
# FORESTS' ROLE IN TOURISM: PHASE 1

## FINAL REPORT

Research Contract for the Forestry Commission

**by**

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**May 2000**

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# Contents

# Acknowledgements

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# Executive Summary

***Background and aims of the study***

Forests, woodlands, and trees provide "amenity services". These attract people to visit forests specifically, and countryside areas more generally and generate a significant level of expenditure. This report presents the findings from a two-stage study aimed at quantifying the economy-wide benefits associated with forest-related visits and expenditures.

The study aims to provide information on the role of various forest characteristics and attributes in generating visit-related expenditures. For example, to what extent can visitors' expenditure be attributed to the presence of a visitor centre or water feature or the species mix at a given site? In addition it aims to identify the potential visitor-related benefits from expanding the forest area, and how this varies according to forest type, site attributes, and site location. Finally, the study aims to provide a better understanding of how expenditure patterns vary according to visitor type (e.g. day visitors v. overnight visitors v. international visitors).

Phase 1 of the study (to which this report relates) is a scoping study to investigate existing research, methodologies and data relevant to the terms of reference. Phase 2, which will follow, will involve carrying out the analysis.

The specific aims of **Phase 1 of the study**, wereas follows:

1. To investigate and review existing methodology and research relevant to the study.
2. To review existing data, identify important gaps and highlight priority areas requiring primary data collection in Phase 2.
3. In the light of both the above, to propose a number of alternative approaches for Phase 2 of the study, varying in terms of a) their comprehensiveness and b) their financial cost.

***Methodological Issues***

A key stage of the study involves identifying the additionality of forests and forest characteristics, where additionality is defined as the extent to which either forests themselves or various forest characteristics lead to visits and expenditures over and above that which would occur otherwise. In this respect, it is argued that Phase 2 will need to distinguish between visitors according to the importance of forests and forest characteristics in influencing their visit decision.

An indicative example of how such a split might be made is given by splitting visitors into three categories:

- forest specific visitors (those for whom the existence of a forest or woodland is of central importance to the visit decision);
- casual visitors (those who did not set out with the intention to visit a particular forest site but who decide, during the course of their outing to spend some time in a forested area);
- passive visitors (those who do not visit a forest specifically but visit an outdoor area where the presence of forests form an intrinsic part of the landscape and where those forests influence people's decision to visit that area).

A number of alternative ways of further disaggregating visitor-types are also discussed including using activity-based criteria (eg dog walkers versus cyclists etc) and expenditure-based criteria (overseas visitors versus day visitors).

It is argued that Phase 2 of the study will need to be explicit about the definition of "visitor" and "forest" adopted for the purposes of the study and the extent to which the chosen definitions are likely to under or over-estimate any aspects of the forest additionality on expenditures and economy-wide effects.

### *Alternative methods for quantifying the role of forests and forest characteristics in generating expenditure*

Three alternative methods are discussed for assessing how forests and forest characteristics effect visitation behaviour. In order to cover all of the different visitor types, it is argued that Phase 2 of the study will need to adopt a combination of methods. As was emphasised above, once a model has been designed that is capable of predicting the number of visits made to particular sites, calculating the expenditure attributable to forests is simply a case of multiplying the change in number of visits induced by the presence of forests by the expenditure per visit.

Trip generating functions (TGF) attempt to predict the number of visits made to particular sites based on the location and size of local populations relative to the site, the accessibility of the site relative to those populations, and a range of attributes specific to the site (such as the existence of a visitor centre, the species mix, the length of walking trails, etc.) The advantages of TGF are that they are able to calculate explicitly the role of forest location and forest attributes in determining visitation behaviour, and also that is able to distinguish between different visitor types (however these happen to be defined). Disadvantages include the fact that the method is very data-demanding (especially if one wishes to assess the effect of a wide number of site attributes) and that it cannot be used to assess situations where visits are not made specifically to forests, but are made to countryside areas generally where forests contribute to landscape appearance.

The expenditure partition method asks visitors to rank the importance of various site attributes in determining their visitation decision. A proportion of their total visit expenditure is then apportioned to each of these attributes depending upon their responses. The method suffers from the fact that it is arbitrary in its allocation of expenditure. It may however be a useful tool for assessing the role of forests in landscapes generally, given the absence of other suitable methods.

The contingent visit approach (CVA) involves asking visitors to particular sites how their visitation behaviour would change given a change in some site characteristic. As with the expenditure partition method, CVA is likely to be most useful for assessing the role of forests in landscapes generally rather than the role of forest attributes at specific forest sites.

### *The role of forest attributes*

Previous studies have examined the significance of various site-specific attributes (such as species mix, walking trail distance, presence of campground, etc.) and visitor socio-economic characteristics (such as age income, rural v. urban dweller, etc.). Key factors to emerge are that visitor perceptions (as opposed to statistical values) of attributes are important, and that the importance of various attributes varies according to the site studied. The importance of covering a range of visitor types from forest enthusiasts to the more general visitor in Phase 2 of the study is also emphasised.

### *Aggregating the results to country level*

Chapter 3 concludes by considering the methods available for aggregating the results from a handful of sampled sites to population (country) level. This can be done by a simple multiplication approach, such as by multiplying average expenditure per hectare of forest by total forest hectares at country level. Alternatively, GIS methods (such as so-called benefit transfer methods) can be used. The advantages of using GIS methods are that one can take into account specifically the spatially

heterogeneous pattern of population centres, road networks, the location of different visitor types and the contrasting attributes at different sites.

### *Alternative methods for calculating the multiplier effects associated with forest tourism*

Three alternative methods for calculating the multiplier effects associated with forest expenditures are reviewed: Keynesian multiplier analysis; input-output analysis; and computable general equilibrium modelling. Keynesian multiplier analysis is the least data demanding of the three methods, but it only provides an aggregate (i.e. non-sectoral) picture of expenditure impacts. In contrast, an input-output approach can provide detailed information on the expenditure effects on individual sectors of the economy, but is more data demanding and time-consuming than the Keynesian approach. The CGE method is the most realistic of the three methods in terms of its assumptions regarding the functioning of the economy, but is even more data-demanding than the input-output approach, and provides limited detail of individual sector effects. Given these facts, we recommend the use of input-output methods where possible. However, published input-output tables are only available for Wales, Scotland, and the UK as a whole. Therefore, if the study was to be carried out at national level, Keynesian multiplier analysis would have to be utilised for England.

### *Suitability of existing data*

Chapter 5 reviews the suitability of existing data for utilisation in Phase 2. The Forestry Commission collects a significant amount of data on the type, characteristics, motivations and origin of visitors to Forestry Commission sites. While potentially useful for Phase 2, this data suffers from the fact that specific numbers of visitors to FC sites are not calculated, which makes use of this data for analysis problematic.

Data on the number of day trips made to forests and woodlands in England, Wales and Scotland, and a breakdown of the average expenditure on each of these trips is collected by the UK Day Visits Survey. Data of a similar nature is collected for tourists in the UK Tourism Survey and for international visitors in the International Passenger Survey, although neither of these two surveys specifically identify visits to forests, and therefore some manipulation of data will be required if these surveys are to be used in Phase 2.

Analysis of existing data suggests that what is lacking is detailed information at specific site level. For example, there are few reliable visitor counts at individual forests, and information on many site specific attributes (such as walking trail distance, car-park size for example) is not collected. Nonetheless, existing data can be used at an aggregated level for some purposes (outlined below).

### *Proposals for Phase 2 of the study*

Five alternative approaches to Phase 2 are suggested . Options A to D are listed in ascending order of both their comprehensiveness and their financial cost. Option E is a hybrid approach. It should be pointed out that all of the proposed options are indicative rather than definitive: there exists an almost infinite combination of methods that could be utilised in Phase 2, depending upon what were deemed to be the most important questions for the study to address.

Option A is the cheapest and least comprehensive of the five proposed options. It uses existing data to calculate a figure for the role that forest visit-related expenditures play in total economy-wide expenditure. Option A does not however provide any additional information on the role of site attributes in driving expenditure patterns, or how expenditure patterns or visitation behaviour may vary between different visitor types. It could therefore not be used to estimate the marginal benefits of expanding or adaptingt he forest estate.

Option B requires collection of primary data and uses the trip generating function method to examine how site attributes and visitor characteristics effect expenditure patterns. Aggregation would be performed using GIS methods. Option B suffers from that fact that, like Option A, it is not able to calculate the expenditure resulting from visits that are not to forests specifically, but are instead to landscape areas where forests form an intrinsic part of the landscape.

Option C also requires primary data collection and uses a combination of methodological approaches. It improves on Option B in that it calculates the expenditure that can be attributed to forestry where visits have not been made to forests specifically. However, its analysis of the role of site attributes in expenditure levels is not as reliable as that provided by Option B.

Option D is the most expensive but also the most comprehensive of the five approaches. It combines Options B and C and is therefore able to calculate the role of forests in generating visit-related expenditure, taking into account the role of forest attributes, forest location, visitor socio-economic characteristics, and whether the forest is the main reason for the visit or not.

Option E takes a hybrid approach. It uses the same methodology as Option A to calculate an approximate figure for the role of forests in driving tourist expenditure. In addition, a number of case-studies would be carried out, designed to shed light on some of the more pertinent questions raised in the tender. However, to reduce costs, it is not envisaged that these case-studies will be carried out on a scale wide enough for aggregation purposes. In other words, they will remain as separate case-studies rather than part of a comprehensive analysis.

# 1. Introduction

## 1.1 Background to the study

One of the defining characteristics of forestry is that it produces multiple outputs. In addition to timber production, forests support biodiversity and nature conservation, they absorb carbon from the earth's atmosphere, enhance landscapes and provide opportunities for recreation and tourism. This study focuses on the latter of these benefits: the role of forests in supporting recreation and tourist activity in the UK.

In Britain, over 350 million day trips are made to forests each year (Forestry Commission, 2000). In addition, forests and woodlands form an intrinsic part of the landscape that attracts tourists to certain areas for longer periods. Many previous studies have tried to estimate the so-called non-consumptive use value of forests, that is the value that people derive from using forest and woodland resources for recreational purposes (for example, Benson and Willis, 1992, Bateman et al., 1999, Hanley and Ruffel, 1993). In contrast, this study aims to measure the actual visitor expenditures associated with the recreational use of forests and woodlands, taking into account that such expenditures generate multiplier benefits (both in terms of income and employment) for the wider economy. Whilst there is no direct correlation between use value and visitor expenditures, many of the methods used to estimate use values involve measuring the influence of forests and forest attributes on visitation rates and, subsequently, visitor expenditures. Thus they are of direct relevance to the study in hand.

The study has been split into two phases: Phase 1 (to which this report relates) is a scoping study to investigate existing relevant research, methodologies and data in the area. The output of Phase 1 is a number of alternative approaches for Phase 2 of the study, which will involve actually estimating the level of forest-related expenditure and magnitude of multiplier effects generated in the wider economy.

## 1.2 Aims of the Study

The aim of the study (Phase 1 *and* 2) is **to quantify the economic benefits associated with forest-related tourism**[1] **taking into account different forest types, differing forest locations and different forest attributes**. In addition, two specific outputs from the study for the development of forestry policy will be:

- the identification of the potential tourist-related benefits of expanding the forest area by new planting, and how this varies according to forest type, attributes and location.
- a better understanding of how the demand for different forest attributes varies between tourist types (e.g. day visitors, longer-stay tourists etc).

With respect specifically to **Phase 1 of the study**, the aims are:

4. To investigate and review existing methodology and research relevant to the study.
5. To review existing data, identify important gaps and highlight priority areas requiring primary data collection in Phase 2.
6. In the light of both the above, to propose a number of alternative approaches for Phase 2 of the study, varying in terms of a) their comprehensiveness and b) their financial cost.

[1] Included within these are expenditures associated with recreation. Throughout the report the terms tourist and visitor are used interchangeably.

## 1.3 Structure of the Report

The rest of this report is structured as follows: Chapter 2 addresses certain key methodological issues for the study including the identification of certain key stages for Phase 2, the meaning of "additionality" in the context of identifying forest's role in generating tourist and recreation expenditures, and finally, given the study's aims and objectives, the definition of certain tourist types. Chapter 3 outlines the alternative methodological approaches that could be used to identify the importance of forests for each of these tourist types. Three main types of approaches are discussed: the trip generating function method, contingent visit analysis and the expenditure partition approach. In addition, the types of forest attributes that should be taken into account in Phase 2 of the study are discussed as are other influences that might affect the magnitude of forest tourism expenditures. The chapter finishes with a discussion of how information collected at the site level could be aggregated up to the level of the study area.

Having estimated the total value of expenditures arising from forest-related tourism, a key aim of Phase 2 of the study is to calculate the magnitude of knock-on or "multiplier" effects for the wider economy arising from this expenditure. Chapter 4 reviews three alternative approaches for measuring these multiplier effects: Keynesian multiplier methods, input-output analysis and Computable General Equilibrium (CGE) models. Chapter 5 presents a comprehensive review of existing data of relevance to the study. At various key stages in the report recommendations are made. Chapter 6 brings these together by proposing five alternative approaches for Phase 2. A number of other issues such as displacement and how the results from three country-level studies might be combined are also addressed in the light of the proposals.

# 2. Methodological Issues

## 2.1 Stages to the study

Figure 2.1 shows the key building blocks that are required for estimating the total contribution of forests to tourism. They also apply to the measurement of the marginal benefits from new planting or alternative planting policies in relation to the types and locations of forests and visitors.

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***Figure 2.1: Stages of the estimation of economic benefits from forest tourism***

There are two basic approaches to the measurement of tourism benefits. In the first, benefits are aggregated from data relating to individual forests and forest types. In the second, national tourist data on visits and expenditures are disaggregated to reveal the contribution of forests and woodlands. In practice the two apparently different approaches require the same components in the analysis. The focus of this report is on the methodological issues that are central to both approaches.[2]

## 2.2 Additionality and key definitions

**Defining "forests"**

It is well recognised that perceptions of what constitutes a "forest" differs between different people, and that people picture quite things when asked to distinguish "forest" from "woodland" and "trees", (Lee, forthcoming). In defining what constitutes a forest and what does not, factors that could be taken into account include: the size of the forest block (i.e. do we classify an individual tree as a forest? If not, where do we draw the line as to how small a forest can get before it ceases to become a forest?); whether human-modified management practices can be classified as being part of the forest (i.e. can a visitor centre be classified as being part of the forest, or should it fall under some kind of separate definition of visitor attractions that need not be forest-specific?).

The way in which forests are defined in respect of these issues will influence the results of Phase 2. For example, if individual trees in landscapes have the potential to influence peoples' visitation and expenditure behaviour, then by not including them in analysis results will underestimate the contribution of forestry to economy-wide expenditure. In this respect, preliminary results from Phase 2 will be able to shed light on how far the definition of forests should go. What is also clear from the above discussion is that Phase 2 should be able to distinguish those expenditures that are due to management characteristics from those that are due to the forests in their natural state. Whether the expenditures due to management characteristics can be attributed to "forestry" or not will be a difficult and controversial issue to resolve, so the most appropriate approach for Phase 2 seems to be to state clearly the assumptions made in any definitions, and to produce figures that can be interpreted according to alternative definitions where possible.

**Defining "visitors"**

Phase 2 will also have to define what is by a "visitor" for the purposes of the study. A number of important questions will have to be addressed in this regard. Clearly, the stricter (more specifically)

[2] As discussed further in Chapter 6, the second approach has less potential for providing information on the role of forest attributes in influencing visitor behaviour and/or the extent to which the existence of forests explain the visit choice of certain types of tourists.

we define "visitor" the simpler we make analysis, because with a strict definition there are fewer factors influencing visitors to make a trip, and therefore fewer factors to account for in analysis. However, if we adopt a relatively strict definition, we risk neglecting either certain types of visitors (eg those taking a trip from a workplace) or fail to account for those visitors for whom forests represent a minor, albeit significant factor influencing the visitation decision. Because of both reasons, the role of forests in contributing to expenditure across the whole economy is likely to be underestimated. Therefore, we suggest a wide definition of "visitor", as anyone on a trip for leisure purposes for whom the existence of forests or forest characteristics influences expenditure patterns in some way.

### Additionality

A key aim of the study is to isolate the role of forests in explaining visitation rates and visitor expenditures. In other words, the study aims to identify the **additionality** of both forests and forest characteristics in determining tourist demand. Additionality in this sense is defined as **the extent to which either forests themselves or various forest characteristics lead to visits and expenditures over and above that which would occur in the absence of those forests or in the absence of a given forest characteristic.**

In terms of this study, as shown in figure 1, there are two stages involved in calculating the extent of additionality. The first is to determine how visitation rates are influenced by the presence or absence of forests as well as the internal quality characteristics of forests. In this context, two extremes are a) that a visit is totally due to the existence of a forest and would not have taken place had the forest not existed, as compared to b) a visit is unrelated to the existence of the forest and would take place regardless of its presence. The second stage is to determine visitor expenditure according to recreational activity, length of stay, type of visitor, etc. The two stages can then be combined to produce an estimate of the expenditure value of forest related tourism.

### Displacement

In the case of estimating the potential benefits arising from expanding the forest area, an extra complication has to be taken into account - that of displacement. Displacement effects occur when extra demand at one site is at the cost of demand at another site. Displacement is particularly difficult to measure in that it is not clear exactly what kind of activities or sites may represent substitutes for forest sites. This issue is discussed further in chapter 3.

### Splitting visitors to capture additionality

Clearly the degree of additionality of forests in influencing tourist demand and thus visitor expenditures will vary between different types of visitors. Although in all cases the expenditure that can be attributed to the existence of the forest will depend critically upon how we define the terms "forest" and visitor", it is useful to distinguish at the outset between three different types of visitors:

- **Forest specific visitors**. These are visitors who make a conscious decision to visit a specific forest. The forest is therefore of central importance to their decision to make the trip. It seems reasonable to assume that all of their expenditure is due to the existence of forests[3].

[3] This is assuming, of course, that the forest is the sole reason for the visit. It may be the case that, while a visit is "forest specific" in that the visitor makes a conscious decision to visit a specific forest, they combine the forest visit with a trip to a relative, for example. In this case, some apportionment must be made as to the proportion of trip expenditure that can be attributed to the forest.

- **Casual forest visitors**. These are visitors to who did not specifically set out to visit a particular forest site or forested area but who decide, during the course of their outing, to spend some time in a forested area. They may, for instance, have been attracted by the existence of signs directing them to a site and/or informing them of particular facilities at a site. In the case of casual visitors, it seems unreasonable to attribute all visit expenditure to the existence of a forest, given that the visitors would have made their trip regardless of whether or not the forest existed, and would presumably have found somewhere else to stop had they not seen the forest and/or signs directing them to it.

- **Passive forest visitors**. These are defined as visitors who do not make a trip to a specific forest site, but are attracted to an area in which the presence of forests contributes to the general nature and appearance of that area. For example, there are visitors to Deeside in North East Scotland who do not specifically visit or spend any time at a forest site, but are attracted by the general landscape to which forests contribute. Clearly, the proportion of passive visitors' expenditure that can be attributed to forests will depend upon the degree to which those forests are seen as important in contributing to the landscape appearance. In landscapes where removal of forestry would cause a decline in the number of visitors, the corresponding decline in expenditure can be attributed to forestry. But where removal of forestry would result in no change in visitor numbers to the area, no visitor expenditure can be attributed to the presence of forestry.

There are of course a number of ways Phase 2 could further split visitor types for analysis. For example, forest visitors could be split into categories such as "forest enthusiasts", "sports enthusiasts", "dog walkers" etc. [4] However, it should be clear from the preceding discussion that what is important from the point of view of this study is to quantify the *importance* of forests on the visit decision. Thus it will be crucial for Phase 2 to analyse visitors according to how this importance differs between different visitor types.

Further, it should be noted that many of the methodologies we have proposed in Chapters 3 and 6 are quite flexible in terms of the ways visitors can be split and analysed. It is quite possible for Phase 2 to compare the concepts of "specific", "casual" and "passive" with any alternative splits such as "forest enthusiasts", "sports enthusiasts", and "dog walkers", and see which concepts are most suitable for analysing the question of forest importance on the visit decision. For the rest of the report we will refer to the terms "specific", "casual" and "passive", as we feel that, in the absence of any existing evidence, these terms provide a useful and illustrative framework for thinking about the problems Phase 2 will need to address.

**Splitting visitors according to expenditure**

In addition to distinguishing between visitors according to the role of forests in their visitation choice, it is also important to distinguish between visitors with different levels and/or patterns of expenditure. For example, visitors could be split according to whether they are visiting an area from a home base, or whether they are staying in the local area in tourist accommodation. The latter category of visitors are likely to have significantly higher expenditures compared with the former group, and the patterns of expenditure are also likely to differ between the two groups. There are of course additional ways that visitors could be split to reflect different expenditure patterns, and Phase 2 can explore which of various splits is most suitable. Particularly in terms of estimating the marginal effects of changing the forest area, distinguishing UK from overseas tourists will be important. However, for illustrative

[4] The argument against this approach is that there is no *a priori* reason why the proportion of dog walkers' expenditure that can be attributed to forests is the same for all dog walkers. For some dog walkers, being surrounded by trees may be a major incentive for going on the walk, but for others, the forest may simply be more convenient for reasons not directly linked to the forest itself- they would be equally as happy to walk along a beach. A similar situation can be envisaged for sports enthusiasts.

purposes, we discuss the implications of splitting visitors according to whether they are day trippers or overnight tourists. In this context, three categories would need to be distinguished:

- Holiday visitors spending at least one night within the area,
- Holiday visitors visiting the site on a day trip from accommodation outside the area,
- Day visitors

Where "area" refers to the geographical area of the study, whether this be country level or regional level. It is necessary to distinguish between holiday visitors staying within the study area and those staying outside as, clearly, if visitors stay outside the study area, the expenditure benefits to that area will be greatly reduced than if the visitors were staying within the study area. Additional, sub-categories could be specified (for example, local residents could be distinguished from the broader category of day trippers; overseas visitors could be distinguished from UK tourists). Moreover, in terms of the expenditures of forest-specific and casual visitors, there may be differences in spending patterns associated according to the type of recreational activity being pursued, for example forest walkers may spend more or less on food and drink than cyclists, etc. However, there is at present no strong evidence to support further division of tourists into these recreationally based categories.

Taking into account both the differences in the role of forests in influencing visitation decisions and differences in the expenditures of visitors, a "matrix" of visitor types can be specified as shown in Figure 2.2

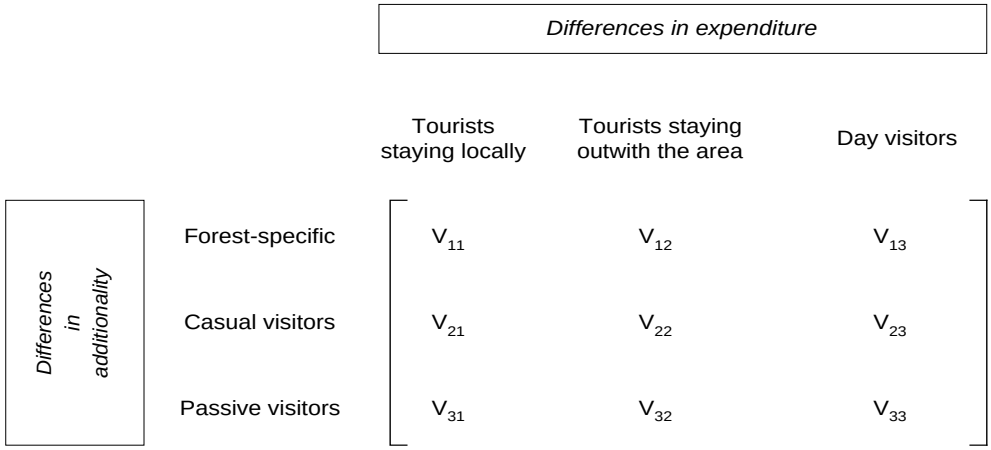


***Figure 2.2 Different visitor types to be distinguished in the study***

A priori, one may expect visitors falling within category $v_{11}$ to provide the most forest-related tourism benefits for the local economy since they will be spending significant amounts in the local economy and the primary reason for their visit is associated with the existence of forests. However, the relationship between the magnitude of forest expenditure and all other visitor types in the matrix is less clear. For example, without additional information on the factors influencing the choices of individuals, it is impossible to ascertain whether two tourists spending identical total amounts, one a casual visitor, the other a passive visitor, will generate the highest expenditures attributable to forests. Likewise, it is difficult to rank the importance of two forest-specific tourists one staying outwith the area and the other a day visitor without knowing details about their expenditure levels and patterns.

In order to generate an accurate estimate of total forest related expenditure, Phase 2 of the study will need to estimate the importance of each of the submatrices in Figure 2. In effect, the alternative approaches given in Chapter 6 differ in terms of the extent to which they recognise and accommodate for differences in expenditures in each of the submatrices.

The following chapter reviews the alternative methods for analysing the role of forests in explaining visits and recreational activity. It will emerge that the additionality of forests for each of the visitor types is best measured using different methodological approaches.

# 3. Alternative methods for quantifying the additionality of forests

This chapter discusses the advantages and disadvantages of three alternative methodologies for examining the role of forest and forest attributes in determining visitation behaviour. Once the effect of forests on visitation behaviour has been assessed, ascertaining the expenditure attributable to forests is simply a case of multiplying the expenditure rate of each visitor type by the proportion of visits due to the existence of forests.

## *3.1 Trip generating function method (TGFM)*

The trip generating function method (TGFM) has frequently been used to assess the use value of outdoor recreational sites. However, the methods under-pinning the TGFM can be used to construct a model capable of predicting the number of visits made to particular forest sites and, subsequently, forest visitor expenditures. The main advantage of this approach is that it can distinguish between different visitation rates of different visitor types (e.g. day-trippers v. overnight tourists) and can provide information on how changes in the quality of site attributes would effect visitation rates. However, for reasons to be elaborated below, the TGFM would only be suitable for assessing the visitation rates of forest-specific and casual visitors, and cannot be used to analyse the visitation behaviour of passive forest visitors.

In its most basic form, the TGFM attempts to predict the number of visits made to a particular site using information on travel cost and travel time incurred by individuals to reach that site. This basic model takes the form:

$$V_{ij} = f\,(TC_{ij}, TT_{ij})$$

Where

$V_{ij}$ = the number of visits made by individual i to forest site j

$TC_{ij}$ = travel cost faced by individual i to reach site j

$TT_{ij}$ = travel time incurred by individual i to reach site j

The travel time variable may be included in a monetary form or simply as time taken. The advantage of including travel time as a monetary variable is that it can be added to the travel cost variable, thereby avoiding a problem of multi-collinearity between the two variables. Given the difficulty in calculating the marginal value of time for different people, and the fact that some visitors will have to forego income to visit a forest whereas others will not, there is no consensus on the best way to monetarise the travel time variable. Some studies (e.g. Benson and Willis, 1992) have followed the Treasury approach of calculating the costs of travel time based on the assumption that people value leisure time at 43% of their wage rate. However, recent advances in calculating travel time to particular sites using GIS methods, which can explicitly account for the non-uniformity of road networks, have the potential to substantially improve the results obtained from TGFM analyses.

By extending the basic model, the TGFM approach can assess the costs of accessing a site with different quality characteristics. For example, the TGFM can indicate if people will visit a site containing a mix of broadleaved and coniferous species more frequently than to one containing just coniferous species. Following on from this, the resulting model can predict how visit rates would

change given a change in the quality of the attribute variable. Variables representing visitor type (e.g. day visitor v. holiday tourists) and socio-economic characteristics of visitors can also be included, so that differences in preference for various attributes can be assessed[5]. The extended model can therefore be represented as:

$$V_{ij} = f(TC_{ij}, TT_{ij}, SE_i, Q_j)$$

Where variables are defined as before with the addition of

$SE_i$ = a vector of socio-economic characteristics of visitor i, such as income, age and education,

$Q_j$ = a vector of quality characteristics of site j. This may include variables such as the length of walking trails or percentage of broadleaved species, and dummy variables for elements such as the presence or absence of a visitor centre.

When a suitable model has been constructed, findings can be extrapolated across the entire geographic extent of the study, thereby predicting the number of visitors of each type likely to be visiting any given forest in the study area (Bateman et al., 1999)[6]. Data on expenditure levels of each different visitor type can then be applied to the forecast visitation rates for each forest area to acquire a figure for the total expenditure due to forests.

An early example of this approach was provided by Willis and Benson (1989). Their model attempted to predict visitor numbers from particular zones to Forest Commission sites using the following variables: travel cost, the average income of residents in each zone, various socio-economic characteristics of residents in each zone, and variables representing various wildlife attributes of each site. This is an example of a *zonal TGFM*, i.e. the model attempts to predict the number of visitors from each of a selection of zones around the site to the site itself. The alternative is to adopt an *individual TGFM*. The latter attempts to estimate the number of trips any one person may make to the site in question over a given time period. An example of the latter approach is Creel and Loomis (1990), who estimated the change in the number of trips an individual hunter takes in response to several site characteristics including length of hunting season. The individual TGFM has a number of theoretical advantages over the zonal TGFM, and is now the more widely applied approach (Bateman et al., 1997).

When applying TGFM there are several other issues to resolve in addition to the issue as to whether the TGFM should take a zonal or individual approach. One of these issues is the type of visitation decision to be modelled. The three studies mentioned above were concerned with measuring those factors which influence the *number* of trips people make to particular sites. However, there are a number of other visitation decisions that may be influenced by site attributes and which may also affect expenditure rates (Loomis 1995). One of these factors is the decision over length of stay at the site. Bell and Leeworthy (1990), for example use a TGFM to assess factors influencing the length of stay (in days) at a beach site. The authors find, among other things, that length of stay is positively related to income and that average lengths of stay are higher among young adults and those in their later years than for people in middle age. This result was replicated in Brainard et al. (1999), who

[5] In practice, there are two ways in which this approach could distinguish between day trippers and tourists. One could either include additional (dummy) variables to represent the difference between the two visitor types, or, if the addition of so many variables was restrictive in terms of degrees of freedom, the same travel cost equation could be estimated separately for the different visitor types.

[6] This method is discussed further in section 3.5 below.

point out that the effect of age and income on visitation rates is likely to vary according to the activity type in question. For example, many studies of hunting in the US find that visit frequency is inversely related to income (Loomis 1995), whereas other activities (e.g. mountain biking) may be positively related to income.

More important than the length of stay decision however, is the decision individuals make as to which of available sites to visit. When attempting to predict which of a number of different sites an individual may visit, the most common method is to use a multinomial logit (MNL) model. In an MNL model, the probability of an individual visiting a given site is predicted by comparing the travel cost and site quality variables for that site with those of all other sites (or a representative sample of all other sites).

Many early TGFM studies focus only on the trip frequency variable and ignore issues of length of stay at the site, and the substitution effect resulting from the fact that people may have a choice of a number of different sites to visit. However Loomis (1995) shows that, when analysis ignores one of these visitation decisions, biased results of the economic impact of site quality improvements are likely to be attained. Indeed, the Willis and Benson study has been criticised for ignoring the effect of substitute sites.

Particularly since one of the aims of Phase 2 of the study is to identify how changes in the structure or attributes of forest would change the aggregate expenditure derived from tourism, a key aspect to be considered is that of displacement effects, that is when extra tourist demand at one site is at the cost of demand at another site.

Estimating the potential extent of displacement is difficult. Clearly, if a new set of forest facilities is created within the catchment area of an existing forest, then some displacement may well ensue, particularly in the case of the provision of specific facilities such as new off road cycle trails. However, the displacement may be from non-forest areas as much as existing forest areas. Where new facilities are being provided within an existing forest area there again may be some displacement from existing facilities, and indeed such additional provision may be provided specifically for that purpose to relieve visitor pressure on existing facilities.[7]

A number of mechanisms have been explored for including the effect of substitute sites in travel cost equations for predicting number of visits to sites. These include: extending the variables included in the travel cost model to account for whether respondents believe a substitute site exists (Ward, 1987; Hanley and Ruffel, 1993; Willis and Benson, 1989); including a variable to reflect the next most visited site (Bell and Leeworthy, 1990; Ozuna et al., 1993); including an access matrix to all surrogate destinations (Choe et al., 1996); estimating a systems demand model (Vaughan and Russell, 1982; Smith and Desvouges, 1985; Bockstael et al. 1987), adopting a recursive approach (Loomis, 1995; Bockstael et al., 1990), and combining site selection and visit frequency models (Parsons et al., 1999). Studies vary in the extent to which they find that the existence of substitute sites are important in influencing visitation rates. A key issue here is the distinction between substitutes in the form of other forests as opposed to substitutes in the form of other recreational sites, such as beaches. The existence of substitute forest sites will clearly reduce visitation rates to each forest, while the effect of other substitute sites is less clear- these may reduce the number of day trips made to the forest by local residents, but could on the other hand increase the likelihood of a tourist visiting the area in the first place.

**The issue of displacement is clearly important in the context of deciding on an appropriate scale of analysis, aggregating results up to national level and combining the results from three-country level studies .** Thus a key decision in Phase 2 will be determining the extent to which

[7] Displacement issues for new forests are even more difficult, partly because of the extensive time lag between planting and attractive maturity. In such circumstances, the extent to which one could quantify displacement is questionable. A starting point might be to look at if there is any evidence that the new National Forest and the community forests are leading to reduced use of existing forest areas.

substitute sites should be included in analysis. Presumably new forest sites should be thought of as substitutes for existing forest sites, and forest sites should be thought of as substitutes for each other in the process of aggregating results up to population level. However, a decision will have to be made regarding the extent to which the analysis should incorporate other outdoor sites, such as beaches or national parks, or even theme parks and cities.

While it may be true that these additional activities may represent substitute sites for forestry, it is likely to be extremely difficult to account for them in the analysis of Phase 2 for a number of reasons. First, it would be difficult to know where to draw the line as to what could be included as a substitute and what could not. Second, in previous studies, visitors have had immense difficulty in identifying what sites they considered as substitutes, even when faced with a very narrow definition of "substitute" (Hanley and Ruffel, 1993; Willis and Benson 1989; Ward 1987). Third, the factors influencing people to visit forests are likely to be quite different from the factors influencing people to visit other types of sites (even where there is some degree of substitutability between the two sites), and therefore it will not be possible to analyse the joint visitation choice simultaneously. Finally, any method of analysis is constrained in terms of the number of variables that can be included. Any attempt to include all forms of substitute sites in analysis will rapidly run out of degrees of freedom. For these reasons, we suggest that the analysis of substitutes in Phase 2 should probably be confined to forest sites.

An important complication of using TGFM analysis for Phase 2 of the study is that it implicitly assumes that when a visit is made to a particular site, that one site is the sole motivation for the visit, that is in terms of the visitor types defined above, it assumes that all visitor are forest-specific visitors. Complications arise in the case of casual visitors where, for example, a visitor pays a trip to a relative, and stops at a forest on the way home. In this case, some apportionment of costs (both in terms of money and time) between the two visit sites must be made otherwise the role of forests in generating expenditures will be overestimated. Further, TGFM cannot be used to assess the factors influencing visits made by passive visitors. Even if a model could be designed to accommodate all factors influencing a passive visit, the presence or absence of forests is likely to be a relatively small influence on the visit decision, with the result that a forest variable may well appear statistically insignificant.

A travel-cost analysis clearly requires a large amount of data. At very least, data is required on the number of visitors to a range of different sites with different characteristics, as well as information on the original location of visitors. However, by only sampling visitors at particular sites, analysis is potentially biased because it does not include potential visitors. Willis and Garrod (1991) and Loomis (1995) discuss estimation methods to overcome this bias, but, particularly given the requirement to estimate a site selection model, it may be appropriate to complete some household surveys as well.

## 3.2 The Expenditure Partition Method

This method, although somewhat crude, is a useful mechanism for assessing the effect of forest existence and/or forest qualities on visitor expenditure levels. Visitors are asked to rank the importance of various attributes at a site. Visitor expenditure is then apportioned appropriately to each attribute. Typically, a Likert scale is used. This is an ordinal scale that parallels a discrete choice set such as :

- Main reason
- Very important
- Important
- Not very important
- Not important

The scale might be 0 (not important) to 4 (main reason).

Where forestry is the main reason for a visit to a site or region, 100% of expenditure is attributed to the presence of forestry. When the forest is 'not important' 0% is allocated. Arbitrary intermediate allocations are made. There seems little difficulty in interpreting the 0% category, but the other categories raise important questions about the validity and meaning of the partition of expenditure.

In the absence of more refined methods, the expenditure partition method has been widely employed in studies to assess the role of various non-market factors in explaining the behaviour of visitors and/or assigning expenditures to these non-market factors. For example, Crabtree et al. (1994) asked visitors to wildlife sites how important wildlife was in attracting them to those sites. Where wildlife was the main reason for a visit to the area, 100% of expenditure was attributed to wildlife, whereas if wildlife was very important or quite important, 50% and 25% respectively was apportioned to wildlife. Harley and Hanley (1989), in their analysis of the economic benefits of nature reserves, attribute 100% of visitor spending where the reserve is the sole reason for stay, but if the reserve was just one of several reasons for stay, 50% of expenditure is attributed to the reserve. If the reserve caused holiday-makers to increase their length of stay in the area by one day, then one days expenditure was attributed to the reserve.

A slight variant of this approach was utilised in a study of the economic impact of conserved landscapes in the South West (Tourism Associates in association with Geoff Broom Associates, 1999). In this case, visitors leaving the South West were asked to attribute a score out of ten to indicate the extent to which conserved landscapes had motivated their trip away from home. The average score was 7.8, which was converted into a motivation factor of 78%. The interpretation given to this motivation factor is that 78% of holiday trips (or on average 78% of each holiday trip) are motivated by conserved landscape. Figures on the number of holiday trips taken in the south west can then be adjusted accordingly to reflect this motivation factor when calculating the economic benefits to the region of conserved landscapes.

As well as being used to measure the proportion of expenditures that can be attributed to a nature area itself, the expenditure partition method can also be used to apportion expenditure to particular forest characteristics. Mattsson and Li (1994) use the partition method to assess the extent to which different management practices effect the non-timber value of forests. Interviewees were shown photos of forests under four different silvi-cultural management practices, and asked to rank the photos according to their preference concerning the forest environment. The authors find substantial evidence that silvi-cultural management practices can influence the non-timber value of forests (and therefore effect visitation behaviour). Willis and Benson (1989) asked visitors to Forestry Commission sites to imagine they had 10 tokens to spend on purchasing wildlife, landscape, other recreation, and information-interpretation facilities. This information was used to determine the relative importance of these attributes in visitors' valuation of the forest estate as a whole. The authors report some differences between sites in terms of the relative importance of these different attributes, although wildlife is consistently perceived a more important attribute than any others.

In summary, the partition method suffers from the fact that it is completely arbitrary in its allocation of expenditure. Another limitation arises from the fact that it simply provides an indication of the relative importance of attributes, and is not able to say how these attributes effect visitation behaviour. It is not possible to interpret the expenditure partition method in terms of decision or demand theory, nor is it useful for examining the effect of changes to forest quality characteristics. At best it gives an ordinal ranking of regions or sites in terms of the impact of forestry on tourism expenditures. Therefore, in terms of Phase 2 of the study the partition method is likely to be most useful for analysing the role of forests or forest characteristics in determining the visitation behaviour of passive visitors, for whom the trip generating function method becomes unreliable. In addition it may be particularly useful for apportioning some component of expenditure by casual visitors in conjunction with a travel-cost analysis.

## 3.3 The Contingent Visit Approach

The contingent visit approach (CVA) involves asking visitors to a particular site how their visitation behaviour would change given a change in some site characteristic. For example, Loomis (1993) asked visitors to a lake how their visitation behaviour would change given a change in lake water-levels. Crabtree et al. (1999) showed visitors to an Environmentally Sensitive Area (ESA) two photographic images. Each image used the same original photograph, but attributes in one of the images were modified to reflect the effects of an absence of ESA policy. Respondents were asked how their visitation behaviour would change if the countryside changed to the image representing the policy-off scenario. Expenditure attributable to the ESA programme could then be estimated by multiplying the difference in number of annual trips between policy-on and policy-off by the average trip spend for each party. The potential for CVA in visitor expenditure studies has only recently been identified, but Loomis (1993) provides evidence that CVA can generate reliable and valid predictions of actual visitor behaviour and expenditure.

The contingent visit approach has been adapted slightly in Hanley and Ruffel (1993), in an attempt to ascertain the value of various forest characteristics. Incremental willingness to pay is calculated by showing visitors pairs of photos and asking how much they would be prepared to pay to visit forests with the various different visual characteristics appearing on the photo. Their approach is similar to that of Bostedt and Mattsson (1995). Whilst not explicitly focussing on visitation patterns this study mirrors the CVA approach by comparing two contrasting situations. In particular, visitors at two sites in Sweden were asked the following questions, and asked to tick the portion of the statement most relevant to their preferences: "My experience would have been more positive if the forest had been: 1) more dense/open; 2) had more/less broadleaves; 3) had more clear-cuts but each were smaller/ had fewer clear-cuts but each were bigger; 4) had more/fewer old trees; and 5) had been more accessible and been visited by more people/ had been less accessible and visited by fewer people. Responses to this question were combined with a willingness to pay question. The authors conclude that a considerable portion of the value to tourists is attributable to forest characteristics, and that the value to tourists can be increased by modifying these characteristics: for example by making clear-cuts smaller even if there were more of them.

Tourists visiting an area for the first time would not be aware of the actual level of forest contribution to the landscape although they may have a perceived view that may or may not match actuality. Thus in the case of these visitors, the questions within the CVA survey need to ask about the influences on the trip decisions as well as how changes in the actual forested area or characteristic might affect future visitation behaviour. It may be possible to combine the CVA with other methods. For example, Ward (1987) used a series of "what if" questions to elicit changes in quantities of trips an individual would take under various alternative scenarios. These responses were combined with information on their current trip cost to estimate a series of augmented TGFM demands for stream recreation.

As in the case of the partition method, the contingent visit approach may be most useful for analysing the role of forests or forest characteristics in determining the visitation behaviour of passive visitors, for whom the trip generating function method becomes unreliable. The main danger of the approach is that, by focusing solely on forest variables, the analysis becomes biased, with the result that the role of forests or forest attributes on visitation behaviour is exaggerated relative to other factors. In addition, responses to hypothetical questions may exhibit bias. For example, people may make exaggerated "strategic bids" or they may simply be unable to hypothesise how their visitation behaviour might change given a change in site characteristics (Ward, 1987).. For instance, a major market research exercise was undertaken in respect of the Armouries Museum in Leeds, prior to any decisions being made, where a large sample of residents in the likely catchment area of the museum were asked whether they were likely to visit the museum given the following contents. On the basis of the survey and those saying that they were highly likely to visit, it was estimated that upto 1.2 million visitors might be attracted. In practice, visitor numbers have been around 400,000 or less. The same factor may affect CVA. Another key issue in using the technique is the way in which results are aggregated to population level. In this respect, the issue of displacement should be borne in mind.

Given these qualifications, Loomis (1993) has provided evidence that the contingent visit approach can generate valid and reliable estimates of visitation behaviour.

**RECOMMENDATION**

Having reviewed the various alternatives, we propose that in order to cover all of the different visitor types, a combination of methods is required. The trip generating function method is able to explain the number of visits to forest sites, taking into account socio-economic factors, substitute sites, forest attributes and location factors. It is therefore the most appropriate means for estimating the visit function for forest-specific visitors. For casual visitors, given that not all of their spending can be attributed to forests, travel cost estimates must be combined with some information on the importance of forests for those visits otherwise the total level of expenditure associated with forest will be overestimated. This information could be ascertained through use of some stated preference method which could be either the partition method or the contingent visit approach. We have argued, however, that the trip generating function method is not suitable for capturing the effect of passive visitors. In this case, either the partition method or contingent visit approach would be more suitable for analysing the role of forests or forest characteristics in determining the visit decision.

## 3.4 Choice of forest types, attributes and other factors to include in phase 2

A number of previous studies have generated information on the importance of forest attributes and other variables on tourist demand and/or use value. A wide range of different attributes have been considered, ranging from size of trees and woodland management practice to the presence of car parks, open ground and dirt tracks, to length of walking trail and bicycle hire availability. The key findings from these studies are presented in Table 1 below.

***Table 3.1 Summary of findings relating to the role of forest attributes and visitor characteristics***

| Study | Method | Study area | Significant forest attribute variables | Significant socio-economic variables | Other significant variables | Comments |
|---|---|---|---|---|---|---|
| Willis and Benson (1989) | Travel cost plus partition method to assess importance of wildlife | 6 Forestry Commission sites | Wildlife and forest landscape valued higher than recreational, information and museum facilities | Percentage of households with one or more cars | | The authors note significant differences in preferences for attributes at different sites |
| Englin and Mendelsohn (1990) | Hedonic travel cost[8] | Washington State US | - excellent view;<br>- clear-cuts;<br>- closed spruce forests;<br>- rock and ice;<br>- hemlock;<br>- large trees | - urban inhabitant;<br>- Eastern Washington v. Western Washington;<br>- group size | - presence of campground;<br>- dirt road | The authors show that the value placed on particular attributes depends upon the abundance of the attribute in question. |
| Hanley and Ruffel (1993) | Contingent valuation with photos | A selection of Forestry Commission sites | - diverse tree height;<br>- mix of conifers and broadleaved (as opposed to conifers only);<br>- presence of a water feature | | | |
| Hanley and Ruffel (1993) | Willingness-to-pay (with bid rent curve) | A selection of Forestry Commission sites | - mean height of trees;<br>- rating of views;<br>- rating of visitor facilities | Visitor income | - purpose of visit to walk dog;<br>- hot weather;<br>- weekend visit v. weekday visit;<br>- day tripper v. otherwise; | Insignificant variables included: height diversity of trees; proportion of broadleaved trees; conifer species diversity; presence of water-feature |

[8] The hedonic travel cost method differs from standard travel cost analysis in that, rather than attempting to explain the number of visits to a site based on travel costs and site characteristics, the hedonic travel cost approach measures the costs associated with travelling to sites with different characteristics. This "hedonic cost function" can be used to estimate "hedonic prices" for site characteristics. These hedonic prices are then used to estimate demand functions for the site characteristics. Given that the hedonic travel cost approach is concerned with measuring demand for site attributes, and not with estimating a visit function for forest sites, the methodology itself is not useful for the purposes of this study, although the results are informative.

| Study | Method | Study area | Significant forest attribute variables | Significant socio-economic variables | Other significant variables | Comments |
|---|---|---|---|---|---|---|
| | | | | | - age of respondent | |
| Mattsson and Li (1994) | Partition method using photos | A selection of sites in North Sweden | - visitor's preferences were significantly different between 4 different silvi-cultural practices (e.g. natural regeneration using advance growth v. natural regeneration using seed trees)<br>- percentage of pine | | | |
| Bostedt and Mattsson (1995) | Contingent Valuation method | Sweden | - stand density;<br>- proportion of broad-leaved trees;<br>- size and abundance of clear-cuts;<br>- tree age | | | Preferences varied according to the area under study. The authors suggest that this is because of the relative abundance of particular characteristics at different sites. |
| Bateman et al. (1996) | Travel cost | Thetford Forest | - visitors' rating of scenery | - respondent employed<br>- respondent in the National Trust | - holiday visitor v. day-tripper<br>- respondent loves near site<br>- main reason for the visit is dog-walking | The authors suggest that calculating travel-costs may be more accurate using GIS for "pure" visitors, but visitors' own perceptions of travel cost may be better for "meanderers" |
| Brainard et al. (1999) | Travel cost (for purposes of benefit transfer) | Thetford Forest, with results refined using data from 33 Forestry Commission sites | - walking trail distance (km)<br>- site in National Park<br>- presence of bike-hire | - households without a car<br>- economically active males seeking work<br>- retired persons | - woodland index value (to reflect substitute sites)<br>- holiday visitors v. home visitors | |

A number of points arise from the findings of these studies. Firstly, it would appear that the relative importance of forest attributes varies between sites. For instance, both Willis and Benson (1989) and Bostedt and Mattsson (1995) found significant differences in preferences for attributes at different sites. Lee (forthcoming) suggests that the potimal combination of attributes depends on the general management aims of the forest, that is whether it is aimed for example at tourism, wildlife or timber production. Moreover the evidence also suggests, not surprisingly, that different visitor types have different preferences when it comes to forest sites (Englin and Mendelsohn, 1990; Hanley and Ruffel, 1993; Brainard et al. 1999).

Secondly, the findings suggest that it is the relative as much as absolute level of certain attributes that is important. For instance both Hanley and Ruffel (1993) and Englin and Mendelsohn (1990) find that several forest attributes have satiation levels, below which the attribute is good but above which the attribute is bad. For example, people currently drive to avoid clear-cuts, but if management practices caused the number of clear-cuts to approach zero, people would drive to see them. This needs to be borne in mind when estimating the marginal effects of new forest on the total level of forest-related expenditures.

Finally, Hanley and Ruffel (1993) found evidence that it is, in fact, visitor *perceptions* of attributes that are important, for instance their own personal rating of say a view and how good they felt certain visitor facilities were. Importantly, what visitors perceive of a particular forest may be quite different from what the data indicates about a forest. For example, a forest may be 95% Sitka spruce, but if the area around the car-park was predominantly made up of deciduous trees, and people did not stray far from their cars, their perception of the forest may be quite different from the reality.

**RECOMMENDATION**

Given the findings of previous studies, we suggest that if Phase 2 of the study is to be split into three country studies, the attributes considered in each study should be allowed to differ to reflect differences in forest types between the areas. At the same time, however, it should be recognised that for statistical reasons, the number of attributes that can be included in any one study will depend on the number of sites being investigated and sample size. Further, given that visitor perceptions are important, attention will have to be given to the way in which questions are framed (for example, rather than simply including a variable within the specification of the travel cost function relating to species mix, it is more appropriate to explicitly ask visitors how natural they think the forest appears). At the very least it would seem sensible to define attributes in ways that are easily interpreted (e.g. height of trees as opposed to species type). Finally it will also be important to cover a range of visitor types from forest enthusiasts to the more general visitor.

## 3.5 Locational aspects and aggregation of results to population level

The method used to aggregate findings to population level will clearly depend upon which approach is adopted in the survey stage of the analysis. However, the various methods for aggregation can be classified into two main types:

*Clustering approaches*

In their assessment of the value of recreation on the Forestry Commission estate, Willis and Benson (1992), clustered forests for sampling on the basis of the forests' quality and internal characteristics. The separate estimates of consumer surplus per visit for each cluster were multiplied by the number of visits per cluster to produce a cluster total. They then identify two means for aggregating to the national level: the estimated consumer surplus per visitor can be multiplied by the total number of visitors to the whole estate, or the consumer surplus per hectare can be multiplied by the area of the whole estate. This is also the method employed by Willis and Garrod (1991) in their attempt to measure total consumer surplus on inland waterways. Clearly, results from these methods will only be accurate if the sampled sites are typical of the population, in terms of proximity to population centres, the distribution of different visitor types, and quality characteristics. This is often not the case given the need to sample regularly visited sites. Roberts et al. (1999), in their study of the economic impacts of different forestry types, adopt a similar procedure of sampling forests according to their internal characteristics and then summing over the total area of each of these forest types.

*Benefit transfer methods*

A more accurate means of aggregating from sample to population level may be achieved by utilising combined TGFM and GIS techniques to model "benefit transfer" (Bateman et al. 1999; Brainard et al. 1999; Lovett et al. 1997). Benefit transfer can be defined as "adapting existing models or value estimates to construct valuation for resources that are different in type or location from the one originally studied" (Smith 1993).

In the study carried out by Bateman et al. (1999), an arrivals function for Thetford forest in East Anglia was estimated. Having ascertained visitors' journey origin, GIS maps to show the availability and quality of roads were over-layed with population maps. In this way an arrivals function was specified taking into account travel time and population for a variety of zones around the Thetford site. The authors were able to apply this arrivals function to forest sites in Wales, and when site-specific dummy variables were included (to take account of different recreational service provision, for example) the arrivals function was able to explain 98% of the variation in visitor numbers across forest sites. These results could be combined with visitor expenditure data as a means to aggregate from sample to population level.

Brainard et al. (1999) have further developed the benefit transfer approach in a number of ways to explain visitor numbers at FC sites. Of particular interest for the purposes of this study was the fact that Brainard et al. were able to gain more accurate results by splitting visitors into two categories- those travelling from home and those travelling from a holiday base. An advantage of using GIS methods when aggregating to the population level is that the analysis can give some indication of the extent to which the expenditure generating capacity of forests varies by location, i.e. to what extent regularly visited forests close to population centres compare with forests far from population centres visited predominantly by overnight tourists. Given that one of the aims of the study is to investigate the importance of the location of forests in terms of generating forest-tourism expenditures, the ability of using GIS methods to allow for such considerations is important.

Brainard et al. then compared their estimated figures for visitor numbers at forest sites with the official counts provided by the Forestry Commission. Given the uncertainty and different methods employed in the Forestry Commission data, Brainard et al. aimed to predict visitor numbers to each site within 25% of the official counts. The results indicate that their method can predict visitor counts

within 25% of official counts for about half of all sites. However, for a third of sites their results over or under-estimated official figures by more than 50%.

**RECOMMENDATION**

The methods employed by the benefit-transfer approach provide estimates that are methodologically much more appealing than the simple "adding-up" or clustering approaches. The benefit transfer methods could be further improved upon by categorising forests according to their relative size and level of amenity provision (larger forests with multiple recreation facilities are likely to have rather different demand curves than of smaller sites, Brainard et al., 1999). In addition, studies suggest that visit levels are likely to be more accurately predicted when socio-economic characteristics of surrounding populations are taken into account. Finally, analysis should recognise explicitly the existence and location of substitute sites, and GIS is a powerful tool in this regard.

# 4. Alternative methods for calculating the multiplier effects associated with forest tourism

Up to this point, the discussion has focussed on methods of estimating the total value of visitor expenditures that is associated with the existence and use of forests. The level of this visitor expenditure is a measure of the direct importance of forest tourism for the economy. This expenditure provides income for firms and businesses directly catering for tourist needs such as hotels and self-catering enterprises, restaurants, pubs, souvenir shops and leisure activities. However the same visitor expenditure also gives rise to multiplier effects for the wider economy both in terms of income and employment.

A key stage of Phase 2 of the study will be to quantify the magnitude of these multiplier effects and thus estimate the "full" contribution of forest tourism to the economy. Three alternative approaches are available for this stage of the study; Keynesian multiplier analysis, Leontief Input-output analysis, and CGE models. The advantages and disadvantages of each of these methods are considered below bearing in mind the remit of the study.

## *4.1 Keynesian multiplier analysis*

Keynesian multiplier methods were originally used to explain fluctuations in income and employment at a national level. However the same basic approach can be adapted to reflect regional and/or local circumstances. It has been used widely by regional economists to examine the local impacts of changes in economic circumstances, new industries or policies (Greig, 1971: McGuire, 1983; Harris et al.,1987; Armstrong ,1993; Crabtree et al. ,1999).

The basic idea of the Keynesian approach is that the total change in local gross income in an area associated with, for example, forest tourism**,** $\Delta Y_r$, is a multiple, $k_r$, of the injection into the economy, J* (visitor expenditures). That is

$$\Delta Y_r = k_r J^*$$

In principle, the use of Keynesian multiplier methods involves the estimation of the multiplier, $k_r$, where the main determinants are the local value added generated per unit expenditure, the average and marginal propensities to save, consume, and pay tax, and the marginal and average propensities to import into the local economy. Each of these determinants will vary between areas and, concomitantly, so will the magnitude of the multipliers. In general, the magnitude of the multiplier will depend on the size of economy under analysis, its remoteness, the degree of economic diversification and degree of integration between local firms. Multiplier values will also change over time in line with changes in technology.

In practice however, rather than estimating them, multipliers are often "picked" from the literature (for example, see MacKay Consultants, and Independent Northern Consultants, 1995) and, in some cases, adjusted in such a way as to better reflect the particular economy under analysis (chapter 9, Crabtree et al., 1999). To the extent that picking and adjusting multipliers is an arbitrary process, estimates of the indirect and induced income and employment effects using such methods should be interpreted with due care.[9]

[9] To give some indication of the usual range of multipliers associated with visitors sites of natural amenity value, the Money Generation Model (MGM) used to estimate the local economic benefits of parks, suggest that the multipliers usually range between 1.2 to 2.8 with an average value of 2.0.

Another important issue associated with the use of Keynesian multiplier methods is the estimation of the initial injection of expenditure into the economy. Previous studies have shown that it is critical that the injection is adjusted downwards to allow for injection leakages *before* calculating the multiplier effects of any type of impact to the economy. This is because, some of the gross injection may leak out of the area before it has an opportunity of stimulating any multiplier effects. Moreover, the size of direct leakages from an economy is a function of the type of expenditure. For example, visitor expenditures on travel costs to and from a tourist site are less likely to accrue to local businesses than expenditures on food and drink whilst at the site.

There are a number of multiplier studies around with respect to tourism, notably the Scottish Tourism Multipliers study 1992 produced by the Surrey Research Group which provides survey based information on multiplier effects generated in different types of locality and by different types of user. The Cambridge Model makes use of a number of individual business studies to derive similar information for a range of locations in England.

The fact that Regional Keynesian multiplier analysis has become a standard tool of regional impact assessment is indicative of the potential value of the approach. It is far less data demanding than input-output analysis (see below) and would be less restrictive when choosing the optimal scale of analysis for Phase 2 of the study. However, such methods, only provide an aggregate (that is, non-sectoral) picture of expenditure impacts. Moreover, in practice it often involves "borrowing" information from other studies on the behaviour of households and firms and is thus less rigorous that the alternative methods discussed below.

## 4.2 Input-output methods

Input-output methods have been used extensively to measure the multiplier benefits associated with timber production and harvesting (McGregor and McNicholl, 1989, Thomson and Psaltopoulos, 1993, Roberts et al. 1999, Munday, et.al, 1999).. The same methods can be used to measure the contribution to the economy of forest tourism. The fundamental idea underpinning input-output methods is that sectors in an economy are "linked" through the demand for materiel inputs the sales of intermediate output. It is these links or interdependencies that give rise to multiplier effects.

In algebraic terms, assuming n industries in the economy, the basic demand-driven input output model solves for the level of gross output in an economy, x, consistent with a given level of final demand , d, taking into account the inter-industry linkages and thus multiplier effects contained within the matrix $(I-A)^{-1}$ , where x and d are (nx1) column vectors and $(I-A)^{-1}$ is a square matrix of order (nxn):

$$x = (I-A)^{-1}d$$

Given that forest visitor expenditure is a source of final demand, d, the model can be used to estimate the impact on gross outputs in the economy (and subsequently income and employment) consistent with a given level of visitor expenditure taking into account the multiplier effects arising from inter-industry dependencies.

Importantly, unlike the Keynesian multiplier approach, the input-output approach can provide detailed information on the impact of the tourism on individual sectors. It can thus show the distribution of effects between different sectors in the economy, and with the appropriate disaggregation, the types of household and types of their employees most affected by a change in tourist activity.

Previous studies using input-output techniques to look specifically at tourism in the countryside have suggested that different types of tourists generate very different multiplier effects. For example, Slee et al. (1997) found that whilst visitors staying in hotels in the Badenoch and Strathspey area of the Highlands, Scotland spent the most directly, the pattern of expenditure by visitors staying in bed and breakfasts was such that it generated a higher level of local economic activity (and thus income and employment) per unit of visitor spend. The study thus highlighted a potential trade off between the total volume of visitor spending against the locally beneficial effects. Other studies have also

highlighted differences in multiplier effects between visitor types (Coppock, Duffield and Vaughan, 1981, Sinclair and Sutcliffe, 1984). In each case differences were explained to a large part by the differing expenditure patterns of the visitor types[10].

The main practical problem associated with adopting an input-output approach is that it is extremely demanding in terms of data requirements. In particular, it requires the existence of a complete, balanced and up-to-date input-output table showing the value of transactions between every industry in a particular economy (from which the multiplier matrix $(I-A)^{-1}$ is derived). The time and cost associated with creating such a table means that if an input output approach is adopted in Phase 2 of this study, the scale of analysis will be constrained to cases where there is an existing, recent input-output table. Tables are currently produced at the national level for Scotland, Wales and the UK as a whole. However no such table is available for England. Some Regional tables also exist for particular sub-national areas, for example, Grampian Scotland (Roberts, 2000), however it is unlikely that these areas are appropriate for the study in hand.

## 4.3 Computable General Equilibrium Models

From an economic modelling perspective both Input-output and Keynesian approaches share a number of weaknesses: In particular, both lack supply constraints, ignore potential substitution effects, and are insensitive to the time path of economic adjustments. In contrast Computable General Equilibrium (CGE) models are far more flexible and reflect more realistically the types of behavioural and technical relationships that exist within an economy.

It has been shown that except under certain limiting assumptions, Input-output methods tend to overestimate the magnitude of multiplier effects (McGreogor , Swales and Yin, 1996). This point has been illustrated by Aavalapati et al. (1998) who used both input-output and CGE models to assess the economic impact of forestry developments in Alberta. The results from the two alternative types of models differed with the CGE model giving generally smaller income and employment effects than the less flexible input-output framework. Also, unlike input-output estimates, the estimates of impact effects derived from CGE models were not unidirectional. That is, an increase in tourism could lead to a decrease in output of some sectors in the economy as the system re-adjusts back to equilibrium. The authors argue that the CGE approach has both advantages and drawbacks: Whilst it is undoubtedly a more realistic and flexible tool for policy analysis , it is very data-demanding (even more so than the input-output approach) and that for computational reasons the sectoral detail in such models is limited.

For the latter reasons outlined above, a CGE approach to estimating the economy-wide effects of forest tourism is beyond scope of this study. However, the suggestion that linear fixed coefficients methods such as Keynesian multiplier and input-output techniques may lead to an overestimation of the multiplier effects of visitor expenditure should be borne in mind.

**RECOMMENDATION**

Given the above discussion, we propose that Stage 2 of the Study adopts an input-output approach to estimate the multiplier effects of forest tourism and note that this means restricting the scale of estimation of the "full" contribution of forest tourism to the national level (Scotland and Wales). The problem of not having an input-output table for England means that a Keynesian multiplier approach would have to be adopted for this region

[10] On an analogous point, the recent forest multiplier studies carried out for the forestry commission found differences in the multiplier effects associated with planting maintaining and harvesting different woodland types arising form the different input expenditure patterns of each forest type (Roberts et al. 1999, Munday, et.al, 1999, PACEC, 2000).

# 5. Review of existing data

## 5.1 Forestry Commission Data

*Forest Visitor Surveys*

The Forestry Commissions' Forest Visitor Surveys provide information on a number of factors related to forest recreation in the UK. To date, there have been four FVS's, the most recent of which being that of 1998. Each FVS includes results from surveys completed at 30 Forest Commission sites- 10 sites are sampled in each of England, Wales and Scotland. However, the sites sampled vary somewhat between surveys, so there is potentially data for more than 50 sites across the UK.

Data collected by the FVS includes a number of factors relevant to this study, such as type of visitor, i.e. whether a visitor to a given site is a local, day-tripper or holiday-maker. The division of visitors into these types varies significantly between sites, from 1:2:97 at Kylerhea (Fort Augustus, Scotland), to 94:1:5 at Kincardine (NE Scotland) (1998 Survey). The FVS also collects data on the age structure of each visitor group, which could be useful if it emerged that different age group structures led to different expenditure levels or patterns.

The FVS's ask visitors what the main purpose of their visit is. Categories distinguished are: dog walking; other walking; cycling; fresh air/ exercise; watching wildlife/ birds; relax/ picnic; visitor centre; and other. Other information collected by the FVS's include the frequency of visit by each group to a given site, and length of stay at the site. This information could be used to assess relationships between site characteristics and visitation decisions, for example in a travel cost analysis.

There are however a number of difficulties posed when trying to use the FVS data for the purposes of this study. Most noticeably, there is the problem of aggregating the visitor number data up to country level: the FVS simply reports the results of the surveys, no information is provided on the proportion of visitors that have been surveyed, and there is no attempt to aggregate even to the individual forest level, whether that be over the period of the survey, (usually summertime) or over a whole year. However, if data on visitor numbers to particular forests could be attained from some other source (primary or secondary), the FVS could be used to calculate the proportion of those visitors falling into various different categories (according to visitor type, group age structure, etc.) This information could then be combined with data on the expenditure patterns of these different groups to calculate total expenditure due to each particular forest.

*Visitor Monitoring Trends Index Report*

The Forestry Commission collects data on visitor numbers to selected Forest Enterprise and other comparable sites in the Visitor Monitoring Trends Index Report. The Trends Index uses monthly readings from a number of sources: vehicle counters, pay and display ticket sales, pedestrian counters and visitor centre counters. The Trends Index includes data from some 80 "core" sites in the UK. These sites represent all those with a visitor centre and a representative sample of other FE sites. For some sites, data is available for all twelve months of the year, but for many it is not. Because of this, and the fact that different sites employ different visitor counting mechanisms, the Trends Index is used predominantly for assessing changes in visitor numbers to each site over time, and not for deriving accurate figures for comparing between different sites at a set point in time. However, the Forestry Commission do attempt to estimate total visitor numbers to Visitor Centre sites using Trends Index data, taking into account missing data and calibrating to estimate the number of people. Combining this with information from the UK Day Visits Survey, the Forestry Commission is able to estimate the total number of visitors to all Visitor Centre sites (broken down into England, Wales and Scotland) and other FE sites (again broken down into the three countries).

Visitor numbers to some non-FE sites are also collected from the publication *Visits to Tourist Attractions 1998*, which estimates visitor numbers for sites with more than 10,000 visitors per year. As with the FE sites, trends over time, rather than between sites, are the principle use of this data.

The Trends Index data could be used to assess the accuracy of a benefit transfer analysis, as in Brainard et al. (1999). The Trends Index data could also be used as a component of a travel-cost analysis, if combined with data on factors such as visitors' journey origin, their socio-economic status, etc. The FVS asks respondents to state their home post-code. This information could be potentially useful in a number of ways. It could be used as a mechanism for splitting visitors according to socio-economic characteristics. It could be combined with data on transportation mode (also recorded in the FVS's) to calculate a figure for expenditure incurred in getting to the forest site. Finally, it could be used to formulate a travel-cost visits function which could be used to aggregate results on visitor numbers from a few forests to country-level (for example by using a benefit-transfer approach).

*Expenditure data*

The Forestry Commission does not collect any data on expenditure by visitors to Forestry Commission sites.

## 5.2 The UK Day Visits Survey (UKDVS)

The UKDVS is a household based survey, conducted biannually (in 1994, 1996, and 1998). The aims of the UKDVS are to measure the extent, scale, and value of leisure day visits made by adults in the UK. Leisure day visits are defined as round trips made from home or work within the same day for leisure purposes. The data collected by the UKDVS is separable into England, Wales and Scotland.

Importantly for the purposes of this study, trips involving visits to woods and forests are distinguished from other visit types. Given that the UKDVS is a household survey, the question as to what constitutes a visit "involving" woodland or forest is left open to the interpretation of the respondents.

For trips involving visits to woods and forests, the UKDVS contains data on the average duration of trips (in hours), the mode of transport on each trip, the distance travelled on each trip, and a comprehensive breakdown of the main activity participated in on the trip. The UKDVS also collects data on the age, social grade, personal mobility and working status of visitors. All this could potentially be useful information if the sampling method employed involved attempts to aggregate detailed site-level primary data to the national level.

However, the most useful aspect of the UKDVS is that it records average expenditure patterns per visit. The expenditure categories distinguished are: fuel; fares; parking; admission; tolls; travel/entrance inclusive; alcoholic drinks; meals, snacks and non-alcoholic drinks; gifts and souvenirs; hire of equipment and facilities; and clothes. The UKDVS is thereby able to provide information on the annual number of trips involving forest or woodland, and the average expenditure per trip in each of the aforementioned categories. These categories, although fairly broad and aggregated in nature, would be sufficient for use in an input-output framework, to measure the multiplier effects of forest expenditures. However, the accuracy of the spend data is subject to question once you get down to regional level with surveys showing considerable swings at below national level for different regions between survey years.

UKDVS is currently being reassessed with a view to introducing improvements in the survey to come into practice in 2001. There will be no survey in 2000, so that the 1998 data will be the most upto date until mid 2002 at the earliest.

## 5.3 The United Kingdom Tourism Survey (UKTS)

The UKTS is a biannual household survey that provides information on tourism activity by UK residents. It does not specifically identify visits to forests and woodlands. The UKTS does however identify visitors to countryside areas although this may not be a good indicator of the number of trips taken to forest areas by holidaymakers since a substantial number of holiday day trips to forests may well come from urban as well as countryside locations. The UKTS also collects expenditure data in a similar manner to the UKDVS.

In terms of using the UKTS in Phase 2 of the study, some additional (primary) data to identify the proportion of UKTS visits that involve trips to forest and woodland would be required. Alternatively, the 1994 UKDVS included some survey information on day visits from a holiday base, which suggested that around 7% of all such trips involved visits to forests and woodland, and this figure could be taken as a rough approximation, avoiding the need for additional data collection.

The survey in its current form ceased in 1999. A new survey is operating in 2000 which we understand should produce similar information but it will not necessarily duplicate the existing data generated by UKTS.

## 5.4 The International Passenger Survey (IPS)

The IPS provides information on overseas visitors to the UK. A detailed breakdown of spending is not normally undertaken as part of this survey, although from time to time (1992/3 and 1996/7), expenditure data is compiled from a sub-sample[11]. Calculating the proportion of IPS visits that involve trips to forest and woodland is likely to be more problematic than in the case of the UKTS because the IPS does not even distinguish visits to the countryside from other visit types- instead the IPS records visitor numbers to local authority districts. Breaking this data down so that it was forest specific may therefore require some assumptions about the proportion of IPS trips made in each district that involve forest visits. These assumptions could be based on variables representing the extent and location of forest in each district, as well as some kind of notoriety index for each forest site. Alternatively, it might be possible to get a fix on the proportion of overseas visitors using forests by looking at the Forestry Commission survey data on visitor origins.

The expenditure categories identified in the UKDVS, UKTS and IPS are slightly different in each case, with 13, 9 and 16 expenditure categories identified in each survey, respectively. Some further aggregation or breaking down of data may therefore be required if data from the three studies is to be made commensurate. Another potential difficulty in combining data from these three surveys is that the years in which they were completed may differ. For example, the most recent version of the UKDVS was 1998, while the IPS exists for 1997, a year for which UKDVS data does not exist. Some deflation of expenditure data will therefore be required.

## 5.5 Other site attribute data

In terms of site characteristic variables, information on walking trail or bridle-way length at individual sites is not collected by the Forestry Commission. However, Hanley and Ruffel (1993) in their valuation of particular forest characteristics, collect data on: the mean height of trees; height diversity of trees; broadleaved trees as a percentage of all trees; conifer species diversity; the presence or absence of a water feature; and open space as a percentage of total forest area; for a selection of

[11] The IPS expenditure survey data does not show major shifts between survey dates in the breakdown of overseas visitor expenditure.

Forestry Commission sites. This research was originally published as a report to the Forestry Commission, and these indices are collected by the FC on a regular basis for individual sites.

In their benefit transfer study, Brainard et al. (1999) utilise data on site-specific attributes. However, they collected this data themselves from primary surveys. Data was collected on bicycle hire availability, the existence of a nature reserve, car-park capacity and the percentage of deciduous trees among other things. The fact that, while the authors used some Forestry Commission data but the information on site attributes was collected by the authors themselves suggests that the Forestry Commission data was deemed unsuitable in some way.

In terms of accounting for substitute sites when conducting a benefit transfer analysis, Brainard et al. (1999), and Lovett et al. (1997) identify three useful data sources. The ITE Land Cover Map of Great Britain gives the percentage of deciduous and coniferous trees in 1km grid-squares. The trouble with this data-set is that it involves land cover and not land use (i.e. some forests may have no recreational facilities). Alternatively, Whiteman (1995) asked respondents to more than 1000 interviews about the woodlands they had visited over a specific time period. Finally, there is the Bartholomew data-base, which more accurately identifies recreational woodlands, but suffers from the fact that it omits small woodland fringes on the edges of urban areas- these woodlands, while small, often provide substantial recreational opportunity.

Summary

The primary weakness of existing data sources is that (apart from FC sources and the UKDVS) they do not provide sufficient information on visitors specifically to forested area. Even in the case of the FC surveys and the UKDVS, there is insufficient information on visitors to specific forest sites which means that it is difficult to estimate the importance different site characteristics in influencing visitation rates. Moreover, none of the existing data sources can be used to help the importance of passive forest visitors. Although some expenditure data is available it is at a fairly aggregated level and, if it is to be used to estimate the injections into an input-output model, it will require some manipulation to place it one the same valuation and pricing basis as the data within the IO table.

# 6. Proposals for Phase 2

In this section, we propose four methodologies that could be utilised in phase 2 of the analysis. Options A, B, C and D are listed in ascending order of both their comprehensiveness and their financial cost, while Option E takes a relatively cheaper hybrid approach. For ease of exposition, we are assuming that analysis will be carried out at the country level (i.e. three studies relating to England, Wales and Scotland will carried out as part of Phase 2). In the case of options B, C, D, and E, where primary data is collected, it is important that the analysis controls for both seasonality and weather conditions.

Table 6.1 summaries the characteristics of the five options, and table 6.2 illustrates aspects of their financial cost.

## *6.1 Option A (Basic)*

***Method:***

Option A would utilise data from existing sources only and take a top-down approach to the analysis.

As discussed in Chapter 5, the UKDVS provides information on expenditures made by day visitors while on trips to forests and woodlands. To acquire similar data for tourists and international visitors would require some adaptation of data presented in the UKTS and the IPS. In the case of the UKTS, some estimate would have to be made as to the proportion of tourism trips involving visits to forest and woodlands. This estimate could be made in liaison with experts from the Tourist Boards or simply by accepting the figure of 7% given in the 1994 UKDVS. It may also be possible to incorporate a number of additional questions into the next UKTS, in collaboration with the Tourist Boards, that would be able to shed more light on this issue. In the case of the IPS, similar assumptions would again have to be made as to the proportion of visits involving a trip to forest or woodland. This may prove more difficult for the IPS than for the UKTS given that the IPS does not distinguish visits to countryside areas from other visit types, but simply records visitor numbers to local authority districts.

To calculate the total economy wide-effect of day visitors', tourists', and international visitors' trips to forests and woodland, the expenditure data must be combined. To combine data for the three visitor categories will require the expenditure figures to be deflated to a common year, and a "bridging" process to make the expenditure categories in each data source compatible. For Wales, Scotland, and the UK as a whole, the expenditure data can be fed into existing input-output tables to calculate the economy-wide effect of forest visits. For England, given the absence of published input-output tables, Keynesian multiplier analysis would have to be used.

***Primary data collection:***

Option A will require no additional data collection, but would require information and advice from experts from the Tourist Boards so as to identify, from UKTS and IPS information, the proportion of visits that involve trips to forests.

***Advantages:***

Option A would provide, at low cost and over a narrow time scale, an estimate of total forest tourism expenditure allowing for visitors from different origins who are likely to have very different expenditure patterns.

***Disadvantages:***

Because the UKDVS identifies trips that *involve* a visit to forests, it does not distinguish between forest-specific and casual visitors. Implicitly, it assumes that 100% of expenditure by casual visitors can be attributed to the existence of forests, and thus will overestimate the value of forest-related

expenditures. In addition, Option A ignores completely the expenditure by passive visitors that can be attributed to forests. Moreover, this method will not be able to provide any information on how site attributes effect visitation and expenditure patterns, nor what would be the economy-wide effect of increases in the area of forests, and how this effect may vary according to where forest expansion takes place.

## 6.2 Option B (Attribute-focussed)

***Method:***

Option B improves upon Option A in two ways: first, it is capable of estimating the marginal effects of new forest sites and the importance of site attributes in determining visitation rates; and second, Option B calculates the expenditure by casual visitors that can be attributed to forests.

The method would utilise the individual trip generating function method. A range of sites would need to be selected, primary data collection undertaken and analysis carried out (see below). The travel cost equation would be specified so as explain the number of visits to a site as a function of site attributes, visitor characteristics, and of course, travel cost and travel time. Separate equations would be estimated for forest-specific and casual visitors. The estimated equations would then be combined with GIS analysis to estimate the total number of forest-specific and casual visitors to forests at a national level. The influence of substitute sites should be incorporated into the GIS analysis. The most simple way of achieving this would be to introduce two variables to reflect the next most visited forest site, but the other techniques listed in section 3.1 should also be investigated bearing in mind their cost and returns. Expenditure per visitor would be ascertained with a face-to-face, on-site survey.

For forest-specific visitors, the predicted number of visits would be multiplied by expenditure per visit (the analysis would be able to distinguish between different expenditure patterns of visitors according to socio-economic characteristics) and 100% of this expenditure would be attributed to the presence of forests. The total number of casual visitors to forests, and their total expenditure, would be calculated in the same way. Casual visitor would be identified by asking them if they planned to come to the forest when they set out on their trip. The proportion of expenditure by casual visitors that could be attributed to forests would be decided from the results of the travel cost analysis (and according to the definition of "forest", recall discussion in Chapter 2). For example, if the decision by casual visitors to visit a forest tended to be influenced by woodland attributes, then a higher proportion of casual visitors' expenditure would be apportioned to forests than if their decision to stop was due to facilities such as play areas, toilets and car parks (again, this depends on the definition of "forest").

For Wales, Scotland, and the UK as a whole, the expenditure data can be fed into existing input-output tables to calculate the economy-wide effect of forest visits. For England, given the absence of published input-output tables, Keynesian multiplier analysis would have to be used.

***Primary data collection:***

To assess the role of site attributes on the visitation decision, sampling must take place at a range of sites with different levels of the attributes to be assessed. These "sites" need not be geographically distinct forests, but could be, for example, two different car-parks within the same forest. The survey should aim to collect data from as many sites as possible, but four per country would be a minimum. On site surveys would collect information on: visitors' journey origin; whether they were day trippers, tourists staying locally, or tourists staying outside the study area; visitors' socio-economic characteristics; whether they were forest-specific or casual visitors; and a list of their visit related expenditures. The survey should aim to collect at least 50 interviews at each site providing information on around 200 visitor parties (if four sites were sampled) in total.

If resources do not allow for sampling at multiple sites, the alternative would be to combine a travel-cost analysis at one site with a contingent visit survey at the same site (similar to the approach of Ward 1987). This would reduce the need for multiple site sampling but would bring all the associated problems of bias involved with the contingent visit approach into the travel-cost analysis. In addition, this combined method could only be used for assessing the effect of one site attribute, and this may not be useful from a policy point of view.

***Advantages:***

Option B is able to provide information on how site attributes effect visitation and expenditure patterns, and how these patterns differ between different visitor types. It would therefore be valuable for policy analysis, in that it could inform on issues such as: Would it be better to encourage forest expansion close to settlements or in remote areas? What kind of site attributes attract visitors, and which attributes have little influence on the visit decision? Option B also provides comprehensive information on the proportion of casual visitors' expenditure that can be attributed to forests, while the GIS methods used for the aggregation are explicitly able to incorporate information on substitute sites and displacement effects.

***Disadvantages:***

Option B does not take account of the role that forests may play in attracting passive visitors to a given area.

## 6.3 Option C (Tourist-focussed)

***Method:***

Option C would reliably estimate the proportion of expenditure that can be attributed to forests by forest-specific, casual and passive visitors. However, like Option A, it would exaggerate the contribution of casual visitors by not adjusting their expenditure to reflect the role of forests in their visit decision. Option C would also not provide such detailed information on the role of site-specific attributes as Option B.

The contingent visit approach would be used to capture the effect of passive visitors. A number of (non-forest) site surveys would be conducted to ascertain the role of forests in encouraging passive visitors to make the trip to the study site. This contingent visit survey could use a question based or photo-montage based approach. It is imperative that a wide range of outdoor sites are chosen for sampling, so as to reliably ascertain the role of forests in the visit decision. Having ascertained this, results would be aggregated to population level using benefit transfer techniques but in this instance considering total woodland coverage at a certain spatial resolution as opposed to visits to specific forest sites.

For calculating the expenditure of forest-specific and casual visitors, a basic individual TGFM would be employed within which visitation rates would be explained as a function of travel time, travel cost and socio-economic variables. However, rather than collecting data from a range of sites with different attributes, Option C would estimate a visits function based on sample work from one or two forest sites, and would ignore the role of forest attributes. This visits function would be aggregated to population level using GIS techniques and incorporating dummy variables for site attributes (i.e. site attributes would be allowed for to improve model "fit", but the analysis would not be capable of explicitly analysing the role of site attributes in driving the visit decision). A face-to-face survey would ascertain the expenditure rates of different visitor types. As previously mentioned, all expenditure by casual visitors would be apportioned to forests based on findings from the face-to-face surveys.

***Primary data collection:***

As with Option B, the travel-cost part of the analysis would require information on visitor socio-economic characteristics, visitor origin, and visitor expenditure patterns. However, only one or two sites per country would need to be assessed.

The contingent visit analysis would require a wide range of sample sites as the role of forests in visit decisions may vary significantly from one area to another. This questionnaire should also ascertain visitors' trip related expenditure.

***Advantages:***

This method takes into account the expenditure of all visitor types.

***Disadvantages:***

Option C is not able to ascertain explicitly the role of individual site attributes in influencing visitation and expenditure patterns. It could however be used to ascertain the impact on total forest expenditures under certain simplifying assumptions. The method of apportioning casual visitor expenditures is also likely to be less robust due to the fact that the TC function will not measure the influence of specific forest attributes.

## 6.4 Option D (Optimal)

***Method:***

Option D is the most comprehensive of the four proposed options. It would involve accounting for the role of site attributes using the comprehensive travel-cost approach as outlined under Option B. It would also reliably calculate the proportion of expenditure by passive visitors attributable to forests and forest characteristics. The proportion of expenditure by casual visitors attributable to forests would be calculated the same way as under Option B and C (i.e. using results from the travel-cost model), while the proportion of expenditure by passive visitors attributable to forests would be calculated using a contingent visit approach as under Option C.

***Primary data collection:***

Option D would require an identical travel-cost approach as outlined under Option B, and a contingent visit study as outlined under Option C.

***Advantages:***

Option D is comprehensive both in terms of its treatment of different visitor types and the assessment of the role of site attributes on visitation and expenditure patterns. It will provide the most accurate estimate of total visitor expenditures associated with forests and will also be capable of predicting in some detail the impacts of expanding the forest estate.

***Disadvantages:***

Option D is the most time-consuming and costly of the four approaches.

## 6.5 Option E (Option A plus case studies)

***Method:***

Option E would use the same methodology as Option A to calculate an approximate figure for the role of forests in generating economy-wide expenditure flows across the study area. In addition, Option E would aim to study two sites in each country to get some idea of the role played by site attributes in

generating expenditure flows, and also the role that forests play in generating expenditures where forests form a part of the landscape but are not a focal point for the visit. This case-study approach would not require the sampling procedure to be as detailed as under Options B, C, or D, and there would be no attempt to aggregate results from the case-studies to population level. Instead, the case-studies would be intended to shed light on some of the more pertinent issues addressed in this report, while not incurring the expense involved in estimating the role of forest attributes at a country level.

***Primary data collection:***

As with Option A, Option E would require no additional primary data collection insofar as calculation of expenditures due to forest specific visits is concerned- data provided by the UKDVS, UKTS and IPS would be utilised as before. However, the approach would require at least two case-study sites per country. One would be of specific forest sites, designed to shed some light on the role that forest characteristics play in generating expenditures, using the trip generating function method. The other case-study could be of outdoor sites of a more general nature, where forests form part of the landscape but are not the main motivation for the visit, using a contingent visit approach.

***Advantages:***

A reasonably accurate figure would be calculated for the role that forests play in generating economy-wide expenditures by visitors. In addition, the case studies would provide useful information on factors such as the role of forest attributes in driving expenditure patterns, and the role of forests in driving economy-wide expenditures in general landscapes. Because the sampling procedure does not have to be rigorous enough for aggregation, Option E is cheaper than Options B, C, and D.

***Disadvantages:***

The case studies simply provide an indication of the role of forest attributes in driving visit related expenditures. By not making an attempt to aggregate the results of these case-studies to population level, no firm conclusions will be able to be drawn about national-level issues, for example, the issue of the extent to which new forests are needed, where they should be located and what kind of attributes they should possess.

***Table 6.1 Characteristics of Options***

| | Alternative Proposals | | | | |
|---|---|---|---|---|---|
| **Characteristics** | **Option A** | **Option B** | **Option C** | **Option D** | **Option E** |
| Tourist-types covered | Forest specific | Forest specific<br>Casual | Forest specific<br>Casual<br>Passive | Forest specific<br>Casual<br>Passive | Forest specific |
| Tourist-types not covered | Casual visitors incorrectly estimated<br>Passive visitors ignored | Passive | | | Casual visitors incorrectly estimated<br>Passive visitors ignored |
| Attributes covered | None | All | Limited | All | All (but not at aggregated level) |
| Primary data required | None | On-site surveys at a range of sites<br>Data on: visitor type, visitor origin, socio-economic characteristics, expenditure | As option B, but fewer sites required for TGFM. In addition a CVA at a wide range of sites | TGFM as option B, CVA as option C | TGFM and/or CVA at small number of sites |

***Table 6.2 Sampling characteristics and costs of alternative options***

| | Alternative Proposals | | | | |
|---|---|---|---|---|---|
| **Characteristics** | **Option A** | **Option B** | **Option C** | **Option D** | **Option E** |
| No. of study sites per country | 0 | 4 | 3 for CVA<br>1 for TGFM | 3 for CVA<br>4 for TGFM | 1 for CVA<br>1 for TGFM |
| No. of interviews per site | 0 | 50 | 75 for CVA<br>200 for TGFM | 75 for CVA<br>50 for TGFM | 75 for CVA<br>100 for TGFM |
| No. of revisits for seasonality | 0 | 2 | 1 | 1 for CVA<br>2 for TGFM | 0 |
| Total cost (000's) | £10-15 | £45-55 | £55-65 | £75-85 | £35-45 |

## 6.6 Combining the results from country-level studies

Each of the four approaches outlined above could be applied at national level so as to reveal the contribution of forest-related tourism to England, Wales and Scotland separately. In terms of estimating tourist expenditure at the GB level, this could be calculated simply as the sum of expenditure from each country study regardless of the approach adopted[12]. However, in terms of calculating the multiplier effects at UK level and the potential impact of new plantations on forest tourism, it would be important to ensure that similar approaches were adopted in each separate study. This is due to the following two reasons:

i) One would have to take into account displacement effects between countries when estimating the marginal effects of new forests on tourist expenditures, (in particular whether a new forest in one country would displace visitor from existing forests in another country).

ii) There would be difficulties in estimating multiplier effects when no GB input-output table exists.

In effect, both are reasons why the total contribution of forest tourism at the GB level will not be a simple sum of the contributions at country level and why the marginal effect of new plantations at country level might exceed the marginal benefits at UK level.

Both problems are surmountable given (additional) information on patterns of visitor behaviour at UK as opposed to country level and either propensities (to allow for the estimation of multipliers) or multipliers themselves relating to the GB economy. However, it would be easier to ensure that results were compatible and could be aggregated if a single contractor as opposed to three separate contractors carried out the studies.

[12] There would, of course be differences in the accuracy and coverage of the results if, for instance Option A was adopted for Wales, Option D for Scotland etc.

# 7. References


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# Appendix A

## The STEAM and Cambridge models

The national surveys such as the United Kingdom Tourism Survey, the International Passenger Survey and the United Kingdom Day Visits Survey collect data at national level, and which can be disaggregated to regional and county level. However, the sample size is limited so that significantly increased levels of statistical error can arise at County level. Below County and Region level, the sample size is not sufficient to generate reliable estimates of activity.

In order to address the needs of local authorities and other organisations requiring local information below the Region/County level, a number of model approaches have been developed, of which the two leading versions are the STEAM and Cambridge models. Both models seek to generate a view of the volume and value of tourism activity within normally a District Council area, and the resultant impact in terms of jobs within the local economy. However, there are variations in the ways in which the models generate their estimates.

The STEAM model seeks to build up a view of local tourism activity by undertaking an audit of tourism accommodation capacity and an ongoing survey of the occupancy of such accommodation. From this information, the volume of tourist trips and nights using that accommodation is generated, and supplemented by estimates of similar activity using non-commercial accommodation based on available local information and national survey data. Day visitor estimates are built up based on locally available information including attendance at attractions and car parking data. A view of the economic impact is developed using data on employment from the accommodation survey, Census of Employment data and multiplier ratios derived from national and/or regional surveys. The approach attempts to deliver a view on activity within three months or so of the survey date, including seasonal variations derived from the occupancy and other local survey data. The approach does depend on carrying out local surveys and therefore involves an element of survey cost.

The Cambridge model approach utilises information from the national surveys at regional or county level, and distributes the trips and nights within the region or county based on the share of different forms of accommodation and population at the local level. Day visitor volumes are estimated on a similar basis using national data at regional level distributed by reference to the level of visitors at tourist attractions, countryside and coastal areas and activity in the service sector measured by reference to Census of Employment data. Having established a view of the value of visitor expenditure within the local area, the direct, indirect and induced employment affects are estimated on the basis of business surveys from a range of different locations in England. The approach is dependent on the publication date of the national surveys which normally involves a gap of twelve months or so, but the outputs are then consistent with the output at regional and county level of those national surveys. The approach does not involve local surveys in that the input data required is either taken from national surveys or is information held by the Regional Tourist Boards on local stock and use, although the model can be customised by undertaking specific local surveys.

Given the problems of measuring tourism activity through field surveys, the modelling approach is likely to provide as reasonable a view at much cheaper cost of the level of tourism activity and value at local level. However , neither model would claim to provide a definitive view of tourism activity but rather a best indicative estimate.

The models can in theory be applied to areas other than District Council areas, such as EU Programme areas or National Parks. As such, they could generate estimates of activity in “wider” forest areas which encompass settlements and tourism infrastructure, although the smaller the base then the less accurate any estimate is likely to be. However, neither model can produce useful information with regard to specific sites or defined forest areas that do not include substantial accommodation or population bases.

The only other interest in these model approaches is that they can provide estimates for District areas of tourist populations which might be used for any model involving generating estimates of forest visitors based on the attractiveness of the forest and the catchment area from which it is likely to draw visitors.