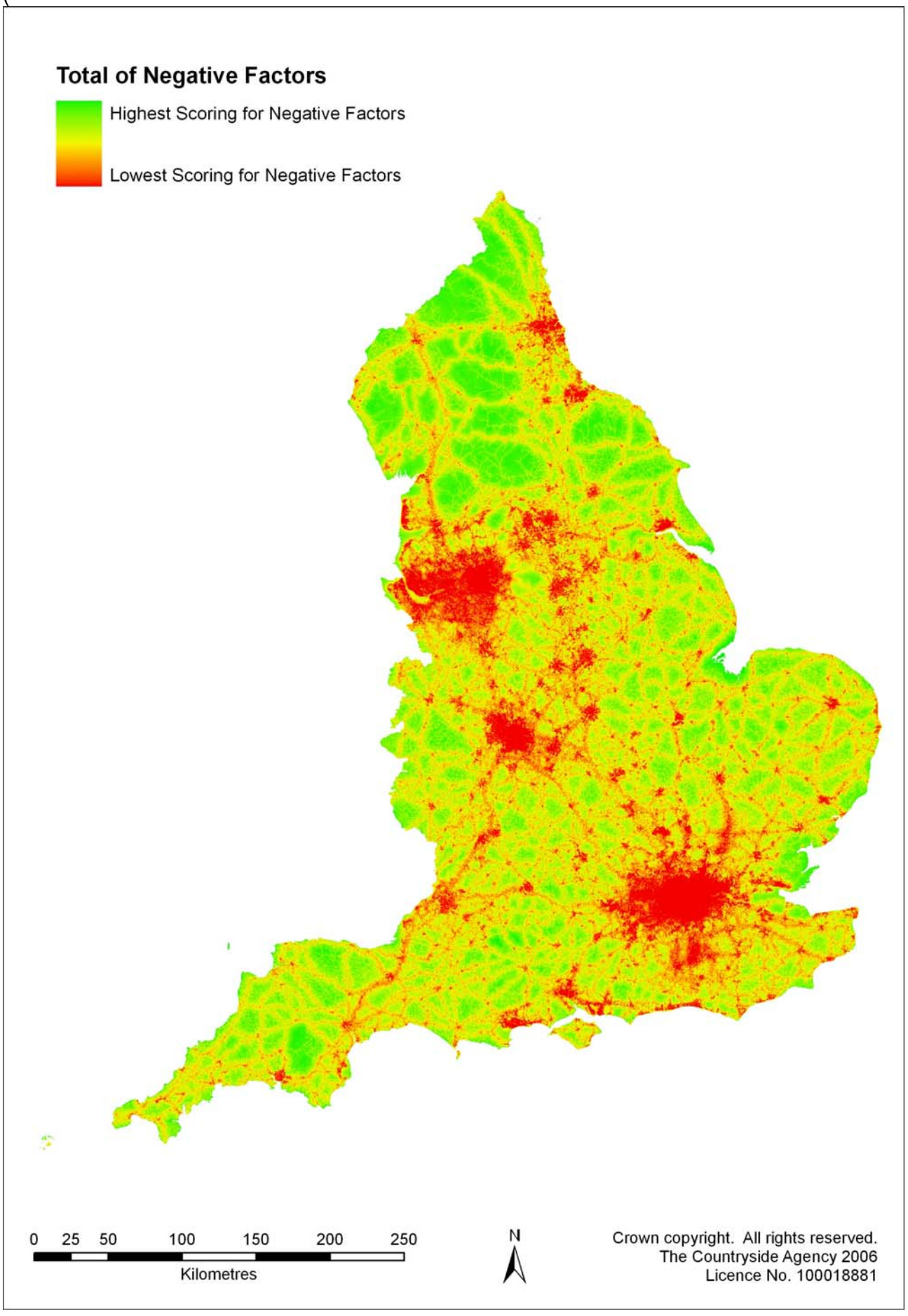
Figure 32: A schematic example of processing data for the option choice 'seeing, the sea'

The maximum and minimum values for each individual option choice represent the range of values for all 500 by 500m grid cells that cover England. The range of data is therefore representative for the whole of England.

The steps outlined above were carried out for each option choice. In putting together the final GIS model of relative tranquillity:

- The PA weighted data representing the positive and negative option choices were combined through a process of summation to give a total score for the positive and negative components.
- The summed data of all the positive option choices is then multiplied by a coefficient of 0.5 – the sum of all the PA weighted coefficients (Figure 33)

- The summed data of all the negative option choices is then multiplied by a coefficient of 0.48 (



- Figure 34)
- The two weighted layers are then combined (Total Positive x 0.5) – (Total Negative x 0.48) to give the final map which is illustrated in Figure 35.

The final map of relative tranquillity highlights areas nationally where a person has an increased chance of experiencing tranquillity within a rural environment, according to our methodology. It should be noted that the unique combination of the different option choices takes into account the characteristics within a 500m by 500m grid square. The methodology accumulates positive and negative scores to generate a final score but does not as yet interpret their interaction. Therefore it is possible that in a map of tranquillity at a national scale the influence of a major road running through an otherwise undisturbed natural landscape may not be sufficiently negative to make the area covered by the line of the road appear at the lower end of the tranquillity spectrum. This may occur because the negative score for the road may be outweighed by the significantly greater positive scores for the 500m cells through which the road runs.

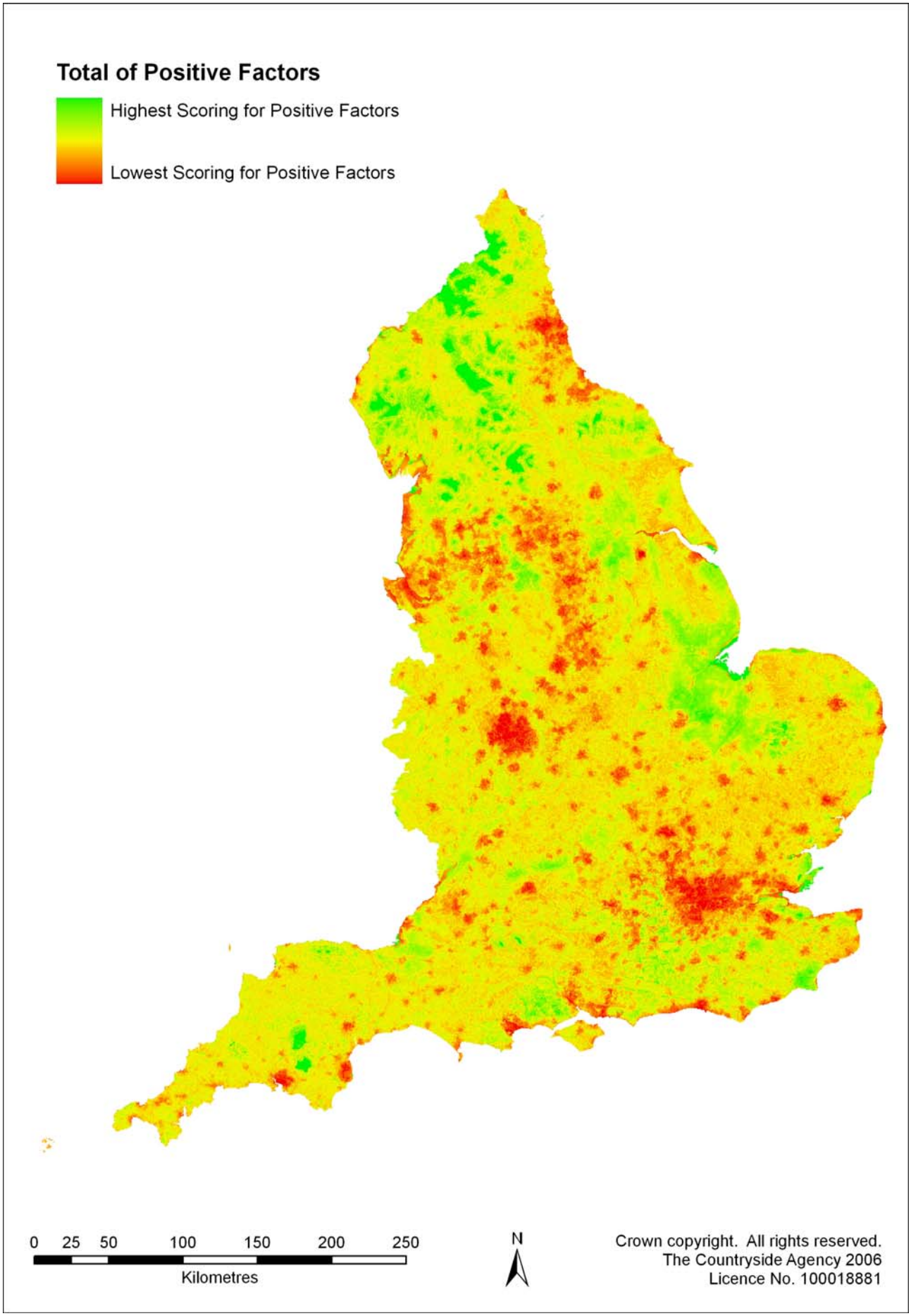


Figure 33: Composite map of positive factors

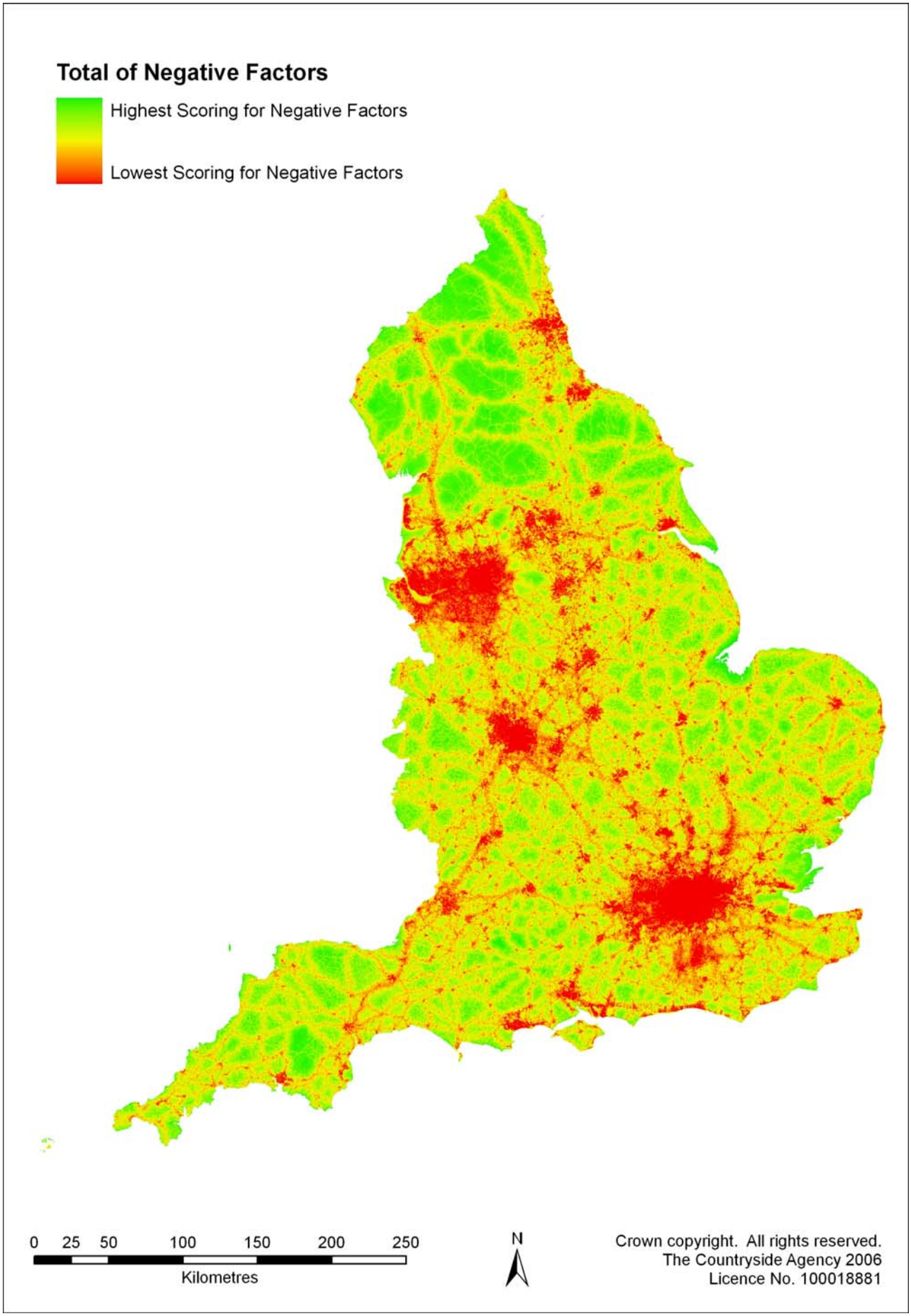


Figure 34: Composite map of negative factors

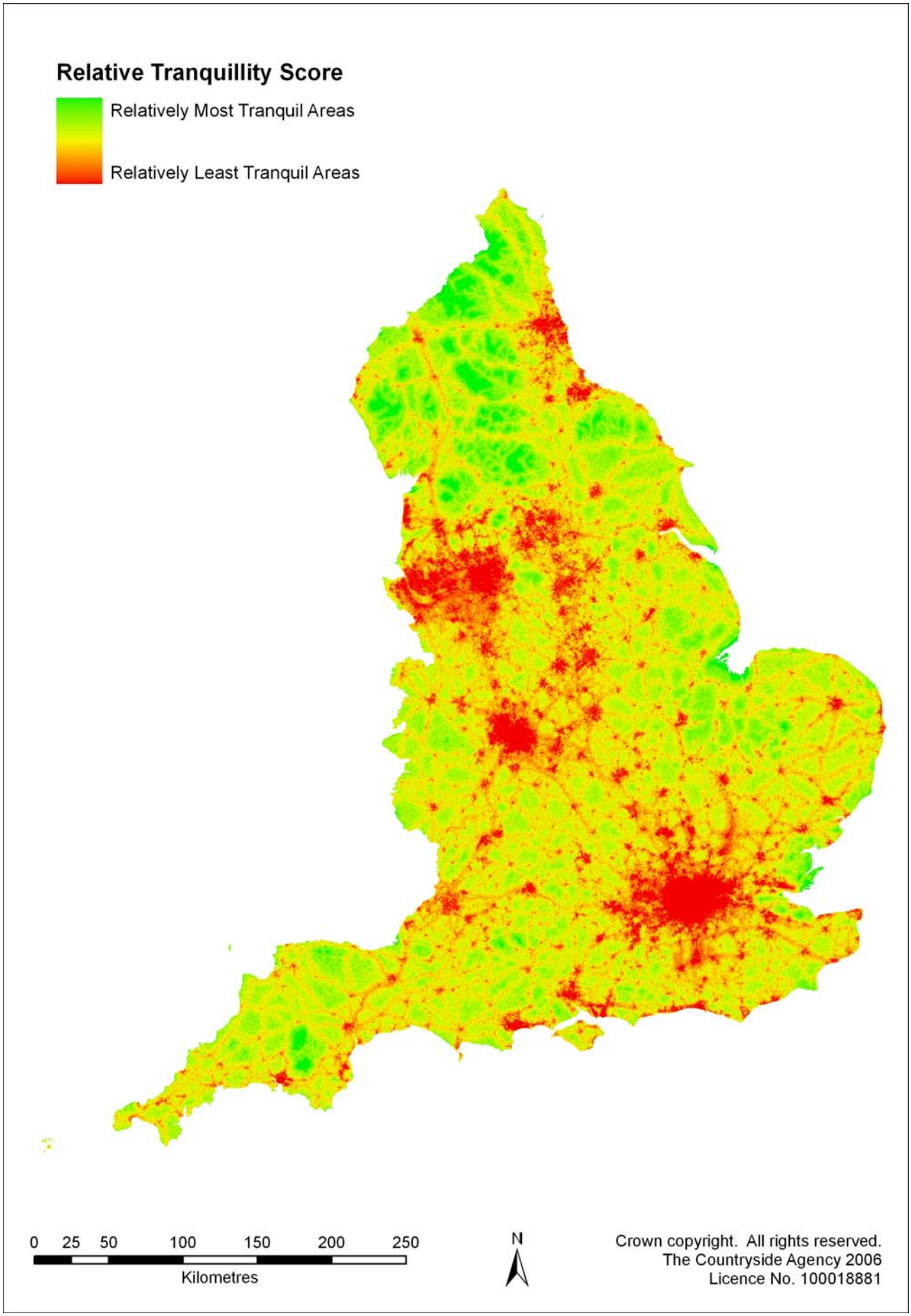


Figure 35: Map of relative tranquillity - England

5 Discussion

'The English Countryside is universally valued as an important national asset, with 95% of people wanting to keep the English Countryside the way it is'.
Rural White Paper Review 2002[32].

Rural White Paper 2000[33] committed the government to 'a protected countryside in which the environment is sustained and enhanced and which all can enjoy'. In its vision to protect and enhance the countryside the White Paper promised the publication of a measure of change in countryside quality - listing issues such as biodiversity, tranquillity, heritage and landscape character - as one of 15 headline indicators for rural areas.

The Review of the Rural White Paper under its heading 'Conserving and enhancing the countryside' does not mention the protection of tranquillity per se but refers to the protection and enhancement of areas and characteristics which were found in this study to play a part in the generation of the conditions necessary for 'feelings of tranquillity' .

Tranquillity is valued by the people who were consulted in countryside locations in England. There is a sense of a special quality appreciated for its personal benefits and often linked to specific times and places. It is considered to contribute to quality of life and feelings of well-being.

This research develops the 2004 studies in the Northumberland National Park, the West Durham Coalfields and the Chilterns. The existing responses were refined to provide options which could be mapped using GIS and also included research on threshold analysis to quantify the perceived naturalness of land cover and limits of negatively perceived elements in the landscape.

The discussion is broken down into eight key elements:

a) Mapping tranquillity at a national scale - the background
b) Tranquillity assessment
c) A general discussion of the methodology:
    PA led research
    GIS methodology: caveats and limitations
d) A discussion of the survey findings
e) Relative tranquillity defined
f) Case study examples
g) Discussion of findings and implications for countryside policy, planning and management
h) Future development.

[32] The Rural White paper Review (2002) http://www.defra.gov.uk/rural/rwpreview/default.htm

[33] The Rural White Paper (2000) http://www.defra.gov.uk/rural/ruralwp/default.htm

5.1 Tranquillity mapping at a national scale

The researchers on the 2004 project were not the first to tackle the concept of tranquillity, or to try and map it. The literature review sets the scene of what has been done before and the wider context within which this project was conceived.

Peterken (1996) has argued that "most terms seem to have a planetary structure, i.e. a solid core of meaning, surrounded by an 'atmosphere' of diminishing applicability, with edges so fuzzy that exact delimitation is impossible or arbitrary" (p.12). The extensive consultation work carried out during the 2004 study underscores this and makes a precise and universally acceptable definition of tranquillity very difficult. However, the fact that certain variables emerge strongly and repetitively across many cases, allows us to build a picture of what characterises and detracts from these tranquil areas, or areas that permit people to find tranquillity.

The 2004 research underscored the significance of tranquillity at a personal level to many of the respondents consulted during the study, citing a range of personal and internal reasons relating to 'personal balance', 'destress[ing]', achieving 'peace of mind' and 'getting away from it all'. This research grounds the concept of tranquillity in specific quantifiable findings from prescribed options. The 2006 study has developed through quantitative survey of prescribed option choices and threshold analysis research. It considers and expands on what people value in the landscape, findings that have implications for targets, indicators, policies and plans relating to quality of life, countryside quality, landscape strategies and environmental management. Underpinning the 2004 and 2006 research was a belief that many of the concepts used in environmental management are relative, that is, the characteristics or qualities exist on a spectrum and that discrete, binary categories such as high/low quality, natural/unnatural, wild/managed or tranquil/non-tranquil fail to capture either the variability of human perception or the 'fuzziness' of boundaries in space and time. For this reason the projects focused on the identification and mapping of relative tranquillity. At a much larger scale relatively tranquil areas are those where the physical and experiential characteristics of the landscape are more likely to provide countryside users with the space and conditions to relax, achieve mental balance and a sense of distance from stress. Relatively tranquil areas are characterised by a low density of people, minimal levels of artificial noise and a landscape that is perceived as relatively natural, with few overt signs of human influence.

The project developed the work of Rendel and ASH Consulting using the techniques in social research and geographical mapping that are now available. Levett (2000) outlines that a fundamental problem for tranquillity mapping is that the choice of impacts is intrinsically subjective and has never been grounded in people's perceptions. This is exactly what the 2004 project sought and succeeded in addressing and which has developed in the 2006 national project.

This was carried out by unpacking the concept of tranquillity and extracting and operationalising the criteria that make it up; it thus follows the lead from other studies that have done so with similarly subjective concepts. Where our work differs is that these criteria were developed solely from the responses of the people that were consulted in the 2004 studies. This project aimed to both address and capitalise on the subjective nature of 'tranquillity' and the values of people who experience it by basing the research on them.

Previous research identified 'reservoirs' of tranquillity in the countryside. Reservoirs can of course grow and shrink with time and, to stretch the analogy, some may be of higher quality than others. However, reservoirs are essentially fixed categories; something either is a reservoir or it is not. Through the 2004 consultation the concept of tranquillity was split into different factors, those that contribute to tranquillity and those that detract from tranquillity. This has enhanced understanding of what people mean by and seek in tranquil areas, and has permitted the application of GIS-based modelling tools to represent the spatial distribution of these mappable attributes, both positive and negative. In so doing we have moved, both conceptually and in terms of the results, from reservoirs of tranquillity to relative tranquillity. In this current study the GIS modelling has been further developed to provide national and regionally based maps weighted by data from an extended survey as detailed in Section 4.1.4.

5.2 Tranquillity Assessment

CPRE's work[34] prior to 2004 was intended to identify (a) changes in tranquillity over a thirty year period to establish the context for campaigning work on this front and (b) where significant 'reservoirs' of tranquillity remained. Due to the more simplistic methodology used prior to 2004 and the enormous advances in 2004 and 2006, these maps are now considered to be intrusion or disturbance rather than tranquillity maps (Figure 36).

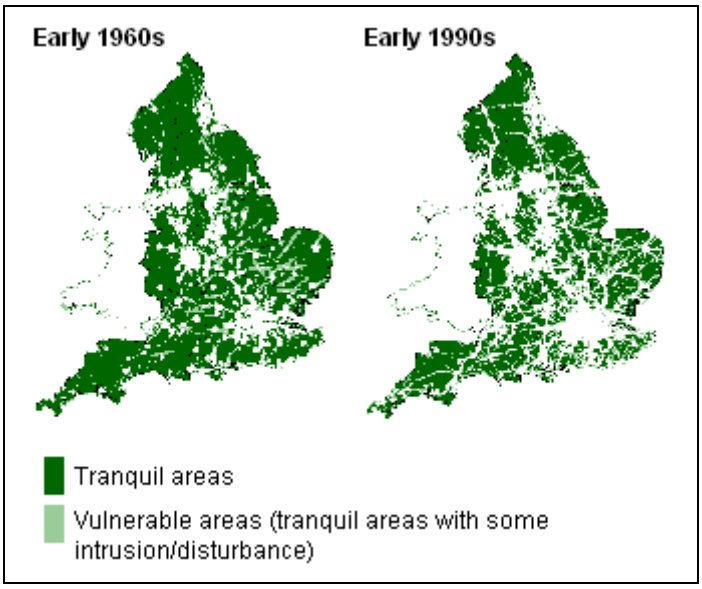


Figure 36: CPRE's Disturbance (Tranquillity) Maps of 1995 (reproduced here with the permission of CPRE / Contryside Commission))

In 2000, a detailed critique of the original CPRE/Countryside Commission maps was published. This argued that a measure of tranquillity was needed that included all and only sources of disturbance which people felt actually damaged tranquillity; and which weighted them in proportion to people's perceptions of their relative impacts on tranquillity. This is exactly what was done subsequently.

The conceptualisation of tranquillity mapping and its development over the last decade, was novel, hugely influential and demonstrated the value of such a concept. Against this background, the 2004 Mapping Tranquillity projects built significantly on this work by developing a methodology and an underpinning definition of tranquillity. In so doing they differed from the previous work on tranquillity mapping in a number of ways:

a) Rather than starting with an expert definition of what comprises tranquillity, the 2004 research started with extensive consultation work to arrive at the definition. Consequently, a wider range of variables were considered than in previous research, for instance incorporating night time skyglow and the perceived naturalness of landscape. In previous research the researchers defined the parameters and then applied the modelling and mapping from that point. This failed to accommodate the likelihood that a wider cross section of the population might have different or divergent views on the subject.

b) Previous work had focused exclusively on factors that detract from tranquillity, such as roads and airports. Our approach includes positive factors that contribute to, as well as negative factors that detract from tranquillity. A combination of the positive and negative factors weighted according to how important people think they are in determining the tranquillity of a place and the use of the scoring from the threshold research was used to arrive at a composite relative tranquillity score.

[34] http://www.cpre.org.uk/campaigns/landscape-and-beauty/tranquil-areas/

c) More advanced modelling techniques allowed the mapping of the diffusion of variables' impact over space. For example, noise levels decrease with distance from sources such as roads, but this is mediated by other factors such as vegetation and terrain. In the 2004 study we were able to take into account these effects. Similarly the 2006 work models attenuation of noise to produce continuous surface maps of relative tranquillity, rather than zones of tranquil/non tranquil, or high/medium/low tranquillity.

d) In the 2004 research a conceptual framework of relative tranquillity was developed, and has been expanded on in this current study. Relatively tranquil areas are those which have higher scores on the positive factors and lower scores on the negative factors, than other areas. Our maps reveal areas, both large and small, where people are likely to experience tranquillity. But they do not identify absolutely tranquil areas, nor do they produce sharp lines dividing tranquil from non-tranquil areas. Relative tranquillity is something that is context dependent. For instance the most relatively tranquil areas within the urban conurbation of Tyne and Wear would still be judged relatively non-tranquil if considered alongside Northumberland and the North Pennines. Relative tranquillity is critical and will be addressed more fully in Section 5.4.2.

e) These mapping techniques also allowed varying conditions, notably topography and vegetation to be taken into account, with cumulative effects of factors that add to or detract from tranquillity and the interaction between factors being included in the work. It was also possible to incorporate local effects, excluded from the 1995 CPRE/Countryside Commission maps, highlighting the importance of areas that have many of the characteristics of tranquillity that are in close proximity to centres of population and therefore of considerable value in their local context.

f) Finally, the projects have expanded mapping processes; factors were included that arose as important during the consultation.

5.3 A general discussion of the Methodology

This research was commissioned to take forward previous work in tranquillity mapping and develop a methodology that was sufficiently robust that its results (tranquillity maps) would have credibility amongst relevant practitioners. As a secondary objective the methodology should be able to be used in what may be termed an environmental assessment mode, whereby the impact of proposed developments (visual, noise and perception related) could be measured to test for negative impacts on areas that are judged to be tranquil and worth protection for that reason. The GIS model developed in this project meets both these requirements, but there are issues arising from the project that need to be set out clearly as these are relevant to any future development or application of the methodology. These include limitations of data availability, precision and methods applied.

5.3.1 The public consultation

The 2006 work necessitated an approach to consultation that was far narrower in scope than the 2004 project. The reason for this is twofold. Firstly, the timescale was much shorter and secondly the PA research threw up many variables which the GIS model was simply unable to accommodate. For this reason, and to bring into sharper focus those factors which can be mapped using nationally consistent datasets, the range of tranquillity options was much reduced, focusing on visual and noise related characteristics of landscape and intrusions to tranquillity. Although this meant that a lot of the qualitative 'richness' of the initial PA data was not be replicated at the national scale, the approach is more easily understood and the connection between the consultation and the mapping exercise is more direct and transparent. In essence the differences in approach (and rationale for their usage) can be visualised as in Figure 35 below.

For the North East and Chilterns work the project team wanted to generate data that was both qualitative and in-depth in order to begin understanding tranquillity and perceptions of it, within the

locations under study. As such, a complex picture emerged (represented by the greater width of the base of the triangle above) that fused together a wide range of variables felt by respondents to embody what tranquillity meant to them. Such data is extremely very useful in understanding tranquillity in an analytical or operational sense at the local level, as it is detailed, thorough and comprehensive in scope – it builds a clear and meaningful picture of perceptions of tranquillity in all their complexities and through exploration of all elements in detail in those areas.

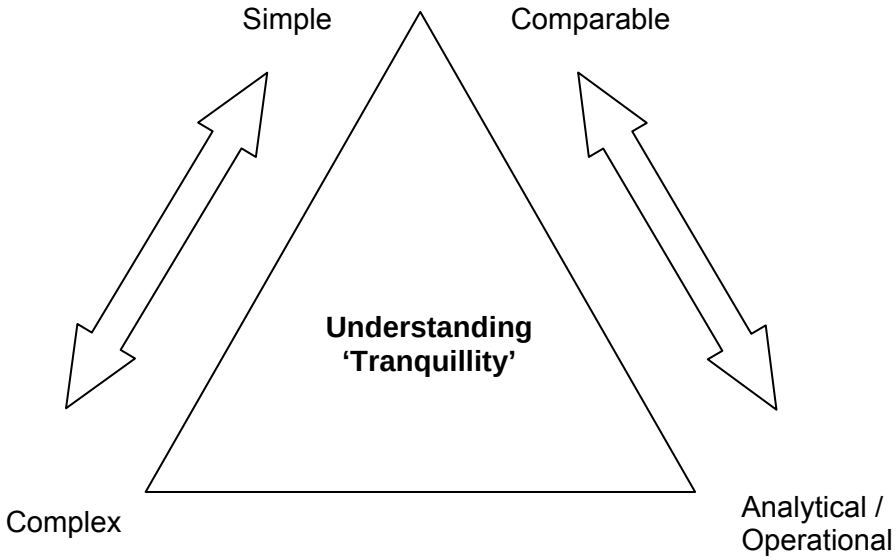


Figure 37: Differences in Approach

However, such a qualitative approach does not lend itself easily to comparison in a clear and rigorous way across and between areas, as was noted on completion of the Chilterns follow-on study. Whilst the overall tone and weight of the different responses expressed in the Chilterns were clearly 'different' to those in the North East it is difficult to express exactly how they are different other than through an equally qualitative description and analysis, through use of relatively hazy nuanced differences such as tone, apparent extent of repeated comments and so on. This is not really surprising in that the participatory appraisal based work undertaken in these two pilot areas was never envisaged as forming an approach that could easily and confidently allow for clear comparison in views across areas. However, the approach undertaken in the national work – the questionnaire - has been constructed with exactly that aim in mind – to allow for comparability of responses across time and space - by limiting the options available and maximising the ability for quantification of the choices subsequently made to most effectively inform the GIS model.

The process of identifying 'how far to go' (that is, how many options to provide, how much detail to go into – just 'water', or 'rivers', 'the sea' and so on…) was explored for some time by the project team. It was strongly informed by discussions surrounding the benefits, or otherwise, of allowing participants in the study to choose options that would not inform the GIS mapping (due to the lack of a dataset that such options would be linked into) and findings taken from the previous theming and verification work. It is worth, at this stage, reminding ourselves of the 'theming' process that had been undertaken in the previous work. Following the main research phase and prior to verification, responses were coded using a hierarchy of themes from the general to the specific. Four levels of coding were used. At the most general level each response was linked to whether it was broadly related to 'nature' or 'humans'. Below this (level 2) the responses were coded according to whether they were something 'you see', 'you hear', 'doing', 'of the mind', 'do not see', 'do not hear' and so on (loosely based on human senses, reflecting the positioning of humans at

the centre of experiencing tranquillity). They were then coded again (level 3) according to more specific information (for example, as 'activity' or 'landscape') and finally, for level 4 (if necessary) a more specific scale again (for example, 'walking', or 'river').

The theming process identified above had been based around a 'theming key' for each of the two main questions that had been employed in the 2004 study – what is tranquillity and what is not tranquillity. The theming key for each was essentially a horizontal tree root diagram divided into 4 main stages, with the 'branches' (theming levels) becoming thinner and thinner and greater in number (more detailed/specific) as the diagram moved from left to right. Hence, 'human' and 'nature'/'non-human' (the highest level theme) was on the left of the diagram, with increasingly detailed responses being found (from 'natural', to 'water', to 'rivers', to 'babbling brook' and so on) towards the right hand edge. For the purposes of identifying options to allow participants to choose from on the consultation questionnaire, the project team began by examining the main themes found towards the left of each theming key and combining these with the responses that had received greatest support during the previous pilot studies.

With this (quite lengthy) list of possible options identified, the team then explored the benefits (and otherwise) of including options that would not play a role in the GIS mapping (such as all the responses that had been included within the 'of the mind' theme in previous work). There were two main arguments and viewpoints. On the one hand there would be no harm done in including non-'data-driven' options as it would again provide a pertinent expression of the importance of such issues in exploring tranquillity, should participants vote for them. Further, whilst they would not be incorporated into the model, they would still be acknowledged qualitatively in the final report. On the other hand the brief from the project commissioners was clearly directed towards the generation of tranquillity maps, not a further 'qualitative' study and inclusion of such options would ultimately dilute the impact of the consultation (as well as increase the number of options to be chosen from, or replace data-driven options, on the questionnaire).

Much of the rationale for ultimately deciding to remove all options that were not 'data-driven' can be found in previous Mapping Tranquillity reports (in sections relating to the GIS work)e In very simple terms this decision included excluding any potential options relating to the North East theme of 'experiencing' smells, the impact on mental issues ('stress', 'escape' and so on…) and 'doing' a range of activities (such as walking, drinking and so on), whilst also conflating many options back up into higher level themes that could both cover a range of issues and also directly link to available data sets (with, for example, the huge range of issues relating to the negative presence of people being reduced down to a much smaller range of 'people'-related option choices). In the final stages the options were again reviewed and slightly expanded upon in light of previous voting patterns to include other options that would have direct links to the GIS and to allow a balance in number of option choices between the two main questions being asked. In sum, however, the project team erred on the side of caution, keeping the number and range of options to be chosen from the potential list to a minimum where possible, whilst maximising the input from the consultation to the GIS mapping (and available datasets).

There were a limited number of issues that arose during the consultation process itself. Clearly, the arrival of people at the venues could not be controlled. Access to respondents was therefore affected by their flow and by the inability to interview more than one person at any one time. However, good team work and clear identification of duties ensured that, for example, during busy times one person took an administrative role taking completed questionnaires for bundling and storage and preparing clipboards with new forms which were then issued to the other three researchers to maximise their ability to engage. Along similar lines it was found to be more beneficial to present the participants with the survey turned to the first question. The instructions for completion appeared on the front cover and therefore were not visible and the procedure had to be verbally explained. Finally, the survey sheets were divided into factors under 'seeing' and 'hearing' categories. Frequently participants thought that they had to choose three from each section rather than three from the whole page, but were guided to the correct mode of completion by the researchers.

5.3.2 Threshold Analysis

Thresholds arrived at by independent research have an important part to play in grounding the myriad of visually derived information. They provide considered guidelines, but need always to be viewed in the light of new research information and site specific detail.
Previously established thresholds, for example Benson *et al*. (2002), have a variety of functions. They are used to assist in providing guidelines around which planning decisions can be made; for example in regional spatial strategy development and for environmental impact assessment, to guide planning decisions impartially.
They have been used in this study to weight the GIS data (Section 4.3.2.4) and therefore provide a consistent framework for the visibility data. The spatial threshold research considered the perceived naturalness of land cover, the effect of people and their activities in the landscape and a methodology to establish distance thresholds for urban and rural settlements, roads and vertical elements represented by pylons.

5.3.3 GIS Model: caveats and limitations

The type or data available, the method used to generate data and the format of the data is variable for each option choice. Data generation for some option choices is relatively easy and readily quantifiable. The data are specific and precise; for example, the location of power lines as a footprint is known and they either can or can't be seen (within the limitations of modelling visibility). For some of the datasets it has not been possible to provide a recognisable or quantifiable footprint of location in order to model visibility or noise. The flight paths of high altitude aircraft and the ability to see lots of people have all required the use of a proxy dataset - a dataset ranging from low to high values, that represents the likelihood of being able to see or hear people and high flying aircraft that will detract from or contribute to an experience of tranquillity.

For some option choices more than one dataset is required to provide a representation of likelihood of seeing a wild landscape or hearing birds or peace and quiet. Seeing a wild landscape has used the raw data from three option choices to generate a figure that allows a distinction between one area being seen as 'wilder' than another area. Consequently, for some option choices input from other option choices has been used to cover all aspects of the criterion. In addition, seeing a wild landscape or a natural landscape is less specific and leaves questions unanswered about vegetation cover, proportions and levels of public bias towards different types and combinations of vegetation or interpretations of what is wild (Table 2).

Wherever possible, as recommended in the 2004 research, expert judgements are limited to the use of tools within GIS to generate data that represents the relative contribution of each option choice.

To summarise, the process of linking digital datasets to each option choice has been governed by the following:

- the choice, availability and quality of datasets
- the selection of GIS tools and methods applied
- their 'perceived' contribution to an experience of tranquillity

Table 61 summarises the difference in data precision between the raw data used for each option choice along with a summary of the main caveats and limitations.

The success of this approach is of course wholly contingent upon methodological consistency throughout. The raw data for each option choice has a range of maximum and minimum values representing a greater contribution to or detraction from tranquillity. These raw values of the same type of data, be it distance-weighted visibility, time-weighted noise levels or L_{eq} in dB, are then re-classed so that the contribution to or from an experience of tranquillity is relatively comparable. This allows the use of datasets of variable precision and accuracy, for example L_{Aeq} measurements

of noise attenuation and the length of river within a 500m grid square, to model relative contribution to an experience of tranquillity for the whole of England.

It is important to note that the raw data generated for each option choice vary greatly in terms of their (technically defined) precision. This is especially important to consider if figures of relative tranquillity are used in planning and policy. A definition of relative tranquillity with the caveats and limitations outlined above taken into consideration is provided in Section 5.4.2.

5.3.4 Subsequent development of the methodology

National and regional tranquillity maps were published by CPRE in October 2006. Following publication the researchers noted an error in the generation of vector (shapefile) noise buffers in the calculation of data for primary routes. This error was corrected for and the national tranquillity mapping data was recalculated. The recalculation lessened the impact of primary roads. The recalculation allowed an additional revision to be made to extend the mapping out from high to low water mark. Subsequently, revised national, regional and new county based tranquillity maps were published by CPRE in March 2007.

Further research by Northumbria University in late 2007 indicated that in combining and formatting GIS layers to calculate tranquillity, the PA weighted layer for Seeing, and Hearing, High altitude aircraft has been under represented by a figure of 0.5 (10 * 0.45 (PA weighting) = 4.5 – dataset in GIS is 4) during processing. All other factors are correct. Error introduced is relative to the whole coverage of data for England.

Method	Raw Data Type	Main Caveats and Limitations
What you can see:		
Visibility/distance weighted	A count of how many features can be seen multiplied by a distance weighted factor (STA)	Assumption of bare ground in visibility calculations, no vegetation or buildings taken into account when visibility is modelled.
Visibility: context specific presence/absence	A figure that represents a proportion of the presence of a feature within a 500m grid square - Area (m2) or length (m) or a count of number of features	No account is taken of the distance impact or diffusion of effect upon an experience of tranquillity over distance.
Visibility at night	Skyglow in Nanolamberts – weighted by population or urban area and distance	Uses a methodology and equation developed for modelling urban skyglow in the US.
Openness	A count for each grid square of the number of other grid squares that can be seen	Assumption of bare ground in visibility calculations, no vegetation or buildings taken into account when visibility is modelled. Assume that higher the score the more 'open' the field of view.
Perceived naturalness	Use of LCS2000 categorisation of land cover. Percentage of each type of vegetation is weighted by multiplying by STA score – a mean of the surrounding scores is also included to take into account context.	STA helps identify public perceptions of different types of vegetation – reliant on classification of vegetation of remotely sensed data at a resolution of 25m by 25m.
What you can hear:		
Modelling noise - L_{aeq}	A figure in dB of attenuation of noise taking into account temporal frequency	Does not take into account attenuation over distance by buildings or vegetation. Does not take into account differential contribution of engine, tyre noise or type of vehicle at point source of noise.
Modelling noise – Time weighted	A figure in dB of attenuation of noise using a proxy of temporal frequency – time weighted.	Does not take into account attenuation over distance by buildings or vegetation. Assumptions made about how long you are likely to hear a train or low flying aircraft.
Modelling noise - Context Specific Presence/absence	A figure that represents a proportion of the presence of a feature within a 500m grid square - Area (m2) or length (m) or a count of number of features	No account is taken of the distance impact or diffusion of effect upon an experience of tranquillity over distance.
Combined datasets	Use of quartiles to select out the high and low data of existing raw datasets from other option choices that are then combined to provide a relative figure of contribution to or detraction from tranquillity	Expert judgement on which datasets to combine in order to generate a representative dataset for these option choices

Table 61: GIS methods, raw data, caveats and limitations

5.4 Discussion of findings

This section highlights the main findings of the PA research and how they are reflected in the results of the GIS model for mapping relative tranquillity for the whole of England.

5.4.1 Survey findings

The consensus across regions as to the main qualities which promote feelings of tranquillity and those which detract from it provides the basis for differentiation of the importance of different option choices that are incorporated into the GIS model. In simple terms the results suggest a general level of agreement across the study locations concerning what is and is not perceived to enhance, or detract from tranquillity, with resonance to the previous work conducted in the North East and Chilterns. The tables below show that although in many cases the most preferred options were similar across all locations (as highlighted) there are differences. This is most true of the positive responses, whilst people appear to be more definite about the things that detract from tranquillity. The positive anomalies also tend to occur away from the most popular choice. At almost all (17 out of the 20) locations a41 was the most popular positive choice and a22 the second most popular. The third most popular choice overall however (a17 Hearing, Peace and Quiet), was only chosen as the third most popular choice at three locations.

In very general terms, therefore, the results resemble views uncovered in the previous, more detailed consultations, with positive perceptions of a range of 'natural' features and negative perceptions of the presence of lots of people and aspects of the urban environment.

Tranquil Places

Participants were also asked to name a tranquil place. The tranquil places named are considered, in brief, here, and listed in full in Appendix 9. The tranquil places were compiled alongside the six responses and demographic data, providing a link between the three data types. The limited analysis here of the tranquil places named used TextSTAT, a freely downloaded text analysis software application. The analysis required three stages: collation of the tranquil places, ranking words according to their occurrence and finally, looking at the word's context. The Appendix is therefore spit into three. Firstly tranquil places are listed alphabetically and according to the session in which they were named. The number of times that each tranquil place was mentioned are listed (but only those that occurred more than ten times) and finally their context.

The tranquil places named varied considerably between sessions and at the same session. The lists show a clear correlation between the locality and the tranquil place named. The majority of places are relatively local to the area in which the consultation occurred. Fewer responses name places more distant and these tend to be larger, designated areas and even countries (or parts of them) e.g. 'Lake District' 'Haweswater Lake District' 'Scotland' 'Scotland - Mallaig area'. Places also vary from general, descriptive types of landscape to very specific locations and times.

The table showing the number of times words occur omits those that are mentioned fewer than ten times. Clearly this excludes the vast majority of words mentioned, but to include them would only be useful if they were to be considered individually. The list includes all words mentioned, so many will not refer to a place (such as and, in, on, the, etc). At this level of analysis the Lake District (or some variation of it i.e. the Lakes) is mentioned often, as is Yorkshire, in its different forms. Sessions took place in Yorkshire and Devon (which was also mentioned often) but did not in the North West. Although tranquil places tended to be more rural a small number of more urban areas (and locations within them) were mentioned e.g. 'Stratford' 'Jesmond Dean' 'Swansea'. Aside from places named, people also mentioned landscape types or features e.g. Forest, Woods, Moors, Park, Valley, Beach, Coast, etc. although these were often related to a place. Looking at the information at this level might skew the data; mention of specific places within areas (those that are more likely to be mentioned fewer times) are less likely to be listed.

The lists that show examples of a word's context help to clarify this. 'District' was the most mentioned word. By itself it could mean several things. The context however shows that it applies to two things: the Lake District and the Peak District. Likewise, 'lakes' might refer to different lakes,

the Lakes, or lakes as a generic term. In fact it applies to all three. Devon is mentioned a number of times and often alongside specific locations within Devon. The data can be seen at a different levels from the geographically large to specific locations and from a landscape type to its associated place e.g. ‘coast’ and ‘Dorset Coast’.

Some of the words that were not listed (less than 10 occurrences) include:

- action words e.g. ‘sitting’
- non-geographical locations e.g. ‘home’
- organisations e.g. RSPB
- man-made features in the landscape e.g. ‘bridge’
- sense related e.g.. ‘quiet’
- time related e.g.. ‘day’

Table 62 and Table 63 rank the choice of option according to location.

Rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	a01	a01	a13	a01	a01	a01	A01	a13	a01	a01	a01	a01	a01	a13	a13	a01	a01	a01	a01	a01
2	a07	a13	a01	a17	a13	a15	A13	a01	a13	a07	a12	a07	a03	a08	a01	a11	a13	a13	a13	a13
3	a13	a11	a19	a13	a07	a11	A07	a12	a12	a08	a17	a08	a13	a17	a07	a13	a17	a17	a12	a08
4	a17	a03	a15	a12	a15	a13	A08	a15	a17	a03	a08	a12	a02	a01	a11	a07	a11	a08	a17	a17
5	a12	a15	a11	a14	a17	a17	A17	a11	a02	a17	a10	a13	a04	a11	a02	a12	a08	a20	a04	a12
6	a14	a17	a12	a15	a02	a09	A05	a02	a19	a13	a07	a14	a09	a07	a15	a08	a09	a02	a08	a03
7	a09	a12	a07	a19	a12	a19	A09	a05	a08	a09	a15	a15	a07	a09	a08	a17	a03	a07	a19	a19
8	a02	a07	a03	a02	a14	a02	A14	a07	a11	a11	a11	a03	a11	a05	a09	a09	a07	a10	a02	a15
9	a05	a08	a08	a05	a19	a07	A12	a08	a05	a14	a14	a05	a12	a12	a12	a03	a02	a11	a07	a14
10	a11	a09	a10	a07	a05	a12	A15	a09	a04	a15	a13	a11	a14	a02	a14	a02	a14	a15	a09	a04
11	a03	a20	a14	a11	a08	a20	A19	a14	a07	a02	a03	a17	a18	a14	a17	a19	a05	a19	a14	a10
12	a10	a19	a09	a08	a06	a04	A03	a17	a14	a12	a05	a09	a20	a20	a04	a20	a15	a09	a10	a02
13	a19	a18	a05	a18	a09	a18	A11	a19	a15	a04	a19	a10	a21	a03	a18	a04	a19	a12	a15	a06
14	a08	a04	a18	a03	a11	a14	A18	a03	a18	a05	a20	a02	a05	a04	a19	a21	a04	a03	a11	a11
15	a15	a05	a02	a06	a21	a08	A02	a06	a20	a10	a18	a18	a08	a10	a20	a14	a10	a05	a03	a05
16	a04	a02	a21	a09	a03	a03	A20	a20	a03	a19	a21	a21	a10	a18	a03	a15	a12	a18	a05	a07
17	a20	a21	a20	a16	a18	a05	A06	a10	a06	a21	a02	a16	a15	a06	a05	a06	a21	a04	a18	a09
18	a06	a10	a17	a10	a04	a10	A04	a18	a09	a16	a04	a19	a17	a15	a06	a10	a06	a14	a20	a18
19	a21	a14	a06	a21	a10	a16	A10	a21	a21	a18	a06	a20	a06	a19	a21	a05	a16	a06	a21	a16
20	a16	a16	a04	a04	a16	a21	A21	a04	a10	a20	a09	a04	a16	a16	a16	a18	a18	a21	a06	a21
21	a18	a06	a16	a20	a20	a06	A16	a16	a16	a06	a16	a06	a19	a21	a10	a16	a20	a16	a16	a20

Table 62: 'What is tranquillity' - ranking of responses according to location

Rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	a41	a41	a41	a41	a41	a41	a41	a41	a41	a22	a41	a22	a22	a41	a41	a41	a41	a41	a41	a41
2	a22	a22	a22	a22	a22	a22	a22	a22	a22	a25	a22	a41	a41	a22	a22	a22	a22	a22	a22	a22
3	a30	a30	a30	a30	a37	a30	a30	a30	a24	a41	a24	a37	a24	a30	a30	a30	a38	a37	a30	a30
4	a24	a24	a37	a24	a24	a37	a38	a24	a25	a30	a30	a28	a37	a37	a24	a37	a25	a30	a34	a37
5	a28	a33	a24	a37	a30	a24	a24	a25	a38	a24	a34	a38	a30	a25	a28	a24	a30	a28	a28	a25
6	a34	a28	a31	a34	a28	a38	a34	a28	a28	a28	a37	a30	a25	a28	a25	a25	a37	a25	a24	a24
7	a25	a38	a38	a38	a34	a34	a25	a37	a29	a38	a25	a25	a28	a38	a33	a28	a34	a38	a25	a31
8	a38	a37	a33	a25	a38	a44	a28	a38	a30	a36	a38	a29	a36	a31	a34	a31	a24	a34	a37	a34
9	a36	a34	a44	a28	a29	a25	a29	a31	a37	a33	a31	a24	a43	a34	a37	a34	a33	a24	a33	a38
10	a37	a25	a25	a33	a44	a28	a37	a33	a34	a34	a33	a34	a23	a44	a38	a33	a28	a33	a38	a44
11	a43	a44	a28	a31	a33	a33	a44	a36	a31	a37	a36	a36	a26	a24	a36	a29	a44	a36	a29	a28
12	a44	a36	a36	a32	a36	a31	a36	a34	a36	a29	a42	a33	a31	a29	a31	a36	a31	a31	a44	a29
13	a29	a29	a34	a36	a25	a42	a33	a44	a23	a31	a44	a44	a32	a33	a42	a42	a29	a29	a36	a33
14	a33	a26	a40	a39	a42	a26	a31	a43	a26	a26	a28	a32	a33	a36	a23	a44	a32	a44	a42	a36
15	a31	a31	a39	a40	a23	a32	a42	a32	a27	a32	a29	a42	a34	a43	a40	a32	a36	a27	a43	a26
16	a42	a40	a29	a35	a26	a36	a43	a29	a33	a40	a32	a31	a38	a23	a26	a38	a27	a40	a31	a27
17	a27	a42	a43	a42	a31	a23	a23	a23	a35	a44	a23	a27	a42	a26	a27	a23	a42	a42	a23	a40
18	a40	a23	a23	a26	a32	a27	a26	a26	a42	a27	a26	a40	a44	a40	a29	a26	a23	a23	a26	a42
19	a26	a27	a26	a29	a40	a35	a27	a27	a44	a39	a27	a43	a27	a27	a32	a40	a26	a26	a27	a43
20	a32	a32	a32	a43	a43	a43	a35	a35	a32	a23	a35	a23	a29	a32	a35	a27	a39	a32	a32	a23
21	a23	a39	a42	a44	a27	a29	a32	a39	a39	a35	a39	a26	a35	a35	a39	a35	a43	a43	a40	a32
22	a35	a35	a27	a23	a39	a39	a39	a40	a40	a42	a40	a35	a39	a39	a43	a39	a35	a35	a35	a35
23	a39	a43	a35	a27	a35	a40	a40	a42	a43	a43	a43	a39	a40	a42	a44	a43	a40	a39	a39	a39

Table 63: 'What is not tranquillity' - ranking of responses according to location

5.4.2 Relative tranquillity

The results of this study provide a value of relative tranquillity for each individual 500m x 500m grid square for the whole of England at a snapshot of time - 2006. The figure for each individual cell should not be interpreted out of context for two clear reasons:

1. A cell with the same value can have different combinations of the 44 option choices resulting in the same figure – raw scores of tranquillity
2. The value is produced using extremes in the raw data for national datasets, to give a maximum and minimum range of levels nationally for hearing or seeing each of the option choices identified. This therefore allows a comparison of tranquillity relative to anywhere else in England only – relative tranquillity.

There are implications of an approach that identifies the relative tranquillity of all areas, rather than the areas defined in absolute terms as tranquil, or by default, non-tranquil. The following sections define what is meant by the two terms adopted here of raw tranquillity scores and relative scores of tranquillity both spatially (change between locations) and temporally (change in raw data for option choices over time).

5.4.2.1 Raw scores of tranquillity

The scores for the final map of tranquillity range from -140.51 (low relative tranquillity) to 148.54 (high relative tranquillity). These values do not represent a 'factual' characteristic of the landscape. They represent a combination of re-classed raw data (levels of noise you are likely to hear or distance weighted visibility of urban areas) that has then been weighted by a PA coefficient. These quantitative tranquillity scores exist in what may be described as a limbo, without an appreciation of what a value of -140.51or 148.54 actually means. They are interval data, not dissimilar to the way in which temperature is measured; just as 10ºC is not twice as hot as 5ºC the difference is broadly understood in terms of what it means and feels like. Examples of the implications of this will be presented using case studies in Section 5.4.2.3 below. It is important to ensure that when this data is used the quantitative tranquillity scores are understood and the implications of differences in how the scores are compiled can also be appreciated.

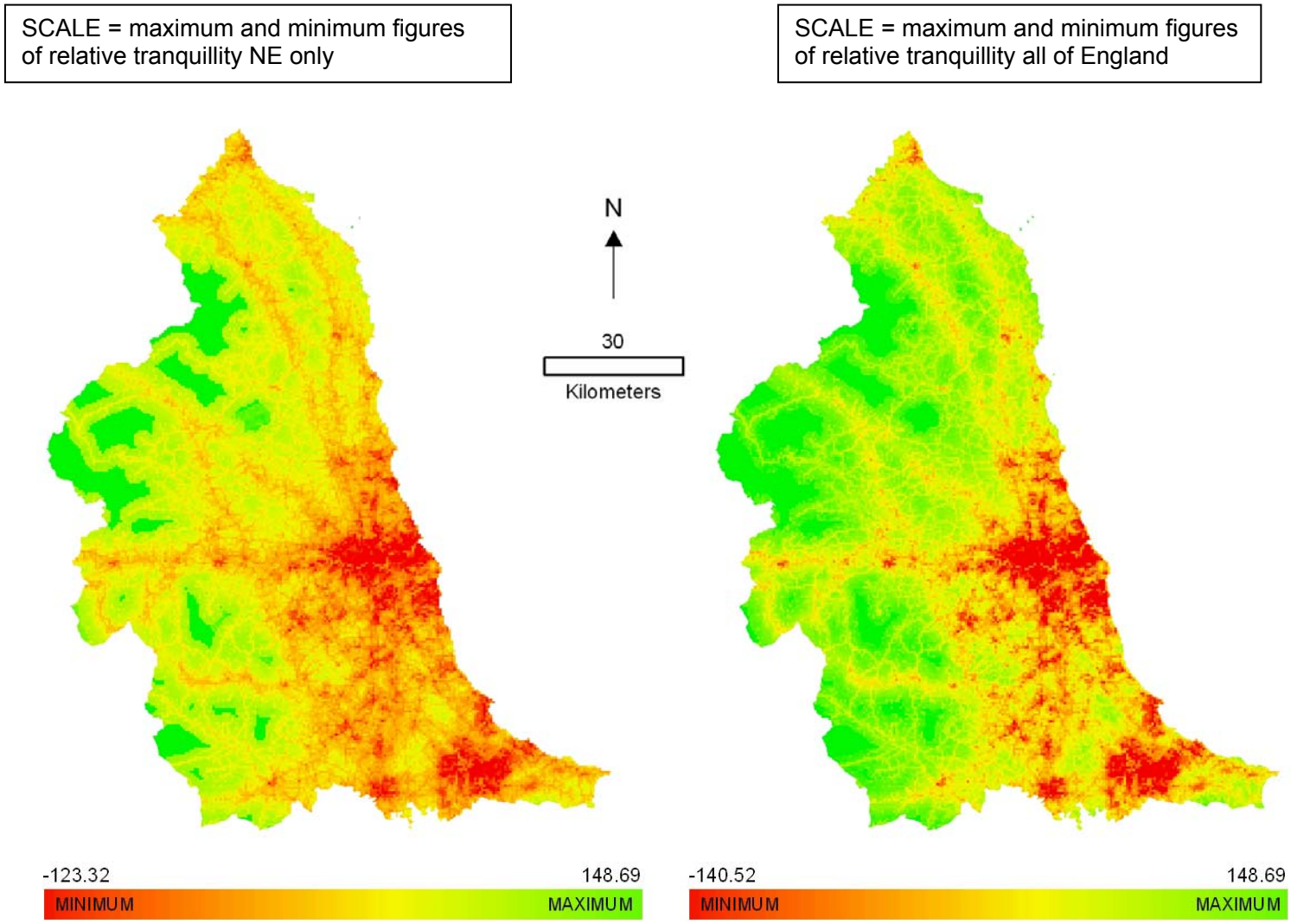


Figure 38: Displaying relative tranquillity regionally and nationally

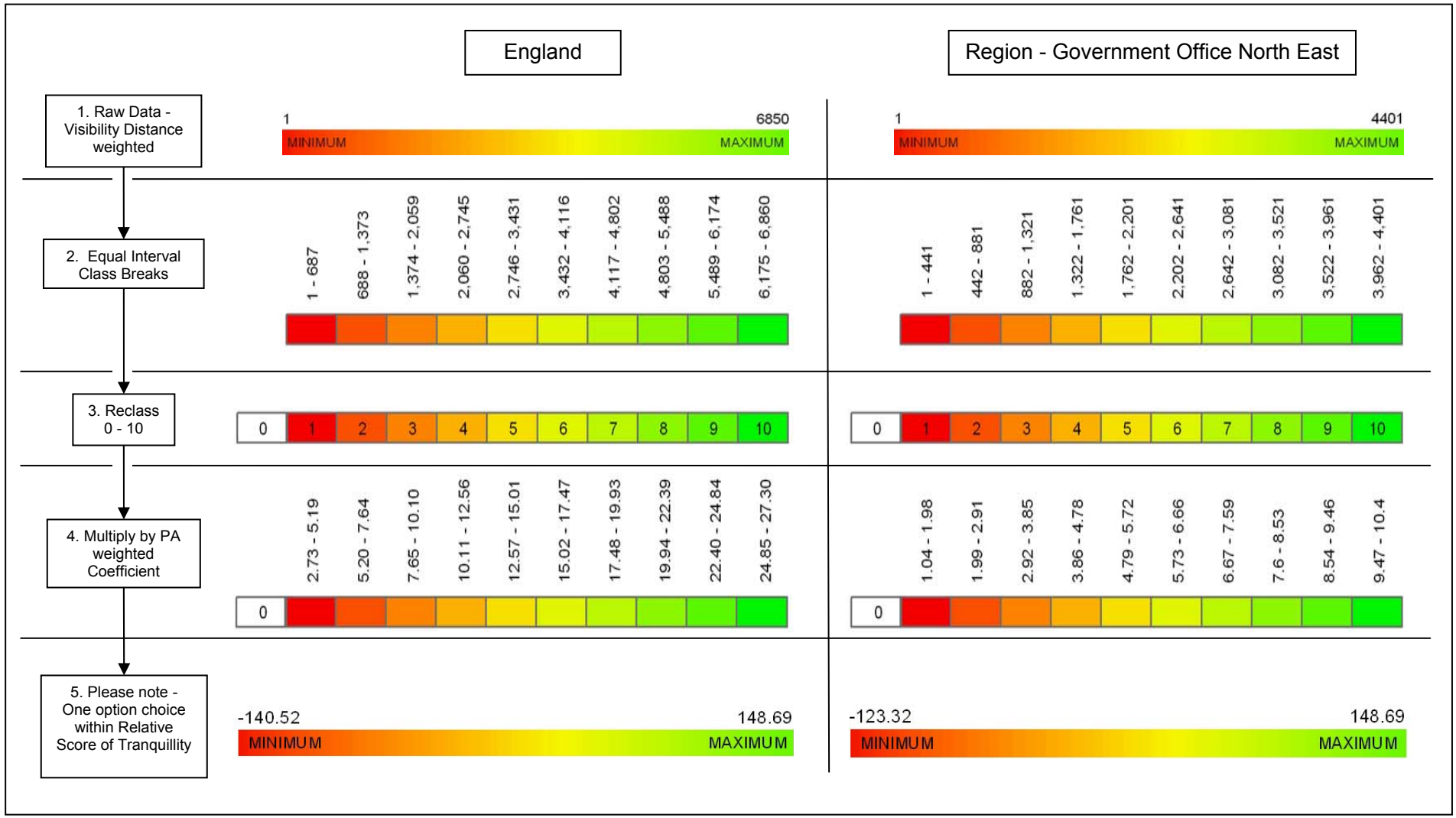


Figure 39: A schematic example of National and regional relative tranquillity scores for one option choice - seeing the sea

5.4.2.2 Relative values of tranquillity

The map of relative tranquillity for England identifies nationally the relatively most tranquil areas – a score that is judged or measured in comparison to other scores within the minimum and maximum range of data values. Relative tranquillity has been identified based on the defined criteria, the maximum and minimum values for all the individual option choices of the GIS model (e.g. seeing, any signs of human impact, hearing, trains and railways and seeing, wild landscapes etc.) and therefore this allows relative tranquillity and scores of local areas to be appreciated against a yardstick of known dimensions for the whole of England.

The national map of relative tranquillity is the final product or output of the GIS model. By displaying the data using the maximum and minimum values for the whole dataset it is possible to interpret visually where the most tranquil areas are within England. Because the data is presented at a national scale, differences of relative tranquillity within a region are hard to interpret visually (as explained below). However, it is possible to display visually only those values that lie within a given region. In doing so the maximum and minimum values within the range of data that lies within a given region are used to display the data and regional differences are more readily apparent as illustrated in Figure 38. This is a cartographic device, as the data is still a figure relative to the whole of England. This stretches the extremes and areas that are more 'green' when displayed using a regional range of data values and the gradation of relative tranquillity becomes clearer. This is pertinent information in the context of urban fringe area management as well as strategies for the wider countryside. As SNH (2003) have observed "Some green enclaves within our cities can act as vital sanctuaries from adjacent noise and urban congestion and can have a sense of wildness relative to their setting" (p.2, our emphasis).

As recognised in the 2004 study, to understand the local effects of tranquillity in more detail the GIS model has to be run using regional data only. To understand more easily why this is the case (steps 1 and 2) illustrates the principle of reclassing data in order to produce a relative scale for all data sets used. The option 'seeing the sea' has been used as an example of the procedure needed for all 43 option choices. The maximum figure of 1 and the minimum figure of 6850 is the range of raw data (visibility/distance weighted) for the whole of the UK at a given snapshot of time (2006). By looking at the range in maximum and minimum values for just one region, for example the North East, the maximum and minimum values differ markedly and are relative to the region only. This has important implications as to where the raw data is re-classed on the scale from 0 – 10. By just using the raw data for a given region before reclassing, the data provides relative tranquillity that is specific to that region. This is substantially different from the simple cartographic device of displaying the national maximum and minimum values of relative tranquillity for the North East as shown on Figure 38.

The effects of the reclassification process and whether it is carried out on a national or regional scale are especially important when it comes to looking at change over time, for example, modelling the effects of new build on overall relative tranquillity. Local authorities and planners will be more concerned with looking at modelling regional effects of change and so the regional GIS model of relative tranquillity is the effective way of looking at how to manage and maintain regional relative tranquillity especially within the constraints of data availability. However, if only modelled for a region it is not possible to interpret the change in relative tranquillity on a national scale. Data will subsequently be out of context with the rest of England unless all the option choices affected by the new build are re-calculated and incorporated back into the national GIS model of relative tranquillity. Individual maps can represent either relative tranquillity at a regional level or relative tranquillity at a national level but not both.

The term 'relative tranquillity' is important for both conceptual and methodological reasons. This research does not identify specific thresholds above which absolutely tranquil areas are identified. The evidence (a) supports the concept of tranquillity as being complex and multi-dimensional and (b) does not support or warrant the identification of sharp (both spatially and in respect of ranges of values) boundaries. Furthermore, just as there are technically no absolutely natural areas left within the British Isles, no areas are entirely free from the factors that detract from what the survey

work has allowed us to define as the experience of tranquillity. Thus, both the individual components of the model and the final maps themselves show only ranges of values. It is of course technically possible to define thresholds above which it is judged tranquillity is high, medium or low, but these would be essentially arbitrary judgements.

The final maps do however identify on a national scale the most tranquil areas and not surprisingly these are areas most remote from centres of population. The high scores allocated to such areas by no means make them irrelevant to people in those centres of population just because they are relatively distant and certainly different from their everyday environment. However, we argue that attention in recognising, protecting and enhancing the characteristics which underpin the tranquillity of such places should not exclude a recognition of the value of areas, often much smaller in size, that are closer to the centres of population. Such areas would rate, in raw and national terms, a low tranquillity score, but when considered in their local to regional context, they have real significance for a great many people. This poses some problems for the management of tranquillity as a local resource which will be presented in more detail in the case studies that follow.

In addition, the identification of the 'relatively' most tranquil areas in England highlights a paradox that has long concerned agencies with an interest in tranquillity: if such areas are identified and even publicised as being tranquil, consequent levels of interest may degrade their underlying characteristics and qualities. However, this is an issue for the management of those areas and the publicity of the results of any study, not the methodology of it.

5.4.2.3 Case study examples

Four case studies have been selected to illustrate the range in data of raw values of relative tranquillity. The use of relative tranquillity scores are then put into context regionally and for the whole of England. For the range in values from minimum to maximum, two 500m grid cells with the same score in the mid-point of the upper and lower quartiles were randomly selected (Figure 39).

Table 64 and Table 65 provide a breakdown for each case study area. Each option choice and its contribution as a percentage of the total for this individual grid cell have been ranked. It is evident from these tables that the contribution from each option choice is, for both negative and positive, different in each case despite the same relative score of tranquillity[35]. This highlights the need for care when interpreting national scores of relative tranquillity. In each sample only one individual grid cell has been examined here, but the context of that cell, that is its immediate and wider setting, is also important.

[35] The weighted scores within case study examples for locations one and two are subject to rounding errors. It is not possible therefore to precisely calculate the sample tranquillity score given (-28.72 or -28.18) from the weighted scores listed. Please note that the data in GIS is unaffected by this rounding error in calculating tranquillity. This is a presentational error which is an effect of importing data into Excel from the GIS data to produce the case study tables given. Excel normally retains the absolute number that is imported. However, in this instance using Excel to round up the data to two decimal places (rounded either up or down) has introduced an error of 0.01 for some of the factors. When combined for one grid square, with more than one layer affected, this can result in a larger difference (0.03 is equivalent to three layers).

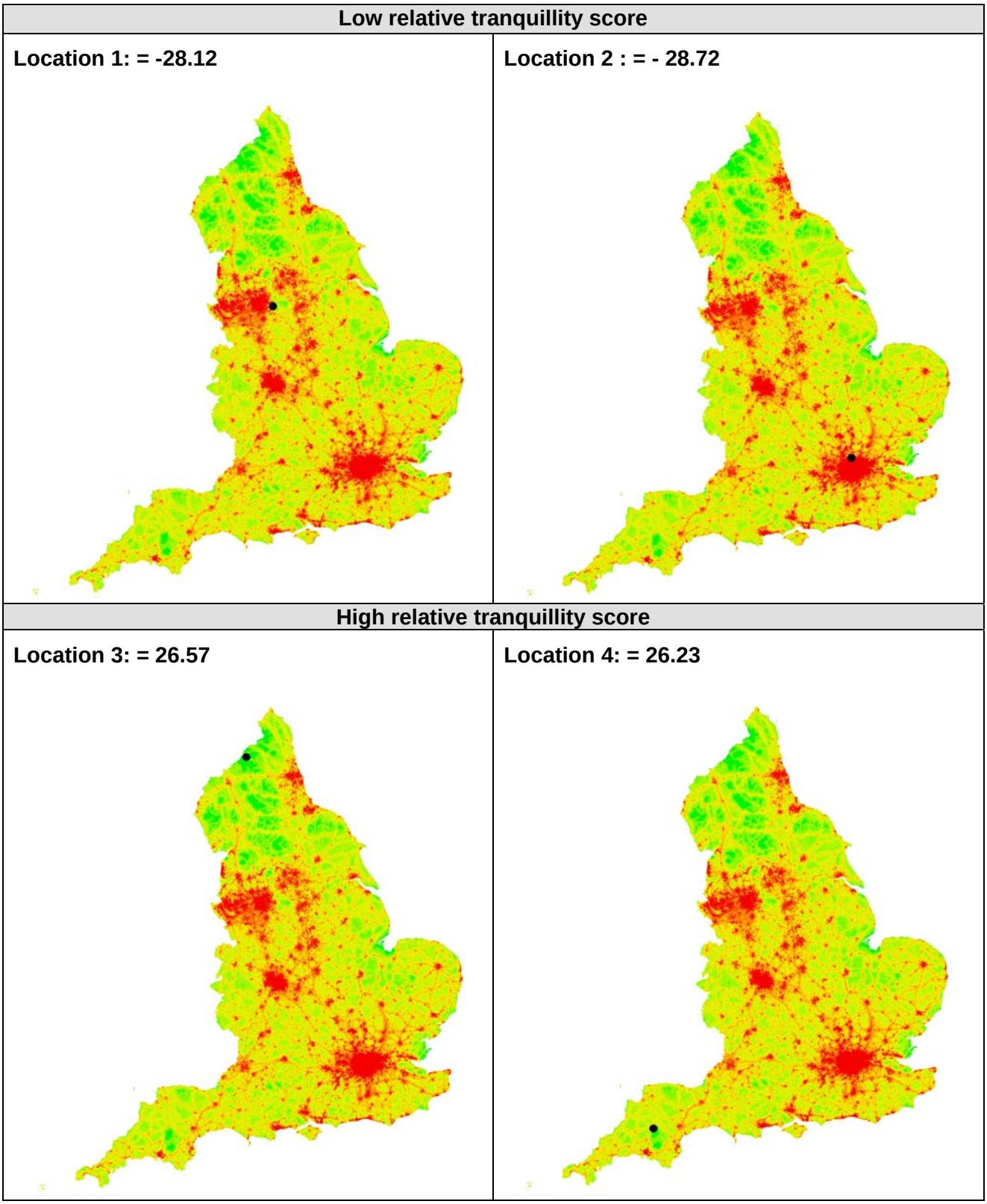


Figure 39: Location of case study areas

	Location 1 (-28.72)			Location 2 (-28.18)		
Option Choice	**Weighted Score**	**Percentage of Total**	**Rank**	**Weighted Score**	**Percentage of Total**	**Rank**
Negative						
Hearing, Constant noise from cars, lorries and/or motorbikes	54.8	41.72	1	54.8	37.70	1
Hearing, Low flying aircraft	25.02	19.05	2	25.02	17.21	3
Hearing, Non-natural sounds	10.56	8.04	4	11.88	8.17	4
Hearing, Occasional noise from cars, lorries and/or motorbikes	2.16	1.64	11	1.62	1.11	12
Hearing, Trains and Railways	1.2	0.91	14	0.3	0.21	15
Seeing and Hearing, Lots of people	11.05	8.41	3			
Seeing, Low flying aircraft				25.38	17.46	2
Seeing and Hearing, High altitude aircraft	4	3.05	7	4	2.75	7
Seeing, Any signs of human impact	1.26	0.96	13	1.26	0.87	13
Seeing, Anyone at all	0.22	0.17	16			
Seeing, Coniferous woodland	0.21	0.16	17	0.21	0.14	16
Seeing, Overhead light pollution (night time)	3.34	2.54	8	3.34	2.30	8
Seeing, Power lines	2.73	2.08	9	2.73	1.88	9
Seeing, Railways	0.37	0.28	15	0.37	0.25	14
Seeing, Roads	1.72	1.31	12	1.72	1.18	11
Seeing, Towns and Cities	2.5	1.90	10	2.5	1.72	10
Seeing, Urban development	4.62	3.52	6	4.62	3.18	6
Seeing, Villages and Scattered Houses	5.6	4.26	5	5.6	3.85	5
Seeing, Wind turbines						
Total	**131.36**	**100 %**		**145.35**	**100 %**	
Positive						
Hearing, Lapping water						
Hearing, low noise areas						
Hearing, Running water						
Hearing, The sea						
Seeing, A natural landscape	26.36	41.6	1	39.54	50.7	1
Seeing, A wild landscape						
Seeing, Deciduous trees in the landscape	0.89	1.41	7	0.89	1.14	8
Seeing, Lakes				1.46	1.87	7
Seeing, Natural looking woodland	3.17	5	4	3.17	4.07	4
Seeing, Remote landscapes				0.00	0	
Seeing, Streams and Rivers	4.96	7.83	3	4.96	6.36	3
Seeing, The sea						
Seeing, The stars at night	24.00	37.9	2	24.00	30.8	2
Seeing, Trees in the landscape	1.81	2.86	6	1.81	2.32	6
Seeing, Wide open spaces	2.15	3.39	5	2.15	2.76	5
Total	**63.34**	**100 %**		**77.98**	**100 %**	

Table 64: 500m Cell value break down option choices low relative tranquillity score -28

	Location 3 (26.23)			Location 4 (26.57)		
Option Choice	**Weighted Score**	**Percentage of Total**	**Rank**	**Weighted Score**	**Percentage of Total**	**Rank**
Negative						
Hearing, Constant noise from cars, lorries and/or motorbikes	10.96	34.99	2			
Hearing, Low flying aircraft	2.78	8.88	4	2.78	7.37	4
Hearing, Non-natural sounds						
Hearing, Occasional noise from cars, lorries and/or motorbikes				2.16	5.73	5
Hearing, Trains and Railways	0.3	0.96	7	0	0.00	
Seeing and Hearing, Lots of people	11.05	35.28	1	22.1	58.62	1
Seeing , Low flying aircraft	2.82	9.00	3	2.82	7.48	3
Seeing and Hearing, High altitude aircraft				4	10.61	2
Seeing, Any signs of human impact	1.26	4.02	6	1.26	3.34	7
Seeing, Anyone at all	0.22	0.70	8	0.44	1.17	8
Seeing, Coniferous woodland	0.21	0.67	9	0.42	1.11	9
Seeing, Overhead light pollution (night time)						
Seeing, Power lines						
Seeing, Railways						
Seeing, Roads	1.72	5.49	5	1.72	4.56	6
Seeing, Towns and Cities						
Seeing, Urban development						
Seeing, Villages and Scattered Houses						
Seeing, Wind turbines						
Total	**31.32**	**100 %**		**37.7**	**100 %**	
Positive						
Hearing, Lapping water				4.05	4.53	6
Hearing, low noise areas						
Hearing, Running water						
Hearing, The sea						
Seeing, A natural landscape	39.54	47.9	1	32.95	36.9	1
Seeing, A wild landscape						
Seeing, Deciduous trees in the landscape	0.89	1.08	7	0.89	1	9
Seeing, Lakes				4.38	4.9	5
Seeing, Natural looking woodland	3.17	3.84	4	6.34	7.1	3
Seeing, Remote landscapes	0.00	0		0.00	0	
Seeing, Streams and Rivers	4.96	6.01	3	4.96	5.55	4
Seeing, The sea						
Seeing, The stars at night	30.00	36.4	2	30.00	33.6	2
Seeing, Trees in the landscape	1.81	2.19	6	3.62	4.05	7
Seeing, Wide open spaces	2.15	2.61	5	2.15	2.41	8
Total	**82.52**	**100 %**		**89.34**	**100 %**	

Table 65: 500m Cell value break down option choices high relative tranquillity score 26

The individual grid cells highlighted lie in four different Government office regions:

- Government Office North East
- Government Office North West
- Government Office South West
- Government Office London

It is possible for a number of administrative boundaries (regional, Local Authority boundaries, National Parks or AONBs) to carry out summary statistics for the national relative tranquillity score and the contribution of each individual option choice:

1. Percentage area covered by each option choice, relative contribution to a defined administrative boundary
2. Displaying data relating to each individual option choice, ranking relative to national score of tranquillity
3. Fringe effects of relative tranquillity for urban and protected areas

As a planning tool it is evident that maintaining or improving scores of relative tranquillity will be of interest to Local Authorities. As noted above the context of a given cell and those surrounding it is important when looking at surfaces of change. Basic summary statistic will allow regional comparison in a national context. Also, it is possible to look at the variation of contribution of each option choice by region. On a national and regional scale using the methodology outlined here it is also possible to:

1. Review relative tranquillity scores in areas of change, either positive or negative in landscape terms
2. Identify protected areas, wildness, remoteness, areas of low noise

However, as noted in Section 5.4.2.2, any review of relative tranquillity will be in context with the whole of England. In order to understand local changes in relative tranquillity raw data has to be reclassified at a local scale and range in raw data values which will be specific to a given administrative boundary. This issue of relative national tranquillity as opposed to relative regional tranquillity is a critical one in considering how to underpin the development of a positive planning tool to account for and promote tranquillity as a landscape quality in policy, planning and management decisions at a variety of different scales.

5.5 Tranquillity mapping and countryside policy, planning and management

The 2004 pilot study introduced the potential application of the tool as:

- a campaigning tool
- a regional image / promotional tool
- a map on the wall
- a series of unpacked component maps which identify things that can be planned and managed to improve the situation as distinct from things that cannot
- an environmental assessment application

This list is still applicable. From a planning and management perspective the disaggregation of the model into a series of component maps that draw attention to what is valued and should be protected and what is problematic and could be mitigated is of very real value. The following list illustrates examples of potential applications of individual mapped components of the overall model:

- visibility assessments of new structures should be aware of the cumulative effect. It becomes a planning decision as to whether diffusion or concentration of visual impact is preferable.

- developments could take account of perceived naturalness of land cover.

- areas that experience low levels of time-weighted noise exposure may be protected against new sources of noise, and measures to mitigate noise such as tree planting could be considered

- identification of those areas where the maintenance of tranquillity is both important and practical

- protection, and, where appropriate, expansion of tranquil areas, nationally and locally, when formulating policies for land-use, transport and traffic management' (GONE, 2002, p, 51).

Underpinning many such planning applications of the methodology are decisions about whether concentration of negative effects or their diffusion within the surrounding context is most desirable. This is a social generally 'expert driven' judgement. The application of a participatory led approach such as this in an environmental assessment mode could at present identify the relatively most and least tranquil areas on a spectrum grounded on public perceptions. However, many decisions require more information than this and typically a planner or a planning inspector may want to know about the tranquillity of a given area when compared with other areas and on a national scale.

Many activities around planning and environmental assessment require defined boundaries. Limits of Acceptable Change (Cole and Stankey, 1998) for instance require limits to be defined in appreciable terms beyond which change becomes unacceptable. Land-use planners (broadly defined) require specific zones to be defined by sharp spatial boundaries, for instance National Parks, AONBs, SSSIs, Areas of Great Landscape Value and Green Belts; the implication is that rules which apply inside these boundaries do not apply, or are different to the rules that do apply, outside of them.

As previously stated, tranquillity is an identified indicator, most commonly of countryside and environmental quality, in a range of reports and documents from government agencies, local government and NGOs. Aspirations and more concrete policies that emerge from these include the protection of tranquillity and the enhancement of tranquil areas. For instance in RPG1 (Regional

Planning Guidance for the North East 1, November 2002), ENV9 (Tranquil areas) indicates that 'Development Plans and other strategies should positively consider relative tranquillity.

However, an adherence to relative tranquillity, both conceptually and methodologically, fails to service the demand of planners, related professionals and other stakeholders for:

- Spatially discrete zones of tranquillity (either absolute for graded high/medium/low)
- Sharply defined thresholds for quality assessment or compliance testing purposes
- SMART36 Objectives for environmental enhancement projects

Indicators are most useful when associated with thresholds. An indicator, against which progress or change may be judged, is most effective when targets (quantified levels of achievement, change or progress) are established. Responsible authorities then have an aiming point and stakeholders have a yardstick against which to assess the actions and outcomes taken to achieve that aiming point.

Sharp boundaries are those where values, categories, names or other attributes change across a defined line (Figure 40). In many cases, for instance Census data, administrative area names or watersheds these are acceptable representations of the underlying phenomena. However, many environmental variables are much harder to represent using such discrete or sharp boundaries. Landscape character, soil type and noise levels are good examples of these where values tend to be spread across a continuum and although classes, thresholds and breakpoints can be set, these can be points of convenience rather than true meaning in respect of the spread of the data.

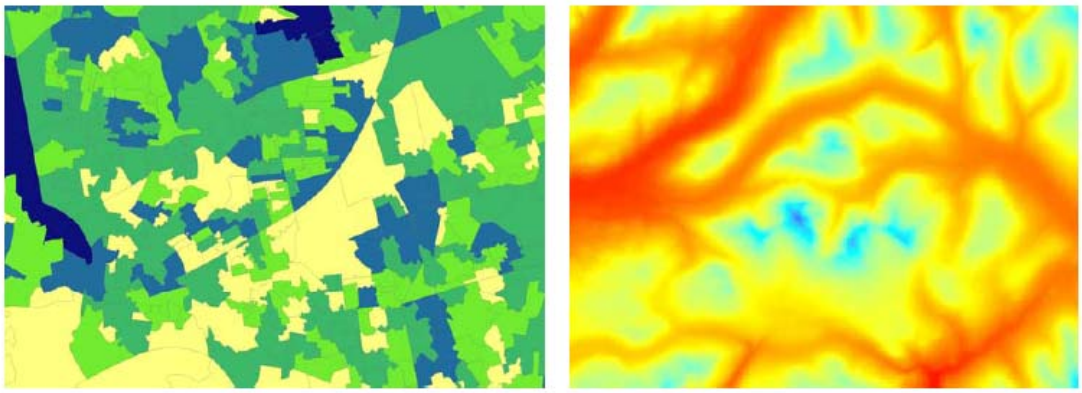


Figure 40: Sharp and Fuzzy Boundaries (not relating to the same dataset)

Many of the raster-based calculations used in this project resulted in a spectrum of values that had to be classified to apply differential weighting across a common scale, but the final map was one which illustrated relative tranquillity rather than tranquil areas.

This is not to say that such crispness cannot be implemented at a technical level. The failure to identify such crisp boundaries in this project is not a symptom of vagueness of thought, but rather an appreciation of and conceptual commitment to reflect the diversity of experience and expectation that underpins people's interaction with their environment. It might reasonably be noted of course that the same logic could be applied to nature reserves (where much conservation theory emphasises the beneficial effect of buffer zones and sympathetic management of the wider countryside (Adams *et al.*, 1994)) and landscape designations where the in/out nature of boundaries has been associated with the 'halo' effect of a ring of development around the designated area that would not be permitted within it. Identifying appropriate boundaries is often a matter of professional debate and issues of landownership and public finances are often crucial in the way they are finally drawn.

Our objective throughout has been to arrive at a fuller appreciation of tranquillity as a concept and develop a more representative, thorough and rigorous methodology for assessing the relative

tranquillity of defined areas. The results from this methodology allow the relatively most and least tranquil parts of England to be identified, but it does not support the identification of absolute significant thresholds. The only absolute significant points are the minimum and maximum values, which themselves reflect the character of whole of England.

The organic nature of change, new roads and urban build will affect raw scores and relative values of tranquillity, for the methodological reasons described in Section 5.4.2. This is therefore both a technical point (relative location on the range of values depends on the minimum and maximum values) and a conceptual point (areas defined as relatively highly tranquil when considered in a local context may be relatively non-tranquil when considered in a national context).

5.6 Future development of the methodology

The methods in the 2004 study have been developed and in some cases simplified due to the constraints of data availability nationally, the restricted timeframe and the national scale of the project. Consequently, specific areas where a future application of the methodology might be improved are identified below.

5.6.1 The public consultation

As noted in section 4.3.1 the form of consultation employed in exploring perceptions of tranquillity varies according to the aims of the work. For this work the key aim was for the data generated during the consultation to be comparable across the five study areas, and across time should further studies be conducted in the future which aim to track changes in perception over time. By contrast, previous explorations in the North-East, and Chilterns were based on the desire to explore fully perceptions at the local level, with less emphasis on being able to compare readily across both time and space. As such they were based on the use of participatory appraisal, a community-based approach to consultation that prioritises the views of local people as experts, and their direct involvement in the study. The 2004 Mapping Tranquillity project set out to develop a methodology that was robust and had the potential to support a range of activities, particularly land use and landscape planning and Environmental Impact Assessment. The approach developed to date (and it is still developing as the more extensive work conducted here has helped reflect on its more local, in-depth counterpart) meets these requirements and satisfies the criticisms that have been made of previous approaches to tranquillity mapping. It was founded in broad-based consultation of countryside users as well as stakeholder groups. While tranquillity may be a personal experience, there are places where it is more likely to be experienced. Although tranquillity merits a mention in a variety of documents, policies and reviews, unless the experiential or 'felt' aspects of landscape are considered alongside more easily quantified characteristics, landscape, countryside and environmental quality can only be partially accounted for. For example, the North East Mapping Tranquillity project had already established the ability for changes in tranquillity to be identified and mapped over time, as well as identifying the more and less tranquil area within a given study area, whether this is at the national, regional or local scale. As noted previously, it also differed from the previous work on tranquillity mapping by gathering definitions of what tranquillity is and is not perceived to be from extensive public consultations and by the usage of more advanced GIS modelling techniques that have allowed the mapping of the diffusion of variables' impact over space, thereby also allowing the production of continuous surface maps of relative tranquillity, rather than zones of tranquil/non tranquil, or high/medium/low tranquillity. The Chilterns AONB Tranquillity Study emanated from a desire to explore the utility of the consultation approach across different areas (to see how well it 'travelled'), whilst also exploring the similarities and/or differences in responses to what local countryside users envisaged tranquillity to be across different areas. It had also been intended that members of the local Chiltern Society would be trained in the use of PA and subsequently act as peer researchers (in an attempt to create a more sustainable, less extractive approach to consultation). However, due to time and resource constraints this plan was adapted so that PEANuT facilitators undertook the consultation with support from local volunteers. It is such a people-centred approach to exploring perceptions of tranquillity that need to form the basis for future explorations of the concept.

5.6.2 Spatial threshold analysis

The work described in this report has begun a process of participatory led research into public perceptions of the effects of distance, people and types of land cover on experience of tranquillity. Development of this work could include:

- Verification of these results in a wider variety of locations
- Within the confines of photography in the UK climate increased control over the selection of images to ensure greater standardisation for distance thresholds to include similar levels of visibility, light etc.
- Consideration of the effects of mitigating factors on distance and detractors to tranquillity

- Increasing the print size to A4 minimum;, selection of mid-distances (1km – 2km) to increase the accuracy of threshold establishment
- Continued research into thresholds of nuisance - not only visual but oral and experiential.

5.6.3 GIS Technical Research – dataset availability

Both technical issues and availability of datasets and information associated with the datasets have simplified methods developed in the 2004 study and in some cases have made them more representative using the recommendations that have been highlighted.

Technical issues are mainly concerned around processing time at 500m by 500m resolution. This took the computers to the edge of their capacity to run calculations for visibility analysis. The same caveats and recommendations identified for noise modelling apply here also.

The is still the need to increase the accuracy of modelling the attenuation of noise away from point source noise taking into account the effects of woodland and terrain. Again, the effects of these factors on long distance attenuation of noise would require further research as part of any future project, including the gathering and analysis of actual field measurements of noise levels. In addition, it is recommended that some account be taken in visibility modelling of the effects of buildings and woodland/vegetation. The datasets could be made available for future work and for more detailed regional investigations.

Gathering data from multiple sources is very time consuming and although we accepted from the start that we would have to use only national (e.g. Ordnance Survey or CEH Landcover data) datasets there would be significant time costs in assembling and processing a national dataset. Below is a wish list of data identified that will improve the representation of some of the option choices:

- Ability to distinguish between different types of road surfaces to increase the accuracy of the effect of road noise
- Access to L_{eq} data for all airports
- Access to more accurate information from the Ministry of Defence (MOD) on flying times and type of aircraft
- Access to the MOD dataset on non-flying point sources of noise
- Frequency of railway traffic to improve time-weighted frequency data
- Research into levels of public use at honey-pot sites - volume use at visitor attractions and dispersal patterns from point source

Access to this data will increase the technical precision of datasets used to represent some option choices but inevitably this data will be combined with datasets that are less precise. The value of this model is the ability to produce a range of values that represent contribution to or detraction from an experience of tranquillity and the ability to use disparate datasets: for example raw data modelling of what can be seen or heard can be used alongside a proxy representation of the likelihood of hearing or seeing an option choice. Any improvement of the techniques or methods applied will fine tune the maximum and minimum range in the data values that highlight nationally differences in that option choices contribution to an experience of tranquillity. This is not static. This map represents relative tranquillity at a snapshot of 2006. New build roads or houses, changes in land use will affect the tranquillity score. As shown in Section 5.4.2.2 the effects of new build can be modelled regionally and incorporated into the national model using the techniques outlined here. However, the important element in this model is the use of the PA weighted coefficients and Spatial Threshold data that essentially rank the perceived relative importance of each option choice to the likelihood of contribution to or from an experience of tranquillity. This also has a temporal element as peoples' perceptions may change.

The ASH (1995) work illustrated that tranquillity changes over time, when measured against a defined yardstick. However, yardsticks of what is desirable, acceptable or achievable may also change over time, so there is an issue about measuring such change. If a rule base for a GIS-based tranquillity model is rooted in a robust and accepted methodology then it can generate

results that are themselves broadly accepted within the decision-making process. However, the model is ultimately based on processed consultation data, gathered at specific points in space and time. The issue of spatial variation of results and the implications for the mapping exercise have been discussed above. The question for temporal variation is one of whether change between time A and time B should be based on the consultation data for time A and updated spatial datasets describing the key parameters for tranquillity at time B, or whether the consultation should also be re-run for time B. It is our judgement that the latter option (updating both the data and the consultation) would not be effective over time periods of ten years or less, for the problems of disentangling objectively measured environmental change (i.e. using the available spatial datasets) and the socially constructed assessment of the significance of these parameters. Over longer time periods research into changing perceptions and valuations of tranquillity should also be considered.

6 Conclusion

This research builds significantly on the 2004 studies which developed a robust framework of approach with the potential to support land use and landscape planning. Through quantitative data collection based on the 2004 findings in a variety of national sites it provided weighting for the integrated GIS datasets, singly or in multiple ways. This was complemented by specific additional research to consider public perception of perceived naturalness of land cover and establishment of thresholds of nuisance. The GIS methodology has developed significantly, where possible within the national scale of the project, in its detail and complexity to provide this cutting edge current study.

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8 Appendix: Results of the consultations

NE work Consultation findings

As in the reports for the NE 2004 study, the findings section below is organised, structured and presented in two main sections. The first main section concerns responses to the 'positive' range of questions that were posed during the PA sessions – questions such as 'what is tranquillity'; 'what adds to tranquillity' and so on, that were explicitly asking for positive responses. This is followed by the responses that sought to explore participants' perceptions of negative impacts on tranquillity - factors that reduce tranquillity, or impact negatively on it. The positive question responses were presented first simply because, overall, there were more of these than those which seek to identify what detracts from, spoils, or are not perceived to represent tranquillity. The 2004 reports noted how some respondents chose to identify what they believed tranquillity is not, even when the direction of the questioning was to identify those factors and/or issues that are perceived to add to, or positively represent their understanding of the term/concept. It was suggested that this probably reflected a sense that it is sometimes easier to identify what something is not, rather than identify what makes it valued, or what it actually is. These responses are noted at the end of the positive question sub-section.

What is "Tranquillity"?,

Perceived Links to 'Nature'

A large proportion, and a wide range, of the responses made during the research linked 'tranquillity' to hearing, seeing and/or experiencing various aspects of perceived 'nature' and 'landscape'. Respondents suggested links to 'nature', and aspects of nature, in general 'experiential' terms. They noted the importance of 'nature, beautiful', 'Nothing just nature', 'Natural', 'natural countryside', 'Restful and natural scene', 'Natural place', 'nature', and 'natural. calm unspoilt', of 'being among nature' (which received 34 dots at verification), 'part of nature', and 'close to nature', in a 'more natural setting'.

These links to 'nature' had aural and visual aspects. Aurally, respondents noted the specific importance of 'Natural sounds', which received the second highest combined verification score with 95 dots (but which was added to at verification with 'depends a bit on what the natural sound is; tractor ploughing'). Participants suggested 'natural noises sea birds wildlife sounds', 'animal noises', 'hear wildlife', 'variety of quiet natural sounds', 'nature noise', 'Just natural sounds', 'sounds of nature', 'noises of nature', 'hearing natural noises of the countryside', 'just the noise of nature', 'quiet (but with natural sounds)', 'natural sounds', and 'natural sounds (water, birds)'. 'Wind though leaves' received 37 dots at verification.

For many experiencing 'the landscape' (which was supported at verification with 34 dots, a 'natural landscape', or elements of it, was a key idea, with a wide range of related aspects being suggested. Some respondents focused on general, abstract, or large-scale features, suggesting 'the landscape', 'countryside', 'Mainly countryside', 'In the country', 'Un-built-upon', 'wild landscapes', 'scenery', 'Alive scene', 'Beautiful scenery', 'visual beauty - babbling brook, sunlight through trees', 'Good scenery', 'lovely scenery', 'beauty', 'gentle scenery', 'All kinds of scenery in the park', 'beauty of surroundings', 'seeing the stars', 'sky changes all the time', 'unspoilt and traditional', and 'natural, unspoilt places Without any urban impact -inc. road signs'. The respondents who made this last comment argued that there are far too many signs in countryside (such as road signs, directions, and so on) meaning that it often 'looks like Northumberland Street'. They believed tranquillity to be 'fox hunting on high fells – the sound of nature taking place'. One respondent suggested that the 'CPRE logo has it all'.

Some respondents focused on elements of a 'Rolling countryside' as being key to their perceptions of tranquillity and tranquil places - 'hills', 'all of national park, high hills', 'Valleys and hill tops', 'Valley floors', 'hills', 'Rolling hills', 'valley –vast'. Others identified a range of additional landscape 'types' or key characteristics - 'parks', 'Interesting geology', 'tidy farms', 'Fields', 'Beach in the Sun with a pint of lager', 'Peaceful little stream quiet valley country', 'a glade', 'Feeling safe walking on

beach', 'moorland', 'High ground with feature - cairn/stone circles', 'natural stone formations', 'no trees, wind, water', 'Low unnatural elements', 'Open Moorland', 'limestone cliffs', 'Soft lines in the landscape e.g. skylines, stones, rocks, vegetation, old vernacular buildings', 'moors, dales', 'mountain top scottish', 'lack of populated areas', 'not coastal erosion', and 'protected coastline'. For others, the landscapes envisioned were of a smaller scale - 'Being in my garden', 'flowers in the garden', 'wild flowers', 'nice flowers', 'bench kept grass steps to beach', 'Wildflowers', 'Grass', 'Flowers', 'Wild Plants', 'Daisies', 'Wild flowers', 'wild plants', 'flowers', and 'Beautiful Flora and Fauna'.

The importance of 'Water' and related aspects was emphasised by many respondents. The 'sound of water, rivers, waves' was the highest ranked response at verification with 104 dots (and added to at verification with 'lapping sound – waterfalls not necessarily') and 'The sea' receiving 79 dots as something you hear in a tranquil place (ranked 6th) and 35 dots as something you see in a tranquil place. Participants suggested tranquillity is related to 'Lapping waves on shore -beach or lake', the 'action of water', 'water, wind, birdcall, animals esp. running beck', 'the sea', 'rough seas - fresh air (beach)', 'stream (slow flowing)', 'Gurgling Stream', 'stream over pebbles', 'natural noise of coast', 'Running water', 'Beach', 'Streams', 'Rivers, water', 'water', 'water (flowing stream running water (sound)', 'Rivers', 'Rippling water', 'Rivers', 'Streams', 'streams and rivers', 'riverbanks', 'sea', 'clean running water', 'Sea - wild waves wind', 'Calm sea (+seagulls)', 'rivers running', 'Watching raging (foam) sea (calming)', 'Babbling brooks', 'Rivers', 'Water', Stream', 'River', 'running water', 'water babbling brook', 'Running Water', 'Any sort of water -streams -water running over rocks -water falls', 'flow in a river -sound and vision', 'water trees wildlife', 'Sunset on water/trees', 'Swans on water in sunset'. Others focused on the sound of water, suggesting 'Gentle quiet sounds of water', 'sound of water', 'water quiet', 'sound of water (any water) gentle lapping', and 'Sound of rivers'. The respondent who suggested 'sound of water' also commented 'isn't it funny - you always think of sounds for a 'tranquil' place'. Another respondent argued that a smelly, dirty river is 'not good', with them preferring 'clean water'.

Many respondents focused on greenery (or other perceived 'natural' related colours) as central to their understanding of tranquillity. They noted the importance of 'Green', 'Natural colours', 'green areas', 'white silver makes me feel calm', 'Green', 'Colours in gardens (grass)', 'Greenery', 'Plenty of greenery', 'Muted colours are tranquil. e.g weathered stone, colours changing with different weather conditions, browns, greys, greens ashed-out look', ' A green place -plants. Green makes me feel calm and at peace', 'contented blues and lilacs', 'colours', 'or small, peaceful green space', 'scenery', 'muted colours and blended', 'green', 'the green colours', and 'nice peaceful green'. One respondent suggested 'white silver makes me feel calm'. This respondent also noted, in discussion how white is associated with panic, and silver with calm. They argued that dark is also calming. Other things they associated with tranquillity were candles, moon and stars, a flat sea, Open, .No cars – 'make them walk', and that forest is tranquil.

Linked to notions of greenery, participants in the research noted the importance of 'woodlands', 'deciduous woodland', 'Old block of geometric forestry', 'Glades', 'Mixed birch/sp woodland', 'Trees, woodland glade dampn musty earthy smells soft moss' 'Woods and fells', 'a wood', 'trees', 'breeze through trees', 'trees old English woodland', 'forest', 'movement of trees', 'greenery', 'wooded', 'Quiet in trees (conifer and B'L's)', 'hillsides where you only see trees', 'woodlands-mixed deciduous and higher levels', 'Forests', 'Sitka is too dark', 'All trees (every tree has its own character)', 'Woods', 'Older deciduous trees', 'greenery trees', deciduous trees not firs', 'Lots of trees', 'trees and forests', 'Deciduous trees', 'Deciduous trees not firs', 'trees - broad leaf not fir', ''trees and forests', 'Seats out of Tree Trunks', 'Forests and Moors', 'trees, flowers, NOT plantations, conifers', 'not open spaces -prefer woods and habitation nearby', and 'trees flowers'

Another range of comments related to the importance of 'Long vistas', 'See views', 'Landscapes and views', 'View to look at fields and hills', 'Plenty of sky', 'views', 'far horizons', 'on top of hill, looking down', 'Top of a hill', Rolling hills (a lunch with a view) {Long views}', 'Good to be high and look down', 'Something to focus on (monument in this case)', 'Long distance visability', 'distance', 'Open landscape -far horizons, flow of lines within the landscape', 'the view', 'sights', 'good view', 'altitude', 'View -area of natural beauty', ''green hills, distant mountains, long and open beaches'',

‘hills’, ‘but also dead/lifeless’, and ‘quiet farming landscape’. One respondent went into some detail, noting ‘Sat on a mountain top looking down on traffic and the world going about its business can add to the feeling of tranquility Try sitting on top of Blencathra in the Lakes and watching the traffic on the A66 (only minimal distant noise)’.

Other focused on the notion of ‘open space’ and ‘remoteness’. Participants noted the importance of being ‘Away from civilisation’, of ‘space’, ‘Open spaces’, ‘openness’, ‘wide open spaces’, ‘Access to areas of open countryside’, ‘emptiness, low population density’, ‘lots of space for people to spread out, ‘Open space without people’, ‘lots of space’, of ‘Emptiness - not -stuff' going on’. One respondent suggested ‘Island of the Sun Lake Titicaca – Peru High altitude clear skys distant views of Andes V. little pollution Miles from anywhere Sunrise Sunset’. Others spoke of links to ‘outdoors’, ‘Space to go strolling’, ‘off the beaten track’, ‘Nothing’, ‘remoteness’, ‘out of the city’, ‘open spaces’, ‘space’, ‘Space’, ‘open’, ‘Places to sit and enjoy’, ‘A place that suggests 'openess' expansive landscape and sky’, ‘open spaces’, ‘Could be wide, open space (countryside)’, and ‘wide open spaces’. One of the respondents who noted the importance of space also suggested that a tranquil place would be void of traffic and noise pollution, as roads were perceived to intrude. They also argued that a ‘big sky’ is important (that is, the Pennines), as would be a ‘three-masted schooner with three sails, set in a seascape. For them, total darkness is also very tranquil. A participant who suggested ‘going beyond the safe environment’ argued that once a move was made ‘beyond the safe zones’ (for example areas close to facilities and tourists), then tranquillity could be found. He felt that there were zones which tourists/day trippers didn't venture beyond, thereby providing vast areas of countryside where there were few people.

Aspects of ‘wildlife’ were perceived by many respondents to also be very important to their notions of tranquillity, with ‘the sight of wildlife behaving naturally (animal and plant)’ receiving 49 dots at verification. Participants noted ‘wildlife -bees -animals –badgers’, ‘skylarks’, ‘wildlife - birds, mammals, deer’, Buzzards Ravens Meadow pippets’, ‘Wildlife/Natural/Birds’, ‘Sea Birds’, ‘Skylarks’, ‘sheep’, ‘more birds’, ‘otters, fish curlews’, ‘curlews –peewees’, ‘sparrows, tits, bird noise in the distance’, ‘wood peckers’, ‘Curlews’, ‘all kinds (of wildlife)’, ‘Close to wildlife’, ‘larks’ ‘fauna’, ‘lambs, waterfalls, springs’, ‘Peacefulness Rain Birds’, ‘rabbits’, Wild birds Green’, Fish’, ‘Photo swan, spring ripples around swan’, ‘Terns diving’, ‘watching wildlife’, and ‘living things’. One participant suggested ‘thrushes’, and also noted in discussion how they do not mind background noise, such as the sound of a heartbeat, but they do mind too much music.

A large number of respondents commented on the positive effects of ‘hearing bird song’, some in very specific terms. ‘Sounds of curlew, lapwing, skylark’ received 50 dots at verification, but was added to with ‘this is seasonal - skylark its noise is; lying in the dunes or long grass and falling asleep listening to skylark’. Others noted ‘a robin singing’, ’Birds on moor’, ‘birds’, ‘birds singing’, ‘more bird song’, ‘none sound' that you can hear (e.g. Distant birdsong….), ‘birdsong –blackbirds’, ‘Birdsong’, ‘Quietness but able to hear birds’, ‘small birds singing distant’, ‘Sound of birds’, ‘like to hear birds’, ‘Sounds of birds, crickets etc’, ‘hearing the birds’, and ‘bird song and bubbling water’. Other respondents suggested ‘wind through leaves’, ‘noise of trees’, and ‘breeze rustling leaves’.

Finally, in relation to perceived ‘natural’ elements, a focus for some respondents was the weather, and the difference it can make to a tranquil experience. Participants in the research noted the importance of ‘Warmth, sun on skin soft sunshine (not burning sun)’, which received 69 dots at verification (ranked 8th), and ‘sunshine’, which received 48 dots. Participants also commented on the importance of ‘sunshine still’, ‘sunlight, ‘Distant thunder in sea’, ‘rough windy and tranquil’, ‘cloud, windforce (weather)’, ‘late june’, ‘rainfall (soft) is tranquil’, Not too much sunshine’, ‘weather can affect tranquillity’, ‘weather makes a difference - sun, warmth’, ‘Nice sunny’, ‘Weather -warm – still’, ‘gentle rain’, ‘‘Snow and rain’, ‘warm weather, fresh weather’, ‘sun shining’, ‘nice weather’, 'in winter snow capped’, ‘sunshine’, and ‘stillness’. One respondent suggested ‘Winter -wild, windy days on moor’. They noted how they would ‘walk every weekend, 4-6 of us’, and that company is very important to tranquillity, as was getting away from lots of people and traffic. They argued that a good place to go is the Cheviots, with lots of open spaces, as well as the end of the Pennine Way. It was suggested that it was best to go walking in winter, however, when it is wild, with winds and blizzards. These respondents argued that they don’t like the Lake District as there are too

many people all following paths. In contrast, Kielder Water was perceived to be tranquil, although it was felt that the forest can become boring and less tranquil because you have to follow set routes.

For others, smell was important, stressing ‘Clean air’, ‘fresh air’, ‘air smells different’, and ‘smell of newly mown grass’.

Tranquillity ‘of the Mind…’

Whilst the many interrelated aspects of ‘nature’ were highly valued by many respondents during the research, another key aspect of tranquillity related to ‘internal’ as opposed to ‘external’ influences. Respondents argued that ‘Perceptions of tranquillity and tolerance levels depend on what you're used to e.g NE "quiet" compared to say Lake ‘District visitors from London to Lakes would view different’. Likewise, other respondents suggested that it ‘‘Depends on your sense of 'pace' -how secure you feel etc.’, that ‘tranquillity is judged against a personal reference frame’, and that it is a ‘a relative concept’.

Tranquillity was considered to be very important by many respondents for a range of personal/internal reasons – many of which were well supported at verification. ‘To restore personal balance’ received 48 dots, ‘to destress’ received 45 dots, ‘feeling like miles away from anywhere’ received 44 dots, ‘preserve areas if quiet wilderness’ received 41 dots, ‘at peace with myself’ received 40 dots, ‘no stress’ received 40 dots, ‘stillness’ received 40 dots, ‘feeling of well being’ received 39 dots, ‘calm mind and body’ received 37 dots, ‘peace of mind’ received 33 dots, inner calm, not always external’ received 33 dots, and ‘the true meaning of recreation - giving people a chance to renew themselves’ received 32 dots.

Respondents commented upon the beneficial consequences of being able to ‘Get away from noise’, ‘An escape, like being in a different world, no stress’, ‘Getting away from everyday life and good to switch off ‘, ‘Getting away from it all and to have a change of scene’, ‘Switch off from everything’, ‘De-stressed, restful, nice and calm’, ‘Feel good factor’, ‘The true meaning of recreation - giving people a chance to renew themselves’, ‘Nice to get away from it all - so much hassle the rest of the time’, ‘Not to be surrounded by noise - have a hectic life’, ‘Hectic life surrounded by noise’, ‘Preserving natural places and maintain heritage also to escape from the horrible hustle and bustle of daily life’, ‘Relaxed’, ‘Calm, relaxed, forget about work’, ‘Getting away from people’, ‘Takes away problems/worry’, ‘vital everyone needs some form of tranquillity in their lives (even if they don’t know it)’, and ‘not available to everyone. Tranq makes it easier to think’.

Much of this reasoning was seemingly related to the ambiguous notion of (achieving) ‘peace’. Peace can be used to refer to a complete lack of noise, with ‘silence’ receiving 43 dots at verification, and added to with ‘complete silence can be very scary’. Alternatively, it could mean a lack of noise so that natural sounds can be heard, or, and moving beyond simple aural aspects, the notion of being ‘at peace’ – a mental or psychological feeling of well-being. As such, all such responses are identified below, but with comments made in conjunction with notions of ‘quiet’ (as in ‘Peace and quiet’, (which received 93 dots at verification)) coming first, followed by more implicitly or explicitly psychologically-nuanced comments.

Concerning a link between tranquillity and a lack of noise (to whatever degree), respondents noted the importance of ‘quiet’, ‘silence’, ‘NO noise‘, ‘periods of silence’, ‘periods of silence’, ‘peace, quiet’, ‘Silence’, ‘quiet’, ‘peace and quiet’, ‘Peace and quiet’, ‘quiet’, ‘peace and quiet’, ‘peace and quiet’, ‘quiet, ‘, ‘silence’, ‘peace and quiet’, ‘Quiet -no wind in Trees’, ‘silence’, ‘Quiet’, ‘-peace -quiet -no bugger about’, ‘Respect the place being quiet’, ‘peaceful and quiet’, ‘Peace and Quiet’, ‘Peace and quiet’, ‘Quietness’, ‘Peace and Quiet’, ‘Quietness’, ‘quietness’, ‘Peace and quiet’, ‘Peaceful - natural noise only’, ‘Peace and Quiet’, ‘Quietness and’, ‘Plants and peace and quiet’, ‘Quiet (lack of human noise)’, ‘Peace and quiet – solitude’, ‘quiet’, ‘quiet’, ‘Peace and quiet’, ‘Outdoors Quiet places’, ‘peace and quiet’, ‘peace and quiet’, ‘Noise intrudes’, ‘unobtrusive noise’, ‘peace and quiet’, ‘Quietness’, ‘quiet AND’, ‘NO noise’, ‘Peace and quiet’, ‘Quiet "Hear nowt"‘, ‘Quiet’, ‘Quiet’, ‘quietness’, ‘No noise so you can hear nature’, ‘quiet’, ‘Hear a penny drop''‘, ‘quiet 'Hear a pin drop''‘, ‘Quiet’, ‘quiet’, ‘Quiet’, ‘Gentle noise is ok’, ‘Stillness’, ‘silence and birdsong’, ‘peace –space’, ‘lack of extraneous noise’, ‘quiet spots’ (with ‘York is too flat, needs woods’ added in discussion,

‘Quiet’, ‘Peace and quiet‘, ‘unhurried’, ‘stillness’, ‘silence to think, just be….’, ‘Relaxing Peaceful Quiet’, ‘quiet, calm’, ‘quiet, calm’, ‘peaceful, calm, quiet’, and ‘-Peaceful Stream -Quiet Hill’. This last respondent identified, in discussion, ‘Regulation/Laws Aircraft/Traffic Military planes’ as disturbing tranquillity. Hexham Mart, Durham Cathedral, Holy Island and Cragside Gardens were considered to be tranquil places, featuring birdsong, being away from traffic, calm and peaceful. Others also focused on ‘Quiet and relaxed’, ‘Peace and quiet Alone Forests, woods, hill’, ‘countryside, when peaceful and quiet’, ‘Walk around in peace and quiet’, and ‘quiet serenity’. One respondent did suggest that ‘Boring too quiet’. One of the respondents who noted the importance of ‘periods of silence’ added that they like to walk together, but enjoy not talking for some periods; that they like to spend some time in silence whilst looking at plants/birds/mammals. Another, who responded with ‘quiet’ added in discussion that although it is possible to be with others, others have the potential to spoil tranquillity mainly by being noisy.

As noted above, other responses including the notion of peace could be considered to infer meaning beyond an absence of noise, or as one respondent argued, ‘It’s a place where you feel at peace i.e. 'feeling' rather than absolute peace’. Many respondents highlighted an ‘internal’ element to tranquillity – ‘‘Stillness a sense of calm, both internal and external. One is response to the other’ – essentially, tranquillity as ‘peace of mind’ in a range of ways. Hence they talked about ‘peace’, ‘Peace and calmness’, ‘feeling restful, at peace with myself’, ‘From within Calm’, ‘In mind (peace of)’, and ‘NO stress’. One participant suggested ‘The presence of "calm" What makes things "calm"? -Mood -Naturalness -Space -Enclosure closing out external ‘xtrusions –Solitude’, and ‘peace, calm alone with my dog’. In discussion a particular concern of the last respondent was to be away from noise, especially music.

Others suggested ‘Peace and Calm’, ‘peace’, ‘peaceful’, ‘calm’, ‘peace’, ‘calm, peaceful’, ‘peace’, ‘calms -you down -peaceful –come every week’, ‘Calm and peaceful’, ‘Somewhere peaceful calm No stress’, ‘Peace, stillness’, ‘-Relaxing same as tranquillity -traffic (not)’, ‘perfect peace’, ‘Peace’, ‘My garden, peaceful -it has everything you need to be tranquil’, ‘peace, other people around’, ‘Peaceful’, ‘calm’, ‘calm’, ‘Stillness a sense of calm, both internal and external. One is response to the other’, ‘calm, peaceful’, ‘Peace’, ‘Peace’, ‘Peaceful on the tops’, ‘Peace, feeling of well-being’, and ‘Real Peace’, ‘Peaceful’, ‘Peace without outside interference -not necc. alone, but people can irritate you’. The respondent who made the last comment noted that it was not necessarily the number of people that is important in detracting from tranquillity, but ‘particular type of people’. For him, tranquillity was ‘making things with wood/metal/any materials’.

Others noted the need for ‘space to reflect’, ‘empathy with surroundings’, ‘time for thoughts’, tranquillity as a ‘state of mind when in nice surrounding’, ‘Quietness (in the spirit)’, ‘sit in the quiet and listen to God speak’, ‘calm mind and body’, ‘Calm and Karma’, ‘peace -serenity within not outside Everything can contribute’, ‘A feeling of peace with natural env in background birds/bees’, ‘calm -quiet -peaceful –relaxing’, ‘Nothing to worry about Peace, quiet Spinning’, ‘Calm, relaxing State of mind’, ‘alone, silence, nature’, ‘Difficult to describe -a feeling, not specific space -calm, still (state of mind)’, ‘calm relaxation with others/alone’, ‘Home’, ‘Time for me to be there/ Quiet re non-natural’, ‘An emotional response rather than a physical description’, ‘tranquillity is a dream peace of mind and freedom of spirit’, ‘Being in the moment an absence of time and space’, ‘sense of well being, thinking space’, ‘time to think’, ‘feelings thoughts’, ‘Being comfortable’, ‘Time to yourself’, ‘sense of history’, ‘absence of influences’, ‘space to reflect’, ‘fulham winning by 4 goals’, ‘internal not external’, ‘pleasant thoughts’, ‘different rhythm to urban life’, ‘spiritual awareness’, ‘Driving long distances on my own -do all my thinking’, ‘Quality of Life’, ‘feels like going back in time’, and ‘A safe place to be’. One of the respondents who suggested ‘peace of mind’ also noted in discussion how she hated tourists, and hated being one – ‘they all fuck it up’. Another respondent suggested ‘switched off’. They also noted in discussion the potential for night fishing in the wind and rain to be a tranquil experience, and that excitement can be needed in order to get tranquillity – ‘just lying around is boring not tranquil’. The respondent who suggested ‘perfect peace’ also referred to the following in discussion - ‘Blanchland, a July evening, out with dogs, no other people around…. Game keeper is allowed. See nothing but heather all around. –magic’.

Others equated tranquillity with ‘getting away from it all (which received 57 dots at verification, but which was added to with ‘I've been really away from it and it can be really frightening! e.g. glaciers, mountains in bad weather’), particularly other people - ‘away from noise with birds’, ‘Anywhere away from noise –TV’, ‘Feeling like miles away from anywhere’, ‘away from it all’, ‘Feeling far away from town’, ‘getting away from it all’, ‘Hustle and Bustle (away from it)’, ‘away from everyday life no detailed planning’, ‘An area you can visit to leave all your troubles behind -escape life's hustle and bustle’, ‘About escape -being away from the bustle of normal life’, ‘everything you cant get at home’, ‘Away from stress of work and day to day pressures’, ‘Escape from people -human interference’, ‘No one’, ‘Getting away from speed’, ‘Peace and Quiet away from stress’, ‘Not being bothered’, ‘Can sleep Not disturbed’, ‘Being alone’, ‘lack of people unspoilt live nearby’, ‘Away from everyone else’, ‘no people’, ‘not too many people’, ‘lack of people’, ‘This without people and dogs’, ‘Lack of people’, ‘Just Me’, ‘No too many people (here today is too many)’, ‘alone’, ‘seclusion’, ‘Secluded’, ‘atmosphere. cordial people’, ‘few people’, ‘alone….‘, ‘Absence People and their moods (taking it out of you)’, ‘Solitude on Cheviot’, ‘away from people -noise and rubbish’, ‘(no) Other people - distract from contemplation; feel need to interact’, ‘Solitude’, ‘Not lots of people in crowded place’, ‘Lack of fast man made movement e.g.vehicles, like slow pace e.g. grazing animals’, ‘Absence of man made sound Elitist view -I should be the only person there.’, ‘solitude’, ‘solitude’, ‘no people’, ‘tranquillity = less people = more peace’, ‘being alone’, ‘ Alone or with others’, ‘Lack of people’, ‘no people’, ‘No people’, ‘solitude’, ‘with few people around’, ‘NOT too many people’, ‘Lack of people’, ‘No people’, ‘not too many people’, ‘No other people’, ‘not many people ‘, ‘not many people’, ‘not too many people’, ‘lack of people’, ‘not too many people’, ‘It is good hardly to see another soul’, ‘Lack of people (and want to keep it that way)’, ‘not a lot of people’, ‘Being a long way from other people’, ‘not too many people’, ‘No other people’, ‘Not being bothered by surveys’, and ‘few people (not hoards of teeming people)’. One respondent suggested ‘get away from people’. This respondent noted how he worked on the Tyne and Wear Metro system, and liked to get away from work, people and the city and go walking. Another respondent suggested ‘NO bigots’ (supported at verification with 33 dots). In discussion he noted that he had gay friends who had lived in the countryside who had not had a good experience due to the attitude of other locals. One of two female respondents (a mother and daughter) suggested ‘having a place that belongs to you -can keep people out -own space’. In discussion, the daughter noted how she liked her bedroom as it was 'her space' – it belonged to her and she could keep people out.

For others, tranquillity related to ‘The history of places’, ‘remembrance of a special place and special moment’, ‘Drawn here by bridge/history’, and ‘history recall’,

Doing Things

Many respondents identified particular activities that they considered added to their experiencing of tranquillity. Of these, a particular focus emerged around ‘walking’ (which received 64 dots at verification) – ‘somewhere you have to walk to but when you get there, the rewards are tremendous’, ‘Pleasant Walk’, ‘quiet hill walking’, ‘nice walk’, ‘long walks’, ‘hiking/walking either alone or with somebody else but more so when alone’, ‘ability to move to other areas to retain tranquillity’, ‘Walking dogs in woods’, ‘long walks’, ‘Walking through woods.’, ‘dawn organised walks’, ‘being able to enjoy a nice walk’, ‘valley walks (bad back) {Ingram valley is ideal}’, ‘to walk all day and not see anyone’, ‘not going to work lie-in on Sunday morning No stress, no hangover’, ‘Nice relaxing walk’, ‘Making things with wood or metal, anything’, ‘Horse ride alone’, ‘walking in the countryside free as a bird’. One respondent suggested ‘organised walks - like dawn 'bat walk'’. In discussion this respondent argued that guided walks are good so you can take other walks away from where these walks go. Another respondent suggested ‘walking in woods near home, with dog/family -anytime of year its beautiful’. In discussion this respondent noted the combination of open and enclosed spaces, and that there is a stream there. The respondent preferred to walk with dog and her husband, with litter and motocross bikes spoiling tranquillity.

A range of other activities was also suggested. ‘Things i enjoy with friends and family’ received 45 dots at verification, and was added to with ‘with husband always tensions in a group so only alone or with husband’, and ‘enjoying the landscape’ received 35 dots. Other responses were: ‘curtains closed and a nice fire’, ‘a consuming novel’, ‘Sitting still/lying down in comfortable place with background sound (not motor traffic or roads)’, ‘good sex’, ‘naturism’, ‘I am tranquil when I’m with

wood working with it outdoors in natural environment', 'Being in a rowing boat, sailing dingy rocking slowly or steadily in breeze. No fast motor boats whizzing past', 'bed', 'Bird watching at scott nature reserve', 'I am tranquil when im playing horses outside by myself', 'Fox hunting on high fells -sound of nature taking place.', 'out cubbing at 6am' (with the respondent adding that 'I like hunting foxes in the morning especially cubbing', and 'You have to be quiet in case the victim is disturbed'), 'floating in a calm sea surrounded by nothing but flat horizon', 'On a seat having a quiet beer', 'Watching world go by pint of beer', 'glass of beer', 'sitting by fire', 'family', 'Yoga -cut yourself off', 'More tree planting', 'relaxing in garden, alone –afternoons', 'Going into countryside away from traffic and people -river walks', 'fishing (no work)', 'Ice cream (9 yr old)', 'gardening', 'People working in landscape ok e.g. walkers, farmers etc', 'Camping Holiday', 'Fishing', '(Gardening) Satisfaction of growing things yourself. Space/time to be by self.', 'Gardening/bird watching -quiet -away from tv.', 'doing things I enjoy, friends and family', 'Knowing God (through Jesus Christ)', 'archaeology', 'traditional activities', 'BBQ by river', 'on a mountain bike', 'watching a wedding can enhance', 'nice view from a beer garden', 'no particular thing to do', 'in the car alone on a dry road at night when the heater, radio and all other sounds are off and there isnt another car in sight – it doesn't last for long but is a great sensation when it happens', 'Walks in the hills when the weather is just right and the company is good', 'On an airbed in the middle of a pool, glass of wine in one hand, book in the other', 'Swimming in a remote lake', and a 'Single malt whisky drank in a quiet glen in Scotland Glen Lyon'. One respondent argued that he/she 'Need(s) excitement to be tranquil (lying on the sofa is just boring)'. Another added 'a good book', also suggesting that 'jet skis should have their own place, I place in UK'.

Perceived Human Related Benefits

Whilst much of the focus of participants comments concerned perceived 'natural' factors, some respondents suggested certain human-related aspects could also be important in heightening the experiencing of tranquillity. Some participants suggested that some human-related developments (and humans themselves) in the landscape added to their sense of tranquillity. These were 'old buildings', 'well maintained', 'suble blending in services', 'No to the exclusion of man made landscape or noise', 'Appropriate development (tea rooms in farm houses, etc', 'Children -Crowds -Pleasant surroundings', 'doesn't have to be solitude', 'Doesn't have to have absence of vehicles', 'Company - 4 to 6 people walking every weekend Important', and 'Wind turbines are OK'. One respondent suggested 'Need more windmills (no oil in 15 years)' – this participant argued that people need to protect tranquillity and speak up for wind power. Others suggested tranquil places would be 'safe for kids', having 'seats', 'clean places to eat', 'maintained areas', 'free from play grounds', 'clean areas', church history scenery', 'more garbage bins', 'Open space for children', 'Safe places to run around (9 year old)', 'Hill forts, settlements, roman ruins', and 'cared for hedgerows'.

Some respondents noted benefits of certain human-related sounds, linking tranquillity to 'beethoven's last 4 quartets', 'music', 'music', 'music classical', 'nice music', 'vaughn-williams', 'Gentle quiet converstion –yes', ' murmuring conversation', and 'quiet roads'.

Tranquillity is… 'what it is not!'

Most of the human related aspects that participants suggested as representing what tranquillity is actually focused quite clearly on perceptions of what it is not. Participants suggested 'NOT technology', 'lack of unnatural noise', 'Absence of industrial noise', 'NO army firing', 'no mobile phones - own phone, fact that I cant get away phone - feel like I have to carry it with me.', 'no phones', 'lack of unnatural noise', 'Absence of industrial noise', 'NO army firing', 'no mobile phones - own phone, fact that I cant get away phone - feel like I have to carry it with me.', 'no phones', 'NO human noise'. Some people focused on issues surrounding various forms of transport - 'lack of people traffic', 'NO aircraft noise', 'NO car noise', '(no) Noisy off-shore boats etc.', 'Distant traffic noise', '(no) Low flying jets', 'Traffic Noise (lack of)', 'Traffic none (little) no waiting', 'Not military jets screaming past overhead (unfortunately they are usually in otherwise "tranquil" areas)', 'not any traffic, aeroplanes', 'lack of traffic noise', 'Place free of man made noise', 'The absence of "disturbance" What makes things "disturbing"? -Intrusiveness -Character -Volume -Prevalence –"Mood" crowds Absence of activity e.g. traffic, people etc. "things going on" -artifacts that sit uncomfortably in the wider scene', 'lack of traffic', 'no traffic', not too much traffic', 'No traffic', 'No

cars or aeroplanes', 'No cars or aeroplanes', 'No traffic', '(-) aeroplanes -military aircraft practising', 'NO traffic', 'NO traffic', 'NO planes or trains', 'Cannot see roads' 'NO motors', 'no cars ', 'away from traffic', 'Cars (detract) hustle and bustle', ' (-) traffic -motorbikes (clubs) en masse', 'away from traffic', 'Northumberland is tranquillity -no motorway -whole county', 'No motorbikes', 'few (or no) cars', 'LESS traffic', 'NO traffic', 'NOT many cars', 'NO cars', 'NO traffic', 'RESTRICTIONS on quad bikes', 'no traffic', 'No cars', 'No motorbikes', 'no traffic AND', 'NOT traffic', 'No cars', 'No motors on path', 'no passing traffic', 'not near a road', 'lack of car alarms', 'no cars', 'Anywhere where cars not allowed', and 'car parks, signs in keeping -encourage -awareness –respect', and 'No Main Roads'. Two respondents suggested 'mountain bikes (NO)'. They focused on mountain bikes or quad bikes, particularly those used off road, because of their effect on the land, which could be 'cut to death', and because they destroyed the footpaths and trails. The two respondents said that they were often forced to walk on the heather because of the state of the paths and were concerned that they were destroying the heather as a result. Another respondent suggested 'No motorbikes', adding in discussion that benches and places for children to play are important as well. One of the respondents who suggested 'no cars' noted how they were most concerned about traffic noise, and that too much traffic makes it less safe for children.

Other noted tranquillity as related to 'no national trust signs or heritage', 'few (low) fences', '"Visually" tranquil -lack of man made structures e.g. powerlines, cables.', 'no traffic signs', 'reduced level of human impact', 'no barbed wire', 'NOT modern straight edged fences, buildings etc.', 'wind turbines', '(no) Council estate', 'no artificial smells', 'NOT -funfairs –noises', 'Absence of human "recreation" ', '(no) 76 Hikers in bright cagoules, 'Not keen on the adders (for their dog)', 'Not keen on the adders', 'no dogs', 'kids', 'Children', 'lack of children's noise', 'lack of child centred activities (bouncy castle etc)', 'NO churches', 'NO plastic cups, NO litter, NO pop drinks', 'LESS people, NO litter', 'unspoilt (no pubs etc)', 'unspoilt by development', 'unspoilt by development', 'lack of industry or obvious signs of capitalism', and 'parking restrictions'. One respondent noted the negative impact of 'interruptions when reading in bath (my daughter)'. In discussion the respondent noted specific negative interruptions of builders and drill noise. Another respondent suggested 'NO technology', saying in discussion that they preferred natural landscapes. Another participant suggested 'no churches'. The walker was part of the Gay Men's Walking Group and argued that he personally found churches to be particularly offensive because of his sexuality. He associated churches with persecution of gay people and didn't want to see them when out walking and wanting peace to enjoy the countryside.

One respondent suggested 'not litter on beach not housing in green areas' – in discussion they also suggested that church and history are linked to tranquil memories.

The Impact of Humans

As might be expected following the last set of responses, a large majority of the responses to the question 'what is not tranquillity' (and some responses to being asked what is) focused on the impact of humans in a variety of different forms.

On a general level, it was the mere presence of humans that detracted from tranquillity for many respondents. Participants suggested that tranquillity is not 'Too many people', 'Too many people', 'Too many people', 'Too many people', 'Too many people', 'Too many people', 'Too many people', 'Too many people', 'big crowds of people (rowdy)', 'too many people', 'too many people' 'Too many people', 'Too many people', 'Too many people', 'Too many people walking the paths', 'Too many people', 'too many people', 'Density of population', 'too many people', 'Crowds', 'shoulder to shoulder', 'Human noise and business', 'too many people', '(lots of) people -noise/disruptive', 'Busy/lots of people', 'People -like to be there alone with dogs, although gamekeeper is allowed', 'Irritation -people, particular people, not all', 'People -> Lake District -too many people, tourists', 'people', 'lots of people you don't know', 'Human beings', 'Tony Blair', and 'Uninvited people'.

Certain types of behaviour and/or activities undertaken by humans were considered as detracting from tranquillity, much of which revolved around the issue of unwanted noise and/or disturbance (both visual and aural). At verification 'Mobile phones' received 65 dots as something you hear when not in a tranquil place, and 79 dots as something you do not hear when in a tranquil place

(ranked 7th and 10th!); ‘ghetto blasters/radios’ received 65 dots as something you do not hear (ranked 9th) and added to at verification with ‘but walkmans ok’, ‘noisy people’ received 54 dots, ‘sound of blasting music’ received 39 dots, ‘loutish behaviour received 50 dots, ‘unnecessary noise; received 47 dots, ‘the alarm’ received 45 dots, ‘people shouting’ received 38 dots, ‘hooligans received 38 dots.

Participants commented on the negative impacts of people ‘not respecting an area’, ‘drunken teenagers’, ‘loutish behaviour’, ‘lack of respect’, ‘people screaming and shouting’, ‘Irritating Drunks’, ‘Sister -coming in bedroom -making mess’, Attitude of people (to area) who live hear’, ‘Anger, people fighting and arguing’, ‘Being at everyone's beck and call, no time to self’, ‘inconsiderate people’, ‘inconsiderate people’, ‘Un-natural noises’, ‘noisy rowdy people’, ‘Noisy people’, ‘noisy neighbours’, ‘Noisy kids’, ‘Noisy children’, ‘Noisy kids’, ‘Grandchildren –Noise’, ‘Radios loud’, ‘not natural noise’, ‘unnecessary noise’, ‘man made noise’, ‘Noise -machinery irritating’, ‘Noisy people (Radios)’, ‘Unnatural noise -prefer jets to crowds -hate crowds’, ‘Noisy neighbours’, ‘noise’, ‘Excessive noise’, ‘Noise’, ‘mobile phones’, ‘Mobile phones’, ‘mobile phones’, ‘people's radios mobile phones’, ‘-sound of blasting music’, ‘background noise -jazz music’, ‘Loud Music’, ‘Noise -manmade esp. music’, ‘Un-natural noises especially loud car radios’, ‘Noise -other peoples music’, ‘loud music, out of cars’, ‘loud music’, ‘Radios’, ‘Radios loud’, ‘prolonged noises e.g. chainsaws’, ‘Noise -machinery -dogs -not natural noises’, ‘Noise’, ‘Noise’, ‘(-)Dogs Barking’, ‘Shouting loud children, ghetto blasters -no!’, ‘(-) Noise -loud music. (young kids driving)’, ‘(-) noise intrusion too many people’, ‘people shouting’, ‘BBQs’, ‘Picnics, BBQs’, ‘A shoot (but understand need)’, ‘Builders digging our patio’, ‘interrupting when spinning’, ‘building works’, ‘(in Bedroom) Cats and Dog -> lie on bed dog chases cat’, ‘hooligans, young people loud music.’, ‘Too many children’, ‘Kids playing (scream all the time) kids noisier and louder these days –don’t play quietly.’, and ‘Children running about disturb peace’.

Some respondents identified how being in the wrong frame of mind can detract from perceived tranquillity - ‘Lads stress!’, ‘stress’, ‘-Problems -things outside your control -can only control your own stuff’, ‘Interruptions -like stresses, kids, etc.’, and ‘worry’.

A key issue concerned the perceived spoiling of tranquillity through litter (31 votes), rubbish (88 votes – 5th rank, and added to at verification with ‘rubbish/litter’) and pollution received 34 votes at verification. Participants noted the negative effects of ‘Rubbish’, ‘rubbish' ‘litter/dog dirt (beach)’, ‘Rubbish’, ‘litter‘, ‘mess’, ‘beer cans’, ‘commercial rubbish’, ‘Rubbish’, ‘litter’, ‘rubbish out of place things’, ‘Litter’, ‘Rubbish’, ‘Rubbish, plastic bags and fly tipping’, ‘Litter’, ‘Rubbish’, ‘Rubbish’, ‘Litter’, ‘Litter’, ‘dog dirt’, ‘dog dirt’, ‘dogs should be controlled’, ‘litter’, ‘Mess’, ‘Rubbish -allsorts fly tipping’, ‘-too many people -dropping rubbish’, ‘litter, crosser? bikes in summer’, ‘Pollution’, ‘litter’, ‘litter’, ‘litter/hoardings’, ‘Litter’, ‘(-) litter’, ‘litter’, ‘burnt out cars’, ‘people –litter’, ‘Pollution’, and ‘Litter’.

The negative impacts of various forms of transport and vehicles was commented upon by a number of respondents, with ‘traffic’ receiving 93 votes at verification as being something not seen in a tranquil place (and added to at verification with ‘not ok if its parked -still has to get there cars are ugly’, ‘ok if parked not moving (driving in it)’, ‘4 wheel drives on green lanes’, and ‘don’t mind a bit of traffic’), ‘car noise’ receiving 54 dots as something you do not hear in a tranquil place and 47 dots as something you hear in a non-tranquil place (added to at verification with ‘especially a constant roar e.g. motorways trunk roads’), ‘motorbikes’ 46 dots, and aircraft noise, 31 dots. They noted the negative impacts of the following on tranquil experiences – ‘traffic, too much, cars, skunks, wolves’, ‘Quad Biking’, ‘motorways aircraft children cars car parks motorbikes’, ‘traffic - stops it being safe for children’, ‘traffic -danger to children’, ‘cars’, ‘-burger vans -traffic -litter – graffiti’, ‘-national grid pylons -light pollution -cars/traffic (noise) -radios (i.e. RAP)’, ‘Motorbikes’, ‘Motor bikes and trail bikes (exhaust smell + noise)’, ‘Motor Bikes’, ‘Too much accessibility for cars’, ‘Long wait for public transport to tranquil place’, ‘Loud traffic’, ‘motor cycles’, ‘Jets (but not too disturbing comes and goes)’, ‘traffic –motorbikes’, ‘aeroplanes’, ‘Jet skis’, ‘off road motorbikes’, ‘Motorbikes’, ‘Military Planes’, ‘-motor bikes -airplanes -people -> angry offensive’, ‘Cars’, ‘Roads, mobiles, industry, human infrastructure’, ‘-Lots of people –motorbikes’, ‘motorbikes, jet skis’, ‘Cars’, ‘cars/traffic’, ‘too much traffic cars close to you’, ‘aircraft noise’, ‘-roads ->car noise ->traffic noise’, ‘Motorbikes – Noise’, ‘Hate microlights noise’, ‘(-) low flying aircraft’, ‘Noise levels -difficult to get

away from roads/aircraft. Some levels acceptable/inevitable.', 'engine sounds, cars', 'Noisy M. Bikes', 'b/ground noise -traffic -aircraft in certain areas', 'Road noise (not the roads)', 'traffic noise', 'traffic noise', 'Traffic noise (no new car parks), Fighter planes', 'Cars with noisy radios', 'Jet noise (Thursday is low flying day)', 'Traffic noise', 'road noise', 'traffic noise', 'traffic noise', 'Noise – motors', 'Traffic noise', 'traffic noise. Cars with loud music (boom boom)', 'Aircraft and traffic noise', 'Cars and radios too many people shouting', 'Noise of a road', 'Noise from -motor bikes -light aircraft -low aircraft', '-motorbikes in countryside -scrambling bikes in countryside', 'Roads outside our house Noise', 'Noise -e.g. jet going over', 'Traffic -noise pollution not natural noises', 'Noise – traffic', 'Cars Noisy People', 'Developments Noise Motorbikes', 'Traffic noise Litter Intensive farming', 'Jets coming over from newcastle airport', '-low flying jets -trial bikes -noisy vehicles – noisy', 'jets noise', 'car radio noise', 'traffic noise', 'Army on manoeuvres', 'Burger van', 'Loads of coaches', 'Traffic', 'Quad bikes', 'Caravans', 'Exhaust fumes'

A more general form of negative human impact concerned various forms of 'development' in the landscape, particularly any that was perceived to be 'Too commercialised' or 'Incongruous things like -Fun Fair in a village green -moto scramble?'. 'Vandalism' received 51 dots at verification, and 'industrial sounds' received 35 dots as being things not seen or heard in a tranquil place. Participants commented on the perceived negative impact of 'Cafes, car parks with facilities and stalls', 'over management', 'over commercialisation (Supermarkets, etc)', 'over commercialisation (Supermarkets, etc)', 'Commercialisation', 'Any encroachment', 'Commercialisation (holiday villages, etc)', 'any industry', 'Over development', 'Don't change anything', 'Obvious development', 'Development of any kind', 'Any development', 'Too much commercialisation eg cafes, etc', 'Too much development -buildings, houses, etc. Too commercialised', 'Too large visitors centre, car parks', 'Too commercialised', 'Big building sites', 'machinery', 'Noise, pollution -> machinery, cars, other people', 'Quarry noise', 'factories', 'new housing areas', 'Keep facilities at the edge', 'Anything manmade', 'Modern Lifestyle', 'too much of everything', 'Industry, Ghetto Blasters ->noise/pollution', 'Industrial Sounds', '-too built up -traffic (noise) (fumes) -city living -graffiti/rubbish -less pathfinders -hikers less -less people', 'Something that intrudes', 'big city commercialisation', 'burning tyres', 'people -modern manmade things', '-pylons -windfarms (not sufficiently efficient)', '-Industry', 'Technology', 'Power cables', 'Smoke from industrial areas', 'High rise buildings', 'Too much building', 'Housing estates', 'Industry (unless picturesque like Cornish Tin mines', 'Pylons', 'Wind turbines on the top of hills - but ok out to sea', 'Mobile telephone masts', 'Over management', 'Anything unnatural', 'Modern buildings', 'All pylons and masts', 'Lots of houses', 'Anything modern', 'Multi-story car parks', 'Big Windmills', 'Ugly Buildings', 'Ugly farm buildings, sheds, etc', 'Masts', 'Electric pylons', 'Wind Turbines (Not effective for visual pollution created)', 'restricted access', 'Tarmac' paths', 'Army restricted access', 'Sterile tarmac paths', 'Army restricted access', 'Old buildings', 'Destruction', 'Big billboards', 'Tarmac on paths', 'Graffiti', 'Graffiti', 'Signs -makes it look like Northumberland St', 'asphalt paths', 'Tree planting which denies access', 'Signs of mans interference', 'Artificial management', 'Prefer here to the Lakes as it is less commercialised', Insufficient information', 'Un-natural smells', 'Un-natural smells', and 'bad smells'. The participant who suggested 'Un-natural objects that draw your eye' added in discussion that it is not just the size or the proximity of the object, but rather its visual impact and the issue of whether it can be ignored that is important.

Finally, some respondents identified seemingly 'natural' factors as detracting from tranquillity. These were - 'midges', 'sea (rough) detracts ', 'Bad Weather', 'bad weather', 'The weather wind rain "really bad weather"', 'Too many conifers', that 'open areas not necessarily tranquil (whilst walking ok when stopped)', and 'wood pigeons (spoils)'.

Findings from Chilterns work

The findings section is organised, structured and presented in the same way as in the northeast Mapping Tranquillity work. The first main section concerns responses to the 'positive' range of questions that were posed during the PA sessions – questions such as 'what *is* tranquillity'; 'what *adds* to tranquillity' and so on, that were explicitly asking for positive responses. This is followed by the responses that sought to explore participants' perceptions of negative impacts on tranquillity - factors that reduce, spoil or impact negatively on tranquillity. The positive question responses are presented first simply because, overall, there were more of these than those which seek to identify what detracts from, spoils or are not perceived to represent tranquillity.

As in the northeast work, some respondents again chose to identify what they believed tranquillity is not, even when the direction of the questioning was to identify those factors and/or issues that are perceived to add to, or positively represent their understanding of the term/concept. This probably reflects a sense that it is sometimes easier to identify what something is not, rather than identify what makes it valued, or what it actually is. Since the northeast report it has been noted that many, if not all of these responses could be incorporated in the section that concerns 'getting away from…' rather than representing a section of their own. Despite this, and for ease of comparison (for now at least), these responses are still noted at the end of the positive question sub-section.

We begin presentation of the responses made during the PA consultation, therefore, with the positive responses to the question 'what *is* tranquillity?'

What *is* tranquillity?

A wide range of responses was made to the question 'what is tranquillity'. As one participant in the research suggested, 'Can't have a committee to decide what tranquillity is everybody will lose. Tranquillity is totally independent to each person. My tranquillity is not other people's tranquillity…'. Another respondent argued, 'it is different for every person.

Perceived links to 'nature'

A large proportion, and a wide range, of the responses made during the research linked 'tranquillity' to hearing, seeing and/or experiencing various aspects of perceived 'nature' and 'landscape'. Participants noted the importance of being 'surrounded by natural beauty', 'anything natural', 'being in nature', 'close to nature in natural environment', 'natural', 'nature', 'nature', 'nature –unspoilt', 'nature and me in my own way', and 'primeval instincts –natural'. Others suggested "naturalness", 'attention to nature –conservation', 'Essentially natural things', 'lots of nature', 'natural colours', 'natural elements ???? man made features e.g. noise, light, buildings, vegetation', 'natural materials', 'natural things', 'natural unspoilt wide open spaces' (which was supported at verification with 4 votes), 'natural wildlife for habitat', 'nature -nature trails', 'nature carrying on around you', 'the chance to be alone with nature/the environment/elements', 'looking at nature eg fungi', and 'seeing signs of nature'. For many people, 'tranquil has to be natural not man-made'.

These links to 'nature' had aural and visual aspects. Aurally, respondents noted the specific importance of 'Natural sounds', of being 'able to hear nature' (which was supported at verification with 4 votes), of 'hearing natural sounds', 'hearing the sounds you don't normally hear', of 'natural noise (lots can be just fine)', 'Natural Sounds', 'sound of the wind', and 'sounds -gentle -wind through trees/not sounds', 'being able to hear the sounds of nature', 'natural noise [in natural environment]', 'natural noises', and 'natural noises more than man made'.

For many experiencing the 'countryside', a 'natural environment', or 'beautiful' elements of it was a key idea, with a wide range of related aspects being suggested. Participants identified 'a beautiful setting', 'attractive', 'beautiful area', 'beautiful setting', 'beautiful surroundings', 'beauty', 'beauty but not frightened of it', 'scenery', 'scenery –countryside', 'unspoilt', 'unspoilt natural environment' and 'Natural environment' as key factors. They noted the significance of 'being/living in the countryside all the time', of 'common land', and, more generally, 'countryside', 'countryside and water', 'countryside nature', and 'English countryside'. Participants also

suggested ‘curves not straight lines’, ‘natural contours’, ‘natural -curves rather than straight’, and ‘vast landscapes’.

Some respondents focused on elements of the ‘English countryside’, suggesting ‘beach’, ‘Beach, palm trees, sun’, ‘on beach’, ‘the beach when its nice and quiet’, ‘desert absolute tranquillity absolute quiet’, ‘sanddunes’, ‘seaside’, ‘hills’, ‘hills trees valley like around here’, ‘hills, can see long distance’, ‘hills’, ‘hills’, ‘hills/views’, ‘huge contrast between town and in hills’, ‘geomorphology - where settlements -land use’, ‘fields’, ‘living near fields’, ‘beautiful hidden valley’, ‘valleys’, ‘mountain’, and ‘mountains’.

The importance of ‘Water’ and related aspects was emphasised by many respondents. They suggested ‘water’, ‘water’, ‘water [in built environment]’, ‘water –calm’, ‘water -for fishing’, ‘water in streams’, ‘water –river’, ‘water running’, ‘water -v. calm, even when rough’, ‘Water, trees, peace and quiet, being able to walk about - not getting lost’, ‘any water relaxing’, ‘beside water’, ‘Flowing water’, ‘gentle running water or fountains’, and ‘Running water’. Participants pointed to the importance of ‘perhaps a running stream’, ‘pond with no ripples’, Still water - see sheep’, ‘reflections on water’, ‘reservoirs’, ‘river’, ‘a stream makes the countryside tranquil with pretty fragrant flowers’, ‘canal’, ‘sea’, ‘sea (in and out) and water ???? etc’, ‘seas’, ‘near sea and views’, ‘the sea’, ‘the sea’, ‘the sea -natural –cliffs’, and ‘watching water sea or a lake’. Other responses focused on related aural aspects of water - ‘Running water –noise’, ‘sound of sea or streams’, ‘sound of the sea’, ‘sound of water’, ‘sound of waves’, ‘sounds of running water’, and ‘sounds of sea’.

Many respondents focused on ‘greenery’ (or other perceived ‘natural’ related ‘colours’, the latter term being supported at verification with 4 votes) as central to their understanding of tranquillity. Participants suggested ‘blue’, ‘bright colours’, ‘colour green’, ‘countryside green’, ‘green’, ‘green is calm colour’, ‘green pleasant peaceful’, ‘green spaces’, and ‘green spaces -woodland, parks’. Linked to this participants in the research noted the importance of ‘trees’, ‘woodlands’, ‘forests’ and other vegetation. They suggested ‘beech-ash woods’, ‘blue bell woods’, ‘bluebells’, ‘bluebells’, ‘broad leaved woodland with open views’, 'deciduous forest behind‘, 'flowers’, ‘flowers’, ‘forest – trees’, ‘forests’, ‘forests’, ‘grass’, ‘grass’, ‘grass’, ‘In the middle of the wood’, ‘In the woods -no sign of modern life’, ‘Leaves rustling’, ‘lots of different types of trees doing different things at different times of year’, ‘lots of trees -variation of’, ‘not conifers -sounds are different from deciduous’, ‘plants’, ‘rustling trees and bird song’ (which was supported at verification with 6 votes), ‘small pool light shining through trees reflecting in the pool’, ‘this stretch of woodland the light coming through the trees (beech woodland glade sun dapples dancing through the leaves)’, ‘trees’, ‘trees’, ‘trees and green spaces [in natural environment]’, ‘trees and open spaces’, ‘trees lots of greenery big spreading trees, ‘trees rustling in the wind’, ‘trees -through the seasons’, ‘tress all around’, ‘Wind in the trees, not too fierce’, ‘wooded area’, ‘woodland’, ‘woods’, and ‘woods’ as all being important potential aspects in experiencing tranquillity.

Another range of comments related to the importance of ‘views’ and ‘wide vistas’. Here, respondents focused on the relevance of the ‘view’, ‘view’, ‘view -long distance’, ‘view -space makes problems go away’, ‘views’, ‘views’, ‘vistas’, ‘wide view’, ‘wide vistas’, ‘big views’, ‘engaging view’, ‘fantastic view’, ‘fine views’, ‘good view’, ‘good views’, ‘good views’, ‘gorgeous views’, ‘horizons’, ‘look across open countryside’, ‘looking out into the distance’, ‘lovely scenes’, ‘lovely views’, ‘lovely views’, ‘open views’, ‘scenery’, ‘seeing a long way’, ‘sweeping views’, ‘The early morning mist rising over the hills’ (which was supported at verification with 6 votes), ‘things in distance to look at uninvolved’, ‘things to see -animals, trees, flowers’, ‘Top of hill looking down’, ‘uninterupted views’, and ‘vast expanse’.

Seemingly linked to this, other responses focused on the notion of ‘open space’ and ‘remoteness’. Participants stressed the significance of ‘being out in open’, ‘being out in the countryside’, ‘being outdoors’, ‘Being outside’, and ‘being somewhere where I can immerse myself in pleasant thoughts and enjoy the beauty of the countryside flaura and fauna’. This was often linked to ‘sky’, ‘big skys’, ‘blue skys’, ‘blue sky’, ‘nice blue sky’, ‘can see stars with back to luton’, ‘clear skys (no flight paths) [in natural environment]’, ‘dark night skys’, ‘Huge skies in East Anglia, the Bullrushes, Migrating

birds', 'open sky', 'open sky, clear water and silence but for seagulls and water' (which was supported at verification with 4 votes), environment helps you to be tranquil', 'more designated open spaces', 'open air', 'open aspect of downs', 'open fields', 'open fields', 'open space', 'open space', 'open water [in natural environment]', 'openness', 'outdoor', 'own space', 'people have enough space for themselves', 'sky', 'space', 'space', 'space to think', 'Space/not crowded', 'space: appropriate -personal space doesn't need to be huge good to see other people enjoying also (lighter for my pipe -walker returning to cave)', 'spaciousness', 'uncluttered' and 'Wide open spaces'.

'[E]ncounters with wildlife other unexpected things' were perceived by many respondents to also be very important to their notions of tranquillity, with 'animals' being supported at verification with 5 votes. They noted how tranquillity is enhanced by encounters with 'animals', 'Animals', 'animals e.g. cows', 'animals farm related planes', 'animals from a distance', 'animals like living in the countryside and all the beautiful plants', 'being alone -apart from wild animals', 'cattle grazing', 'deer', 'deer', 'birds', 'birds', 'Hearing Bird song and Leaves Rusling', 'hearing birds, grasshoppers', 'insects', 'kingfishers', 'like to seee hills and wildlife, esp. birds', 'listening to birds', 'more foxes', 'preserving wildlife', 'seagulls', 'seeing animals', 'seeing wildlife', 'snuggly animals', 'sound of birds', 'tuning into nature –birdsong', 'vultures wheeling above my head ???? ???? in the middle of spain (????)', 'watching birds and animals', 'watching dogs run about', 'wild animals', 'wildlife', 'wildlife', and 'wildlife [in natural environment]'.

Finally, in relation to perceived 'natural' elements, a focus for some respondents was the weather, and the difference it can make to a tranquil experience. Respondents suggested 'Afternoon like this in the countryside, sunshine', 'autumn and winter the best', 'spring and autumn are best', 'has to be cold', 'dry weather only', 'elements', 'Sun/Moon', 'clouds', 'nice weather', 'Beautiful day', 'seasonal', 'seasonal changes of trees', 'experience all the elements', 'not too hot not too cold', 'wind', 'breeze', 'weather', 'wind', 'the wind', 'wind in the trees', 'wind in trees', and 'wind, air', 'reasonably warm no rain', 'seasonal winter clear, nice high pressure summer more going on', 'seasons', 'seasons -as long as weather ok and well dressed ????', 'still days', 'Stillness', and 'stillness and calm'. For some, 'summer is best', 'Summer', 'sunny days (autumn)', 'sun', 'Sunny day', 'sunny mornings', 'sunshine', 'lots of sunshine', 'sunshine/weather', 'the sun being out -don't care how cold it is', 'the sun -doesn't need to be warm just sunny', 'sunrise (early morning)', 'sunsets', 'sunshine', 'sunshine', 'warmth', 'warmth'.

Tranquillity 'of the mind…'

Whilst the many interrelated aspects of 'nature' were highly valued by many respondents during the research, another key aspect of tranquillity related to 'internal' as opposed to 'external' influences. Much of this reasoning was seemingly related to the ambiguous notion of (achieiving) 'peace'. As was noted in the northeast work, 'peace' can be used to refer to a complete lack of noise; alternatively, it could mean a lack of noise so that 'natural sounds can be heard', or, and moving beyond simple aural aspects, the notion of being 'at peace' – a mental or psychological feeling of well-being. As such, all such responses are identified below, but with comments made in conjunction with notions of 'quiet' (as in 'Peace and quiet') coming first, followed by more implicitly or explicitly psychologically-nuanced comments.

Respondents noted the importance of 'no noise', 'no noise', 'no noise pollution', 'no noise un-natural', 'lack of noise', 'lack of noise pollution', 'low noise', 'no unnatural noise', 'no unnecessary noise', 'no wind chimes', 'not hearing any man-made sounds', 'not hearing noise', 'not man-made sounds', 'not noisy'. They stressed the need for 'peace – quiet', 'peace -absence of noise and stress', 'peaceful and quiet', 'peaceful quiet spacious and natural surroundings', 'peace and quiet', 'peace and quiet', 'peace and quiet and calm', 'peace and quiet in the country, atmosphere', 'peace quiet', 'peace and quiet is important', 'peace and quiet to think and listen' (which received the joint tenth highest total of votes (8) at verification), 'peacefullness, quiet, silence', 'quiet', 'total quiet, 'quiet', 'quiet peaceful, natural environment', 'quiet and peacefullness', 'quiet areas on trains, planes, offices', 'quiet enough to hear the birds', 'quiet from man-made noise', 'quiet garden scene' -encourages, ???? tranquillity', 'quiet of the woods', 'quiet places', 'quiet solitude (mid-week spring/autumn/winter)', 'quiet, silence', 'Quietness', 'quietness', 'Quietness with my boy' and

‘quietude’. Other responses noted the significance of ‘Silence’, ‘silence’, ‘silence’, ‘Utter silence’, ‘almost perfect silence’, and ‘complete silence’.

As noted above, a large number and range of other responses were made including the notion of peace that could be considered to infer meaning beyond an absence of noise – as something ‘in the mind’. Interestingly, this section also includes all of the responses to the question, ‘why is tranquillity important?’.

Respondents argued that tranquillity ‘Is good for the soul’, ‘a peaceful and happy place in the countryside’ (which was supported at verification with 4 votes), ‘a place to find inner peace’, ‘a place where one can reflect without interruption’, ‘a state of being’, an ‘ability to relax in pleasant natural relatively quiet surroundings’ (which was supported at verification with 4 votes), is ‘being able to think about things without worrying’, ‘being fulfilled, useful’, ‘Being in a peaceful environment - no people, no street lights’, ‘being in accordance with my goals/intention’, ‘being on my own’, or being found ‘By going deeper into woods and losing oneself’. It represents being ‘at peace with god’, which received the fourth highest number of votes (11) at verification, about ‘absolute peace of mind’, and ‘acceptance of change in surroundings area it positive –enhancing’,. It was suggested that it ‘allows heart to shine through otherwise gets obscured’, it ‘allows you time to think’ (which was supported at verification with 4 votes), is ‘an essential antidote to the stress of everyday life’, ‘an age thing’, provides ‘an inner truth calmness of mind’, is an ‘antidote to stress’, an ‘appeasement of the senses e.g. woods -things outside of you that calm you’, is about being in ‘balance’, the ‘Balance of everything’, ‘be with thoughts’. Participants suggested it is important ‘because engenders a more civil society’, and ‘because we have a right to it’.

Other responses linked tranquillity to a sense of ‘calm’, ‘calm’, ‘calm environment’, ‘calm, peace’, to a ‘calmer, peacefull, better, friendlier approach to life’, to ‘calmness’, ‘calmness no worries’, a ‘chance to think’, ‘chill out’, having ‘clarity of mind’, ‘clear mind’, ‘clear your mind, take a step back, de-stress, wind down’ (which received the joint tenth highest total of votes (8) at verification), that it ‘clears my head’, ‘clears the mind’, ‘comfortable situation’, that ‘coming out to a place like this peaceful don't see many people’, ‘coming to terms with what happens and getting on with it’, ‘constant stress and strain’, ‘contentment’, ‘contentment and happiness’, and ‘contentment -lack of things being threatening’, this last comment being supported at verification with 4 votes. Other responses linked tranquillity to the ability to ‘de-stress’, ‘for de-stressing’, that it ‘enables self reflection’, ‘encourages consideration between people and nature and people and other people’ (which was supported at verification with 7 votes), is about ‘enjoying own thoughts’, that it is ‘essential to good health, peace of mind, feeling of well being’ (which received the third strongest support at verification, with 14 votes), about ‘evenness (in life)’, where you ‘feel at ease’, ‘feel relaxed’, ‘nice and peaceful’, ‘feeling at peace with yourself in nature’, a ‘feeling of well being’, that you ‘find in yourself,’. Some responses linked it to the ability to ‘forget about your troubles’, to ‘get away from hassles’, to ‘get rid of pent up feelings especially bad day’, about ‘getting away from everyday life’, that it ‘gives balance to life’, ‘gives you a sense of freedom’, ‘good after working all week’, and that is has, or is ‘good connotations’.

Respondents noted links to ‘‘happiness’, '"emotion recollected in tranquillity" Wordsworth’, ‘harmony’, ‘Harmony with nature’, that it is where you ‘have time for thinking’, ‘have to be some cannot have tranquillity all the time’, ‘having enough time to sit down, calm down get in touch with oneself’, about ‘having personal space’, ‘head space’, being ‘healthy’, that it ‘helps people relax’, ‘helps wind down from stressfull life’, and ‘helps you to relax’. Respondents commented that they ‘hope I can/could be in such a state all time’; that ‘I cant think what I'd do if I didn’t have true time for myself sometimes’, that ‘I enjoy it’, and that it is ‘important because everybody is too frantic and shallow without it’, which was supported at verification with 5 votes. Responses suggested it is about being ‘in tune with nature’, ‘Inner -at peace with yourself’, ‘inner calm’, ‘inner calmness -need to put troubled thoughts aside’, ‘inner peace’, ‘inner peace’, ‘inner, outer peace’, that ‘it can be an inside thing -you can exclude extraneous things’, that ‘it is a time to enjoy life’, ‘its a basic right’, about ‘enjoyment’, and that it ‘makes everyone happier’. Some responses linked tranquillity to ‘time to sit for a bit recharge’, ‘to chill out’, that ‘its relaxing laziness’, ‘its what we were made for - everything else is to get here’, ‘its within yourself’, ‘just like a quiet life’, that it ‘keeps some

balanced', that 'life is difficult and stressed', that 'life is so stressfull', 'like to feel tranquil sometimes', that it is 'lovely quiet places', linked to 'mental health', to 'need time to think and be', a 'need to live more in harmony', a 'need to relax need others to relax so you can keep calm' and a 'need to relax sometimes'.

For some respondents 'peace of mind' and 'peacefulness' was key. Tranquillity, for them, was about an 'ordered state of peace', being 'out of yourself', about 'peace', 'peace', 'peace and ????', 'peace and calm', 'peace and calmness', 'peace of mind', 'peace of mind', 'peace of mind', 'peace of mind', 'peace of mind and peace in surroundings' (which was supported at verification with 4 votes), 'peace of mind -need peace inside', 'peace summer days', 'peace -that's the word -that immediately came to mind', 'peace with myself, god and the environment', 'peace with yourself', 'peace within', 'peaceful', 'peaceful state', 'peaceful valley with river running through the bottom grass fields and horses and cattle grazing (i.e. chenies - off junction 18 m25 where my horse lives)', 'Peaceful, calm, beauty', 'peacefullness', and 'peacefullness, contentment, spiritualness, state of mind induced by environment', which was supported at verification with 6 votes.

Other responses concerned 'people accepting others', having a 'Place to clear your head', to 'protect our heritage', being 'reborn, reinvigorated', that it 'recharges you -creates some space', is about 'relax', 'relaxation', 'relaxation', 'relaxation in yoga', 'relaxed', 'relaxing', 'relaxing', 'relieves stress', 'rest from work', 'rest recuperation everyone needs it', 'restful', 'restfulness', 'security', 'seeing less cars', 'sense of being at peace with oneself, avoiding things that make you stressed', 'sense of history/time', 'sense of well being', 'Sense of well-being with or without people', 'senses stimulation', 'serenity', 'shutting out the outside world', 'shutting out world and problems', 'slow down in life', 'something from inside', 'something that pleases you', 'spiritual?', 'spiritual renewal' (which was supported at verification with 4 votes), 'state of mind', and 'state of mind'.

Responses suggested feeling tranquil 'stops anger', is a 'stress free place', 'stress relief', 'stress – reliever', 'switch off', 'take away stress of living', 'takes you away from stress', 'taking your hearing aid out', 'the need to recoup, recover', 'therapeutic', 'time for yourself', 'time to recharge your batteries', 'time to renew and recover from stressful life esp. in job where constant demands made of you', 'time to think' (which was supported at verification with 5 votes), 'to a hectic lifestyle in perspective', 'to balance emotional stress', 'to get away from everything', 'to get away from hustle and bustle of everyday life' (which was supported at verification with 4 votes), 'to have an escape from everyday normal life', 'to relieve the stress of life' (which was supported at verification with 4 votes), 'to stay sane', 'tranquillity important to recharge batteries in busy life', 'tranquillity is a state of mind', 'tranquillity is important because otherwise would go mad', 'tranquillity is the purpose of doing everything else', 'tranquillity is with you it cannot be imposed', 'Undisturbed peace', 'unwind', 'unwind after a busy day', 'utopian vision of peace', 'very important', 'we all need a bit of peace sometimes', 'we get in touch with our true self', 'we need it', 'well being', 'when you are jolted out of your mood', 'without it you would go mad in 6 months', 'within ones self, 'you can be tranquil in a busy city - it depends on your state of mind', and 'you need time to stand stare'. Participants noted links to 'no agro', 'no rush', 'no stress or anxiety', 'no worries', 'not being able to hear any man-made sound for a lenthy period (or at all)', 'not being worried', 'not having any worries', 'Not having to worry about anything' (which was supported at verification with 5 votes), 'not having to worry about having to be somewhere else or having to do something else' (which was supported at verification with 5 votes), 'not much time off work so want to clear my mind, drift off and not think about things.

Others equated tranquillity with 'getting away from it all', 'away from bustle', 'away from hustle and bustle', 'away from it all', 'away from modern life', 'away from phone', 'escape from civilisation', 'escapism -from pressure', 'escapism -without the imposition of man', 'free of towns', 'freedom', 'freedom to roam', 'getting away from everything', 'me being happy with myself -not a lot of external things', 'miles from anyone', 'miles from anywhere', 'nice to get away from modern world', 'nice to get out of house', and 'sense of remoteness from urbanising influences'.

One respondent argued, however, that they 'could feel peacefulness without being in a tranquil place'. Other responses were that tranquillity needs 'not perfect silence', 'not sounds silence', 'not

to do with environment -inner calm but green trees space no buildings all help', that it is found 'only if you are looking for it', and requires the 'opportunity to be in contact with your surroundings'. One respondent argued, 'I'm not sure if its important'.

Doing things

Many respondents identified a wide range of activities that they considered added to their experiencing of tranquillity – as 'Doing something you like doing'. These were 'a day at the museum', 'a newspaper', 'a nice place to drink and eat with no smokers', the 'Ability to walk where you want - freedom to roam', 'bacon sandwich treat', 'being able to do what you want when you want', 'Being at anchor in a nice bay with a bottle in your hand', 'being on holiday (Isle of White)', 'being together (alone)', the 'boats at tring, 'books with beautiful pictures of scenery and nature', 'bottle of wine and a joint', 'camping', 'chocolate', 'combination of many interests all respecting each others activity', a 'comfortable chair', 'cooking', 'Cricket on village green', 'cup of tea', 'cycling', 'day on sofa', 'dinner', 'dog always with me', 'dogs', 'drink (whisky mac)', 'drugs', 'eat, drink without cooking it', 'exercise', 'families enjoying ashridge, kicking ball about -that's tranquil', 'feed the badgers and the foxes', 'feel like you are the first person to walk this way', 'flying in glider', 'flying kite', 'food', 'football', 'fun', 'fun', 'g and t on a Friday night', 'gin', 'glass of wine', 'gliders', 'going for a walk', 'going out to pub, getting drinks', 'going up mountains' (which was supported at verification with 4 votes), 'good food', 'hot air balloons', using a 'hot water bottle', 'I do quilting - something not your usual activity', 'In my hammock with book', 'in the lounge on the playstation', 'keeping birds from being killed', 'like meditating', 'likes to play in woods', 'listening to music', 'listening to some of my favorite music!', 'music -listening to someone playing piano well', 'musician (music), 'little one likes the stuffed badger in the visitors centre', 'looking at dogs or at a nice garden', 'looking out the kitchen window at the south downs', 'lying in bed Sunday morning with no noise', 'meditation', 'Meditating on a beach next to the sea' (which received the joint sixth highest total of votes (9) at verification), 'more time for country walks taking dog with us', 'motorbikes', 'mountain biking in the middle of nowhere - then stopping -looking at the view and 'seeing all the wildlife', 'nice swimming', 'no work tomorrow', 'not working', 'not watching tv', 'off-road motorbiking', 'on holiday, sunbathing', 'pint of beer and cigarette', 'playing on the playstation', 'playing on xbox', 'pot', 'put in some effort to get t'here - but not too much', 'reading', 'real ale and a nice beer garden', 'running', 'scrabble', 'scuba diving', 'sex', 'sit', 'sit down', 'sitting', 'sleep', 'sleeping', 'staying on my own in a room reading a book clears my mind', 'stella artios', 'stereo', 'stopping for a while', 'strolling in the park', 'tai chi', 'this (walking with a group) is tranquillity', 'time outdoor', 'walking', 'walking in woods with dogs', 'when your praying', 'when your reading in the library', 'Willow on leather', and 'working here -time doesn't matter -people are nice'.

Perceived human related benefits

Whilst much of the focus of participants' comments concerned perceived 'natural' factors, some respondents suggested certain human-related aspects could also be important in heightening the experiencing of tranquillity. Some participants suggested that some human-related developments (and humans themselves) in the landscape added to their sense of tranquillity.

Tranquillity is linked to 'Access to the countryside', 'aircraft', 'beautiful music', 'Being able to access these places, get to Ashridge etc.' (which was supported at verification with 6 votes), 'being with family', 'bright lights and big city is tranquil', 'broad walkways [in built environment]', 'can see m/way -no noise -like beads on a string', 'car parks etc.', the 'cared for look', 'children', 'children asleep', 'chilterns sculpture trail', 'churches/cathederals', 'Clean sheets at bed-time', 'considerate people', 'consideration', 'crowds' (which was supported at verification with 4 votes), 'Empty house', 'facilities', 'families', 'families', 'general upkeep', 'having someone to share it with' (which was supported at verification with 5 votes), 'historic buildings [in built environment]', 'I don't even mind the crowds in summer', 'jazz -kenny G', 'Keep horses to selected areas', 'landrover', 'landscaping [in built environment]', 'less intrusive man-made noise', 'like minded people', 'like to see familys dogs and children', 'like to see the children and families', 'lots of people ok', 'lots of tracks', managed accessability', 'man-made noises aircraft, cars', 'materials use in construction well considered [in built environment]', 'mobiles', 'more access vs more traffic noise built steps in hills good for all vs bad for my knees', 'music (which was supported at verification with 4 votes), 'Music can do it', 'music choral ???? classic fm in the early morning ethreal', 'my sleeping baby', 'nice cup of tea', 'nice eople', 'nice meal', 'nice people', 'Nice to hear childen at play', 'not no people but not a

lot of people', 'paths level good for disabled', 'people don't worry me', 'people -imp. for people to be there to enjoy it', 'People not making a nuisance', 'people willing to be themselves and ????', 'people you meet have more time for each other, time to say hello', 'politeness', 'proactive - weekly meal plan then more tranquil in the week advance planning', 'public footpaths', 'public footpaths (so environment accessible) [in natural environment]', 'road markings', 'safety of parking your car when more cars are around', 'screaming kids', 'sculpture [in built , environment]', 'Signs pointing back to monument', 'soft music', 'toilets', 'trains', 'Village church', 'well considered street furniture [in built environment]', and 'words',

Tranquillity *is*…what it is not!

Most of the human related aspects that participants suggested as representing what tranquillity *is* actually focused quite clearly on perceptions of what it is *not*. However, as noted earlier, the following responses might also be effectively 'placed' within the tranquillity 'of the mind' section, and a focus on escapism and 'getting away from…'.

Respondents spoke of '[absence of] detracting man-made features', '[absence of] light pollution', '[absence of] low-flying aircraft', '[absence of] man-made noise', , '[absence of] other people', '[absence of] pylons', '[absence of] roads built development', '[absence of] traffic', '[absence of] wind turbines', 'absence of anyone', 'absence of intrusive man made features in views', 'absence of intrusive noise'(which was supported at verification with 4 votes), 'absence of light blight', 'absence of man-made irritations', 'absence of man-made noise' (which was supported at verification with 5 votes), 'Absence of noise', 'absence of noisy machinery', 'absence of other people -almost nobody', 'absence of poor modern development', 'absence of traffic', 'Absence of traffic', 'away from people', 'away from roads', 'away from the demand of others', 'away from traffic and noise', 'away from urban areas', 'being able to walk around without crowds of people', 'being alone', 'being alone (solitude)', 'being away from people', 'being away from towns and cities', 'being out on the bike and just being alone', 'can get well away from roads', 'cant hear any cars', 'contrast with work', 'Few people', 'fewer people', 'free from artificial noise', 'free from man-made sound and movement', 'free of people buildings traffic', 'get away from people', 'get away from work', 'get rid of cars in ashridge', 'getting away from crowd', 'getting away from crowds', 'how few people you see', 'isolated', and 'isolation'.

Others noted 'lack of boat club', 'lack of cars', 'lack of extraneous noise (man made)', 'lack of human beings and their accompanying mess and noise', 'Lack of intrusion into personal space', 'lack of man-made noise -cars, planes trains, etc', 'lack of modernistaion', 'lack of noise', lack of people', 'lack of people', 'lack of people at same time, space', 'lack of traffic', 'lack of traffic', 'lack of traffic e.g. village', 'less people', 'life before children', 'litter', 'no aircraft', 'no ambulance police ????', 'no background traffic noise', 'no barking dogs', 'no barriers/fences', 'no bloody aeroplanes', 'no bloody politicians', 'no buildings (new)', 'no cars', 'no cars', 'no helicopters', 'no houses', 'no houses at all', 'no houses -different from where we live', 'no idea, solitude maybe', 'no internal combustion engines', 'No Kids', 'no lights', 'no litter', 'no man-made machinery', 'no mechanical noise', 'No mobile phones', 'no outside man made noise pollution i.e. traffoc', 'no people', 'no people', 'no people like you', 'no people, cars, planes and towns', 'no people, shouting screaming children', 'no phones', 'no pylons', 'No roads', 'no traffic', 'no traffic', 'no traffic [in built environment]', 'no traffic noise', 'noise controls', 'noise –traffic', 'not having a husband', 'not heavy traffic', 'not London', 'not lots of people', 'not possible with little ones', 'not too many tourists', 'nothing there but you and the land', 'on my own', 'out of the office', 'out of the town', 'people/arseholes', 'reduce population by 60%', 'remote from traffic', 'secluded', 'seeing few people -a sense of being alone', 'solitude', 'solitude', 'some people but not too crowded', 'somewhere no-one can bother me', 'structures not a problem noise the problem', 'the office when the phone doesn't ring', 'this is a metting place for lovers of various persuasions and this spoils it for me', 'Time away from motor vehicles', 'we have two young children so we don't know the meaning of the word', 'when no adults are about', 'when the children are fit and well and in bed and asleep', and 'your kid being asleep'.

What is *not* tranquillity?

As might be expected following the last set of responses, a large majority of the responses to the question 'what is *not* tranquillity' (and some responses to being asked what is) focused on the impact of humans in a variety of different forms.

On a general level, it was the mere presence of humans that detracted from tranquillity for many respondents. Participants suggested their sense of tranquillity is reduced when there is 'a lot of us around', by 'closely crowded people', 'crowded', 'crowding', 'crowds', 'gangsters!', 'get rid of the scumbags', 'having to share it with other people', 'Here at week is ok not weekends/summer - too busy', 'human beings and modern living', 'interruptions', 'large groups of people', 'loads of people', 'lot of people around', 'lots of noise (people)', 'lots of people', 'not being able to get away from people (ok to start off with in crowded place)', 'not too many fishermen', 'other people', 'other peoples likes and dislikes impinging on me', 'overcrowded country', 'overflowing car parks', 'people', 'grand daughter and daughter', 'people too close, in your space, intrusion', 'people too many too close', 'people who don't like tranquillity', 'people: I come here in the week', 'Too many people', 'too many people close together', 'too many people -got to be managed'.

Other responses focused on 'noisy children', 'adolescent children', 'kids arguing', 'kids don't appreciate tranquillity - want the opposite', 'kids playing wrong kind of music', 'kids screaming or running riot', 'kids shouting and screaming', 'kids with footballs', 'noisy children (particularly teenagers) ', 'noisy children who are not corrected', 'screaming children', 'screaming kids', 'misbehaving children', 'Loud youngsters', 'large groups of noisy teenagers', 'the noise of teenagers', 'badly behaved kids', and 'Boys wrecking cars', 'children', 'children and adults making noise, jeering', 'children shouting', 'irritable children', and 'kids'. These responses were linked to 'claustrophobia caused by crowds', crowds 'endangers children', and 'illness'.

Beyond simply being present, certain types of behaviour and/or activities undertaken by humans were considered as detracting from tranquillity, much of which revolved around the issue of unwanted noise and/or disturbance (both visual and aural) – indeed, 'anti-social behaviour' and 'ill mannered people -no respect for surroundings' were the two highest scoring responses at verification, with 22 and 15 votes respectively. Participants highlighted the negative impacts of (in alphabetical order): 'alcohol', 'Anger', 'any man-made noise -people, aircraft', 'Bad manners', 'being asked questions on day off', 'blindness', 'Bombs', 'bonfire smoke', 'chaos', 'closed gates', 'crime', 'cut down trees', 'cutting branches off trees', 'Damage', 'discord', 'fireworks' (which was supported at verification with 4 votes), 'fireworks night', 'firms on the phone', 'graffiti' (which was supported at verification with 5 votes), 'groups of walkers (although sounds selfish)', 'having children', 'horses churn up ground', 'hunting', , 'inability to get pot', 'inconsiderate ????', 'inconsiderate behaviour', 'inconsiderate people generally', 'inconsideration', 'Lack of respect', 'lack of respect -vandals smash trees', 'Late night fireworks', 'lawn mowers', 'load music', 'lots of people screaming shouting', 'loud lawnmowers, chain saws', 'loud music from cars', 'loud music in pubs', 'loud music -wrong type -bang bang', 'loud people', 'loud talking on mobile phones -busses –trains' (which was supported at verification with 5 votes), 'loud voices', 'media', 'metallica', 'mobile phones' (which received the joint tenth highest total of votes (8) at verification), 'mobile phones in the countryside' (which was supported at verification with 5 votes), 'mobile phones ringing', 'mobiles', 'music playing', 'Music, noisy radios', 'my brother annoying me', 'Neighbours mowing lawn on weekend', 'news', 'newspapers –negative', 'no interaction with people', 'noise - man-made, not birds', 'Noise - sudden shouting', 'noise -artificial sounds', 'noise e.g. people', 'noise especially pop music', 'noise man-made', 'noise -music -road diggers -continuous -lots of people', 'Noise - People shouting -Any I wouldn't want to hear', 'noisy neighbours', 'noisy people', 'non-natural noise', 'not punk or heavy rock', 'Other peoples mobile phones', 'other peoples noise', 'outside noises –shouting', 'over run damaged', 'people always in a hurry', 'people and things that shouldn't be here', 'people are out of control especially teenage children', 'people being rowdy', 'people create all the problems', 'people demanding money for parks in the countryside', 'people invading space', 'people playing football', 'people shouting', 'people shouting', 'People talking English', 'people that shout', 'people who don't respect countryside', 'people who hurt people', 'people who think dogs/cats are people', 'phone ringing', 'phone rings', 'queuing to get in somewhere', 'radio', 'Radio and TV noise', 'radios', 'Radios -pop music blaring', 'radios/transistors', 'researchers', 'rowdyism', 'rude people', 'safety of car while out walking', 'selfish people who disturb other peoples pleasures -noise -bad behaviour' (which was supported at verification with 5 votes),

‘shouting’, ‘shouting etc.’, ‘smashing windows’, ‘smoke, bonfire’, ‘smoking’, ‘some music (techno the bass beat)’, ‘sounds we don’t ????’, ‘stealing from garden shed’, ‘stereo’, 'stopped coming to ashridge on a sunday cos its too busy’, ‘t.v.’, ‘talking’, ‘television’, ‘The beat of modern music’, ‘the news’, ‘tourists’, ‘transistors loud’, ‘urban pusuits intruding e.g. ???? ????’, ‘walking over our roof’, ‘when I'm on the playstation and mum said its dinner time’, ‘yobs’, and ‘yobs (at night) -bad atmosphere.

A key issue concerned the perceived spoiling of tranquillity through ‘eyesore –litter’ (which received the fifth highest allocation of votes at verification with 10), ‘litter/fly tipping’ (which received the joint sixth highest total of votes (9) at verification), ‘fly tipping’ (which received the joint tenth highest total of votes (8) at verification), ‘chewing gum’, ‘dog shit’, ‘dogs’, ‘Dogs, dog mess’,’, ‘fag ends on path’, ‘flytipping old boilers etc.’ (which was supported at verification with 4 votes), ‘litter’, ‘litter and hassle’, ‘litter, dirt’, ‘mess’, ‘rubbish’, ‘rubbish and untidiness’ (which was supported at verification with 6 votes), ‘rubbish -plastic bottles’, and ‘step in dog poo a bit annoying’

Some respondents identified a range of negative impacts relating to how being in the wrong frame of mind can detract from perceived tranquillity. They noted the potential importance of ‘anything that breaks concentration e.g. noise, rubbish, showing people have been ‘disrespectful’, ‘confusion’, ‘having a worry to think about e,g, money, noise, etc.’, ‘hecticness of modern world’ (which was supported at verification with 5 votes), ‘hustle and bustle’, ‘hustle bustle’, ‘Imbalance’, ‘inconveniences’, ‘Internal and external forces’, ‘internal psychological worries problems stress’, ‘lack of money’, ‘pain’, ‘panic’, ‘personal problems’, ‘Personal space being invaded’ (which was supported at verification with 6 votes), ‘physical discomfort’, ‘pressures of work family’, ‘stress (you cant enjoy it)’, ‘suffering’, ‘voices in your head such as conscience’, ‘worry about safety of car while walking around’ and a ‘worrying fretful state of being’.

The negative impacts of various forms of transport and vehicles were commented upon by a number of respondents, both in terms of their visual and aural presence. Participants stressed the importance of ‘4 WD access motorbikes should'nt be allowed Mbikes are ???? Selfish’, ‘4 wheel drives on open moorlands’, ‘4x4s ridges ruts’, ‘a lot of heavy traffic’, ‘Aeroplanes’, ‘aeroplanes, jets’, ‘aggression -particularly on roads’ (which received the joint sixth highest total of votes (9) at verification), ‘aircraft’, ‘aircraft fly-over’, ‘big roads: lorries’, ‘bloody motorway’, ‘bloody off road motorbikes’, ‘burger vans’, ‘burnt out cars’, ‘buses’, ‘busy railway or unnatural noise’, ‘busy roads’, ‘car’, ‘car break ins’, ‘Cars’, ‘cars -dangerous for children (particularly gypsies) -noise not particularly a problem’, ‘cars on countryside roads’, ‘cars rushing by’, ‘constant plane’, ‘cycles (shouting/lack of bells)’, ‘cycling’, ‘cyclists should have bells’, ‘Cyclists, especially on tow paths’, 'driving around dunstable’, ‘footpaths close to motorways’, ‘Helicopters in particular’, ‘helicopters more than planes’, ‘horrible motorcross bikes’, ‘I don’t hear it, I know its there and it does spoil my tranquillity (motorway)’, ‘Ice cream vans’, ‘invasion of cars motorbikes’, ‘jets takeoff’, ‘joy riders’, ‘lots of traffic’, ‘Low flying fighters’, ‘M25’, ‘m40 doesn’t help doesn't worry me’, ‘main roads’, ‘major roads’, ‘motorbikes’, ‘motorcycles’, ‘motorcyclists on footpaths’, ‘motorways’, ‘motorways and housing’, ‘planes’, ‘push bikes -can be ok, but can be frightening if going too fast’, ‘Roads’, ‘roadworks’, ‘sit down on the seat be bloody miles away but that m/way brings you back to reality’, ‘smell of deisel and petrol and fumes’, ‘speeding on lanes’, ‘too many cars’, ‘too much traffic fast traffic’ (which was supported at verification with 4 votes), ‘tractors’, ‘traffic’, ‘traffic (sitting in it) -waste of time’, ‘traffic jams’, ‘Trains’, and ‘traffic -not tractors’.

Other responses focused more overtly on transport-related noise. Participants suggested ‘Aircraft noise’, ‘airplane noise -should ban air travel’, ‘banging cars revving up outside my flat’, ‘beeping horns’, ‘car alarms’, ‘car and lorry noise’, ‘car noise’, ‘car sounds’, ‘Cars with loud radios blaring’, ‘loud cars’, ‘loud, thumping music in cars’, ‘m/way noise breaks my heart having to listen to that bloody m/way’, ‘manmade noise e.g. aeroplanes’, ‘no car’, ‘Noise – cars’, ‘noise (jets, cars, inconsiderate people and their children)’, ‘noise -aeroplanes -young farmers on motorbikes’, ‘noise aeroplanes, young chaps on motorcycles’, ‘noise -aircraft –vehicles’, ‘noise –cars’, ‘noise -cars, motorbikes’, ‘noise levels -not appropriate e.g. jet by stream’, ‘noise -loud, jet engines, cars, shouting and screaming’, ‘noise of planes, jets’, ‘noise of planes’, ‘noise -planes, horns, motorbikes’, ‘noise traffic’, ‘noise -vehicles off road tractor ok’, ‘noise: aircraft -not necessarily -like

sounds of helicopters and 2nd ww aircraft', 'noises, traffic', 'not natural noise aeroplanes', 'out in the camper van', 'parking fees', 'plane noise', 'plane noise -so much part of our lives hardly notice', 'road noise', 'Road noise, aircraft noise', 'sound of traffic', 'traffic noise', 'traffic noise and helicopters', 'traffic noise and horns', 'Traffic Noise, very dependant on wind', 'traffic noise, volume, speed', 'trafic noise -especially people honking in greeting',

A more general form of negative impact concerned various forms of 'development' in the landscape, again in both visual and aural terms. Here respondents suggested various spoiling elements - 'All the new development in Chesham, many new flats - green space going', 'anything that looks modern', 'anything that does not fit into the surroundings', 'Anything that impinges on "space"', 'artificial and commercial things', 'balance natural/managed', 'building on it', 'building sites', 'buildings', 'buildings -industrial sites, residential', 'bunch of tall buildings, high rise', 'Bustle', 'chilterns not tranquil because can never fully escape from noise', 'commercialism -shops, food', 'Concrete', 'congestion of people and traffic', 'don't let things spoil it', 'electricity lines', 'engines', 'gates on big expensive houses', 'houses', 'Houses in village bought out. Big gates put up. Jewish commuity.', 'housing', 'housing estates', 'ill considered building development unsensative' (which was supported at verification with 4 votes), 'industrial estate', 'industrial sites', 'innappropraite things in inappropraite places', 'internet providers', 'lack of landscaping', 'light pollution', 'lighting', 'lighting (poor)', 'Lights', 'Man made things', 'man-made intrusive features', 'man-made objects', 'mcdonalds', 'no more consumerism -tea room ok', 'no mre concrete in countryside', 'no space for contemplation now', 'over commercialisation', 'over expoitation', 'Playgrounds in the wrong places', 'playing areas', 'pollution' (which received the joint sixth highest total of votes (9) at verification, 'pollution -smoke in air', 'pylons', 'seats too high more seats', 'shops', 'tarmac paths', 'things that are poor quality or poor design', 'too commercialised -tea room ok', 'too many buildings', 'Too much commercial ', 'too much management', 'too much movement', 'too much structure', 'ugly buildings', 'uncared for places', 'unnatural', and 'visual: signs too much visual stimulation coca cola .signs'.

Concerning negative impacts relating specifically to noise, respondents noted the significance of 'noise', 'noise (excess)', 'noise and people that disrespect the area that you feel is tranquil', 'noise and pollution', 'noise and technology', 'Noise in general', 'noise –loud', 'noise -not local generated', 'noise of any sort', 'noise pollution', 'noise that doesn't fit with environment', 'Noise -Wind –Deers', 'noise, quarries, 'noises', 'noisy, dirty, polluted environment' (which received the joint tenth highest total of votes (8) at verification), 'alarms', 'any noise that is not wanted', 'Artificial noise', 'auditory: noise doesn't belong to surroundings', 'background noise', 'Barking dogs', 'Inappropriate noise', 'inappropriate noise (to me)', 'Intrusive noise levels, rainlway, planes, loud music', 'irritating noise', 'irritating noises sirens', 'machinery noise', 'man-made noise', 'too much noise', 'unexpected loud noise', 'unnatural noise', 'un-natural noise', 'Unwanted noise', and 'workmen -horrible sound'. One respondent argued that 'you can cut out visual but not noise'.

Finally, some respondents identified seemingly 'natural' (or naturally related) factors as detracting from tranquillity – 'bad weather', 'climate', 'cold days', 'countryside claustrophobic', 'rain', 'rain wild -but can be peaceful', 'Seagull pooing on my head', 'thunderstorms', 'wasps', 'wind', and 'windy'.

9 Appendix: Tranquil places

Session 1, Central 1, Stratford Greenway Car Park - Tranquil Place
?meston medieval village at night
Around Broadway/Worcs
Asham Farm - Tamworth
Bishampton near Pershaw Worcestershire
Brandon Mill
Bridge over river Stour - Greenway. Middle of Oakley Woods ? -early Crachley woods ? - early
Broadway
Camping in woodland
Chaddesey Woods Brumsgrove Wurls
Cliff walks in Devon/Cornwall coast
Coast of Cornwall - coastal path
Constantine Bay - Cornwall
Constantine Bay, Cornwall
Cosmeston Village nr. Cardiff
Cotswold Hills
Derbyshire peaks
Devon
Devon
Devon and Cornwall
Devon and Cornwall
Dovers Hill
Dover's Hill Chipping Campden
Draycote Water
Draycote Water
Draycote Waters
Draycote Waters
Dunstanborough Castle - 1 1/2 miles from Craster
Edgehill Woods Stratford on Avon
Evesham
Greenway
Greenway
Greenway
Greenway + Lake District Coastal walks in Cornwall
hapel at Ullen Hall -15 Miles from Stratford
Hartshill Hayes Country Park Hartohill
Haweswater Lake District
In the countryside lots of colour and away from people
Jesmond Dean
Kincardinshire
Lake District
Lake Vuynry Wales
Loch Striven (Scotland)
Lundy Island
Lyme Regis
Mid Wales Nr Rhyder
Munt - West Wales
National Park - Brecon
New Forest
Norfolk Beaches
River Stdur River Wear (Stratford)

Riverside Stratford
Romsley - Worcestershire
River in DartmoorDungld (1 year ago)
Scotland
Scotland
Scotland - Mallaig area
Seaside (Bournmouth)
Seaside in Swanage, Dorset
Severn Meadows (Stratford)
Shut Mill, Romsley, Near Halesowen, Worcs
Snowdon in Winter
Somewhere like the Greenway
St Ives
St Ives
Stratford by the River
Stratford Riverbank
Stratford upon Avon
Stridwood, nr Bolton Abbey in Yorks
Tarn Hows - In Lake District on a quiet day
Tarn-Hows Lake District
The Lakes
The Sea
This Walk
top of Helvelyn (Lakes) - 3,000 ft mountains Cumbria
Tryarnon Bay coastal path
Wales seaside countryside - walks in the woods - stay horse on golf course
Walks around Broadway
Wall?y by the river when it is quiet in the morning
Warwickshire Countryside Malverns
Winderton (Shipston on Stour) Warwickshire

Session 2, Central 2, Charlecote - Tranquil Place
Anglesea
Anglesea
Back Garden
Badderley Clinton Warwickshire
Baddesley Clinton Warwickshire
Bamburgh Northumberland
Blea Tarn, Red Pike
Bledington (Cotswolds) Village
Botanic Gardens in Oxford
Buttermere
Cadbury World in Bourneville, Birmingham
Cardingmill Valey Shropshire
Charlecote Park
Chichester - West Witterings Beach
Clent, Birmingham
Coast of St. Andrews, Scotland
Cornwall Coastline
Cuttivett (Cornwall)
Dartmoor
Dartmoor
Dartmoor

Derbyshire Dales
Derbyshire Dales
Derwent Water - Peak District
Deseerted Beach anywhere in the UK
Desert
Devon
Dinham Bridge Ludlow Shropshire
Dovecote Derbyshire
Draycote Water - Rugby (Reservoir)
Dunham Park. Altringham. Cheshire.
Exmoor
Exmoor National Park
Eyebrook Reservoir Leicestershire
Forest of Dean
Forest of Dean
Glastonbury Tor
Glenridding to Ullswater
Gloscestershire esp. Cirencester Park
Haywood -> Balesly Clinton W?s
Here ! Charlecote
Here Cherlecote
Holy Island Northumberland
Knipton
Lake District
Lake District
Lake District -Coniston
Lav?wock nr Pewarth
Llyn Brnig N. Wales
Lyn Dam (Manchester)
Marlow
Marshes at Snape, Suffolk
Minions in Cornwalls (openland, part of Bodmin Moor) Helford River, Cornwall
Miserdon (Cotswolds)
My Sitting Room
N York Moors
National Park and Estate Exmoor
New Forest
New Forest
New Forest
Newborough Sands, Anglesea
Northumberland Coast
Northumberland Park
Northumbria
On top of Sussex Downs or Malvern Hills
Parts of Cornwall
Penbryn Beach
Portscatho, Cornwall
Red Wharf Bay
Roadwater Somerset
Shell Island - Bournemouth
Sittig by a lake anywhere away from things I have listed i.e. The Lake District
Sitting on the Cambridge Backs by the river Cam & clare gardens
Snowdonia

Snowdonia
Snowdonia
South West Coast Path
St Just in Roseland Church gardens Cornwall
Starling Wood
Sussex Downs
the Cornish coastal path
The seaside Isle of White
The Wolds Yorkshire
Tresco - The Scilly Isles
Warwickshire Countryside
Wellow (nr Bath)
Wellow nr Bath
Woods in Wales Ystrad Fellite - (Brecon Beacons)
Yorkshire Dales
Yorkshire Dales

Session 3, Central 3, Butterfly Farm - Tranquil Place
Aber Falls (North Wales) Lizard Peninsula (Cornwall)
alongside river (Severn) by Cathederal
Barton St. David - Somerset
Barton, St. David Somerset
Beach
Belfairs Park (a natural wildlife park) Leigh-on-Sea Essex
Bow Fell, Lake District
Brancaster - North Norfolk Coast
Canals
Cannock Chase
Chase Waters
Coastline Wear The Wash
Cornish Beaches
Cotswolds
countryside
Criffle
Cumbria
Elvaston Castle
Exmoor
Forest of Dean
Glen Coe
Haughmond Hill, Shrewsbury
Haughmond Hill, Shrewsbury
Hawkhurst fish farm
Hot Water Beach NZ
In the garden at home on my own
Iona
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District

Lake District
Lake District
Lake District
Lake Windemere
Lakes
Loch Ken
Malvern Hills Worcs
Mansdon Moor, Hudderfield
N. York Moors
New Forest, Hampshire
Newquay
Next to a natural lake with all of the wildlife going around doing things in harmony
park
parts of Sutton Park, Birmingham. Countyside around Lichfield where we live
Pennine Way
Portreath, Cornwall
Ranworth Broad in Norfolk
Sennan Cove - Cornwall
Sheringham Woods - Norfolk
Sherringham
Skiddaw House (Laske District, near Keswick)
Somerset Levels
St Ives, Cornwall
Stonehenge after visitor's hours
Stowe Cotswolds
Sutton Park
Swansea (wales) Bath and surroundng area
Sway Lakes in New Forest
The Fairy Glen, Wales
The Gardens of Cambridge
The Lakes (Lake District)
Virginia Waters
Wales
Wash Coastline
Wass N. Yorks
Welcombe Hills - Stratford
Wolluton Park
Woodland; the Beach
Worth Matrarers (Swanage, Dorset)
yorkshire
Yorkshire Moores (Dales)

Session 4, Central 4, Ilmington - Tranquil Place
(Home) ArdensGrafton Warks. (warwickshire)
?
Admington - Ctswolds
Allenheads Area
Askrigg Yorkshire
Barcheston
Bays in South Cornwall
Berkswell Village
Bryn Bach
Cotswolds

Crantock Crnwall
Crantock Crnwall
Crummackdale, Yorkshire Dales
Dalby Forest, N York Moors
Devon
Dove Valley, Derbyshire
Dove Valley, Derbyshire
Doves Hill Chipping Compton
Green way Stratford upon Avon
High Falls High Force Teesdale
Hillside above Coniston in the Lake District
Hod Hill, Dorset
Howgill Fells
Idlicote Hill (Warwickshire Semi Wooded)
Ilmington
Ilmington
Ilmington
Ilmington
Ilmington
Ilmington
Ilmington
Ilmington
Ilmington - Warwickshire
Ilmington Downs
Kidsey Pike, Lake District
Lake District
Lake District
Langdale Pikes
Malham - nr Skipton
Malham Tarn
Model Village, Warwickshire (my back garden)
Mourne Rouge Beach, Grenada, Carabbean
North Cornwall
North Cotswolds
North Sea Coast
North York Moors Yorkshire Dales Cornwall South Coast
North Yorkshire Moors
Oxford Ne?s - Suffolk
Peak District
Peak District
Peak District
River Isis, Oxford
Scottish Highlands
Simonsbath - Devon
Skomer Island - Pembrokeshire Lake District
Sno?hill Cotswolds
Southsea, Hamps
Stratford River @ Night
The Cotswolds
The Cotswolds
The Gower Coast
The Highlands in Scotland
The Lakes - out of season

The New Forest
The top of my field at Dovedale Blockley Glos
Wales - Snowdonia
Watersmeet above Lynmouth + Lynton
Wenlock Edge
West Coast N Scotland
Yorkshire Dales
Yorkshire Dales
Yorkshire Dales
Yorkshire Dales
Yorkshire moors and dales

Session 5, Devon 1, Wallace's Farm Shop - Tranquil Place
a winter beach - Lulworth Cove
Beach Woolacombe
Bircher Common (near Croft Castle), Herefordshire (Croft Ambry)
Blackdown Hills
Blackdown Hills
Blackdown Hills
Blackdowns
Bridgewater and Taunton Canal
Canic Wood, Cannock Chase, Staffordshire
Crackington Haven
Crackington Haven, Cornwall
Culm Valley Riverbank
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor in low peak season
Devon
Devon
Domary Pool. Bodmin Moor.
Duliverton Somerset
Exemoor
Exmoor
Exmoor
Exmoor
Exmoor - Devon
Exmoor National Park
Exmouth/exmoor
Field Farm Hammcole
Greatgable Lake District
Hangar Down, Cornwood (Moorland)
Hawkridge Exmoor
Herefordshire Woodlands
home (garden, birds, trees - everything natural)
Humkin Wood - Culm Valley
Isle of Skye
Kilve
Kinlochbervie

Ladybay Clevedon
Lake District
Lake District
Lake District high fells
Lichfield, Staffs. Nr. Cathederal
Lindisfarne
Mendip Hills
Morecombe Bay
North Devn Coast
North York Moors
ON the beach, Hayling Island (out of season) Hants.
Orkney Morecombe Bay
Otterford Lakes
Otterford Lakes, Devon
P'down Hills
Porlock
Quantock Hills
Quantocks
Quantok Hills Sommerset
Roman Wall in Northumberland
Sidmouth, Devon
Smallridge Devon
Tarr Steps
Tarr Steps - Devon
Tarr Steps, Exmoor
The Blackdown Hills
The close around Lichfield Cathederal
the fields by the river between C?mstock & uff?lme, particularly near Craddock
The Quantocks - somewhere near Crowcombe (can't quite remember)
The Wellington monument
The West Highlands
Tindale Tarn, Nr. Brampton Cumbria
Top of Quantok Hills
Wallace's Farm
Woodland - Nottingham, Bunny Woods
Yorkshire Dales
Yorkshire Moors

Session 6, Devon 2, Bickleigh - Tranquil Place
? Salterton Wet Lands
?shill in ?shire
1) Hope Cove 2) Longborough
Ashness Bridge
Back Garden/Whimple - Devon
Beaulieu (Hampshire)
Bickeigh Mill
Bickleigh Mill, Devon
Branscombe
Brockwood Park
Caldy Island Pembrokeshire Lake District
Canonteigh Falls in Spring
Cliff path overhanging Combe Martin Bay
Clovelly (North Devon)

Connaught Gardens /Sidmouth
Coombe Valley - Cornwall
Coombe Valley nr. Kilkhampton, N. Cornwall
Cornish Coast
Cornwall
Cornwall near the sea
cornwall near the sea
Cotswolds
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Derbyshire Dales
Devon Countryside
Ding Dong (Madron Cornwall)
Doone Valley
Dovedale
exemoor
Exemoor in the week!
Exmoor
Exmoor
Exmoor
Exmoor
Hardwick Hall, Derbyshire - the gardens, during the week when no-one much is around
Hay Bluff, Hay on Wye
Isles of Scilly - off Lands End
Killerton Gardens
Kindel Scout Plateau Dark Peak
Lake District
Lake District in remote parts
Landkey N. Devon
Loch Long in Scotland
marazion (marches) cornwall
Mount Edgecombe Cornwall
Parsand Cornwall
Powderham village, nr River Exe
Priests Cove, Cornwall
Remote beaches in N. Devon
Rice Point in Torrington
Sharpham Woods, Totnes
Shaugh Prior - Dartmoor
Slapton - Devon
Snaefell I.O.U Bick? Mill with no customers
St Just: Cornwall
steps bridge
Summerleze beach, In Bede
Swaledale
Tarr - Steps
The coast near Penzance in Cornwall
The Doone Valley

The moors near Hepstonstall in West Yorks
Thruxton
Tiver Taw between Taw Marsh (Belstone) and Newlands Mill (North Tawton)
Torrington Commons (Tar?er trail)
Trough of Bowland
Village in Devon 'Landkey'
Webbers Post - A spot on Exemoor near Luccombe in Sommerset
Wye Valley Forest of Dean

Session 7, Devon 3, Eggersford Garden Centre - Tranquil Place
"Hoory Mill" Hollocombe Devon
Anstey Common
arund Wembworty
Belstone N. Okehamton
Bishops Tawnton Devon
Bishops Tawton, Devon
Blackdown Hills - Devon
Blagdon Lake, South Bristol (you can hear trout) local pub in Blagdon Lake very good
Bluebell Wood Bear Wood Wokingham Berkshire
Cape Cornwall
Centre of Exmoor
Chagford, Devon
Chulmleigh
Chulmleigh, Devon
Chumleigh - around the area
Chumleigh, Devon
Coombe Cross Cornwall
Cornwall
Cornwall
Cow Castle Withypool Somerset
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor
Dartmoor - Belsham
Dartmoor on top!
Devon
Devon
Devon
Devon
Devon
Devon
Devon Countryside
Eggersford Railway stn Bridge over river
Eggesford
Eggesford Forest
Eggesford Forest

Eggesford Garden Centre
Eggesforde Forest
Egglesford Garden Centre
Empty Church
Epping Forest Essex
Ex Valley
Ex Valley
Exmmor (Border Devon & Somerset)
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Fernworthy Reservoir
Fingle Bridge, Dartmoor
Hartland, borders Corwall Devon (coastal)
Haytor (Dartmoor)
Heasham Lancashire
Heasham, Lancashire
Helsdon - North Devon
Here - eggesford
Hidden Valley
Home. Devon Eastleigh
Huntercott Valley - North Devon (near Chumleigh)
Lake District
Lake District
Lake District
Lakes
Landacre
Landacre, Devon
Lower Porthemoor Cornwall
Lydford Gorge, Devon
Mid Devon
Mid Devon
More remote lake district
North Cornwall Coast
Okehamton - by the river, but on the moor
Parts of Exmoor
Peak District
Pembrokeshire
River Taw - Devon
River Teigh near Murchington
Salisbury Plain, Wiltshire
Saunton Sands, N. Devon
Scorehill, Gibleigh
St Michaels Convent Retreat, Richmond
Sussex Downs

Tar Steps. River Exmoor Somerset
Two Bridges, Dartmoor. (2 Miles) from here
Ulleswater
Ullswater
Upper Tamar Lakes - away from the car park
Wembworthy, Devon
Wemliworthy, Devon
Widicombe in the moor - (Dartmoor)
Wimbleball Lake
Yorkshire Moors
Zeal Monach?

Session 8, Devon 4, Eggersford - Tranquil Place
A quiet bit of canal towpath - Like the Great Western Canal
Abbotsham Cliffs N. Devon
Beaworthy
Beaworthy
Canal Tiverton
Chord Reservoir
Chord Resiviour Somerset
Cotswolds
Dartmoor
Dartmoor
Dartmoor Moors
Dartmoor N/Park. New Forest (Winter)
Derby Dales
Devon Countryside
Eggesford Forest
Exmoor
Exmoor
Exmoor
Exmoor
Exmoor
Exmore
Filleigh North Devon
Fir Tor
Flashdown Wood
Fur Tor Dartmoor
Hartland Forest Devon
Heddons Mouth N. Devon
Islay
Lake Coniston
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District
Malvern Hills
Martindale (Lake District)
North Devon
North Devon Countryside

Outside My House (views from)
Pagham Beach, West Sussex
Parts of the Lake District
Somewhere at night which is quiet
Stour head woods
Stream on Dartmoor
Torridge Valley, Devon
Windermere
Woodbury Common Devon
Woodlands Devon

Session 9, West Lindsey 1, Nettleton Car Park - Tranquil Place
Beach not crowded
Bradley Woods
Donna Nook, Lincs
Foreshore Edge Rimac Reserve Saltfleet Lincs (When aircraft not bombing)
Here - without too many people or My Garden
Herefordshire
Holten le Moor
Home
Kinder Scout
Lake District
Lincoln Cathederal
Lincolnshire Wolds
Lincolnshire Wolds
Maiden Castle, Dorset
Milar's Dale Near Bakewell
My Garden
Nepal Anaperna Mountains
Nettleton
Nettleton
Nettleton
Nettleton Top
North Lincs Hankstowe
Not Caistor
Pebbles/Sea - Sussex
Pembrokeshire Coast
Pottertons Nursery
Pttertons Nursery
Rutland
Snowdon
South Downs
The Wolds
The Wolds
Top of a mountain
Willingham Wood
Yorkshire Moors Wolds Lincs/Yorks

Session 10, West Lindsey 2, Willingham Woods Car Park - Tranquil Place
Back Garden
Beaches near here as can go and take dog
Bottom of our Garden
Cornwall

Cornwall Seaside - unspoilt
Dalby Forest
Dartmoor
Gainsby Park (Dog Walking)
Hartsholm Park
Lake District
Lake District
Loking at the Sea
Not Here
Old railway line at the bottom of our garden just outside of Grimsby
Peak District
Peak District, Dartmoor
Ripon, N. York Howgill Fell
Rivlin Nr Sheffiled
Scotland
Snowdonia Falls North Wales
Spurn Point
Summer Coates
The Lakes
Thorpevale Lake
Walesby
Walesby
Wellingham Woods
Whisby Native Park
Willoughby Woods (here)
Yorkshire Dales -> to the coast
Yorkshire Moors
off the farmyard -at Tealby - Side of the river

Session 11, West Lindsey 3, Tuetoes Car Park - Tranquil Place
Back Garden
Borth (Wales)
Clumber Park
Cornwall
Dales
Downs - Folkstone
Home
Lake District
Laughton Woods
Laughton Woods
Laughton Woods
Lincolnshire Wolds
Monsdale Head walk near the stream (with nobody there) Derbyshire
Scotter Woods
Scottish Highlands
The Woods
These Woods
These Woods
These Woods
These Woods Laughton Forest
Wales
Whisby Nature Reserve (Near Lincoln)
Wittenham Clumps Oxfordshire

Wolds (Linc's)

Session 12, West Lindsey 4, Chambers Farm Car Park - Tranquil Place
Any Animal/Bird Place
Bed
Ben Nevis (In week)
Buchal Etive Mohr. Glen Coe
Buchal Etive Mohr. Glen Coe
Dilham
Don't Know
Glen Coe
Here
Here
Here
Highlands of Scotland
Irby Dales
Jamaica
Leverton
Loch Lomond
Mickersley Wood. S. Yorks
North Wales
Open Country, No Housing Richmond Area North Yorkshire
Scorby Village
The outake (nr Leverton)
Top of Langdale Pikes
Wildlife Centre

Session 13, Swale 1, Elmley Bird Sanctuary Car Park - Tranquil Place
Ellmlea RSPB
Elmlea RSPB
Elmley Marshes
Goodnestone
Leighton Moss RSPB Reserve and surrounds Silverdale Lancashire
North Norfolk Coast
North York Dales
Pulborough Brooks. Sussex
Sierra Nevada in sSpain in Summer
Top of Great Gable
Ullswater, Lake District

Session 14, Swale 2, Doddington Place Car Park - Tranquil Place
All Hallows
Any nature countryside area
Barley Warren
Bolton Maliby
Centre Parks Elversden
Churchwood Bicknor/Bredgar
Clovelly
Cumbria
Dedham
Dedham
edge of lakes in Ontario, Canada at dusk
Hadrian's Wall

Haystacks, In the Lakes
Husking W?
Karsney Abbey Dover
Kings Wood (Kent)
Leeds Castle
My Garden
My own workshop at home
North ?
Oare
Rural France
Selsea - Sussex
The Cheviot Hills
The Downs
Watering? (River Medway)
Working at home

Session 15, Swale 3, Oare Nature Reserve Car Park - Tranquil Place
Alnmouth Beach Northumberland
Any Slt Marsh Area
Ashdown Forest
Ashdown Forest
Binsey Fell, Lake District or Crummock Water
Blean Woods Dargate Kent
Cairngorms (nowhere in England)
Cornish Coast
Dungeness Beads?
Elmley Isle of Sheppy
Exmoor
Great Gable Peak
Gunpowder Walk Near Faversham
Harty Ferry Oare RSPB
L? Heathland in Suffolk
New Forest
North Kent Marshes
North Kent Marshes Dungeness & Romney Marsh
Oare
Oare
Oare
Oare
Oare
Oare
Oare RSPB
Oare RSPB
Oare RSPB
Oare RSPB
Oare RSPB
Perry Woodlands
Rough Common
Rough Commons Kent
Saltmarsh Area
Seashore
Seashore
Sell? (Perry Woods)

Snowdon
South Foreland Valley
The Street, Whinstable
The Swale
Top of a quiet mountain in Lake District
Wildlife Reserve

Session 16, Swale 4, Perry Wood Car Park - Tranquil Place
Berwick Pond Fishing Lake
Can't think of anywhere tranquil but too many people
Cornwall
Lake District
Lake District in Snow
Minster Beach Front
New Zealand
Oare
Oare Marshes (not at the w/e)
Our farm on the outskirts of Faversham
Perry Wood - Selling Nr Faversham - Kent
Perry Woods
Perry Woods
Perry Woods
Perry Woods Oare Gunpowder Site Seasalter
Selling - Kent. Nr Canterbury
Sitting on the beach listening to the waves on the shore. Or the Maldives.
The Antrim Coastline

Session 17, Yorkshire 1, Fewstone Reservoirs Car Park - Tranquil Place
All Moors Yorkshire
Any Coastal Area. Northumberland
Ardnamurchan (Scotland) Sprinkling Tarn (Lake District)
Bamburgh Northumberland
Betty-coed, North Wales
Blea Tarn, Lake District
Bluebell Woods in the Wye Valley
Bolton Abbey
Brimham Rocks
Brimham Rocks
Brimham Rocks
Buckdon Pike
Burnsall
Burnsall (Yorks Dales)
Cornwall Padstow Stives - Bingley
Dent - Yorkshire Dales
Douthwaite Dale North York Moors
Dunstanburgh
Fewston, Harrogate
Fewstone Resevoir North Yorkshire
Grange-Over-Sands
Grassmere
Gwenva Beach, Cornwall
Hag Dyke Nr Kettlewell
Hag Dyke Nr Kettlewell

High Pemmel Fells
Ilkley Moor
Isles of Scilly
Lake District
Lake District
Lake District
Lake District
Lakes
Linhope Spout. Ingram Valley
New Forest
New Forest
New Forest
North York Moors
North Yorkshire Moors
North Yorkshire Moors
North Yorkshire Moors
Northumberland
Northumberland Coast
Northumberland Coast
Northumbrian Coast
Northumbrian Coastline
Nothumberland
Padston - Cornwall St Ives - Bingley
Pately Bridge
Rogait, Sutherland, Scotland
Runswick Bay, Yorks
Scilly Isles
Spurn Point
Tang, Harrogate
Tang, Harrogate
Top of Helvelyn
Top of Pavy Ark, Cumbria
Truscross Resevoir
Ullswater
Upper Nidderdale
Upperwarfedale
Upperwarfedale
Washburn Valley
Washburn Valley - Harrogate
Wast Water in the South Lakes
Wastwater Resevoir Lake District
Windermere, Lakes

Session 18, Yorkshire 2, Fountains Abbey - Tranquil Place
Ann Bolyns Seat, Surprise View Vale of York
Bamburgh Beach
Beningborough Hall
Beresford Dale. Derbyshire.
Bolton Abbey
Burley Moor Burley in Wharfedale Horsham Steps, Manaton, Devon
Burnsall N/Yorkshire
Cornwall, Hayle
Cotswalds

Dartmoor
Dartmoor
Derwent Water
Dinham Massey - Cheshire
Dorset Coast
Dorset Coastline
Dovedale (peak district)
Elterwater - Cumbria
Filey Beach
Fountain Abbey
Fountains Abbey
Fountains Abbey
Fountains Abbey
Fountains Abbey
Fountains Abbey
Fountains Abbey
Fountains Abbey Yorkshire
Fountains Abbey, North Yorkshire
Glencoe
Harewood Estate Lake District
Harstam Steps, Dartmoor
In winter overlooking Grasmere
Isle of Skye
Lake District
Lake District
Lake District
Lake District Fountains Abbey The Hollies Park, Meanwood, Leeds
Lake District on a quiet day
Langdale Pikes
Minsmere - Suffolk
Moors above Carlten-in-Coverdale
Moors on Wensleydale
My parents house - near Bala, Gwynedd
New Forest - Lyndhurst
North York Moors and Dales
Northumbrian Coast
Peak District
Pendle Hill on a sunny day
Richmond Park
Robin Hoods Bay
Robin Hood's Bay in Winter
Rufford Park, Notts
Salcombe Estuary in Winter
Shropshire
Simon's Seat Scarborough
Skelwith Bridge/Elterwater Lake District
St Marys Wath Church (N. Yorks)
Studley Park
Tasmania
Teggs Nose - Cheshire
The Pine Woods, Harrogate
Thrton le Dale
Titchwell Bird Reserve, Norfolk

tley Chevin, North Yorkshire
Waterfall a West Buoton, Wensleydale
Westernbert - Wiltshire
Yorkshire Dales
Yorkshire Dales

Session 19, Yorkshire 3, Brimham Rocks - Tranquil Place
Appletreewick Nr Bolton Abbey
Asgarth Falls
Barden - Beamsley Beacon
Beach at Craster (Northumberland)
Black Sail Youth Hostel, Ennerdale, Lake District
Bolton Abbey
Bolton Abbey
Brimham Rocks
Brimham Rocks
Brimham Rocks
Brimham Rocks
Chatsworth House Gardens
Chatsworth Park
Dalby Forest
Dales
Dales
Dolbey Forest
Dovedale
Eastby Betham Majorca
Fewston
Fountains Abbey
Grassington, Yorkshiere Dales
Hangng Moor, Blubberhouses
Havlyn Bay Beach Cornwall
Herefordshire
Howgill
Howgill Lodge Bolton Abbey
Husgarth Falls
Kielder - Northumberland
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District
Lake District, Wast Water
Leeds
Malyan Spout, Goathland
Most places in Lake District Top of Scafell
Nidderdale
Nidderdale
North Norfolk - Holkham Beach
North Norfolk Coastline
North Yorkshire
North Yorkshire Moors
Northumberland

Plomton Rocks
Ravenscar
Robin Hoods Bay
Siwerdale, Lancs (Morecambe Bay)
Skiddaw (back of)
Striperstones - Shropshire
Swinstey Reservoir
Tarn Hows (Lake District)
Tarn Hows (Lake District)
Tay Valley Scotland
The bath
The Dales
Thurlstone Devon
Thurlstone Devon Eastby
Top of hill in the Yorkshire Dales
Trollers Gill
UpperWarfdale High Cote Moor
Valley of Desolation. Yorks
Westerdale N. Yorks
Wicken Fen Asgarth Falls Wells Next Sea
York Dales
York Moors
Yorkshire Dales
Yorkshire Dales

Session 20, Yorkshire 4, How Stean Gorge - Tranquil Place
Beach on Remote Island
Coniston old man
Daley, N Yorkshire
Dentdale
Derbyshire
Dunges Gill (Langdale)
Dunster, Somerset
Easegill, North Yorkshire
Edale Derbyshire
Edale, Derbyshire
formby red squirrel sanctuary
Fraisthorpe Beach East Yorkshire
Grassington Manor
Great Whernside
Head of Langstrothdale
How Stean Gorge
How Stien Lofthouse
Howstean
Humanby Gap
Hutton-le-Hole
Ilkley Mor (Top of)
Knaresborough
Lake District
Lake District
Lake District
Lake District
Lake District

Lake District Ambleside
Lake District, the Fells
Lofthouse/Stean, Nr Harrogate
Malham Tarn
Middlesmoor
Middlesmoor (when quiet can hear a bumble bee in a foxglove)
Nidderdale
Nidderdale
North York Moors
North Yorkshire Moors
Our back garden in Nelson Lancs
Pott Ridge - Masham Moor
Scar House
Scar House Nidderdale
Scar House Nidderdale
Scarhouse Dam Lofthouse
Scotton Banks
Stean Middlesmoor
Swaledale
Swaledale
The Dales
The Lakes
trough of bowland, lancashire
Ullswater
Ullswater
Ullswater
Upper Nidderdale
Upper Nidderdale
Upper Ribble Valley
Walking by the River
Weets Fell Barnsoldwick Lancashire
Whitby
Woodland in Devon
Yorkshire Dales
Yorkshire Dales
Yorkshire Dales
Yorkshire Dales

Tranquil Places - Word Occurrences (Over 10 Occurrences Only)

District	96
Lake	95
Devon	64
in	53
of	51
Cornwall	46
Dartmoor	45
the	45
Yorkshire	45
North	43
The	41
Dales	36
Exmoor	35
Forest	30

Woods	27
Moors	24
Park	24
Valley	22
Beach	20
Coast	20
Abbey	19
N	19
on	18
Lakes	16
Oare	16
Hills	16
near	15
Wales	15
Northumberland	14
York	14
New	14
Bay	13
Derbyshire	13
at	13
Scotland	13
River	12
a	12
Stratford	11
St	11
and	11
Cotswolds	11
Top	11
Peak	10
Somerset	10
Nr	10
Wood	10
Fountains	10
Ilmington	10
Garden	10
Yorks	10

{Heading 2} Tranquil Places – Context Examples

Context, Example – 'District'
akes Lake **District** Washburn
lley Lake **District** Lake Dist
rict Lake **District** New Fores
arn (Lake **District**) Bamburgh
mere Lake **District** Upperwarf
voir Lake **District** Blea Tarn
arn, Lake **District** Buckdon P
hire Lake **District** on a quie
folk Lake **District** tley Chev
gate Peak **District** Fountain
ater Lake **District** Simon's S
hire Lake **District** St Marys
evon Lake **District** Fountains
tate Lake **District** Lake Dist
rict Lake **District** Dovedale
ales Lake **District** Black Sai

ale, Lake **District** Chatswort
dens Lake **District** UpperWarf
Gill Lake **District** The Dales
ows (Lake **District**) Tarn How
ows (Lake **District**) Hangng M
s in Lake **District** Top of Sc
hire Lake **District** Malyan Sp
dale Lake **District** York Moor
bbey Lake **District**, Wast Wat
ales Lake **District** Brimham R
ater Lake **District** Ullswater
ale) Lake **District** Knaresbor
iver Lake **District** Grassingt
moor Lake **District** Coniston
hire Lake **District** Weets Fel
ouse Lake **District** Ambleside
hire Lake **District**, the Fell
Wood Lake **District** Beach not
ere) Lake **District** Lake Dist
rict Lake **District** Cornwall
esby Peak **District** Gainsby P
oint Peak **District**, Dartmoor
oods Lake **District** Downs - F
ter, Lake **District** Pulboroug
ell, Lake **District** or Crummo
n in Lake **District** Great Gab
sham Lake **District** Lake Dist
rict Lake **District** in Snow C
ilve Lake **District** Quantok H
anal Lake **District** Greatgabl
able Lake **District** North Dev
ales Lake **District** high fell
hire Lake **District** Landkey N
wall Lake **District** in remote
arts Lake **District** Connaught
evon Peak **District** Chulmleig
rset Lake **District** Lake Dist
rict Lake **District** Epping Fo
akes Lake **District** Dartmoor
ale (Lake **District**) Lake Dis
ict) Lake **District** Cotswolds
more Lake **District** Parts of
the Lake **District** Devon Cou
ston Lake **District** Chord Res
rset Lake **District** Woodbury
mere Lake **District** Fir Tor D
evon Lake **District** A quiet b
rthy Lake **District** Pagham Be
ay + Lake **District** Coastal w
In Lake **District** on a quie
Hows Lake **District** Winderton
ning Lake **District** Lundy Isl
ater Lake **District** Edgehill
er - Peak **District** Glosceste
land Lake **District** -Coniston
folk Lake **District** New Fores
ales Lake **District** The seasi
The Lake **District** Deseerted
kes (Lake **District**) Lake Dis
ict) Lake **District** Lake Dist

rict Lake **District** Lake Dist
rict Lake **District** Lake Dist
rict Lake **District** parts of
live Lake **District** Skiddaw H
se (Laske **District**, near Kes
Way Lake **District** countrysi
each Lake **District** Cumbria S
mere Lake **District** Lake Dist
rict Lake **District** Newquay C
ell, Lake **District** Sherringh
stle Lake **District** Lake Dist
rict Lake **District** Admington
hire Lake **District** Peak Dist
rict Peak **District** Ilmington
ford Peak **District** North Sea
oast Peak **District** Malham Ta
ike, Lake **District** Yorkshire
the Lake **District** The Highl
evon Lake **District** Cotswolds
gton Lake **District** Doves Hil

Context, Example – 'Lakes'
r in the South **Lakes** Cornwall Padst
ales Ullswater **Lakes** Lake District
st Windermere, **Lakes** Northumbrian C
hire Dales The **Lakes** Dentdale Yorks
, Dartmoor The **Lakes** Cornwall Whisb
stacks, In the **Lakes** Selsea - Susse
owns Otterford **Lakes**, Devon Tarr St
ment Otterford **Lakes** Yorkshire Moor
or Upper Tamar **Lakes** - away from th
bworthy, Devon **Lakes** Lake District
p of Helvelyn (**Lakes**) - 3,000 ft mo
Nr Rhyder The **Lakes** hapel at Ullen
Shrewsbury The **Lakes** (Lake District
Norfolk Wales **Lakes** Loch Ken Stowe
Hampshire Sway **Lakes** in New Forest
alham Tarn The **Lakes** - out of seaso

Context, Example – 'Devon'
Manaton, **Devon** Lake Dist
hurlstone **Devon** Barden -
hurlstone **Devon** Eastby Ea
odland in **Devon** The Dales
mallridge **Devon** Exmouth/e
rd Lakes, **Devon** Tarr Step
r Steps - **Devon** Domary Po
Exmoor - **Devon** Tarr Step
tok Hills **Devon** Blackdown
ak season **Devon** The close
Sidmouth, **Devon** ON the be
Thruxton **Devon** Countrysi
Slapton - **Devon** Exmoor Ti
ly (North **Devon**) Beaulieu
andkey N. **Devon** Village i
illage in **Devon** 'Landkey'
igh Mill, **Devon** Canonteig
Whimple - **Devon** Dartmoor
hes in N. **Devon** Branscomb
shire Mid **Devon** Mid Devon

Devon Mid **Devon** Sussex Do
n - North **Devon** Cornwall
ver Taw - **Devon** Peak Dist
ulmleigh, **Devon** Wemliwort
liworthy, **Devon** Fingle Br
ollocombe **Devon** Coombe Cr
Dartmoor **Devon** Chagford,
Chagford, **Devon** Scorehill
n Hills - **Devon** Eggesford
r (Border **Devon** & Somerse
humleigh, **Devon** Exmoor No
Sands, N. **Devon Devon** Dev
N. **Devon Devon Devon** Dar
von **Devon Devon** Dartmoor
y - North **Devon** (near Chu
s Tawnton **Devon** Bishops T
s Tawton, **Devon** Ullswater
rch Home. **Devon** Eastleigh
of Exmoor **Devon** Countrysi
mbworthy, **Devon** Lakes Lak
Landacre, **Devon** Dartmoor
rd Gorge, **Devon** Dartmoor
Cornwall **Devon** Devon Dev
all Devon **Devon** Devon Har
von Devon **Devon** Hartland,
s Corwall **Devon** (coastal)
Cliffs N. **Devon** Hartland
nd Forest **Devon** Chord Res
District **Devon** Countrysi
ry Common **Devon** Somewhere
Woodlands **Devon** Lake Dist
sex North **Devon** Countrysi
igh North **Devon** Dartmoor
e Valley, **Devon** Exmoor Ex
Mouth N. **Devon** Eggesford
est North **Devon** Cosmeston
stershire **Devon** and Cornw
Cornwall **Devon** and Cornw
walks in **Devon**/Cornwall
ire peaks **Devon** Wales sea
te Waters **Devon** Camping i
hropshire **Devon** Lyn Dam (
onsbath - **Devon** Howgill F
Highlands **Devon** Lake Dist

Context, Example – 'Yorkshire'
ll Dent - **Yorkshire** Dales Bet
ley North **Yorkshire** Moors Nor
oir North **Yorkshire** Douthwait
ast North **Yorkshire** Moors Ard
ate North **Yorkshire** Moors All
All Moors **Yorkshire** Top of Pa
in, North **Yorkshire** Robin Hoo
in Winter **Yorkshire** Dales Yor
ire Dales **Yorkshire** Dales Cor
urnsall N/**Yorkshire** Studley P
ey, North **Yorkshire** Dinham Ma
ins Abbey **Yorkshire** Harewood
e of Skye **Yorkshire** Dales Yor
and North **Yorkshire** Moors Kie

ell North **Yorkshire** Lake Dist
Goathland **Yorkshire** Dales Nid
ll in the **Yorkshire** Dales Lak
each East **Yorkshire** Beach on
erbyshire **Yorkshire** Dales Pot
Ullswater **Yorkshire** Dales Our
lham Tarn **Yorkshire** Dales The
Dentdale **Yorkshire** Dales for
ll, North **Yorkshire** Lake Dist
Daley, N **Yorkshire** Scotton B
nks North **Yorkshire** Moors Upp
Nettleton **Yorkshire** Moors Wol
ck Garden **Yorkshire** Dales ->
gill Fell **Yorkshire** Moors Sum
rea North **Yorkshire** North Wal
Quantocks **Yorkshire** Dales Lak
ord Lakes **Yorkshire** Moors Dar
Dartmoor **Yorkshire** Moors Hun
The Wolds **Yorkshire** Tresco -
Anglesea **Yorkshire** Dales Lak
Red Pike **Yorkshire** Dales Par
ay Canals **Yorkshire** Moores (D
ill Fells **Yorkshire** Dales ? I
Ilmington **Yorkshire** Dales Ask
s Askrigg **Yorkshire** Ilmington
ale Pikes **Yorkshire** Dales Sko
ork Moors **Yorkshire** Dales Bry
ork Moors **Yorkshire** Dales Cor
mackdale, **Yorkshire** Dales Kid
District **Yorkshire** moors and
les North **Yorkshire** Moors Hil

Context, Example – 'Coast'
Northumberland **Coast** Any **Coast**al Ar
Northumberland **Coast** Linhope Spout.
s Northumbrian **Coast** North Yorkshir
Glencoe Dorset **Coast** Dorset **Coast**li
s Northumbrian **Coast** Bamburgh Beach
Pembrokeshire **Coast** Lincolnshire W
North Norfolk **Coast** All Hallows Ha
e RSPB Cornish **Coast** The Street, Wh
ict North Devn **Coast** Herefordshire
xemoor Cornish **Coast** Rice Point in
North Cornwall **Coast** Saunton Sands,
side Stratford **Coast** of Cornwall -
Northumberland **Coast** Derwent Water
rland Dartmoor **Coast** of St. Andrews
ire South West **Coast** Path Snowdonia
North Norfolk **Coast** Lake Windemere
olds The Gower **Coast** River Isis, Ox
rict North Sea **Coast** Barcheston Dal
Cornwall South **Coast** Peak District
l, Dorset West **Coast** N Scotland All

Context, Example – 'Northumberland'
nd Ilkley Moor **Northumberland** Coast Any Coas
Coastal Area. **Northumberland** Northumberland
Northumberland **Northumberland** Burnsall (York
orkshire Moors **Northumberland** Coast Linhope
rict) Bamburgh **Northumberland** Upperwarfedale

folk Coastline **Northumberland** North Yorkshire
oors Kielder - **Northumberland** Ravenscar Most
ch at Craster (**Northumberland**) Plomton Rocks
Alnmouth Beach **Northumberland** Binsey Fell, L
Roman Wall in **Northumberland** Quantocks York
wolds) Village **Northumberland** Coast Derwent
rencester Park **Northumberland** Park Bamburgh
Park Bamburgh **Northumberland** Dartmoor Coast
th Holy Island **Northumberland** Back Garden Ha

10 Appendix: Spatial Threshold Analysis Images

Perceived Naturalness of the Landscape 1

Imagine you are standing in each of the scenes in these photographs, numbered 1-8.
How natural do you think each of the scenes is?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 indicates that you see the scene as being completely non-natural
10 indicates that you see the scene as being extremely natural.

1

5

2

6

3

7

4

8

Perceived Naturalness of the Landscape 2

Imagine you are standing in each of the scenes in these photographs, numbered 9-16.
How natural do you think each of the scenes is?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 indicates that you see the scene as being completely non-natural
10 indicates that you see the scene as being extremely natural.

9

13

10

14

11

15

12

16

Signs of Human Development - Roads

Imagine you are standing in each of the scenes in these photographs, numbered 1-5.
How much does the road in the photo take away from your feelings of tranquillity?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 represents 'the road would not, in any way, take away from my feelings of tranquillity'
10 represents 'the road would totally take away from my feelings of tranquillity'

1

4

2

5

3

Signs of Human Development – Urban 1

Imagine you are standing in each of the scenes in these photographs, numbered 1-5.
How much do the built elements in each photo take away from your feelings of tranquillity?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 represents 'the buildings would not, in any way, take away from my feelings of tranquillity'
10 represents 'the buildings would totally take away from my feelings of tranquillity'

1

4

2

5

3

Signs of Human Development – Urban 2

Imagine you are standing in each of the scenes in these photographs, numbered 1-5.
How much do the built elements in each photo take away from your feelings of tranquillity?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 represents 'the buildings would not, in any way, take away from my feelings of tranquillity'
10 represents 'the buildings would totally take away from my feelings of tranquillity'

1

4

2

5

3

Signs of Human Development – Pylons

Imagine you are standing in each of the scenes in these photographs, numbered 1-6.
How much does the pylon in the photo take away from your feelings of tranquillity?
Please note, you are not being asked whether you like each of the scenes!
Please score each scene from zero (0) to ten (10) where:
0 represents 'the pylon would not, in any way, take away from my feelings of tranquillity'
10 represents 'the pylon would totally take away from my feelings of tranquillity'

1

4

2

5

3

6

11 Appendix: Modelling the Attenuation of Noise: Theory (2004 Study)

Modelling the diffusion and attenuation of sound energy is complex. There are a number of specific pieces of software which have been developed to model sound diffusion around sources such as roads, military equipment and aircraft. Such software tends however to focus on relatively small geographical areas, especially in the case of roads and their applicability at the landscape scale where an understanding of likely diffusion over kilometres and not just tens to hundreds of metres is required, is less clear. For this reason, coupled with the expense of such products, this research focused on applying models of sound diffusion from acoustics theory, within GIS.

Noise diffusion or the rate of attenuation away from its source is a complex function of a number of variables, including:

- whether the sound is generated in the air or on the ground
- the volume (measured in dB) of the sound
- the frequency (Hz) of the sound
- the distance between receptor and source which gives a predictable level of reduction with geometrical divergence
- the characteristics of the ground between the source and the receptor, including
- whether there is line of sight between the source and receptor
- whether the ground is hard (e.g. tarmac, concrete or compacted earth) or soft (e.g. un-compacted soil, crops) or very soft (e.g. wet vegetation or snow)
- whether there is an extensive belt of high vegetation such as trees in place between source and receptor
- the existence of any structures or surfaces which may reflect, deflect or absorb sound energy
- atmospheric variables such as temperature and humidity, which affects atmospheric absorption of sound energy in different ways for different frequencies
- weather conditions such as rain or wind strength and direction

It should be clear from the above that modelling sound is contingent on a great many variables, many of which are not constant. Accounting for inter-visibility (i.e. line of sight) between source and receptor is relatively straightforward and will not change over time unless engineering, tree planting or similar works are carried out. However, accounting for the effect of wind, for example, is extremely complex. Wind can ‘carry’ sound further under certain conditions and orientations of source and receptor, or it can accelerate the rate of attenuation. Further to this, wind generates sound around structures, vegetation and even around people that can be louder than other sounds. No model, however carefully constructed, finely grained or tightly calibrated can hope to accommodate the full range of acoustic, environmental and human variables.

A model of sound attenuation is given by Piercy and Daigle (1991) as:

$$Atotal = Adiv + Aair + Aground + Amisc$$

Where:

- Atotal, is the total attenuation for the defined set of parameters
- Adiv, is the attenuation from geometrical divergence over distance
- Aair, is attenuation resulting from air absorption
- Aground, is attenuation by the ground
- Amisc, is attenuation from other effects including reflection from surfaces, foliage and
- buildings.

Each of these variables is elaborated below in the detail that is necessary to establish the methodology for this study. For more details refer to Piercy and Daigle (1991).

Attenuation from geometrical divergence over distance (Adiv)

Sounds that are generated in the free field, or in the air and not in contact with the earth (e.g. aircraft) attenuate by between 6dB and 7.5 with each doubling of distance. So, for a sound such as an airbursting artillery shell with a volume of approximately 180dB, the attenuation rate (at the lower level of 6dB per doubling of distance) would be:

Distance (m)	75	125	250	500	1000	2000	4000
Volume (dB)	170	164	158	152	146	140	134

This rate of 6 to 7.5dB reduction per doubling of distance is also applicable to point noise sources such as quarry blasts and artillery or small arms fire. Sounds from linear sources that are generated in contact with the earth (e.g. traffic on roads or railways) attenuate at a more gradual rate of 3dB with each doubling of distance, unless over soft surfaces in which case the rate is 4.5dB per doubling of distance.

To calculate sound levels at various distances away from specified sources an equation was needed. Using Mathematica software the dataset shown below was entered and a curve and equation fitted to predict sound values at specified distances.

Distance (m) from source	**Attenuation at a rate of 3dB decrease per doubling of distance**	**Attenuation at a rate of 4.5dB decrease per doubling of distance**	**Attenuation at a rate of 6dB decrease per doubling of distance**	**Attenuation at a rate of 7.5dB decrease per doubling of distance**
125	12.8	14.3	15.8	17.3
250	15.8	18.8	21.8	24.8
500	18.8	23.3	27.8	32.3
1000	21.8	27.8	33.8	39.8
2000	24.8	32.3	39.8	47.3
4000	27.8	36.8	45.8	54.8
8000	30.8	41.3	51.8	62.3
16000	33.8	45.8	57.8	69.8
32000	36.8	50.3	63.8	77.3
64000	39.8	54.8	69.8	84.8
128000	42.8	59.3	75.8	92.3
256000	45.8	63.8	81.8	99.8

Table 66 : dataset used in Mathematica to calculate distance attenuation equations

The equation for the attenuation rate of 3dB per doubling of distance is:

$$12.8 + 3x \left(\text{Log}_2 \, x \, \frac{\text{distance}}{125} \right)$$

Where:
12.8, is the sound attenuation at 75 metres from source
3, is the attenuation in dB per doubling of distance
distance, is distance from the sound source
125, is a constant

The equation for the attenuation rate of 4.5dB per doubling of distance is:

$$14.3 + 4.5x \left(\text{Log}_2 \, x \, \frac{\text{distance}}{125} \right)$$

The equation for the attenuation rate of 6dB per doubling of distance is:

$$15.8 + 6x \left(\text{Log}_2 \, x \, \frac{\text{distance}}{125} \right)$$

The equation for the attenuation rate of 7.5dB per doubling of distance is:

$$17.3 + 7.5x \left(\text{Log}_2 \, x \, \frac{\text{distance}}{125} \right)$$

It is very clear from this that unimpeded sound could travel great distances. However, this level of sound diffusion is not experienced as atmospheric, terrain, vegetation, built environment and weather related factors serve to absorb and otherwise attenuate the theoretical distribution of energy. These variables and the way they are represented in the GIS model are discussed below.

Attenuation resulting from air absorption (Aair)

The rate at which the atmosphere attenuates sound energy is variable and depends upon the frequency of the sound, the temperature and the humidity of the air. Within approximately 700m of a sound's source, atmospheric attenuation is insignificant, although it can be extremely significant at increasing distances and especially for higher frequencies (>2000Hz). Table 67 to Table 69 illustrate average temperature and relative humidity for Newcastle upon Tyne, the nearest point of recording to both study areas.

	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
°F	48	38	38	42	44	50	55	59	59	54	49	43	40
°C	8	3	3	5	6	10	12	15	15	12	9	6	4

Table 67 : Average Temperature for Newcastle upon Tyne[36] (Years Charted: 18)

	Annual Average	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
%	85	84	83	84	84	86	86	86	88	86	86	85	84

Table 68 : Average Morning Relative Humidity for Newcastle upon Tyne (Years Charted: 13)

	Annual Average	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
%	71	81	76	69	65	64	64	65	64	67	73	78	82

Table 69 : Average Afternoon Relative Humidity for Newcastle upon Tyne (Years Charted: 15

Table 70 illustrates the atmospheric attenuation levels for a temperature of 10°C and a relative humidity of 70%, which are judged to be representative of the study area, for sounds at variable frequency levels.

[36] Source: International Station Meteorological Climate Summary, Version 4.0

	Frequency (Hz)					
	125	**250**	**500**	**1000**	**2000**	**4000**
Example Sound Source (Central Frequency)		Large calibre weapons		Landing Passenger Jet		
Air Attenuation (dB/km)	0.41	1	1.9	3.7	9.7	33

Table 70 : Air Attenuation Coefficients (dB/km) at a sea level ambient pressure, for a temperature of 10oC and a relative humidity of 70%

Another aspect of the complexity of modelling noise diffusion is the fact that the sounds categorised for example as 'traffic noise' and 'aircraft noise' are comprised of a whole set of individual sounds such as tyre noise, engine noise and airflow over the moving object. These individual sounds exist across a wide range of frequencies. For example traffic sounds typically range from below 100Hz up to 8,000Hz with the latter being outside the range of human hearing. The modal or central frequency of the main noise sources within the study area appear in Table 71.

Noise Source	Central frequency (Hz)
Explosions	~50
Small arms fire (rifle & machine guns)	~250
Low flying aircraft	~500
Lorries	~700
Cars	~1000
Railway trains	~1000
Fast industrial machinery (e.g. power saws)	~1000
Helicopters	~4000 +

Table 71 : The central frequency (modal value) of noises in the study area

The rate of attenuation per kilometre was disaggregated (per km attenuation x 0.25) to the level of 250m cells and a value for each ring of 250m increasing distance away from the source in Excel. The resulting table was then joined to the GIS data.

Attenuation by the ground (Aground)
Sound attenuates over hard ground (such as concrete, tarmac and compacted earth) at a slower rate than over more energy absorbent surfaces such as wet earth, snow or vegetated ground. As described for (Adiv) this varies between 3dB and 4.5dB per doubling of distance (Hendricks, 1995). Given the dominantly rural nature of both study areas and also the need for generalisation at a resolution of 250m x 250m the rate for representing (Adiv) was set at 4.5 dB per doubling of distance for linear sources and 7.5dB for point sources.

Distance (m) from source	Attenuation at a rate of 3dB decrease per doubling of distance	Attenuation at a rate of 4.5dB decrease per doubling of distance	Attenuation at a rate of 6dB decrease per doubling of distance	Attenuation at a rate of 7.5dB decrease per doubling of distance
75	10	10	10	10
125	13	14	16	17
250	16	19	22	25
500	19	23	28	32
1000	22	28	34	40
2000	25	32	40	47

4000	28	37	46	55
8000	31	41	52	62
16000	34	46	58	70
32000	37	50	64	77
64000	40	55	70	85
128000	43	59	76	92
256000	46	64	82	100

Table 72 : Options for ground attenuation rates

Sound energy is not just absorbed by the ground, it can also be transmitted through it (Harris, 1991). Vegetated ground, especially by trees and shrubs, maintains a more porous soil that attenuates sound energy more rapidly. This effect was not included in the model, but it is referred to here to emphasise the positive effect of planting on noise attenuation.

Attenuation from other effects (Amisc)

Sound energy does not depend upon a clear line of sight to be received, although if the receptor is in 'dead ground' that has no line of sight to the sourc,e a significant level of attenuation is observed. Note that line of sight in this specific context relates to the effect of the terrain alone; it does not include an obstructed view due to vegetation, trees, buildings or other structures. As the DEM used in all visibility calculations in this study is 'bare ground', that is to say no account is made of buildings, woodland or other vertical extrusions from the ground surface, no account is taken of such features in the visibility calculations.

12 Appendix: Quantitative Representation of the Effect of Temporal Frequency (2004 Study)

The levels at source of the different noise generating activities within the study areas were identified from a wide review of the literature and on-line resources and are summarised in Table 73.

Noise Source	dB at Source
A road and above	70
B road	66
Minor Road	62
Industrial	60
Urban	50
Railway	87
Explosions	180
Artillery	180
Anti-Tank / Rockets	182
Large calibre weapons (e.g. heavy machine gun)	150
Small calibre weapons (e.g. rifle and light machine gun)	157
Helicopters	104
4x4 vehicles off-road driving	95
Watersports (e.g. jet skis)	80
Motorcycles	95

Table 73 : Noise Levels at Source in Decibels

Once noise has been attenuated over a set distance a temporal frequency needs to be taken into account. Noise sources differ in essentially three ways:

- how loud they are and from this how far away from the source they may be heard;
- how frequent they are and as a secondary issue, how regular or otherwise they are;
- how the receptors (those affected by the noise) perceive it and deal with it.

The first and second of these can be modelled with GIS. This affective impact of noise is something that has been examined in the literature (for example Ouis, 2002) and studies have demonstrated the way in which predictable, regular noises are more readily accepted than those that are irregular and unpredictable and the way in which people can become desensitised to constant and regular noise in a way that people who are unaccustomed to them are not. However, this is outside the realm of GIS.

In affective terms, peoples' experience of an otherwise quiet area can be adjusted by a sudden, unexpected noise such as a military rocket salvo, a low flying jet or an explosive blast in a quarry. There is no simple answer to these problems as modelling physical noise diffusion is complicated by temporal frequency of the source and a range of environmental variables that affect attenuation away from the source. Modelling the affective impact of noise on individuals is only possible at the general level, crudely defining certain noises as more or less significant than others. The 'handle' for this comes from the PA data.

What is important is the ability to accommodate, within the methodology, the impact of noises that are variable in both noise volume and in temporal frequency. The PA results do not offer any real evidence for differentiating between noise sources on the basis of their frequency, other than by defining the type of noise, from which frequency can be inferred. We know that low flying aircraft are relatively infrequent (measured in number per day rather than per hour under most circumstances, road noise is much more constant and motorcycles being driven at speed are much less frequent than cars and much more temporally concentrated at weekends. Following from this,

it becomes a question of how these different kinds of noise should be treated within the GIS model. The primary objective of this research is the development of a methodology for tranquillity assessment and mapping. However, the primary output of this methodology is a map, a single composite map of relative tranquillity. A difficulty is and this is much more relevant to noise than other factors than affect tranquillity, is that the 'picture' will be different at different times, for instance at weekends (usually no artillery but more motorcycles in the Northumberland National Park) and at night time (fewer trains and less frequent traffic in the West Durham Coalfield).

To represent the 'temporal averaging' effect, a simple L_{eq} measure is constructed by applying a coefficient to areas where noise diffuses down to 25dB from each of the feature classes. As the various noise sources vary a great deal in respect of the temporal frequency of the noise at the modelled volume (for instance busy roads compared with occasional aircraft low flights) the coefficient is an estimate, for each noise source of the percentage of the day (7am to 7pm) for which the noise can be heard at the predicted volume. Thus a constant noise would get a coefficient of 1 (equating to 100%) and a noise than can only be heard 2-3 times a day for periods of a few seconds would get a coefficient of 0.001 (equating to 1%). There is clearly a high level of estimation in this and it also takes no account of the affective impact of different types of noise, only quantifying the temporal frequency of their occurrence.

Noise source	**Temporal frequency (% of time noise can be heard within max noise range)**
Main Roads (M-way, Trunk and A Roads combined) (See note 1)	90%
B Roads	65%
Minor Roads	10%
East Coast Main Railway (See note 2)	5%
Secondary rail links (e.g. Sunderland - Newcastle – Carlisle)	3%
Minor rail link through WDC (See note 2)	0.5%
Heritage and tourist railways (See note 3)	n/a
Urban areas	100%
Military Artillery, Explosions and Rocket fire (See note 4)	1.4%
Large and Small Calibre Weapons (e.g. rifles and machine guns) (See note 5)	2.5%
Military Fixed Wing Aircraft (low flying <2000 ft)	1.5%
Military Helicopters (low flying <2000 ft)	1.5%
Civilian aircraft (See note 6)	n/a
4x4 vehicles off-road driving (See note 7)	n/a
Watersports (e.g. jet skis) (See note 8)	n/a

Table 74 : Temporal frequency assumptions for time-weighted calculations

Notes:

1	Although individual roads and different classes of roads within this category will carry different levels and mixes of traffic, a single value is assumed for all roads in this category. This could be differentiated in a future application of the model.
2	The four different classes of railway identified carry different levels and mixes of traffic. Timetable information was used where possible to estimate traffic levels
3	Heritage and tourist railways are not included in these calculations.
4	These are the highest volume noise sources within the OTA. They are not all precisely the same but ~180dB is used as a single figure for all these point noise sources. The 19991-2000 average number of days firing per year was 80 days. In those 80 days an average of 15,699 rounds of ammunition for the 105mm, 155mm and MLRS artillery systems were fired.
5	Large calibre machine gun fire is quieter than smaller calibre rifle and light machine gun

	fire. As they are both used in the same training areas, the louder figure is used in the model. No number of the rounds of ammunition fired within the OTA danger area was available, but there were an average of 269 training days on the OTA between 1991-2000.
6	Civilian aircraft are not considered in this study. Overflights relating to both study areas are generally at a high level and therefore the noise is low. However, this would not necessarily be the case in any other study area and the method here can easily accommodate additional noise sources.
7	Although these can be quite locally significant as noise sources, they were not considered in this study for reasons of data availability.
8	In common with 4x4 driving, although these can be quite locally significant as noise sources; they were not considered in this study for reasons of data availability.

The temporal frequency weighted noise levels is in effect a surrogate for L_{eq} measures. The data required for L_{eq} calculations (in effect sound energy averages over a given time period which supports the direct comparison of high volume and infrequent noises with constant but lower volume noises) were not available for this study, but Table 74 identifies the banding used in this study, although the L_{eq} measure is estimated rather than precisely calculated.