The economic impacts of wind farms on Scottish tourism

A report for the Scottish Government

GLASGOW CALEDONIAN UNIVERSITY

MOFFAT CENTRE FOR TRAVEL & TOURISM BUSINESS DEVELOPMENT

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Executive summary

1. Background and Approach

Over the last two decades Energy Policy has seen a marked shift towards renewables as part of the UK commitment to reduce green house gas emissions by 20% between 2000 and 2010. The policy was reinforced in November 2007 with a new target of 50 per cent of Scotland's electricity from renewables by 2020, and an interim milestone of 31 per cent by 2011. The 2011 target implies around 5,000 Megawatts of installed capacity almost double current levels. Given current technology and the time needed to plan and develop large projects such as storage hydro or offshore wind farms, the policy suggests a very significant increase in on-shore wind farms with associated impacts on Scotland's landscape.

Scottish tourism depends heavily on the country's landscape, with 92% of visitors stating that scenery was important in their choice of Scotland as a holiday destination, the natural environment being important to 89% of visitors (Tourism Attitudes Survey 2005). As part of the general policy to create a more successful country, with increasing sustainable economic growth, the Tourism sector has agreed a target of 50% revenue growth in the ten years to 2015

The potential problem is that many people find that man made structures such as pylons and wind turbines reduce the attractiveness of a landscape. It is logical to assume that reduced quality of an important feature could reduce demand to some degree which in turn may result in either reduced prices for tourism services or reduced numbers of tourists or both. Any loss of expenditure will lead to a reduction in economic activity and result in a loss of income and jobs.

However the tourism industry itself requires a reliable supply of electricity and climate change threatens radical changes to our valued habitats and wildlife, and may irreversibly alter the very landscape that visitors value so highly. Wind turbines are an established technology readily available in today's market place, able to supply electricity whilst reducing the effects of our energy usage on climate change. Sensitively located, renewable energy can also bring social and economic benefits to communities and to local businesses. Government is required to evaluate all the issues including landscape, tourism, security of supply, the impact of climate change internationally (which is indisputably large and negative), and the public financial support implicit in the renewable obligation of the energy industry. To develop appropriate policy requires an understanding of the significance of each of these elements.

In reality the discussion on any particular wind farm proposal is now almost always an adversarial debate, and opinions on the policy area of wind farms in Scotland have become polarised and founded on competing myths (of which some are, and some are not, founded in reality). This research sought to provide an evidence base on one contentious element of the decision, the impact on tourism in Scotland, and to assist decision making by identifying:

- The potential number of tourists that would be affected

  - Geographic Information Systems (GIS) were used to assess the number of tourists that may come into contact (accommodation in sight of wind farms or through exposure while travelling by road) with any of the projects that are built, already permitted, or currently in the process of applying for permission within the planning system.

- The reactions of those tourists affected by wind farms

  - this was established by carrying out both a large-scale internet-based survey of current and potential tourists' attitudes and values, along with nearly 400 direct interviews of visitor intentions at tourist spots located close to existing or proposed wind farms.

- The economic impact of those reactions

  - this was believed to result from two main sources. First, there may be a change in the number of tourists going to an area when a wind farm is constructed, and it should be possible to estimate the related change in expenditure (through the intercept survey). Secondly, the views from some accommodation will be affected by the construction of wind farms. Under certain assumptions, a fall in average willingness to pay for a "room with a view" results in a proportionate fall in the average price actually paid by the tourist. Consequently, any proportionate fall in expenditure on accommodation can be calculated (through the internet survey). Bringing together the two effects allows the estimation of the net economic impact at the local and Scottish levels.

Examining the three questions above is a crucial step in:

- Replacing myth with evidence
- Determining if there is a trade-off, for local communities and for Scotland as a whole, between energy and environmental benefits and tourism impacts, or
- Identifying the circumstances when there should be a general presumption for or against a development.

The initial step in assessing economic impact was to look to the experiences of other countries, by way of a literature review.

2. The Literature Review:

This aimed to provide the background and likely bounds for the final results, by reviewing, as comprehensively as possible, previous research on the economic impact of wind farms on tourism. The review examined some 40 studies in the UK and Ireland. In addition, to ensure international experiences were also covered, the review examined reports from Denmark, Norway, the US, Australia, Sweden and Germany. As part of the review a number of the more important studies on attitude and value change were also examined. The findings of the review can be summarised as follows:

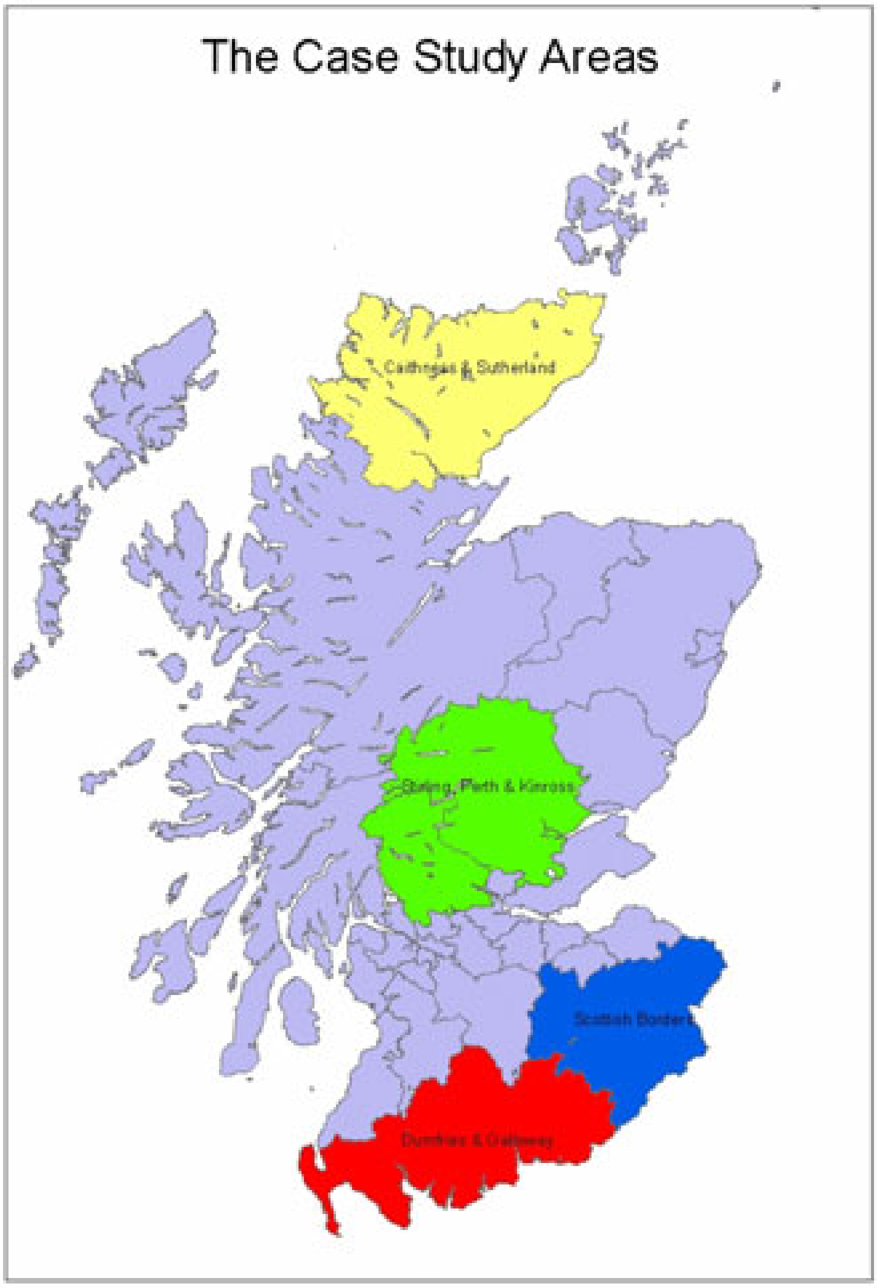
- There is often strong hostility to developments at the planning stage on the grounds of the scenic impact and the perceived knock on effect on tourism. However developments in the most sensitive locations do not appear to have been given approval so that where negative impacts on tourism might have been a real outcome there is, in practice, little evidence of a negative effect.
- There is a loss of value to a significant number of individuals but there are also some who believe that wind turbines enhance the scene.
- An established wind farm can be a tourist attraction in the same way as a hydro-electric power station. This of course is only true whilst a visit remains a novel occurrence.
- In Denmark, a majority of tourists regard wind turbines as a positive feature of the landscape
- Over time hostility to wind farms lessens and they become an accepted even valued part of the scenery. Those closest seem to like them most.
- Overall there is no evidence to suggest a serious negative **economic** impact of wind farms on tourists

3. Number of Tourists Affected

The research programme focussed on identifying the impact of wind farms on tourism in areas that depend heavily on the sector in the local economy, in addition to assessing the impact on Scotland as a whole.

The choice of which areas should be used as case-studies was made according to the importance of tourism and the landscape in those areas and the presence of wind farms either in operation or under construction. The locations for the person to person surveys were within four case study areas:

Caithness &Sutherland; Stirling, Perth & Kinross; The Scottish Borders and Dumfries & Galloway.



Not all tourists in an area will see a wind farm or stay in a room with a view of a wind farm[1] at a time when it is visible. The Geographic Information Systems (GIS) study was concerned with estimating these numbers.

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[1] "In view" was defined as four or more wind turbines in vision

The first element consisted of developing a Zone of Visual Impact (ZVI) for each wind farm that was identified as constructed, with permission for construction or currently under consideration after formal application. It did not cover those at the scoping stage or those that had been rejected. Summary table 3 shows the number of wind farms analysed in each area.

Summary Table 1: Number of Farms and Turbines Considered

	Constructed and Permitted		Applications		Total		
Area	**Farms**	**Turbines**	**Farms**	**Turbines**	**Farms**	**Turbines**	**%Scottish Capacity**
Caithness & Sutherland	6	60	8	125	14	195	4.4%
Stirling, Perth & Kinross	4	85	3	88	7	173	5.3%
Scottish Borders	7	157	6	217	13	274	5.4%
Dumfries & Galloway	8	134	10	246	18	380	8.2%
Total	25	436	27	676	38	1022	23.4%

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

Using these as a starting point, the following tourist numbers were identified:

Summary Table 2: Proportion of Tourists and Accommodation Affected

	Tourists		Accommodation[1]	
	Percent	**Vehicles (th)**	**Percent**	**Beds**
Caithness & Sutherland	81 %	64	9.83%	643
Stirling, Perth & Kinross	85%	1,088	13.20%	1515
Scottish Borders	91.60%	287	13.40%	932
Dumfries & Galloway	98%	1,887	32.40%	2946

The vehicle numbers include long day visits and transitory journeys by tourists. Thus the Dumfries & Galloway and the Stirling, Perth and Kinross figures are high because of their position on the major tourist arteries, the M74 and the M9/A9. In the case of Dumfries and Galloway the current situation is only a negligible fraction of the future position. Partly this is the result of the development of the Robin Rigg offshore farm and its impact on the holiday

[1] These figures are the total number of bed spaces in affected hotels. The number of affected bed spaces is assumed to be 50% of this total (back v front)

accommodation along the Solway coast. However the research also uncovered the apparent impact of new developments on views from the M74 which the research shows carries 80% of non-Scottish tourists into Scotland. Further investigation is required to confirm that the ZVI's undertaken for this project (which suggest substantial visibility) are correct, given some uncertainty about turbine location. Further work on the extent to which screening could or does reduce impact is also needed.

The importance of tourism in each if these case study areas is shown in summary table 3.

Summary Table 3 : The importance of selected tourist industries in each study area

	Total GVA £m	Horeca[1] GVA £m	%ge of total GVA	Total employee -jobs	Horeca employee -jobs	%ge of total jobs
Caithness & Sutherland	466	22	4.8%	16,000	1,590	9.9%
Perth & Kinross & Stirling	2,961	149	5.0%	99,500	10,600	10.7%
Scottish Borders	1,150	74	6.4%	42,100	3,600	8.6%
Dumfries and Galloway	1,661	70	4.2%	57,100	4,800	8.4%
Scotland	77,912	2,702	3.5%	2,391,000	174,000	7.3%

Together the case study areas cover approximately 12% of tourist activity and 24% of current or proposed wind farms.

4. General Attitudes of Current Visitors Towards Wind Farms

The person to person survey intercepted 380 tourists at locations that maximised the likelihood that respondents would have seen a wind farm during their visit (such as certain Tourist Information Centres or tourist hotspots such as Stirling Castle), and was primarily aimed at confirming whether the experience had altered the likelihood of a return to an area or to Scotland as a whole.

[1] Horeca is the 3 industry grouping Hospitality, Recreation Services and Catering. Although these are important recipients of Tourist Expenditure they incorporate substantial non-tourist expenditures and cover only half tourist expenditure, the other most important recipient industries being retail, fuel and transport. However together they provide a useful industry based comparative measure.

The findings in the four case-study areas included:

- In total, three-quarters of people felt wind farms had a positive or neutral impact on the landscape, of which:
    - 39 per cent of respondents were positive about wind farms,
    - 36 per cent had no opinion either way, and
    - 25 per cent were negative (including 10 per cent who were strongly negative).
- Compared to 10 other structures in the landscape (including pylons, mobile phone masts and fish farms) wind farms received the joint lowest number of "no impact" responses. It appears that opinions on wind farms amongst tourists are heavily divided relative to other structures with the majority of respondents (64%) offering either pro- or anti- wind farm views.
- The level of negative response to wind farms (25%) was the fourth highest of the 11 structures in the landscape upon which opinion was sought, behind pylons (49%), mobile telephone masts (36%) and power stations (26%)
- Overseas visitors seemed to be more positive about wind farms than domestic tourists.
- Interestingly, the proportion of respondents whose main activity was indicated as walking/hillwalking (where the landscape change is a major part of the experience) and who indicated a negative attitude to wind farms (19%) was lower than the overall figure of 25 per cent; and likewise they were also more positive (45 per cent versus 39 per cent).
- 68 per cent of tourists were positive about the statement "A well sited wind farm does not ruin the landscape" with a further 12% neutral
- 48 percent of visitors were positive about the statement "I like to see wind farms" with a further 24% neutral.
- Importantly, respondents that had seen a wind farm were less hostile than those who had not.
- The results confirm that a significant minority (20% to 30%) of tourists preferred landscapes without wind farms. However of these only a very small group were so offended that they changed their intentions about revisiting Scotland.

The internet survey of current and potential tourists (600 based in the UK, 100 from the US) also discovered that:

- The perception is that turbines are as prevalent in areas designated as areas of natural beauty as they are in other non-scenic parts of the country.
- Tourists are generally unaware of attempts to keep wind farms away from the most scenic areas.
- The youngest respondents (ages 16-25) in general appear to think that wind farms have less of an impact than potential visitors in other age ranges.
- A much higher percentage of respondents indicated that they would not visit an area if a wind farm was constructed (17.8%) than was found in the intercept survey. It should be noted that this result is less robust

than the estimate provided by the intercept survey and should therefore be treated with caution, as, unlike the intercept study, respondents were not made aware of what constituted the "local area". However, the result is indicative of the level of negative feeling some people have towards wind farms.

- As in the intercept survey, wind farms appeared to be more favoured by foreign tourists compared to UK visitors.
- Most individuals appear to prefer a landscape from the hotel bedroom without a wind farm (63%) but there is also a substantial proportion that is neutral (28%) and a few who positively like wind farms (9%). The size of the negative reaction is in marked contrast to the intercept survey result. It is believed that this reflects the difference between a transitory view when moving on a road, and a static longer lasting view from a hotel bedroom. For example seeing the wind farm at the Braes of Doune when heading north on the A9 generates some interest, even excitement, for a short (1 minute) period. Most people however, appear to believe that, from the hotel bedroom, it is better to face an open hillside, rather than a wind farm.
- There appears to be a diminishing marginal loss of value associated with increasing size of wind farms. In effect, it appears that once there has been an intrusion into the scenery, the effect on the value of the landscape of expanding the size is relatively small.

5. Effect of Wind Farms on Visitor Intentions to Return

The survey of visitor intentions at the four case study areas also sought to assess the likelihood of returning to the area and to Scotland in the face of further development. As expected the impact with respect to Scotland is far lower reflecting the substitution that will occur as tourists move to less affected areas.

Normally three return visit likelihoods were required from respondents based on three different visual situations:

1. Having actually seen the windfarm;
2. Having been shown a photo-montage of the local landscape before and after the creation of the existing windfarm;
3. Having been shown a photo-montage of the local landscape illustrating the existing windfarm and how the landscape would look if the windfarm was extended by 40%-50%

Under all circumstances, the vast majority (93-99%) of those who had seen a wind farm suggested that the experience would not have any effect. Indeed there were some tourists for whom the experience increased the likelihood of return rather than decreasing it. <u>The assessed change in likelihood combines both decreases (negative impacts) and increases (positive impacts)</u>

In the second case (no farm to current levels) the net result of these changes in intentions at both the area level and nationally is relatively small, and in almost all cases is not significantly different from zero in a statistical sense. However when the farm was extended respondents became significantly more negative. The extended development scenario at the area level shows a small but statistically significant (at the 10% level) fall of 2.5% in the likelihood of revisiting an area and just under 0.5% fall in the likelihood of revisiting Scotland.

The result at first sight seems to stand at odds to the result from the internet survey, where it appeared that once there was an intrusion into the scenery, the effect on the value of the landscape of expanding the size is relatively small. It is believed that this discrepancy may be explained by the difference between stated and revealed actions. The extended photos used in the intercept study were theoretical developments. Again those who did not like the idea of wind farms were given the opportunity to register a "protest vote" by threatening to withdraw if it proceeded. Because of the context this protest was far lower than in some other studies but it would appear to exist. Consequently it is our view that the identified change should be viewed as the maximum response that might be expected.

The resulting impact on gross expenditure is summarised in summary table 4

Summary Table 4: Estimated Reduction in General Expenditure of Tourists by Area

Area	Tourists Affected%	Tourist Expenditure Reduction%	Tourist Expenditure £m	Expenditure Reduction £m
Caithness and Sutherland	60.75%	1.54%	£37.35	£0.58
Stirling, Perth & Kinross	51.00%	1.30%	£657.00	£8.54
The Scottish Borders	62.29%	1.58%	£175.00	£2.77
Dumfries & Galloway	67.62%	1.72%	£359.00	£6.17

A problem arises because although tourists can stipulate a likelihood of return that is fairly accurate, they do not know when that will occur and indeed are likely to underestimate the time. Even if the likelihood of return drops by say 20% as a result of wind farm development and that likelihood covers a five year period, then it will take five years before the total drop has occurred. The economic impact analysis thus reflects what might occur at an unspecified point in time when all developments and all outcomes have worked through the system.

6. Effect of a view of Wind Farms on Accommodation Expenditure

The main objective of the internet survey was to provide estimates on the proportionate drop in the expected revenues obtained by the owners of hotel, bed and breakfast or self catering accommodation if a property gained a view of a wind farm.

Because of supply inelasticity and the fixed to variable cost ratios, the reaction of hoteliers in the short term is to drop prices using special and "on the evening" offers. Thus in the short term, given the assumption that the demand curve is linear, the fall in demand (willingness to pay) for a "room with a view", results in a corresponding fall in the average price actually paid by the tourist. Consequently, the proportionate fall in tourist expenditure on affected accommodation can be calculated. When combined with the estimated proportion of rooms in an area affected by wind farm development (identified in the GIS analysis) estimates of tourist expenditure lost in the accommodation sector in each area can be obtained. The percentage change for each area is shown in summary table 5

Summary Table 5: Percentage Reduction in Accommodation Expenditure by Tourists

Area	Affected Accommodation%	Reduction in Expenditure %
Caithness and Sutherland	4.90%	0.48%
Stirling, Perth & Kinross	6.60%	0.65%
The Scottish Borders	6.70%	0.66%
Dumfries & Galloway	16.20%	1.59%

In the longer term, because the industry is competitive and normal profits are expected both currently and in the future, it might be anticipated that prices would move back towards current levels and the supply of rooms would contract. The hotels most vulnerable are expected to be those most affected by the wind farms.

7. Economic Impact

The economic analysis follows from three core pieces of information for each area and Scotland:

- The number of tourists affected
- The typical expenditure of these tourists
- The size and structure of the local economy.

Each study area consists of one or more NUTS4 regions (a NUTS4 region being a local authority or some division of it relating to an enterprise company area). In this case, Caithness and Sutherland, Dumfries and Galloway and the

Scottish Borders are NUTS4 regions, whilst the Stirling, Perth and Kinross area consists of two such regions corresponding to the local authorities.

Tourism statistics are often presented by tourist areas, most recently referred to as Network Offices. In the case of Dumfries and Galloway and The Scottish Borders these are identical to the Local Authority/NUTS4 regions. Perthshire Tourist Board Area covers the Perth and Kinross region but Stirling is part of the network office that covers Argyll, Loch Lomond, and Forth Valley. Caithness and Sutherland is part of the Highlands but has had a number of analyses undertaken at the NUTS4 level.

Estimates of tourist activity (number of overnights) by NUTS4 area were made using VisitScotland data complemented by the evidence submitted by local authorities to support Grant-in-Aid financing. Estimates of "long" day trips were made utilising the GB Day Visitor Survey supplemented by the Road Analysis undertaken as part of the GIS study, the National Travel Survey and a gravity model. Estimates of expenditure patterns for tourists had been made in a number of studies undertaken by the consultants over a number of years. No attempt was made to identify a specific pattern for those likely to be lost to a specific region. Together these estimates provide the expenditure by main category in each region.

The size and structure of the four local economies is provided by the Detailed Regional Economic Accounting Model (DREAM). This system is based on a 123 sector input output model for each NUTS4 region (NUTS3 in England and Wales) with inter-regional trade flows estimated by a constrained gravity model. In the case of Stirling, Perth and Kinross the two NUTS4 regions were simply combined. Because DREAM has to be consistent with published national totals, the Scotland model is in fact simply the latest nationally published input-output table.

The economic impact of changed expenditure can be traced through the system by identifying the expenditure that initially stays within the local economy (the Direct Effect) and then is spent by the receiving firms within the local economy (the Indirect Effect) or is spent by receiving individuals within the local economy (the Induced Effect). There is also uniquely in the DREAM model an estimate of the feedback effects from local trade. That is, a proportion of the expenditure spent on imports to region A from an adjacent economy in region B is then spent by that economy on goods and services from economy A (the Trade effect).

The proportion of tourist expenditure lost in each region as a result of wind farms was calculated by combining the results of the Intercept survey and the GIS roads analysis and applied to the estimated tourist expenditure in the region. The resulting change in expenditure was then fed into the DREAM model of the region to provide estimates of the employment and income (gross value added) lost.

The change (loss) in tourist expenditure in the accommodation sector was estimated by combining the proportionate fall in price of affected rooms, the proportion of rooms affected and the total expenditure on accommodation by tourists in the region. This was then input into the DREAM model and the impact on employment and income estimated.

The results at the area level are summarised in Summary Table 6.

Summary Table 6: Economic Impact of Wind Farms on Tourism

	Current Estimated Total GVA		Potential Reduction by 2015 due to Tourism Visits (vs. no wind farms)		Potential Reduction by 2015 due to Accommodation Spending (vs. no wind farms)		**Maximum** Total Reduction by 2015 due to Tourism Effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7=3+5)	(8=4+6)
	GVA £m	Jobs	GVA £m	Jobs	GVA £m	Jobs	Total GVA in all industries £m	Total jobs in all industries
Caithness & Sutherland	£466	1,590	£0.6	27	£0.1	3	£0.7	30
Stirling, Perth & Kinross	£2,961	10,600	£5.2	279	£1.1	60	£6.3	339
Scottish Borders	£1,150	3,600	£1.5	75	£0.2	6	£1.7	81
Dumfries & Galloway	£1,661	4,800	£3.0	200	£1.1	77	£4.1	277

It should be noted that

i. The estimate is based on all wind farms currently in operation, being constructed or with a current application submitted. Whilst it is recognised that success for all those at application stage is unlikely, it does not include other farms currently at the scoping stage that may be built.

ii. The figures are only the tourism impacts; they do not show other economic impacts of wind farms that may work to offset/reinforce these. These impacts may be particularly important in the Caithness area where activity in renewables is large and losses from tourism relatively small.

iii. Whilst most of these will be in Tourism related industries jobs and income in other industries will be lost due to the indirect and induced effects.

At the Scotland level any contraction in overall spending, including accommodation, has been taken into account by the contraction of tourist numbers. It is assumed that specific losses in accommodation in one area are likely to be offset by gains in other unaffected areas as existing spending is redistributed. In effect it is assumed that as "nice views" contract in one area they expand in another, in the short term by changes in price and in the long term by changes in supply.

Given this assumption the estimate of impact is confined to those who stated in the Intercept study that they would not return to Scotland and who were necessarily not domiciled in Scotland. Because of the impact of wind farms on the important tourist corridors, it is estimated that 95% of tourists to Scotland will experience[1] wind farms in the future. As before, the change in likelihood was combined with the proportion of tourists affected and estimates of total tourist expenditure in Scotland to give an estimate of expenditure change. In the Scottish case the DREAM model is the input-output table for Scotland, which is used to generate estimates of the direct, indirect and induced effects and the **Maximum** total impact on employment and income. For Scotland this is ***211 Full Time Equivalent Jobs*** (equivalent to 0.1% of tourism employment in Scotland) *equivalent to* ***£4.7m*** of **Gross Value Added** at 2007 prices.

The importance of substitution within Scotland should be noted; a bigger loss in Perth, Kinross and Stirling area than in Scotland as a whole is estimated. Part of this result is due to the exclusion of Scottish Tourists, who are assumed to continue to spend in Scotland. However this estimate is also dependent on the maintenance of areas without, or with very few, turbines.

Finally it is important to reiterate that this is a **worst case scenario** because

a) The research was based on reactions to the extended farms
b) The research assumed perfect visibility conditions
c) There was an upper bound of 100% to likelihood of return. One individual who indicated an initial certainty of return was given a101% likelihood but there may have been others also constrained. One option is that the constrained individuals would respond with increased frequency.
d) The intercept study possibly overstates the likely negative responses because they were based on hypothetical extensions and were out of line with the marginality findings of the internet study. It is believed that there is an inherent possibility of a protest vote against wind farms which is not matched by similar responses from supporters.

[1] Experience being defined as a view of at least 4 wind turbines at less than 15km for more than 1 minute.

e) There has been no attempt to estimate any possibility of an increase in likelihood of return if trips to wind farms prove to be a significant tourist attraction.

f) The development will happen over a number of years and both the market and tourists are likely to in part adjust to meet the new challenges.

8. Planning Recommendations

Every development is in some ways unique. Consideration by planning authorities has to include

- the distribution of the viable wind resource;
- technical and economic constraints to the viability of exploiting different wind speeds;
- electricity grid access constraints;
- protected areas;
- impact on wildlife
- Impact on local economy and community development
- Landscape character and visual amenity
- Historic environment

and the

- Impact on tourism

In general this research has found that the negative impact of wind farms on tourism at national level is small and any reduction in employment in tourism will be less than the numbers currently directly employed in the wind power industry. However the impacts in some local areas are important enough to warrant specific consideration by planning authorities. These should include the following:

- The number of tourists travelling past on route to elsewhere,
- The views from accommodation in the area,
- The relative scale of tourism impact i.e. local and national
- The potential positives associated with the development
- The views of tourist bodies i.e. local tourist board or VisitScotland

In many cases this consideration would be greatly assisted if the developers produced a **Tourist Impact Statement** as part of the Environmental Impact Analysis. The core of the statement would be the tourist accommodation and the number of tourists on roads within the ZVI. However in tourist areas the developer might also be expected to generate proposals to make use of the positive aspects of the development.

At the national planning level the research in this report identifies that from a tourism viewpoint:

- Having a number of wind farms in sight at any point in time is undesirable
- The loss of value when moving from medium to large developments is not as great as the initial loss. It is the basic intrusion into the landscape that generates the loss.

This suggests that to minimise the impact on Tourism very large single developments are preferable to a number of smaller developments, particularly when they occur in the same general area.

Finally this research found that, in general, the public did not recognise that some areas had been protected from development. Currently those tourists who do find wind turbines an objectionable presence are most likely simply to move to another area in Scotland. To ensure substitution opportunities it is important that areas are retained where turbine development is limited to supplying local needs in small remote communities, and indeed the wilderness nature of these areas publicised. Equally the research found some tourists positively attracted to wind turbines, particularly in quiet rural areas. The research suggests that there may be an opportunity to market these areas as “Green” and to view wind farm development positively. Of the case study areas only Caithness would appear not to be able to easily absorb the predicted fall in tourism employment and equally it is this area that has the greatest opportunity to promote itself as a centre for Renewable Energy.

9. Conclusions

This research has shown that even using a worst case scenario the impact of current applications would be very small and for three of the four case study areas, would hardly be noticed. The fourth, Caithness and Sutherland, has an extremely fragile economy with its largest, indeed dominant, employer disappearing. Renewable Energy offers an alternative but whilst business tourism would probably expand in the short term it would negatively affect those tourists to Caithness looking for scenery and tranquillity. It might well be argued that one answer is to utilise the strongly positive attitudes of some tourists and market the area as **the** region for Renewable Energy and seek to ensure farms are accessible and have information boards and centres.

The GIS work has shown that even large sites such as Dalswinton can have minimal impact on Tourism. Conversely the exposed nature of the Braes of Doune wind farm and its location on the most important tourist artery north of the central belt would appear to maximise the admittedly very limited negative reactions. The situation with the new developments along the M74 needs further investigation.

The research suggests that there is a need to make clearer to the general public that in some "scenic/wilderness" areas they will not see large commercial wind farms and that some other areas are positively marketed as green centres of renewable energy. In this context it should be noted that this research suggests that a few very large farms are better than a large number of small farms. A number of medium size farms dispersed in a relatively small area so that they become contiguous, is also not desirable. The current policy on cumulative effects should thus be maintained.

Finally this research set out to establish if meeting targets on renewables would significantly impact on the possibility of meeting tourism targets. Our overall conclusion is that the effects are so small that, provided planning and marketing are carried out effectively, there is no reason why the two are incompatible.

Study Team, Contact and Acknowledgements

The study team was:

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Initial Queries about the study should be addressed to

The Tourism Policy Unit, Scottish Government

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1 Introduction

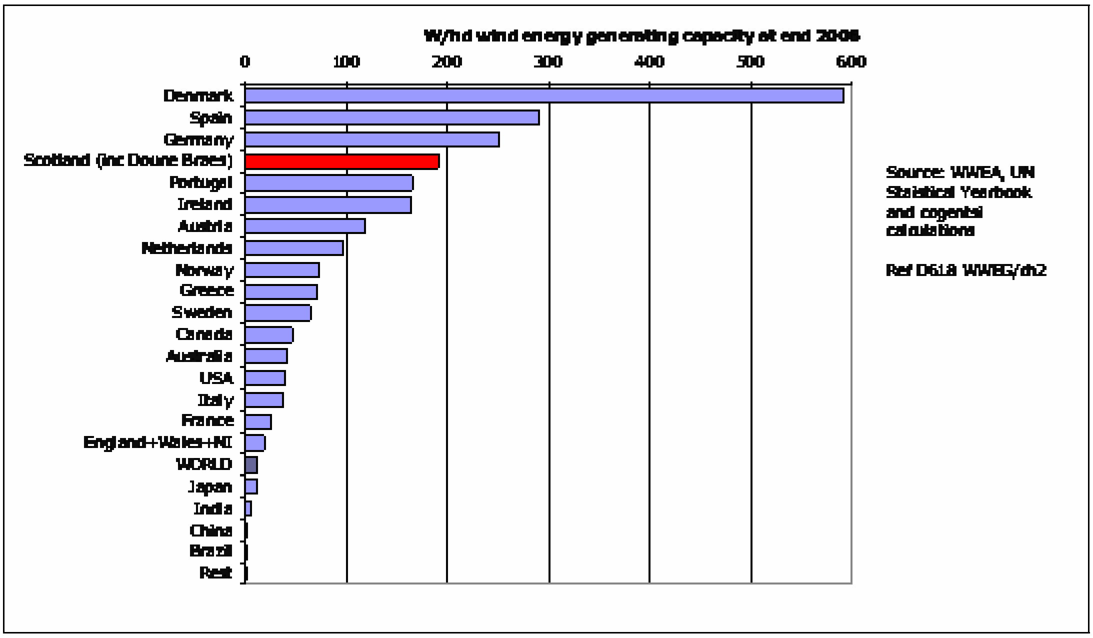
1.1 Background

Wind farms require wind. The map of UK wind speed distribution is almost identical to a topographic map of the country with a superimposed rim of higher speeds around sections of the coast. These areas often have little economic land use and remain beautiful wilderness areas of semi-natural land which are highly valued by tourists. It is no coincidence that our Designated Areas - National Parks, Areas of Outstanding Natural Beauty and many Sites of Special Scientific Interest etc are almost all within these pre-industrial landscape remnants. To many wind farms are unwelcome intrusions into Scotland's scenery.

The Scottish Government is mindful of its need to balance sustainable economic growth with environmental responsibilities, and ministers have, with broad support, made substantial commitments to carbon dioxide reduction and thus to generation without hydrocarbons. Despite its small size, if it were accounted as a separate country Scotland would be 13th in the world league for wind energy capacity, with just over a Gigawatt of capacity[1]. The United Kingdom has a large proportion of Europe's wind resource, and a large share of that is located in Scotland.

Per head of population Scotland has almost 200 W per head of population, against a world average of 12 W. On a per capita basis it would rank fourth in the world after Denmark, Spain and Germany.

Figure 1-1 Watts/ Installed Capacity



[1] World Wind Energy Association figures for end 2006, updated to allow for Braes of Doune wind farm inaugurated on 9 February 2007.

Scotland already has half of Britain's installed wind capacity, as well as more than half of its most beautiful scenery. The basic problem of location in a scenic area is exacerbated because efficient energy production and transmission requires very large turbines, spaced across a relatively concentrated location. The economic ideal for the wind-energy producer is a development involving a large number of turbines sited on exposed ground. In effect some large wind farm developments may industrialise large areas of wilderness or semi wilderness.

Tourists want scenery and tranquillity, and the recreational opportunities it offers. Uniformly, every nationality of visitor to Scotland sampled in the latest *Tourism Attitudes Survey* cites 'scenery' and 'natural environment' as the main attractions. In areas that by definition are unsuited for producing goods, and where there is scant local market for services, tourist spending generates income for the fragile communities that can just subsist. Tourism revenue underpins not just the people and businesses that provide bed and board, but many other local services. So **if** wind farms deter significant numbers of tourists, they threaten not just the local tourism industry but one element in the economic sustainability of the local community. On the other hand community based energy production can also play a role in sustaining remote or island communities.

The discussion on any particular wind farm proposal is now almost always an adversarial debate, and the policy area of wind farms in Scotland has become polarised and founded on competing myths (of which some are, and some are not, founded in reality).

Fundamentally this research seeks to provide knowledge of:

- The potential number that would be affected
- The reactions of those affected to these schemes
- The economic impact of those reactions

Examining the three questions above is a crucial step in:

- Replacing myth with evidence
- Determining if there is a trade-off, for local communities and for Scotland as a whole, between energy and environmental benefits and tourism damage
- Identifying when there should be a general presumption for or against a development.

More generally the objective of this research is to:

- Assist in the development of policy, particularly in those areas where tourism is an important part of the local economy
- Provide practical guidance on assessing the economic impact of wind farm developments and related infrastructure on tourism

- Identify how this assessment can be taken into account when considering sites for new developments

1.2 Research objectives

The original tender identified five objectives:

- Which parts of Scotland are most reliant on their landscape for tourism purposes? Which areas should be chosen as possible case studies?
- What are the principal characteristics of a wind farm development?
- What do the experiences of other countries tell us?
- What are the likely economic impacts of wind farms on tourism, across the range of scenarios/case studies?
- How can the results be generalised for use: in the planning system; and to inform tourism policy; and with what level of confidence?

Each of these objectives was clearly to be framed in the context of Scotland and the decisions that have to be made to create the growing sustainable economy desired. In addition to the objectives the tender document suggested three key challenges:

- Determining appropriate geographical areas and selecting case studies
- Valuing the economic significance of that part of tourism attributable to the visual surroundings – and how it would be affected by wind farm development. The economic effects need to be identified and measured at the local, Scottish and UK levels; as well as some measure and discussion of the way in which impacts at the margin may change as the number of wind farms grows.
- Generalising the results for use in the planning system.

Our proposal suggested a three level approach with increasing focus on specific wind farms and their impact. In discussion with the Steering Group and in the light of increasing knowledge as the research progressed, this approach has evolved. What has become apparent is that the key question to be answered is the **size** of any negative impact, which the literature review suggests might, on the one hand, be as little as zero (or even just possibly positive) or, on the other, as much as 30% of the tourist expenditure in an area. In the context of planning it is the **size** of the impact that must be central to the discussion. The research has consequently adopted a very quantitative approach even when the data supporting it may be questioned. We collect from our surveys information on activities and perceptions but the focus of our work is always the associated numbers. It should be understood that this approach is uncommon in Tourism research and, as far as we can tell, unique in tourism/wind farm research.

1.3 Structure of report

The report is presented in 3 parts:

- Introduction and Review;
- Methodology;
- Results.

Within Part 1, this first chapter outlines the research objectives and philosophy and discusses those affected and the case study areas. Chapter 2 then discusses the theory underlying Economic Impact Analysis and outlines the methods used to identify expenditure change and the resultant changes in employment and income. Chapter 3 then reviews the quite extensive literature, both domestic and international, on the impact of wind farms.

The methodology utilises four discrete steps:

- A survey of tourists to identify likely reactions to wind farm developments
- A GIS study to identify how many tourists will be exposed to wind farm developments
- An Internet survey of tourists in general to gauge the loss of scenic value from a wind farm development
- An economic modelling exercise that combines intentions, loss of value and tourist exposure with a study of the importance of tourism in each area in order to identify changes in tourist expenditure and consequently changes in employment and income.

Each of these stages may be seen as important pieces of research providing more information than is required for the impact analysis. Consequently in part 2 chaps 4, 5, 6 and 7 the methods used and the results from each are discussed in some depth.

Part 3 Chaps 8, 9, 10, 11 &12 are concerned with the findings for each case study area and for Scotland as a whole and each Chapter covers the following:

- The Local Economy and the importance of Tourism
- Wind farms: Current and Applications
- The Viewshed Analysis
- Tourist Travel in the Area and Numbers Affected

- Accommodation in the Area and Percentage Affected
- Estimated Percentage Change in Expenditures
- Economic Impact

Chap 13 draws together the findings and discusses the implications of those findings on planning policy in Scotland. There are two specific issues. Firstly it may be argued that tourism issues are so important in our local economies that they should be explicitly covered by planning policies and that an official tourist body ought to be a statutory consultee on planning applications. This is discussed further in Chap 13.

The second issue discussed is the size or agglomeration of developments and the evidence gained in the surveys hopefully provides guidance on this issue.

1.4 Defining the tourist

A major problem with tourism research is defining the tourist. VisitScotland defines a tourist as a non-resident who spends one or more nights in Scotland. This is then subdivided into four groups:

- Holidays
- Business
- Visits Friends and Relatives
- Other

The 2005 totals are shown in Table 1-1.

Table 1-1 Value and Volume of Scottish Tourism (2005)

	Trips		Nights		Expenditure	
	(m)	(%)	(m)	(%)	(£m)	(%)
UK Tourists 2005						
Holidays	9.45	63	37.7	70	2023	67
Business	2.53	17	7.3	14	681	23
Visits to Friends & Relatives	2.18	15	6.8	13	240	8
Other	0.71	5	1.8	3	62	2
Total	14.87	100	53.6	100	3,006	100
Overseas Tourists 2005						
Holidays	1.10	46	9.30	38	584	48
Business	0.40	17	2.80	12	217	18
Visits To Friends & Relatives	0.75	31	7.60	31	273	23
Other	0.14	6	4.63	19	133	11
Total	2.39	100	24.33	100	1,208	100

Significantly this definition does not cover day trippers who constitute an extremely important market for visitor attractions.

The national travel survey defines some 21 purposes as shown in Table 1-2.

Table 1-2 Long Distance (>50 miles) Journey Purpose

		Frequency	Percent	Valid Percent	Cumulative
Valid	Commuting	7749	12.3	12.3	12.3
	Business	10173	16.1	16.1	28.4
	Other work	132	.2	.2	28.7
	Education	514	.8	.8	29.5
	Food shopping	154	.2	.2	29.7
	Non food shopping	1727	2.7	2.7	32.5
	Personal business	222	.4	.4	32.8
	Personal business	8	.0	.0	32.8
	Personal business other	2897	4.6	4.6	37.4
	Visit friends at private	14799	23.5	23.5	60.9
	Eat/drink with friends	354	.6	.6	61.5
	Other social	2526	4.0	4.0	65.5
	Entertain/ public activity	3127	5.0	5.0	70.4
	Sport: participate	797	1.3	1.3	71.7
	Holiday: base	9840	15.6	15.6	87.3
	Day trip	4976	7.9	7.9	95.2
	Just walk	4	.0	.0	95.2
	Other non-escort	8	.0	.0	95.2
	Escort commuting	88	.1	.1	95.4
	Escort business & other	88	.1	.1	95.5
	Escort education	396	.6	.6	96.1
	Escort shopping/pers.	523	.8	.8	97.0
	Escort home (not own) &	1911	3.0	3.0	100.0
	Total	63013	100.0	100.0	

Day Trips typically are less than 50 miles to the local park, castle, museum or forest. In practice local visitors on day trips tend to dominate visitor attractions. Even if limited to journeys over 50 miles it is clear that Day Trips are an important element in the Tourism sector.

For the purpose of assessing the impact we have assumed that Business Tourism and short journey day trips will be unaffected by wind farm developments whilst VFR and Long Journey Day Trips will be affected.

VFR covers tourists with a range of purposes from offspring returning to the family home to long lost aunties looking for a cheap holiday in Scotland. It is not possible from available statistics to distinguish reasons for the visit and consequently all have been assumed to be holidaymakers and to have similar reactions to "ordinary" holidaymakers.

Similarly those visiting for reasons of sporting activity range from the totally unaffected (visit to Celtic Park) to the most affected such as long distance walkers. Again it is impossible to identify more precisely and sporting "tourists" are assumed to have the same response as normal tourists.

1.5 The selected case study areas

The selection of case study areas was based on the following criteria:

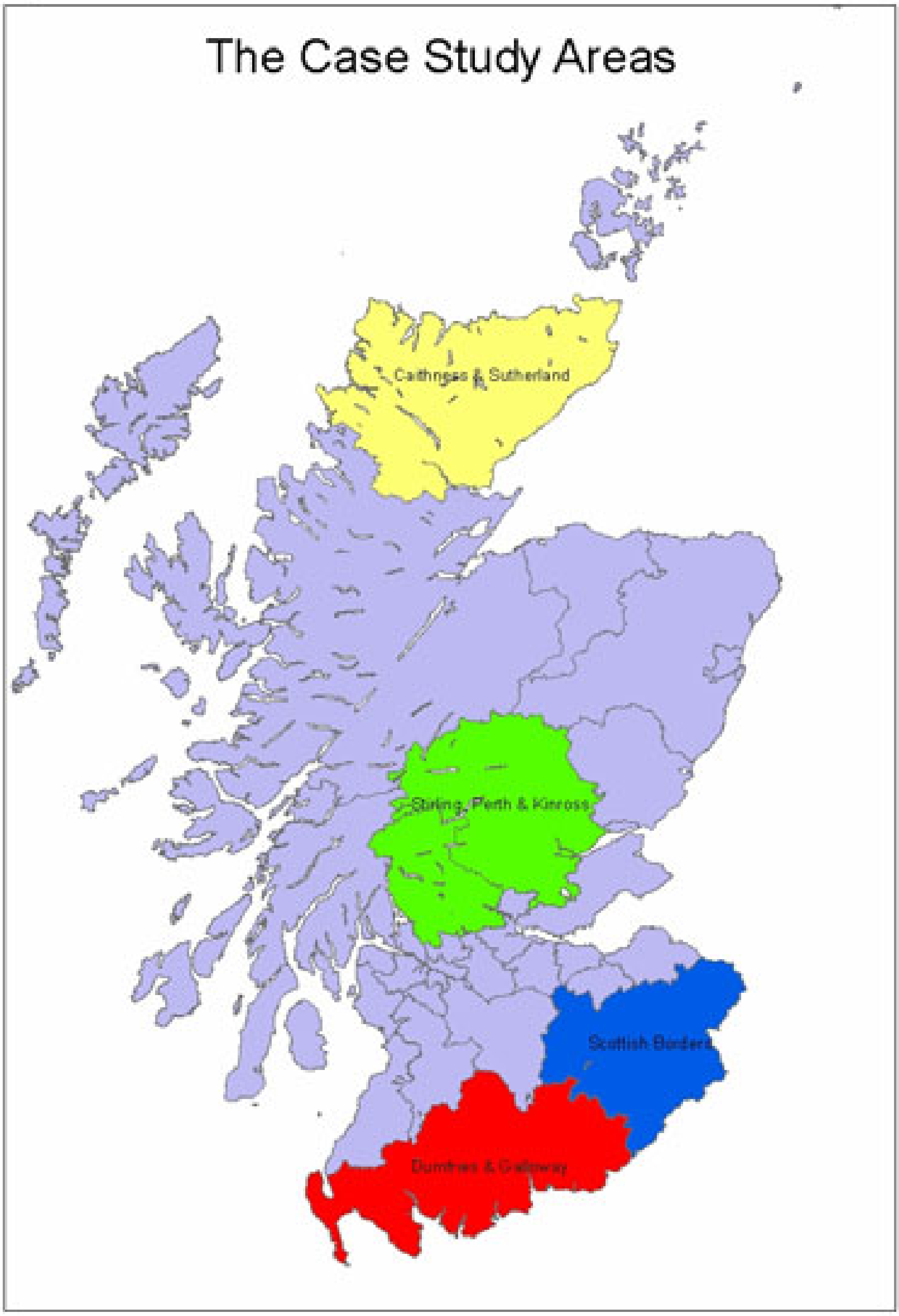
- Importance of Tourism in the area
- Significant number of actual or proposed developments
- Range of sceneries and characteristics
- Data availability
- Ability to identify appropriate intercept survey sites

We were also asked to avoid very controversial areas currently at the Inquiry or Appeal stage. After some debate the following areas were agreed:

- Perth, Kinross and Stirling
- Caithness and Sutherland
- Dumfries and Galloway
- The Scottish Borders

Smaller areas were considered but the absence of economic data precluded their use. The areas cover North, Central and Southern Scotland as shown in Figure 1-2

Figure 1-2Case Study Areas



Although not dissimilar in physical area and in the importance of tourism, there are substantial differences in Tourism expenditure. For comparative purposes these are shown along with the five biggest tourist economies in Table 1-3

Table 1-3 Tourist Expenditure in the Case Study Areas

Area	Expenditure £M	Percent of Scotland
Edinburgh	£1,064	14.45%
Highland (inc C&S)	£747	10.15%
Glasgow City	£703	9.55%
Argyll & Bute	£413	5.61%
Fife	£361	4.90%
Perth, Kinross and Stirling	£657	8.93%
Dumfries & Galloway	£359	4.88%
Scottish Borders	£175	2.38%
Caithness and Sutherland	£35	0.48%

The corresponding identified farms for use in the intercept study were:

- Braes of Doune (for Perth, Kinross and Stirling)
- Causeymire (for Caithness and Sutherland)
- Dun Law (for The Scottish Borders)
- Dalswinton (under construction in Dumfries and Galloway)

Initially we had intended to focus on a limited number of developments and model the visibility and physical impact in relation to such factors as area and height. However it became increasingly obvious that each development was unique and a general model would be hopelessly inaccurate. It was decided therefore to model all the developments in the area and create, for the first time, a combined ZVI. The number and characteristics of the developments in each area are discussed in Part 3 of this report.

2 Outline methodology

2.1 The estimation of expenditure change

2.1.1 Introduction

In chap 3 estimates of the total level of tourist expenditure in our chosen regions are given. Economic Impact occurs when the level of economic activity, normally in the form of a change of expenditure, changes. This section is concerned with the critical identification of the percentage of the expenditure that will be lost or gained as a result of tourists being negatively (or positively) affected by wind farm activity.

An Economic Impact Analysis framework involves an estimate of the economy before and after a specific event. Normally the "after" is immediately following the innovation but, particularly where activity is expected to grow, the "after" period could be any specific time in the future. The framework produces two time related problems. First, in the case of wind farm development, there is no single point but a continuing series of innovations. In addition there is no certainty about which developments will obtain consent and when they will commence. For the purposes of this exercise we have assumed:

- That all project with current applications will proceed;
- no other projects will occur;
- they will all be complete at an analysis point that has no specific time attached.

The second problem arises because whilst tourists can stipulate a likelihood of return that is fairly accurate, they do not know when that will occur and indeed are likely to underestimate the time. If the likelihood of return drops by say 20% as a result of wind farm development and that likelihood covers a five year period, then it will take five years before the total drop has occurred. Again to minimise problems of re-order distributions and biased time estimates the economic impact analysis is conducted at an unspecified point in time when all developments and all outcomes have worked through the system.

2.1.2 The Theoretical Framework

In this research we assume two models of behaviour relating to two distinct situations. Firstly we model the tourist travelling in Scotland enjoying the attractions and scenery. An unknown percentage of these will observe one or more wind farms and as a result, for these, there may well be a change in the likelihood of returning to the area. In effect there will be a shift of the demand curve.

It is worth noting that there is some evidence in the literature of positive impacts of attractions at a very localised level, probably as a result of their rarity (e.g. mountain biking, visitor centres, walking). The most obvious developments are information centres that offer an inexpensive wet weather destination to the holiday tourist. In addition large wind farms offer an extensive car free road network in the hills often with extensive views over the area. The Land Reform Act suggests such areas should be available to walkers and cyclists and could well be a tourist asset if properly promoted.

This report has not explicitly attempted to identify the potentially positive impacts of wind farms as a tourist attraction at the size of local area levels used in the case study areas; in part because the substitution effects are so substantial - if the tourist did not go to the wind farm they would go somewhere else instead. However this analysis if applied to any tourist attraction be it a bird sanctuary, a castle or a theme park, would suggest minimal economic impact. But the number, range and quality of attractions available in an area do have an impact and in complementing that package a wind farm centre might have an effect significantly greater than implied by a conventional impact analysis. Such an analysis would be of considerable interest.

However, we feel that our methodology goes some way to capturing any residual positive impacts that may exist after these displacement effects, as any tourist that feels that a wind far m m ight act as a tourist attraction could indicate an increased likelihood of return to the area under our questionnaire design.

The second model relates to accommodation directly exposed to wind farm developments. There are two extreme positions we can identify. In the first we assume that the supply of beds is fixed and the price falls due to a decrease in demand. This is likely to be the short term position. As discussed in section 2.1.6, this leads to situation where the drop in price is equal to the drop in the mean willingness to pay.

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In the alternative scenario we assume that the hotelier charges at a level that covers costs and normal profits and that these do not change with the view. Consequently if the value of the room falls we would expect in time the number of rooms available in the affected area to fall with price maintained. The expenditure change will be the result of change in sales and the accommodation model relates this change in sales to the estimated change in willingness to pay.

Particularly over the longer term, the concept of two discrete models, one for the travelling tourist and one for accommodation is far too simple. Any change in demand is likely to have an effect on prices charged and the average expenditure of tourists will inevitably include some of the affected accommodation expenditure.

Our estimates therefore have to be seen as indicative with a range which has a minimum given by travelling tourists only and a maximum defined by the sum of the accommodation and travelling effects.

It is acknowledged that the impact on some of those most affected such as long distance walkers, are not included in this analysis. Because the numbers and average expenditure of these groups are low we are confident that any negative economic impact will be extremely small. However, we do believe that this area is worthy of further study.

2.1.3 Forecasting the Numbers Exposed to Wind Farms

Wind farm developments only affect a proportion of tourists and an even smaller proportion of the accommodation. It would seem obvious that a key question relates to the proportion of tourists exposed and yet we were unable to find a single study that attempted to make such an estimate. In part we suspect this relates to the absence of appropriate skill sets in typical tourism and economic consultancies and the limitations of available data.

In appendix A we discuss in detail the use of the industry standard Arc-GIS software to identify the Zone of Visual Impact (ZVI) collectively for the wind farms in each of the study areas, the length of road in each of the ZVIs and the number of bed spaces within these areas. Appendix B discusses the data sources available for estimating the number of tourists on the specified roads and the classification of the whole of the tourist body into three classes; Unexposed, Medium Exposure and High Exposure. These procedures require a number of quite contentious assumptions and consequently we conduct, as with the expenditure effects, sensitivity analyses and a range of estimates.

The "order of magnitude" estimates that emerge from this process are, in our view, robust and extremely enlightening. As a result we believe that similar analyses should become a part of the planning process to provide objective measures of the local and tourist population affected and the impact on the tourist infrastructure.

2.1.4 Forecasting the Behaviour of Tourists Exposed to Wind Farms

Methods for forecasting behaviour are normally classified as either quantitative or qualitative. Although quantitative approaches are preferred (Scott Armstrong, 2003**)** they are dependent upon the existence of adequate relevant data for analysis. In this case any model would need to take into account factors such as exchange rate fluctuations, economic growth, demographic changes and even airport security congestion in order to identify any wind farm effect. In addition the detail of the data would need to match the detail of the impact. As an example we would need time series data for at least ten years on the specific areas of the Highlands affected by wind farms rather than for the Highland and Island Tourist Board area as a whole. The only quantitative study attempted was the Cornwall Tourist Board (2000) study and predictably no significant impact could be found. Any effect, if it existed, was effectively swamped by the other factors of demand.

The two appropriate qualitative methods are broadly Intention Surveys and Expert Opinion. Both have been used, sometimes together (e.g. System3, 2003). Scott Armstrong (2001) continually emphasises that qualitative approaches are subject to bias and that structure is fundamental to success. In his seminal 2 1985 work, he identifies Expert Opinion as possibly the most inaccurate (Scott Armstrong 1985). This relates, in part, to the surprising finding of research by Griggs(1958), Levy and Ulman(1967) et al that <u>experts forecast no better than trainees</u> and were more susceptible to bias and anchoring[1]. It is clear that surveys of the opinions of those involved in tourism are not likely to be as accurate as surveys of the intentions of tourists themselves. If the approach is to be considered then the construction of a Delphi group, covering all relevant disciplines, is likely to generate far more accurate forecasts. The Steering Group associated with this project would be a good example of such a group.

Morwitz (2001,2006) and Scott Armstrong et al (2000) examined the forecast performance of intentions surveys and the requisite conditions needed for accuracy. These were summarised in Scott Armstrong (1985) thus:

- Event Important
- Respondent has Plan
- Respondent Reports Correctly
- Respondent can fulfil plan
- New information unlikely to change plan

The most important type of trip from both the tourist view and in terms of expenditure is the summer vacation. This is important, is planned and is in control of the respondent. The information set is inevitably dependent upon the forecast horizon. As the horizon recedes into the distance unknown but significant events, such as births, deaths and marriages that affect plans are more and more likely.

The way the respondents report their intentions is important. Morwitz(2001) found that likelihood was more accurate that yes/no type responses. She also found that there was a consistent under-estimation of the time before the repeat event e.g. if the respondent was asked the likelihood of purchasing the good or service in the next five years then this corresponded most closely to the likelihood of purchase in the next seven. As discussed earlier this problem has been side stepped by locating the time point for the economic analysis at some unspecified time in the future when effects have worked through the system.

[1] Anchoring occurs when too much weight is given to early events. For example, when forecasting transplant success rates, a very experienced heart surgeon may well understandably take into account the very low success rates of the early years. In practice these are likely to be irrelevant.

Given that the conditions for accurate assessment are largely met this still leaves the question of how accurate. Assessment of accuracy is difficult because of problems such as time delays and dealing with likelihoods. Armstrong et al (2000) conducted a meta study comparing published intentions type forecasts with trend extrapolation and with a combination of both. Unlike Lee et al (1997) they found that intentions data significantly improved trend forecasts and if there was a choice intentions data might be preferable. For the telephone service they found the mean absolute error to be around 3%. This seems very acceptable. However we are primarily interested in change which may well be of the same order of magnitude[1]. Again we provide potential ranges of responses.

2.1.5 The Relative Effect

For each tourist subgroup j the intercept survey provides an estimate of the before and after likelihoods of return (r and s) under different levels of exposure k, r_{jk} and s_{jk}. We assume that tourists who have not previously been to Scotland, continue at the same steady rate. The percentage of the tourists in an area with high, medium and no exposure p_k are also known from the survey. Chap 3 gives the expenditure by each sub group x_j. Consequently we calculate the change in expenditure by $\Sigma\Sigma(r_{jk} - s_{jk})*p_k *x_j$. Table 2-1 and Table 2-2 illustrate the process

Table 2-1 Likelihood of Return Example

		% Likelihood of Return			Group Spend £m
		High	**Medium**	**None**	
Holiday	**Before**	80	80	80	£650
	After	60	70	80	
Long Day	**Before**	90	90	90	£350
	After	80	90	90	
% in Category		5	25	70	

[1] The accuracy of economic forecasts of GDP is around 1.5%. This seems extremely good except it gives a range for growth typically between 1% and 4%; rather less good.

In the table above the likelihood of return for the two types of tourists, holiday makers and those out for a long day trip are identified when they had high exposure, medium exposure and no exposure. As we would expect the no exposure likelihoods are always the same. The total spend for each group in the area is also given.

To obtain the second table we multiply the difference between the likelihoods in each category by the percentage of the group in that category and the expenditure of the group. For example holiday makers who had high exposure had a 20% fall in likelihood and high exposure occurred for 5% of the group. Thus we would anticpate a 20% * 5%*£650m =£6.5m fall in the tourist expenditure for holiday makers staying overnight who had high exposure to wind farms.

Table 2-2 Assessment of Expenditure Example

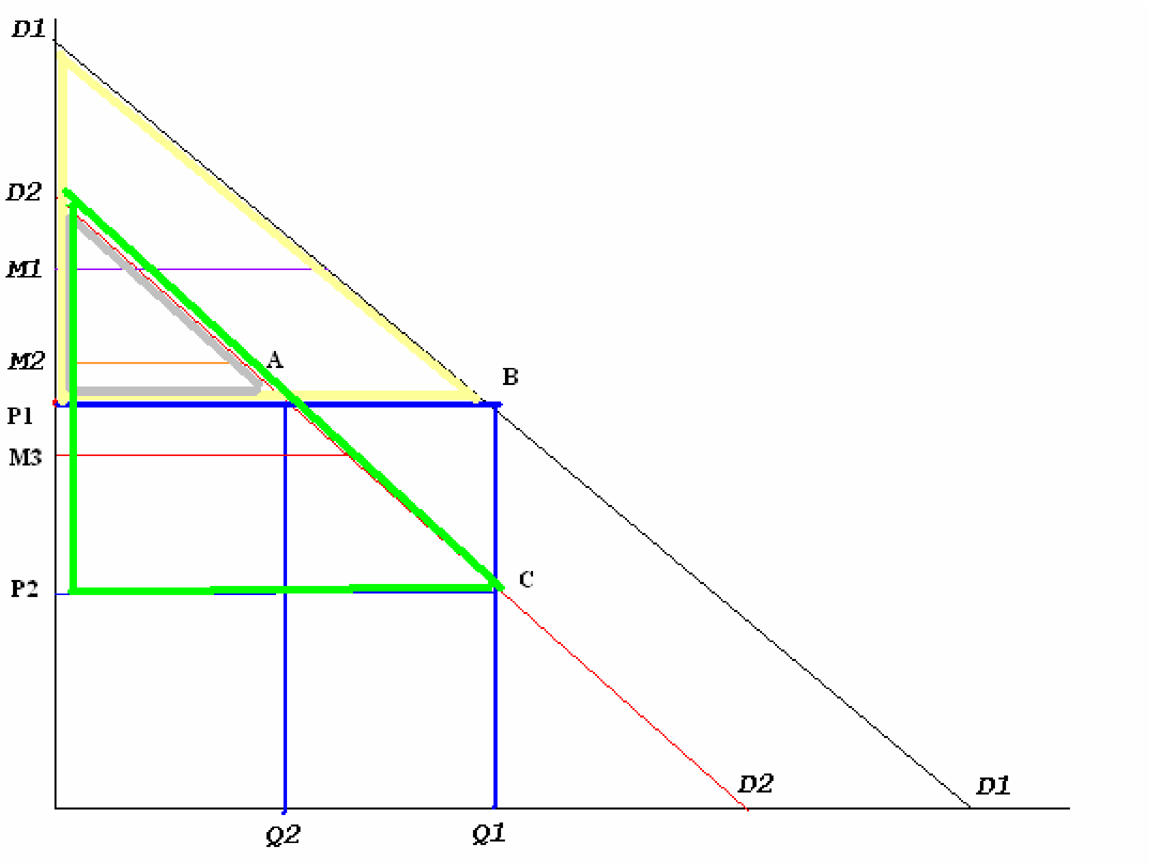
	High	Medium	None	Total £m
Holiday	6.5	16.25	0	£22.75
Long Day	1.75	0	0	£1.75
Total	**8.25**	**16.25**	**0**	**£24.50**

This example leads to a total 2.45% reduction in expenditure. A critical factor in this example is the large number of tourists that are simply not affected by wind farms.

2.1.6 The Change of Expenditure in the Accommodation Sector

It is clear that individuals value the scenery and the introduction of "industrial" infrastructure, be it wind turbines or other large metal structures such as electricity pylons or masts, reduces that value. There has been a long tradition of assessing the change of value by examining the change in willingness to pay. Figure 2-1

Figure 2-1



Assuming the demand for a room is linear and in part dependent upon the scenery and is given by the Demand Curve D1. At a given price P1 the consumer surplus is given by the triangle D1,B, P1. = ½ βQ^2 where β is the slope of the linear demand curve. From a sample of consumers the mean WTP extra would be M1-P1= ½ βQ_1 ie. β = $2*(M_1-P_1)/Q_1$.

The short term is represented by supply inelasticity (Q1) and a fall in price from P_1 to P_2 as hoteliers publicise special offers in a bid to fill the bed spaces. Given the constant supply the consumer surplus (represented by D2,C,P2) will be constant (=½ βQ_1^2) and the mean willingness to pay extra ($M_2 - P_2$) also constant. Thus

$$\boxed{\text{The proportionate change in expenditure } = (M_1-M_2)/P_1}\ .$$

In a similar way, in the longer term, supply contracts towards Q_2 and price moves back to P_1. In effect we would expect marginal suppliers, whose have dropped prices in an attempt to fill beds, to drop out of the market as requirements for investment in refurbishment become apparent. $Q_2 = 2*(M_2-P_1)/\beta$ and thus we obtain $Q_1-Q_2 = 2*(M_1-M_2)/\beta$. and the proportionate change in expenditure is given by $(P_1*(Q_1-Q_2))/(P_1*Q_1)$. Given $\beta = 2*(M_1-P_1)/Q_1$ we obtain

$$\boxed{\text{The proportionate change in expenditure} = (M_1-M_2)/(M_1-P_1)}$$

The before and after mean WTP is given by the Internet Survey and consequently we can assess the before and after (and percentage change) in accommodation expenditure in the affected rooms. Taking this percentage change, the percentage of rooms affected and the accommodation expenditure in the area we obtain an estimate of the expenditure change[1].

2.2 Economic impact analysis

The full effect on regional income and employment of each (gross or net) pound of the change in tourist expenditure depends, among other things, on what the tourist purchases and the strength of the direct effect, the indirect effects and the induced effects. These effects are briefly explained below.

The **Direct Effect** is simply the increase in local income and employment arising from the *initial* tourist expenditure. Through a combination of taxation and the purchase of supplies from outside, a proportion of this initial expenditure will be immediately lost to the area, and effectively can be ignored. However, a proportion of expenditure will remain within the area. It is this proportion which creates the direct effect. For example, the direct *employment* effect of tourist expenditure on, say, accommodation is simply the proportion of employment in hotels that is dependent on that expenditure. The direct *income* effect of accommodation expenditure is the wages and profits paid by hotels to local households.

It should be noted that some categories of expenditure have a minimal direct impact. For example, only about 5% of spending on petrol has a direct effect locally; 95% 'bounces off' through tax, duty and the purchasing of inputs from outside. If the only expenditure incurred from a day trip to a hill or forest area is the petrol at the local garage then the direct effect will be minimal. In contrast, accommodation expenditure has a strong direct effect. The composition of tourist expenditure is thus important in determining the magnitude of the direct effect on local incomes and employment.

There are **Indirect Effects** arising from the Direct Effect. For example a hotel may purchase butcher supplies locally. This supports the wages of the local butcher's staff, the butcher's own income from self employment and perhaps the rent charged by the shop owner. It also contributes to employment in the butcher's shop. These effects are known as the first round indirect effects. There are further indirect rounds to be considered. The butcher may purchase some of his supplies from a local abattoir, thereby supporting the wages of abattoir staff and the abattoir's profits. It also contributes to employment in the abattoir. There will be further rounds of, albeit

[1] Suppose the respondent states a WTP of £60 for a room before and £50 after and the room price is £40. In the short term the impact will be (£60-£50)/£40 =25%. In the long term it will be (£60-£50)/(£60-£40) = 50%. In the short term expenditure is maintained at the expense of the proprietors. In the long term this largesse disappears.

successively smaller, indirect effects. For example the abattoir may purchase livestock from local farmers, who in turn may purchase building services from local companies. The combined impact of the direct and all the rounds of indirect effects are modelled by what is termed "Type I" multiplier analysis. Among other things, this analysis would calculate the total Type I household income in the area (measured by Gross Value Added (G.V.A.)) and employment (measured by Full Time Equivalents (FTEs)) dependent on tourism..

As described, both the direct effect and every round of indirect effects increases household incomes in the area in the form of wages, profits, rents and income from self employment. Thus, the income of a diverse range of households will be increased as a result of tourist spending (e.g. hotel workers, hotel owners, butcher's staff, the butcher, butcher's landlord, the abattoir staff, owners of the abattoir, farm workers, the farmer, building workers etc….). In each spending round a proportion of these incomes are spent on locally produced goods and services, creating further local income and employment. This is the **Induced Effect**. "Type II" multiplier analysis incorporates these induced effects into the analysis, enabling the estimation of the corresponding Type II total income Effect (Type II GVA) and Type II total employment (Type II FTEs). In this report we only record the outcome of the Type II analysis.

The strength of the direct, indirect and induced effects depend on such things as inter-firm linkages within the regional economy, taxation policy, and the proportion of local income normally spent within the region. These parameters themselves will be dependent on the size of the region. Specifically, the smaller the area the less likely local business and retailers will purchase locally produced supplies (weak indirect effects). Also, the smaller the area, the less likely local households will purchase locally produced goods (weak induced effects).

In modelling the regional economy, this study is using the **Detailed Regional Economic Accounting Model** (DREAM®) developed by CogentSI. This model is described in chapter 7.

3 Literature review

3.1 Introduction

This chapter seeks to bring together evidence from the UK, Denmark, and, because of its similarities to Scotland, Norway on the economic impacts of wind farms. A brief mention is also made of the experiences in the US, Australia, New Zealand, Sweden and Finland. For the UK and Norway a key factor is that the evidence to date is based on a very limited number of wind farms and the relative rarity has possibly made them more of a tourist attraction than repellant.

The limited experience to date has meant that the number of published studies of actual, as opposed to projected, effects is limited. The limited evidence from Denmark is important in that it is based on a community which already has very extensive experience of wind farms.

In the UK the planning system, discussed in Chapter 13, has an important role. An environmental appraisal is required for all developments and where there is a significant negative impact on the environment the assumption is that the development will not be allowed. Given the assumed direct relationship between landscape and tourism, *ex post* findings of limited impact of wind farms on tourism could be taken as evidence of effective planning rather than evidence that wind farms in inappropriate locations or linked in a continuous band could not have serious negative effects on tourism

3.2 The UK

3.2.1 Introduction

One of the major problems of a literature review of studies of the impact of wind farms on tourism is that apparently important new information turns out to be existing evidence reworked to support a case either for or against a development. Typically developers or their agents report positive or no impact and minimise or disregard any studies which suggest an impact. Opponents, on the other hand, invariably select the limited number of studies that suggest a negative impact and ignore those that suggest none or positive impact. These include, for example written submissions to Select Committees or verbal accounts to Planning Inquiries. The following boxes provide some examples.

Written Evidence to: Select Committee on Welsh Affairs June 2005

Evidence by: Mynydd Llansadwrn Action Group

Evidence: 2002 Visit Scotland Survey

"Evidence from Europe suggest a 40% drop in tourism in areas where there wind farms. The 2002 VisitScotland Survey of visitor attitude showed that tourists avoid landscapes with wind turbines…. The effects of a drop in tourism will be felt most keenly in rural areas. Most tourists come to Wales to enjoy the peace and tranquility of the countryside and to engage in outdoor activities. Wind farms are incompatible with this type of tourism. The result will be fewer visitors to rural areas and, therefore, fewer tourism-related jobs in communities where employment opportunities are already very limited."

Verbal Evidence to: Griffin Forest Inquiry

Evidence by: Murdo Fraser MSP

Evidence:

"The tourism industry throughout Perthshire accounts for about 15% of all employment in the area. When tourism comprises such a large proportion of employment, it can be deemed as not only very important, but essential… The vast majority of studies I have come across, even undertaken within the pro-wind lobby, still arrive at the conclusion that wind farms could harm tourism"

Verbal Evidence to: InverCassley Inquiry

Evidence from: M.Mouat (Chair, Creich, Ardgay and Lairg Community Councils)

Evidence: Local Experience

"the grounds for objection were: tourism and the economy; .. Tourism and the local economy would be adversely affected as the unspoilt views would be lost and a niche market damaged"

The evidence base for the objectors in practice seems to be limited to the findings of the System 3 survey of 2002 for VisitScotland , a WITB survey (TMS,2003) and a customer "survey" reported in Strachan et al (2003) discussed in 3.2.4 The developers, on the other hand, working through the British Wind Energy Association, have presented extensive evidence collated by David Stewart Associates suggesting either a positive or no effect of wind farms on tourism. In May 2006 they presented a document on "**The impact of wind farms on the tourist industry in the UK" to the All-Party Parliamentary Group on Tourism (BWEA ,2006).** Attached to that paper is an annex listing the survey evidence available on the impact of Wind farms on tourism and this list forms the basis of much of the evidence base presented here.

3.2.2 England

Cornwall and South West have seen a considerable number of studies.

Aitchison (2004) found that **"** *93.9% of those surveyed would not be discouraged from visiting the area if there was a wind farm. Only 6.1% said they would be 'marginally' or 'strongly' discouraged from visiting, a higher percentage (7.2%) stated that they would be more encouraged to visit if there was a wind farm"*. Contrary to this, the Devon Marketing Bureau has apparently conducted a survey which suggests that visitors would be discouraged from retuning the area if there was a wind farm, however the survey has not been released for public view.

The Cornwall Tourist Board (2000) found that for the year's 1996 to 2000 wind farms did not alter the percentage of tourists returning for repeat visits. In 1996 79.6% of those responding to the tourist board questionnaire said they were returning to Cornwall, in 1997 the figure was 81.2%, in 1998 it was 80.1%, in 1999 it was 79.2% and in 2000 it was 81.5%.

An earlier study by **Robertson Bell Associates (1996)** found that *"Nineteen out of every twenty tourists (94%) say that the presence of wind farms has had no impact on the likelihood of them visiting North Cornwall again – the majority of the remaining 6% say that the presence of wind farms will actually encourage them to visit again with only one respondent stating that the wind farms will discourage them from visiting the area in the future."*

A contemporary study by **Nicholas Pearson Associates (1996)** reported that **a**nalysis of the visitor figures since 1991 to important tourist attractions within 10km of the Delabole Wind Farm showed no decrease in the numbers since the advent of the wind farm. Indeed there had been a marginal increase to some attractions including Tintagel Castle.

In Somerset the **Centre for Sustainable Energy, (CSE,2002)** carried out a survey in order to answer the concerns of a number of people in Brean, Sedgemoor about a proposed wind farm having a detrimental impact on the local tourism industry. Of the 331 people who were interviewed:91.5% said that the proposed development would make no difference to how often they visit the area, 3.6%said they would visit less often, 3.9% said they would visit more often and 0.9% had no opinion

Other key findings were:

• The majority of respondents supported wind technology, with a total of approximately 8 out of 10 in favour or strongly in favour of wind power

• Approximately 7 out of 10 respondents viewed the proposed wind farm as a positive development for the area.

The edges of the Lake District have seen some of the most vocal opposition and consequently, research.

Robertson Bell Associates (2002) carried a survey of local residents close to the Lambrigg farm and found that:

• 3% of respondents believed that the wind farm had caused a fall in visitor numbers;

• 11% believed in had caused an increase and the

• remainder felt there had been no effect.

This was then extended to cover visitors for the Lake District National park Authority which found:

• 87% of visitors either approved or strongly approved of wind power.

• 75% of respondents claimed that significantly more wind farms would make no difference to the number of times they visited.

• 2% of respondents claimed they would visit more often

• 22% claimed they would visit less often.

Campey et al (2003) were commissioned by the Friends of the Lake District to research the views of tourists and tourism organisations and businesses. Opinions were sought near three wind farms all situated on the borders of the Lake District National Park; Lambrigg, near Kendal, Kirkby Moor near Ulverston and the proposed development at Wharrels Hill near Bothel, Responses were collected from 143 tourists and 24 tourism organizations. Although small and possibly not statistically significant, these responses are worth noting given the location, the nature of the respondents and also the commissioning organisation, a group with a history of not viewing the development of wind energy positively.

Primary research found that over 80% of visitors and tourism organizations interviewed within the Lake District and Cumbria feel positive about renewable energy and wind farms. The three sites under investigation were found to have little or no effect on tourism within Cumbria and the Lake District. <u>The majority of visitors / tourists were not aware of the wind farms</u> under investigation and after being made aware they felt it would not impact on future visits. The majority of tourism organisations reported no effect on their business from the presence of an existing wind farm in their vicinity, nor did they expect any effect associated with the proposal for a new wind farm. The majority of visitors (75%) said that increases in the number of turbines in the next few years would not have any effect on them visiting in the future, <u>although 22% of visitors said that if the number of wind turbines increased considerably over the next few years, they would be discouraged from visiting the area.</u>

It is interesting to note that **the opinion of tourism organisations differ from actual tourists.** When asked how they would react if a wind farm were to be developed near them, the majority - 46% - said that they would have a negative reaction and only 21% said that they would react positively, compared with the 75% of tourists who said that increases in turbine numbers would have no effect on their visiting the area in future.

Amongst those that said they would react negatively were attractions and ramblers clubs. This is in keeping with their previous views towards wind farms in general. Hotels were also amongst those that had a negative reaction towards proposed developments near them. This contrasts with their positive opinions towards renewable energy and wind farms in general.

3.2.3 Wales

As a mountainous windy area with a large tourist industry Wales has had a number of studies undertaken. The earliest of these date back to the mid nineties.

ETSU (1994) examined the situation following the construction and 12 month operation of the Cemmaes Wind Farm in Mid Wales, They found that 62% of respondents thought that the wind farm should be promoted as a tourist attraction with 25% saying 'no' and 14% 'don't know'. The consensus of opinion was that 'people still believe that the wind farm is more likely to attract visitors than it is to deter them - even though the novelty value has more or less disappeared over the past year.' Moreover 92% of the respondents were 'not bothered' by the look of the wind turbines."

Chris Blandford Associates (1994) provides further evidence that local people feel wind farms are a tourist attraction. For Llandinam, Rhyd-y-Groes and Llangwyryfon Wind Farms, 65%, 59% and 49% respectively, of local people believe the wind farms would attract tourists.

Robertson Bell Associates (1997) surveyed residents close to the Taff Ely development and found that the majority of residents (68%) felt that the number of people visiting the area has not been affected, but of those who thought there had been some effect, many more say that visitor numbers have increased (15%) than have decreased (1%)."

David Stewart Associates (BWEA, 2006) also report on a thesis undertaken for the Wales Tourist Board (WTB) in 2001. The key conclusions of this study were:

• 96% of visitors would not be put off visiting Wales if more wind farms were be developed

• almost 70% would visit a wind farm if an information centre was built.

• There is not a large difference in opinion on wind farms between people that have seen a wind farm during their stay and people who have not.

• Most people believe that their contribution to renewable energy outweighs their impact on the landscape.

As a result of the findings by NFO in Scotland in their 1996 report they were commissioned by the Welsh Tourist Board to assess the potential 'Impact of Wind Farms on Tourism in Wales'.

NFO (2003) found that:

▪78% of all respondents had a neutral or positive view on wind farm development

▪21% had a negative view

▪ 68% would be interested in attending a visitor centre at a wind farm development

▪ 68% said it would make no difference to their likelihood to take holidays in the Welsh countryside if the number of wind farms increased

Amongst businesses and organisations the general view was that wind farms should be very carefully sited and not in areas which were deemed to be particularly sensitive to their development. There were variations in the explanation of what constitutes a 'no-go' area with some more explicit than others in their definition. Nevertheless, there was general consensus that they should be located outside of designated areas (e.g. National parks and Area's of Outstanding Natural Beauty, Sites of Special Scientific Interest) and in areas in which the visual and environmental impacts would be minimized.

Because no research in Wales (or elsewhere) has attempted to quantify the impact of wind farms on tourists, most respondents found it difficult to make any estimates of future impact. Amongst those that did provide an opinion most believed that the impacts of tourism were negligible, although these views are based on anecdotal evidence.

3.2.4 Scotland

Of the home countries Scotland has probably the most extensive list of studies of the best quality.

Hanley and Nevin (1999) conducted a detailed study of renewable energy options for the North Assynt Estate. The study is notable in both investigating the economic impact and in valuing scenic change using contingent valuation. Central to the study are the reactions of both visitors (tourists) and the small local community.

North Assynt is a remote community owned estate in North West Scotland that hosts 130 households in 12 townships. The options considered were:

- A three turbine wind farm
- A hydro-scheme
- A bio-mass plant

A survey of 76 visitors was undertaken using standard photo-montages of the likely appearance of the three schemes. Table 3-1 shows the percentage of people who stated they were more or less likely to return.

Table 3-1 Reaction of visitors to renewable energy developments in Assynt

	Wind	Hydro	Bio-Mass
More Likely	5.3	3.9	0
No Reaction	90.8	82.9	86.5
Less Likely	3.9	13.2	14.5
Net Effect	1.4	-9.3	-14.5

On the basis of tourist expenditure per head of £21.50 Hanley and Nevin estimate a fall of £2,590 for every tourist day lost; the impact would be very small even if it was negative.

The contingent valuation related to the drop/increase in value to the local community. Those in favour of the scheme were asked about their willingness to pay into a fund to ensure that the scheme proceeded. Those against were asked to identify the drop in electricity prices or the number of jobs that would need to be created for them to cease opposition. The results are seen in Table 3-2.

Table 3-2 Rating and WTP scores for energy options, residents' sample

Renewable energy option	Percentage in favour of scheme	Percentage opposed	Proportion of those opposed who would accept compensation[1]	Mean rating on Likert scale (1–5)	Mean WTP[2] of those in favour of scheme (per annum)	Mean WTP across whole sample (per annum)	Implied community WTP (per annum)[3]
Wind farm at Raffin	78	22	3/10	3.7	£87	£52.25	£13,585
Biomass schemes at Culkein/Stoer	42	58	7/26	3.2	£77	£25.54	£6,642
Small-scale hydro on Loch Poll	87	13	0/6	4	£77	£54.93	£14,282

Opposition to the wind scheme was wholly locational and based on loss of scenic value (and potential loss of tourist income). Of the 10, only 1 would accept a decrease in electricity price as compensation and another 2 would accept full time employment as adequate community compensation. It is not clear how Hanley and Nevin obtained the value for the whole sample but the figures presented suggest a mean willingness to accept for the opponents of £71. If we assume that the supporters are indifferent to scenic effects (some may have a positive WTP, some negative) then the mean value of the scenery would be £15.6 which is very similar to the values for scenery found elsewhere (see section 3.6).

One of the most quoted studies for opponents is the survey undertaken by NFO System 3 for VisitScotland (NFO System 3, 2002). For example even in New York State, Jones and Strauss-Jones (2007) write "*In 2003 the tourism board in Scotland released a 190 page report that completed contradicted the earlier BWEA survey. This new report concluded that 15% of tourists would definitely avoid areas with Wind farms and that an additional 10% would be less likely to return. Over 50% of tourists agreed that Wind farms spoiled the look of the countryside. The study concluded that plans for additional Wind farms would eliminate 4,000 to 6,000 tourism jobs, and result in $120M to $210M in lost tourism revenue.*"

The study does however have a number of detractors due to the methodology adopted.

The NFO/System3 (2002) study employed what they termed the "Hall approach.". In this methodology tourists are invited into a rented hall for a semi-structured in- depth discussion for up to 30 minutes on general issues. In this case the identified topic was the importance of scenery. One contentious point was the selection of only those who described the natural landscape and natural scenery as important to their stay. This excluded anyone visiting the area on business and visiting fiends and relatives, rather than because they were on holiday. In addition it eliminated anyone who was undertaking some activities not deemed to be landscape focused such as golf and fishing whilst including hill-walking, short walks, cycling, mountaineering and sightseeing.

A total of only 180 people were interviewed, a relatively small sample. Initially nobody identified wind farms as detracting from the enjoyment of the countryside.

Table 3-3

Developments/facilities which detract from enjoyment of Scottish countryside

Base: All respondents (N=180)

	Seen any wind farms in Scotland?		Type of visitor		Origin			ALL VISITORS
	Yes	No	Active	Passive	Scots	Other UK	Overseas	
Too much building work going on	6	8	7	8	8	10	3	8
Nuclear Power Stations	5	2	3	5	8	1	-	4
Fish Farms	2	3	1	4	4	-	5	3
Quarries	1	2	1	3	4	1	-	2
Lack of public toilets	2	1	-	3	4	-	-	2
Amusement arcades	1	1	1	1	3	-	-	1
Others	29	12	20	19	21	22	13	19
Nothing	51	71	64	59	47	65	80	61
Base (Total Interviews):	*82*	*89*	*70*	*110*	*72*	*68*	*40*	*180*

\- Nil respondents

Source: NOS 2003

The questioning then proceeded with increasing focus on wind farms and their appearance. At this stage 29% stated that wind farms detracted from their experience of the countryside, a not unsurprising result.

Table 3-4

Table 0-38 – 10: Wind farms and turbines (%)
Base: All respondents (N=180)

	Seen any wind farms in Scotland?		Type of visitor		Origin			ALL VISITORS
	Yes	No	Active	Passive	Scots	Other UK	Overseas	
Enhances experience	21	13	17	18	15	21	18	**18**
Detracts from experience	28	30	34	26	33	29	23	**29**
Neither	51	56	49	55	51	50	60	**53**
Seen in Scotland?								
Yes	85	31	56	57	67	56	40	**57**
No	15	69	44	43	33	44	60	**43**
Base (Total Interviews):	*82*	*89*	*70*	*110*	*72*	*68*	*40*	***180***

Having established that wind farms reduced the value of the scenic experience interviewees were then asked how they would respond to an increase of wind farms in the area, where area was left undefined. Indeed it is not clear if respondents were referring to a hillside that contained a wind farm or Scotland.

Table 3-5

Table 0-63 – Impact on further holidays in the Scottish countryside if the number of wind farms was to increase (%)
Base: All respondents (N=180)

	Seen any wind farms in Scotland?		Type of visitor		Origin			ALL VISITORS
	Yes	No	Active	Passive	Scots	Other UK	Overseas	
Would make no difference	70	54	63	63	56	65	73	**63**
Steer clear of the area	12	19	16	15	19	13	10	**15**
Less likely to come back	7	12	10	10	11	10	8	**10**
Depends on the area	6	7	6	6	7	6	5	**6**
Minimal impact	1	2	3	1	-	4	-	**2**
Other	1	2	1	2	4	-	-	**2**
Don't Know/Not stated	2	3	1	4	3	1	5	**5**
Base (Total Interviews):	*82*	*89*	*70*	*110*	*72*	*68*	*40*	***180***

As a result of the structure of the interview 50 people, who had not even identified wind farms as a problem at the start, eventually identified it as a serious enough threat to change planned behaviour.

Detractors (e.g. David Stewart Associates, 2006) believe that the combination of quantitative measures and in depth probing of underlying attitudes may have, unwittingly, led the interviewee into identifying a response because it appeared obvious that they should respond in that way. Perhaps the most notable point is that unlike every other survey not one individual was positive about wind farms.

The problem is that despite the flawed methodology the study does offer some proof of a potentially serious threat of wind farms to tourism. This finding is however mitigated by the responses of tourism organisations which were summarised thus:

'In summary, most respondents were of the view that as long as wind farms were 'sensitively sited' i.e. outwith designated areas such as National Parks and National Nature Reserves as well as those areas which are regarded as key tourist 'honeypot' locations then wind farms should have few negative impacts on tourists and tourism businesses. At the existing level of wind farm development in Scotland, the impacts of wind farms on tourists were felt to be relatively minimal.'

The Tourism Trade responses were similar:

'In general, the respondents tended to be more positive than negative towards the impacts of wind farms on tourism, although most of the views presented had a conditional aspect to them. A few could be said to be strongly in favour of wind farms and a similar minority three expressed views strongly against. The majority had more neutral opinions, where most of them tended to be in favour if certain conditions were met, regarding, for example, the siting and scale of new wind farms developments.'

A contrasting study in Argyll and Bute was carried out by **MORI (2002).** There were three large commercial wind farms in operation in the area at the time the survey was undertaken. More than 300 face-to-face interviews among tourists visiting Argyll and Bute were analysed. Interestingly, despite the presence of the farms, 3 in 5 of tourists questioned <u>were not aware of their presence</u>, and the majority - 71% - had visited areas close to the wind farms.

Respondents were asked about how wind farms affected the idea of Argyll as a place to visit:

- 43% said presence of a wind farm had positive effect
- 43% said made no difference
- 8% said had a negative effect

When asked about the impact on the likelihood of visiting Argyll in future:

- 91% said made no difference
- 4% more likely to return
- 2% less likely to return

As so many studies show there was strong interest in visiting a wind farm if opened to the public. If a wind farm had a visitor centre, 80% would be interested in going, with 54% 'very interested and 19% not interested.

The majority of tourists who knew about the wind farms came away with a more positive image of the area because of their presence.

Strachan et al (2004) discuss evidence produced in a short newspaper article in *The Aberdeen Press and Journal* on 28th May 2002. This concerned a couple who surveyed 100 people renting their cottages in Lochavich. They found that over 70% said they would not return to the area if the wind farm was built, and 68% said they would not visit Scotland if wind farms proliferated in the landscape. The validity of such a "survey" should undoubtedly be challenged but it is impossible to dismiss the broad finding; that some individuals might react so negatively to the intrusion of wind turbines that they might not return.

Busbridge (2004) also utilises the VisitScotland figures to argue that the impact on tourism in the Western Isles of the Lewis development would be serious. He points out that for island communities the opportunities for local displacement are limited. He reinforces his worries with evidence eventually presented in TMS(2005).

TMS(2005) were commissioned by the Western Isles Tourist Board (WITB) and surveyed the opinions of tourism suppliers in the area on the likely impact of the proposed wind farm developments. Of the 402 questionnaires posted 139 were returned a response rate of 35%. The responses covered the islands and business types proportionately and there is no reason to suppose significant non-response bias. Whilst 74% were in support of wind power developments on the islands in principle approximately the same proportion opposed the specific proposed developments on Lewis. The sample was then split into those defined as generally supportive and those adamantly opposed. Of the former group 50% believed there would be no impact on tourism and 62% disagreed with the statement that there would be a positive impact. It would appear that of this supportive group those who believe it to have a positive impact outweighed those who thought it would have a negative impact but the largest group thought they would have no impact.

The second set of questions were aimed at those who were opposed to wind farm development but seems to have been answered by some who were generally supportive. Table 3-6 shows the key table from the report. Even if we assume that all who did not answer disagreed with the statement two thirds of those surveyed would have agreed with the statement that wind farms "..will destroy the natural and visual landscape and **less tourists will visit**"

Table 3-6 Potential Dis-Benefits of Wind Farms

	Agree Strongly %	Agree %	Disagree %	Disagree Strongly %
They will displace leisure tourists during construction due to demand for accommodation by contractors	47	36	11	6
They will destroy the natural and visual landscape and less tourists will visit	70	18	8	4
They will a detrimental long-term effect on bird/animal life	55	23	18	4
They will not create the jobs and wealth as suggested	53	36	8	4
They will have a negative impact on my business	62	22	11	5

Hinton (2006) carried out a review of "**Wind Farm Public Attitude and Tourism Studies in Scotland"**. This covers VisitScotland data on tourism and the activities therein and most of the literature discussed elsewhere in this chapter. Of particular interest is the analysis relating the growth in wind farms to the growth/decline in tourism as shown in Table 3-7

Year	Scotland			England		
	Number of New Wind farms	No of UK visitors to Scotland	% change in visitors	Number of New Wind farms	No of UK visitors to England	% change in visitors
2000	5 = 34.8MW	18,980,000		6 = 22.2MW	140,430,000	
2001	4 = 47.5MW	17,500,000	-7.80%	3 = 14.15MW	131,900,000	-6.07%
2002	4 = 49.5MW	18,530,000	5.89%	2 = 2.1MW	134,900,000	2.27%
2003	2 = 4MW	16,500,000	-10.96%	3 = 10.25MW	121,300,000	-10.08%
Average			-4.29%			-4.63%

Table 3-7Comparison of Wind Farm Developments and Tourism Numbers for England and Scotland

As they point out has seen substantially more farms and even more turbines than England and yet has actually experienced less of a decline in numbers of tourists than England. The relationship is not significant and simply confirms previous statements about Cornwall; any impact is slight and submerged by other factors

3.2.5 Attitude, Attitude Change and Tourism Effects

Much of the evidence above suggests that initial opposition can mutate to mild support after construction. Braunholz(2003) led a survey by MORI of the Public Attitudes towards Wind Farms for the Scottish Executive. The survey was undertaken in the summer of 2003 and interviewed 430 people living in and around Scotland's operating farms at Hagshaw Hill in Lanarkshire, Novar in Ross-shire, Windy Standard in Dumfries and Galloway and Beinn Ghlas near Oban. 67 per cent of all respondents said there was something they liked about the wind farm and this figure rose to 73 per cent among those living within 5km of the farm. Prior to the development 40 per cent of respondents anticipated problems while only nine per cent experienced problems after the development; Only 14 per cent of respondents said they would be concerned if extra turbines were added to the farm. Although respondents were generally positive about the farms most felt they should be located in uninhabited areas and high on hills.

Warren et al (2005) review the attitudes to wind farm developments and identify the clear importance of open effective planning mechanisms. Surveys of public attitudes have frequently shown that large majorities of residents in areas with Wind farms are in favour of wind power, both in principle and in practice, and that positive attitudes increase through time and with proximity to Wind farms (Krohn & Damborg, 1999; Redlinger et al., 2002; SEDD, 2002; Elliott, 2003). As an example, in a survey of 1810 people living within 20 km of existing large Wind farms in Scotland, Braunholtz (2003) reports that three times as many people regard their local Wind farm as a positive feature than as a negative feature, with people living closest the most positive. An Irish survey of 1200 people found that only 1 per cent of the general public is opposed to Wind farms, that 84 per cent regard them as a good thing, and that most of those with direct experience of Wind farms do not consider that they have had any adverse impact on the scenic beauty of the area, or on wildlife, tourism or property values (SEI, 2003a). Survey evidence also indicates that people's viewpoints are critically influenced by the nature of the planning and development process: the earlier, more open and participatory the process, the greater the likelihood of public support (Birnie et al., 1999; Khan, 2003). In contrast, ''decision making over the heads of local people is the direct route to protest'' (Krohn & Damborg, 1999, p. 959). On this basis, Wolsink (2000) suggests that local resistance to wind projects does not focus on the turbines themselves but on the people (usually outsiders) who want to build the turbines. Because wind developments frequently occur in rural areas, they can inflame pre-existing rural urban tensions (Pasqualetti et al., 2002a), especially if locals are denied access to the process. Contemporary public attitudes, then, are shaped by a broad range of interacting influences, as explored by Devine-Wright (2005b). Key factors include local perceptions of visual and economic impacts, the inclusiveness of the planning process, social influences, and the political and institutional context.

The message is reinforced in the study of attitudes to the existing Dun Law (DL) and the then proposed Blackhill (BH) farm; support was more muted and opposition stronger for the new farm.

Table 3-8

	Strongly Support		Support		Neutral		Oppose		Strongly Oppose	
	DL(%)	BH(%)	DL(%)	BH(%)	DL(%)	BH(%)	DL(%)	BH(%)	DL(%)	BH(%)
Wind power in Scotland	55	55	35	22	6	16	2	0	2	7
Local wind farm	63	47	25	16	3	20	3	4	5	13

One surprising outcome of the research is shown in Table 3-9. Although the sample was very small, those who responded saw the farm as a positive rather than a negative tourism factor.

Table 3-9 The Perceived Positive and Negative Impacts at Dun Law

	% of responses	Number of responses
Positive impact		
Attractive feature in the landscape	34	13
Community funding	26	10
Intrinsic value	16	6
A local amenity	13	5
Tourist attraction	11	3
Total	100	38
Negative impact		
Unattractive feature in the landscape	44	7
Driver distraction	25	4
No local economic benefits (jobs, contracts)	25	4
Noise	6	1
Total	100	16

Warren et al (2005)

Another noteworthy fact is that almost twice as many people find it attractive as find it unattractive. Landscape values are, of course, notoriously subjective (Habron,1998; Devine-Wright, 2005a). 'Beauty is in the eye of the beholder', or, in the words of Krohn & Damborg (1999, p. 956), ''whether wind turbines spoil or enrich the scenery is a matter of taste''. However the research also found that the setting was extremely important and that the populace did not want wind farms in areas of natural beauty.

3.2.6 UK Conclusions

The evidence presented, although ambiguous in places, suggests the following:

1. There is often strong hostility to developments at the planning stage on the grounds of the scenic impact and the knock on effect on tourism. However the most sensitive of these do not appear to have been given approval so that where negative impacts on tourism might have been a real outcome there is, in practice, no evidence of a negative effect.

2. There is a loss of value to a significant number of individuals but there are also some who believe that wind turbines enhance the scene.
3. Over time hostility lessens and the farms become an accepted even valued part of the scenery. Those closest seem to like them most.
4. Even if there is a loss of value the effect on tourism in practice is extremely small. This possibly reflects the current limited nature of the exposure (e.g 10 minutes in a 5 hour journey) and, as mentioned earlier, the effect of the planning system preventing seriously adverse developments.

3.3 The Danish experience

3.3.1 Introduction

A review of tourist literature suggests that the general tourist perception of Denmark is of a green (in both senses), clean, well organised rural land with excellent sandy beaches, Legoland and "wonderful, wonderful Copenhagen". Wind farms are expected and accepted as part of the green image. An industrial landscape of smoking chimneys, coal tips and marching grid lines are absent.

As of January 2006, Denmark had wind capacity of 3,129 MW of which 423 MW were from offshore wind farms and numbers from 2005 show that wind energy accounts for 20% of the total production of renewable energy and 18.5% of the total Danish power supply. The wind power industry in Denmark employs around 20,000 people and in total makes a turnover ever year at over 20 billion Danish Kroner. (Energistyrelsen 2007e)

Figure 3-1 shows a map of the wind turbines in Denmark in 2006. The wind turbines with output over 1,500 kW are mainly offshore wind turbines or placed near the coast. The most common wind turbines in Denmark, counting for about 50% of the total output, are the ones with output of around 450 kW – 750 kW.

Figure 3-1 Wind Turbines in Denmark 2006

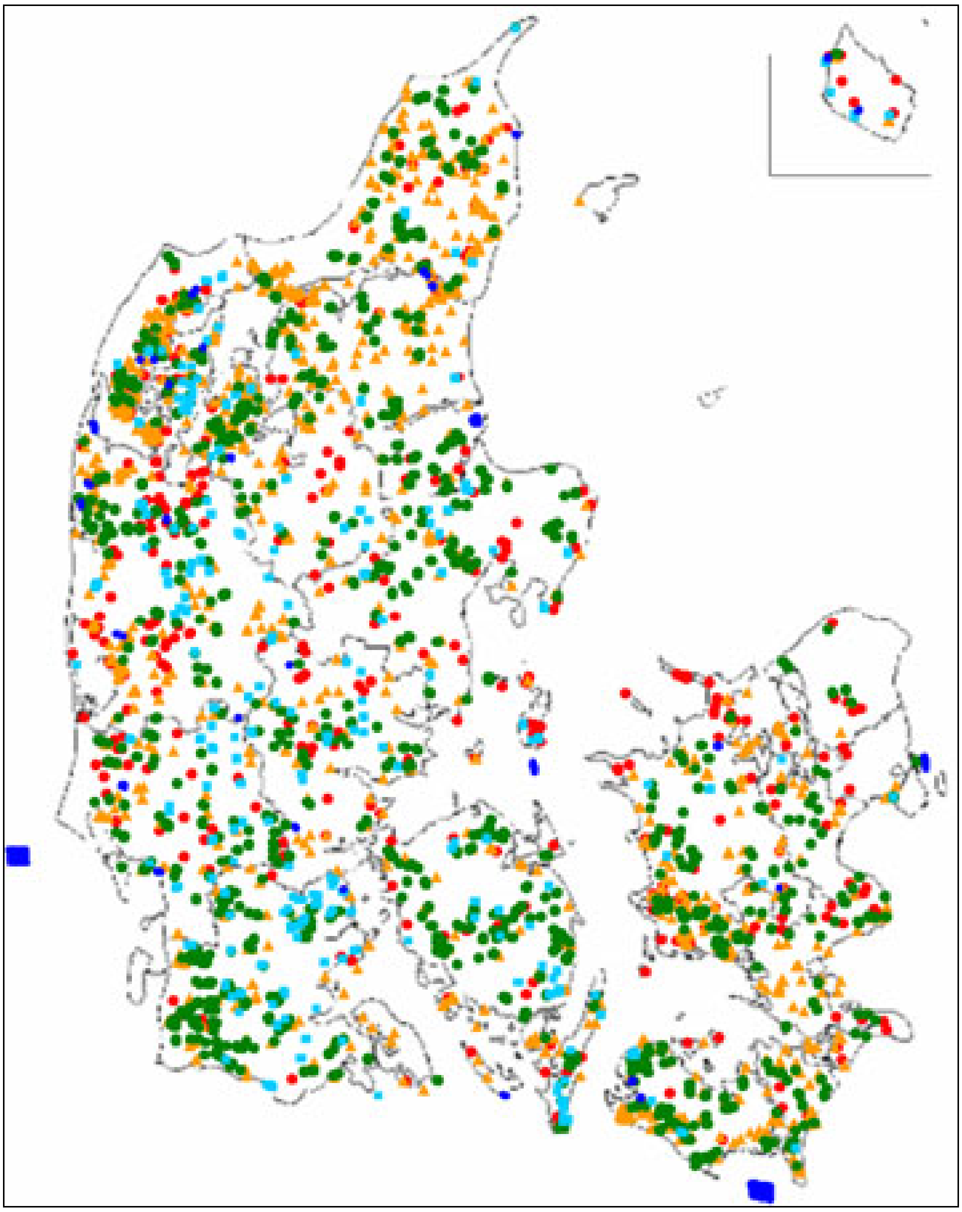


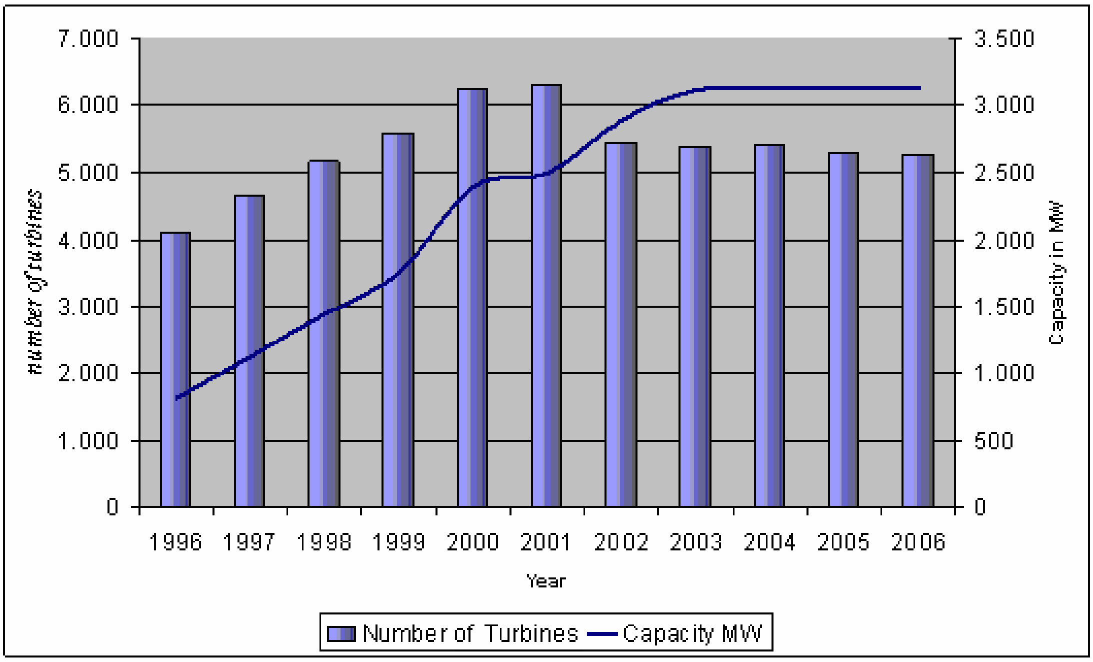
Table 3-10

	Output kW/turbine	Number	MW	% (number)	%-Output
(red)	< 150	426	23	8%	1%
(yellow)	150 – 450	1650	363	31%	12%
(green)	451 – 750	2276	1485	43%	47%
(light blue)	751 – 1500	619	627	12%	20%
(blue)	>1500	305	639	6%	20%
	Sum	**5276**	**3137**	**100%**	**100%**

Source: DKvind 2007

Figure 3-2 below shows the development in number of wind turbines and the total capacity in Denmark from 1996 – 2006. It shows that the number of wind turbines have actually been decreasing after 2001, but still the capacity have increased, though it has only been a small increase from 2003 – 2006.

Figure 3-2 Number of Wind Turbines and Total Capacity in Denmark from 1996 - 2006



Source: Danish Energy Authority

The Danish government can influence the location of onshore wind farms through information, regulations, and national directives, but ultimately it is the local and regional authorities that decide. Because offshore wind farms are normally larger than the ones onshore and therefore can have a greater impact, the government has the planning responsibility. (Energistyrelsen 2007b)

Despite the number of turbines, the population is still broadly in agreement with the expansion. The Nielsen Poll of February 2006 (Nielsen, 2007) found a staggering 91% of the population in favour of continued expansion. In addition 77% of the population generally believe that wind farms present a positive image and do not destroy the scenery indeed a strong majority regard them as beautiful and fitting in with the scenery.

3.3.2 Economic Cost of Wind farms on Scenery

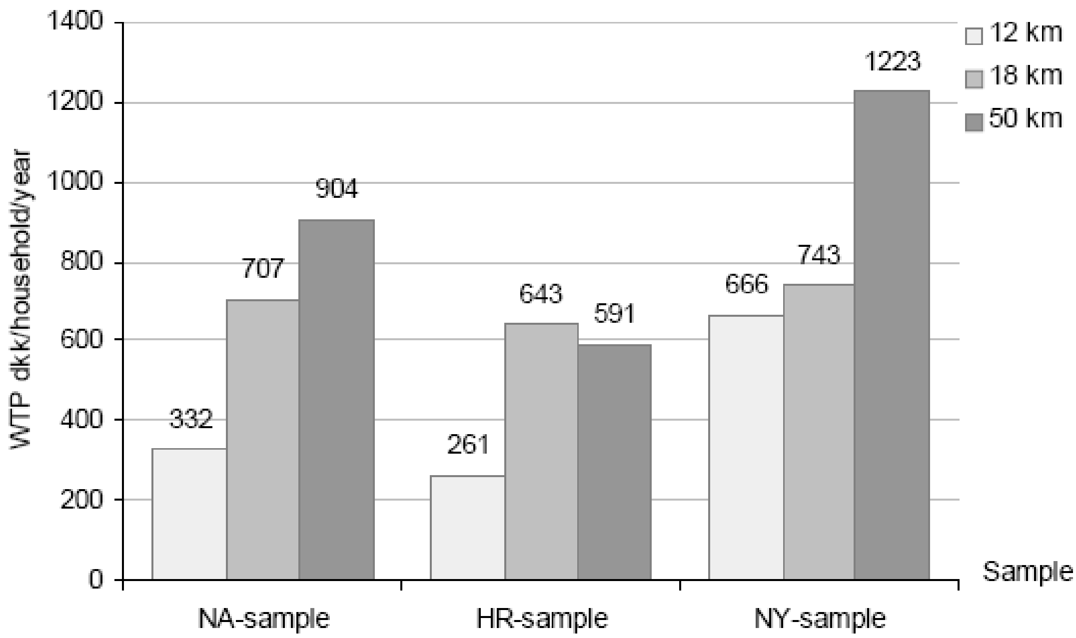
Research into the economic cost of the visual externalities of off-shore wind farms,, as identified by willingness to pay, was conducted in 2005, as a part of the offshore wind farm monitoring programme in Denmark. This section discusses the findings of Ladenburg et al. (2005).

The survey was conducted in 3 areas:

1. A national survey with a sample size of 700 **(NA)**
2. A survey in the area of Horns Rev with a sample size of 350 **(HR)**
3. A survey in the area of Nysted with a sample size of 350 **(NY)**

Respondents were asked about their willingness to pay to have the wind farms moved outside the visual range. The results are shown in Figure 3-3.

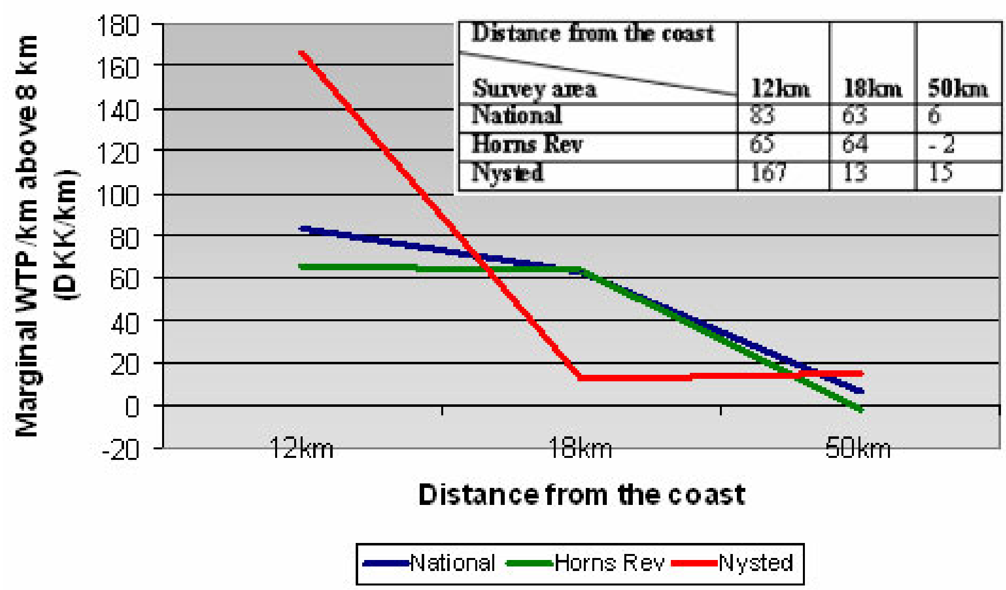
Figure 3-3 Willingness to pay for having future offshore wind farms located at the specified distance from the shore - relative to an 8 km baseline



One interesting finding was that males are willing to pay much more for moving the wind farm from 8 km to 12 km, 18 km or 50 km. This result is similar to the research by Gallup (Tns Gallup 2007) where it was found that men generally are more negative about wind turbines with the height of 100 – 150 m. It could seem that men have stronger opinions about wind farms than women and are therefore willing to pay more to get rid of the perceived problems. Of course it could be simply that men have a higher wage than women in Denmark and therefore they would be able to pay more.

Looking at the marginal willingness to pay (WTP), i.e. expressing the willingness to pay for moving the wind farm one more kilometre away from the shore, it can be seen that the WTP for the national survey and the survey for Horns Rev are quire similar. On the other hand the willingness to pay for the respondents from Nysted is very different from the other surveys.

Figure 3-4 Marginal WTP/km above 8 km



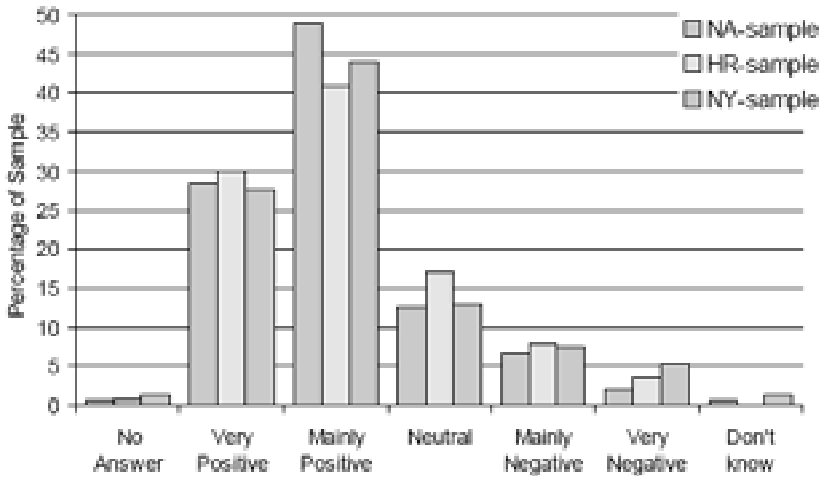
The overall conclusion is though that the highest marginal willingness to pay is found by moving the wind farm from 8 km – 12 km, for all the three samples and varies from a maximum of around £15 per km per household to £7.

The importance of this finding is that it shows that, even in Denmark, there is a quantifiable preference for landscapes without wind farms. The link between value and demand was discussed in chapter 2 and one would expect a negative effect on tourist demand and consequently revenue. However for other reasons, the local population might actually want the expansion of wind farms, that is negative impacts on tourists could be associated with positive attitudes to wind farms.

3.3.3 Attitudes to On-Shore Farms

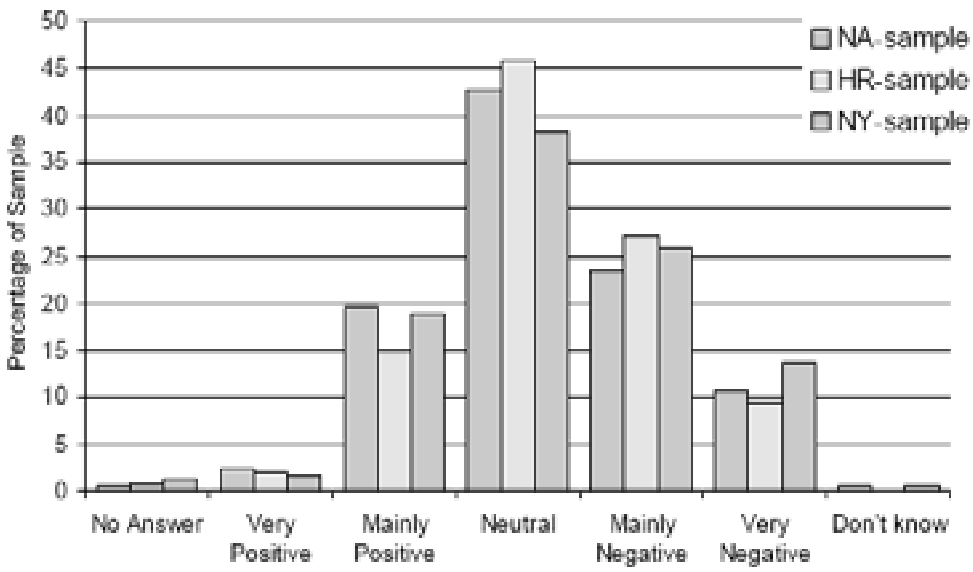
Landerberg et al (2005) also surveyed the attitudes of the three groups towards existing onshore wind turbines. The results are shown in Figure 3-5 and are notable by their positive nature.

Figure 3-5 Attitudes towards existing land-based wind turbines



There is however a significant difference in the respondents' attitude towards existing and new onshore wind turbines where 22% are in some way negative towards an increase. They are especially negative in the Nysted sample, whereas the most positive attitudes can be found in the national sample.

Figure 3-6 Visual impact of land-based wind turbines



When asked about the visual impact of onshore wind turbines just around 25% are positive or neutral, while 35% – 40% are negative with the balance neutral.

In summary most of the sample wanted further development of wind farms, thought they were not unattractive but, in general believed they had a negative impact and were willing to pay to reduce that impact.

3.3.4 Case Study from Nysted Tourist Information

Because of the lack of published work on the impact of wind farms on Tourism, information was obtained directly from the Nysted Tourist Information about the tourism in Nysted and the impact of Nysted Offshore Wind Farm. This found that the offshore wind farm has had little effect on how many tourists have been coming to Nysted. For example Nysted camping site has had an increase in the number of visitors over the last 10 years, despite of the fact that it is situated along the shore with a view to the wind farm.

On the positive side Nysted Tourist Information has arranged boat trips to the wind farm with great success since 2003 and now that the wind farm is completed it is possible to sail between the wind turbines to get a very good view of them. They have only cancelled a trip because of too much wind, but never because too few were interested. It was expected that the boat trips would be popular during construction of the wind farm, but today people still take trips to Nysted with the intention of seeing the wind farm.

The insignificant effect Nysted Offshore Wind Farm has on tourism can also be seen when looking at vacation houses with a view of the wind farm. The view of the wind farm has not affected the prices of the vacation houses.

In conclusion Nysted Tourist Information believes the negative effects are minimal and outweighed by the positives. Generally speaking, tourists, especially Germans can be attracted by promoting "green tourism", since they have considerable interest in the new technology and in environmental issues. (AUSWEA 2004)

3.3.5 The Hantsholm Harbour Development

Although opposition to wind farm development in Denmark has been muted, occasionally special areas of scenery or for tourism have been the subject of protest. Perhaps more contentious and relevant from a Tourist viewpoint is the proposed development at Hanstholm Harbour on the northern coast of Jutland. Throughout the second part of 2005 windsurfers from Denmark, Sweden, Germany, Holland, Finland, Norway, Canada and USA stated their opposition. Typical statements made were *"…the harbour is one of the best places in the world for surfing and windsurfing and is visited by thousand of tourists every year for that reason" "This will destroy the best windsurfing place in Northern Europe" "It will seriously affect the tourism in Hanstholm and Klitmøller carry through such a project" "It is the area that every spring, summer and fall is attracting large numbers of Germans, Dutchmen, Poles and Estonians…to windsurf"* (Translated from Viborg Amt 2005b) The surf club in Thisted is certain that owners of gas stations, holiday cottages, campsites and a lot of other businessmen will loose income from thousands of visiting surfers. The Danish Windsurfer Organisation mentions that the area is used for national and international competitions and if the basis for this is taken away the organisation believes that there will be a loss to the tourism industry of 40 million Danish Kroner (£3.64 million)(Viborg Amt 2005b). However, in this case, the protesters seem to have been successful in preventing this development, as the proposal will not now apparently get government approval.

3.3.6 Conclusions on Denmark

Despite a very large number of wind turbines, attitudes are still extremely positive with 90% supporting expansion. Indeed a majority think they are attractive and blend well with the Danish landscape. As far as can be ascertained, there have been no negative and possibly some positive effects on tourism. That is not to say that there has not been any opposition and in the case of the development at Hantsholm this is led by sports tourists.. The lesson seems to be that in a relatively flat, rural, agricultural landscape, wind turbines are seen as an acceptable, even attractive, addition. Similar areas do exist in Scotland (e.g. Buchan and Caithness) and it might be reasonable to assume similar responses.

3.4 Norwegian experience

3.4.1 Introduction: The planning system

The Norwegian landscape is clearly more similar to the Scottish Highlands than most other landscapes (particularly Denmark) and tourists to Norway are looking for simalr dramatic landscapes. Any research in Norway could, therefore be useful, in developing a policy for the Highlands.

In 2007 Norway signed the EU directive of Renewable Energy Sources (Directive 2001/77/EC) which aims for expanding the share of renewable energy in total energy consumption from 13.9 % in 1997 to 22.1 % in 2010. As a consequence of this Norway has set a target of 90 % of total energy consumption to come from renewable energy sources by 2010. The long run objective for Norway is to expand their renewable energy production by 30 TWh from 2001 to 2016, Fornybar (2007).

In Norway all energy projects above 1 kWh have to apply for a concession from the Norwegian Water Resources and Energy Directorate (NVE (2007)). Currently they have 143 applications listed on their webpage at various stages If a proposal gets approval the opposition can only appeal the case to the government who will then decide whether or not the proposal should be approved. The local authorities work together with NVE, but it is NVE and the government who have the final decision, (National Office of Building Technology and Administration,1999).

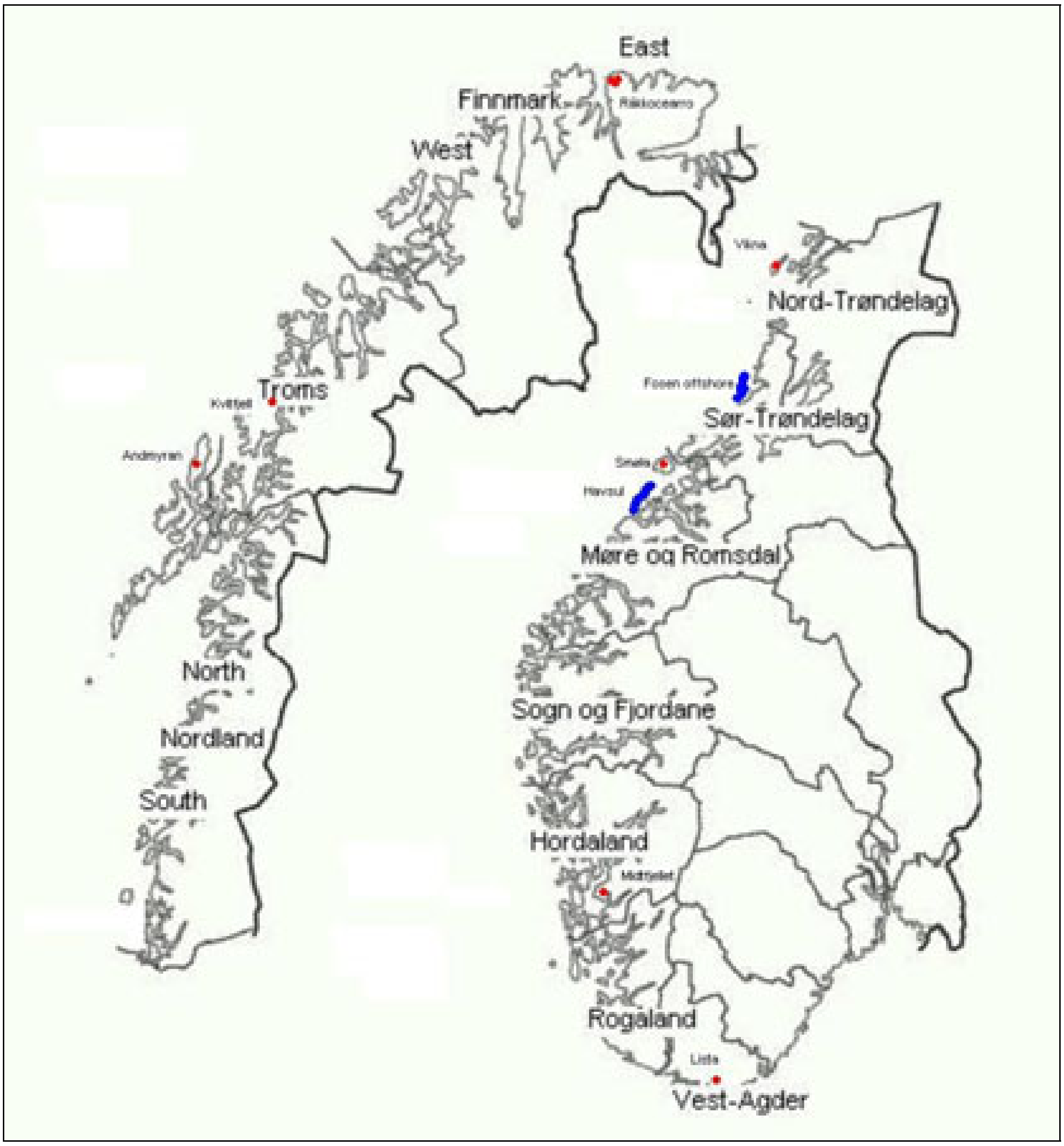
In March 2007 a list was published on the webpage of NVE which was an evaluation of 75 Norwegian wind farm proposals from 3 different perspectives, military, environment and heritage. They were graded by on the impact inflicted on military, environment and heritage, and farming (grazing reindeer).

Like Scotland, nature and scenery is the primary factor in the choice of tourists who select Norway. Like Scotland the major source of conflict is between scenic beauty and wind farm development.

3.4.2 Wind Farms, Outdoor Activity and Tourism

Farms onshore in Norway present serious problems. The low lying areas and islands have a surprisingly large population and the higher ground offers major construction, climatic and environmental problems. As a consequence Norway has a far larger proportion of offshore wind farms planned or in operation than anywhere else. The map indicates the current and larger proposed developments.

Figure 3-7 Major Norwegian Wind Farm Developments



Source: WindSim (2003)

This map only has some of the major wind farms marked on it. The red colour indicates an onshore wind farm while blue is offshore. The only one of the projects currently running is the Smøla onshore wind farm.

There are currently 3 offshore wind farm projects from the Norwegian company Havgul (2007). Opposition, however, comes from an unexpected quarter. The Norwegian Trekking Association (DNT (2006)) claims that Havsul 1-4 could ruin unique landscapes along Mørekysten (The shores of Møre). Normally DNT policy is positive towards wind energy, but they are totally Norway could lose against the Havsul proposal as they believe it could destroy the tourism and outdoor industry. They claim that its position as both a regional and national tourist destinations as a result of the project. They urge for more national guidelines on the location of wind farms.

Mathisen (2005) interviewed three Norwegian politicians about the biggest challenges of coastal planning in Norway. Geir Knutson confirmed that the biggest area of conflict is between outdoor enthusiasts and the wind energy industry. A lot of the Norwegian coast line has good conditions for wind energy, but is also very important for the outdoor and tourism industry.

The Norwegian organisation Vern Kysten (2006) (Protect the Coast) also believes that huge Wind farms along the shores will ruin all the landscape and thus all the tourism in these areas. They refer to the current guidelines in Denmark and suggest the Norwegian government develop similar guidelines. They want the wind farms to be located in valleys or far out in the ocean to avoid the scenic damage of a wind turbine from a summit. They also want a limit for the maximum noise level from the wind farms, as they see the noise level as major environmental damage to the surroundings. They feel that people have been deceived by NVE and the project companies because the area and height of the wind farms has not been publicised.

A number of other tourist related issues have led to application rejection. There is a 150 MWh wind farm currently running on the isle of Smøla in the North West of Norway. The island is in many ways similar to the Western isles, and the population density is about the same. However the area of Harris and Lewis is 10 times bigger than the isle of Smøla. The wind farm has been running since 2002 with 20 x 2 MWh wind mills and in 2005 phase 2 was established with 48 x 2.3 MWh wind mills. There were studies on all the negative impacts of the wind farm before it got approval, Smøla Kommune (2001).

Since September 2005, 9 sea eagles have been killed by the turbines on Smøla Wind. On the basis of this experience RSPB fear that the planned wind farms on Lewis could also harm the some rare birds.

Two proposed expansions of the wind farm of Smøla were rejected by NVE (Norwegian Water Resources and Energy Directorate) due to the environmental impact. One of the major points of rejection was the impact on birds i.e. collision of birds, disturbance effect of birds, and the loss of bird habitat. Another wind farm proposed in Stadlandet was first approved by NVE in 2000 but then later in 2002 rejected by OED (Ministry of Petroleum and Energy) due to complaints from numerous wild life groups and landscape protecting groups, NVE (2002).

3.4.3 Attitudes to wind farms

Vestlandsforskning (2005) commissioned an attitude survey. As in Denmark and the UK the general attitude was positive:

Table 3-11 Attitude towards wind power

	Utsira	Havøysund	Karmøy
Positive in general	38	19	76
Negative in general	1	7	11
Don't know	0	0	8
Total	39	26	95

To see if their attitude had changed they were asked if the construction of a wind farm in their local area had changed their attitude towards wind power. Most of them were unaffected but surprisingly a lot had actually become more positive. There were more people who were positively affected than people who had become more negative.

Table 3-12 Post Build Attitudes

	Utsira	Havøysund	Karmøy
Unaffected	19	13	55
More positive	14	7	22
More negative	1	4	11
Don't know	5	2	7
Total	39	26	95

Most of the respondents did not find that the turbines were destroying the landscape. However there were more people in Havøysund and Karmøy who were negative than in Utsira and this could be related to the size of the wind farm.

Table 3-13 Views on negative impact on landscape

	Utsira	Havøysund	Karmøy
Yes	3	7	27
No	35	19	62
Neutral	1	0	6
Total	39	26	95

The respondents did not seem to think that wild life was affected by the wind farms in particular. Again in Utsira the percentage that thought there would be a negative impact was lower.

Table 3-14 Views on negative impact on the wild life

	Utsira	Havøysund	Karmøy
Yes	4	8	30
No	29	18	54
Don't know	6	0	11
Total	39	26	95

The respondents were asked if they believed that the wind farms had any impact on outdoor activities. Most people saw it having a positive impact and very few people saw it as having a negative impact. However most of the respondents from Karmøy did not see any impact at all.

Table 3-15 Views on impact on outdoor activities

	Utsira	Havøysund	Karmøy
No impact	8	6	61
Positive impact	30	17	17
Negative impact	0	3	9
Don't know	1	0	8
Total	39	26	95

A question about tourism was also presented to the respondents and again there are some surprising results. Most people in Utsira and Havøysund actually thought that the wind farm would have a positive impact on tourism in the area. Only in Karmøy where the wind farm in not actually built yet is the result different. But it is still believed to have no impact rather than a negative impact on tourism.

Table 3-16 Views on impact on tourism in the area

	Utsira	Havøysund	Karmøy
No impact	7	3	69
Positive impact	32	17	11
Negative impact	0	3	8
Don't know	0	3	7
Sum	39	26	95

3.4.4 Norway: Conclusions

The problem with the location of a wind farm is simple; almost all places have an interest for at least one group of people. One of the onshore wind farms in Norway was rejected because it was to close to a town, and the noise impact was considered too great. Those involved with protecting birds do not want the wind farms in deserted areas whilst people, in general, do not want to have them close to them. The expensive solution of offshore farms has equally been criticized.

Within Norway the populace seems to be equally clear in their support and surprisingly positive in terms of appearance, wildlife and tourism. This may change but the message is similar; Wind farms are necessary, do not automatically have a detrimental effect on the scenery and have little impact on tourism.

3.5 Other international evidence

3.5.1 The US Experience

Wind power is at its most extensive in the western states, particularly California. Despite some huge developments, opposition has been limited and negative tourism impacts have not been mentioned. However as development spread east opposition has strengthened to "protect" the hill areas of Virginia, Vermont and New York State. With opposition has come increasing attention to the economic impacts of a decline in tourism. Nevertheless no research has been undertaken to identify such impacts, if they exist. The American Wind Energy Association for example states categorically *"There is no evidence that wind turbines draw tourists away. In some areas wind turbines even draw tourists…..Surveys have found that the presence of wind turbines would not affect the decision of* ***most*** *visitors to return. The thousands of turbines in Palm Springs, California have had no negative impact on the number of tourists; on the contrary the local tourist office organises bus tours to the wind farms"*(AWEA,2007).

Schleeds (2004) produces a searing attack on the NREL-JIND economic impact model (Goldberg, 2002) for wind farms. Amongst the many points he identifies a negative economic impact arising from a contraction from tourism but fails to make any estimate.

For change in value the most reliable study of the impact of wind farms would appear to be by the Renewable Energy Project (Sterzinger et al 2007). They write:

"If property values had been harmed by being within the view-shed of major wind developments, then we expected that to be shown in a majority of the projects analyzed. Instead, to the contrary, we found that for the great majority of projects the property values actually rose more quickly in the view shed than they did in the comparable community. Moreover, values increased faster in the view shed after the projects came on-line than they did before. Finally, after projects came on-line, values increased faster in the view shed than they did in the comparable community. In all, we analyzed ten projects in three cases; we looked at thirty individual analyses and found that in twentysix of those, property values in the affected view shed performed better than the alternative." Sterzinger et al (2003)

The survey was strongly attacked by Boone(2007) who argues that it is unreliable because of

1. limited sample size
2. atypical wind farms
3. limited time horizon
4. a definition of viewshed that was simply a property in a 5mile radius (as opposed to the standard definition that turbines could actually be seen from the property)
5. failure to distinguish between properties close to the wind farm compared to those on the periphery
6. the use of simple averages in the presence of inflation.

He identifies in his paper some examples of very substantial decreases in property values and a court decision to award substantial damages for loss of value due to a wind farm development.

Boone(2007) also reports on study in 2001 and 2002, by the Moratorium Committee of Kewaunee County, Lincoln Township, Wisconsin. In this study they compared property sales prices to assessed values before and after the construction of two wind energy facilities, each having relatively small .65 MW turbines. An assessor reported that property sales (vs. 2001 assessed values) declined by 26% within one mile and by 18% more than one mile of the wind project. The Moratorium Committee also sent anonymous survey forms to 310 property owners, of whom 223 responded. These responses were then grouped based upon proximity to the wind plants. The survey results found that 74% of respondents would not build or buy within 1/4 mile, 61% within 1/2 mile and 59% within 2 miles of the wind plants. In fact, a large percentage stated that they would not buy a home within 5 miles of the turbines. The wind plant's offer to purchase neighboring homes for demolition—to create an "additional buffer for the wind turbines"—came immediately following the release of a noise study showing the Lincoln wind turbines increased the ambient noise level significantly, depending on wind conditions, etc.

In summary the literature emanating from the US suggests that the economic impact on tourism is very limited and on property values, if it exists at all, is very small.

3.5.2 The Experience of Australia

One of the most detailed studies of the costs and benefits of wind farms that thoroughly incorporates tourist activity was undertaken by Sinclair Knight Mertz for Pacific Hydro and looked at wind farm development on the capes at Portland and Yambuk in Victoria State (Sinclair et al 2007). The market analysis identified the size and likely reactions of the key segments of the market. The most affected “eco-tourist” market was relatively small and consequently the research suggested any impact would be small. Against that they found that the wind farm could be a positive factor in the tourist experience for other larger segments provided the experience was organised and marketed. Even assuming that there was a substantial (50%) loss of tourists particularly affected, the number of jobs would still increase as a result of the wind farm development. Interestingly they point out that there was no impact on tourism of two wind farms in the Esperance region of Western Australia.

3.5.3 New Zealand

Although New Zealand has a number of wind farms, an extensive tourist industry and a proportionate number of bitterly fought developments, the issue of a detrimental effect on tourists has not been raised. Ashby (2004) in an excellent review of wind farms and planning policies merely notes the use of a wind farm as an icon, used in promoting tourism.

3.5.4 German Experience

Ashby (2004) reviews international experience including many of the UK cases studied earlier. Northern Germany is well known for its large number of wind turbines, both along the coast and further inland. Lower Saxony is the largest coastal north-German State, but has not been one of Germany's more popular tourist destinations. In 2000, Lower Saxony had only 2.3 million overnight stays by foreign visitors in comparison to Bavaria, which had 9.5 million. However, in the same year, Lower Saxony experienced the highest growth rate in overnight stays for all of Germany. Lower Saxony's growth rate was 27.3%, compared with 12.4% for Bavaria and an average of 12.8% across all German States. Based on those figures, there is no correlation between the presence of many wind turbines and low tourism growth rates.

3.5.5 Swedish and Finnish Experience

As part of their study of the possible impacts on Scottish tourism NFO/System3 examined the situation in Sweden and Finland.

For **Sweden** they found:

• There are approximately 600 wind turbines in Sweden, accounting for 0.5% of the country's annual energy production. There are plans to increase this target to 7% by 2015

• Sweden covers a geographical area approximately 5-6 times the size of Scotland. The existing wind farms are located in both remote and more developed areas.

• The most important impact of wind farms and tourism is the visual impact with the siting regarded as crucial. Similar to Scotland, many tourists come to Sweden to experience the unspoilt scenery.

• To date, there have been more positive than negative impacts reported about wind farms. There is, however, particular debate about wind farms located in the mountains and coast.

• There are strict guidelines for the siting of wind farms and they not allowed in areas of 'national interest' (e.g. areas already protected with historical heritage, coastal areas and mountain), national parks and nature reserves.

• The planning process in Sweden is very 'open' and developers have a duty to consult more at the local level with local consultation groups which seems to work relatively well.

For **Finland:**

• There are around 60 wind turbines in Finland which account for 0.1% of the country's annual energy production. There are plans in the future to increase this target to 1% by 2010.

• Finland has a population similar to Scotland but its geographical area is around 8 times the size of Scotland. It is a vast country with wind farms located in large remote and underdeveloped areas.

• There have been more positive than negative impacts recorded on tourism although there is more debate about the wind farms situated in the archipelagos

• Wind farms are used in parts of the country for tourism marketing and also marketing to investors.

3.6 Landscape value

This project is concerned with assessing the Economic Impact of wind farms (notably jobs and incomes) not the economic value (the satisfaction individuals obtain from viewing a beautiful landscape) that will be lost if a wind farm is developed. However there is a logical relationship between the value placed on a scene and the expenditure of tourists. As an obvious extreme example the town of Niagara is highly dependent upon the value associated with the local scenery, the Niagara Falls. Few would dispute the importance of the scenery to the economy of Skye. Evidence that the value of scenery changes (decreases) when wind farms are built is *prima facie* evidence that there might well be a negative impact.

Moran (2005) prepared an extensive review for the Scottish Executive Environmental and Rural Affairs Department (SEERAD) on the value of landscape which covers some 42 studies. Remarkably all these studies generate positive values for the preservation of existing rural landscapes. The summary annex is reproduced as an annex to this chapter.

Most of these studies are based on stated valuations of respondents to theoretical change, often in the form of photo-montages. This approach is known as contingent valuation. Methods based on the revealed actions of individuals are based either on Travel Cost or on property prices. Because of the variability in property characteristics a standard approach is based on multiple regressions and is known as Hedonic Pricing Analysis. Garrod and Willis (1992) provide a good example of its use in identifying the value of landscape.

Overall the values given in Moran (2005) to maintain the environment in areas like national parks are typically in the range £10 to £70 per household per year which will include both use and existence values and cover residents and visitors.

As shown in chapter 2 a decline in willingness to pay results in less expenditure and consequently has an economic impact. It is difficult, however, to directly translate figures that relate to a general value over an unspecified number of visits to the expenditure of a tourist on a single trip who might pass through a particular area for a short period other than to conclude that loss of values per head per day from scenery change are likely to be relatively small.

With specific reference to wind farm developments Farizo and Hanley (2002) examine the change in value associated with a wind farm development in the Ebro valley in Spain. They used two choice experiment structures, contingent valuation and choice experiment and four attributes, cliff protection, habitat and flora protection, landscape and cost. For landscape they used before and after photo montages of the wind farm development. The results suggested a loss of landscape value of between 3000 and 6000 pesetas (£12 to £24) per head loss of value. This is very similar to the figures in Moran's survey.

3.7 General conclusion

Most of the literature surveyed has not been refereed or formally published. Some of it is best described as advocacy; some of it rather poorly conducted opinion surveys.

One approach is to limit the results to either revealed behaviour, stated intentions or stated values of tourists (as opposed to locals). Using this limitation Table 3.17 summarises the literature which is on return intentions/economic impact and Table 3.18 that on the economic value change.

Turning first to Return Intentions none of the studies of tourist number change could find a significant effect. In most cases the stated intention studies showed wind farms affected only a small minority and that this small minority was almost equally split between those who were positively affected and those who were negatively affected. For 5 of the 7 studies the average positive proportion is 4.75% and 4.5% negative. Note that these are proportions affected and no study attempted to quantify the size of this reaction. The two outliers are the NFO studies in Scotland and Wales where they found 32% and 25% negatively affected. The problems of these studies suggest that they should be treated with caution.

We conclude that whilst there is evidence of a belief from local people prior to a development that it might be injurious to tourism there is virtually no evidence of significant change after development has taken place. However that is not to say that it could not have an effect, rather it reflects the undoubted fact that where outstanding scenery, with high potential tourist appeal, has been threatened, permission has been refused. The conclusion is that any effects we are likely to find in Scotland, if they exist, are likely to be small.

On the question of value the evidence is more ambiguous. Clearly people state they prefer scenery without intrusions such as wind farms and when asked to compare give small but significant negative values to wind farm developments. Empirically, however, these changes are so small relative to other socio-economic factors that they often cannot be directly identified in time series studies of property values. Over time the situation is also confused by sample selection bias; those who lose most will in time move out, those who object least will move in. Probably the best approach to reveal value loss is cross-section hedonic pricing analysis. The quoted study does provide some evidence of stated values being manifest in property prices, albeit without direct reference to wind farms.

In terms of economic impact, changes in property values should have no effect on expenditure in the area[1]. However for transient visitors we would expect a change in value to be replicated in a change in accommodation price and a small negative impact on expenditure in an area.

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[1] The impact on spending of wealth changes is central to modern macro-economics, increases in nominal wealth do induce increases in spending. However it is equally true that a decrease in house price to a new arrival in an area will divert expenditure from mortgage payments made outside an area to expenditure within.

Table 3-17 Summary of Studies of Wind Farm Impacts on Return Likelihood (excluding attitudes and local opinions of impacts)

Type	Study	Year	Location	Star Quality[1]	Size (if known)	Limitations	Findings
Revealed Likelihood	Cornwall Tourist Board	2000	Cornwall	3	4 years	Data & Collinearity	No Effect
	Nicolas Pearson	1996	Dealbole,	3	5 years	Size and Area	No Effect
	Hinton	2006	Scotland	2	4 years	England/Scotland	No effect
	Nysted	2007	Nysted,	2	10 years	Area	No Effect
	Ashby	2006	Germany	2	2 years	Bavaria/Saxony	No Effect
Stated Likelihood	Aitchison	2004	Cornwall	4		Survey Size & Location	6.1% negative, 7.2% Positive
	Roberson Bell	1996	Cornwall	3		Survey Size & Location	94% indifferent. Majority of 6% +ve
	CSE	2002	Somerset	5	331		3.6% -ve, 3.9% +ve
	Campey et al	2003	Lake District	4	193		Majority Unaware.: Big Expansion then 3% +ve 22% -ve
	BWEA	1997	Wales	3			4% -ve
	NFO	2003	Wales	4		Methodology	21% -ve to wind farms; 32% -ve intention
	Hanley & Nevin	1999	North	3	76	Size, Location	5.3% +ve, 3.9% -ve
	NFO/System3	2002	Scotland	4	180	Methodology	**25% -ve**
	MORI	2002	Argyll &	5	300		75% not aware. 4% +ve, 2% -ve
	Strachan	2004	Lochavich	2	100	Methodology, Location	70% would not return.

[1] Subjective Evaluation: 1= Limited Use possibly misleading; 2=Limited Use; 3= Some Use but limitations; 4= Important, some limitations. 5= Very Important

Table 3-18 Summary of Studies of Wind Farm Impacts on Value (excluding attitudes and local opinions of impacts)

Type	Study	Year	Location	Star Quality	Size	Limitations	Results
Revealed Value (Property Price)	Nysted	2007	Nysted, Denmark	2		Limited Area	No Change
	Sterzinger	2002	US	3	30	Methodology	No Effect (+ve)
	Boone	2007	Lincoln, Wisconsin	3		Limited Area	-ve effect; 25% fall 1km, 18% more than mile
	Garrod & Willis	1992	Welsh Borders	3		Hedonic Price **Not Windfarm**	Urban View -5.7% fall in value of property
Stated Value	Hanley and Nevin	1999	North Assynt	3	45	Residents Only	Mean Value p.a.of landscape £15.6 (caculated)
	Ladenburg et al	2005	Denmark	5	1400		Max Value form moving 8-12km: £7-£15 per km
	Fabrizo & Hanley	2002	Ebro, Spain	5			£12-£24 loss per head from farm
	Moran	2005	Europe	4		Review Study of Landscape Value (CVM) **Not Windfarm**	£13-£85 pp/pa value for conserved landscape

The overall conclusion is that we might expect a negative reaction from a small percentage of the tourists (of the order of 5%) and assuming they are simply less likely to come (as opposed to definitely would not come), a reduction in expenditure smaller than this. There is no evidence of the size of that change.

Similarly we might expect a small reduction in prices charged in affected accommodation that has a small economic impact in the local area.

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Annex : Summary table of relevant landscape demand studies

Author	Country	Environmental Good	Proposed Good	Reference scenario	Population	Survey type	Relevant area	Method	Payment vehicle	Scenario devices	Year	Landscape category or attributes	Average values
Alvarez et al. (1999)	Scotland	Landscape and biodiversity: Grassland, cultivated Machair , dune systems, rare birds and flowers	Preservation Of traditional Agriculture with ESA	Current condition of Machair	UK public Residents of ESA Visitors to ESA	Postal & face to face	ESA, Machair in the Uists	CVM (O/E)	Income tax	Photos	1995	Agricultural landscape	13.44£/per s/yr (358)*
Bishop (1992)	Wales	Landscape and biodiversity	Preservation of agricultural land	Current	Park visitors	Face to face	Local park	CVM (O/E)	Entry price			Agricultural landscape	0.42£/visit (100)
					Park visitors	Face to face	Local park	CVM (O/E)	Annual entry			Agricultural landscape	18.53£/per s/yr (100)
Bishop (1992)	Wales	Landscape and biodiversity	Preservation of peri urban forest	Current	Park visitors	Face to face	Local park	CVM (O/E)	Entry price			Agricultural landscape	0.54£/visit (100)
					Park visitors	Face to face	Local park	CVM (O/E)	Annual entry			Agricultural landscape	27.03£/per s/yr (100)
Bonnieux & Le Goffe (1997)	France	Landscape biodiversity And ecological functions	Préservation du bocage =traditional small fields and hedgerows	Current	Residents of the lower Normandy regional national park Residents on periphery	Face to face	Regional national park of Lower Normandy	CVM (DC)	Local Tax	Photos	1995	Landscape de bocage	201FF/hh/ yr (400)
Bullock and Kay (1997)	Scotland	Southern uplands Landscape = Heather and tree coverage ; Biodiversity change as a result of grazing intensity	Reduction of intensive grazing	Current but respondents had to indicate their perceived status quo	Residents in Southern and central Scotland	Postal. Face to face	ESA	CVM (DC)	Income tax	Photos	1994	Rural landscape rural (agriculture and forestry)	83£ /pers/yr (459)

				Current	Residents of the region	Postal. Face to face	ESA	CVM (O-E)	Income tax	Photos	1994	Rural landscape (agricultural & forestry)	49£/pers/yr (88)
				Current	ESA visitors	Postal. Face to face	ESA	CVM (DC)	Income tax	Photos	1994	Rural landscape (agricultural & forestry)	55£/pers/yr (459)
				Current	ESA visitors	Postal. Face to face	ESA	CVM (O-E)	Income tax	Photos	1994	Rural landscape (agricultural & forestry)	49£/pers/yr (88)
Colson et Stenger (1996)	France	Landscape	Restauration des bocages	Current	Residents	Postal	Département of Loire Atlantique	CVM (O-E)		Photos	1994	Landscape bocager	103F/yr/page
			Préservation des bocages		Residents	Postal	All agricultural Land	CVM (O-E)		Photos	1994	Landscape bocager	60?F/yr/page
Drake (1992)	Denmark	Landscape, species diversity	Preservation of agricultural land instead of spruce forest	Current	Whole population	Face to face	Agricultural land in whole country	CVM (O-E)	Income tax	Photos	1986	Agricultural landscape	4685 crowns /pers/yr (1089)
				Current	Regional residents n.r Uppsala	Face to face	Agricultural land in whole country	CVM (O-E)	Income tax	Photos	1986	Agricultural landscape	48455 crowns /pers/yr (152)
Garrod et Willis (1992)	G.B.	Landscape and presence of forestry, Welsh borders Gloucestershire	Value of presence of attributes at housing: woodland, water and wetland	Current	Population		ESA	Hedonic pricing	Revealed preference		1992	Rural landscape	Presence of canal/river adds 4.9% to price ; Wetlands <1km away reduces price by 10% Urban view reduces by 5.7% Woodland view – 7.3%
Garrod et Willis (1995)	G.B.	Landscape	Conservation of agricultural landscapes	Current	Population	Face to face	ESA	CVM	Tax	Photos	1992	Rural landscape	67.42£/hh/yr (237)
				Current	Population	Face to face	All ESAs	CVM	Tax	Photos	1992	Rural landscape	27.52£/hh/yr (218)
				Current	Visitors	Face to face	ESA	CVM	Tax	Photos	1992	Rural landscape	94.29£/per s/yr (237)
				Current	Visitors	Face to face	All ESAs	CVM	Tax	Photos	1992	Rural landscape	19.47£/per s/yr (220)
Gianni et al. (2000)	Italy	Landscape	Preservation of agricultural landscapes	Current	Tourists	Face to face	National park	CVM (DC)	Daily charge	Photos	1997	Agricultural landscape	1euro/day/visit (344)

Hanley (1989)	Scotland	Landscape	Forest preservation	Current	Visitors	Face to face	Regional park	CVM (O-E)	Entry price	Description	1987	Forest landscape	0 .20£/visit (1148)
Hanley et al. (1998)	Scotland	Landscape	Conservation and enhancement of landscape quality	Current	Residents	Face to face	ESA	CVM (DC)	Income tax	Photos	1995	Agricultural landscape	60£/hh/yr (249)
			Conservation and enhancement of landscape quality	Current	Residents	Postal	ESA	CVM (DC)	Income tax	Photos	1995	Agricultural landscape	47£/hh/yr (325)
			Conservation and enhancement of landscape quality	Current	Visitors	Face to face	ESA	CVM (DC)	Income tax	Photos	1995	Agricultural landscape	90£/hh/yr (325)
Hanley et al. (1998)	G.B.	Landscape	Forest management		Population	Face to face	National forest area	CE	Income tax			Essence	12.88£/hh/yr (284)
												Forme	13.90£/hh/yr
												Diversité des espèces	11,36£/hh/yr
Hanley et al. (1998)	G.B.	Landscape	Forest management		Population	Face to face	National forest area	CVM (O-E)	Income tax	Photos		Essence	11.73£/hh/yr (284)
												Forme	12.75£/hh/yr
												Species diversity	11.24£/hh/yr
Hanley et al. (2001)	England	Landscape	Hedgerows	Current	Population	Face to face	All agricultural land	CVM (O-E)	Donation	Description	2000	Hedgerows (10% increase)	1.56£/hh/yr (70)
													1.93£/hh/yr (130)
Hanley et al. (2001)	England	Landscape	Quality of field margins	Current	Population	Face to face	All agricultural land	CVM (O-E)	Donation	Description	2000	Field margins (10% increase)	2.84£/hh/yr (70)
													3.20£/hh/yr (130)
Nunes (2002)	Portugal	Landscape	Park protection from tourist pressure	Current	Tourists	Face to face	National park	CVM (DC)	Donation	Description	1997	Managed rural Landscape	38euros/hh/yr
				Current	Tourists	Face to face	National park	CVM (DC)	Donation	Description	1997	Wild rural landscape	40euros/hh/yr

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Pruckner (1995)	Austria	Landscape	Conservation of agricultural landscapes	Current	Tourists	Face to face	Tourist area	CVM (DC)	Transport costs (parking, bus, etc.)	Description	1991	Agricultural landscape	0.70 ecu /pers/day (2110)
Taylor et al. (1997)	G.B.	Landscape	Characteristics and quality of forest landscape	Uncertain	Resident Population	Face to face	Whole country	CVM (O/E)	Tax	Sketches	1997	Essence	10.97€/hh/yr (638)
												forêt organique	12.75€/hh/yr (638)
												Species diversity	11.24€/hh/yr (638)
												Ideal forest	29.16€/hh/yr (638)
Taylor et al. (1997)	G.B.	Landscape	Characteristics and quality of forest landscape	Uncertain	Resident population	Face to face	Whole country	CE	Tax	Sketches	1997	Essence	12.89€/hh/yr (284)
												forêt organique	13.90€/hh/yr (284)
												Species diversity	11.36€/hh/yr (284)
												Ideal forest	38.15€/hh/yr (284)
Tempesta (1998)	Italy	Landscape	Conservation of rural landscape		Residents	Face to face	Region	CVM (O/E)	Tax	Photos		Landscape rural	87.662lire /hh/yr
Santos (1998)	Portugal	Landscape	Preservation of rural landscape	Current	Tourists	Face to face	National park	CVM (DC)	Income tax	Photos	1994	Agricultural landscape	72.05€/hh/yr (2394)
Santos (1998)	G.B.	Landscape	Preservation of agricultural landscape	Current	Tourists	Face to face	National park	CVM DC	Income tax	Photos	1994	Agricultural landscape	115.59escudos /hh/yr (3782)
Willis & Garrod (1993)	G.B.	Landscape	Conservation of current landscape	Uncertain	Residents	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	28.03€/hh/yr (300)
					Visitors	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	22.12€/hh/yr (300)
Willis & Garrod (1993)	G.B.	Landscape	Loss of traditional farms	Uncertain	Residents	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	7.67€/hh/yr (300)
					Visitors	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	23.73€/hh/yr (300)
Willis & Garrod (1993)	G.B.	Landscape	Conservation and enhancement of agricultural landscape	Uncertain	Residents	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	13.38€/hh/yr (300)
					Visitors	Face to face	National park	CVM (O/E)	Tax	Photos	1990	Agricultural landscape	18.18€/hh/yr (300)

Part 2

Methods

4 Intercept Survey

4.1 Intercept locations

The intercept study sought to investigate the reactions and views of tourists by personal interviews within Scotland. One of the key aims was to undertake interviews with individuals who had actual experience of wind farms (as opposed to mocked up pictures in before/after studies) in part because some held the belief that individuals inadvertently exaggerated their reactions. Thus intercept points had to be established as close as possible to actual Wind farm sites that were either operational or that had been approved for construction. Intercepting a significant number of visitors on the actual sites of Wind farms would not have been reasonable due to their location. Therefore certain criteria were set to decide intercept locations in order to optimise response levels and ensure a representative sample:

- safe and convenient for respondents to stop
- maximise intercepting people who have made a tourist visit decision
- maximise the likelihood that respondents will have seen the local Wind farm(s)
- recognised as tourist destinations
- provide a reasonable spread of locations throughout Scotland

As shown in Table 4-1, four areas were chosen for the survey covering five operational Wind farms and one approved Wind farm. The intercept locations were a combination of local Tourist Information Centres (TICs), visitor attractions or transport hubs. This ensured that the majority of people interviewed would be tourists. Questionnaire design ensured that those people who were not in the area for tourist reasons would not form part of the survey sample (see Appendix I for questionnaire).

Table 4-1 Visitor Destinations, Wind farm Sites and Intercept Locations

Wind farm Name & Location (Grid Reference in brackets)	Intercept Locations
Stirlingshire & Perthshire *Braes of Doune Wind farm* (NN 718 105), near Doune/Callander	Stirling Castle, Callander TIC, Tullibardine Visitor Centre (Blackford),
Caithness & Sutherland *Buolfruich Wind farm* (ND 160 355), *Causeymire Wind farm* (ND 155 505) and *Forss Wind farm* (ND 019 695)	Thurso TIC, Scrabster Harbour
Scottish Borders *Dunlaw Wind farm* (NT 466 572), near Lauder	Thirlestane Castle and Melrose TIC
Dumfries & Galloway *Dalswinton Wind farm*, near Dumfries Grid Ref. (NX 945 893)	Dumfries TIC and Kircudbright TIC

An initial pilot survey was undertaken at two of the Stirlingshire/Perthshire intercept locations (Callander TIC and Tullibardine Distillery & Visitor Centre) to test the questionnaire

The full survey was undertaken at the intercept lcoations during the summer months of July, August and September. The purpose of using the summer months was twofold:

- the wind farm sites were at maximum visual impact, due to the most favourable weather conditions relative to the rest of the year.
- being the high season for tourism in Scotland, this would help maximise response levels

4.2 Questionnaire design

4.2.1 Objectives of Design

The two key research questions for the intercept survey were as follows:

- what were the attitudes of visitors seeing Wind farms in the landscape
- what were the return visit intentions of visitors prior to and after knowledge of the existence of a Wind farm at the destination

4.2.2 Attitude Questions

To answer the first research question, the survey adapted a question from the Wind farm report commissioned by VisitScotland[11] in 2001, which asked respondents to indicate how certain features in the landscape affected their tourist experience.

This question was presented and recorded as follows:

Table 4-2 Structure of Question on Attitudes

"***Q17.*** *How do you feel the following structures impact on your experience of Scotland's scenery?"*

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative
Electricity pylons and wires	1	2	3	4	5
Wind farms and turbines	1	2	3	4	5
Mobile telephone masts	1	2	3	4	5
Ski Uplift (Railways, Chairlifts, Tows) and Ski Fencing	1	2	3	4	5
Planted forestry and forest felling	1	2	3	4	5
Telephone wires and poles	1	2	3	4	5
Hydro-electric dams	1	2	3	4	5
Power stations	1	2	3	4	5
Fish farms	1	2	3	4	5
Quarries	1	2	3	4	5
Trails and tracks across open upland areas	1	2	3	4	5

[11] NFO/System3 (2002), *Investigation in to the Potential Impact of Wind Farms on Tourism in Scotland*

This provided an indication not only of popular attitudes towards Wind farms, but also allowed comparison with other built features to establish the relative position of Wind farms in terms of public opinion.

4.2.3 Impact of Development on Tourist Intentions

To answer the second research question, respondents were asked to indicate their likely future visit intentions to both the local area and Scotland as a whole. Using the slide-rule device shown in **Figure 4-1** respondents were asked to indicate their likelihood of returning to the Area and to Scotland by sliding the indicator to a point between 0% (Definitely Will Not Return) and 100% (Definitely Will Return). Based on the figure below, the Area score is 50% and Scotland score is roughly 75%. The purpose of using the slide-rule was to overcome the weakness of providing arbitrary scales (e.g. 0-25-75-100, or even 10-20-30-…90-100), so that respondents could more intuitively indicate their intentions.

Figure 4-1 The Sliders Used to Assess Likelihood

At a later point in the interview - once the subject of the local Wind farm was introduced – respondents were shown the slide-rule again with the markers still where they had put them. They were then asked to indicate whether – now having knowledge of a Wind farm development - their likelihood of return would change. The extent of the change was indicated by sliding the indicators to a new position.

The visit intention was required from respondents three times based on three different visual situations:

4. having actually seen the Wind farm;
5. shown a photo-montage of the local landscape before and after the creation of the existing Wind farm;

6. shown a photo-montage of the local landscape illustrating the existing Wind farm and how the landscape would look if the Wind farm had been extended by 40%-50%

Any change recorded for each of the above situations would indicate the level of change in intention.

4.2.4 Estimating the Change in Intention

Prior to any discussion on wind farms the interviewee was asked about their intention to return to Scotland. In the figure above the respondent has indicated an **initial intention of return to the area of 50% and to Scotland of 75%:**

After discussion of wind farms the interviewee was required to state their return intentions in the following situations:

1. Having actually seen the Wind farm

New Slider Positions	Area = 25%	Scotland = 75%
Result: Change in intention	Area = 25%	Scotland = 0%

2. Shown a photo-montage of the local landscape before and after creation of the existing Wind farm

New Slider Positions	Area = 10%	Scotland = 75%
Result: Change in intention	Area = 40%	Scotland = 0%

3. Shown a photo-montage of the local landscape showing the existing Wind farm and how the landscape would look if the Wind farm had been extended by 40%-50%

New slider positions	Area = 0%	Scotland = 70%
Result: Change in intention	Area = 50%	Scotland = 5%

This methodology allows for the measurement of people's reaction not only to actual Wind farm developments but also to different levels of development. The latter has become more of an issue as the number of operations and applications for new or extended developments has increased significantly in recent years.

4.2.5 Other Questions

In addition to these two main research questions, a number of profiling questions were asked in order to test responses across different demographics and tourist motivations.

Finally, a set of four questions were asked at the end of the interview related in the main to planning policy considerations.

4.3 Survey results

4.3.1 Number and Location of Responses

There were a total of 380 responses from the four areas under analysis. As shown in Table 4-3, Stirlingshire & Perthshire accounted for nearly half (44.8%) of responses. The other three areas had a similar proportion of the remaining responses.

Table 4-3Response by Interview Location

Interview Location		Frequency	Percent	Cumulative Percent
Stirlingshire & Perthshire	Callander TIC	77	20.3	44.8%
	Tullibardine Distillery	13	3.4	
	Stirling Castle	80	21.1	
Dumfries & Galloway	Kircudbright TIC	70	18.4	20.2%
	Dumfries TIC	7	1.8	
Caithness & Sutherland	Scrabster	63	16.6	18.4%
	Thurso TIC	7	1.8	
Scottish Borders	Melrose TIC	51	13.4	16.6%
	Thirlestane Castle	12	3.2	
	Total	380	100.0	

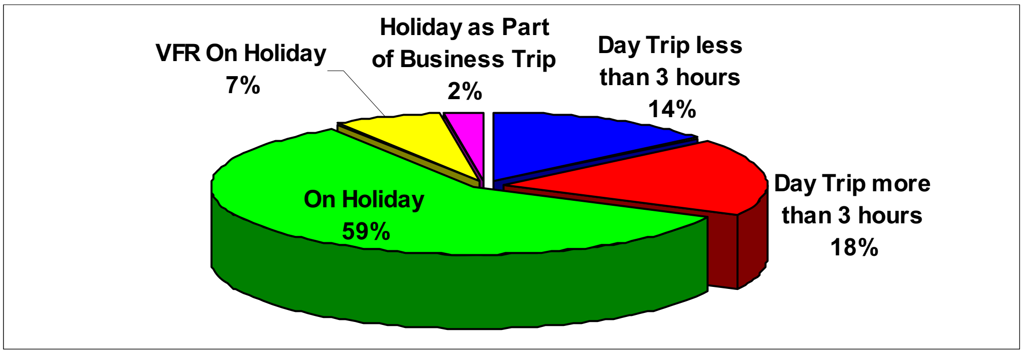
4.3.2 Respondent Profile

Trip Type

Just over two-thirds (68%) of respondents identified themselves as being on some form of holiday with an overnight stay. This consisted of three holiday types: general holiday (59%); visiting friends and relatives (VFR) (7%) and holidays as an extension of a business trip (2%).

14% of respondents were on a day trip of less than three hours, while a further 17% identified that their day trip lasted for 3 hours or more.

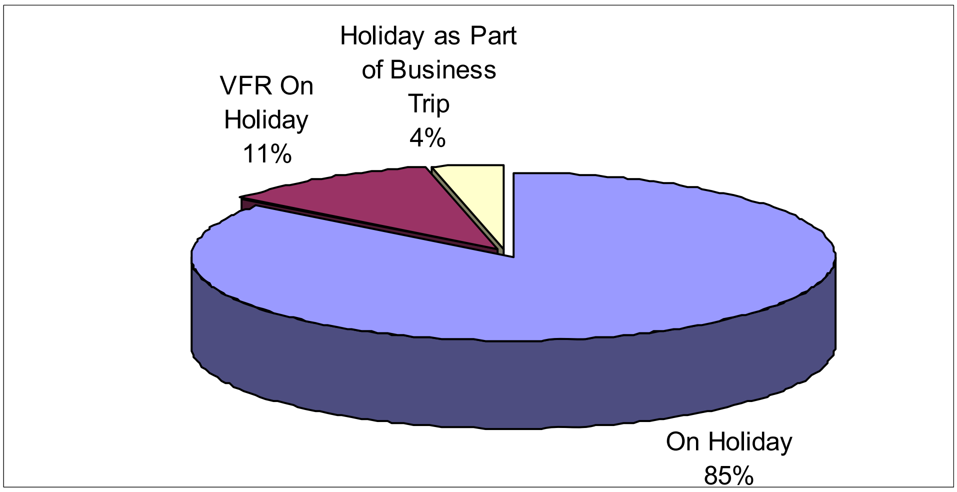
Figure 4-2 Trip Type



N= 380

Figure 4-3 shows that among overnight stay respondents only, 85% were on a general holiday and 11% were visiting friends and relatives.

Figure 4-3 Trip Type - Overnight Stays Only

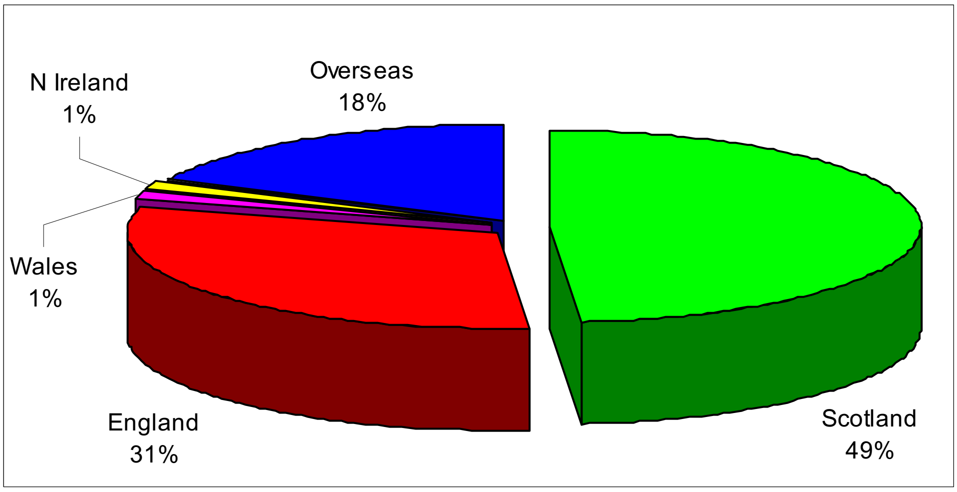


N=223

Country of Origin

The distribution of country of origin among all respondents (n=380) shown Figure 4-4 illustrates that visitors from Scotland and England predominate – accounting for 80% of responses.

Figure 4-4 Country of Origin of All Respondents



N=380

Table 4-4 provides more detail on the home countries of overseas respondents.

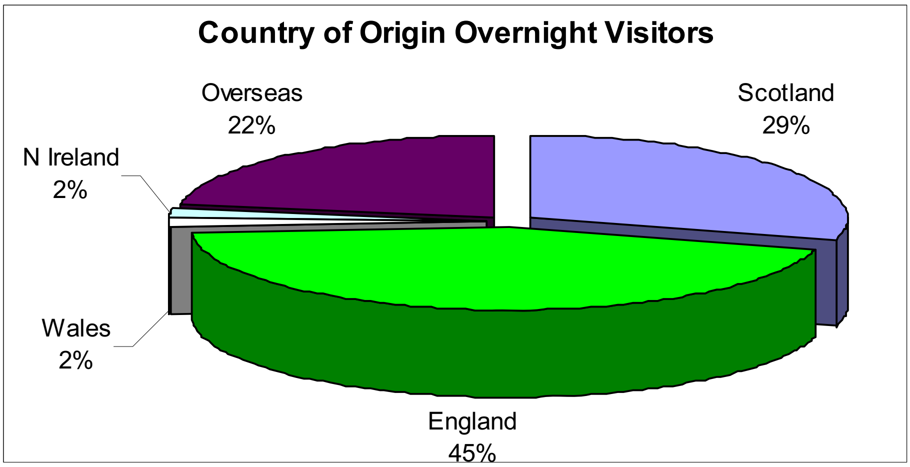
Table 4-4 Country of Origin of Overseas Respondents

Country	N	%	Country	N	%
USA	16	23%	Austria	1	1%
Australia	15	22%	Belgium	1	1%
Canada	9	13%	France	1	1%
Germany	7	10%	Hungary	1	1%
Spain	4	6%	Japan	1	1%
Netherlands	3	4%	Lithuania	1	1%
Italy	2	3%	New Zealand	1	1%
Sweden	2	3%	Russia	1	1%
Switzerland	2	3%	South Africa	1	1%
			Total	**69**	**100%**

N=69

However, looking at overnights stays only (n=223), as shown in Figure 4-5, visitors from Scotland and England make up 74% of the sample – with English visitors being significantly in the majority (45%). There is therefore some under-representation of Scottish overnight visitors if compared to the VisitScotland data shown in Table 4-5 Visitors from England and Overseas are slightly over-represented, both by 5%. However, we would suggest that the sample is still sufficiently representative to draw meaningful conclusions regarding opinions on Wind farm developments.

Figure 4-5 Country of Origin of Overnight Stay Visitors Only



N=223

Table 4-5 Country of Origin from VisitScotland Data

Country	Trips 2006 (m)	%
Scotland	6.35	40%
England	6.40	40%
Northern Ireland	0.38	2%
Wales	0.15	1%
Total Overseas Tourism	2.73	17%
Total	**16.01**	100%

Source: VisitScotland (2007), Tourism in Scotland 2006

Numbers on First Trip to Scotland or the Area

Almost 9 out 10 of respondents (86%) had made a trip in Scotland before. It was the first trip to Scotland for a total of 52 respondents, with 39 from overseas, 10 from England and 3 from Scotland.

Table 4-6 Q4 First Trip to Scotland?

	Frequency	%
Yes	52	14%
No	327	86%
Total	379	100%

N=379

Of those staying overnight (n=222), it was the first trip for 41 of them. 31of these respondents were from overseas and 10 were from England.

Table 4-7 Q4 First Trip to Scotland - Overnight Stays Only

	Frequency	Percent
Yes	41	18%
No	181	82%
Total	222	100%

N=222

First trippers were much more in evidence in Stirlingshire/Perthshire, Caithness & Sutherland and the Scottish Borders, compared to Dumfries & Galloway. This is mainly a function of a greater proportion of overseas respondents in these areas - 23%, 19% and 24% respectively - compared with only 3% in Dumfries & Galloway.

Table 4-8 Q5 First Trip to Area, by Area

	Q5 First Trip to Area?		% first trip to area	Total
	Yes	No		
Stirlingshire & Perthshire	64	106	38%	**170**
Caithness & Sutherland	29	41	41%	**70**
Scottish Borders	20	42	32%	**62**
Dumfries & Galloway	12	65	16%	**77**
Total	**125**	**254**	**33%**	**379**

Of the 222 overnight stays, it was the first trip to the area for 93 of them. Of these, 38 were from overseas and 38 were from England, with the remainder coming from Scotland (14) and Wales (3).

Table 4-9 Q5 First Trip to Area? - Overnight Stays Only

	Frequency	Percent
Yes	93	42%
No	129	58%
Total	222	100%

N=222

Most areas, with the exception of Dumfries & Galloway, had a similar proportion of overnight stay visitors on their first trip.

Table 4-10 Q5 First Trip to Area, by Area - Overnight Stays Only

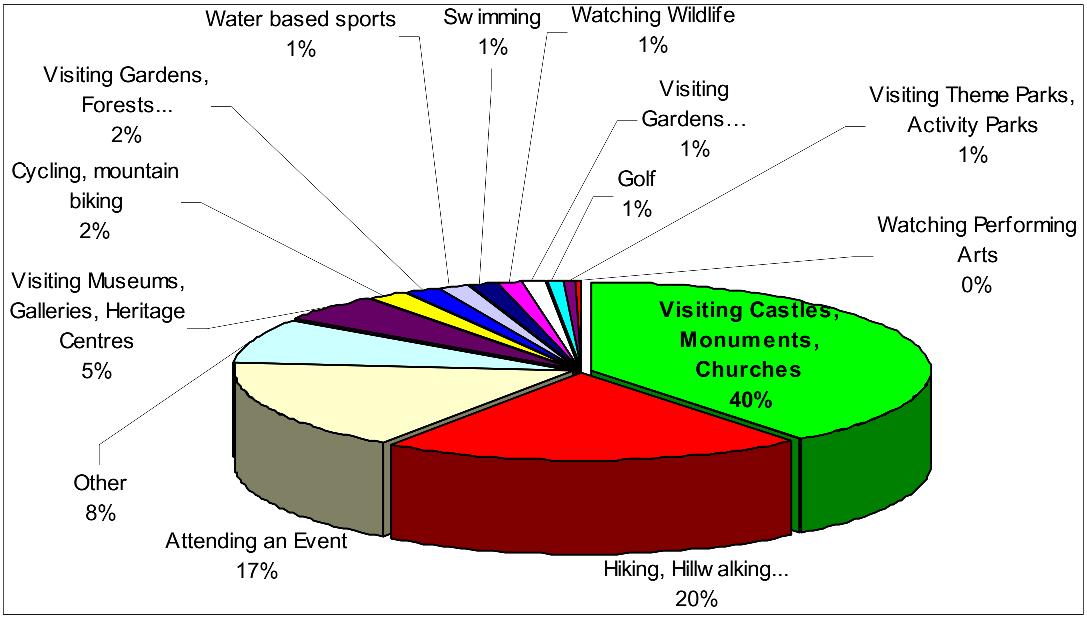
	Stirlingshire & Perthshire	Caithness & Sutherland	Borders	D&G	Total
Yes	46	28	8	11	93
No	52	38	9	30	129
Total	98	66	17	41	222
% first trip	**47%**	**42%**	**47%**	**27%**	**42%**

4.3.3 Main Activities Undertaken

The main activities undertaken by respondents were similar to tourists in general (see VisitScotland data[12]). The proportion of respondents attending events was higher than normal because the intercepts occurred when most areas had their main summer season events.

[12] Tourism in Scotland 2005 (VisitScotland, 2006)

Figure 4-6 Main Activity Undertaken

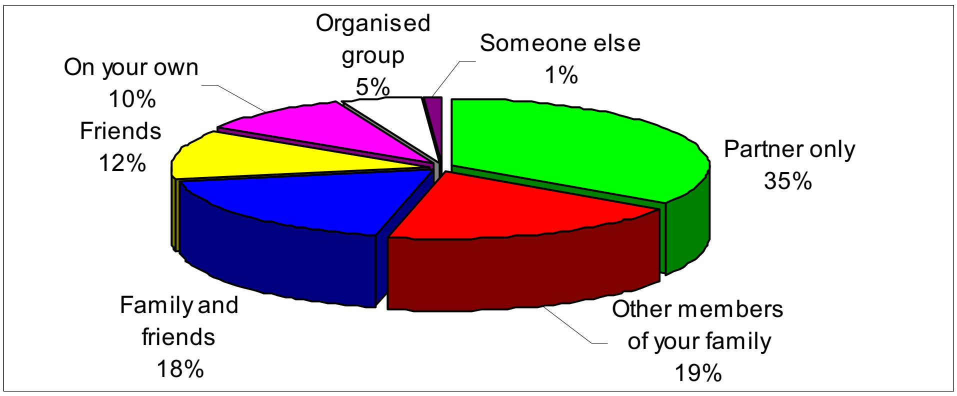


n=357

4.3.4 Travel Group Profile

The most represented visitor group type among respondents was those in a couple (35%). The next equal largest groups were 'Other members of your family' (19%), 'Family and Friends' (18%) and 'Friends (12%). These three close informal groups overall accounted for 49% of respondents. Evidence from most Scottish destinations identifies the couples market as the largest market, ranging from one-third to well over a half.

Figure 4-7 Travel Group Profile

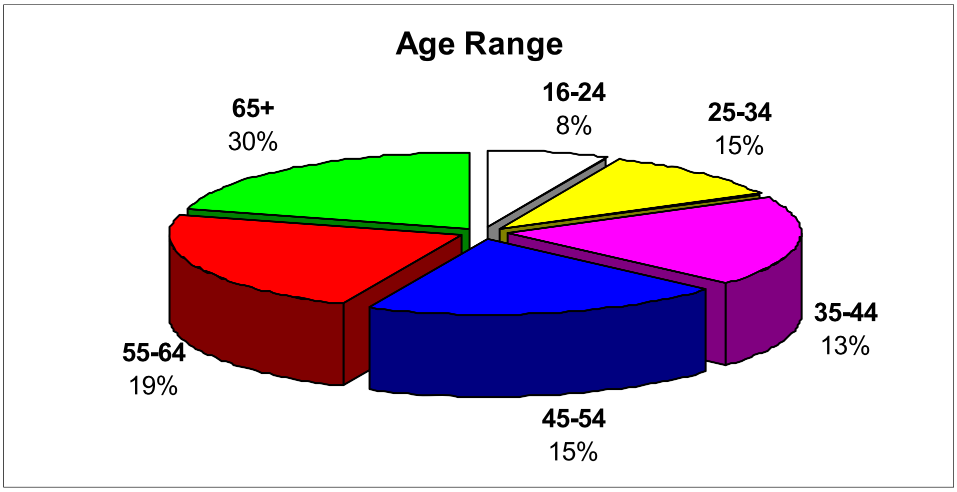


n=380

4.3.5 Age Range and Gender

There is some over representation in the older age ranges, but in general we believe the distribution of respondents is acceptable for the purposes of this project.

Figure 4-8 Age Profile of Respondents



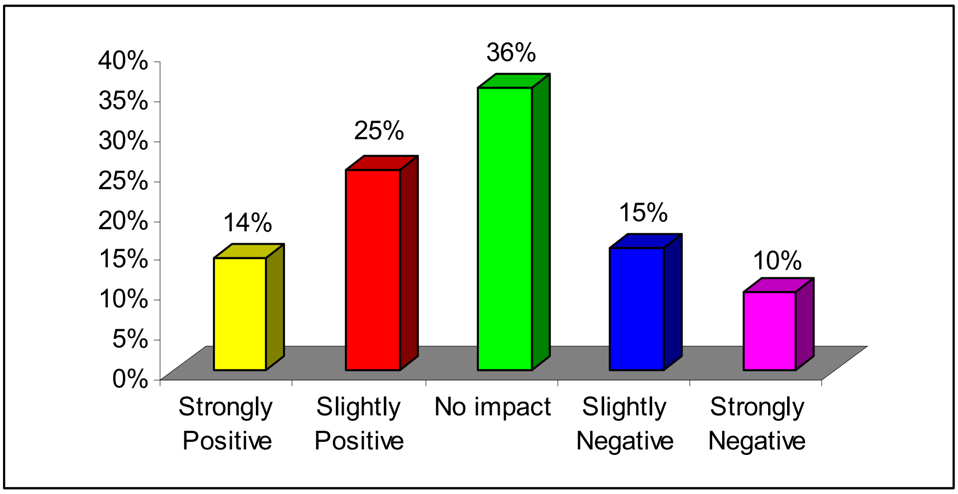
N=375

There was a highly even balance of respondents by gender, with 194 males and 186 females.

4.4 Attitude to structures in the landscape

42% of respondents had some level of positive opinion towards Wind farms, while one-quarter (25%) indicated some level of negative response. One-in-ten respondents (37 responses) indicated that they were strongly negative.

Figure 4-9 Q17 Opinion of Structures in the Landscape - Wind farms



In terms of positive attitudes, Wind farms were behind only Upland Trails and Tracks (55%) and Planted Forestry and Felling (46%). If taken along with 'No Impact' responses, three-quarters of respondents (75%) believe that Wind farms have a positive or neutral impact on the landscape.

On the other hand, the level of negative response (25%) towards Wind farms was the fourth highest of the 11 structures in the landscape upon which an opinion was sought – behind Pylons (49%), Mobile Telephone Masts (36%) and Power Stations (26%).

Table 4-11 Opinion of Structures in the Landscape - All Structures

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative	+ve rank	-ve rank
Pylons	2%	5%	44%	32%	17%	10	1
Wind farms	14%	25%	36%	15%	10%	3	4
Mobile Telephone Masts	1%	3%	59%	27%	9%	11	2
Ski Facilities	3%	16%	73%	6%	2%	6	9
Planted Forestry/Felling	15%	31%	36%	15%	3%	2	7
Telephone Wires/Poles	2%	8%	69%	17%	3%	9	6
Hydro-electric Dams	10%	18%	66%	5%	2%	4	10
Power Station	4%	7%	63%	20%	6%	8	3
Fish Farms	4%	18%	67%	8%	3%	5	8
Quarries	3%	10%	64%	16%	7%	7	5
Uplands Trails/Tracks	23%	32%	41%	3%	1%	1	11

The extent to which these opinions have an impact on visitor intentions to return to an area is explored in the next section.

As shown in Table 4-12, the proportion Scottish and English respondents who displayed a negative view of Wind farms was almost twice that of overseas visitors. A high proportion of overseas visitors were also neutral on the subject. All groups had similar proportions indicating a positive disposition towards Wind farms and their impact on the landscape.

Table 4-12 Opinion of Wind farms by Country of Origin

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative	Total
Scotland	16%	23%	34%	18%	9%	182
England	11%	30%	30%	16%	13%	116
Wales	20%	40%	20%	0%	20%	5
N Ireland	25%	0%	50%	0%	25%	4
Overseas	13%	22%	49%	9%	6%	67

Day Trip visitors were also slightly more negative towards Wind farms than holiday visitors (overnight stays), illustrating perhaps that people are perhaps more negative towards Wind farms the closer they live to them. That is, overseas are the least negative, while domestically overnight stay visitors (who by definition live further away than day visitors) are less negative than day visitors.

Table 4-13 Opinion of Wind farms by Trip Type

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative	*n*
Day Trip less than 3 hours	19%	23%	32%	19%	8%	53
Day Trip more than 3 hours	9%	23%	36%	17%	14%	69
On Holiday	14%	25%	37%	14%	10%	218
VFR On Holiday	24%	40%	20%	12%	4%	25
Holiday as Part of Business Trip	11%	11%	56%	11%	11%	9

N=374

Analysis of attitudes based on the main visitor activity undertaken by respondents is shown in Table 4-14. Only a small number of these categories had sufficient responses to provide meaningful analysis and within these it can generally be concluded that none deviated significantly from the figures for the sample as a whole.

Interestingly, the proportion of respondents whose main activity was indicated as walking/hillwalking (where the landscape is a major of the experience) and who indicated a negative attitude towards Wind farms (19%) was lower than the overall figure of 25%. This group also had the most positive attitude (45%) among those categories where the sample size was of sufficient size for analysis.

Table 4-14 Opinion of Wind farms by Main Activity

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative	*n*
Visiting Castles, Monuments, Churches	12%	25%	38%	15%	9%	138
Hiking, Hillwalking...	26%	19%	37%	10%	9%	70
Attending an Event	10%	22%	42%	18%	8%	60
Other	17%	28%	17%	21%	17%	29
Visiting Museums, Galleries, Heritage Centres	11%	22%	39%	22%	6%	18
Cycling, mountain biking	29%	14%	14%	29%	14%	7
Visiting Gardens, Forests...	17%	50%	17%	0%	17%	6
Water based sports	0%	40%	40%	0%	20%	5
Swimming	20%	60%	20%	0%	0%	5
Fishing	0%	25%	50%	0%	25%	4
Watching Wildlife	0%	0%	67%	0%	33%	3
Golf	0%	33%	0%	33%	33%	3
Visiting Theme Parks, Activity Parks	0%	50%	0%	50%	0%	2
Watching Performing Arts	100%	0%	0%	0%	0%	1

N=351

4.5 Likelihood of return

4.5.1 Initial Estimate of Return to the Area and Scotland

Prior to asking respondents direct questions about their opinion of Wind farms, they were asked to indicate their likelihood of return to the area in which the intercept was taking place. These responses would provide a zero base from which to compare how people's intentions to return were affected once the issue of Wind farms was explored directly.

As shown in Table 4-15 only 6 respondents to this question had indicated that they were unlikely to return to any of the four the areas, with 4 respondents indicating this in Stirlingshire/Perthshire and 2 respondents in Caithness & Sutherland. Of these, one person provided a reason which was that they 'Don't visit places twice".

Dumfries & Galloway had the highest proportion of respondents indicating a 100% likelihood of returning to the area, at 88%, followed by the Scottish Borders (54%), Caithness & Sutherland (46%) and Stirlingshire/Perthshire (45%). This again reflects the profile of respondents in each area, with Dumfries & Galloway having 97% of the sample being domestic visitors compared to levels of around three-quarters to four-fifths in the other areas.

Table 4-15 Frequency of Likelihood of Return to Each Area

	Caithness & Sutherland		Perth, Kinross & Stirling		The Scottish Borders		Dumfries & Galloway		All	
Likelihood	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
0	4	2%	2	3%	0	0%	0	0%	6	2%
5	3	2%	1	1%	0	0%	0	0%	4	1%
10	4	2%	1	1%	1	2%	0	0%	6	2%
15	0	0%	1	1%	0	0%	0	0%	1	0%
20	4	2%	4	6%	1	2%	1	1%	10	3%
30	1	1%	5	7%	2	3%	0	0%	8	2%
40	0	0%	2	3%	0	0%	0	0%	2	1%
50	26	16%	7	10%	8	13%	0	0%	41	11%
60	9	5%	1	1%	2	3%	0	0%	12	3%
70	16	10%	3	4%	1	2%	0	0%	20	5%
75	4	2%	1	1%	2	3%	2	3%	9	2%
80	13	8%	2	3%	4	6%	1	1%	20	5%
85	0	0%	1	1%	3	5%	2	3%	6	2%
90	8	5%	5	7%	4	6%	2	3%	19	5%
95	0	0%	0	0%	1	2%	0	0%	1	0%
99	0	0%	1	1%	0	0%	1	1%	2	1%
100	75	45%	31	46%	34	54%	68	88%	208	55%
	167	**100%**	**68**	**100%**	**63**	**100%**	**77**	**100%**	375	100%

90% of respondents in Stirlingshire/Perthshire indicated a 50% or above likelihood of returning to the area, while the proportion in the areas of Caithness & Sutherland, Scottish Borders and Dumfries & Galloway were 76%, 94% and 99% respectively.

All respondents to this question, save for one, indicated some level of intention to return to Scotland, with four-fifths (80%) definitely returning. 97% of respondents indicated a 50% or above likelihood of returning.

Table 4-16 Q15 Likelihood of Return to Scotland

Likelihood	Frequency	%
0	1	0.3%
5	2	0.5%
10	3	0.8%
20	2	0.5%
25	1	0.3%
30	1	0.3%
40	2	0.5%
50	12	3.2%
60	6	1.6%
70	10	2.7%
75	4	1.1%
80	16	4.3%
85	1	0.3%
90	10	2.7%
95	1	0.3%
99	2	0.5%
100	299	80.2%
Total	373	100%

N=373

4.5.2 Affect on Decision to Visit Again Having Seen the Wind Farm

Numbers who had seen a Wind farm

This question was not asked to those respondents in Dumfries & Galloway as there is only a planned wind farm for that area. As such, the sample for this question was N=246.

Almost two-thirds (63%) of respondents had seen the wind farm en route to the intercept locations in the other three areas.

Table 4-17 Q18 Did you see a Wind farm in the AREA?

	Frequency	Percent
Yes	191	63%
No	111	37%
Total	302	100%

N=302

As shown below, wind farms around the Caithness & Sutherland intercept sites had the highest level of visibility among respondents with 90% having seen a Wind farm in the area. Two-thirds had seen the Braes of Doune Wind farm in Stirlingshire/Perthshire, while only one-quarter had seen the Dunlaw Wind farm near the Scottish Borders intercept sites.

Table 4-18 Q18 by Intercept Area

Area	Yes	No	Total	% Yes
Stirlingshire & Perthshire	113	56	169	**67%**
Caithness & Sutherland	63	7	70	**90%**
Scottish Borders	15	48	63	**24%**
	191	111	302	**63%**

N=302

Likelihood of Affecting Future Visit Intentions:

Of those who had seen a Wind farm in an area (191 respondents), 4 people (2%) indicated that it would affect their intention to visit the area again. It should be noted that all 4 of these respondents were intercepted in the Stirling/Perthshire area, so that none of the respondents in Caithness & Sutherland or in the Scottish Borders indicated that the Wind farm they had seen would affect their decision to visit the area again.

Table 4-19 Q19 Would this affect decision to visit AREA again?

	Frequency	Percent
Yes	4	2%
No	187	98%
Total	191	100%

Taking Stirlingshire/Perthshire alone, the proportion of those indicating a change in visit intention is slightly higher (4%).

Table 4-20 Stirlingshire/Perthshire - Q18 Did you see a Wind farm in the AREA?

	Frequency	Percent
Yes	96	68%
No	46	32%
Total	142	100%

Table 4-21 Stirlingshire/Perthshire – Q19 Would this affect decision to visit AREA again?

	Frequency	Percent
Yes	4	4%
No	92	96%
Total	96	100%

Of the 4 people who said that it would affect their decision, 2 indicated that the likelihood would decrease and 2 signalled that it would increase. No one indicated that they would definitely not return at all as a result of the Wind farm.

Of the two who confirmed that it would decrease, one indicated a change from 70% to 40% and one indicated a change from 100% to 80%. Of those who indicated an increase in likelihood to return, one indicated a change from 100% to >100% (shown as 101% below) and one indicated a change from 10% to 30%.

Table 4-22 Q13 Likelihood of Return to Area *vQ20 How much would it affect decision to visit AREA again? (Seen)

		Q20 How much would it affect decision to visit AREA?				**Total**
		30%	40%	80%	101%	
Likelihood of Return to Area	10%	1	0	0	0	**1**
	70%	0	1	0	0	**1**
	100%	0	0	1	1	**2**
Total		**1**	**1**	**1**	**1**	**4**

Green – increased intention, Cerise = decreased intention

All four respondents also indicated that it would affect their decision to visit Scotland as a whole again (Question 21). As shown below, again two respondents indicated a decrease in intention and two indicated an increase in intention.

Table 4-23 Q15 Likelihood of Return to Scotland v Q22 How much would thus affect decision to visit SCOTLAND? (Seen)

		Q22 How much would thus affect decision to visit SCOTLAND?				**Total**
		40%	70%	80%	101%	
Q15 Likelihood of Return to Scotland	60%	0	1	0	0	**1**
	70%	1	0	0	0	**1**
	100%	0	0	1	1	**2**
Total		**1**	**1**	**1**	**1**	**4**

Green – increased intention, Cerise = decreased intention

The net result of the change in intentions - as indicated by the 4 respondents who would re-evaluate their intention to return – would be a 7.25% fall for the area and a 9.75% fall for Scotland. These percentages are of course related only to that 2% of respondents who had indicated a change. As such, the actual impact is virtually zero – 0.15% for the area and 0.2% for Scotland. Of course, the area in question is

Stirlingshire/Perthshire as respondents at the other locations indicated no change to their visit intentions having seen the local Wind farm.

4.5.3 Affect of Before and After Photos on Future Visit Intentions

All respondents13 were shown a photo montage of the local Wind farm showing how the landscape looked before the development and in its present form. 11 of the 379 respondents (3%) indicated that it would affect their future visit intentions.

Table 4-24 Q23 Would this affect decision to visit AREA again?

	Frequency	Percent
Yes	11	3%
No	368	97%
Total	379	100%

N=379

As shown below, of those 11 respondents confirming a change in visit intention, 4 indicated an increase and 7 indicated a decrease. 2 respondents indicated an intention to definitely not return – one from 30% to 0% and one from 100% to 0%.

Table 4-25 Q13 Likelihood of Return to Area v Q24 How much would this affect decision to visit AREA again? Planned Farms

	Q24 How much would this affect decision to visit AREA again?							Total
Q13 Likelihood of Return to Area	0%	10%	30%	40%	50%	90%	101%	
10%	0	0	1	0	0	0	0	**1**
30%	1	0	0	0	0	0	0	**1**
40%	0	0	0	0	1	0	0	**1**
70%	0	0	0	1	0	0	0	**1**
80%	0	0	0	1	0	0	0	**1**
100%	1	1	0	0	0	2	2	**6**
Total	**2**	**1**	**1**	**2**	**1**	**2**	**2**	**11**

Green – increased intention, Cerise = decreased intention

13

4.5.4 Response to Photos of Actual and Extended Development

All respondents were shown a photo montage of the actual Wind farm development alongside that of an extended development of the Wind farm. 26 of the 379 respondents (7%) indicated that it would affect their future visit intentions.

Table 4-26 Q27 Would this affect decision to visit AREA again?

	Frequency	Percent
Yes	26	7%
No	353	93%
Total	379	100%

N=379

As shown overleaf, of those 26 respondents confirming a change in visit intention, 23 indicated a decrease and 3 indicated an increase. Of the 3 people who indicated an increase in visit intention, 2 were intercepted in Stirlingshire/Perthshire and 1 in Caithness & Sutherland.

7 respondents indicated an intention to definitely not return if the Wind farm was extended to the extent portrayed in the photo montage. 5 of these were from the Stirlingshire/Perthshire study and 2 from the Dumfries & Galloway intercept. Interestingly, one of the seven people who indicated that they would not return having seen the image of the extended development, had initially indicated that Wind farms had a Slightly Positive impact on the landscape. This suggests that for some people there is a natural tipping point at which a positive disposition can become negative as a development's visual impact increases.

Table 4-27 Location of Intercept and Future Visit Intention Based on Extended Wind farm

	+ve intention	-ve intention
Stirling/Perthshire	2	17
Caithness & Sutherland	1	0
Scottish Borders	0	2
Dumfries & Galloway	0	4
Total	**3**	**23**

N=26

Table 4-28 Q13 Likelihood of Return to Area v Q28 How much would this affect decision to visit AREA again? Enlarged Farms (prev 4.5.17)

	Q28 How much would this affect decision to visit AREA again?																Total
Q13 Likelihood of Return to Area	0%	3%	9%	10%	20%	25%	30%	36%	40%	50%	60%	70 %	75 %	85 %	90 %	101 %	
10%	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
20%	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
30%	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
40%	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
50%	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
60%	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
70%	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
80%	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
90%	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	4
100%	2	0	1	0	0	1	0	0	0	1	1	1	1	0	1	1	10
Total	7	1	1	1	1	1	1	1	2	3	1	2	1	1	1	1	26

Green – increased intention, Cerise = decreased intention

4.5.5 Response Summary

The net result of the change in intentions is shown in Table 4-29. This relates to the three scenarios reported on above, namely:

1. change in intention having seen a Wind farm locally
2. change in intention having seen the photo montage pre-development and actual development
3. change in intention having seen the photo-montage of the actual development and extension to actual development

This shows that the impact at both the area level and nationally is relatively small, with only the extended development scenario at the area level showing significant value (-2.54%). However, the figures do show that respondents became slightly more negative towards a Wind farm development as the visual impact increased. This is an important consideration for local authorities and the Scottish Executive in respect of applications for extensions to existing developments.

Table 4-29 Impact of Change in Intention of Three Visual Impact Scenarios

	ALL		Overnight	
Having Seen	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	191	191	137	137
Number Responding	4	4	3	3
Number Not Responding	187	187	134	134
Percent Responding	2.1%	2.1%	2.20%	2.20%
Change in Likelihood	-0.08%	-0.10%	-0.12%	-0.16%
Photo	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	380	380	256	256
Number Responding	11	4	7	3
Number Not Responding	369	376	249	253
Percent Responding	2.89%	1.05%	2.73%	1.17%
Change in Likelihood	-0.73%	-0.05%	-0.70%	-0.10%

Extended	Area	Scotland	Area	Scotland
Number Sampled	380	380	256	256
Number Responding	26	5	19	4
Number Not Responding	354	375	237	252
Percent Responding	6.84%	1.32%	7.42%	1.56%
Change in Likelihood	-2.54%	-0.30%	-2.50%	-0.45%

4.6 Views on specific wind farm issues

4.6.1 Wind farms in the same view

A significant proportion of respondents (44%) agreed that they don't like to see several Wind farms in the same view. These results suggest that those respondents who have indicated having a neutral or even positive perspective on individual Wind farm sites are less likely to have a similar opinion on a landscape that has several developments in view.

This clear result compares with analysis in the previous section where there was a small increase in the negative response as the visual impact increased for an individual Wind farm development. This suggests that people see one large scale development in an area as preferable to several smaller scale developments dotted on the landscape.

On the other hand, both sets of results also confirm that a definite tipping point exists where Wind farm development becomes untenable for a significant number of visitors.

Table 4-30 Q31 - I don't like to see several Wind farms in the same view

	Frequency	%
Agree Strongly	70	19%
Agree Slightly	94	25%
Neither Agree nor Disagree	99	26%
Disagree Slightly	74	20%
Disagree Strongly	40	11%
Total	377	100%

4.6.2 'I like to see Wind farms'

Nearly half (48%) of respondents agreed with the statement 'I like to see Wind farms'. 28% disagreed with the statement. The remaining 24% of respondents were neutral on this statement; therefore overall almost three-quarters (72%) were positive or neutral to this statement. This corresponds to the responses given at Question 17 regarding the impact of structures on the landscape, were exactly three-quarters (75%) of respondents indicated that Wind farms either had a positive impact or no impact on their experience of the landscape.

Table 4-31 Q31 - I don't like to see Wind farms

	Frequency	Percent
Agree Strongly	100	27%
Agree Slightly	81	21%
Neither Agree nor Disagree	91	24%
Disagree Slightly	44	12%
Disagree Strongly	61	16%
Total	377	100%

N=377

4.6.3 I think they should be painted to make them less visible

Exactly half (50%) of respondents did not agree that Wind farms should be painted, with only 29% agreeing to this statement. This is a strong indication that the painting of Wind farm structures, even with the intention of making them less visible, would actually increase the level of negative opinion from that which exists towards their present form. Indeed, a larger proportion of both respondents who are positive and negative towards Wind farms disagreed with this statement.

Table 4-32 Q31 - I think they should be painted to make them less visible

	Frequency	Percent
Agree Strongly	40	11%
Agree Slightly	68	18%
Neither Agree nor Disagree	75	20%
Disagree Slightly	102	27%
Disagree Strongly	87	23%
Don't Know	5	1%
Total	377	100%

4.6.4 A well sited Wind farm does not ruin the landscape

A significant proportion (68%) agreed that a well sited Wind farm did not ruin the landscape, while one-fifth (20%) disagreed with this statement. Interestingly, of the 105 respondents that had disagreed with the statement 'I like to see Wind farms', 40 of them agreed that a well sited Wind farm did not ruin the landscape. However, of the 181 respondents that had agreed with statement 'I like to see Wind farms', 12 actually disagreed that a well sited Wind farm did not ruin the landscape. This suggests that even among those who like to see Wind farms, for some of them there will be certain settings or locations where they would not like to see such a development. It could be argued nonetheless that the existing planning regime already acknowledges this fact and that guidelines attempt to stop such developments.

Table 4-33 Q31 - A well sited Wind farm does not ruin the landscape

	Frequency	Percent
Agree Strongly	111	29%
Agree Slightly	146	39%
Neither Agree nor Disagree	45	12%
Disagree Slightly	40	11%
Disagree Strongly	33	9%
Don't Know	2	1%
Total	377	100%

4.7 Conclusion on Intercept Methodology

The approach chosen was largely successful in obtaining the views of a representative sample of tourists in significantly different areas most of whom had had some experience of viewing a wind farm development. The results confirm that a sizeable minority of tourists did not like wind farms, but only a small minority were so offended as to change their intentions about revisiting Scotland. The impact is consequently likely to be very small.

Importantly those who had seen a farm were less hostile than those who had not, suggesting that previous intention type surveys such as NTS/System3 (2002) and indeed the Internet Survey conducted as part of this research, may have exaggerated the impact. It is believed that this may reflect a "protest vote" response by some who have negative views about wind farms and the landscape and who wish to register those views in some way whilst, in practice, continuing to holiday in Scotland.

One major surprising finding was that those who had had most exposure, specifically those who had driven very close to the wind farms in Caithness (Causeymire) and in the Borders (Dun Law) were possibly even less affected than those who had viewed them at some distance e.g. the Braes of Doune from Stirling Castle. The initial plan to classify tourists by level of exposure was, as a consequence, altered and all exposure was treated similarly.

5 The GIS Study

5.1 Introduction and objective

This chapter provides an overview of Geographical Information Systems (GIS), discusses why it was thought that they might be useful as a solution to the research problem and how they were employed in practice

Providing a definition of a geographical information system is not an easy task. Heywood et al (2002, pp. 11-12) discuss various attempts at providing a definition. The Department of the Environment (1987, p. 6) define a GIS as "a system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the earth". This seems as good a definition as any given that the topic of interest here is concerned with the distribution of wind farms relative to their physical locations and the distribution and activities of tourists.

At first it may not seem obvious why GIS is of interest. This study seeks to identify the actual impact of current and projected wind farms on tourists in order to estimate the potential economic impact. This impact comes in numerous ways. Walkers on the Southern Upland Way, for example, will have almost continuous exposure. On the other hand Scottish tourists going to the West Highlands may have no exposure. The former group may experience considerable loss of value and a considerable proportion of potential walkers may choose to go elsewhere, but the economic impact will still be small if the numbers undertaking the activity are small.

The nature of the exposure is expected to have different impacts. A Wind farm only visible as a pattern on a distant hill (e.g.the Braes of Doune) may have a different impact, both positive and negative, from one adjacent to the road (e.g. Hill of Dun and Causeymire).

Because of the huge numbers of tourists on a major route such as the M74, slight exposure may actually have a significant economic impact. One of our priorities, therefore, has been to estimate the numbers that have exposure as a proportion of all tourists.

Formally the key objective of the GIS study was to combine the roads and accommodation that would be exposed with the numbers of people on the roads or in the accommodation and establish three metrics

1. Percentage of Tourists travelling on roads in the area who had high exposure to wind farms, where high is defined as a view of more than four or more turbines at either less than 1km for 2 minutes or less than 15km for at least 10 minutes

2. Percentage of Tourists travelling on roads in the area who had medium exposure to wind farms, where medium is defined as a view of more than four or more turbines at less than 15km for at least 2 minutes

3. Percentage of accommodation in an area with a view of four or more wind turbines

5.2 The geographical information systems model

GIS is concerned with the analysis of any spatial system. Obvious examples include the distribution of economic, health or social characteristics within the UK (or any locale); the numbers or characteristics of the population within a zone associated with a resource (railway station, school, hospital); spatial links between features such as early settlements and the analysis of urban activity on flood plains. The problem discussed here was how to identify the number of motorists who could view wind farms when they travelled in Scotland and the number of hotel beds that were similarly affected.

The basic tool of GIS is the map. There are two types of map; Raster and Vector. In the raster structure the map consists of a number of cells (e.g. 4000*4000) each of which carries information e.g. colour and height. Since areas, such as forests or roads exceed single cells the cell links are made using colour and external information. For example a set of cells coloured red adjoining each other in a line might be recognisable as a road. In contrast the vector map consists of points, lines and polygons with identified attributes such as the grid reference, the feature class (an "A" road), names ("A99") and other details (vehicle counts). GIS is normally based on vector maps since this is how information is most easily stored and linked.

The two most important functions for analysis are Join and Spatial Join. In "Join" data is attached to the map on the basis of a common factor. For example we might have a map which contains the borders for the Census output areas and has a Name attribute. If data from the census on, for example, employment rates by output area also contains the Name then it can be simply Joined and presented on the map.

Spatial Join examines the location (co-ordinates) of the information to be joined. For example suppose we have a hotel list with co-ordinates and a map containing local authority borders then we can attach each hotel to the local authority using a Spatial Join.

5.3 The software

The software used in this study is ESRI's ArcGIS. ArcGIS is a suite of different applications rather then a single piece of software. The main applications used in this study were: ArcMap, ArcScene and ArcCatalogue. ArcMap allows the creation and analysis of 2D and 3D maps and data. It is used for the majority of the analysis in this study. ArcScene can display data in three dimensions as opposed to the two dimensions used in ArcMap. It also allows some analysis to be undertaken although it requires higher processing power than ArcMap. ArcCatalog is used to create and organise the files used in the rest of the ArcGIS suite.

In addition to the main programs of ArcGIS there are 'extensions' available. These extensions add new features. This study utilises the '3D Analyst' extension and one of the features in this extension allows visibility maps to be calculated. These maps are known as viewsheds within the application. The term is derived from the more familiar concept of a watershed and in the planning arena the alternative and more understandable term Zone of Visual Impact (ZVI) is used. In the system used here the viewshed tool creates a layer on the map which shows areas which are visible from a given point (or set of points). To be more precise, the tool divides the area into cells and then examines each cell in turn to establish how many of the nominated points can be viewed. In this case, the set of points were the wind turbines.

5.4 ZVI analysis

Currently all wind farms which are approved for construction will have ZVI (zone of visual impact/intrusion) studies conducted as part of the environmental appraisal. SNH (2006) provide an excellent discussion of what is involved in a ZVI analysis.

As early as 1996 Sparkes and Kidner (1996) demonstrated the use of GIS and a viewshed tool to select sites which would be appropriate for the construction of wind farms. Their approach took into account wind speed, proximity to centres of population and proximity to roads. It did not, however, attempt to quantify the number of people exposed to wind farms or measure the intensity of those experiences. It is also a fairly simple early example and now, with the growth of computing power, far more sophisticated models become possible.

As far as can be ascertained, the models in this study constitute a major development in two ways. Firstly there appear to be no examples of ZVI data combined with other data sources to quantify the number of people exposed and the level of that exposure.

Secondly we can find no examples of combining three or more ZVIs of individual farms for area wide analysis.

5.5 Model construction

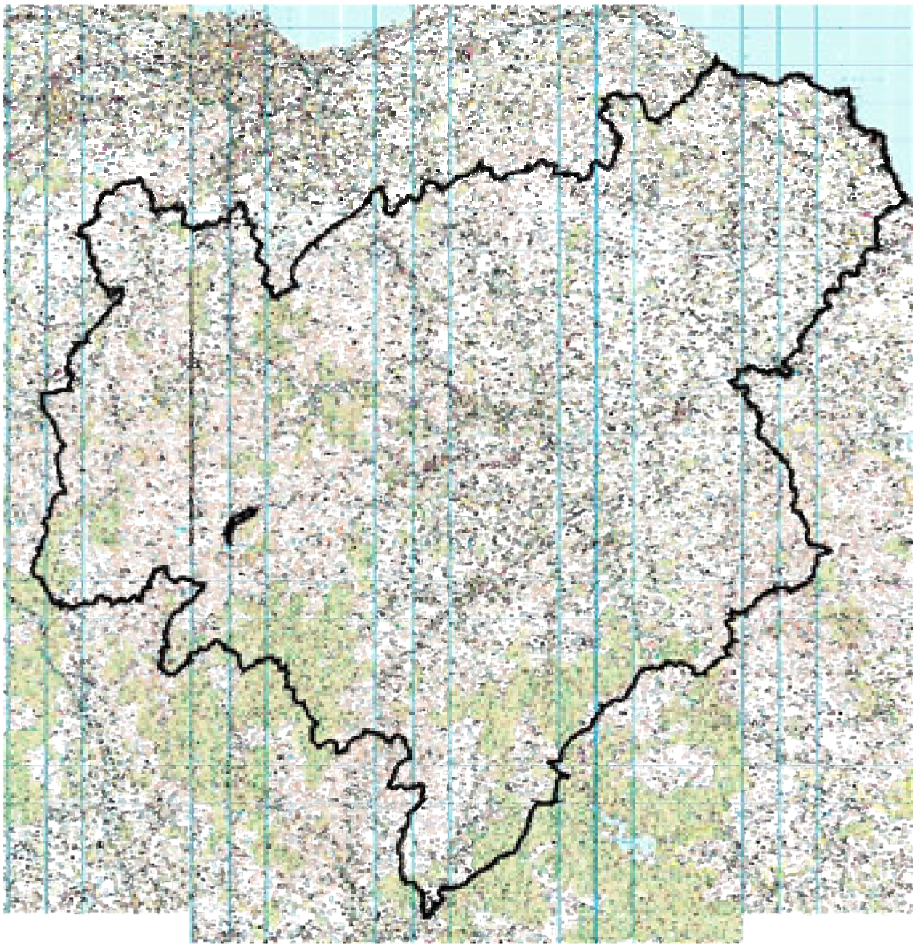
5.5.1 Boundary Maps

There are a number of steps which were completed before the viewshed analysis was carried out. The first stage was to obtain the necessary maps of the borders of the area of interest. These, along with all the other maps required, were obtained from Edina, a service administered by the University of Edinburgh and funded by the Joint Universities. Edina provides boundary maps for all geographies in the UKBorders section and also, critically, provides all the OS maps, both raster and vector in the Digimap section. The boundaries of a specific area of interest can be extracted by removing the other areas from the boundaries file's attribute table or by downloading only the boundary of interest using the 'boundary data selector'. This can be useful if the full borders file is very large (for example, a file covering the whole of the UK).

5.5.2 Colour raster maps

To identify wind farm locations, good maps are required of the area within the boundaries. The first maps obtained were the 1:50,000 scale colour raster maps, available under the data download services section of the Digimap site. The maps are downloaded in 20km * 20km tiles.

Figure 5-1 Colour raster maps of the Borders with boundary superimposed

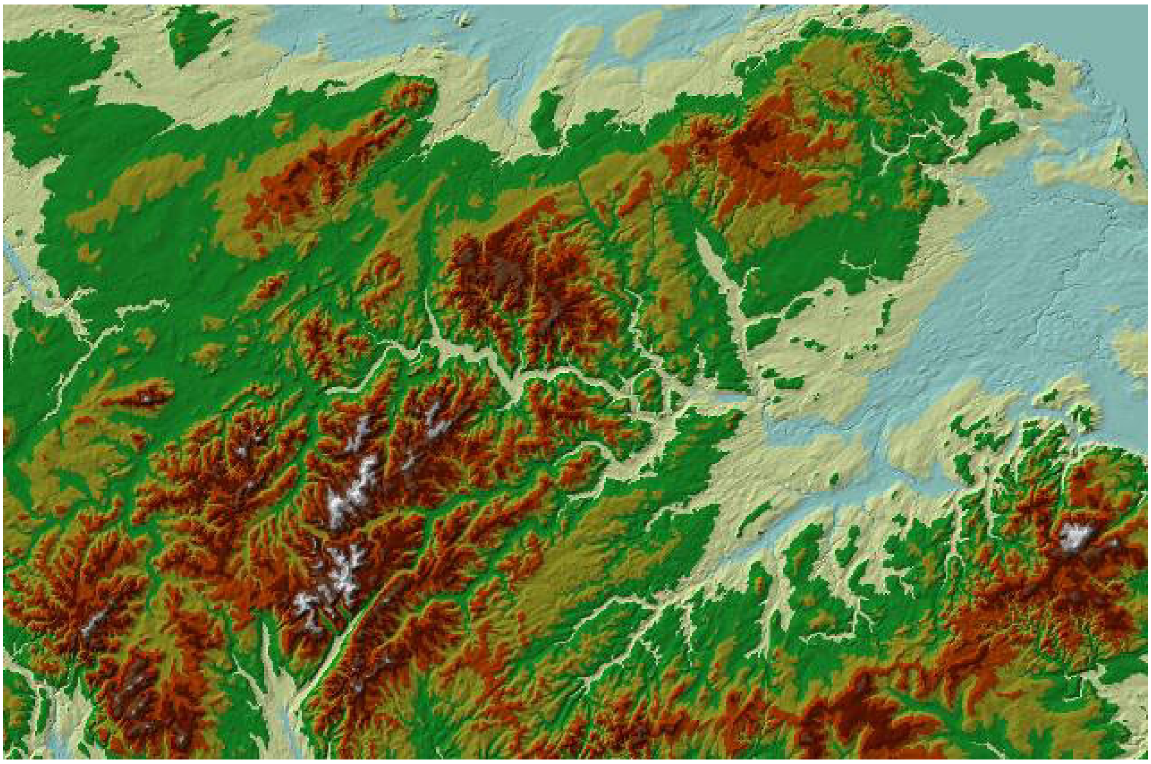


5.5.3 Digital Terrain Model (DTM) files

The raster maps cannot be used for ZVI analysis since they contain no information about the elevation of the points on the map i.e. they contain x and y coordinates but no z coordinates. 3D data is held on DTM maps which can also be obtained from Edina/Digimap. The maps used in the study were the 1:50,000 Landform Panorama DTM maps in dxf format. A tile from here is needed for every tile already obtained (i.e. one DTM tile for every colour raster tile). These maps are slightly less precise than some of the other OS products available but they cover a far larger area. This is an important consideration because four large areas of Scotland are modelled in this study. These maps are considered as acceptable for use in a ZVI (SNH, 2006 p. 28).

The Panorama tiles are unlike the raster and border maps already discussed and cannot be imported directly into ArcMap (or at least, they should not be directly imported when carrying out a viewshed analysis). They are known as CAD (computer aided design) drawing sets and contain a number of features e.g. polygons, points etc. It is the point files that are of interest since each point contains an x, y and z coordinate. The points are 'stitched' into one single surface layer by creating a triangulated irregular network (TIN) file which consists of thousands of triangles connecting the points. An example of the results of this process for the Scottish Borders is given in Figure 5-2

Figure 5-2 TIN model of the Borders



5.5.4 Placing the turbines

Details of all wind farm applications were available from the Scottish Government website[14]. This spreadsheet gives all wind farm applications with their region, status and x, y coordinates.

[14] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-Consents/Applications-Database

The points were added to the map to show the location of each of the wind farms. They do not, however, show the actual turbine locations. The turbines' locations were manually added to the map. For some of the sites, the turbine locations were available as part of the environmental impact statement for the project. However, as some of the applications are at an early stage, the turbine locations were not available. When this was the case, the turbines were laid out in a grid pattern. The number of turbines at each site was obtained from the British Wind Energy Association (BWEA)[15]. The heights of the turbines were not available from one single location and each site had to be looked up individually from various sources. Because clever placement of turbines can significantly reduce visibility, when the location was not available the height of the turbines was reduced by 30%. It is also normal for some turbines to be removed from a proposal before construction begins. Reducing the effective height also helps to compensate for this.

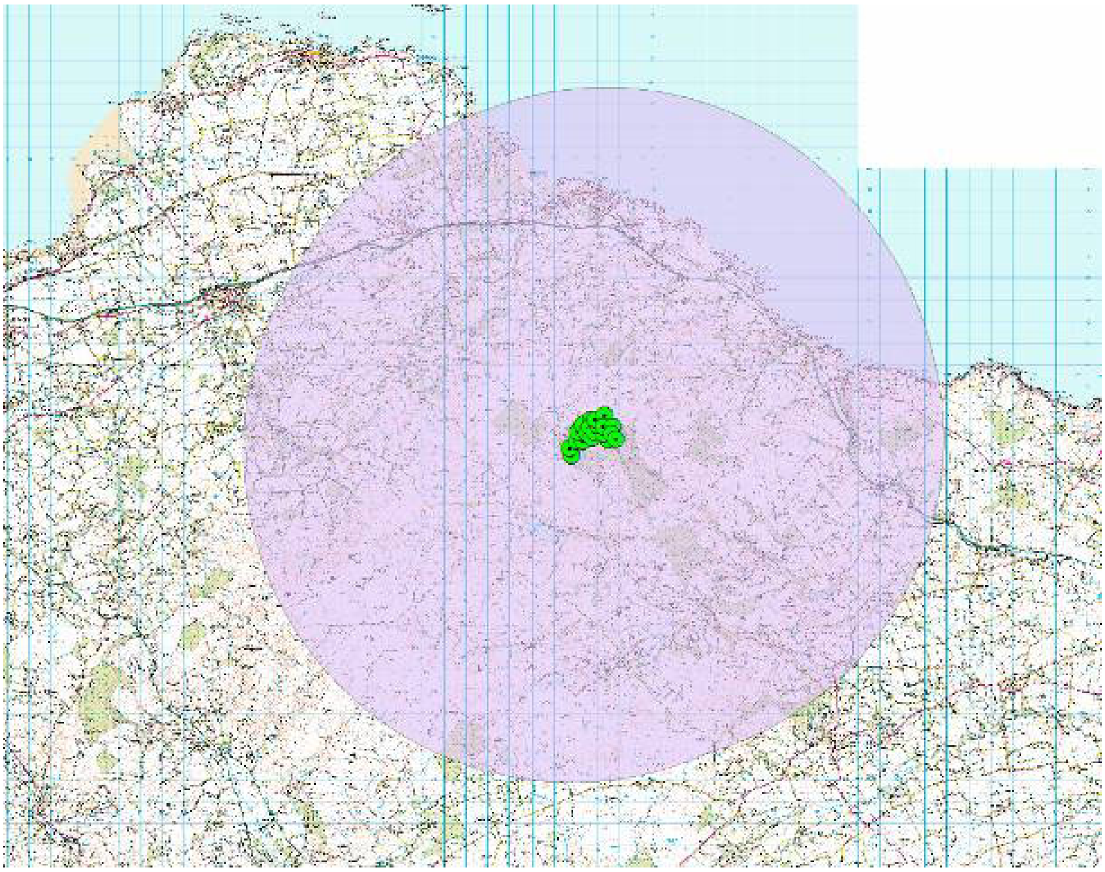
5.5.5 Drawing the 15km visibility region

A 15 km boundary was drawn around each of the wind farms to act as a limit for the ZVI analysis. This is the distance between the Braes of Doune wind farm and Stirling Castle. Beyond 15km, turbines are still visible (given favourable weather conditions) but begin to blend into the landscape. The 15km distance is also recommended by the Sinclair-Thomas matrix16 (planning guidance on the best zones to use for ZVI analysis).

[15] www.bwea.co.uk

[16] http://www.cprw.org.uk/wind/Hlords/hlapp1.htm

Figure 5-3 The 15km buffer around the Crystal Rig wind farm



5.5.6 Generating the ZVI

The Viewshed tool allows certain parameters to be specified. One of these is whether the tool should take into account the curvature of the earth and the refraction of light when calculating visibility. It is particularly important to use this option when large distances are being considered. Because the distance in this case was only 15 km it was not strictly necessary to use the tool but there is little cost in its application.

The Viewshed tool also allows a 'viewer offset' to be specified. Ordinarily, it is assumed that a view will be from around 2m. Tourists in vehicles will be observing from a lower height and even those in high vehicles will have views obscured by hedges and walls. Even though people observing from accommodation may be much higher it was still not felt appropriate to make allowances for 'viewer offset'.

Another parameter which can be set is the cell size option. The Viewshed tool defaults to a set number of cells (100*100) and, because of the size of the area being examined

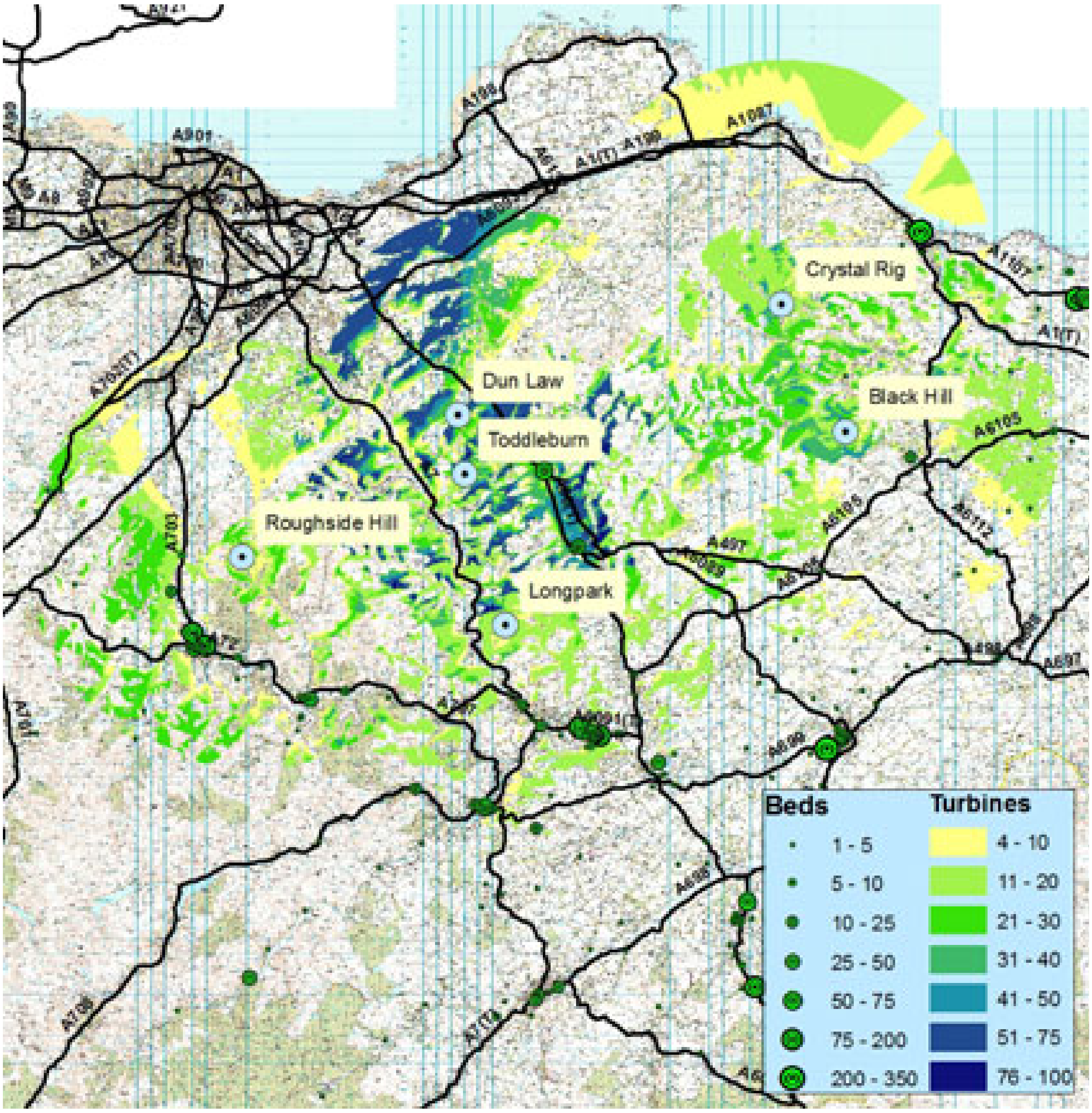
(2500 sq km), the resulting cells were as large as 500m*500m. This was too imprecise to properly distinguish if a section of a road in a valley could see a wind farm. Setting the cells smaller, using the cell size option, dramatically increases the processing necessary. We eventually settled on a 40m*40m cell size. This would require an analysis for the whole area of the exposure of some 16 billion cells. Limiting the area of analysis to the twelve 15km radii circles reduces the number of cells to 530million, still an enormous task requiring modern high speed processors.

5.5.7 Adding the Road Network

One of the key metrics which has to be extracted from the model is the length of road exposed to wind turbines. In order to calculate this, the road network had to be added to the map. Although the roads were already displayed on the raster maps, manual measurement would have been difficult and time consuming. The alternative was a vector map of the roads.

The OS Strategi map is a vector map which contains details on all roads in the UK. The main roads (i.e. A roads and Motorways) for Scotland were extracted and added to the map.

Figure 5-4 Borders combined viewshed (current and agreed) with main roads added



At this stage the model was validated by the research team. This was achieved by direct observation on key routes and by selecting locations that apparently had high visibility of a number of farms. Gratifyingly the predictions of the model were found to match the actual experience with remarkable precision.

5.5.8 Adding Accommodation

An accommodation list for the whole of Scotland was obtained from VisitScotland. This gave a list of all the different accommodation units in Scotland, their post codes, the number of rooms/units and the number of beds.

The post codes of each accommodation unit was converted into a map coordinate using the postcode directory (compiled by the Office of National Statistics) provided by Edina in the UKBorders section of their website. The database allows the conversion of any postcode into another geographical reference (map coordinates in this case).

The method used to calculate the affected accommodation is similar to that for roads. The software identifies locations where the ZVI overlaps the points of accommodation. It then makes a list of the accommodation affected. From this list the number of rooms affected by the wind farms as a proportion of the total number of beds in the region can be calculated.

5.6 Using the model

5.6.1 Visibility Definitions

For a cell to count as being exposed to a wind farm, it was decided that at least four turbines should be visible from it. There were two reasons for this:

It can be difficult to notice only one or two wind turbines (particularly from the road). Since it is 'noticibility' that is of more interest here than visibility, four was regarded as a sensible minimum.

This approach reduces areas which are visible 'at the margin'. The model cannot be thought of as accurate at the margin since the exact location of the turbines is unknown for many farms. The model also takes no account of the screening effects of plants, trees, buildings etc.

The finished map is useful in illustrating visibility in a region. The layer can show how many turbines are visible from each point on the map as well as which wind farm they originate from.

With the 15km zone and the roads added to the Combined ZVI, the model is ready for the necessary analysis

5.6.2 Estimating the Metrics

The objective of the GIS study is to not only identify which roads were exposed at 2km and at 15km but the length of time the traveller was in the zone. Roads consist of a series of straight line sections with common start/end co-ordinates and a name. One of the attributes of each section is the length of the section (calculated from the co-ordinates). The software examines where the ZVI and the road sections overlap and provides a list of which of these sections are affected. Summation of these sections and an assumption of 1km per minute travel time leads to an estimate of the length of time the traveller is exposed to a farm. It should be noted that all the calculations were made under an assumption of good visibility and cloud cover above the turbines. In practice, depending upon the location, clouds may completely obscure the turbines on a number of days and on other days light rain or mist would severely restrict visibility, particularly at a distance of 10-15km. On these days, however, it might be hypothesised that scenery is not a critical element in the holiday experience.

The next problem in the analysis is identifying the number of tourists travelling along these roads and subject to this level of exposure. The estimation of tourist flows is dealt with in the next section

Estimating the accommodation metric is somewhat easier. Accommodation in the zone is identified and the number of bed spaces summed. Total bed spaces are determined and the percentage affected calculated. Together they provide the third metric.

5.7 Estimating traffic flow

5.7.1 Data Sources

This section of the study brings together data from four sources:

- The Scottish Executive Road Traffic Data Base. This data covers all trunk roads in Scotland and is available at: http://www.transportscotland.gov.uk/defaultpage1221cde0.aspx?pageID=295
- Local Authority road traffic databases. For non-trunk roads the local authorities carry out spasmodic traffic counts. In some cases these may only cover a few days in a specific month.
- The VisitScotland visitor database obtained from the UK Tourist and International Passenger Surveys. This data was primarily used as a check.
- The National Traffic Survey Long Distance Journey data. This data was used south of the central belt to distinguish between Scots travelling south for holidays and visits and inhabitants from the rest of the UK travelling north.

5.7.2 The Road Data Base

The trunk road data base, managed by the Scottish Executive, is the most important source of data. Figure 5-5 illustrates the web interface.

Figure 5-5

Selecting any identified point will produce summary data flows and a chance to access detailed data for the last five years. Table 5-1 illustrates typical data obtained.

Table 5-1 Typical Road Data Utilised

Glencoe	7 Day Average		
	North	South	
	Lane A	Lane A	
Month	CCA	CCA	Days
Jan-06	1538	1395	31
Feb-06	1823	1783	28
Mar-06	1793	1776	31
Apr-06	2553	2586	30
May-06	2766	2733	31
Jun-06	2981	2834	30
Jul-06	3271	3234	31
Aug-06	3556	3358	31
Sep-06	2852	2703	30
Oct-06	2316	2184	31
Nov-06	1664	1602	30
Dec-06	1492	1555	31

The difference between Summer (April to September) and Winter (Other Months) is taken to stand as a proxy for tourist traffic. To check theses assumptions and help distinguish between day trips and overnight stays, data on leisure trips from the Visit Scotland website and from the National Travel Survey was then utilised to obtain a tourist traffic flow map for Scotland.

5.7.3 Number of Visitors by Region

Table 5-2 summarises the 2005 data from VisitScotland by Tourist Area and estimates of the associated number of tourist vehicles. A number of points need to be made:

- The survey methodology (random telephone) was subject to an in-depth analysis and found to be underestimating tourist numbers.
- Tourists include Business Trips, Visits to Friends and Relatives and Holidaymakers. Thus the large centres of population inevitably dominate.
- The vehicle calculations make a number of assumptions:
    I. 2 persons per vehicle
    II. 20 persons per coach
    III. 50% of overseas road passengers are in a coach
    IV. 20% of those from overseas arriving by plane take car hire
- The sum of the areas is greater than the Scottish total due to touring holidays.
- The figures do not include day trips.

Data from the Highland Visitor Survey suggests that 22% of visitors to the Highlands stay in Caithness and Sutherland whilst a further 17% take a trip to the area from their holiday base. Given an estimated 530,000 tourist vehicles in the Highlands we might expect of the order of 117,000 overnight tourist vehicles in C&S and an additional 90,000 day visitors. We discuss more precise numbers in the sections on Caithness but as an illustration the number of tourist vehicles travelling north on the A9 to Thurso past the Causeymire development is 25,000. In fact despite the size and importance of wind farms in Caithness we estimate that of the 207,000 tourist vehicles in Caithness and Sutherland a surprisingly low 25% are currently exposed to wind-farm developments simply because the majority of tourists heading north on the A9 go to Wick and then on to John o'Groats. As will be seen in chapter 8 this situation is unlikely to last.

Table 5-2 Estimates of Vehicle Numbers by Tourist Area

	Scotland	Aberdeen and Grampian	Dundee and Angus	Argyll, Isles, Loch Lomond & Forth Valley	Ayrshire and Arran	Scottish Borders	Dumfries & Galloway	Edinburgh and Lothians	Fife	Glasgow & Clyde Valley	Highlands and Islands	Perthshire
Trips	**17.26**	**1.77**	**0.78**	**1.97**	**1.11**	**0.39**	**1.03**	**3.98**	**0.78**	**3.39**	**2.34**	**0.97**
Trips UK	14.87	1.58	0.69	1.67	0.94	0.34	0.97	2.78	0.65	2.62	1.84	0.84
Trip Over	2.39	0.19	0.09	0.30	0.17	0.05	0.06	1.20	0.13	0.77	0.50	0.13
Scot%	45%	62%	66%	51%	49%	23%	30%	24%	61%	32%	58%	53%
Trips Scot	6.75	0.98	0.46	0.85	0.54	0.09	0.31	0.96	0.48	1.08	1.36	0.51
Trips RUK	8.13	0.60	0.23	0.82	0.40	0.25	0.66	1.82	0.17	1.54	0.48	0.33
UK Car %	65%	64%	77%	69%	72%	88%	86%	46%	63%	55%	74%	62%
UKCar	4.83	0.51	0.27	0.58	0.34	0.15	0.42	0.64	0.20	0.72	0.68	0.26
UK Coach%	8%	13%	1%	10%	3%	9%	2%	4%	9%	6%	9%	9%
UKCoach	0.06	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00
Road OS %	19%	12%	12%	12%	3%	25%	12%	13%	6%	12%	25%	7%
Oseas	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.00
Hire (Oseas)	0.19	0.02	0.01	0.03	0.02	0.00	0.01	0.10	0.01	0.07	0.04	0.01
Vehicles	**5.07**	**0.52**	**0.27**	**0.61**	**0.36**	**0.15**	**0.42**	**0.76**	**0.22**	**0.80**	**0.73**	**0.27**
Holidays %	63%	73%	61%	61%	69%	68%	69%	60%	60%	61%	72%	60%
Net Vehicles	3.20	0.38	0.17	0.37	0.25	0.11	0.29	0.46	0.13	0.49	0.53	0.16

5.7.4 The National Travel Survey

In contrast to the UKTS the NTS is a highly structured representative survey of 30,000 households over a 3 year period. Participants in the survey keep a detailed log of every journey made in a specific week and also record details of long distance journeys make in the last four weeks. In this context a long distance journey is defined as in excess of 50 miles. The long distance journey file gives details of origin, destination, mode and purpose amongst other variables, which allows leisure trips by Road to and within Scotland to be separately identified. Riddington (2000) provides more detail on the use of the NTS. Table 5-3 summarises.

Table 5-3 National Travel Survey Results for Scotland

Scotland	Road	13130	86.8%	Day	1879	12.4%
	Other	1997	13.2%	Overnight	13248	87.6%
85.2%	Sub Total	15127	100.0%		15127	100.0%
RUK	Road	2435	92.4%	Day	307	11.7%
	Other	201	7.6%	Overnight	2328	88.3%
14.8%	Sub Total	2635	100.0%		2635	100.0%
Total	Road	15564	87.6%	Day	2186	12.3%
	Other	2198	12.4%	Overnight	15576	87.7%
	Total	17762	100.0%		17762	100.0%

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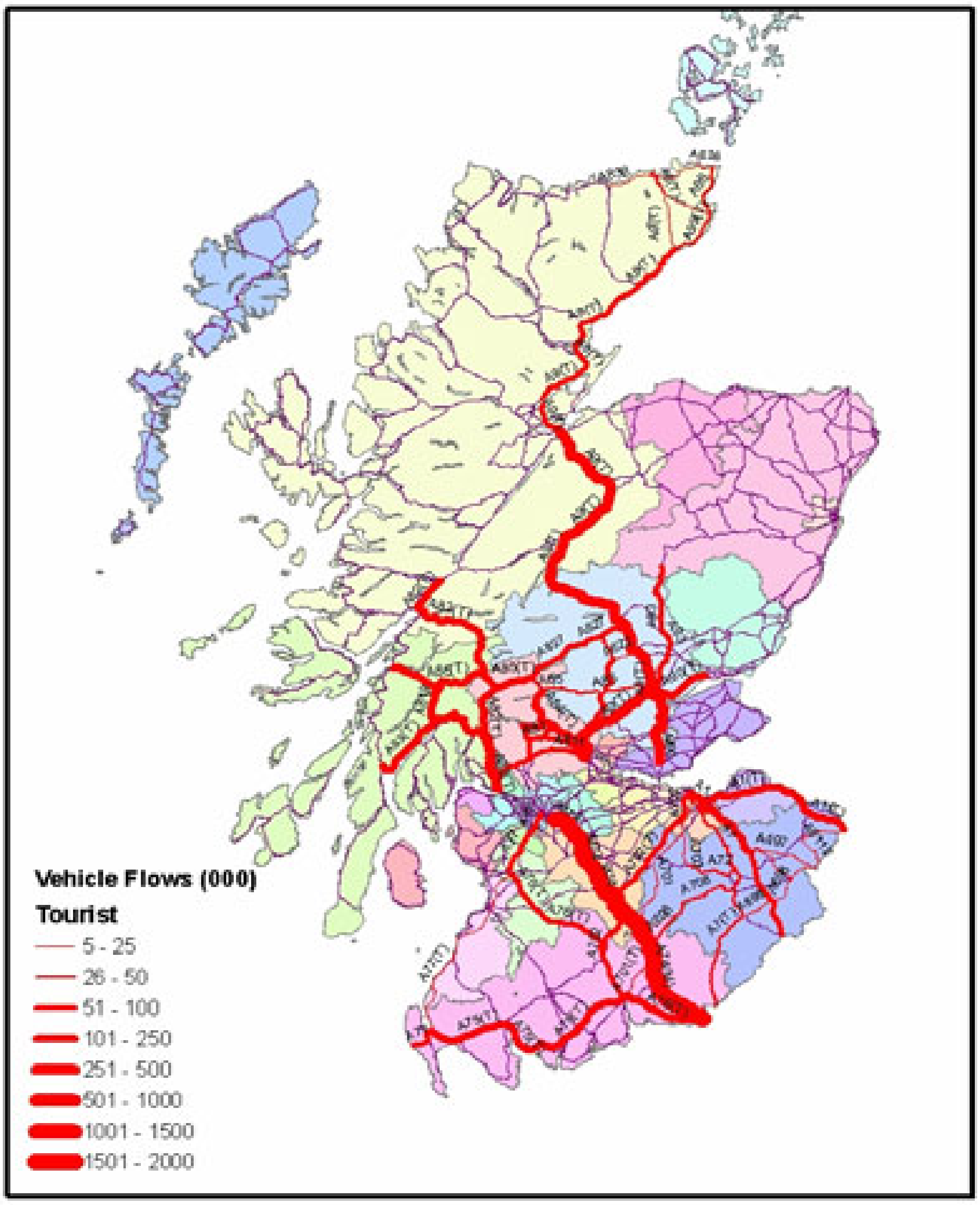
Whilst the overall total of 15.6m overnight trips by UK citizens is comparable to the 14.9m found in the Visit Scotland data the NTS suggests far more trips are by Scots (85% v 45%) and more by road (88% v 73%). The road data suggests a larger proportion of visits are by road than VisitScotland and a larger proportion by citizens from the Rest of the UK than the NTS. The NTS was thus used primarily as a guide to the number of Scots travelling home from the South.

5.7.5 The Tourist Travel Flow Map

The tourist travel flow map was developed to help understand the flows of tourist trips in the Borders and in Perth and Kinross. The Visit Scotland and NTS data were used to check that the road data was consistent with what we know to be the trip totals. The map is given in Figure 5-6 and is the basis of the physical impact assessment in the following sections.

Figure 5-6 Main Tourist Travel Flows



5.7.6 Estimation of Percentage of Tourists Affected

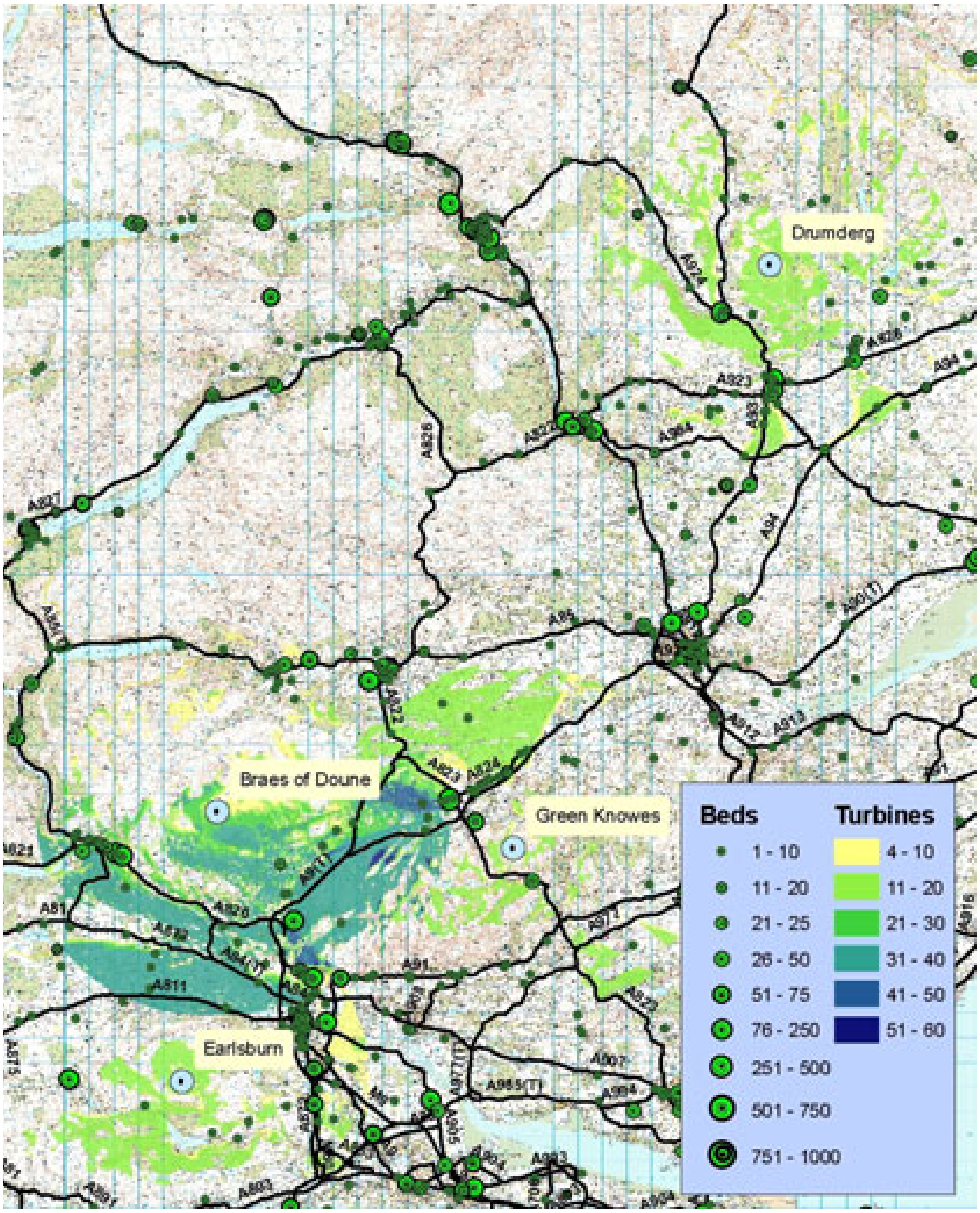
The objective of the GIS section is to identify the proportion of tourists in each area and in Scotland as a whole that are or will have "significant" exposure to Wind farms. Estimation of the accommodation so affected is relatively simple; a hotel is either within the viewshed or outside it. Individuals that are touring, however, may progress on a route that appears to have no exposure e.g. through the Trossachs heading north to Crainlarich, but in practice head east through Callendar into the viewshed of the Braes of Doune. This section discusses the assumptions made in estimating the "proportion affected" metric.

Two "types" of tourist in an area are estimated. Some will simply pass through an area en route to another area, such as those passing through Dumfries and Galloway on the M74 on the way north. We estimate the number of en route tourists by identifying numbers entering and exiting on the same or closely related route. For example tourist vehicles enter the Stirling area on the A82 at the north end of Loch Lomond and exit just past Tyndrum on the A82 and A85 are defined as en route. A key assumption is that vehicles normally return on the same roads. For example the 400,000 tourist vehicles heading north up the A9 will return by the same route. If a route is unexposed heading north then all the vehicles that exit the area are assumed to retrace the same unexposed route. It should be emphasised that many of those en route are on touring holidays and utilise accommodation in the area.

In all cases a number of tourists remain in the area and go no further. These are termed stayers. They include both those taking accommodation in the area and those on long day trips. Some of these will remain in areas unaffected by Wind farms. As an example those coming from Glasgow on the A81 into the Trossachs area of Stirling and do not head east to the A9 for the return trip, will not get significant exposure. However large numbers do travel from west to east in this area. As an ad hoc procedure the ratio of flows north-south and east-west is used to estimate those moving into exposed areas.

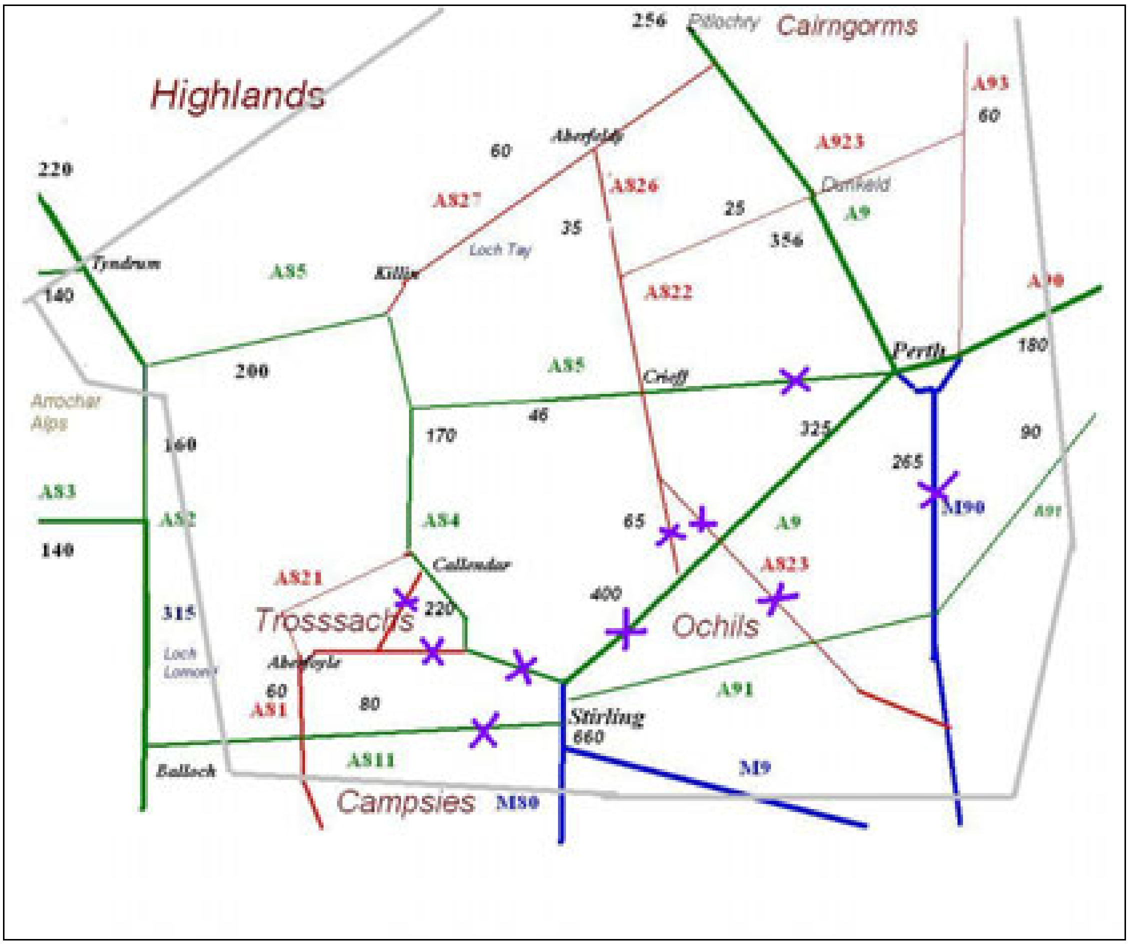
To illustrate the procedure Figure 5-7 gives the combined ZVI for the Perth area (before the rejection of the Calliacher application) and Figure 5-8 a schematic map for the same area with exposed sections of road marked,.

Figure 5-7 Combined ZVI for Stirling, Perth and Kinross (Constructed and Agreed)



Base Map © Crown Copyright

Figure 5-8 Schematic map of road system in Stirling, Perth and Kinross with exposed sections



What is clear is that the only unaffected routes are on the extreme west either on the A82 or on the A81/821 Trossachs route. A limited number of vehicles will enter central Perthshire via Crainlarich. The ratio A82/821: A84/5 is 170:216 i.e. as many as 44% of the 60,000 on the Loch Tay road may not have seen a wind farm. Summing entry and exit points and utilising these calculations generates the following table:

Table 5-4 Assessing the proportion of vehicles exposed

	En Route		Stayers		Total	
	'000	*Percent*	'000	*Percent*	'000	*Percent*
Exposed	776	*82*	312	*92*	1088	*85*
Unexposed	170	*18*	27	*8*	197	*15*
Total	946	*100*	339	*100*	1285	*100*

Again it should be noted that a number of those en route will stay in the area for some time and the assumption is that any impact will apply to all exposed tourist whether stayers or en route.

5.8 Tourist numbers and exposure: conclusion

The GIS study attempts to link the location of wind farms, the position of roads and accommodation and traffic flows to estimate the number of tourists in any area that will be exposed to wind farms. It is recognised that these figures will appear at times contrived, unreliable and potentially erroneous. The perspective of this project, however, has always been that the numbers are best seen as orders of magnitude and should be viewed in the context of alternative claims, such as that the Griffin forest development will cost 2000 jobs. The numbers exposed to Griffin are, in fact, tiny compared to other schemes. The alternative conclusion is that whilst some 85% of tourists in the Stirling, Perth and Kinross area will have significant exposure, the damage, if there is damage, appears to arise from the location of the Braes of Doune adjacent to the A9.

The results of the GIS studies are discussed on an area by area basis in later chapters. We believe these studies provide highly original and important information on the impact of wind farms on tourists.

6 The internet survey

6.1 Objective

The third major element of the study is an internet survey designed to explore the scenic value lost to the public when a wind farm is established. The only exogenous major factor that was thought might determine this value was the income of the individual respondent. However it was also believed that there was likely to be substantial variance between individuals. The approach was therefore to aim for maximum coverage at minimum cost ensuring in the design an allowance for income variance. Experience elsewhere and a promise of access to an extensive relevant email list suggested that an electronic survey would be the best approach

6.2 Contingent valuation

The contingent valuation method is the most direct valuation method and simply asks someone directly to state their maximum willingness to pay for a good or service. The method is well known and has been the subject of several books (Alberini, 2006; Bateman and Willis, 1999; Bjornstad and Kahn, 1996; Braden and Kolstad, 1991; Cummings et al, 1986, Mitchell and Carson, 1989). The technique was introduced in 1949 in an article by Ciriacy-Wantrup (Hanley et al, 2003 p. 3). The first application is provided by Davis (1963). In the early days of the technique, questions were open ended and were of the form 'What is the maximum you would be willing to pay for nice scenery while on holiday in Scotland?. Boyle and Bishop (1984) provide an early example of an attempt to value scenery.

The technique has come under significant scrutiny since its early days. Most of the concerns relate to whether people can give meaningful answers to open ended valuation questions and how their responses are influenced by survey design. These concerns were highlighted in the wake of the Exxon-Valdez oil spill in the US in 1989. A CV study was conducted to assess the environmental damage (including non-use values). Carson et al (2003) provide a review of the study. The study was heavily criticised (Diamond and Hausman, 1994) and as a result the National Oceanographic and Atmospheric Administration (NOAA) commissioned a report on the technique. The report (Arrow et al, 1993) provides a review of the technique, the criticisms of the technique and what can be done to ensure robust results are obtained. Haab and McConnell (2003 pp. 20-22) summarise the key finding which relate to survey design.

One of the key findings was that the form of the question should be changed from open-ended to a referendum type question. With this form of question, the respondent is asked 'Would you be willing to pay £x to preserve Scotland's scenery in its current form?', where the value of x is different for different respondents. This approach is sometimes referred to as the dichotomous choice approach. It is believed that this style of question reduces bias in the results and significantly lowers the cognitive burden faced by respondents. Loomis (1988) discusses the differences in reliability between the open ended and the dichotomous choice methods. An example of this type can be seen in Bennett et al (2003) in the context of countryside access.

One of the problems with the method is that asking a dichotomous choice style question gives only one piece of information. For example, if someone is not willing to pay £30 for something, it is known only that their willingness to pay lies below £30. There is, however, a significant difference between £0.01 and £29.99. There is no way of knowing which is closer to the respondent's WTP. The open ended style question obtains (or at least aims to obtain) the precise figure. To combat this problem, Hanemann (1985) and Carson (1985) proposed asking a follow up question. If, for example, the respondent answered no to paying £30, they might be asked if they would pay £15. This would help to narrow down the range within which their true WTP lies. This approach is known as the double bounded dichotomous choice approach. Hanemann et al (1991) show this method to be more statistically efficient. The method is not without problems though (Carson et al., 1992; Cameron and Quiggin, 1994; McFadden and Leonard, 1993; Kanninen, 1995). The main problem relates to the behaviour of the respondent. When asked the first question the respondent gives an 'honest' answer. When asked the second question, the mindset of the respondent changes to a 'bidding game' mindset. This renders the second answer inconsistent with the first (Barreiro, 2005).

It is often felt that hypothetical answers to hypothetical questions cannot provide robust results. Consequently most of the studies try to include an aspect which makes the respondent believe they will actually be required to pay the amount requested. Other approaches to assessing the reliability of WTP estimates have compared the stated preference results to revealed preference results (Brookshire et al, 1982; Carson et al., 1996). Such studies have shown that similar results are obtained using both methods.

Despite the issues surrounding the use of CV studies, and the considerable expense of dealing with these problems, the technique has been very popular. This is partly due to the fact that it can be used to measure the value of anything. Countless examples are available: Fix and Manfredo (2005) and the value of wildlife; Alonso (2002) and the value of accessible housing; Bateman and Langford (1997) and the value of national parks to non-users; Yoo at al (2006) and the cost of Spam email; Treiman and Gartner (2006) and the value of forests; Green and Tunstall (1991) and the value river water quality improvements and even the value of silence (Barreiroet al, 2005).

6.3 Design

Contingent Valuation Methods are normally based on face to face interviews. A few have attempted self response mail questionnaires but as far as can be ascertained none have used the internet approach. As discussed above in order to elicit sensible WTP results it is important that the respondent understands exactly what is being paid for and exactly how they will be paying for it. One of the advantages of conducting a face to face survey is that the interviewer can explain to the respondent what is happening. Because this survey is being administered online, a scenario which was easy to understand was needed.

It was decided that the respondents should be asked to choose between two rooms at a hotel. One room would have no landscape view (a view of the car park) while the other would have a view of the landscape. As an initial test of the concept, it was decided that respondents would be asked to perform this task 20 times. Each time, one alternative would be the car park view and the other would be a different scene each time. One-third of these scenes would be plain views of hills or water etc., while another third would have the same scenes but with some wind turbines, pylons, telegraph poles or deforestation added. The final third would be the same scenes but with even more of these built features present. The basic idea was that this approach could be used to measure how sensitive people are to seeing any alteration to the environment and then to measure how sensitive they are to the magnitude of the change. It was not clear at this stage if people would be able to understand what was demanded of them and, indeed, if the results generated would make any sense.

The basic survey design was as follows. Firstly respondents were presented with a story about booking accommodation; a standard double room at a 3 star hotel. They were then asked what their maximum willingness to pay for such a room would be. On the next 20 screens they were presented with the car park view put next to the view on offer. They were then asked their maximum willingness to pay to upgrade to the view on offer. Of course, they could choose to pay nothing to upgrade i.e. they would not move rooms or they could choose not to stay in the room with the car park view. The inclusion of this opt out option is important for reasons already discussed.

There were two main reasons for including things other than wind turbines in the photographs. The first was a genuine interest in how tourists respond to different kinds of features on the landscape. The second was to mask the fact that the survey was about wind farms. It was feared that anti and pro wind farm groups might try to manipulate the results of the research if they found out its main purpose.

In addition to these key questions, standard profiling questions were asked in order to test whether WTP figures were dependent on demographic differences and to ensure that the sample who answered the questionnaire was representative of Scottish tourists as a whole. One of the questions asks the respondent what their typical daily expenditure is when on a holiday in Scotland. This is important to make allowance for income differentials when using the willingness to pay to assess the likely economic impact. It also serves another function. One of the key elements in designing a CV study according to Arrow et al (1993 pp. 59-60) is to remind respondents of their budget constraints and alternative uses of the money which they state they would be willing to pay for whatever is on offer (i.e. an improved view). Asking expenditure at the start of the survey helps to remind people how much they would spend per day and therefore what percentage of this they would be spending if they paid extra for a room upgrade.

6.4 Survey construction

For the survey, photographs were needed of various types of scenes. Most of the photographs used were taken over the course of a week and some use was made of photographs already available. Pictures were taken of Braes of Doune Wind farm near Stirling and Earlsburn wind farm in the Campsies, also near Stirling. Other features represented in the pictures were deforestation, pylons and telegraph poles.

The next stage was to modify the core scenes to be clear of their key features (turbines, pylons etc) and to extend their features. This idea is not new and has been used in other CV studies (e.g. Brandolini, 2004). The software chosen to do make the modifications was Adobe Photoshop 7.0 (2002). This is the market leader in the area and has been used in other valuation studies for the same purpose (e.g. Alvarez-Farizo & Hanley, 2002).

SNAP Surveys (2007) was the software initially used to construct the questionnaire. The software makes it simple to ask the most straightforward kind of questions e.g. entering a number for age, or making a multiple choice selection for accommodation type (hotel, self-catering etc). It was decided that rather than give open ended WTP questions that respondents should be able to choose from a drop down list of price ranges. This both speeds up completion and goes some way to presenting the valuation as a choice, as advocated by Savage.

Construction of the photographic section of the survey was more difficult. After some experimentation it was found that externally matching the size and detail of the photographs to the package was essential (as opposed to merely importing the photograph) to cope with different screen sizes and resolutions. No information or detail is lost and reduces the length of time the survey takes to download.

6.5 The pilots

The survey was shown to some Glasgow Caledonian University colleagues before proceeding to a full scale pilot. Around 10 people completed the survey and found that it worked well and that they were able to understand it. It took around 5 minutes to complete and all those who took it reported that it was enjoyable.

For the full pilot, the survey was uploaded to the university's server and the link was sent to the staff email list. Although this was during a holiday period and many staff were not available, over 100 responses were obtained within a day as well as some comments on the survey. Respondents were asked not only to complete the survey but to email comments on design. The results gratifyingly appeared consistent with expectations and the comments largely both positive and helpful.

6.6 Randomizing question order

One key problem identified in the early stages was anchoring; that values set by the respondent in early questions tended to affect the values set in later questions. A typical thought pattern would be "I gave that a value of £15 and I like this one better". An excellent discussion of anchoring is presented in Green et al (1998).

The basic design had been sent to an external expert for comment and he was concerned both about the initial length of the survey and also suggested that it would be better if the order in which the scenes were presented was random.

The possibility of randomising the order of the questions was investigated and it was found that the SNAP "Survey Plus" toolbox contained a Randomize tool. One of the key features of the tool is that it allows portions of the survey to be randomised, and not just the survey as a whole. This was important since the profiling questions were required to be displayed first and the screen thanking the respondents for their participation had to be displayed last. Despite initial problems, which required a patch from the company's website, the eventual design proved a perfect solution to an important problem.

6.7 Publication and distribution

For the internet SNAP generates a set of HTML files. These were then uploaded to the public server at Glasgow Caledonian University which allowed them to be accessed from any location by clicking on the URL www.gcal.ac.uk/econsurv/land

This process proved completely trouble free.

The next stage was to circulate the survey to a set of respondents who would be willing to click on the URL and undertake the survey. Ideally we required a very large email list of individuals likely to be interested in Scottish scenery. VisitScotland, the national tourist organisation, would have been the ideal vehicle through which to access such a list. Unfortunately data protection arrangements with their list members prevented any communication about research that had not been specifically commissioned by the organisation.

Despite a search for a single large alternative, none could be found. One alternative which was progressed was the equivalent of a snowball sample. Email lists of the consulting team were used and key contacts on the email list were then asked to circulate their personal lists with the URL. In addition the Operational Research Society, the Economics Teaching Exchange and the Countryside Network agreed to circulate their members asking them to circulate the URL.

Whilst it may be argued that the population surveyed is likely to be more random than that from a single list distribution there was considerable concern that a strong bias may emerge. As an example one of the authors is keen on outdoor activities and the email list in this case is dominated by members of the local canoe club and of the Scout Association. Any bias in this list towards placing a high value on scenery is likely to snowball via the contacts of the initial contacts. In addition there was a worry that the lack of control made the survey vulnerable to concerted action by those either committed or opposed to Wind farm developments.

One alternative that emerged late in the scheme was the use of panels developed by commercial companies. Because of technical difficulties this eventually involved a rescripting of the survey for different software Net-MR and distribution via the GMI (Global Market Insight) system. In fact two surveys were constructed. The first, designed for a UK general panel was identical to that produced using SNAP and shown in Appendix II. The second was designed for the US panel who had been screened to include only those who had visited Scotland or would do so in the near future. The major differences were the omission of the home country and the use of dollars rather than pounds sterling. Inclusion of other countries was possible but thought to be too expensive for any gain in information.

The size of the commercial panels results in invitations to participate only going to a fraction determined by the target set. For the UK this target was 600 responses with an age and gender distribution reflecting that of UK tourists in Scotland. For the US the target was simply 100 who had been or were likely to go to Scotland in the near future. Because potential respondents will not be able to complete the survey once the target has been met, a conventional response rate cannot be calculated. Response rates on internet surveys are known to be low and, even with incentives, in the UK and US are unlikely to exceed 15%.

6.8 Processing and output

One of the major advantages to electronic surveys is that data processing is automatic. SNAP for example identifies responses from the email subject title and then simply records and processes the message content. Whilst the software incorporates statistical software which is particularly strong for data presentation, it also provides a facility to export the data in SPSS (.sav) format.

Net-MR works in a similar fashion and eventually produces a similar SPSS file of results. These files then had to be processed to obtain the percentage change in the willingness to pay. Firstly respondents were required to indicate what they would be willing to pay in terms of an interval e.g. £35-£50. The coded interval was recoded as the value of the mid-point of the range e.g. code 7 (£35-£50) would be recoded as £42.50.

Table 6-1gives a brief description of the pictures shown by each question and the derived variables.

Table 6-1 Variable Descriptions and Derived Variables

	Category	Description
Q10	Basic Price with View of	Car Park
Q11	Extra For View of	Braes of Doune without wind turbines
Q12		Braes of Doune wind farm (current)
Q13		Braes of Doune wind farm Extended
Q14		Bay near Thurso without wind turbines
Q15		Bay near Thurso with wind farm (planned)
Q16		Bay near Thurso with extended wind farm
Q17		Waterfall without wind turbines
Q18		Waterfall with wind turbines
Q19		Falkirk scene with No Grid Lines
Q20		Falkirk scene with 1 Grid Line
Q21		Falkirk scene with 2 Grid Lines
Q22		River Spey without Poles
Q23		River Spey with telegraph Poles
V1=Q12-Q11	Loss of Value from	Initial Build of Braes of Doune
V2=Q13-Q12		Extension at Braes of Doune (additional loss)
V3=Q15-Q14		Initial Build at Thurso
V4=Q16-Q15		Extension at Thurso (additional loss)
V5=Q18-Q17		Wind Turbine at Waterfall
V6=Q20-Q19		Falkirk scene - 1 Grid Line
V7=Q21-Q20		Falkirk scene - Extra Grid Line (additional loss)
V8=Q23-Q22		Telegraph Poles on Spey

The loss of value as a percentage of the room price (V/Q10) for each individual was then calculated and the mean percentage loss of value for the sample followed.

In the following sections we present the basic results for the surveyed populations and analyse how these differ.

6.9 UK Results

6.9.1 The Respondents

Age, Gender and Home

Table 6-2, Table 6-3 and Table 6-4 show the gender, age and home of the 606 respondents in the UK Survey.

Table 6-2 Distribution of Respondents by Gender

	Number	Percent
Male	303	50.0
Female	303	50.0
Total	**606**	**100.0**

Table 6-3 Distribution of Respondents by Age Group

	Number	Percent
16 - 25	72	11.9
26 - 45	255	42.1
46 - 65	210	34.7
Over 65	69	11.4
Total	**606**	**100.0**

Table 6-4 Distribution of Respondents by Residence

	Yes		No		Total	
Highlands of Scotland	8	1.8%	0	0.0%	8	1.3%
Central Scotland	38	8.7%	0	0.0%	38	6.3%
Rest of Scotland	12	2.7%	0	0.0%	12	2.0%
North of England	109	24.9%	14	8.3%	123	20.3%
Midlands of England	79	18.1%	47	27.8%	126	20.8%
Southern England	163	37.3%	92	54.4%	255	42.1%
Ireland	8	1.8%	0	0.0%	8	1.3%
Mainland Europe	2	0.5%	1	0.6%	3	0.5%
Rest of World	1	0.2%	0	0.0%	1	0.2%
Wales	17	3.9%	15	8.9%	32	5.3%
TOTAL	**437**	**100.0%**	**169**	**100.0%**	**606**	**100.0%**
Percentage Visited	72.1%		27.9%		100.0%	

The sample is broadly representative of the UK population with a significant number in the over 65 category. A significant majority (72%) have visited Scotland at some time. The majority of those who have not are, not surprisingly, located in the South of the UK. Tourist numbers are far more heavily weighted towards Scotland because of multiple repeat visits. Consequently it would have been inappropriate to sample on the basis of home locations of tourists.

With the information available it seems reasonable to conclude that we have a representative sample to identify the value that current and potential tourists from the UK would place on changes in the Scottish landscape.

Accommodation and Activities

Table 6-5 provides details of the accommodation used. It is believed that the majority of the other category is in the homes of "Friends and Family".

Table 6-5 Main type of accommodation used by sample

	Number	Percent
Hotel	203	46.3
Bed and Breakfast, Hostel	87	19.9
Hired Caravan	5	1.1
Caravan, Campervan, Tent	36	8.2
Self Catering	45	10.3
Other	62	14.2
Total	438	100.0

The primary reason for the trip is shown in Table 6-6.

Table 6-6 Principle Reason for Visit

	Number	Percent
To see Scotland	209	47.7
To see friends and relatives	105	24.0
To go shopping	13	3.0
Business trip	27	6.2
To see Scotland as an extension of a business trip	4	0.9
Personal business (appointment with doctor, dentist, solicitor)	4	0.9
To undertake a cultural activity (theatre visit, concert etc)	23	5.3
To participate in a sporting or outdoor activity	21	4.8
To watch a sporting activity	5	1.1
Other	27	6.2
Total	438	100.0

The sample has fewer trips where the principle reason was business than might be expected from the VisitScotland data. However many business trips are likely to be repeated within a year resulting in higher numbers of visits on business than recorded in this sample. In addition it is quite possible that those visiting on business also visit for holiday reasons as recorded here.

On the basis of the sample and with the assumption discussed in Chapter 2, we would expect those engaged on a Holiday Trip, Seeing Friends and Relatives and Participating in a sporting or outdoor activity (76.5%) to have a particular interest in landscape.

6.9.2 The Willingness to Pay for Views

Value of Scenery

The value placed on a scene is a function not only of the landscape but of the weather in which it is viewed. To identify the impact of structures, the report concentrates on the change in value between at same scene. However it is of interest to examine the "values" of the untouched scenes as in Table 6-7.

Table 6-7 The Value of Scenery

	Value of Scene
Braes of Doune	£22.71
River Scene (Spey)	£21.98
Rural near Falkirk	£15.87
Waterfall	£17.41
Bay near Thurso	£24.29
Average	£20.45

This table shows clearly that a good view is extremely valuable and important to a hotel, averaging £20 per room. The implication in terms of planning policy is obvious.

The average price for the room without the view was £40.96, suggesting that a good view could generate a 50% mark-up.

Value of Scenic Change by Location and Type

Table 6-8 provides estimates of the loss of scenic value to the average tourist when different types of developments occur in different locations. The most disliked was the pylon which caused an almost 30% drop in the value of the room, which, under the assumptions discussed earlier, will lead to a 30% fall in expenditure for the affected rooms.

Table 6-8 Loss of Value by Location and Type

	Loss £	Loss %
Loss for Braes	£6.56	18.8%
Additional Loss for Braes Extension	£1.54	6.5%
Total Loss for Extended Braes	£8.10	25.7%
Loss for Thurso	£6.17	16.6%
Additional Loss for Thurso Extension	£0.55	3.9%
Total Loss for Extended Thurso	£6.72	20.6%
Loss for Waterfall Development	£7.97	18.7%
Loss for Grid Line	£9.54	24.6%
Additional Loss for Second Grid Line	£1.22	4.5%
Total Loss for Both Grid Lines	£10.76	29.1%
Loss for Telegraph Poles	£4.58	11.7%
Basic Wind Farm Average Loss	£6.90	18.0%
Extended Wind Farm Average Loss	£7.41	23.2%

The loss for the wind farms varies from £6.17 (16.6%) for the basic Thurso development, to £8.10 (25.7%) for an extended Braes of Doon. A surprising and important result is the diminishing marginal loss associated with increasing size. It appears that once there has been an intrusion into the scenery then the effect of expanding the size is relatively small. This in turn suggests concentrating wind farm development would *ceteris paribus* be preferable to dispersion.

This finding essentially contradicts the finding of the intercept study and throws light on a number of anomalies in research in this area. Respondents to the internet survey are simply faced with a scene against the car park, there is no direct comparison between extended and basic farm. If we take the example of Thurso, individuals object to the wind farm whatever the size. In the internet study the doubling of the size is difficult to reference, particularly as the order of appearance is random. On the other hand if we ask the same respondents about the impact of increasing the size the response is likely to be strongly negative. Indeed we suggest that if the extended view had been referenced to the basic level rather than the car park we would have found a far more significant loss of value.

We find the same sort of problem later where actual reactions to existing wind farms are significantly smaller than the stated reactions in the internet survey. There is clearly a difference between actual and stated reactions and actual and stated values, with the actual being substantially lower than the stated.

It is a matter of conjecture why some developments appear more objectionable than others. The waterfall picture is undoubtedly the least "natural" and the foreground/weather on the Thurso photos the most pleasant with the turbines furthest away. To compute an average wind turbine loss, the loss for the Braes has been added to the loss for the waterfall and the loss for Thurso. This loss is now discussed in relation to the characteristic of the individual respondents.

Loss of value by age, gender and home location

Table 6-9 shows the mean loss of value by gender. Although females appear to place a higher value on the scenery the difference is not significant even at the 10% level because of the high variances and associated high standard errors of the means.

Table 6-9 Loss of Value by Gender

	Loss £	Loss %
Male	£6.94	15.6%
Female	£7.23	24.1%
Total	£7.08	19.7%

Table 6-10 shows the loss of value from wind turbines by age class. What is striking is the much lower value placed by the young on the scenery. This may reflect more familiarity with wind farms, a better capacity to adjust or, possibly, a lower income. The difference in absolute values is highly significant (t=3.116) but is only significant at the 10% for the percentage figures.

Table 6-10 Loss of Value and Age of Respondent

	Loss £	Loss%
16 - 25	£2.86	10.2%
26 - 45	£7.97	21.0%
46 - 65	£7.66	24.1%
Over 65	£6.47	11.7%
Total	£7.08	19.7%

For the elderly a major difference is the higher price for basic accommodation. Despite the apparent differences, unless one excludes the young, the elderly are not significantly different for the group as a whole.

The impact of location on valuation of scenery is shown in Table 6-11. Contrary to what might have been hypothesised the highest values seem to be associated with predominantly rural areas in the Highlands and Ireland. Once again wide variances and small numbers make it impossible to confirm this observation statistically.

Table 6-11 Loss of value by home region

	Loss £	Loss %
Highlands of Scotland	£12.22	38.0%
Central Scotland	£7.04	18.0%
Rest of Scotland	£6.19	20.1%
North of England	£7.80	22.9%
Midlands of England	£6.64	15.5%
Southern England	£6.84	20.1%
Ireland	£12.59	34.4%
Mainland Europe	£3.61	11.9%
Rest of World	£5.42	13.4%
Wales	£6.14	18.7%
Total	£7.08	19.7%

Expenditure, Income and Value

Figure 6-1 shows the distribution of the prices respondents were expecting to pay for the "standard room". It was expected that this might reflect income inequalities but it was found that there was little correlation with the typical spend reported as shown in Table 6-12.

Figure 6-1 Distribution of Room Prices

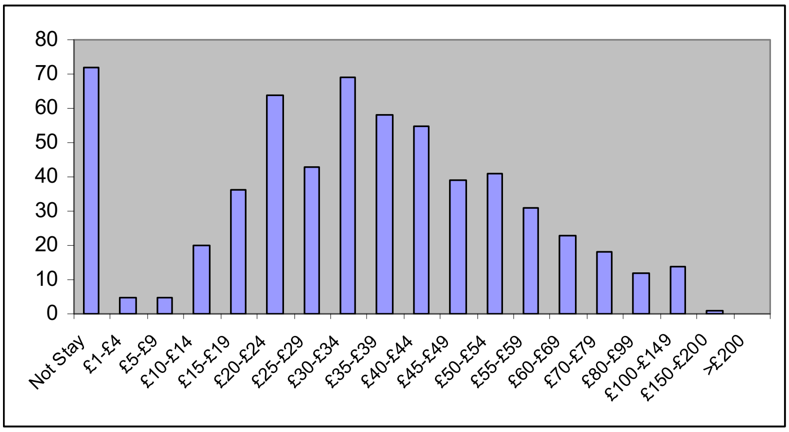


Table 6-12 Price of Room v Daily Expenditure

Daily Expenditure	Price of Room
More than £500	£43.50
£250-£500	£43.10
£150-£249	£43.10
£0-£149	£40.51
Total	£41.80

If the assumption is made that those with high daily expenditures tend to have high incomes and that those with high incomes tend to place a greater value on scenery then it follows that the percentage of the value of a room attributable to scenery should be more equal than the absolute. Table 6-13 shows that whilst there is some evidence of rising values with rising expenditure the variance of the percentage change is equally large. In fact in neither case are the differences statistically significant, and thus we conclude that there is little significant difference in valuations by expenditure (income).

Table 6-13 Relationship between Value of Scenery and Daily Expenditure

	Lost Value £	Lost Value%
More than £500	8.4	16.1%
£250-£500	7.6	18.0%
£150-£249	8.6	20.6%
£0-£149	7.0	20.5%
All	**7.5**	**19.8%**

Value and Visits to Scotland

One hypothesis that has been suggested is that visitors to Scotland tend to value landscape more than the average tourist. Table 6-14 shows the relative values.

Table 6-14 Value of Scenery and Visits to Scotland

	Visited Scotland	Mean
Loss £	Yes	£7.54
	No	£5.91
Loss %	Yes	19.8%
	No	19.6%

Although the absolute values appear to confirm the hypothesis, once again the difference is not statistically significant. In terms of percentage loss there is clearly no distinction.

Scenic Value, Accommodation and Activity

The relationship between value and accommodation in Table 6-15 shows similar consistency.

Table 6-15 Value and Accommodation

	Loss £	Loss %
Hotel	8.75	26.2%
Bed and Breakfast, Hostel	6.01	14.1%
Hired Caravan	3.58	16.3%
Caravan, Campervan, Tent	7.38	17.3%
Self Catering	6.16	19.4%
Other	7.03	8.5%
Total	7.53	19.8%

The cheapest hired accommodation (hired caravan) has the lowest absolute rate but as a percentage of the price paid is in line with other forms. Hoteliers tend to have most to lose from scenic deprivation which probably reflects the higher age ranges attracted.

Table 6-16 Value and Trip Purpose

	Loss	Loss%
To see Scotland	£7.34	18.6%
To see friends and relatives	£7.88	19.0%
Shopping and Business	£8.87	33.9%
Other	£6.78	14.9%

Table 6-16 examines the relationship between value and trip purpose. Once again there are no significant differences.

The range of values for individuals

The analysis so far has suggested that the only group that places significantly different values on the loss of landscape are the young. In part, this is because real differences are swamped by differences between individuals. Most individuals appear to prefer a landscape without a wind farm but there is also a substantial proportion that does not care (and a few who positively like wind farms). Table 6-17 shows this distribution.

Table 6-17 Distribution of values placed on changes by individuals

Percentiles	Braes Current	Braes Extended	Additional Value from Extension Braes	Single Grid Line	Double Grid Line	Additional Value from Extra Pylon	Waterfall	Spey	Thurso Current	Thurso Extended	Additional Value from Extension Thurso
10	-£20.00	-£25.00	-£10.23	-£26.25	-£27.00	-£8.50	-£26.48	-£20.00	-£20.00	-£21.00	-£8.50
20	-£12.50	-£12.50	-£3.75	-£18.00	-£20.00	-£4.00	-£14.00	-£10.00	-£12.50	-£12.50	-£3.75
30	-£8.50	-£9.25	-£1.25	-£12.50	-£12.50	-£0.96	-£9.93	-£6.25	-£9.25	-£9.25	£0.00
40	-£6.25	-£7.00	£0.00	-£8.50	-£10.00	£0.00	-£7.00	-£2.94	-£6.02	-£6.25	£0.00
50	-£3.75	-£5.50	£0.00	-£6.25	-£8.50	£0.00	-£3.75	£0.00	-£2.50	-£3.75	£0.00
60	-£0.96	-£2.50	£0.00	-£4.00	-£6.25	£0.00	-£1.50	£0.00	£0.00	£0.00	£0.00
70	£0.00	£0.00	£0.00	-£2.50	-£3.75	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
80	£0.00	£0.00	£0.00	£0.00	-£0.75	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
90	£0.00	£0.00	£4.83	£0.00	£0.00	£0.29	£0.00	£2.50	£0.00	£0.00	£7.45
Negative	61.70%	68.20%	32.20%	78.90%	81.70%	62.50%	62.50%	47.00%	56.10%	59.10%	22.70%
Neutral	29.20%	22.40%	49.70%	15.80%	14.00%	29.00%	29.00%	39.80%	34.20%	32.00%	52.60%
Positive	9.10%	9.40%	18.10%	5.30%	4.30%	8.50%	8.50%	13.20%	9.70%	8.90%	24.70%

This confirms quite clearly the relative indifference to size of Wind farms (Braes Extension and Thurso Extension) and the general dislike of grid lines and pylons (Double Grid Line). As far as Wind farms are concerned the pattern seems to be that the averages are Negative 63.3%, Neutral 27.8% and Positive 8.9%.

Summary on Value Estimates

There is a wide variance in values placed by individuals on the scenery that almost completely swamps any group characteristics. Given these findings it seems appropriate to treat the respondents as a homogeneous group and to utilize means for the whole group when assessing potential losses of value and consequential economic impact.

6.9.3 Perceptions and Reactions

The final section of the study sought tourist perceptions of the number and spread of wind farms in Scotland. There are two quite surprising findings shown in Table 6-18. Firstly there is the (incorrect) belief that turbines are as prevalent in scenic areas as in non-scenic areas.

Table 6-18 Prevalence of Wind Farms

	Non-Scenic		Scenic	
	Frequency	**Percent**	**Frequency**	**Percent**
Very likely	36	5.9	33	5.4
Quite likely	161	26.6	148	24.4
Likely	186	30.7	198	32.7
Not very likely	213	35.1	204	33.7
Not at all likely	10	1.7	23	3.8
Total	606	100.0	606	100.0

Secondly there appear to be an exaggerated belief that one is currently likely to see a wind farm on a 2 hour journey. As discussed in chapter 5, routes to the west of the country are (M74 and A82/3) are still clear and planning permission has largely prevented developments in scenic areas. This situation may not last.

The final table summarises the responses to the question **"If the number of wind farms in non scenic areas increases, what will be your likely response?"**

Table 6-19 Possible Reaction to increase in number of wind farms

	Frequency	Percent
Go to see them	114	18.8
No response	374	61.7
Avoid the areas	108	17.8
Avoid Scotland	10	1.7
Total	606	100.0

On the positive side there is clearly a latent demand for a visit to a wind farm as part of the tourist experience. On the negative side these figures are very similar to those found in the much criticised System3 (2002) study and which have led to so much worry. They are noticeably different from the results of the "on the ground" intercept study and in reality these figures may well be exaggerated. One test is the difference in perception between those who have visited Scotland and those who have not.

Table 6-20 Difference in perception between visitors and non-visitors of likelihood of seeing Wind farm

	Non Scenic			Scenic		
	Visited	**Not Visited**	**Total**	**Visited**	**Not Visited**	**Total**
Very likely	4.8%	8.9%	5.9%	5.0%	6.5%	5.4%
Quite likely	30.4%	16.6%	26.6%	23.8%	26.0%	24.4%
Likely	27.7%	38.5%	30.7%	30.2%	39.1%	32.7%
Not very likely	35.7%	33.7%	35.1%	37.5%	23.7%	33.7%
Not at all likely	1.4%	2.4%	1.7%	3.4%	4.7%	3.8%
	100%	100%	100%	100%	100%	100%

Those who have visited Scotland can clearly distinguish the policy of protecting scenic areas. Perhaps there is an argument for identifying the many scenic areas more clearly for visitors and the caution associated with their classification.

Table 6-21 Differences in Reaction between visitors and non visitors

	Visited	Not Visited	Total
Go to see them	17.8%	21.3%	18.8%
No response	61.6%	62.1%	61.7%
Avoid the areas	19.2%	14.2%	17.8%
Avoid Scotland	1.4%	2.4%	1.7%
	100.0%	100.0%	100.0%

As Table 6-21 shows the only difference (not significant) in reaction between those who have and those who have not visited Scotland, is avoiding the country rather than the areas. This probably reflects lack of information about the size and its variability of Scotland, but may also indicate a problem in the future about attracting new visitors.

6.10 US results

6.10.1 Respondents

A title of the project was circulated to the US panel, which for the purposes of this study could be regarded as random, and an invitation issued to respond to the survey. Results were obtained from the first 100 who have visited Scotland or plan to do so within 5 years. The number screened out was a surprisingly low 85, almost 55% of the initial sample had been or intended to visit Scotland.

Table 6-22 and Table 6-23 show the age and gender of this sample. It is suspected that the retired tourist is possibly under-represented but this does not have any significant impact (see section 6.10.3)

Table 6-22 Gender of US Respondents

	Frequency	Percent
Male	53	51.5
Female	50	48.5
Total	103	100.0

Table 6-23 Age of US Respondents

	Frequency	Percent
16 - 25	12	11.7
26 - 45	48	46.6
46 - 65	39	37.9
Over 65	4	3.9
Total	103	100.0

A significant majority of the sample used hotels, with the balance being taken up with cheaper indoor accommodation.

Table 6-24 Accommodation used by US Respondents

	Frequency	Percent
Hotel	70	68.0
Bed and Breakfast, Hostel	30	29.1
Caravan, Campervan, Tent	1	1.0
Self Catering	1	1.0
Other	1	1.0
Total	103	100.0

Table 6-25 Primary Purpose of US Tourists

	Frequency	Percent
To see Scotland	68	66.0
To see friends and relatives	7	6.8
To go shopping	1	1.0
To see Scotland as an extension of a business trip	5	4.9
To undertake a cultural activity (theatre visit, concert,	5	4.9
To participate in a sporting or outdoor activity	3	2.9
Other	14	13.6
Total	103	100.0

Table 6-25 shows that the vast majority are simple tourists with the next largest item being for "other" reasons. If we discount this group then it appears that 76.3% of the group would be directly affected by the scenery, remarkably close to the 76.5% of the UK sample.

6.10.2 The Willingness of US Tourists to Pay for Views

Value of Scenery

Table 6-26 compares the value placed on the scenes by US and UK tourists. The most striking features are the willingness of the US tourist to pay more for the view than the UK tourist and the similarity of the rankings of the scenes.

Table 6-26 Comparison of the value of specific scenes to US and UK tourists

	US	Rank	UK	Rank
Braes of Doune	£26.02	3	£22.71	2
Spey	£29.18	2	£21.98	3
Rural	£21.16	5	£15.87	5
Waterfall	£23.43	4	£17.41	4
Bay near Thurso	£30.45	1	£24.29	1
Average	£26.05		£20.45	

The mean price for the room with the view of the car park only was £40.81, compared to £40.96 for the UK sample.

Value of Scenic Change by Location and Type

Table 6-27 shows the loss in value to US tourists compared to the loss for UK Tourists. Whilst they are of the same magnitude it is noticeable that the US tourist experiences less loss of value with wind farms than the UK tourist , despite placing a greater value on the scene. The one glaring exception is the impact of grid lines which are even more offensive to the US eye.

Table 6-27 Loss of value from developments for US and UK Tourists

	US		UK	
	Loss £	Loss %	Loss £	Loss %
Loss for Braes	£4.66	6.2%	£6.56	18.8%
Additional Loss for Braes Extension	£2.61	9.3%	£1.54	6.5%
Total Loss for Extended Braes	£7.27	15.7%	£8.10	25.7%
Loss for Thurso	£6.08	7.3%	£6.17	16.6%
Additional Loss for Thurso Extension	-£0.07	2.7%	£0.55	3.9%
Total Loss for Extended Thurso	£6.02	10.0%	£6.72	20.6%
Loss for Waterfall Development	£5.95	12.7%	£7.97	18.7%
Loss for Grid Line	£12.08	29.8%	£9.54	24.6%
Additional Loss for Second Grid Line	£1.63	3.2%	£1.22	4.5%
Total Loss for Both Grid Lines	£13.72	33.1%	£10.76	29.1%
Loss for Telegraph Poles	£5.74	15.6%	£4.58	11.7%
Basic Wind Farm Average Loss	£5.56	8.7%	£6.90	18.0%
Extended Wind Farm Average Loss	£6.64	12.8%	£7.41	23.2%

Loss of Value by Age, Gender and Purpose

Table 6-28, Table 6-29 and Table 6-30 show the loss of value by age, gender and purpose.

Table 6-28 Loss of Values to US Tourists by Age

	Loss	Loss %	N
16 - 25	-£0.15	-1.5%	12
26 - 45	£5.47	4.9%	48
46 - 65	£7.02	15.5%	39
Over 65	£9.61	18.4%	4
Total	£5.56	8.7%	103

As with the UK example, the young appear to find the scenery equally attractive with or without turbines. In the US case, however, the loss for the elderly is greater than for any other group. Care, however, must be exercise because of low numbers in the category responding.

Table 6-29 Loss of Values to US Tourists by Accommodation

	Loss	Loss %	N
Hotel	£6.23	7.9%	70
Bed and Breakfast, Hostel	£4.24	10.9%	30
Other	£3.22	6.3%	3
Total	£5.56	8.7%	103

Table 6-30 Loss of Values to US Tourists by Activity

	Loss	Loss %	N
To see Scotland	£4.78	5.9%	68
Other	£9.41	16.5%	35
Total	£5.56	8.7%	103

There is no real difference in loss by accommodation type and, by implication, by income. There is no obvious explanation for the higher figure for Other activities except that it is paralleled to a lesser extent in the UK. The difference is not statistically significant (t=0.669 and 1.186)

Range of Values

As discussed under UK Results the variability within the sample is so large that it is difficult to find any statistically significant results. For the US sample this is illustrated in Table 6-31 which identifies the percentage of responses that indicated a loss, indifference (zero value change) and gain.

Table 6-31 Distribution of Values by site

	Negative	Neutral	Positive
Braes Current	57.30%	33.00%	9.70%
Braes Extended	68.00%	21.40%	10.60%
Additional Loss from Extension Braes	35.00%	44.60%	20.40%
Single Grid Line	80.60%	9.70%	9.70%
Double Grid Line	80.60%	9.70%	9.70%
Additional Loss from Extra Pylon	37.90%	46.60%	15.50%
Waterfall	59.20%	29.10%	11.70%
Spey	46.60%	35.90%	17.50%
Thurso Current	40.80%	42.70%	16.50%
Thurso Extended	48.50%	36.90%	14.60%
Additional Loss from Extension Thurso	30.10%	46.60%	23.30%

An important feature of this table is the level of indifference between the basic wind farm and the extension. Even in the case of the second pylon line, indifference exceeds negative reaction. This finding is in line with both the intercept study and the literature, a large group of people simply do not care.

6.10.3 US Tourist Perceptions

The perceptions of tourists form the US are similar to those from the UK but even more inclined to believe that there is a wind farm around each bend. There is some recognition that a tourist is less likely to see a wind farm in a scenic area but even here over 70% believe that they are likely, quite likely or very likely to see a wind farm.

Table 6-32 Views on likelihood of seeing a wind farm

	Not Scenic			Scenic		
	N	Percent	UK Not Visited	N	Percent	UK Not Visited
Very likely	11	10.7%	8.9%	11	10.7%	6.5%
Quite likely	38	36.9%	16.6%	27	26.2%	26.0%
Likely	37	35.9%	38.5%	34	33.0%	39.1%
Not very likely	15	14.6%	33.7%	28	27.2%	23.7%
Not at all likely	2	1.9%	2.4%	3	2.9%	4.7%
Total	103	100%	100%	103	100%	100%

The effect of this belief is small. Fewer individuals say they would avoid areas with lots of wind farms and only 1 respondent identified it as a reason for not going to Scotland.

Table 6-33 Response of US visitors to Wind farms

	Frequency	Percent
Go to see them	37	35.9
No response	54	52.4
Avoid the areas	11	10.7
Avoid Scotland	1	1.0
Total	103	100

Far more would appear to want to go to an area to visit a wind farm.

6.11 Summary and conclusions

The internet study was designed and extensive pilots run using SNAP Software. It was then transferred to a commercial company GMI-MR for distribution to 600 randomly selected individuals from the UK and 100 from the US. The process was remarkably smooth and GMI-MR returned the data in SPSS format within the week. We would strongly recommend this type of surveying for similar projects.

The analysis showed that tourists, both domestic and foreign placed a value on a view from a bedroom in excess of £20 per room. This value was seriously eroded by wind turbines, pylons and telegraph poles. The pylons, in particular were disliked by virtually all with a mean loss of over £10 for UK tourists and over £13 for US tourists. Wind farms generated a loss between £7 and £8 for the UK and between £5 and £6 for the US.

The only distinctively different group were the young, who, in general were less worried than their parents.

The significance of age generated the hypothesis that families with children might have more appreciation of wind farms as a positive holiday experience. This was tested and the results shown in Table 6-34.

Table 6-34 Effect of children in the party

	UK (excl. Scots)		US	
	Mean	**N**	**Mean**	**N**
No Children	£8.05	306	£6.72	72
Children	£6.32	132	£2.88	31

Whilst the US sample showed a difference, albeit not significantly different, this was not replicated in the UK sample.

As a general rule the further the tourist was away from Scotland the more they believed wind farms were more extensive than they actually are and the less they apparently minded. One marked feature was a failure to recognise that permission for developments in "highly scenic areas" are not normally allowed. There is an argument for either more National Parks or for a rigorous marketing of the concept of a National Scenic Area.

A substantial minority would either avoid an area or Scotland all together if the number of wind farms increases substantially. It is difficult to know what is meant by an area in this context and we prefer the findings of the intercept study because:

- Most respondents had just seen a wind farm
- The meaning of area was defined and explained to the respondents

The conclusions are that:

- The internet survey was effective and fast once linked to a commercial organisation.
- Scenery clearly has value.
- Wind turbines do reduce the value of the scenery although for a substantial proportion there is no loss of scenic value.
- The analysis suggests similar responses by nationality, age, gender, general expenditure, although there is some evidence that the young and children are indifferent.
- An estimate of the value lost is between a maximum of some 23.2% of the room price (UK values only for extended farms) and a minimum .of 17.1% (wind-farm basic 90%UK, 10%US) with a mean of 19.7%.. Taking into account the substantial individual variance into account our confidence range would be between 15% and 25% and these form the bounds for our sensitivity analysis.

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7 The Economic Impact Analysis

7.1 Introduction

Chap 2 identified the key stages in estimating the proportionate change in expenditure in an area, specifically

- Identifying the change in likelihood of a return visit to Scotland as a result of different levels of exposure to wind farms
- Identifying the proportion of tourists in an area to whom this applies
- Identifying the proportion of accommodation that is exposed
- Estimating the likely proportionate change in expenditure in the affected accommodation

In chapters 4, 5 & 6 the methods used to identify these four elements were discussed in some detail.

Once the proportion of tourist expenditure that will be lost has been estimated then a number of further stages are required before the economic impact can be determined. These are as follows:

1. The total Tourist (including specifically accommodation) expenditure in each area is identified
2. The lost expenditure is estimated
3. The distribution of the expenditure by industry is determined
4. The proportion of expenditure in an industry that leaves the area is determined (e.g. VAT, Duty, purchases from outside the area brought in for retailing).
5. The balance, the Direct Expenditure by industry is identified.
6. Using a local input output table, the resulting drop in purchases from other local industries (The Indirect Effect) as a result in drop of activity is assessed.
7. The drop in employee incomes as a result of the Direct Effect is calculated.
8. The drop in purchases from local industry (the Induced Effect) by the local employees is identified.
9. The resulting drop in expenditure in local industry as a result of the indirect and induced effect is identified.

10. This Round 1 fall in industry output then itself has an impact. The further contraction in purchases from local industry by local industry and in purchases from local industries by local employees is calculated to give the Round 2 effect.
11. Successive rounds 3, 4,……,10 are estimated and aggregated
12. The implications of the change in output for employment and income or gross value added are identified.

The following sections discuss:

- Estimates of total Tourist Expenditure in an area and the satellite tourist account that identifies the relationship between that send and the spend in local industries
- Estimates of the change in expenditure
- The development of local input-output models and the DREAM system

7.2 Measuring tourism within the Scottish economy

The only official study of tourism's economic significance in Scotland utilising modern methodologies estimated expenditure on tourism in 2001 to be £6175 mn[17] .

This measure is based on the definition of a tourist as someone outside their normal environment and includes business trips, visits to friends and relatives whether as leisure, pleasure or otherwise, study and other motivations. It includes trips including an overnight stay and also includes day trips (although short day trips less than three hours long were excluded by convention, and non-leisure day trips were excluded because they were not recorded).

This report was written in 2007, and so we have attempted an update of the official figures, as follows:

Table 7-1 Estimated tourism spending summary 2006

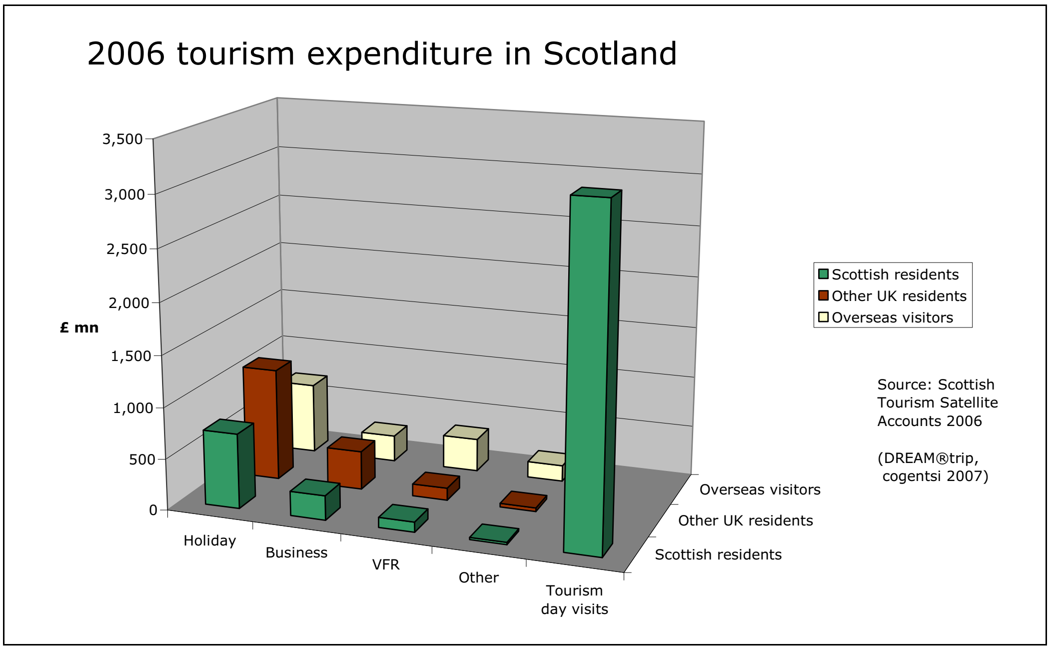
2006	Scottish residents	Other UK residents	Overseas visitors	Total
Holiday	731	1099	696	2,527
Business	238	378	259	875
VFR	98	119	325	543
Other	22	34	159	215
Tourism day visits	3,202			3,202
Total	4,292	1,630	1,439	7,361

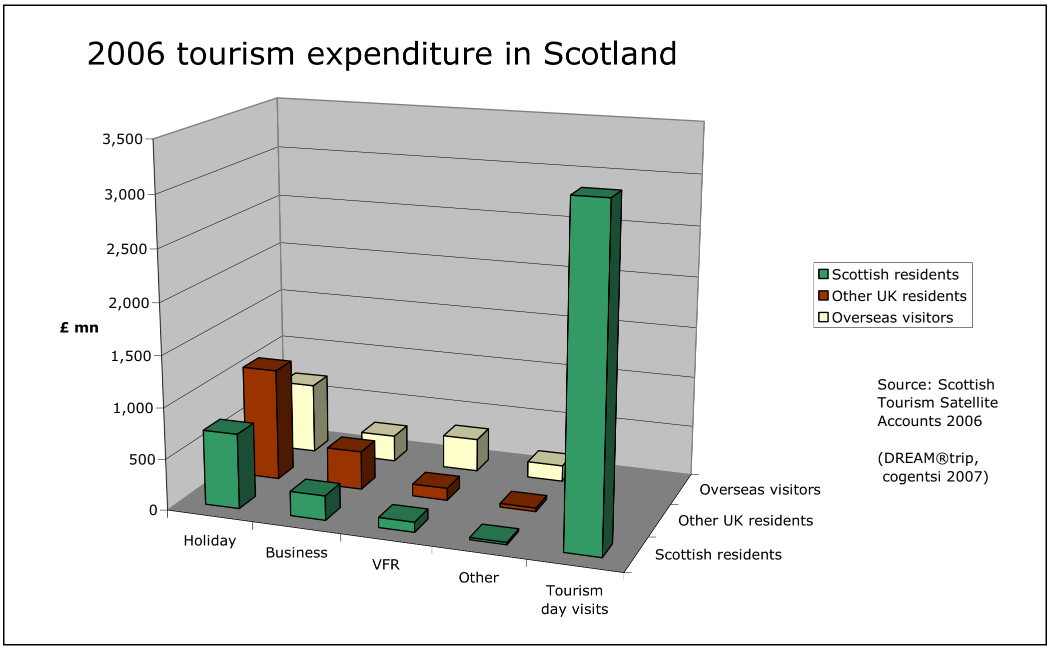
Source: cogentsi based on published 2005/2006 figures:see text
Ref z/data/tourism/ ScotTSAanal.xls

[17] Hayes and Boag, 2004. By 'modern methodologies' we mean the Recommended Methodological Framework for Tourism Satellite Accounts (OECD, United Nations and Eurostat, 2001)

Setting these figures out graphically indicates how important day visits are to the economics of tourism.

Figure 7-1 Estimated tourism spending summary 2006





For decades the long run trend of tourism in the world has been upwards, driven by rising prosperity and reductions in the cost of travel, which have also affected the balance between destinations. In recent years the figures have shown dramatic trends, some of them due to real events like the spread of budget airlines, and some purely statistical effects described below. Attempting to see through the latter to identify actual changes in visits to Scotland, the trends for alternative types of visit from different origins are significantly different. The last five years have seen rapidly expanding foreign visitor numbers (almost a doubling), a declining number of UK visitors and Scottish holiday visitors, but significant expansion of day visits and a slight spending increase for non-holiday visits by Scots within Scotland.

The main reason the trends are uncertain is that the principal surveys for UK tourism found increasing problems. The UK Tourism Survey, which addresses tourism by UK residents within the UK found problems with its telephone interview methods, and had to be switched in May 2005 to face-to-face interviews and a new operator. As a result 2004 figures are generally discounted completely, and the quoted 2005 figures are based on real data for the final eight months, but the first four months are based on uprating the same period of 2002 using May-December 2005 data. Unfortunately both years were highly unusual for the sixty per cent of Scottish tourism that goes on outwith the cities. Early 2001 had been hit by Foot and Mouth Disease, and local views are that the rural areas directly affected did not by any means fully recover in the following year. In 2005 the G8 Economic Summit was held at Gleneagles, with a dramatic effect on Perth and Kinross tourism and lesser, but still large, effects elsewhere.

For leisure day visits no GB survey has been held since 2002/3. However, we have been able to use data from the Scottish Recreation Survey conducted by SNH and the Forestry Commission. For international visits a growing anomaly has had to be addressed. The Office for national Statistics has instituted new sampling points at Prestwick Airport and Rosyth Ferry terminal, where previously visitor totals had been collected, but no information on travellers or destinations.

Given these overall difficulties with the tourism surveys, VisitScotland was uncomfortable releasing local visit details, below the level of tourist areas. The tourist area estimates for UK overnight visits in 2005 were as follows:

Table 7-2 Tourist area estimates for 2005

	mn	mn	£mn	% split of trips			
visitScotland	Nights	Trips	Spend	Holiday	VFR	Business	Other
Aberdeen & Grampian	5.61	1.58	297	73%	10%	14%	3%
Angus & Dundee	2.39	0.69	98	61%	16%	22%	1%
Fife	1.97	0.65	76	60%	17%	22%	1%
Greater Glasgow, Clyde Valley	7.19	2.62	557	61%	16%	17%	6%
Argyll, Islands, Loch Lomond Stirling & Trossachs	6.61	1.67	342	61%	16%	17%	6%
Highland	8.04	1.84	438	72%	10%	14%	4%
Ayrshire & Arran	3.06	0.94	196	69%	17%	11%	3%
Borders	1.26	0.34	58	68%	18%	15%	0%
Dumfries & Galloway	3.56	0.97	200	69%	17%	10%	4%
Perthshire	2.68	0.84	206	60%	17%	22%	1%
Edinburgh & Lothians	7.05	2.78	706	60%	16%	22%	2%
Residual (Islands)	4.18	n/a	n/a				
Scotland	53.6	14.87	3006	63%	17%	15%	5%

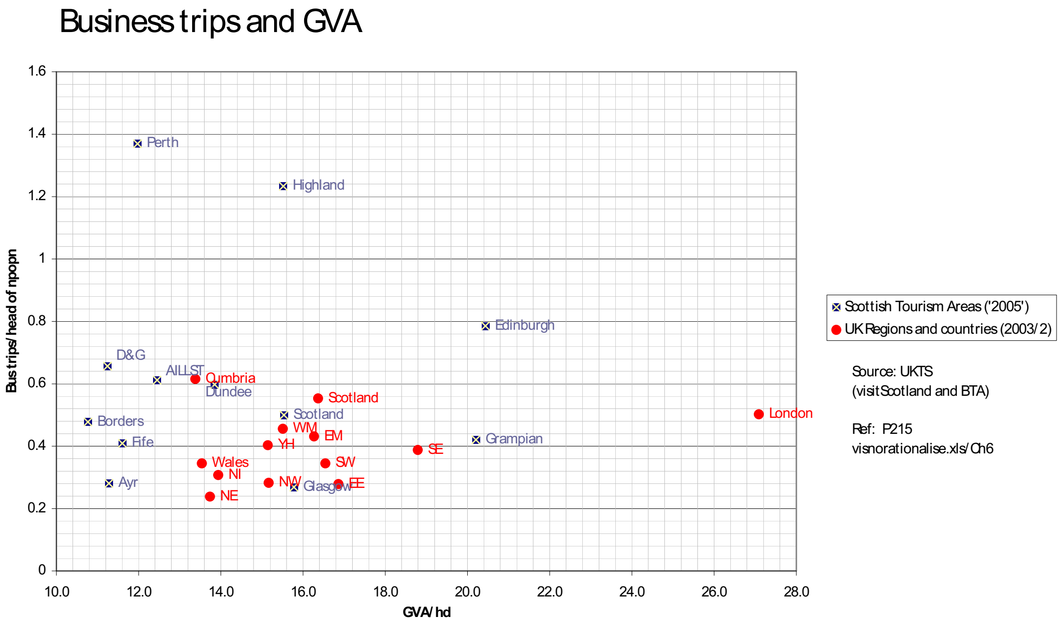
Source: visitScotland regional data sheets Ref: P215 visnorationalise#

We have therefore used detail from happier days to put together a set of Council area estimates for 2006 that add up to the national totals. In the jargon this is known as 'modelling down' and is used, for example, to fill in figures in surveys where the small number of respondents would make sampling errors unacceptably large.

In addition to the national figures and the area figures above, our basic data was overnight stays taken from the Grant Aid calculations for local councils used by the Scottish Executive. These were based on special extracts from the visitor surveys commissioned for 2003. Since funding was directly tied to them they have been scrutinised not only by the Executive but by the councils.

The approach taken was to generate a full matrix of trips, nights and expenditure by the four overnight trip purposes by disaggregating the area statistics, using Scottish averages for trip length and spend per night. The allocation of business trips within tourist areas was by the GVA generated in the area, with a small uprating for the cities as business hubs and Renfrewshire as a transport hub (ie business visitors within Edinburgh and the Lothians were expected to be more likely to stay in Edinburgh, those within Greater Glasgow and Clyde valley to stay in Glasgow or Renfrewshire). This was only done after some investigation and considerable consideration. Although superficially there is a negative correlation between GVA/hd and business trips/hd within Scotland, this appears to reflect an 'accessibility' effect found not only in Scotland but across the UK, shown in Figure 7-2.

Figure 7-2 Overnight business trips increase with dynamic destinations, but are reduced if day trips are feasible



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What appears to happen is that productive and prosperous areas as measured by GVA do attract more visitors overall, but they also typically have far better transport access, so they are much more suitable for business day visits.

From the 2005 figures Perthshire was downrated to allow for the absence of the G8 Summit effect: this effect as estimated by dummy variables in simple regressions (ca 45 per cent) was commensurate with the economic impact estimates made by the Scottish Executive gross of displacement. Since the purpose of the downrating was simply to derive a proper allocation factor, it was not though necessary to adjust other areas where there was undoubtedly a G8 effect, but it was much smaller in proportion to the normal visitor volume.

The same principles were applied to allocate out the Highland figures to sub areas, using here figures which had been collected by HIE and HOST in a number of surveys over the past decade.

The results are shown in the tables on the following page.

7.3 Estimating changes in expenditure

In section 4 the results of the intercept survey were discussed. On of the more important findings was that, contrary to expectations, those intercepted who had high exposure to wind farms were no less likely to return than those with only medium exposure, indeed the evidence might suggest that close contact, such as on the A9 Causeymire, was more desirable than a wind farm outlined on a hill 10km distant. Given no significant difference in the groups the distinction was not pursued.

A second hypothesis was that those staying overnight would be more affected than those on long day trips because of an increased range of opportunities. As Table 7-3 shows, again there was no significant difference between the two groups.

Table 7-3 Intentions

	ALL		Overnight	
Having Seen	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	191	191	137	137
Number Responding	4	4	3	3
Number Not Responding	187	187	134	134
Percent Responding	2.1%	2.1%	2.20%	2.20%
Change in Likelihood	-0.08%	-0.10%	-0.12%	-0.16%
Photo	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	380	380	256	256
Number Responding	11	4	7	3
Number Not Responding	369	376	249	253
Percent Responding	2.89%	1.05%	2.73%	1.17%
Change in Likelihood	-0.73%	-0.05%	-0.70%	-0.10%
Extended	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	380	380	256	256
Number Responding	26	5	19	4
Number Not Responding	354	375	237	252
Percent Responding	6.84%	1.32%	7.42%	1.56%
Change in Likelihood	-2.54%	-0.30%	-2.50%	-0.45%

There are however significant differences between the likelihoods when wind farms are being built or being extended. Where tourists have seen wind farms then it hardly affects their chance of returning at all. We conclude that there would be minimal economic impact if they were dismantled. New wind farm developments on the same scale would have a slightly larger impact. Further extension would add to the likelihood of non return to a specific area. Even then the largest response is only 2.54% and this only applies to holidaymakers (not business trips). The reduction in likelihood of not returning to Scotland is very small indeed, even with substantially increased numbers of turbines.

For the purposes of this study, given that there is going to be both more wind farms and extensions to existing farms the largest of the responses, -2.54%, has been taken as applying to any area and the -0.45% applied to Non-Scottish visitors who might be deterred from visiting Scotland as a whole.

Table 7-4 gives the proportion of tourists and accommodation affected by area.

Table 7-4 Estimated Percentage Change in Tourist Expenditure by Area

Area	Tourists on Holiday%	Travellers Exposed %	Tourists Affected%	Expenditure Reduction%
Caithness and Sutherland	75.00%	81.00%	60.75%	1.54%
Stirling, Perth & Kinross	60.00%	85.00%	51.00%	1.30%
The Scottish Borders	68.00%	91.60%	62.29%	1.58%
Dumfries & Galloway	69.00%	98.00%	67.62%	1.72%

This table shows quite clearly that it is important to note the type of tourists in an area as well as their exposure to wind farms to fully understand the likely reduction in expenditure from a development.

In section 6 the mean percentage short term loss for scenes involving extended farms was found to be 19.7%. This would imply a short term reduction in value of some 9.8% for each hotel using the assumption that 50% of the rooms are affected. Table 7-5 links the percentage of rooms directly affected with the percentage loss in price to give a percentage loss in value and accommodation expenditure.

Table 7-5 Estimated Change in Accommodation Expenditure by Area

	Affected Accommodation %	Reduction in Value %	Accommodation Expenditure £m	Expenditure Reduction £m
Caithness and Sutherland	4.90%	0.48%	£23.73	£0.11
Stirling, Perth & Kinross	6.60%	0.65%	£203.67	£1.32
The Scottish Borders	6.70%	0.66%	£54.25	£0.36
Dumfries & Galloway	16.20%	1.59%	£102.78	£1.63

One assumption made here is that those who currently pay a premium give a value to scenery whatever the purpose for the trip. Most will be holidaymakers but some might be on business. Because the premium will disappear, the drop in expenditure will apply to all tourists not just holidaymakers.

7.4 The DREAM® system

The mapping of tourist expenditure to industrial output and the subsequent estimation of impact is undertaken within the DREAM system. The full DREAM model is based on 123 standard industries (SIC) and products and eight institutional sectors

- Households
- NPISH, Non-Profit Institutions Serving Households
- Central and Regional Government
- Local Government
- Financial Corporations
- Non-financial Corporations
- Rest of the EU26
- Rest of the world

These consuming sectors absorb output and produce inputs for the 123 industries. However consumption is defined in terms of products (not industries) and follows a different international classification. The relationship between industry and product is defined by industry/product models and sub-models. Tourism is an activity that is matched to a pattern of consumption. Thus if we know there is a loss of expenditure of £1m this can be mapped to expenditure on products and from there to changes in direct expenditure in local industries.

Household demand can also be defined by socio-economic characteristics e.g. it is quite possible to distinguish differential impacts of age (e.g. the impact of a new University), sex or occupation.

The standard model has 155 geographic units. These are based on the "NUTS" classification of the European Union. In England, Wales and Northern Ireland the NUTS3 level is utilised. This is equivalent to the local authority areas. Because of the low population densities, in Scotland the model works to NUTS4 boundaries, sub-divisions of local authorities such as the Highland Region that correspond with Enterprise Company Areas such as Caithness and Sutherland. It should be noted however that geographic sub models can be produced to ward or postcode level.

7.5 Estimating the DREAM model

It is important to recognise that the DREAM model is based on the incorporation and reconciliation of ALL current official statistics on Production, Consumption and Trade at the lowest regional level in the UK. These models are updated whenever there is a new release of data. Riddington et al (2006) provides more detail of the construction of the model and some comparative tests of the validity of the resulting estimates.

The unique feature of the DREAM model is the estimation of Trade. The original Scottish models estimated trade matrices between the 41 geographical units used, but as the number of areas has grown (155 in the basic model) the all inclusive strategy has been modified. In the current version of DREAM, a "geography" is defined for each area appropriate to the main Trade flows between seven areas. The result is 123 7*7 trade tables. The seven areas are typically the home region, three key trading regions, the Rest of the UK (RUK), the Rest of the EU (REU) and the Rest of the World (ROW). For example for the Caithness and Sutherland, trade flows for the 123 products were estimated between Caithness and Sutherland, Ross and Cromarty, the Rest of the Highland, the Rest of Scotland, RUK, REU and ROW. In total 5*123, 7*7 Trade matrices (geographies for 4 case study areas plus Scotland, 123 industries, 7 trading partners) were identified to underpin the estimates.

Initial estimates of Trade are prepared using the production/absorption estimates as origin-destination values in a 'gravity' model. In such a model the trade between two areas is proportional to the total flows from the origin, the total flows to the destination, and inversely related to the distance between them. The importance of distance is summarised in a 'friction' coefficient describing the inverse relationship. These are then reconciled with all known data by a process of iteration. It is important to note that within any trade sub-model all trade flows will necessarily be balanced. However it is possible for a model based on the geography of the Scottish Borders which has a set of trading partners that includes the Edinburgh, East Lothian and the North East of England to generate slightly different trade flow values from a model based in the North East that includes the North West of England. Research has shown that these differences are extremely small.

Any disadvantages from the "specific geography" approach are significantly outweighed by advantages in terms of flexibility. Sub-divisions to NUTS4 level in England and Wales can be easily incorporated and analyses for specific problems constructed. As an example the "ripple" effect from a city to the suburban and semi rural areas can be identified as can feedback effects from the suburbs to the city. Gibson et al (2005) provides an example of the use of the model in this context. The identification of Feedback is unique to DREAM.

The first stage, building the Dream Snapshot Regional Model, is complex and data intensive and in general a User would not become involved in such detail other than in discussing the appropriate geography. The assessment of Economic Impact, however, involves detailed knowledge of the project or product. The procedures adopted are now discussed.

7.6 Estimating Direct Impacts

The estimation of direct impact is not straightforward. For each category the following procedure is followed

1. The categories are mapped to SIC industries. For example "Accommodation" and "Food and Drink Bought Out" are mapped to Hospitality. Most purchases however are via Retail. In this case the retail margin is allocated to the retail sector and the balance allocated to other industries. In the case of "Food and Drink Purchased" this involves a split between retail, various food processing sectors, soft drink, alcoholic drink and various agricultural sectors. The defaults for these splits are statistically based but may be modified by the user of DREAM.
2. VAT and DUTY are then removed. In the case of fuel and alcohol these are very significant.
3. The final step is the allocation of expenditure between home production and imports. Where the purchase is direct e.g. Accommodation, then this will normally be 100% Home Production. Where the purchase is via retail then the splits identified by the trade model are normally utilised , although these can be modified by the user to reflect specific situations (e.g. agency arrangements)

These three steps provide estimates of the change in output in each industry in each of the trading partners. It should be noted that in some cases such as fuel purchases in a region without refining or distribution facilities, each pound of expenditure may generate only 5p direct impact. If the main expenditure on an activity is travel by car, then it is quite possible for the expenditure to output multiplier to be less than 1.

7.7 Estimating Indirect Impacts

The indirect impact tracks industry to industry purchases in the local region. The Direct Impact is "spent" on (raw material) purchases from other industries (including services), on wages or is retained by the owners for either distribution or investment. To simplify the analysis, profit is added to wage to make "income" (or rather Gross Value Added GVA) and treated as if it were household income. Similarly investment expenditure is assumed to be exhausted in a year and thus treated as simply raw material in the production process.

The Input-Output Table identifies the split between the industrial sectors and the percentage of that which is expected to be local. This is the indirect impact within the region.

Uniquely the DREAM model also identifies feedback effects from the trading partners. Typically for example quarrying will be outside an urban region. An expansion of building demand in the urban region will lead to a flow of expenditure outside, but that industry will in turn utilise services inside the urban area Thus there will be an expansion of the service output indirectly via the trading partner region.

Aggregation of these industry to industry flows immediately following the expenditure is known as the Round 1 Indirect Impact. This change will then have a further impact as the industries purchase (or reduce) goods and services to meet this Round 1 impact. This Round 2 impact, in turn generates Round 3, Round 4 etc impacts. Although the model itself identifies 10 rounds, in practice 99% of the impact is identified in the first four rounds. The ratio of the total impact to direct impact is known as the Type 1 Output Multiplier.

7.8 Estimation of Induced Impacts

The expansion of activity generates increases in local incomes and consequently increases in local expenditure. In practice these effects are less than generally expected for two reasons. Firstly income tax, national insurance and pension payments reduce disposable income to be spent in the region. If the region does not have a financial sector then expenditures on mortgages and insurance also "leak" from the region.

The second problem is the propensity of consumers to import either directly or via retailers. For example expenditure in the "hospitality" sector will include holidays that are inevitably taken outside the region and increasingly outside the UK.

The procedure for estimating the induced impact is as follows

1. Taxes and NI are removed to give disposable income.
2. The direct spend to industries, as opposed to retail, is identified and the proportion of the direct spend to local industry estimated.
3. For retail the percentage of retail spent within the region is calculated. For small regions where the local retail park is outside the region this can be significant.
4. The retail margin is calculated and forms the retail industry's part of the induced effect.
5. The locally sourced proportion in each industry supplying retail is estimated and provides the third part of the induced effect.
6. The sum of these effects is the Round 1 induced impact and is added to the Round 1 indirect effect to provide a total round 1 impact.
7. The proportion allocated to incomes of the total round 1 impact is identified and goes on to generate the Round 2 impact.
8. The ratio of sum of the indirect and induced effects to the direct impact is known as the Type 2 multiplier.

7.9 Estimation of Changes in Incomes and Employment

In each round the additional income (Gross Value Added) generated is identified. The sum of these over all the rounds provides a measure of the additional (reduction in) income as a result of the change.

As discussed, each industry in each region has a unique productivity (reflecting the speciality of the region) and a unique pattern of employment to produce the output. It is relatively simple, therefore, to take changes in output and identify from that the employment by gender and employment category (PT/FT).

7.10 Presentation of Results

The DREAM model requires large amounts of data and is capable of generating the most detailed of outputs.

Figure 7-3 below is an example of DREAM output. In this case the output relates to the change in expenditure of tourists in Caithness and Sutherland. As can be seen, both Type I and Type II impacts on output, income and employment are reported. In Part 3 estimates of the impacts of both change in tourist expenditure and in accommodation expenditure for each study area and for Scotland as a whole are presented.

7.11 References for Chapter 7

Riddington G, Gibson H. and Anderson J. (2006) **A comparison of gravity model, survey and location quotient based local area tables and multipliers** *Regional Studies,* Vol. 40.9, pp. 1069–1081, December 2006

Gibson H., Riddington G., McIntyre S and Mackay S (2005) **The Economic Impact of Sports, Sporting Events, and Sports Tourism in the U.K. The DREAMTM** *European Sport Management Quarterly,* Vol. 5, No. 3, pp 323- 334, September 2005

Figure 7-3 Stirling, Perth & Kinross Wind farm Tourism Change in Spend

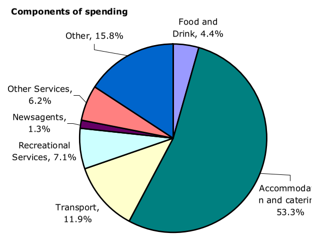
Region: PKS

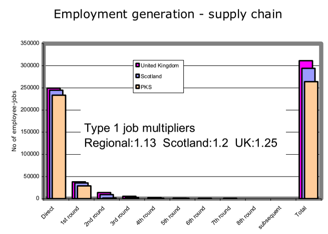
Windfarm Tourism Change in Spend

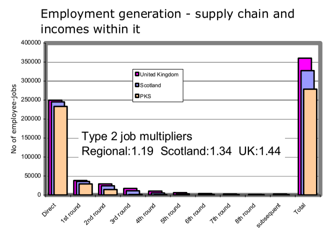
Neighbouring regions:	Glasgow	Argyll & Bute

Survey results

Total spend £8,540







Components of spending

Food and Drink	Accommodation and catering	Transport	Recreational Services	Newsagents	Other Services	Other	Total
£373	£4,552	1019	£608	£111	£525	£1,351	£8,540
4.4%	53.3%	11.9%	7.1%	1.3%	6.2%	15.8%	100.0%

Total effective spend	Retail margins	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all PKS producers	Falling on all Glasgow producers	Falling on all Argyll & Bute producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£8,540	£687	£180	£1,126	£7,414	£5,584	£149	£4	£654	£375	£6,767	£271	£376
100.0%	8.0%	2.1%	13.2%	86.8%	65.4%	1.7%	0.1%	7.7%	4.4%	79.2%	3.2%	4.4%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round Suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
PKS	£5,584	£1,794	£100	£7,478	1.339	233	264	1.131	30924.8	£4,761	£18,026
Rest of Scotland	£808	£438	£679	£1,925		11	30			£968	£32,349
Scotland	£6,392	£2,232	£779	£9,403	1.471	245	294	1.201	34427.9	£5,728	£19,484
Rest of UK	£375	£212	£810	£1,397		5	17			£648	£37,892
UK	£6,767	£2,444	£1,589	£10,800	1.596	250	311	1.247	36429.5	£6,376	£20,495

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round Suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
PKS	£5,584	£4,275	£1,462	£11,321	2.027	233	279	1.194	32639.9	£5,217	£18,714
Rest of Scotland	£808	£689	£2,496	£3,992		11	48			£1,449	£29,973
Scotland	£6,392	£4,964	£3,958	£15,314	2.396	245	327	1.336	38300.4	£6,665	£20,378
Rest of UK	£375	£323	£3,075	£3,774		5	33			£1,298	£39,024
UK	£6,767	£5,286	£7,033	£19,087	2.821	250	360	1.444	42194.8	£7,963	£22,099

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Part 3

Analysis

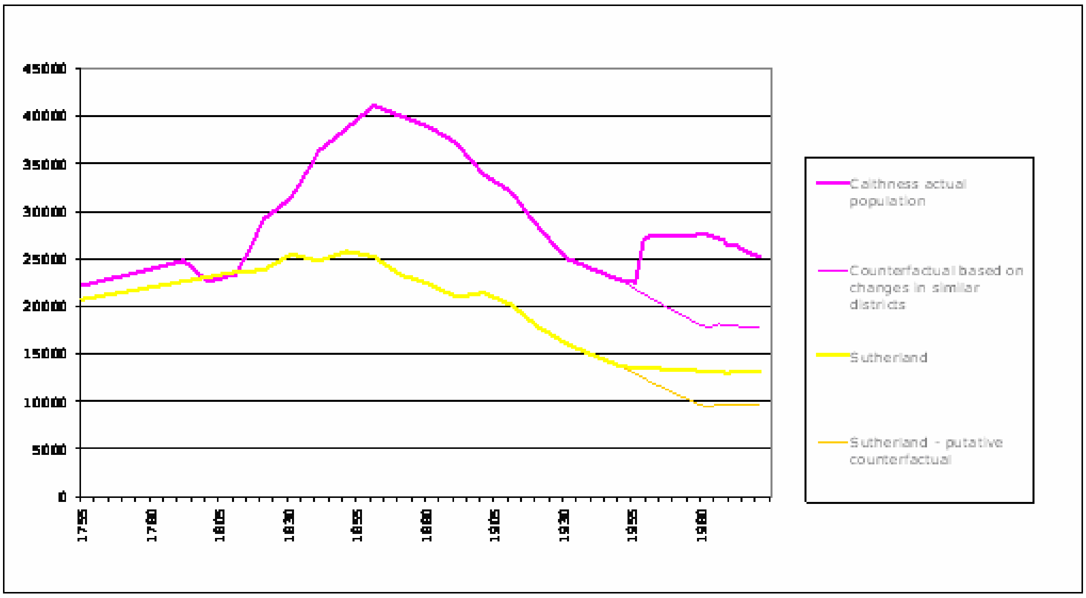
8 Caithness and Sutherland

8.1 The Importance of Tourism in the Local Economy

One issue has dominated the economic trajectory of Caithness and Sutherland since the Clearances, and it is summarised in Figure 8-1and Figure 8-2

Figure 8-1 The Dounreay Fast Breeder Reactor

Figure 8-2 Population Change and the Impact of Dounreay



The population today is estimated to be 40 per cent higher than it would have been without the Dounreay research establishment and power station. Because atomic scientists are well-paid, and the people that clear up after them have to be skilled and conscientious, incomes over the last half century have been boosted even more. GVA is a little over £0.5 bn.

Greening this brownest of Scotland's fields - ameliorating the decommissioning of the facility - is likely to be the most significant factor in the local economy for at least a decade. As a new source of income, renewable energy is an attractive new industry. In the long run onshore wind and hydro may be augmented by other forms of renewables, and other emerging technologies should become more able to play a growing role – for example, the Pentland Firth holds great potential for tidal energy extraction and Scotland's coastline has extensive exposure to wave resources in particular but the new technologies are not yet commercially proven or available in significant quantities. In the short term onshore wind technology is readily available and wind farms are already well established. Offshore wind technology needs to evolve to be able to be deployed in significant amount in the deep water which surrounds Scotland's coast.

The Herculean task of wider economic regeneration is being tackled by local people and by government, which is trying out new organisational forms for economic development. Some distinctive manufacturing experiments, like Caithness Glass and Norfrost freezers, are no more – or at best much reduced or moved elsewhere. Some sophisticated engineering remains, most associated with Dounreay or its decommissioning, but some linked into the North Sea and other oil or energy markets,

When the regenerators select 'industrial stars', sectors where the region has a higher-than-average market share and growth prospects are good, then tourism easily heads the private sector list. **Hotels and catering** alone account for **5 per cent of GVA** in the region and employ over 1700 people out of a workforce of 16000 (10.6%). **Tourism as a whole** (including associated services, tourism retailing, transport and so on) constitutes **about 7 per cent** of the local economy.

Local agriculture and fishing are a major competitive strength, two of only four industries with a significant trade surplus for the region. Attempts are being made to add value through processing and branding the products.

However, nuclear demolition and associated technical functions apart, the rest of the economy is thin, so local multipliers are not large. Retailing is almost exactly the GB average, and other distributive trades are just above half the average. Services are most often acquired from Inverness and the Central Belt and goods, apart from local food, from England and abroad. Any adverse effect on tourism must, therefore, be taken extremely seriously, as there is little chance of substitution within the local economy. The concentration of renewable energy to Caithness and ensuring that the more scenic "wilderness" areas of Sutherland are preserved thus appears to be an appropriate strategy.

8.2 Wind farms: current and applications

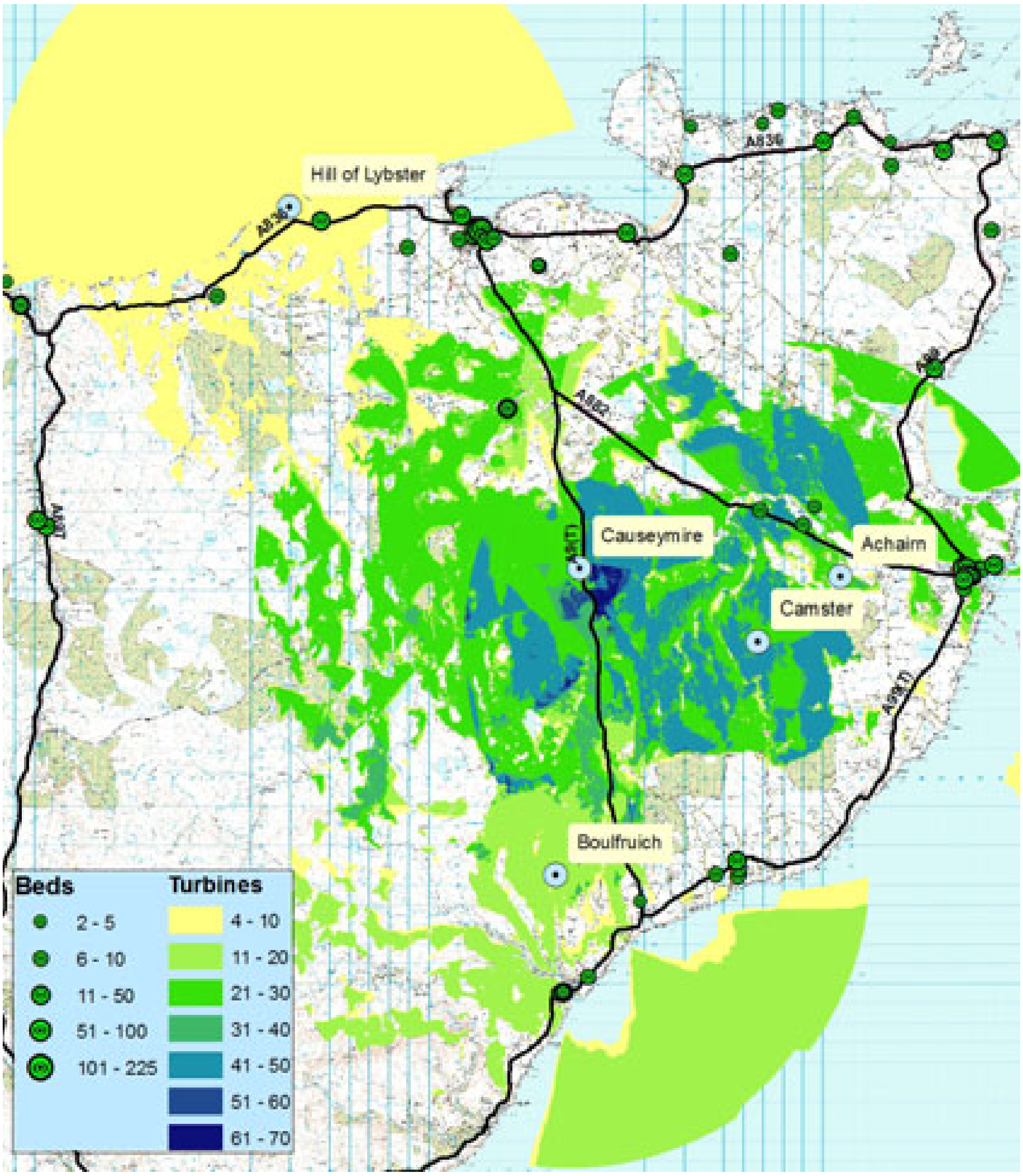
Table 8-1 Wind Farms in Caithness

SITE_NAME	TURBINES	HEIGHT
Boulfruich	12	113
Hill of Lybster	2	78
Hill of Lybster (Extension)	4	78
Causeymire	24	102
Camster	25	120
Burn of Whilk	13	116
Flex Hill	3	93
Achairn	3	100
Dunbeath	17	125
Strathy North	35	110
South Shebster	5	120
Spittal Hill	30	110
Baillie	21	120
Bower Quarry	1	77

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

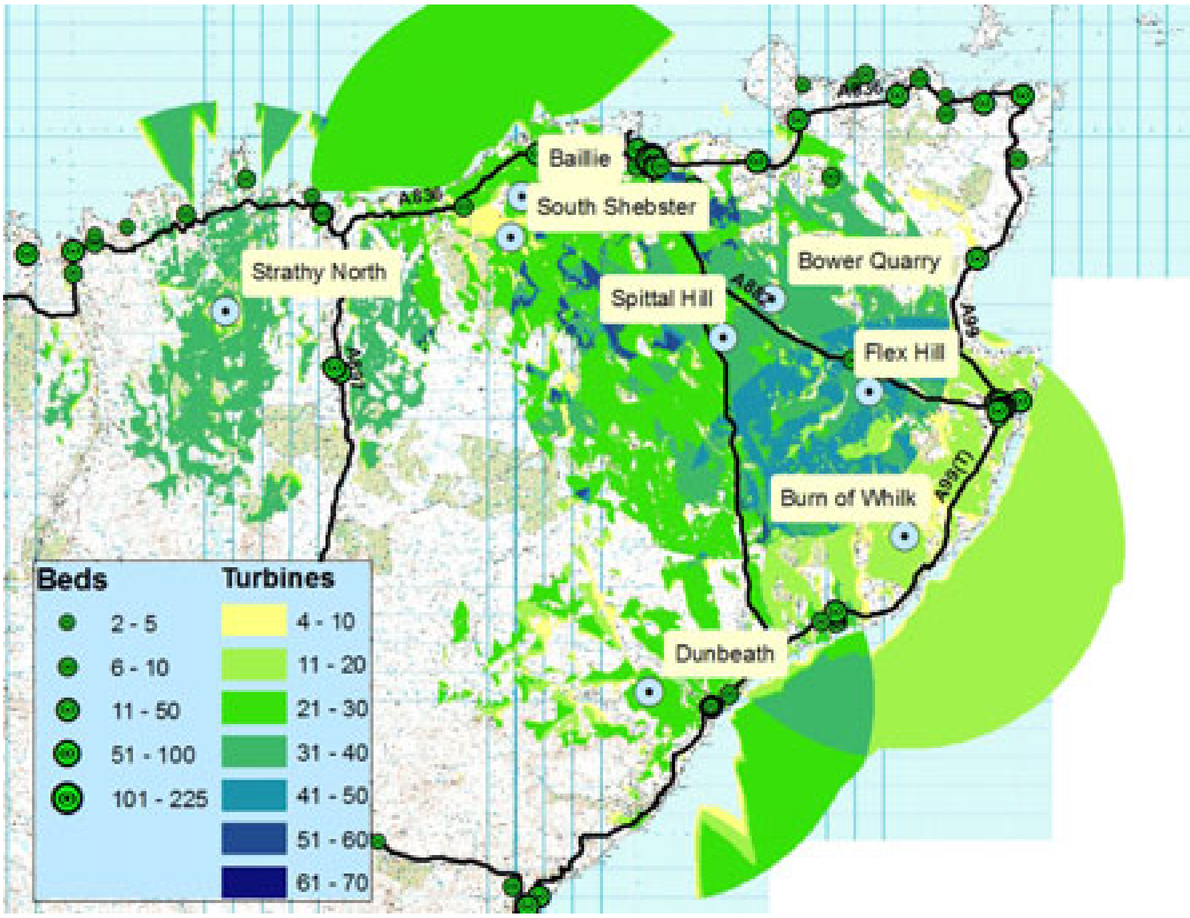
8.3 Wind farms in the landscape

Figure 8-3 Caithness and Sutherland: Approved Applications



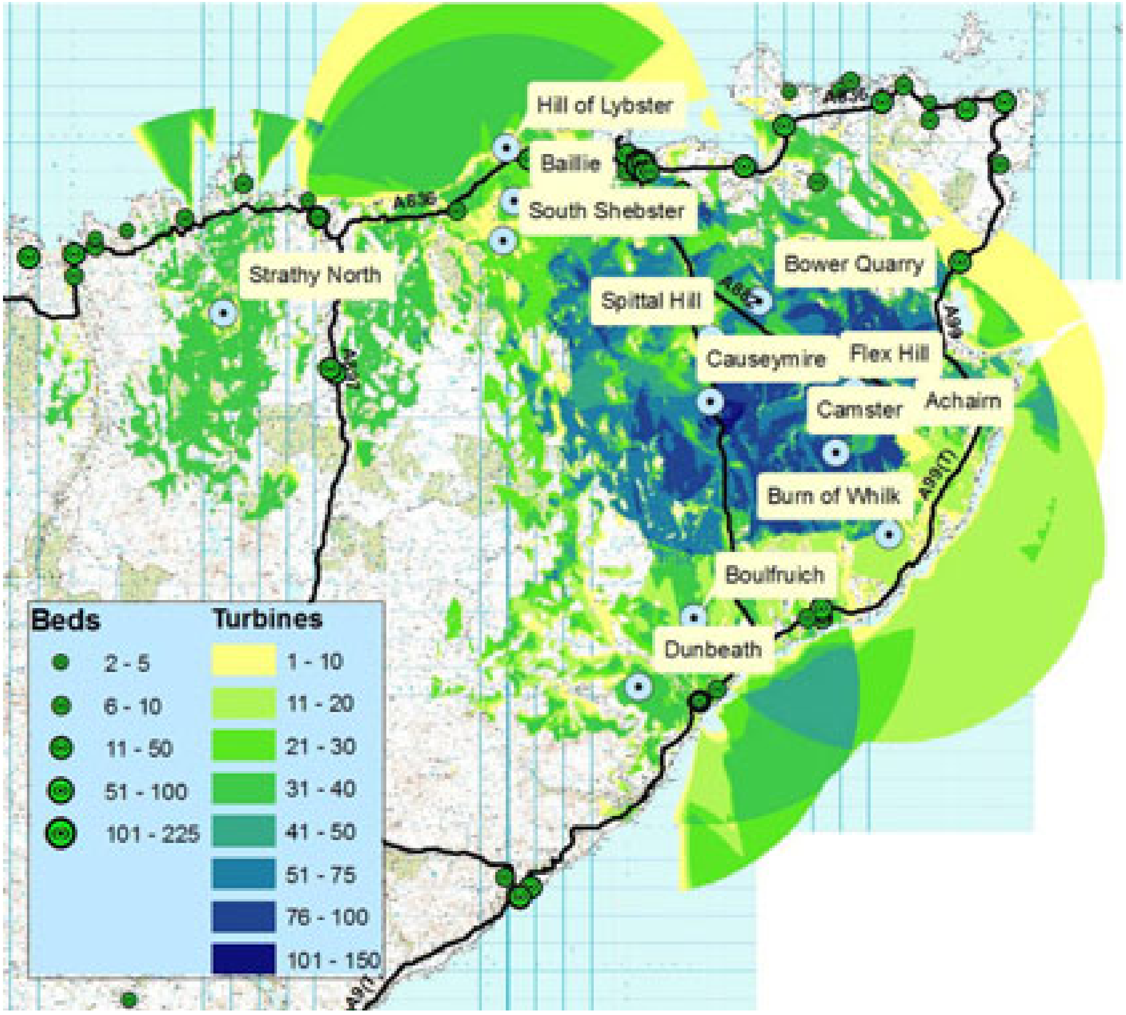
Base Map © Crown Copyright

Figure 8-4 Caithness & Sutherland: Pending Applications



Base Map © Crown Copyright

Figure 8-5 Caithness & Sutherland: All Applications



Base Map © Crown Copyright

8.4 Affected roads

Table 8-2 gives the lengths of road with medium (15km range, > 2km length) and high (2km or >10km length) exposure.

Table 8-2 Length of Road (km) Exposed to Wind farms

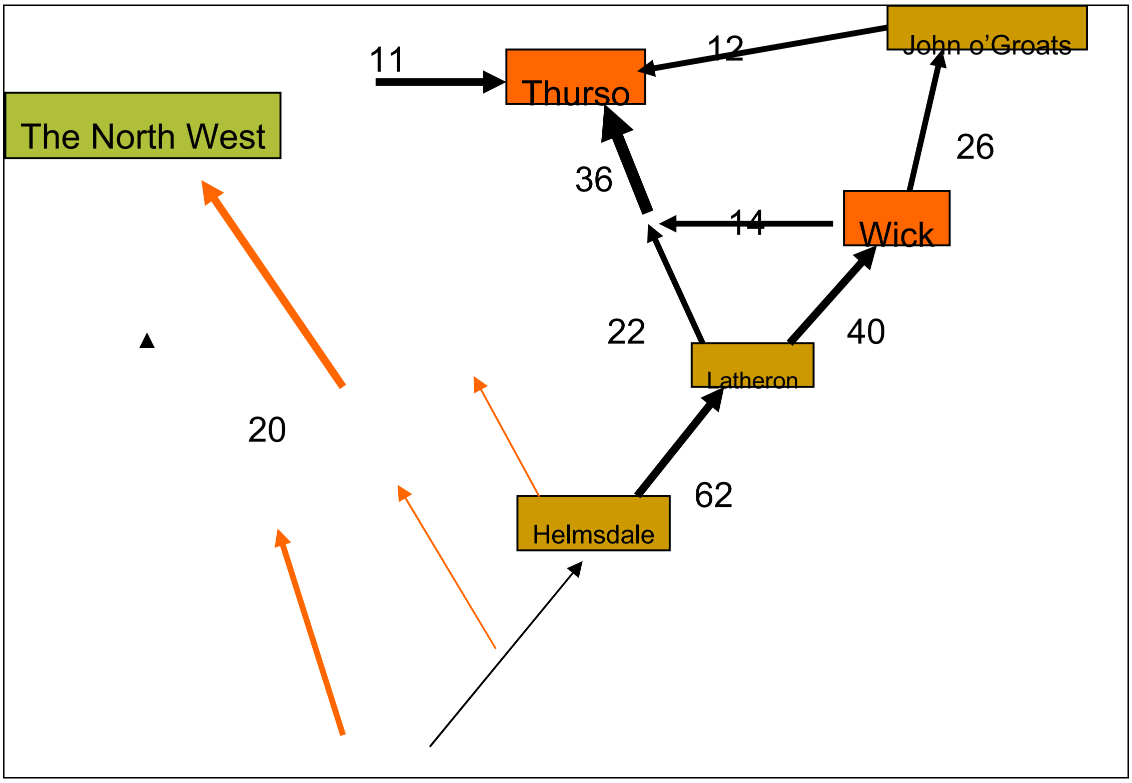
	Distance (Km)		
Road	All	Approved	Awaiting Decision
A836	28.09	4.22	23.87
A882	22.49	1.93	20.56
A9(T)	43.03	6.97	36.07
A99	11.48	5.44	6.04
A99(T)	23.39	3.56	19.82

These roads constitute the majority of the main road network in Caithness.

8.5 Tourist travel

The HIE estimate that in 2003 there were just over 1m bednights in Caithness and Sutherland. Using the business to holiday and bednight to trip ratios for the Highland Region as a whole it is estimated that there were around 165,000 holiday trips or some 75,000 tourist vehicles in Caithness and Sutherland. Many of these vehicles will be "picked up" by traffic counters at a number of spots e.g. most vehicles coming into Thurso from the west will have been counted either at Invershin or on the road to Ullapool. Figure 8-6 provides a schematic diagram of the major road flows

Figure 8-6 Major Tourist Flows in Caithness and Sutherland



Our estimate is that of tourists to Caithness fewer than 11,000 vehicles will not be exposed to wind farms, most will visit Thurso, Wick and/or John o'Groats. All the key routes will be subject to high exposure i.e. the high exposure impact will apply to some 81% of holiday tourists to Caithness and Sutherland at some time in their trip.

Finally holiday makers only constitute 75% of tourists as defined by VisitScotland. As a consequence it is estimated that only 60% of tourists will be affected.

8.6 Accommodation

Figure 8-3 shows that settlements and consequently accommodation tends to be located along the coast whilst the wind farms lie in the agricultural areas in central Caithness. The effect is that planning policy has meant relatively few units are affected. Table 8-3 shows the numbers of rooms, affected and the total. **We have then assumed that room location in the hotel and screening halves the total of rooms affected.**

Table 8-3 Accommodation Affected

	All	%	Approved	%	Awaiting Decision	%	*Total in Area*
Businesses	72	15.58%	28	6.06%	44	9.52%	***462***
Beds	643	9.83%	157	2.40%	486	7.43%	***6541***

On the basis that all pending applications will be granted this implies that 4.9% of rooms are likely to face a decline in price due to poorer scenic quality.

8.7 Economic impact

The internet study suggests a reduction of expenditure of 2.54% might be expected from tourists. Consequently, taking into account those unaffected because of location or activity we obtain an overall fall in the area of 1.54% as shown in Table 8-4.

Table 8-4 Percentage Change in Expenditure: Caithness and Sutherland

Exposure	Tourists in class	Impact on Expenditure	Effect on Expenditure
High/Some	61.0%	-2.54%	-1.54%
Minimal/None or Business	40.0%	0.0%	0.0%
Total	100.0%		-1.54%

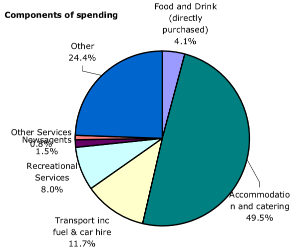
The fall of 1.54% is equivalent to a fall of £1.8m in the Caithness and Sutherland Enterprise area.

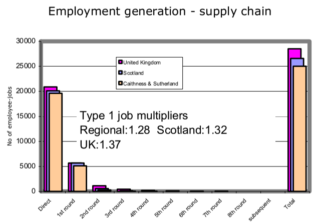
Figure 7-3 shows the DREAM® output associated with a fall of this size in the area.

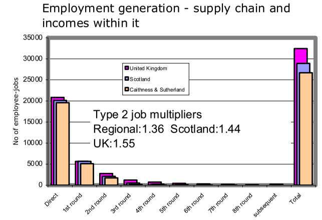
Figure 8-7 Caithness & Sutherland Windfarm Tourism Actual Spend

Region:	Caithness & Sutherland	Neighbouring regions:	Ross & Cromarty	Rest of Highlands and Islands

Windfarm Tourism Actual Spend







Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£51,038	1.54%	£786
Day visit	£15,790	1.54%	£243
Total	£66,828	1.54%	£1,029

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£42.5	£509.4	£120.1	£82.3	£15.6	£8.4	£250.8	£1,029.2
4.1%	49.5%	11.7%	8.0%	1.5%	0.8%	24.4%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Caithness & Sutherland producers	Falling on all Ross & Cromarty producers	Falling on all Rest of Highlands and Islands producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£786.0	£99.0	£25.4	£135.9	£650.1	£664.0	£1.4	£2.6	£31.0	£58.1	£757.1	£53.1	£83.1
76.4%	9.6%	2.5%	13.2%	63.2%	64.5%	0.1%	0.2%	3.0%	5.6%	73.6%	5.2%	8.1%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Caithness & Sutherland	£664	£234	£17	£915	1.377	20	25	1.277	24.3	£535	£21,364
Rest of Scotland	£35	£65	-£22	£78		1	1			£38	£30,007
Scotland	£699	£299	-£5	£992	1.420	20	26	1.306	25.5	£572	£21,776
Rest of UK	£58	£26	£87	£171		1	2			£81	£36,204
UK	£757	£325	£82	£1,164	1.537	21	29	1.365	27.7	£653	£22,905

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Caithness & Sutherland	£664	£462	£150	£1,276	1.921	20	27	1.363	25.9	£578	£21,650
Rest of Scotland	£35	£109	£17	£160		1	2			£56	£29,390
Scotland	£699	£570	£167	£1,436	2.054	20	29	1.422	27.8	£634	£22,165
Rest of UK	£58	£44	£313	£415		1	4			£143	£37,363
UK	£757	£614	£480	£1,851	2.444	21	32	1.554	31.5	£777	£23,956

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Because of the limited size of the economy of the area 84% of that expenditure departs immediately. The indirect and induced more than doubles the remainder to give a total output effect of £1,276,000 which equates to some 27 jobs and a decrease in GVA of £578,000.

The impact of the drop in accommodation is extremely small. The internet study suggests that, at worst, we might expect a fall of 18% in value and consequently prices and expenditure. Given only 4.9% (50% of the 9.8% affected) of the rooms face that loss we would expect a fall in expenditure on accommodation in the region of £114,000. The result of this extremely small fall is given in Figure 8-8.

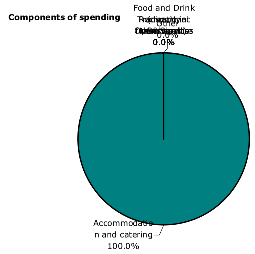
Our analysis suggests that 3 full time equivalent jobs would be lost with a drop in income of the order of £87,000.

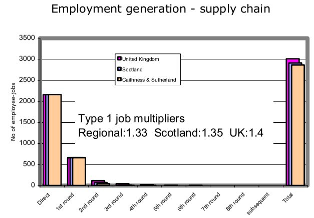
Figure 8-8 Caithness & Sutherland Windfarm Tourism Accommodation

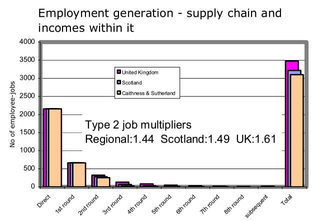
Region: Caithness & Sutherland

Neighbouring regions:	Ross & Cromarty	Rest of Highlands and Islands

Windfarm Tourism
Actual Spend







Estimated spending - accommodation room only

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£23,733	0.48%	£114
Day visit	£0	0.00%	£0
Total	£23,733	0.48%	£114

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£0.0	£113.9	£0.0	£0.0	£0.0	£0.0	£0.0	£113.9
0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Caithness & Sutherland producers	Falling on all Ross & Cromarty producers	Falling on all Rest of Highlands and Islands producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£113.9	£0.0	£0.0	£14.5	£99.4	£99.4	£0.0	£0.0	£0.0	£0.0	£99.4	£0.0	£0.0
100.0%	0.0%	0.0%	12.7%	87.3%	87.3%	0.0%	0.0%	0.0%	0.0%	87.3%	0.0%	0.0%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Caithness & Sutherland	£99	£33	£2	£134	1.352	2	3	1.328	25.2	£81	£28,106
Rest of Scotland	£0	£0	£3	£3		0	0			£1	£28,727
Scotland	£99	£33	£5	£137	1.380	2	3	1.350	25.6	£82	£28,116
Rest of UK	£0	£0	£8	£8		0	0			£4	£36,638
UK	£99	£33	£13	£145	1.459	2	3	1.397	26.5	£86	£28,406

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Caithness & Sutherland	£99	£65	£21	£185	1.864	2	3	1.438	27.2	£87	£27,935
Rest of Scotland	£0	£0	£10	£10		0	0			£3	£28,446
Scotland	£99	£65	£31	£195	1.965	2	3	1.490	28.2	£90	£27,953
Rest of UK	£0	£0	£30	£30		0	0			£10	£38,042
UK	£99	£65	£61	£225	2.267	2	3	1.612	30.5	£100	£28,713

8.8 Conclusion

There is very extensive development planned in Caithness and Sutherland in areas where there is little natural protection and which most tourists will see. We estimate only 15% of tourists to Caithness and Sutherland will not see a wind farm at some stage.

However the number of tourists is small and consequently in absolute terms the loss of employment and income is small, certainly less than the full time jobs in the wind farm industry. We believe it will not exceed 30 jobs in total, probably less, considerably fewer than might be expected from the emerging renewables industry.

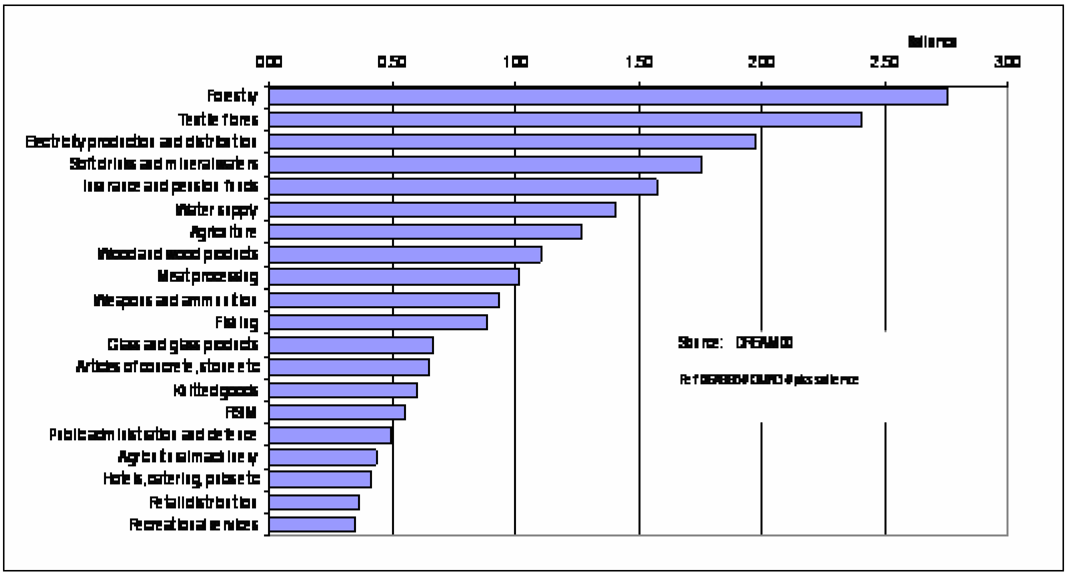
9 Stirling, Perth and Kinross

9.1 The Importance of Tourism in the Local Economy

Located in the centre of Scotland, Perth, Kinross and Stirling service, and are serviced by, all regions of Scotland. In Perth and Kinross 21 per cent of household income is brought home by out-of-district commuters and in Stirling 35 per cent, high figures for places that do not abut major cities. The excellent rail connections are one reason.

The GVA generated annually within the two regions totals £3.2 bn, of which £153 mn, or 4.8 per cent, comes from hospitality industries. **Direct tourism GVA is thus about 6.5 per cent, or £200 mn.** Estimated tourism revenues are £380 mn in Perth and Kinross and £280 mn in Stirling. Tourist-attracting and serving industries are about 40 per cent bigger in Perth, Kinross and Stirling, than in a typical UK subregional economy, and so qualify for the top twenty 'most distinctive' industries. Only Argyll, Highland and Dumfries and Galloway have more tourism bedspaces per head of population.

Figure 9-1 The Top Twenty Distinctive Industries in Perth, Kinross and Stirling



As regards other distinctive industries, the area is one of the forest product centres of the UK, not only growing the trees but adding value to them by making wood products. Forest recreation is a major attraction to both overnight tourists and day visitors. Meat processing and farm machinery are other major land-based industries, and the mineral industry (and originally glass) exploit land resources. The region has a number of distinctive water-based industries, from Highland Spring to drinking water supply, aquaculture (and its research and regulation) and hydroelectricity generation. Recreational fishing is a water-based tourism activity.

The area is particularly important scenically; six of the forty National Scenic Areas lie wholly or in part in the region as shown in Table 9-1

Table 9-1 National Scenic Areas in Stirling, Perth and Kinross

National Scenic Area	Local Authority(ies)	Area (Ha)
Ben Nevis and Glen Coe	Highland, Argyll and Bute, Perth and Kinross	101,600
Loch Lomond	Argyll and Bute, Stirling, West Dunbartonshire	27,400
Loch Rannoch and Glen Lyon	Perth and Kinross, Stirling	48,400
Loch Tummel	Perth and Kinross	9,200
River Earn (Comrie to St. Fillans)	Perth and Kinross	3,000
River Tay (Dunkeld)	Perth and Kinross	5,600

In the west of the area the Loch Lomond NSA is incorporated in the Loch Lomond and the Trossachs national park which attracts both substantial numbers of day visitors from the central belt but also large numbers of overnight "tourists". As might be expected in addition to Perth and Stirling, the area hosts a number of villages and small towns that attract the tourist: including Callendar, Aberfoyle, Dunkeld, Pitlochry, Aberfeldy Kenmore and Killin. Any significant reduction in tourism will affect these settlements substantially. Unlike Sutherland, however, there are alternatives and one would expect substitute employment to occur. The economy of the area cannot be described as fragile.

9.2 Wind farms : approved and applications

Table 9-2 gives details on the wind farms that have been approved and are constructed or in the process of being constructed. Although Griffin is by far the largest of them as will be seen from the next section it would be less visible and be seen by far fewer tourists than the Braes of Doune.

Table 9-2 Wind Farms in Stirling, Perth & Kinross

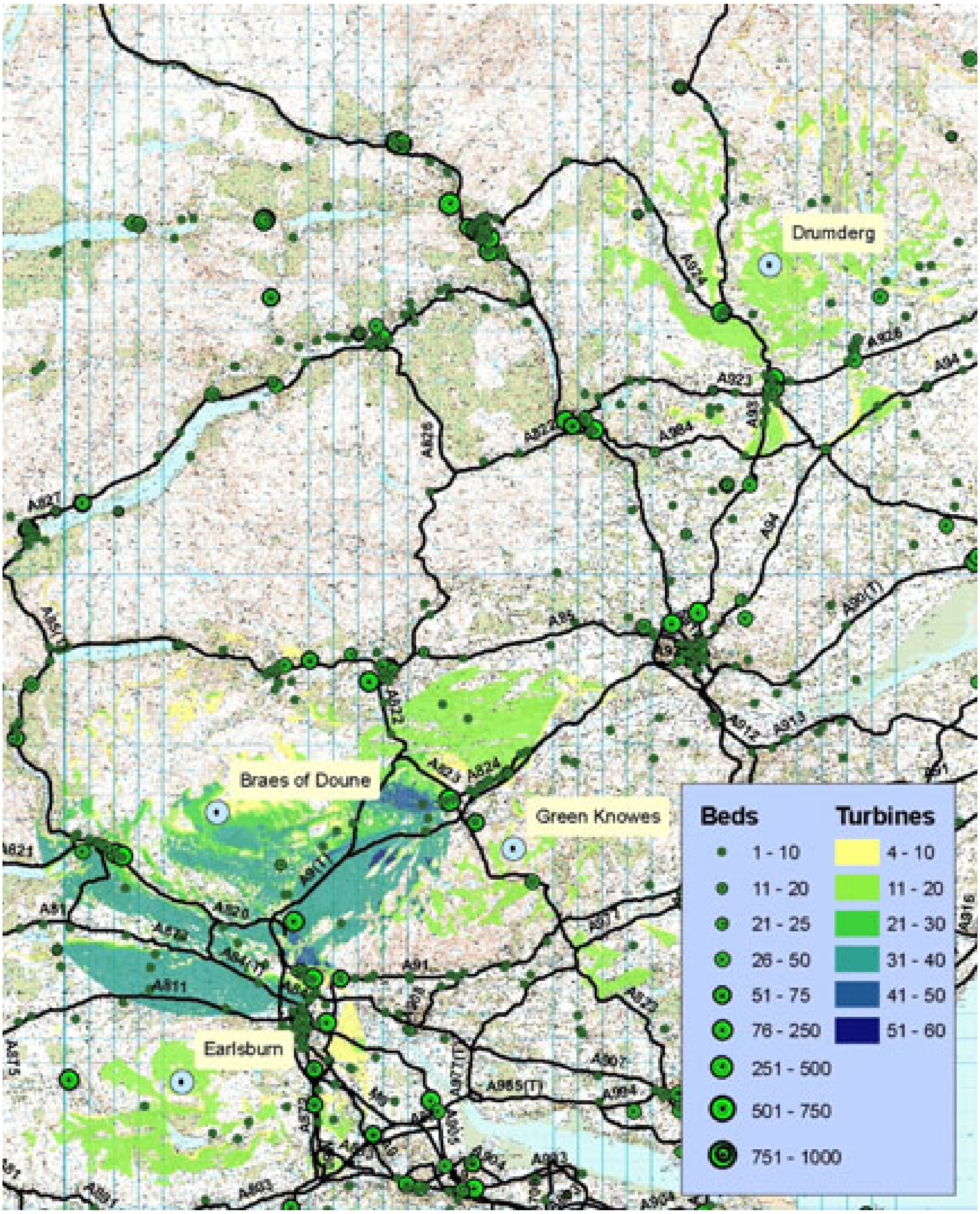
SITE_NAME	TURBINES	HEIGHT	STATUS
Drumderg	16	107	Approved
Green Knowes	18	76	Approved
Braes of Doune	36	100	Approved
Earlsburn	15	110	Approved
Craigengelt	7	125	Application
Mellock Hill	13	102	Application
Griffin Wind farm	68	124	Application

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

9.3 Wind farms in the landscape

Figure 9-2, Figure 9-3 and Figure 9-4 illustrate the exposure of each area to approved, applied for and both wind turbines Also on the map are the key roads and the VisitScotland registered accommodation. Together this allows the assessment of the percentage of tourists that can currently see four or more turbines within 15km and the number that will be able to seen should all applications succeed and there are no further developments . It should be emphasised that neither is likely.

Figure 9-2 Stirling, Perth and Kinross - Applications Approved



Base Map © Crown Copyright

Figure 9-3 Stirling, Perth and Kinross - Applications Pending

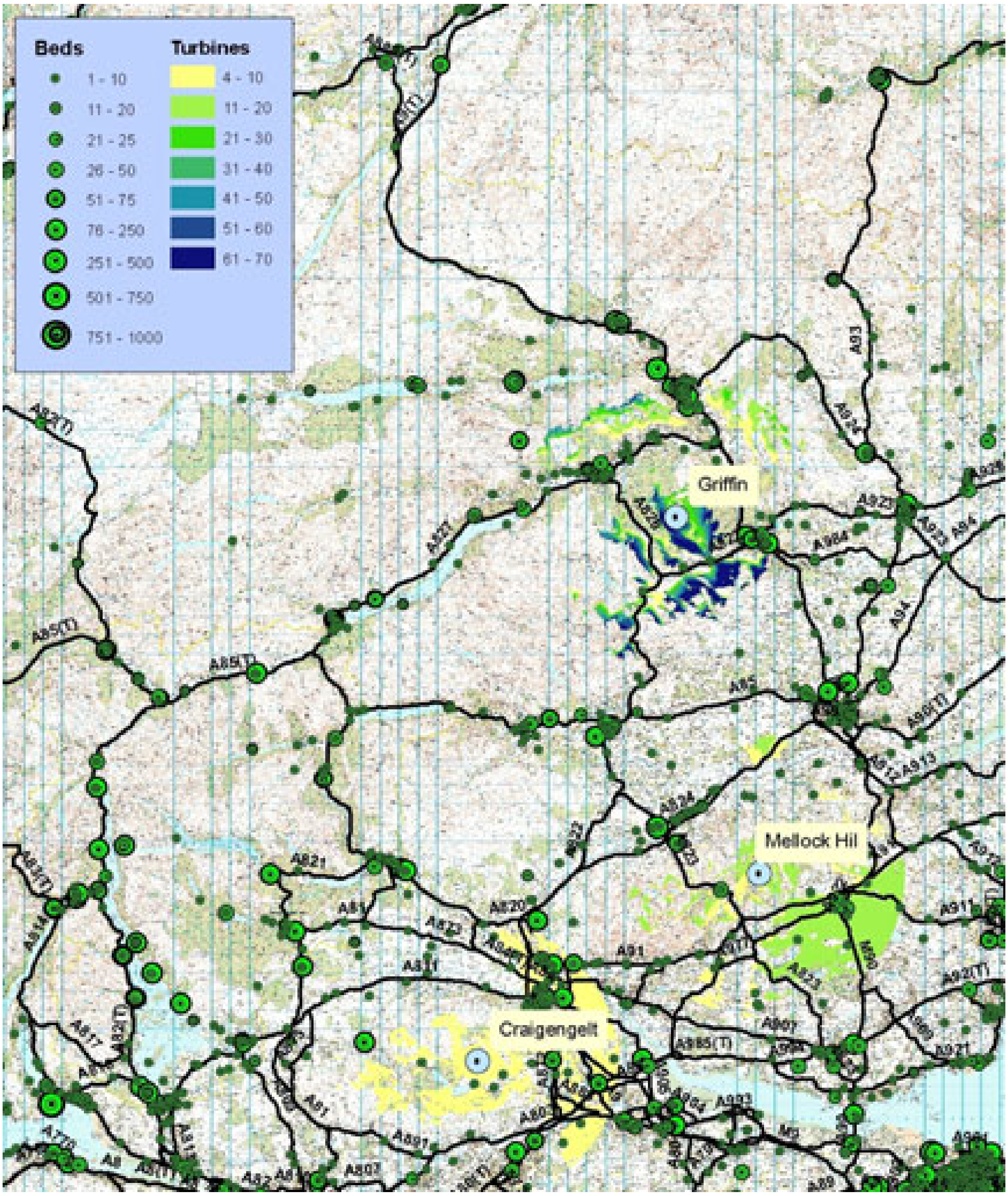


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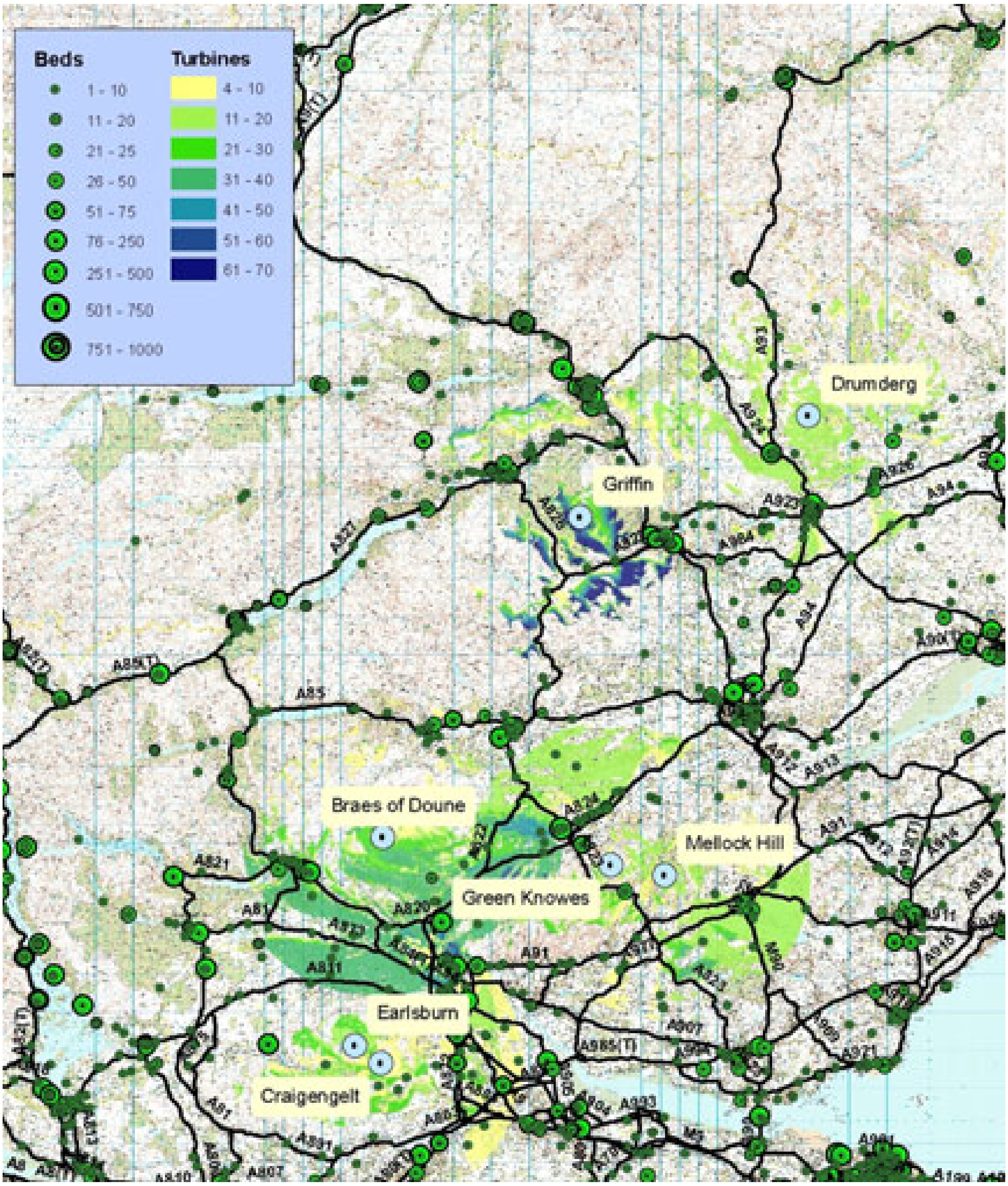
Figure 9-4 Stirling, Perth and Kinross – Accepted and Applications



Base Map © Crown Copyright

9.4 Affected roads

Table 9-3 gives details of the roads exposed and the extent of that exposure

Table 9-3 Length of Road (km) Exposed to Wind farms in S,P&K

	Distance (Km)		
Road	**All**	**Approved**	**Awaiting Decision**
A73	0.35	0	0.35
A803	2.75	0	2.75
A81	6.05	6.05	0
A811	11.45	9.9	1.55
A820	6.13	6.13	0
A821	3.55	3.55	0
A822	14.52	11.72	2.8
A823	10.14	9.1	1.04
A824	6.16	6.16	0
A826	0.02	0	0.02
A84	1.67	1.46	0.21
A84(T)	13.79	13.79	0
A872	5.18	2	3.19
A873	4.27	4.27	0
A88	2.21	0	2.21
A883	5.41	1.09	4.32
A9	8.38	3.19	5.19
A9(T)	29.39	25.35	4.04
A905	7.01	3.07	3.95
A907	4.07	0.44	3.63
A91	14.76	2.68	12.08
A911	5.78	0	5.78

A922	2.57	0	2.57
A923	0.69	0.69	0
A926	0.21	0.21	0
A93	7.08	7.08	0
A94	7.09	7.09	0
A977	10.04	1.78	8.26
A984	1.24	1.24	0
M80	3.5	1.47	2.03
M876	4.36	1.54	2.82
M9	11.54	3.91	7.63
M90	12.9	0	12.9
Total	**224.26**	**134.96**	**89.32**

9.5 Tourist traffic flows

The case study area covers virtually the whole of Scotland north of the central belt and, with the exception of traffic using the A83 to Inverary (for Campbeltown or Oban) all relevant tourist traffic. This traffic consists of primarily three groups:

- Day trippers from the central belt particularly to Loch Lomond and the Trossachs National Park (east side of the Loch), Stirling and its Castle and the Campsies and Ochil Hills.
- Tourists staying for one night or longer in the tourist orientated villages such as Pitlochry, Criff, Callendar, Aberfoyle, Aberfeldy, Killin and Tyndrum
- Tourists passing through to the North and West Highlands and the Cairngorms

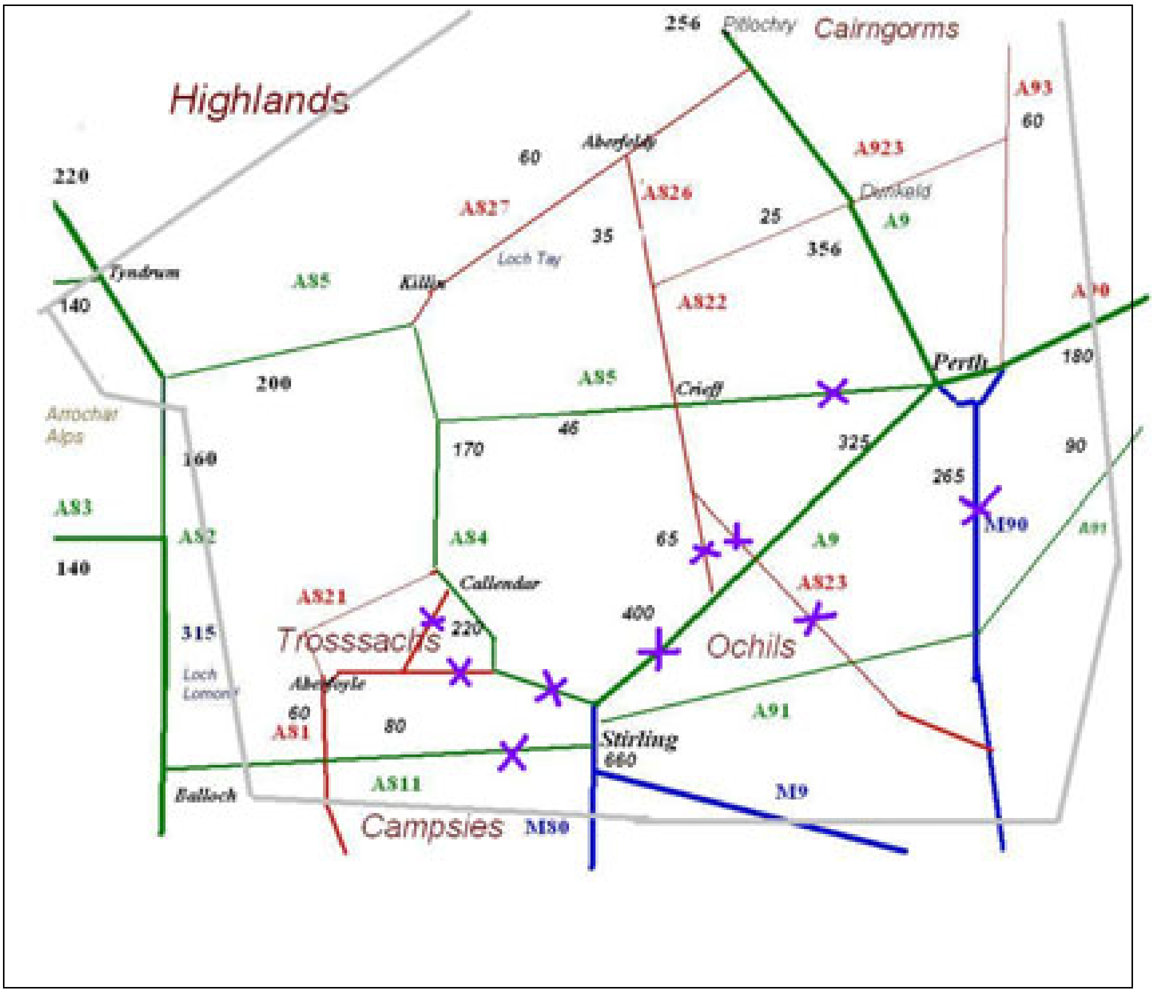
The picture is particularly confused by tourists travelling east to west (and v.v.) either on long day trips or staying overnight whether in or close to the area.

Whilst the numbers on the major routes at specific points is relatively easy to obtain the total number of vehicles and the consequent percentage of vehicles exposed to wind farms is far more difficult to determine. It is not possible to clearly determine if a vehicle travelling along a stretch of road has or has not been exposed before in the area.

Figure 9-5 provides a schematic diagram of these flows. Again whilst we warn that these figures are best estimates and have a wide error margin, the importance of the

A82 as a tourist route is clear, carrying almost as many into the Highlands as the recognised key route, the A9. Equally it is clear that some of the routes in areas subject to extremely vigorous opposition carry relatively low volumes of tourists.

Figure 9-5 Schematic Map of Tourist Flows in Stirling, Perth and Kinross Area



There are a number of wind farms in the area, the most prominent being the Braes of Doune which looks over the A9 and out, in the distance to Stirling. As discussed in section 5.3 the only routes that do not have exposure are the A82 and A81/821 and consideration of the flows gives Table 9-4

Table 9-4 Tourists exposed to wind farms in Stirling, Perth and Kinross

	En Route		Stayers		Total	
Exposed	776	*82*	312	*92*	1088	*85*
Unexposed	170	*18*	27	*8*	197	*15*
Total	946	*100*	339	*100*	1285	*100*

Our estimate is that 85% of holidaymakers will be exposed to wind farms in the area. For Perthshire, Business Tourism constitutes 40% of tourism activity i.e. any impact will fall on 52% (85% of 60%) of the tourism market as a whole.

9.6 Accommodation

Table 9-5 shows the number and percentage of premises and bedrooms that lie within the Zone of Visual Impact, which it will be remembered in this case requires sight of 4 wind turbines within 15km. Again we assume that 50% of the rooms are affected in any business, which suggests an overall decline in price on 6.6% of the accommodation.

Table 9-5 Accommodation Exposed to Wind Turbine

	All	**%**	**Approved**	**%**	**Awaiting Decision**	**%**	***Total in Area***
Businesses	104	12.97%	65	8.10%	39	4.86%	***802***
Beds	1515	13.20%	933	8.13%	582	5.07%	***11478***

Given the size of the tourist economy, however, a significant price decline in 5% of hotels will have measurable impacts.

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9.7 Economic impact analysis

Figs 9.6 and 9.7 provide the DREAM output for the change in expenditure due to decreased numbers going to the area and due to the reduction in the prices that can be charged by hotels in the region.

Examining first the general contraction, it is estimated that the resulting fall in expenditure of £8.54m will lead to a reduction of £5.6m. This, in turn, will reduce demand by £1.8m from local industry and £2.5m in wages. The final outcome is a decrease in income in the area of £5.2m and 279 jobs.

The effect of reduced prices in hotels is put at some £1.32m, a not insignificant sum. Tracing the impact through the system we find

1. VAT reducing the direct effect to £1,150,000
2. Because of the high wage content this has a relatively high type 2 multiplier of 2.066
3. Because the wages are low the employment multiplier is relatively low
4. An overall drop in income (GVA) of £1.08 and some 60 jobs in the area.

Figure 9-6 Impact Analysis General Tourism Spend, Stirling, Perth and Kinross

Region: PKS

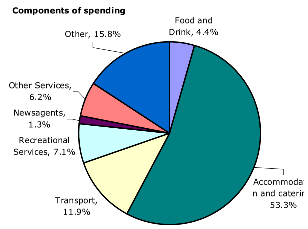
Windfarm Tourism

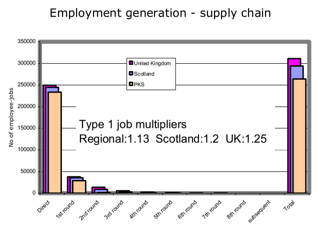
Change in Spend

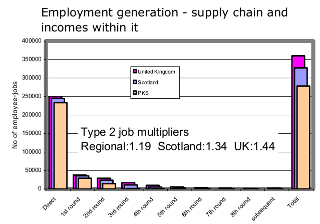
Neighbouring regions:	Glasgow	Argyll & Bute

Survey results

Total spend
£8,540







Components of spending

Food and Drink	Accommodation and catering	Transport	Recreational Services	Newsagents	Other Services	Other	Total
£373	£4,552	1019	£608	£111	£525	£1,351	£8,540
4.4%	53.3%	11.9%	7.1%	1.3%	6.2%	15.8%	100.0%

Total effective spend	Retail margins	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all PKS producers	Falling on all Glasgow producers	Falling on all Argyll & Bute producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£8,540	£687	£180	£1,126	£7,414	£5,584	£149	£4	£654	£375	£6,767	£271	£376
100.0%	8.0%	2.1%	13.2%	86.8%	65.4%	1.7%	0.1%	7.7%	4.4%	79.2%	3.2%	4.4%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round Suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
PKS	£5,584	£1,794	£100	£7,478	1.339	233	264	1.131	30924.8	£4,761	£18,026
Rest of Scotland	£808	£438	£679	£1,925		11	30			£968	£32,349
Scotland	£6,392	£2,232	£779	£9,403	1.471	245	294	1.201	34427.9	£5,728	£19,484
Rest of UK	£375	£212	£810	£1,397		5	17			£648	£37,892
UK	£6,767	£2,444	£1,589	£10,800	1.596	250	311	1.247	36429.5	£6,376	£20,495

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round Suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
PKS	£5,584	£4,275	£1,462	£11,321	2.027	233	279	1.194	32639.9	£5,217	£18,714
Rest of Scotland	£808	£689	£2,496	£3,992		11	48			£1,449	£29,973
Scotland	£6,392	£4,964	£3,958	£15,314	2.396	245	327	1.336	38300.4	£6,665	£20,378
Rest of UK	£375	£323	£3,075	£3,774		5	33			£1,298	£39,024
UK	£6,767	£5,286	£7,033	£19,087	2.821	250	360	1.444	42194.8	£7,963	£22,099

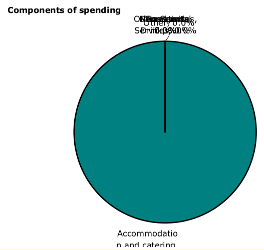
Figure 9-7 Impact Analysis Accommodation Spend, Stirling, Perth and Kinross

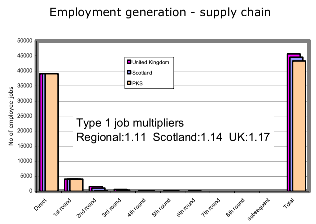
Region: PKS

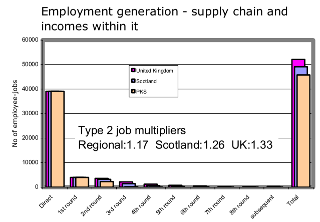
Neighbouring regions:	Glasgow	Argyll & Bute

Windfarm Accommodation
Change in Spend

Survey results	
Total spend	£1,320







Components of spending

Food and Drink	Accommodation and catering	Transport	Recreational Services	Newsagents	Other Services	Other	Total
£0	£1,320	£0	£0	£0	£0	£0	£1,320
0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Total effective spend	Retail margins	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all PKS producers	Falling on all Glasgow producers	Falling on all Argyll & Bute producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£1,320	£0	£0	£447	£873	£873	£0	£0	£0	£0	£873	£0	£0
100.0%	0.0%	0.0%	33.9%	66.1%	66.1%	0.0%	0.0%	0.0%	0.0%	66.1%	0.0%	0.0%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
PKS	£1,152	£371	£20	£1,543	1.339	52	57	1.109	43344.0	£981	£17,153
Rest of Scotland	£0	£0	£101	£101		0	2			£50	£29,446
Scotland	£1,152	£371	£121	£1,644	1.427	52	59	1.142	44633.4	£1,032	£17,509
Rest of UK	£0	£0	£117	£117		0	1			£55	£37,774
UK	£1,152	£371	£238	£1,761	1.529	52	60	1.170	45727.3	£1,086	£17,993

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round suppliers	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
PKS	£1,152	£915	£313	£2,380	2.066	52	60	1.170	45752.6	£1,080	£17,889
Rest of Scotland	£0	£0	£382	£382		0	4			£127	£28,452
Scotland	£1,152	£915	£695	£2,762	2.397	52	65	1.257	49126.8	£1,207	£18,615
Rest of UK	£0	£0	£470	£470		0	4			£158	£39,441
UK	£1,152	£915	£1,165	£3,232	2.805	52	69	1.334	52165.0	£1,365	£19,828

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10 The Scottish Borders

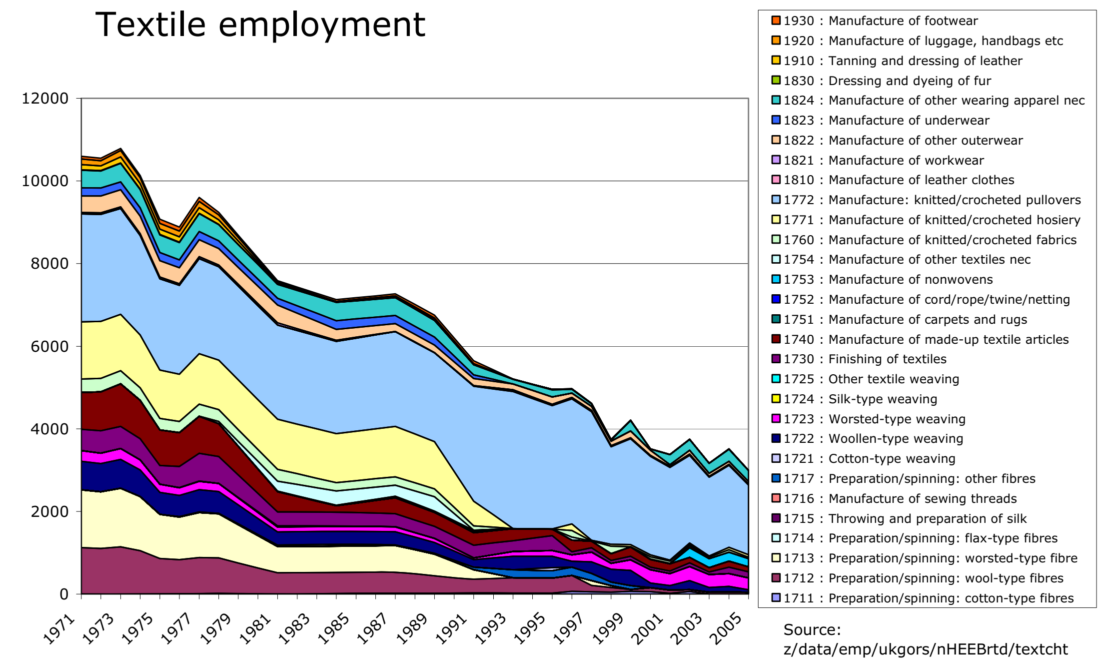
10.1 The economic importance of tourism in the local economy

Coldstream

A glance at the Borders statistics suggests an area with a healthy economy. The level of unemployment amongst local residents is little more than half of the Scottish average, at around 1.2 per cent, and the area's population has grown by 3 per cent in the past five years. The region looks attractive, with many well kept market towns and rolling countryside.

However, the outward prosperity masks subtle differences. The indigenous and more southerly economy has long been one of the lowest-income areas of Scotland. Much of the growth, both economically and in employment terms has been in the north of the region, those areas most convenient for routes north to Edinburgh, around Tweeddale and the Central Borders. Areas like Peebles are now very firmly part of the Edinburgh commuter belt and money earned by commuters makes up about 18 per cent of the overall earned income of Borderers.

The region's traditions are in manufacturing, and more than one in seven jobs are still in that sector. The Borders is famous throughout the world for the manufacture of cashmere and other textiles. However, this is a traditional sector which has gone through some very difficult times in recent years and has seen dramatic reductions in the numbers employed. The Borders also suffered the contraction in the textiles industry, with a number of high profile factory closures during the 1990s. However, manufacturing still very much lives on in the Borders, with firms producing a range of products, ranging from pharmaceuticals to smoked salmon to coat hangers.



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Tourism is an important and growing element of the regional economy, both for its attractions as a destination and for the passing trade heading north and south on the A1, A68 and A7. In 2006 there were an estimated 1.1 million overnight stays by UK visitors and 350 000 by overseas visitors. There were also a large number of day trips, due to the proximity of Edinburgh and some particular attractions, including the 7stanes mountain biking facilities in Glentress Forest Park, a selection of gardens, stately homes and Abbeys as well as sporting events such as the Rugby Sevens.

The health of the local economy and the proximity of Edinburgh suggest that any small decline in the tourism sector could be absorbed with relative ease.

10.2 Wind farms : current and applications

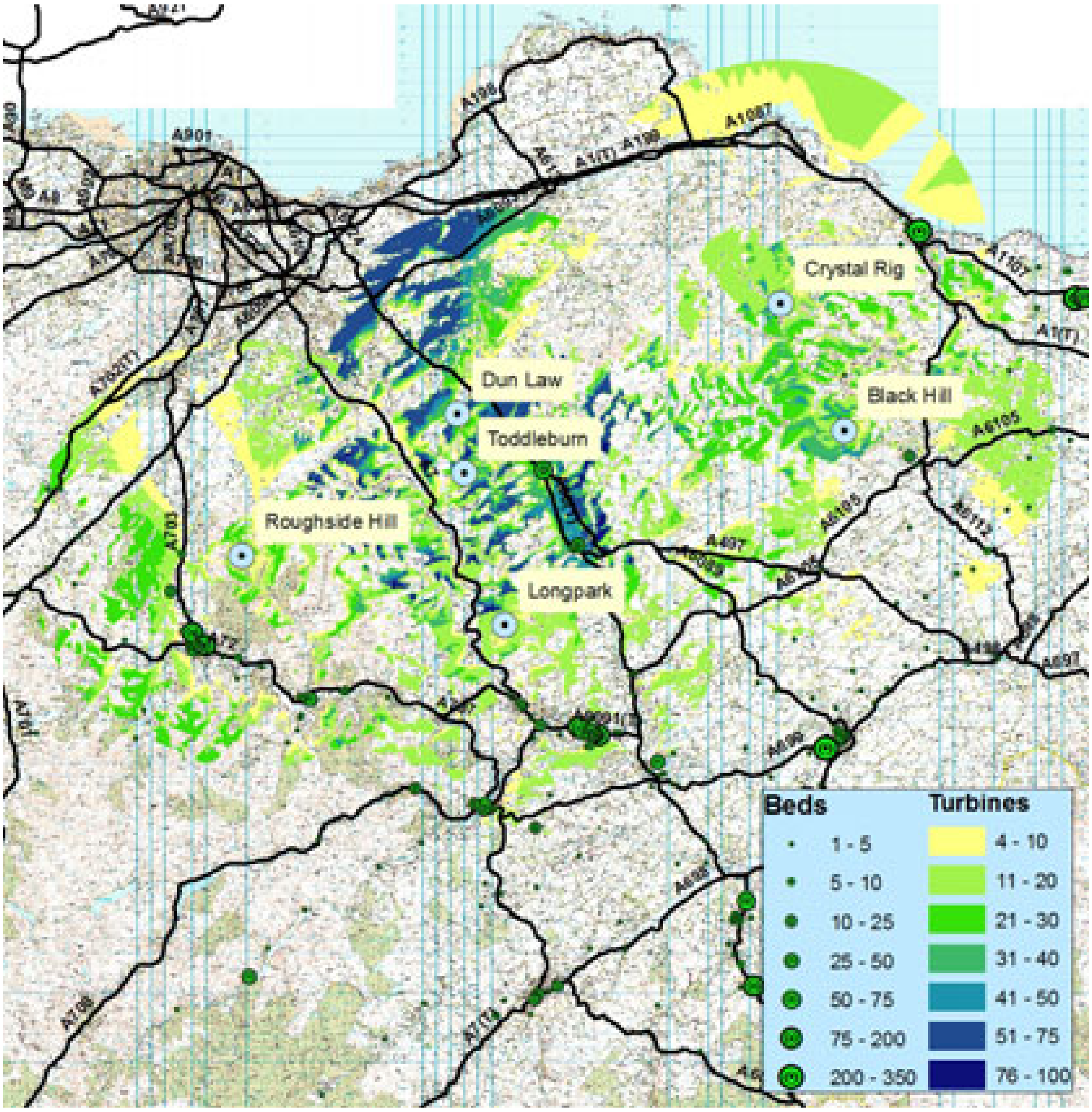
SITE_NAME	Turbines	Height	Status
Dun Law	26	64	Approved
Black Hill	22	78	Approved
Minch Moor	14	100	Application
Dun Law Extension	35	64	Approved
Toddleburn	12	105	Approved
Broadmeadows	13	112	Application
Roughside Hill	23	75	Approved
Crystal Rig	20	100	Approved
Dunion Hill	8	100	Application
Drone Hill	22	76	Application
Longpark	19	110	Approved
Carcant Windfarm	3	107	Application
Fallago Ridge	57	108	Application

Table 10-1 Wind farms in The Borders: Current and Applications

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

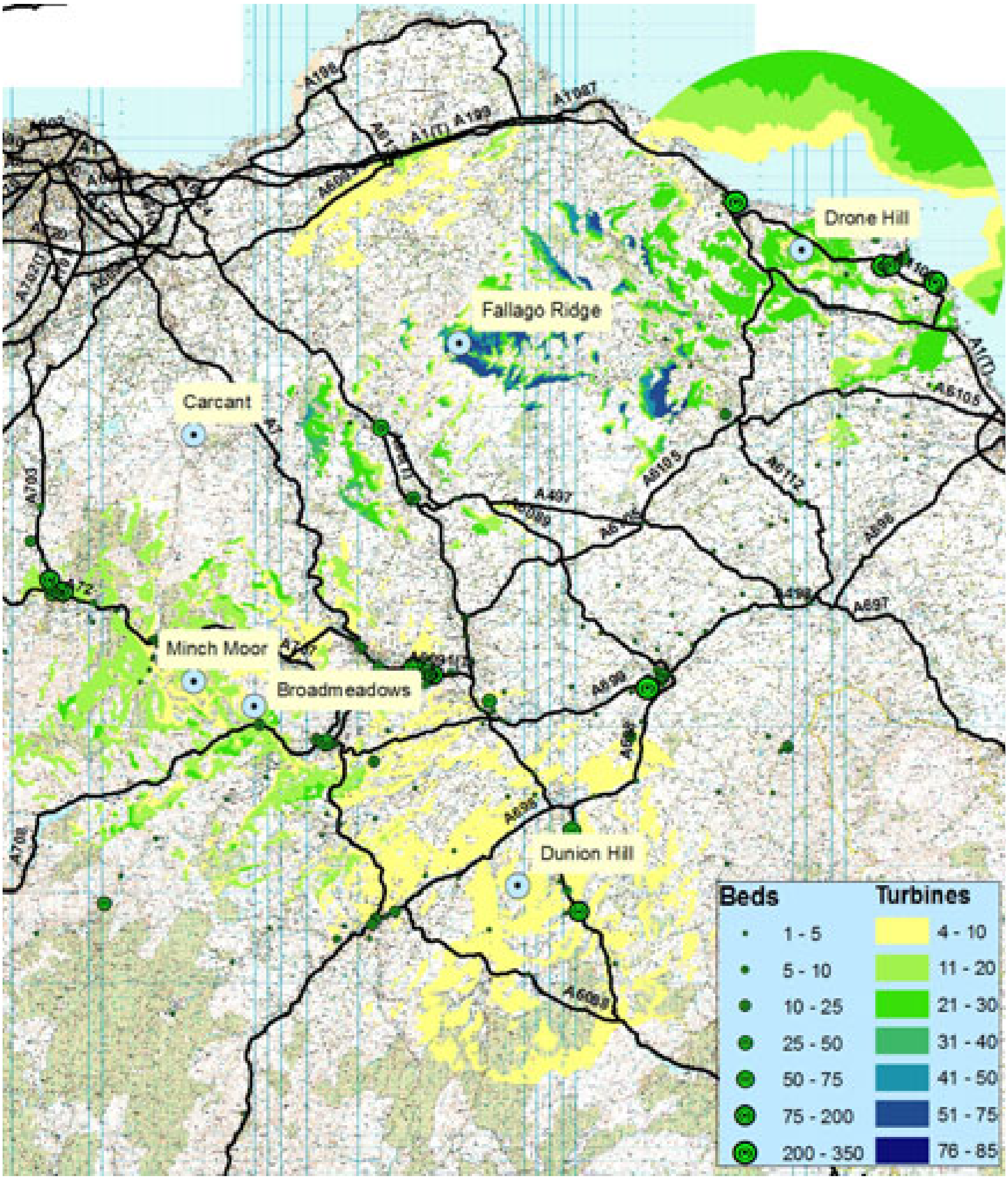
10.3 Wind farms in the landscape

Figure 10-1 *The Scottish Borders: Current and Approved*



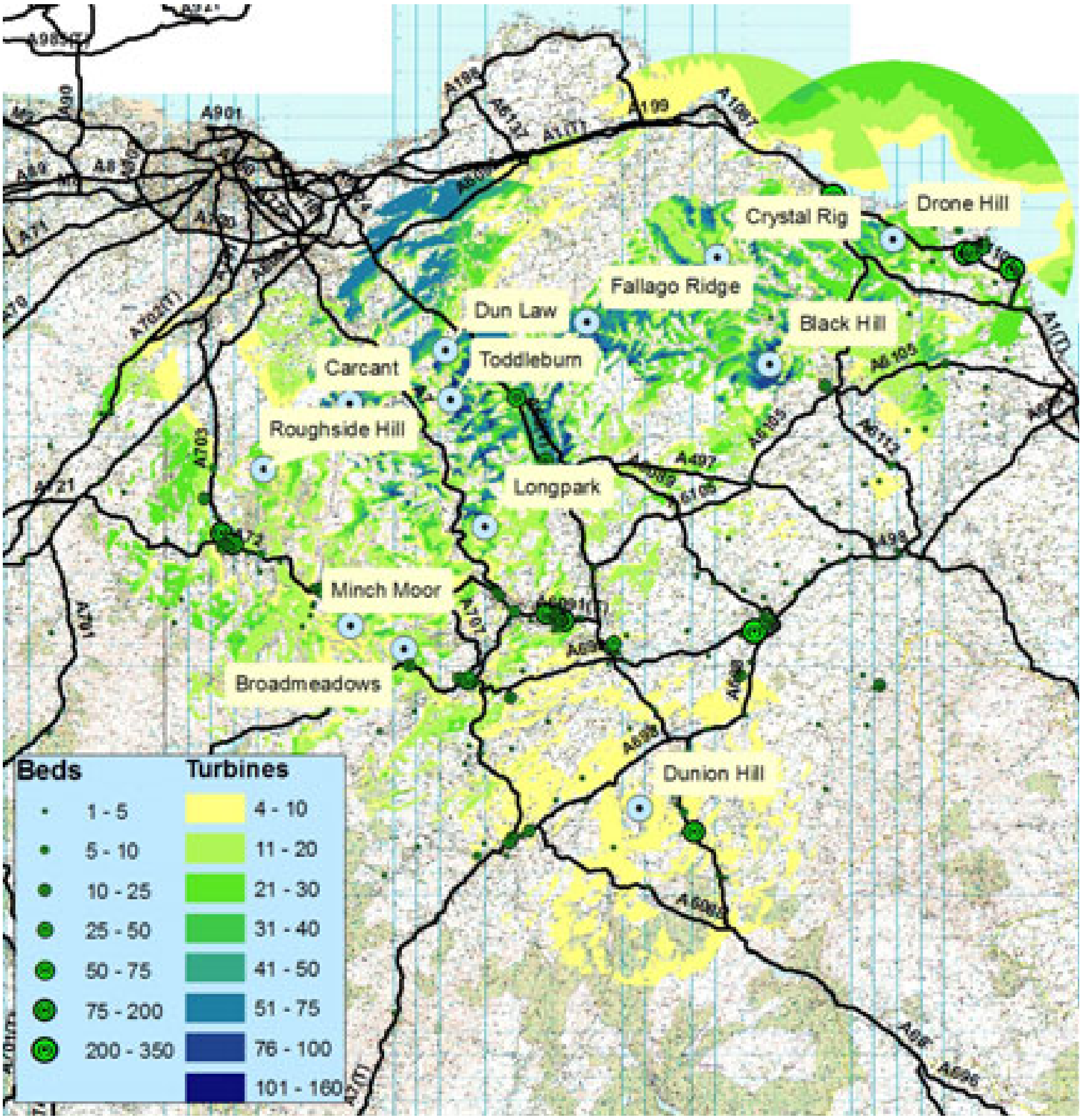
Base Map © Crown Copyright

Figure 10-2 The Scottish Borders: Applications



Base Map © Crown Copyright

Figure 10-3 ***The Scottish Borders: Approved and Applications***



Base Map © Crown Copyright

10.4 Affected roads

	Distance (Km)		
Road	All Applications	Approved	Awaiting Decision
A1(T)	13.59	1.45	12.15
A1087	0.18	0.18	0.00
A1107	7.50	0.37	7.12
A198	3.61	3.61	0.00
A199	7.60	1.10	6.50
A497	17.31	16.73	0.57
A6088	5.83	0.00	5.83
A6089	2.82	2.27	0.55
A6093	14.03	10.30	3.73
A6094	1.37	1.37	0.00
A6105	9.19	9.19	0.00
A6112	6.45	4.91	1.55
A6124	0.56	0.56	0.00
A6137	0.44	0.00	0.44
A68	0.60	0.00	0.60
A68(T)	31.32	24.32	7.00
A698	7.18	0.00	7.18
A699	4.74	1.48	3.26
A7	9.92	7.11	2.80

A7(T)	8.15	1.28	6.87
A701	1.41	1.41	0.00
A702(T)	11.49	11.49	0.00
A703	0.54	0.00	0.54
A708	8.03	0.00	8.03
A72	14.03	2.06	11.97
A766	2.10	2.10	0.00

Table 10-2 Length of Named Roads Exposed to Wind farms

Table 10-2show the km exposed on each named road. In practice there will be few routes that will not be exposed to wind farms in The Scottish Borders if all applications proceed.

10.5 Tourist traffic flows

Tourist traffic in the Borders is of four types. Firstly there are those who are holidaying in the area, either or a relaxing week or, more likely, a short break. This is the group most at risk from any negative impacts. The second group are day trippers predominantly from Edinburgh and the Lothians. The third group are those en route to the towns and cities of the central belt, particularly Edinburgh and the highland areas to the North and West. Finally there are those en route from the central belt to England and further afield.

Although shorter it is clear that most of those "en route" choose the M6 route, with the A1 /A68 being used only by those from the North East and Yorkshire and Humberside. This will, however, include those entering the UK from Newcastle and possibly some from Hull.

Because of the unknown number of circular day trips the estimates on the following schematic map must be treated with considerable caution. The following pie chart shows the number of tourists entering the Lothians from the Borders

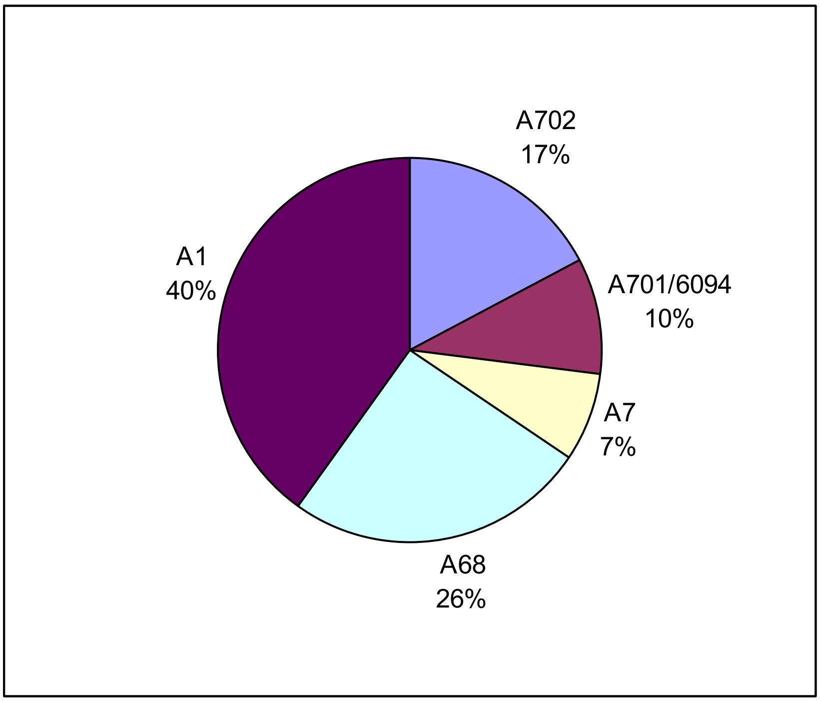
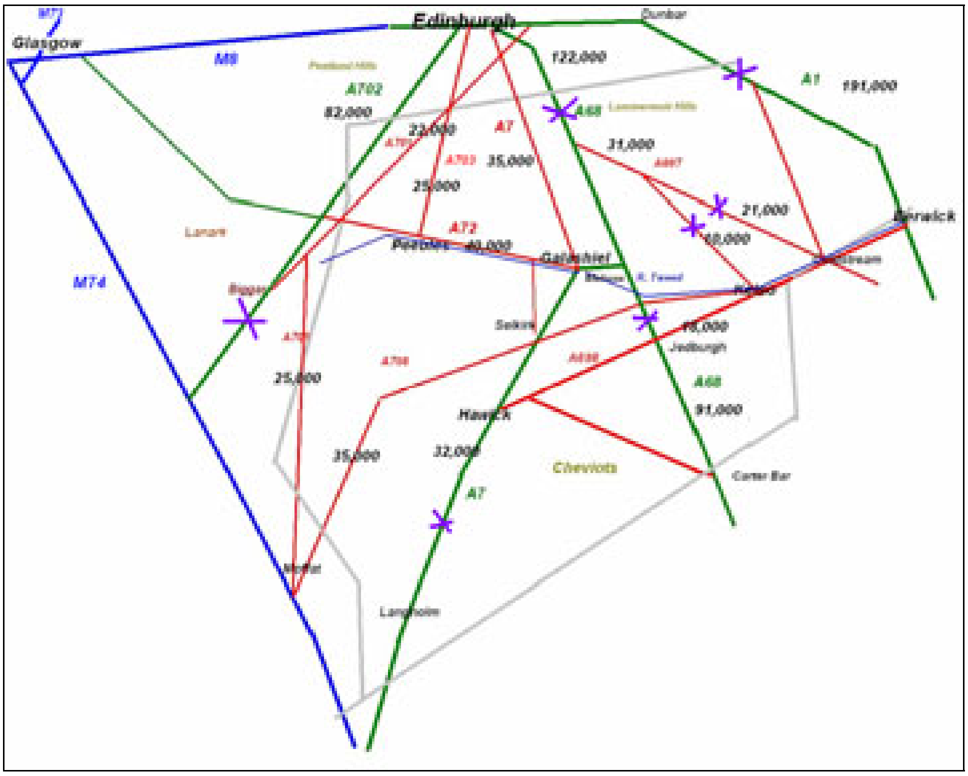


Figure 10-4 Distribution of Tourist Vehicles entering Lothians from Borders

What may be surprising is the importance of the A1 as a tourist route into Scotland.

Figure 10-5 provides the schematic map. Again please note that these estimates are less safe than in some of the other areas because of data quality, circular trips and a more complex road system.

Figure 10-5 Schematic map showing major tourist flows in The Scottish Borders



The result of combining approved and applied applications is to suggest that perhaps only 8.4% of tourists will avoid exposure to wind farms by appropriate choice of circular routes. Conversely 91.6% of tourists in the Borders will be exposed.

10.6 Accommodation

Table 10-3 shows that, if all applications proceed, some 13.3% of beds available in the Borders will be in accommodation exposed to wind farms. It should be noted that the majority of these relate to applications not approvals. Making the 50% assumption this implies 6.7% will have some reduction in value.

Table 10-3 Accommodation in the Borders Affected

	All	%	Approved	%	Awaiting Decision	%	*Total in Area*
Businesses	61	20.82%	20	6.83%	41	13.99%	***293***
Rooms	466	13.34%	104	2.98%	362	10.37%	***3492***

Given the maximum percentage loss of value is 18% this suggests a maximum reduction in expenditure of £221,000. It is important to note that, particularly in The Borders, substitution to unaffected accommodation and a simple reduction in unused capacity is possible which will substantially reduce the economic impact.

10.7 Economic impact

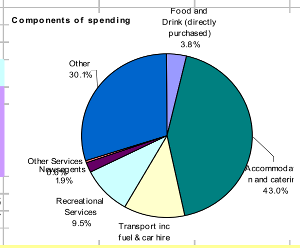
Figure 10-6 provides details of the implications on the local economy of the estimated reduction in tourist activity. Overall the effect is to reduce incomes by over £1.5m and lose some 75 FTEs.

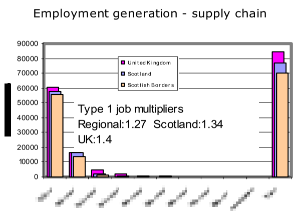
Fig10.7 illustrates the impact of the drop in expenditure of £221,000 on accommodation due to changes in the landscape associated with the rooms. The reduction in VAT payable initially reduces the impact, but the subsequent loss of wages and business for other industries in the area increases the impact to an eventual output effect of £363,000. This drop is associated with falls in incomes totalling £169,000 and 6 fewer jobs. The relatively high wage levels compared to Dumfries and Galloway probably reflects a different type of accommodation with far more country house hotels and far fewer caravans.

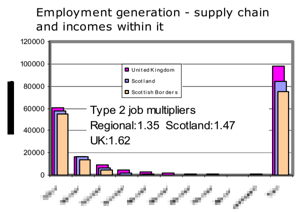
Figure 10-6 Impact Analysis General Tourist Spend: Scottish Borders

Region:	Scottish Borders	Neighbouring regions:	Edinburgh, RoEoS

Windfarm Tourism
Actual Spend







Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£62,729	1.58%	£991
Day visit	£111,793	1.58%	£1,766
Total	£174,522	1.58%	£2,757

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£104.5	£1,185.6	£309.5	£261.4	£52.1	£15.6	£828.7	£2,757.5
3.8%	43.0%	11.2%	9.5%	1.9%	0.6%	30.1%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Scottish Borders producers	Falling on all Edinburgh producers	Falling on all RoEoS producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£991.1	£339.5	£84.5	£365.3	£625.8	£1,740.8	£41.5	£5.2	£103.4	£220.3	£2,111.2	£117.1	£163.8
35.9%	12.3%	3.1%	13.2%	22.7%	63.1%	1.5%	0.2%	3.8%	8.0%	76.6%	4.2%	5.9%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£1,741	£632	£53	£2,425	1.393	55	70	1.271	25.5	£1,402	£19,940
Rest of Scotland	£150	£234	-£37	£348		2	6			£163	£27,899
Scotland	£1,891	£866	£16	£2,773	1.466	58	76	1.325	27.6	£1,566	£20,552
Rest of UK	£220	£95	£340	£655		3	9			£312	£36,487
UK	£2,111	£961	£356	£3,428	1.624	60	85	1.403	30.7	£1,878	£22,160

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

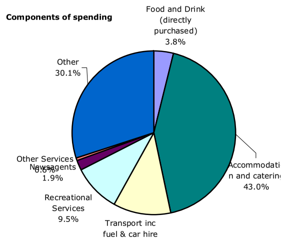
	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£1,741	£1,239	£401	£3,381	1.942	55	75	1.351	27.1	£1,514	£20,260
Rest of Scotland	£150	£385	£127	£662		2	8			£228	£27,000
Scotland	£1,891	£1,624	£528	£4,042	2.138	58	83	1.447	30.2	£1,743	£20,945
Rest of UK	£220	£162	£1,194	£1,577		3	14			£546	£37,767
UK	£2,111	£1,786	£1,722	£5,619	2.662	60	98	1.617	35.4	£2,288	£23,435

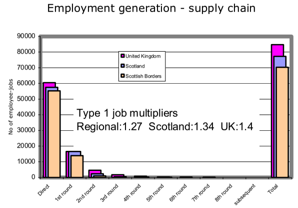
Figure 10-7

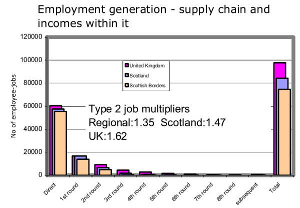
Region: Scottish Borders

Neighbouring regions:	Edinburgh	RoEoS

Windfarm Tourism Actual Spend







Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
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Day visit	£111,793	1.58%	£1,766
Total	£174,522	1.58%	£2,757

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£104.5	£1,185.6	£309.5	£261.4	£52.1	£15.6	£828.7	£2,757.5
3.8%	43.0%	11.2%	9.5%	1.9%	0.6%	30.1%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Scottish Borders producers	Falling on all Edinburgh producers	Falling on all RoEoS producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£991.1	£339.5	£84.5	£365.3	£625.8	£1,740.8	£41.5	£5.2	£103.4	£220.3	£2,111.2	£117.1	£163.8
35.9%	12.3%	3.1%	13.2%	22.7%	63.1%	1.5%	0.2%	3.8%	8.0%	76.6%	4.2%	5.9%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£1,741	£632	£53	£2,425	1.393	55	70	1.271	25.5	£1,402	£19,940
Rest of Scotland	£150	£234	-£37	£348		2	6			£163	£27,899
Scotland	£1,891	£866	£16	£2,773	1.466	58	76	1.325	27.6	£1,566	£20,552
Rest of UK	£220	£95	£340	£655		3	9			£312	£36,487
UK	£2,111	£961	£356	£3,428	1.624	60	85	1.403	30.7	£1,878	£22,160

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£1,741	£1,239	£401	£3,381	1.942	55	75	1.351	27.1	£1,514	£20,260
Rest of Scotland	£150	£385	£127	£662		2	8			£228	£27,000
Scotland	£1,891	£1,624	£528	£4,042	2.138	58	83	1.447	30.2	£1,743	£20,945
Rest of UK	£220	£162	£1,194	£1,577		3	14			£546	£37,767
UK	£2,111	£1,786	£1,722	£5,619	2.662	60	98	1.617	35.4	£2,288	£23,435

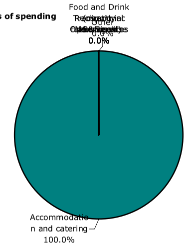
Figure 10-7 Impact Analysis Accommodation Spend The Scottish Borders

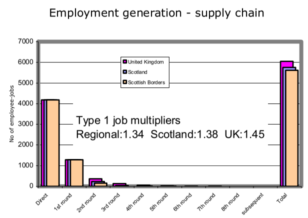
Neighbouring regions:	Edinburgh	RoEoS

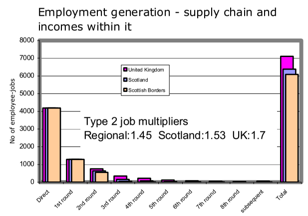
Region: Scottish Borders

Windfarm Tourism

Actual Spend







Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£33,435	0.66%	£221
Day visit	£0	0.00%	£0
Total	£33,435	0.66%	£221

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£0.0	£220.7	£0.0	£0.0	£0.0	£0.0	£0.0	£220.7
0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Scottish Borders producers	Falling on all Edinburgh producers	Falling on all RoEoS producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£220.7	£0.0	£0.0	£28.1	£192.6	£192.6	£0.0	£0.0	£0.0	£0.0	£192.6	£0.0	£0.0
100.0%	0.0%	0.0%	12.7%	87.3%	87.3%	0.0%	0.0%	0.0%	0.0%	87.3%	0.0%	0.0%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£193	£63	£8	£263	1.366	4	6	1.344	25.5	£158	£28,056
Rest of Scotland	£0	£0	£7	£7		0	0			£3	£26,180
Scotland	£193	£63	£15	£270	1.404	4	6	1.376	26.1	£161	£28,012
Rest of UK	£0	£0	£23	£23		0	0			£11	£37,537
UK	£193	£63	£38	£293	1.523	4	6	1.447	27.4	£172	£28,481

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Scottish Borders	£193	£125	£45	£363	1.882	4	6	1.454	27.5	£169	£27,853
Rest of Scotland	£0	£0	£25	£25		0	0			£8	£25,404
Scotland	£193	£125	£69	£387	2.010	4	6	1.526	28.9	£177	£27,736
Rest of UK	£0	£0	£84	£84		0	1			£28	£38,892
UK	£193	£125	£154	£472	2.448	4	7	1.700	32.2	£205	£28,876

11 Dumfries and Galloway

11.1 The importance of tourism in the local economy

With the closure of Chapelcross, Dumfries and Galloway ended a sixty year relationship with the nuclear industry and electricity generated now comes from wood, water and wind.

Dumfries and Annan still have some significant chemicals and engineering businesses rooted in military and maritime history, but the region's main industrial clusters now draw their strength from the location and the land.

Forestry and agriculture shape the landscape, and the latter shapes much of society, as was seen when the region bore the brunt of Scotland's foot and mouth disease in 2001. The UK's most efficient sawmill and Britain's biggest woodburning power station are both leading edge parts of the forest cluster, and there is still meat and fish processing, as well as cheese and ice cream making, to add value to primary food products.

Total GVA is £1.8 bn, of which 4.2 per cent derives from the hospitality industries. They are, after agriculture, now the leading industries and tourism spending is **£330 mn**, more than half of it from day trippers. This makes tourism the leading private sector cluster. It includes tourist brides and grooms at Gretna (marriages in Dumfries and Galloway exceed those in Glasgow, Edinburgh and Aberdeen put together, and many are second-timers from England). It embraces travellers busily heading up the M74 towards Glasgow and along the A75 to Belfast, and yachtsmen lazily cruising into Kirkcudbright. It includes the mountain bikers making big air through the forests on the 7 Stanes, and the bookworms browsing bigger words in Wigtown.

And as well as bringing visitors in for the day or a week, it motivates many folk to embark on the last and longest holiday of their life in the region, albeit not strictly 'tourism'. Dumfries and Galloway has by far the highest in-migration of over 50s in Scotland (again, mainly from England). Many retirees and near retirees say they first visited the region on holiday, and at times when English house prices are booming, but Scottish ones less buoyant, they sell up in Manchester or Merseyside and move across the border. Figure 11-1 shows the forecast age and gender profile.

As people in the region grow older the area will have to expand its health and social work provision so that these become even more leading activities. It will also need to find funds to expand its (higher) education provision if it is to stop haemorrhaging almost all its teenagers to the cities.

The growth in service demand from the elderly suggests that any decline in the tourist sector will have little effect as hospitality services simply move to another set of clients.

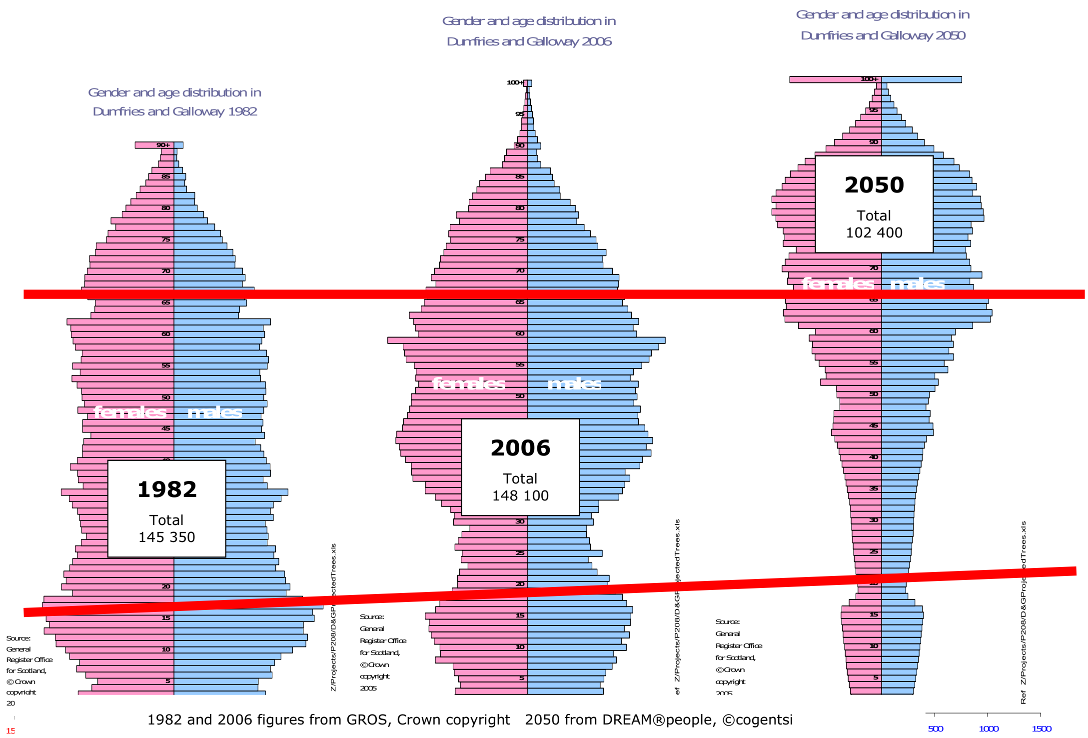


Figure 11-1 Current and Future Age Profiles in Dumfries and Galloway

11.2 Wind farms : current and applications

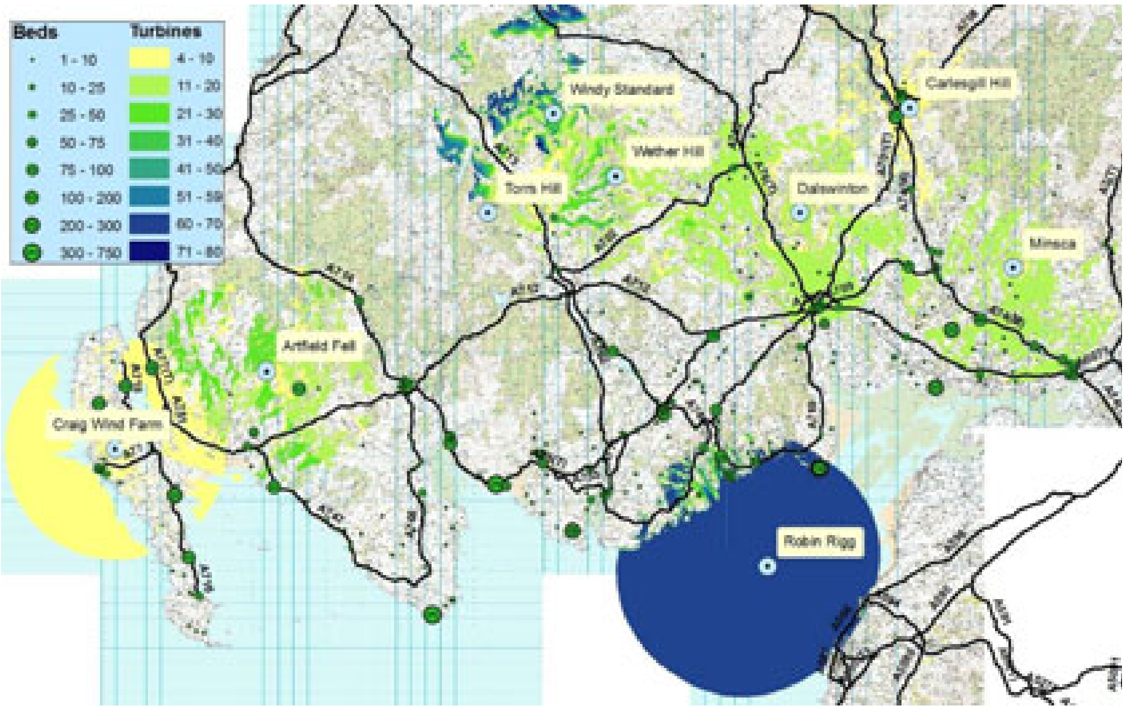
SITE_NAME	TURBINES	STATUS
Torrs Hill	2	Approved
Carlesgill Hill	4	Approved
Wether Hill	14	Approved
Dalswinton	16	Approved
Minsca	17	Approved
Windy Standard	36	Approved
Windy Standard (Extension)	30	Approved
Artfield Fell	15	Approved
Harestanes	71	Application
Whitesidehill	13	Application
Ewe Hill	22	Application
Minnygap	15	Application
Carscreugh	18	Application
Barnbackle Windfarm	2	Application
Margree Windfarm	25	Application
North Rhins	11	Application
Ulzieside	20	Application
Robin Rigg	60	Approved

Table 11-1 **Wind farms in Dumfries and Galloway**

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

11.3 Wind farms in the landscape

Figure 11-2 *Dumfries and Galloway: Approved Developments*

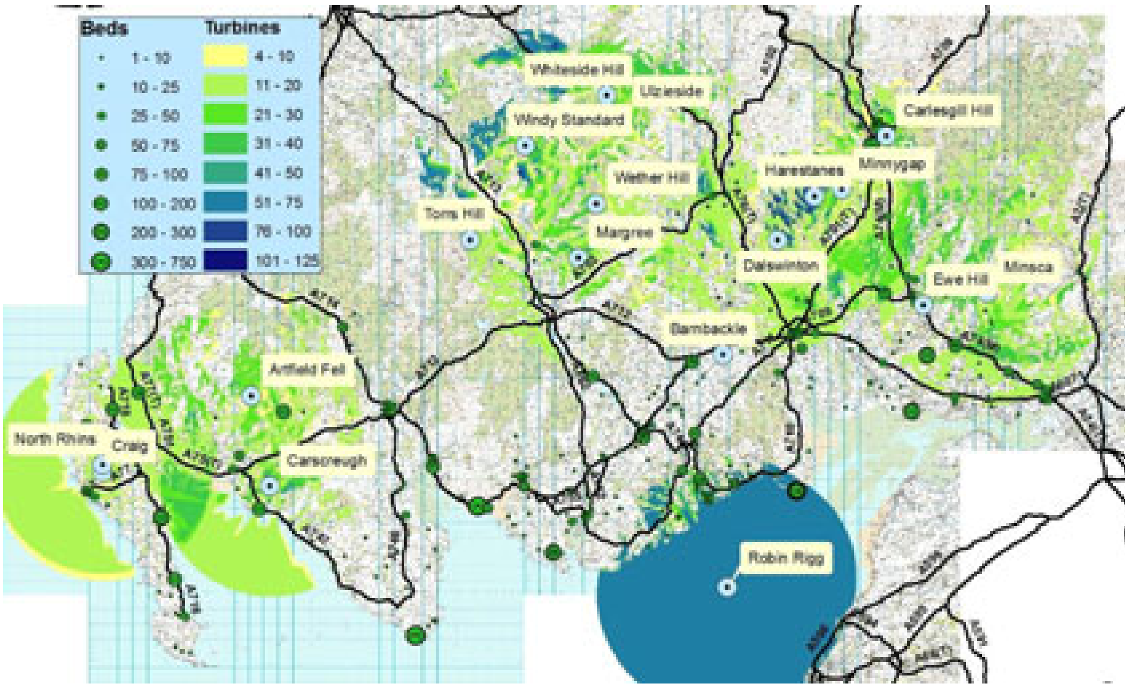


Base Map © Crown Copyright

Figure 11-3 ***Dumfries and Galloway: Applications***

Base Map © Crown Copyright

Figure 11-4 ***Dumfries and Galloway: Approvals and Applications***



Base Map © Crown Copyright

11.4 Roads affected

	Distance (Km)		
Road	**All**	**Approved**	**Awaiting Decision**
A596	4.28	4.28	0.00
A596(T)	0.10	0.10	0.00
A597	0.65	0.65	0.00
A7(T)	0.77	0.09	0.68
A701	14.85	14.85	0.00
A701(T)	20.12	11.37	8.75
A702	8.20	6.67	1.52
A708	4.39	3.59	0.80
A709	14.03	9.07	4.96
A710	9.64	9.64	0.00
A711	10.72	10.72	0.00
A712	0.60	0.00	0.60
A713	4.92	2.84	2.08
A714	3.17	3.17	0.00
A716	2.62	0.00	2.62
A718	1.91	0.25	1.65
A74(M)	25.07	14.31	10.76
A747	3.52	0.93	2.58

A75(T)	39.72	33.52	6.20
A751	2.52	2.52	0.00
A756	1.39	1.39	0.00
A76	1.51	1.51	0.00
A76(T)	36.93	23.20	13.73
A762	4.22	0.00	4.22
A77	2.29	1.46	0.83
A77(T)	13.23	11.64	1.59
A780	5.69	5.69	0.00
A781	0.15	0.15	0.00
Total	237.21	173.63	63.57

Table 11-2 Roads in Dumfries and Galloway Exposed to Wind Farms

Figure 11-4 and Table 8-1 indicate extensive exposure over prolonged lengths of road. The unaffected areas are the Forest Park and most of Kirkcudbrightshire, both important for tourism but the Robin Rigg development impinges on the other major tourist area, the Solway Coast.

11.5 Tourist traffic flows

Identifying Tourist flows in Dumfries and Galloway is extremely difficult because of the overlapping nature of those flows. First there is the flow from England (and Northern Ireland) to a holiday base in the area. Second there is the flow from the central belt to holiday bases. Third there is the flow north which stops overnight in one of the border towns such as Moffat or Dumfries (which could be defined as Short Stay). Fourthly there is the dominant flow north on the M74 consisting of both English travelling on holiday and Scots travelling from their holiday breaks without an overnight stop. Finally there is the flow to and from Stranraer and Cairnryan along the A75 (from England) and down the A77 (Scotland)

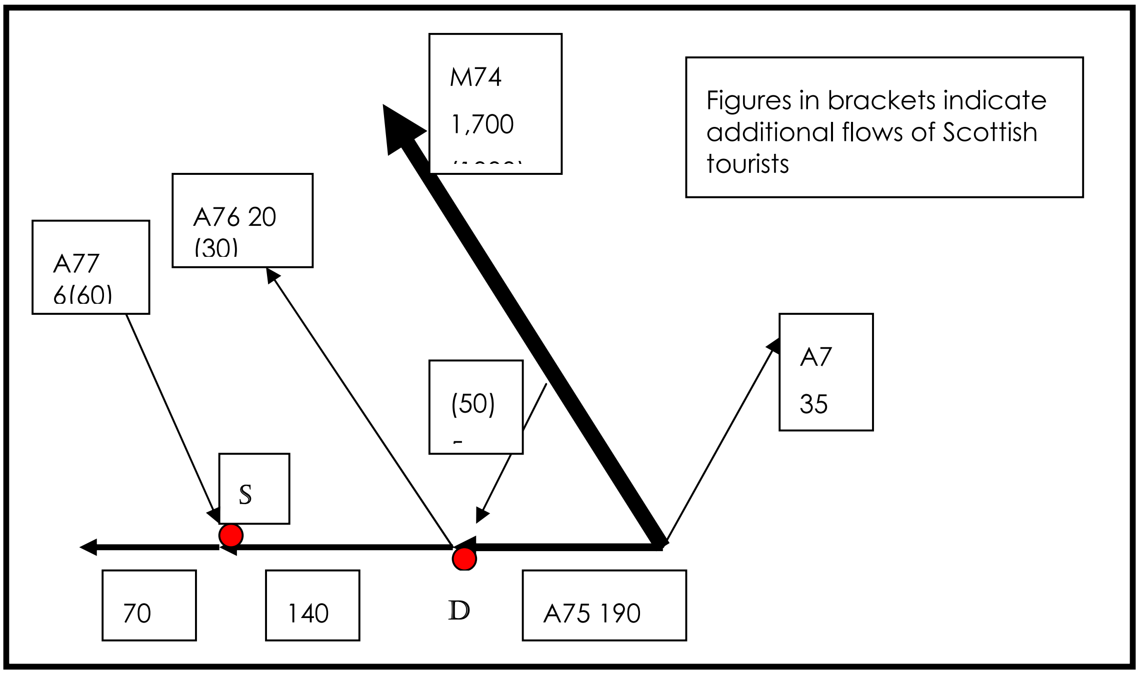


Figure 11-5 Main Tourist Traffic flows in Dumfries and Galloway in thousand vehicles

The 2.7m tourist vehicles on the M74 are estimated to include some 1m Scottish vehicles going or coming home from their holidays leaving a Tourist flow of 1.7m. Figure 11-6 shows the distribution and the dominance of the motorway as the entry point to Scotland

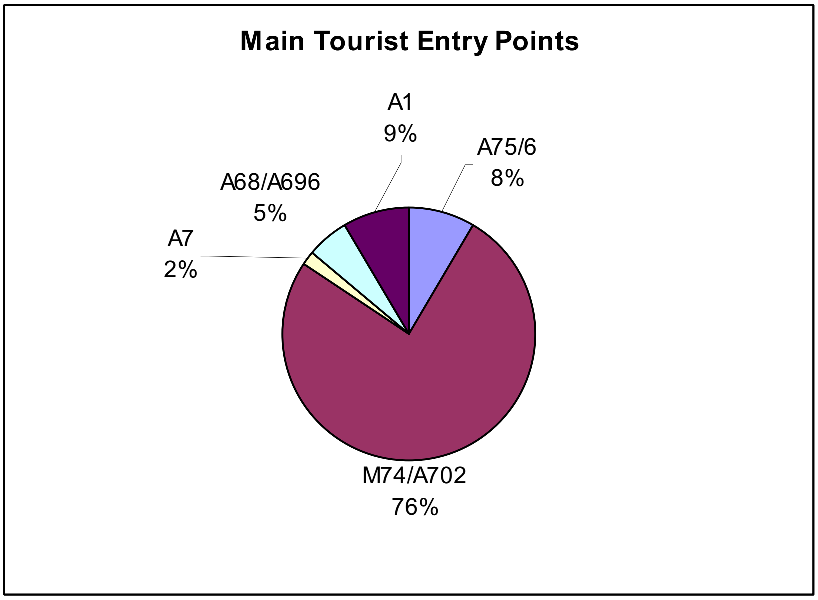


Figure 11-6 Tourist Flows on Main Entry Route to Scotland

Visit Scotland suggest around 1m bednights in the area of which 300,000 are Scottish,. On the basis of vehicle counts the number of long stay visitors would not appear to exceed 400,000, with the balance of 300,000 being English/Irish short stay. This apparently high figure is between 5 and 10% of those on the M74 depending upon if the short stay is 1 or 2 nights. Of the 300,000 Scots a significant number will also be short stay.

Looking at Figure 11-5 it is difficult to identify any routes in Dumfries and Galloway where, at some stage, holidaymakers will not been exposed to wind farms. This perception is re-inforced by table 11.5.1 which gives the length of exposed road by road number. Over 237km of road in Dumfries and Galloway will see at least four turbines at a distance of 15km or less.

Possibly the least exposed road in the area is the A77 and tourists staying in Girvan, Ballantrae or around Wigtown Bay could conceivably be unaffected. Of course that assumes that they are able to distinguish between Dumfries and Galloway and the huge developments on the A77 just north on Fenwick Moor. For estimation purposes we assume 98% of holidaymakers in the area are exposed. In chapter 7 it was found that some 69% of tourists are holiday makers. Thus we might anticipate any reduction to apply to 69% of tourist expenditure in the area.

11.6 Accommodation

Table 11-3 shows that almost one quarter of businesses and one third of rooms will have exposure to wind farm development. A substantial number of the latter relate to the caravan parks on the Solway Coast.

	All	**%**	**Approved**	**%**	**Awaiting Decision**	**%**	***Total in Area***
Businesses	127	23.83%	110	20.64%	17	3.19%	***533***
Rooms	2946	32.30%	2505	27.46%	441	4.83%	***9121***

Table 11-3 Accommodation in Dunfries and Galloway Affected

Utilising the normal assumption we assume there will be a drop in value and price on 16.2% of the accommodation.

11.7 Economic impact

The economic impact in Dumfries and Galloway is given in fig 11.7 and fig 11.8. When indirect and induced effects are deducted, the initial fall in general expenditure of £6.18m results in a fall in employment of just over 200, and a drop on regional income of just under £3m. The low wage level in tourism in this area is particularly noticeable.

As noted earlier the percentage off accommodation affected in Dumfries and Galloway is relatively high because of the impact of the Robin Rigg offshore farm on resorts on the Solway Coast. The fall in direct expenditure is put at around £1.6m leading to an eventual decline in income of £1m and 77 jobs.

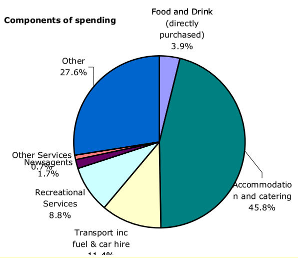
Figure 11-7 Economic Impact of Change in General Tourist Spend: Dumfries and Galloway

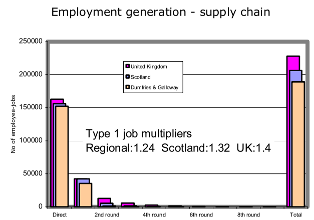
Region: Dumfries & Galloway

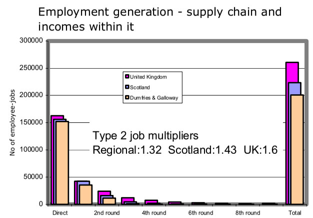
Neighbouring regions:	Scottish Borders	East Cumbria

Windfarm Tourism

Actual Spend







Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£192,827	1.72%	£3,317
Day visit	£166,500	1.72%	£2,864
Total	£359,327	1.72%	£6,180

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£244	£2,833	£706	£546	£107	£42	£1,703	£6,180
3.9%	45.8%	11.4%	8.8%	1.7%	0.7%	27.6%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Dumfries & Galloway producers	Falling on all Scottish Borders producers	Falling on all East Cumbria producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£6,180	£688	£173	£818	£5,363	£3,908	£16	£27	£267	£526	£4,744	£215	£403
100.0%	11.1%	2.8%	13.2%	86.8%	63.2%	0.3%	0.4%	4.3%	8.5%	76.8%	3.5%	6.5%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Dumfries & Galloway	£3,908	£1,910	£83	£5,900	1.510	152	189	1.243	30.6	£2,678	£14,159
Rest of Scotland	£310	£633	-£45	£898		4	14			£419	£30,888
Scotland	£4,218	£2,542	£37	£6,798	1.612	156	203	1.299	32.8	£3,097	£15,279
Rest of UK	£526	£301	£1,192	£2,019		7	25			£957	£37,607
UK	£4,744	£2,844	£1,229	£8,817	1.858	163	228	1.402	36.9	£4,054	£17,769

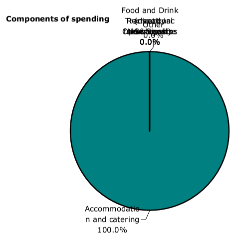
Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

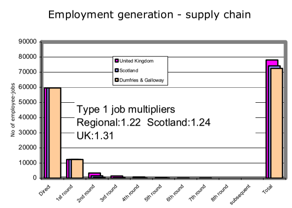
	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Dumfries & Galloway	£3,908	£3,295	£860	£8,063	2.063	152	201	1.318	32.5	£2,948	£14,690
Rest of Scotland	£310	£948	£382	£1,640		4	19			£576	£30,244
Scotland	£4,218	£4,243	£1,242	£9,703	2.300	156	220	1.408	35.5	£3,524	£16,038
Rest of UK	£526	£461	£3,586	£4,573		7	41			£1,590	£38,755
UK	£4,744	£4,704	£4,829	£14,277	3.009	163	261	1.602	42.2	£5,113	£19,612

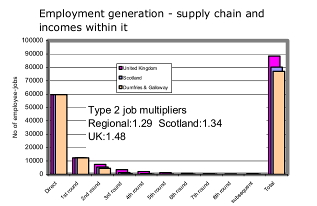
Figure 11-8 Economic Impact of Change in Accommodation Spend: Dumfries and Galloway

Region:	Dumfries & Galloway	Neighbouring regions:	Scottish Borders	East Cumbria

Windfarm Tourism
Actual Spend







Estimated spending - accommodation spend only

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£102,777	1.59%	£1,634
Day visit	£0	1.72%	£0
Total	£102,777	1.59%	£1,634

Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£0	£1,634	£0	£0	£0	£0	£0	£1,634
0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all Dumfries & Galloway producers	Falling on all Scottish Borders producers	Falling on all East Cumbria producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£1,634	£0	£0	£208	£1,426	£1,426	£0	£0	£0	£0	£1,426	£0	£0
100.0%	0.0%	0.0%	12.7%	87.3%	87.3%	0.0%	0.0%	0.0%	0.0%	87.3%	0.0%	0.0%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
Dumfries & Galloway	£1,426	£727	£29	£2,182	1.530	60	73	1.216	44.4	£915	£12,612
Rest of Scotland	£0	£0	£99	£99		0	2			£48	£29,095
Scotland	£1,426	£727	£128	£2,281	1.599	60	74	1.243	45.4	£962	£12,975
Rest of UK	£0	£0	£320	£320		0	4			£154	£38,566
UK	£1,426	£727	£447	£2,600	1.823	60	78	1.310	47.8	£1,116	£14,280

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
Dumfries & Galloway	£1,426	£1,280	£335	£3,041	2.132	60	77	1.292	47.2	£1,022	£13,252
Rest of Scotland	£0	£0	£269	£269		0	3			£89	£28,960
Scotland	£1,426	£1,280	£604	£3,310	2.321	60	80	1.344	49.1	£1,111	£13,854
Rest of UK	£0	£0	£980	£980		0	8			£331	£39,826
UK	£1,426	£1,280	£1,583	£4,290	3.007	60	88	1.483	54.1	£1,442	£16,294

12 The impact on Scotland

12.1 Introduction

A key finding of the intercept study is that most tourists who dislike wind farms to the extent that it will reduce their likelihood of visiting an area will simply relocate in other areas. For a very small minority however exposure to wind farms not only reduces the likelihood of revisiting a specific area but also reduces the likelihood of revisiting Scotland as a whole.

During the study it has become clear that if current applications proceed the chance of non-exposure to wind farms for visitors travelling from the South is almost non-existent as all the relevant trunk roads, particularly the M74. will have substantial wind farm exposure (see section 11.5). It thus seems likely that although the effects of general aversion to Scotland caused by wind farms are very small the number of tourists affected by wind farm exposure will be very large. In section 12.2 we estimate the number of tourists who will be affected and the resulting change in likelihood of return.

The impact of a reduction in scenic value is even more difficult to ascertain. Again it is clear that there will be a small reduction in expenditure in accommodation seriously affected. On the other hand in other unaffected locations, prices may rise as unaffected scenes decrease in number. Equally the expenditure for the vast majority who continue to come to Scotland may simply be re-allocated. At a national level it seems likely that any negative effect, if it exists, will be extremely small, difficult to identify and swamped by factors such as exchange rates and poor weather experiences. No attempt is made therefore to estimate an accommodation impact at the Scottish level.

12.2 The number of tourists in Scotland affected

It is clear that certain groups are likely to be totally unaffected:

- Business
- Visitors to Cities (other than Business).
- Scottish tourists, (none suggested a reduction in visits in Scotland as a whole).

- Foreign Tourists who enter by plane and use the West Coast route to the West Highlands

Table 12-1 provides estimates of these groups based on Table 5.2, Fig 5.2 and the VisitScotland profiles

Table 12-1 Percentage of Tourists Possibly Affected by Wind Farms

Type	Trips	Percent
Business	3.18	18.4%
City Breaks	4.19	24.3%
Scottish Rural Hols	4.51	26.1%
Air/West	0.18	1.0%
Unaffected	12.06	69.8%
Affected	5.20	30.2%
Total Trips	17.26	100.0%

The conclusion is that just over 30% of tourists could be affected by a reduction in likelihood of return.

The intercept survey provides an estimate of the reduction in likelihood of returning to Scotland (for non Scots) because of the adverse effects of wind farms of 0.62% (0.38% of all tourists). Thus the predicted impact on the whole of Scotland is of the order of a reduction of 0.18% of tourist spending and consequently jobs.

12.3 Economic impact of wind farms in Scotland as a whole

Figure 12-1gives the results of the DREAM® model for Scotland as a whole of a reduction of 0.18% in tourist expenditure. Note that day trippers are assumed to be Scots who will continue to spend equivalently within Scotland. The expenditure will not necessarily be on the same activities or in the same areas.

Figure 12-1 Impact Analysis: Scotland

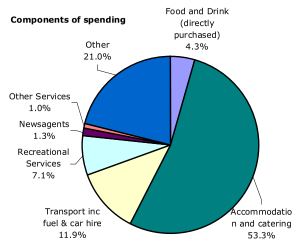
Region: TOTAL Scotland

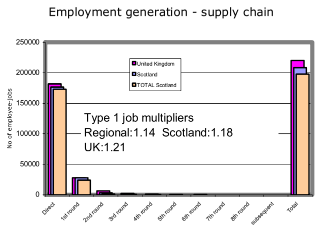
Neighbouring regions:	England	Wales

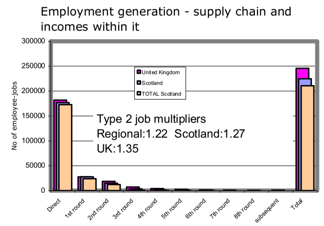
Windfarm Tourism
Actual Spend

Estimated spending

	Total tourist expenditure (£000)	Windfarm affected	Total affected spend
Overnight	£4,159,000	0.18%	£7,486
Day visit	£3,202,153	0.00%	£0
Total	£7,361,153	0.10%	£7,486







Components of spending at purchasers' prices

Food and Drink (directly purchased)	Accommodation and catering	Transport inc fuel & car hire	Recreational Services	Newsagents	Other Services	Other	Total
£324	£3,990	£893	£533	£98	£72	£1,575	£7,486
4.3%	53.3%	11.9%	7.1%	1.3%	1.0%	21.0%	100.0%

Total effective spend	Retail margins inc motor trade	Wholesale margins	VAT and other product taxes	Spend net of product taxes	Falling on all TOTAL Scotland producers	Falling on all England producers	Falling on all Wales producers	Falling on other Scottish producers	Falling on other UK producers	Falling on all UK producers	Imports EU	Imports RoW
£7,486	£602	£158	£987	£6,500	£4,914	£10	£19	£224	£395	£5,562	£382	£556
100.0%	8.0%	2.1%	13.2%	86.8%	65.6%	0.1%	0.2%	3.0%	5.3%	74.3%	5.1%	7.4%

Type 1 multiplier analysis (business-to-business supply chain) (£000)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ mn effective spend	Total GVA generated	GVA/job generated
TOTAL Scotland	£4,914	£1,448	£85	£6,448	1.312	173	198	1.145	26.4	£4,302	£21,731
Rest of GB	£253	£142	£177	£572		4	8			£268	£32,565
GB	£5,167	£1,590	£262	£7,020	1.358	177	206	1.166	27.5	£4,570	£22,163
Rest of UK	£395	£201	£498	£1,093		5	14			£508	£36,659
UK	£5,562	£1,791	£760	£8,113	1.459	182	220	1.209	29.4	£5,078	£23,076

Type 2 multiplier analysis (supply chain plus spending of all who work in it and consequent supply chains)

	Direct expenditure	First round indirect	Subsequent indirect	Total output effect	Output multiplier	Direct jobs	Total jobs	Employment multiplier	Jobs per £ effective spend	Total GVA generated	GVA/job generated
TOTAL Scotland	£4,914	£3,199	£1,060	£9,174	1.867	173	211	1.218	28.1	£4,667	£22,162
Rest of GB	£253	£214	£623	£1,090		4	12			£386	£31,823
GB	£5,167	£3,413	£1,683	£10,264	1.986	177	223	1.259	29.7	£5,053	£22,688
Rest of UK	£395	£321	£1,854	£2,569		5	23			£874	£37,824
UK	£5,562	£3,734	£3,537	£12,833	2.307	182	246	1.351	32.8	£5,926	£24,110

A fall in expenditure of 0.18% leads to a fall in expenditure £7.6m. Some 4.9m of this applies to Scottish producers. This expenditure, in turn, causes a reduction in output of £1.45m within Scotland via the indirect effects and £1.65m through induced effects. The decrease in output is associated with a total fall in employment of 211 and of £4.7m in gross value added (income and profits).

12.4 Estimation of upper and lower bounds

The estimate of 0.18% is subject to considerable uncertainty. The intercept study identified 5 respondents (2.7% of visitors interviewed) whose likelihood of returning to Scotland would be affected by the extended presence of wind farms. Within these 5 the responses range from a positive 15% to a negative 70% change in likelihood with a mean of 22.8%.

Two areas of uncertainty arise. First there is the uncertainty associated with actually selecting an individual. The standard error of that likelihood is given by $\sqrt{\frac{p(1-p)}{n}}$ Using this expression gives an upper bound of

0.027+1.96*sqrt(0.027*0.973/384)= 4.3%.

Within the five chosen there is also a standard error of the mean given by the normal formula and an upper bound of -38%. Consequently the overall upper bound for those affected is given by 1.67%. Overall therefore the upper bound of the estimate is a loss of 0.5% of tourist expenditure.

The basic impact model is linear consequently this could suggest an estimate of the upper bound is a reduction of 630 employees. However, as stated earlier, because we took a worst case scenario and believe that there is a protest element in the responses we believe that the 211 jobs is actually the upper bound.

The lower bound includes zero i.e. at a purely statistical level we could not prove that the change is significantly different from zero. Given the significant loss of value shown in the internet survey, however, we would regard any attempt to claim there is no impact to be misleading. Our best guess is of the order of 200 jobs which is extremely small in an industry the size of tourism

12.5 Conclusion

The study suggests a small negative impact on the economy of Scotland that is estimated to amount to some 211 jobs and income of £4.7m. Whilst most of these will be in Tourism related industries, jobs and income in other industries will be lost due to the indirect and induced effects. Because of the low number of respondents who report a possible response in the intercept survey and the large range of those responses this estimate is subject to considerable uncertainty. The balance with the expected year on year employment on wind farms in Scotland would be interesting.

13 Planning and other issues

13.1 The positive impact of wind farms on tourism

In chapter 2 the literature review indicated that wind farms can have a positive impact on tourism that could possibly, for a few individual farms, even exceed the specific negative aspects of that farm. In Scotland the success of "open days" confirms public interest. The positive effect of increased likelihood of return given current levels of access is taken into account in the intercept survey, albeit with a possible slight downward bias as a result of the upper bound of certainty (which could result in increased frequency) . Increasing levels of access could increase the positive impact further.

The most obvious developments are information centres that offer an inexpensive wet weather destination to the holiday tourist. In addition large wind farms offer an extensive car free road network in the hills often with extensive views over the area. The Land Reform Act suggests such areas should be available to walkers and cyclists and could well be a tourist asset if properly promoted.

This report has not attempted to identify these potentially positive aspects, in part because the substitution effects are so substantial; if the tourist did not go to the wind farm they would go somewhere else instead. However this analysis if applied to any tourist attraction be it a bird sanctuary, a castle or a theme park, would suggest minimal economic impact. But the number, range and quality of attractions available in an area do have an impact and in complementing that package a wind farm centre might have an effect significantly greater than implied by a conventional impact analysis. Such an analysis would be of considerable interest.

As discussed in section 13.2 the number of local jobs generated is small and it would seem sensible for developers, as a matter of policy, to examine opportunities to utilise wind farms as tourist attractions to counter potential losses.

13.2 The direct impact of Wind Farms on the local economy

SRF (2007)[18] published a detailed report on the direct impact of the renewable industry in Scotland. Table 13-1 gives the direct jobs associated with the development and operations of wind turbines.

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[18] Scottish Renewables Forum: *Scottish Renewables Economics Impact Report 07*. Glasgow 2007. www.scottishrenewables.com/MultimediaGallery/1df99f66-e5bd-4823-82c3-10f3f501d30d.pdf

Table 13-1 Direct Jobs in the production of wind energy

	Jobs	%
Project Development to Final Consent	448	41.5%
Consultancy, Energy Services, R&D	180.8	16.8%
Manufacture, Engineering, Fabrication, Assembly	192	17.8%
Construction & Haulage	191.5	17.8%
Operations & Maintenance	66	6.1%
Total	**1078.3**	**100.0%**

Whilst the total number of jobs substantially exceeds those lost in tourism, as can be seen from the table the vast majority of these are not local or in operations. Unless the industry continues to expand either at home or through exports, then in the long term, these numbers might be expected to contract. On the other hand engineering has high value added and we should expect significant indirect and induced effects that suggest a larger long term local effect greater than the 66 operations and maintenance jobs identified.

13.3 Tourism and planning

Scottish Planning Policy (SPP) 6, Renewable Energy, highlights tourism and recreational interests as a matter for consideration in developing policy and in determining applications for renewable energy developments. Planning authorities are however able to interpret national policy so that it is relevant to the circumstances of their own area and, if tourism is considered as a stand alone policy area, to avoid repetition, it may not be explicitly referenced as part of the renewable energy policy. Where there is a separate policy, it is recognition of the importance of the issue to that area as a whole and consequently one that **must** be considered in relation to any development.

As an example Argyll and Bute has both a significant number of wind farms and an important tourism industry. In its section on Renewable Energy it states:

"Proposals shall be supported where it can be demonstrated there is no significant adverse effect on

- Local communities
- Natural Environment
- Landscape character and visual amenity
- Historic environment

- Telecommunications" Argyll(2002)[19]

However whilst tourist policy in Argyll simply discusses the potential of the area for increased environment based tourism; particularly water based and seems totally oblivious to any threats that might exist, in practice in the planning reports the position of tourism is explicitly considered. For example in the Planning Application Report for the Stacain Wind Farm in Argyll (Argyll 2007[20]) the planner discusses in some detail the impact in eleven areas one of which is tourism and recreation. This section of the report is worth quoting.

> **k) TOURISM AND RECREATION**
>
> There has been much debate on the effect on tourism and I believe that if the wind farm could be successfully absorbed into the landscape the effect on tourism would be negligible in this case.
>
> In this case the wind farm can be absorbed into the Loch Fyne, Loch Shira landscape and the impact will be negligible.
>
> However in terms of the landscape of Loch Awe and the tourist site along A85 this is a very important area and busy route to all from Oban. There would be an adverse visual impact in terms of landscape. What effect this would have on tourism in Lorn is difficult to quantify. I have concerns about the impact of this and the adjacent wind farm proposal on tourism and conclude that there would be a negative impact but not enough to justify a refusal on this basis.

As this report shows estimation of impact is not an easy matter. Tourism impact, as one aspect of economic development, should be covered by policy and could be an issue which would warrant refusal if regarded as significant enough. An example of rejection on such grounds has not, however, been identified. What is more usual, as in this case, is a recommendation to reject because of significant scenic impact. In this case the development contradicted national policy guidance NPPG6, NPPG15 and local policies RUR1 and WF1. In addition, almost inevitably, rejection was recommended because of the potential impact on the birdlife, in this case the golden eagle and the hen harrier, being contrary to Structure Plan Policy START DC 7 and NPPG 14, Natural Heritage. The area committee, however, rejected the recommendation and on 27/11/07 voted 6-2 to approve the development.

This research suggests that some developments along the A74 and A9, which have passed all the usual tests and have been granted consent, may have an adverse effect on tourism. Table 13.1 provides a list of current statutory consultees for the Stacain development.

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[19] Argyll(2002). Argyll and Bute Structure Plan 2002

http://www.argyll-bute.gov.uk/yourcouncil/doclib/structureplan?a=0

[20] Development Planning Services Oban, Lorne and the Isles; Land at Stacain

http://www.argyllwind farms.com/stopstacain/Stacain.pdf

Table 13.1 Example of Statutory Consultees

Consultee	Response Date	Comment
Area Roads Engineer	24.06.05	No objections
Scottish Environmental Protection Agency	03.06.05	Requires 3 months to be addressed prior to determination
Scottish Water	27.09.05	No objections subject to conditions
Public Protection Unit	16.09.05	No objections subject to conditions
Defence Estates	27.05.05	
Health and Safety Executive	24.05.05	No comments
Scottish Executive Trunk Roads Authority	01.06.05	No comments on the Environmental Statement
Historic Scotland	21.09.05	No comments
Forestry Commission	08.09.05	No objections

It might be argued that there should also be a statutory requirement to consult a tourist agency such as VisitScotland. Given the findings of this report however on the likely size of the effects and given the need to not further encumber the planning system we would suggest that where tourism is an important part of the local economy **councils be recommended to seek the advice of local tourist agencies.**

In our view councils, when assessing the economic impact of a development on the local economy and tourism, should take into account the following:

- The number of tourists travelling past on route to elsewhere,
- The views from tourist accommodation in the area,
- The relative scale of tourism impact i.e. local to national
- The potential positives i.e. information provision
- The views of tourist bodies i.e. local tourist board or VisitScotland.
- Outdoor Activity in the area of the development

This is effectively a guide to planning authorities of what to consider under the issue of 'tourism impact' and could be helped by the production from the developer of a Tourist Impact Statement.

13.4 Tourist impact statements

Tourist Impact Statements are statements by developers of the likely impacts of the development on the local tourist industry and the methods that can be used to minimise any costs (e.g by screening) and maximise any benefits (e.g. access arrangements). The length of such statements will inevitably be dependent upon the importance of tourism in the local area. Developments along major tourist routes, on nationally recognised walking/cycling or horse riding routes, in or close to recognised scenic areas or adjacent to holiday destinations will inevitably warrant more attention than those with little tourist contact. They are already a recognised if informal part of the planning process in a number of authorities and it is our belief that, because of the importance of tourism to Scotland, it could usefully become a normal part of the environmental impact analysis wherever tourism may have a major role.

At its core would be the information to be considered by the council

- The number of tourists travelling past on route to elsewhere,
- The views from tourist accommodation in the area,
- The relative scale of tourism impact i.e. local to national
- The potential positives i.e. information provision
- Outdoor Activity in the area of the development

It is believed that such statements should be made freely available for comment to local community groups as soon as possible, to ensure that the information is accurate and to enable a "buy-in" by the local community to the development.

13.5 Size and continuity

Current guidance refers at some length to the cumulative impact of a number of neighbouring developments. PAN 45[21] paragraph 79 states that "Different layouts will be appropriate in different circumstances. For example, grouped turbines can normally appear acceptable as a single, isolated feature in an open, undeveloped landscape, while rows of turbines may be more appropriate in an agricultural landscape with formal field boundaries." **It does not identify a maximum size** and accepts that extending wind farms may be acceptable and cost-effective.

The PAN also identifies that the current geographic distribution of wind farm proposals in Scotland is due to

- the distribution of the viable wind resource;
- technical and economic constraints to the viability of exploiting different wind speeds;
- electricity grid access constraints;
- protected areas;
- planning policy.

As a result developments have been focused in a relatively limited number of areas.

The Pan then suggests that in assessing cumulative effects, it is unreasonable to expect this to extend beyond schemes in the vicinity that have been built, those which have permissions and those that are currently the subject of undetermined applications.

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[21] Planning Advice Note 45 (2002): Renewable Energy Technologies http://www.scotland.gov.uk/Publications/2002/02/pan45/pan-45

An example of the application of the guidance on cumulative impacts is the Kyle Wind Farm Proposal, Cumulative Landscape and Visual Assessment (AMEC, 2004)[22]. The key to the analysis is the assessment of the number of farms in sight at a number of different locations.

The research in this report suggests that from a tourism perspective:

- Having a number of wind farms in sight at any point in time is undesirable from the point of view of the tourism industry
- The loss of value when moving from medium to large developments is not as great as the initial loss. It is the basic intrusion into the landscape that generates the loss.

These suggest that to minimise negative tourist impact, a very large single developments are preferable to a number of smaller developments, particularly when they occur in the same general area.

13.6 The 'polluter pays' principle

This and other research has shown that wind farm developments cause loss of value to individuals and the public at large. This loss of value relates both to short term disturbance during construction (transport congestion, noise, dirt) and to long term loss of "clear" landscapes. The literature review and the internet study have shown a clear preference for such landscapes. In recognition of the social cost of the development to local communities, developers have often voluntarily lent support to community projects such as village halls.

The issue of compensation for individuals (and its calculation) is not part of the remit of this project and the size of the loss suggested in this research is, in most cases, so small that none would be expected. However there seems no reason to suppose that the compensation principles developed around environmental degradation due to airports, rail links or new roads could not be covered by Section 75 agreements for communities or the very few individuals who suffer significant loss due to any harm to tourism.

Finally it is believed that the loss of value (reduction in the consumer surplus) of tourists could be at least partially offset if farms were developed as free attractions along some of the lines discussed in 13.1.

[22] AMEC (2004) Kyle Wind Farm Proposal, Cumulative Landscape and Visual Assessment

http://www.amec.com/wind/docs/KyleCLVIAReport.pdf

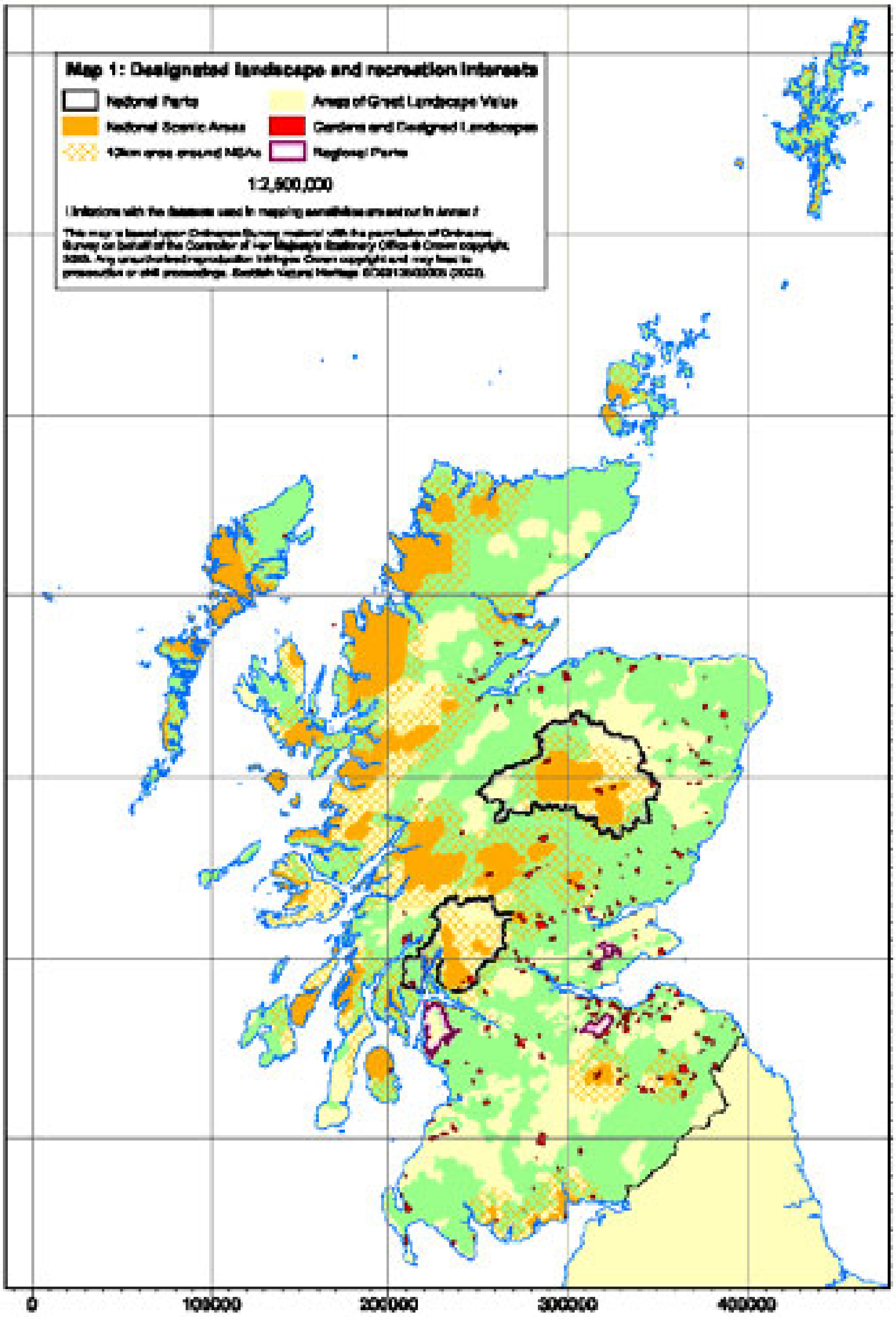
13.7 Protection of Wilderness Areas

There is evidence, particularly in the literature review, that the impact of wind farms is perceived to be greater on remoter, wilder landscapes. The local economies in these areas also tend to be very fragile and tourism extremely important. SPP6 currently states that designated areas should be protected.

The evidence in this study is that most tourists are unaware of these attempts and assume wind farms are spread uniformly throughout Scotland. It may be argued that marketing should try to make a distinction between "undeveloped" wilderness areas with minimal landscape intrusion and "green" rural areas like Caithness and North East Scotland where, as in Denmark, wind farms are accepted as a positive attribute.

Scotland's National Scenic Areas and National Parks (and their buffer areas), shown in **Figure 13-1** could provide an appropriate framework for protection, not only from wind farms but also from other even less desirable intrusions such as Grid Lines and Pylons. It might be argued that the protection should perhaps be offered to all areas defined as of "Great Landscape Value" provided this did not conflict with the marketing message of unspoilt wilderness.

Figure 13-1 Scotland's Scenic Areas



Source: Scottish Executive Rural Group: Paper 2006-2 - Enhancing Our Care of Scotland's Landscapes http://www.scotland.gov.uk/Publications/2006/01/27145442/8

13.8 Conclusion

The general impression gained is that the planning system is in general working well. The research suggests

1. More guidance to planning authorities on how to assess Tourist Impact would be useful
2. In some cases a Tourist Impact Statement within the Environmental Analysis drawn up by developers would be helpful
3. A few large farms would have less total negative impact on tourism than the same number of turbines in medium and small farms
4. This is different from a large number of separate farms in the same area, which is generally unpopular amongst tourists.
5. Most commentators suggest that wind farms in remote and scenic areas have a larger negative impact. Consequently there is a case for the protection of National Scenic Areas and National Parks.
6. Tourists do not recognise that scenic areas are already, in part, protected. It is probably sensible to market these areas as wild or untouched. Conversely those areas, such as Caithness, where there are/will be large numbers of farms, could be marketed as "Green", utilising the positive attitudes to wind farms of the majority of people.

14 Summary and Conclusions

14.1 Introduction

Numerous surveys have established the importance of the Scottish landscape to potential tourists to Scotland. It has also long been realised that many people find that man made structures such as pylons and wind turbines reduced the attractiveness of a landscape. Reduced quality of an important feature must inevitably reduce demand which will result in either reduced prices or reduced numbers or both. This loss of expenditure will lead to a reduction in economic activity and result in a loss of income and jobs. The question therefore is not whether wind farms have an economic impact but rather what is the likely size of the impact, a far more difficult question to answer.

This research sought to answer that question and consisted of five linked sections:

- A Literature Review
- An Intercept Survey of Responses
- A GIS based study of the geographical distribution of the impacts
- An Internet Survey of Loss of Values
- A multiplier analysis to determine the economic impact of any loss of expenditure

It should be noted that each can be regarded as a valid independent study as well as a vital element in identifying the economic impact of wind farms on tourism.

14.2 The literature review

The literature review aimed to provide meaningful bounds for the likely results by reviewing as comprehensively as possible all previous research on the economic impact of wind farms on tourism. The review examined some 40 studies not only in the UK and Ireland but also in Denmark, Norway, the US, Australia, Sweden and Germany. As part of the review a number of the more important studies on attitude and value change were examined. The findings can be summarised as follows

- There is often strong hostility to developments at the planning stage on the grounds of the scenic impact and the knock on effect on tourism. However the most sensitive locations do not appear to have been given approval so that where negative impacts on tourism might have been a real outcome there is, in practice, little evidence of a negative effect.
- There is a loss of value to a significant number of individuals but there are also some who believe that wind turbines enhance the scene.
- An established wind farm can be a tourist attraction in the same way as a nuclear power station. This of course is only true whilst a visit remains an unusual occurrence.
- Over time hostility to wind farms lessens and they become an accepted even valued part of the scenery. Those closest seem to like them most.

- Whilst there is an undoubted loss of value the effect on tourism in practice is extremely small. This possibly reflects the current limited nature of the exposure (e.g 10 minutes in a 5 hour journey) and, as mentioned earlier, the effect of the planning system preventing seriously adverse developments.
- Overall there is no evidence to suggest a serious negative impact of wind farms on tourism.

14.3 The intercept survey

This survey intercepted tourists most of whom had had a recent experience of a wind farm primarily to identify if the experience had altered the likelihood of a return to Scotland. The locations were within four case study areas:

- Caithness and Sutherland
- Stirling, Perth and Kinross
- The Scottish Borders
- Dumfries and Galloway .

The areas were chosen because of the importance of tourism and the landscape in those areas and the presence of a wind farm constructed or under construction.

The survey sought to identify the impact of the actual and simulated wind farm experiences on the likelihood of return. The vast majority (99%) of those who had seen a wind farm suggested that the experience would not have any affect. Indeed there were as many tourists for whom the experience increased the likelihood of return as decreased. Surprisingly there was no difference between those who has a close and extensive experience and those who had a minimal experience. Those who had not seen a farm were more likely to state a decrease in the likelihood of return, which was even stronger when all tourists were faced with a potential extension of the relevant wind farm. However even then this only related to a small minority of tourists. The resulting changes in likelihoods are given in table 14.1.

Table 14-1 Changes in Likelihoods under alternative scenarios

	ALL		Overnight	
Having Seen	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	191	191	137	137
Number Responding	4	4	3	3
Number Not Responding	187	187	134	134
Percent Responding	2.1%	2.1%	2.20%	2.20%
Change in Likelihood	-0.08%	-0.10%	-0.12%	-0.16%
Photo	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	380	380	256	256
Number Responding	11	4	7	3
Number Not Responding	369	376	249	253
Percent Responding	2.89%	1.05%	2.73%	1.17%
Change in Likelihood	-0.73%	-0.05%	-0.70%	-0.10%
Extended	**Area**	**Scotland**	**Area**	**Scotland**
Number Sampled	380	380	256	256
Number Responding	26	5	19	4
Number Not Responding	354	375	237	252
Percent Responding	6.84%	1.32%	7.42%	1.56%
Change in Likelihood	-2.54%	-0.30%	-2.50%	-0.45%

The Intercept Study also investigated attitudes in a broader sense. This found that whilst Pylons were clearly the most objectionable objects, tourists in general disliked wind farms particularly if there were large number of farms within the landscape. The results suggest that whilst there is a clear reduction in the consumer surplus associated with the tourist activity, at the margin the effects are very small; the vast majority simply accepted the reduction.

14.4 The GIS study

Not all tourists in an area will see a wind farm or stay in a room with a view of a wind farm at a time when it is visible. The GIS study was concerned with establishing the numbers who could have visibility, and has used a theoretical maximum exposure with no reductions made to account for tourists staying in rooms where wind turbines are in a line of sight but not visible at the time. This could occur when tourists are only in their rooms when weather or daylight conditions reduce visibility. For example, low cloud or fog could shield hill tops and turbines from view.

The first element of the GIS study consisted of developing a Zone of Visual Impact (ZVI) for each wind farm that was identified as constructed, with permission for construction or currently under consideration after formal application. It did not cover those at the scoping stage or those that had been rejected.

The ZVI's for the areas were combined and each location (square 40m*40m) in the area that could see 4 or more wind farms at less than 15km, identified. The Combined ZVI was layered onto maps containing the important roads in the area and the length of each road in the ZVI calculated. Similarly the CZVI was combined with a map of all accommodation in the area and the proportion of affected bed spaces calculated.

To assess the percentage of tourists affected the number of tourists on each road in the area had to be estimated. This was achieved by extracting from the Scottish Road Data Base monthly figures of traffic flows and taking the difference between summer and winter flows. A number of adjustments were made to account for likely routes and for Scottish tourists heading south

By estimating the number of tourists on roads unaffected by wind farms, the proportion affected could be calculated. Table 14.2 summarises the proportion of tourists and of bed spaces affected in each of the areas

Table 14-2 Proportion of Tourists and Accommodation Affected

Area	Tourists	Accommodation
Caithness & Sutherland	81%	4.9%
Stirling, Perth & Kinross	85%	6.6%
Scottish Borders	91.6%	6.7%
Dumfries & Galloway	98%	16.2%

14.5 The internet survey

The economic impact was believed to result from two main sources. First the intercept study was designed to identify the change in numbers that would go to affected locations. When combined with the proportion of tourists travelling in affected locations it is possible to estimate the proportionate drop in expenditure. Second the internet survey seeks to provide information on the proportionate drop in the prices that would be paid for accommodation if the view from a hotel gained a view of a wind farm.

In the study 600 tourists from the UK and 100 tourists from the US were asked to state how much extra they would pay for a room with a specific view. There were 13 views in total which are summarised in Table 14.3 together with the mean values.

Table 14-3 Scenes and mean values for UK and US respondents

		UK	US
Braes of Doune	**Clear**	£22.71	£26.02
	With Farm	£16.15	£21.36
	Extended	£14.61	£18.75
Bay Near Thurso	**Clear**	£24.29	£30.45
	With Farm	£18.12	£24.37
	Extended	£17.57	£24.44
Waterfall	**Clear**	£17.41	£23.43
	With Farm	£9.44	£17.48
Rural Scene	**Clear**	£15.87	£21.16
	Grid Line	£3.79	£9.08
	2 Grid Lines	£2.16	£7.45
River Scene	**Clear**	£21.98	£29.18
	With Poles	£17.40	£23.44

The only significantly different sub group were the young who found the wind farms far more acceptable. As can be seen from the table, both UK and US Tourists found the pylons the most objectionable of the structures. Wind farms led to a serious decline in value, more marked in the UK than in the US sample. Very surprisingly, when the respondent was unaware that a farm had been extended, the drop in value of the extension was relatively small, as seen in Table 14.4. The consistency of this result coupled with the dislike of a large number of farms suggests that a policy of concentrating developments and making these large would be preferable to a large number of smaller farms scattered over a wide area.

Table 14-4 Loss of Value from Wind Farm Development

	UK		US	
	Loss	**Loss%**	**Loss**	**Loss%**
Basic Wind Farm Average Loss	£6.90	18.00%	£5.56	8.70%
Extended Wind Farm Average Loss	£7.41	23.20%	£6.64	12.80%

In the short term, given a linear demand function, the fall in willingness to pay for a "room with a view", results in an equal fall in the mean price actually paid by the tourist. Consequently the proportionate fall in expenditure on accommodation can be calculated. When combined with the proportion of rooms in an area affected by wind farm development estimated in the GIS analysis, estimates of tourist expenditure lost in the accommodation sector in each area, as shown in Table 14-5 were obtained.

Table 14-5 Reduction in Accommodation Expenditure

Area	**Affected Accommodation%**	**Reduction in Expenditure %**
Caithness and Sutherland	4.90%	0.48%
Stirling, Perth & Kinross	6.60%	0.65%
The Scottish Borders	6.70%	0.66%
Dumfries & Galloway	16.20%	1.59%

The internet study also had three questions concerned with the perception of the number of wind farms and the reaction to them. This showed that:

- The public believed that wind farms were more prevalent than was factually the situation
- That they were unaware of attempts to keep them from the most scenic areas

- That a substantial number (17%) claimed that they were less likely to visit if more wind farms are built
- That this was less marked amongst the young.

In our view a substantial proportion of the 17% are registering what might be termed a protest vote. They do not like the impact of wind farms on the scenery (like the majority of respondents) and indicate that position in the only way they can, by identifying withdrawal. In comparison those actually intercepted have a better idea of the actual numbers and very wide dispersion and the relatively benign impact. The key then is for tourist bodies to insure that the perception of the situation is closer to the reality and to get people to Scotland.

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14.6 Economic multiplier analysis

The economic analysis is based upon three core pieces of information for each area and Scotland:

- The number of tourists
- The typical expenditure of these tourists
- The size and structure of the local economy.

Each study area consists of one or more NUTS4 region, a NUTS4 region being a local authority or some division of it relating to an enterprise company area. In this case Caithness and Sutherland, Dumfries and Galloway and the Scottish Borders are NUTS4 regions, whilst Stirling, Perth and Kinross area consists of two such regions corresponding with the local authorities. Tourism Statistics are often presented by Tourist Areas. In the case of Dumfries and Galloway and The Scottish Borders these are identical to the Local Authority/NUTS4 regions. Perthshire Tourist Board Area covers the Perth and Kinross region but Stirling is part of the huge tourist board that covers Loch Lomond, the Trossachs, Argyll and the Isles. Caithness and Sutherland is part of the Highlands but has had a number of analyses undertaken at the NUTS4 level.

Estimates of tourist activity (number of overnights) by NUTS4 area were made using Visit Scotland data supplemented where necessary by the evidence submitted by local authorities to support Grant-in-Aid financing.

Estimates of "long" day trips were made utilising the GB Day Visitor Survey supplemented by the Road Analysis undertaken as part of the GIS study, the National Travel Survey and a gravity model.

Estimates of expenditure patterns for tourists had been made in a number of studies undertaken by the consultants over a number of years. No attempt was made to identify a specific pattern for those likely to be lost to a specific region.

Together these estimates provide the expenditure by main category in each region.

The proportion of tourist expenditure lost in each region as a result of wind farms was calculated by combining the results of the Intercept survey and the GIS roads analysis and applied to the estimated tourist expenditure in the region. The resulting change in expenditure was then fed into the DREAM model of the region to provide estimates of the employment and income (gross value added) lost.

The change (loss) in tourist expenditure in the accommodation sector was estimated by combining the proportionate fall in price of affected rooms, the proportion of rooms affected and the total expenditure on accommodation by tourists in the region. This was then input into the DREAM model and the impact on employment and income estimated. The results are summarised in Table 14-6

Table 14-6 Economic Impact of Wind Farms on Tourism

	Current Estimated Total GVA		Potential Reduction by 2015 due to Tourism Visits (vs. no wind farms)		Potential Reduction by 2015 due to Accommodation Spending (vs. no wind farms)		**Maximum** Total Reduction by 2015 due to Tourism Effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7=3+5)	(8=4+6)
	GVA £m	Jobs	GVA £m	Jobs	GVA £m	Jobs	Total GVA in all industries £m	Total jobs in all industries
Caithness & Sutherland	£466	1,590	£0.6	27	£0.1	3	£0.7	30
Stirling, Perth & Kinross	£2,961	10,600	£5.2	279	£1.1	60	£6.3	339
Scottish Borders	£1,150	3,600	£1.5	75	£0.2	6	£1.7	81
Dumfries & Galloway	£1,661	4,800	£3.0	200	£1.1	77	£4.1	277

As at June 2007 (obtained from http://www.restats.org.uk/2010_target/2010_Datasheets/Planning_Database_Extract_June_2007.xls)

For Scotland it was assumed that the accommodation losses in one area would be offset by gains in other unaffected areas. Similarly only those who stated in the Intercept study that they would not return to Scotland were used. Because of the impact of new wind farms on the M74 corridor as few as 5% of tourists to Scotland will not experience wind farms in the future. As before the change in likelihood was combined with the proportion of tourists affected and estimates of total tourist expenditure in Scotland to give an estimate of expenditure change. In the Scottish case the DREAM model is the input-output table for Scotland, which is used to generate estimates of the direct, indirect and induced effects and the total impact on employment and income. For Scotland this is £4.7m in come associated with 211 FTE jobs.

14.7 Conclusion and planning implications

Whilst it is clear that there is an impact, this impact is very small. It might however be further reduced if a **Tourist Impact Statement** was made a part of the planning process. This statement would require an analysis of:

- Tourist flows on roads that are located in the ZVI of the wind farm
- Numbers of bed spaces within the same ZVI.

It seems reasonable to hypothesise that the location of farms that can be viewed from major tourist routes like the M74 and A9 should be avoided, or should be developed alongside measures to screen them from view- for example, landscaping with woodlands.

The evidence is overwhelming that wind farms reduce the value of the scenery (although not as significantly as pylons). The evidence from the Internet Survey suggests that a few very large farms concentrated in an area might have less impact on the Tourist Industry than a large number of small farms scattered throughout Scotland. However the evidence, not only in this research but also in research by Moran commissioned by the Scottish Government, is that Landscape has a measurable value that is reduced by the introduction of a wind farm. Concentration of wind farms might have serious implications for a limited number of individual households. A system of compensation by developers might go some way to placate those most negatively affected.

Appendix 1
Intercept Survey

DECLARATION: Interview conducted by me in accordance with instructions and MRS Code of Conduct

Signed (Interviewer Name):____

Time of Interview:__________ **Location of Interview:_____________**

Weather (circle as appropriate):

Sunny **Sunny Intervals** **Cloudy/Overcast**

Light Rain **Heavy Rain**

Introduction guidance:

READ OUT:

Good morning/afternoon….I am an interviewer with Glasgow Caledonian University, we are carrying out a visitor survey on behalf of the Scottish Executive.

The survey is about your opinions on features of Scotland's scenery and landscape. Could you spare some time to answer some questions? The interview will take around 5 minutes, but certainly no more than 10 minutes.

Firstly, may I assure you that the interview will be carried out according to the Market Research Society's Code of Conduct, guaranteeing your anonymity as findings will be reported in aggregate.

A. RESPONDENT PROFILE

SHOWCARD 1 (TRIP TYPE)

Q1. Which of the following is the main reason you are in the area today:

1	On a day trip from home (less than 3 hours) **go to Q4**	*Continue with interview*
2	On a day trip from home (3 hours or more) **go to Q4**	
3	On holiday (overnight stay away from home) **go to Q2**	
4	Visiting friends & relatives (on holiday) **go to Q2**	
5	On holiday as a leisure extension of business trip **go to Q2**	
6	On business (not staying away from home)	*Stop interview and thank them for their time*
7	On business (overnight stay away from home)	
8	Visiting friends & relative (as a duty rather than holiday)	
9	Personal business (e.g. doctor/dentist appointment)	
10	Shopping (normal/for essentials)	
11	Other…(SPECIFY) **go to Q2 if overnight trip is involved** **go to Q4 if no overnight trip is involved**	*Continue or stop interview depending on whether a 'holiday choice' has been made*

Q2. How many nights in Scotland will you be spending on this trip?

Write in number

SHOW MAP A. GIVE RESPONDENTS THE MAP TO REFER TO DURING THIS SET OF QUESTIONS

Q3. How many nights **in this area** will you be spending as part of your Scotland trip?

1	Write in number	*Note: this should be equal to or less than answer to Q2 above*
2	Just passing through	*Note: Enter '0' in box above if just passing through*

Q4. Is this your first holiday in **Scotland**? Yes ☐ No ☐

Q5. Is this your first holiday to this **Area**? Yes ☐ No ☐

(Refer to map again)

SHOWCARD 2 (ACTIVITIES UNDERTAKEN)

Q6. Which activities have you participated in or intend participating in as part of your trip? **MULTIPLE RESPONSES POSSIBLE**

Q7. Which activity is the main activity you will participate in? **SINGLE RESPONSE ONLY**

	Q6 Any Activity	**Q7** Main Activity (one only)
Visiting castles, monuments, churches	1	1
Hiking, hillwalking, rambling, other walking	2	2
Visiting museums, galleries, heritage centres	3	3
Swimming	4	4
Watching wildlife, including birdwatching	5	5
Visiting gardens, forests and other flora locations	6	6
Golf	7	7
Visiting Theme Parks/Activity Parks	8	8
Attending an event	9	9
Fishing	10	10
Cycling, mountain biking	11	11
Water based sports	12	12
Watching performing arts	13	13
OTHER (specify) …………………………………………….. …………………………………………….. …………………………………………….. ……………………………………………..	14	14 specify main activity if several 'other' activities are given ……………………………

Note: the activities used have been adapted from those referred as most undertaken by visitors as evidenced in Tourism in Scotland 2005 (VisitScotland).

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SHOWCARD 3 (WHO ARE YOU TRAVELLING WITH?)

Q8. Which of the following best describes who you are travelling with on this trip?

1	Partner only
2	Other members of your family
3	Friends
4	Family and friends
5	An organised group
6	On your own
7	Someone else (SPECIFY):

……………………………

Q9. In which country do you live?

1	Scotland
2	England
3	Wales
4	N. Ireland
5	Republic of Ireland
6	Other Overseas – **write in here name of country**……………………………

SHOWCARD 4 (AGE)

Q10. What age range are you in?

1	16-24	**5**	55-64
2	25-34	**6**	65+
3	35-44	**7**	Refused
4	45-54		

Q11. Gender?

1	Male
2	Female

SHOWCARD MAP B (ROUTES) – Indicate present location by 'You are here' points

Q12. Which of these routes best describes how you got to your present location?

1	Route 1
2	Route 2
3	Other Route

CHECK RECORD ON QUOTA SHEET AND CLOSE INTERVIEW IF QUOTA REACHED

SHOWCARD – SLIDE RULE

Q13. Could you tell me how likely you are to come and stay in this **AREA** again in the future? **(Refer to MAP A again)**

Explain that 0% means they will never return and 100% means they will definitely return at least once.

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE LIKELIHOOD, NOTE SCORE

Write in score: [%]

Q14. Please give a reason for your answer:..

Q15. Could you tell me how likely you are to visit **another part of SCOTLAND** again in the future?

Explain that 0% means they will never return and 100% means they will definitely return at least once.

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE LIKELIHOOD, NOTE SCORE

Write in score: [%]

Q16. Please give a reason for your answer:..

SHOWCARD 5 (STRUCTURES IN THE LANDSCAPE)

Q17. How do you feel the following structures impact on your experience of Scotland's scenery?

	Strongly Positive	Slightly Positive	No impact	Slightly Negative	Strongly Negative
Electricity pylons and wires	1	2	3	4	5
Wind farms and turbines	1	2	3	4	5
Mobile telephone masts	1	2	3	4	5
Ski Uplift (Railways, Chairlifts, Tows) and Ski Fencing	1	2	3	4	5
Planted forestry and forest felling	1	2	3	4	5
Telephone wires and poles	1	2	3	4	5
Hydro-electric dams	1	2	3	4	5
Power stations	1	2	3	4	5
Fish farms	1	2	3	4	5
Quarries	1	2	3	4	5
Trails and tracks across open upland areas	1	2	3	4	5

READ OUT:

The Executive is keen to obtain your views to help them consider more fully the relationship between the development of wind farms and tourism.

SHOW MAPA again for reassurance

Q18. Did you see a wind farm in this area on your way here?

Yes ☐ **Go to Q19** No ☐ **Go to Q23**

Q19. Now that I have drawn your attention to the wind farm development, would this affect your decision – either positively or negatively – to visit **this AREA again?**

Yes ☐ **Go to Q20** No ☐ **Go to Q21**

SLIDE RULE

Q20. Please indicate how this would affect your decision to visit this Area again

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM ANSWER AT Q13, NOTE SCORE

Write in score [%] **(NOTE: score should be different from that in Q13)**

Q21. Now that I have drawn your attention to the wind farm development, would this affect your decision – either positively or negatively – to visit **another part of SCOTLAND again?**

Yes [ ] **Go to Q22** **No** [ ] **Go to Q23**

SLIDE RULE

Q22. Please indicate how this would affect your decision to visit another part of Scotland again

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM ANSWER AT Q15, NOTE SCORE

Write in score [%] **(NOTE: score should be different from that in Q15)**

RETURN INDICATORS TO ORIGINAL SCORES GIVEN IN Q13 AND Q15

Q23: READ OUT: Here are pictures of the landscape before and after the wind farm development.

SHOWCARD 6 (IMAGES BEFORE AND AFTER WIND FARMS)

Now that you can see the effect of the wind farm in the pictures, do you think this would affect your decision - either positively or negatively – to visit **this AREA again?**

Yes ☐ **Go to Q24** **No** ☐ **Go to Q25**

Q24. Please indicate how this would affect your decision to visit **this AREA again**?

SLIDE RULE

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM BASELINE

Write in score: ☐ % **(NOTE: score should be different to Q13)**

Q25. Looking at the effect in the pictures again, would this affect your decision – either positively or negatively – to visit **another part of SCOTLAND again?**

Yes ☐ **Go to Q26** **No** ☐ **Go to Q27**

Q26. Please indicate how this would affect your decision to visit **another part of SCOTLAND again**?

SLIDE RULE

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM BASELINE

☐ %

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Write in score: **(NOTE: score should be different to Q15)**

RETURN INDICATORS TO ORIGINAL SCORES GIVEN IN Q13 AND Q15

READ OUT: The next photo shows how the area might look if further development of the existing wind farm took place.

SHOWCARD 7 (IMAGES OF BEFORE, AND OF EXTENDED DEVELOPMENT)

Q27. Would this affect your decision – either positively or negatively – to visit **this AREA again?**

Yes ☐ **Go to Q28** **No** ☐ **Go to Q29**

Q28. Please indicate how this would affect your decision to visit **this AREA again**?

SLIDE RULE

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM BASELINE

Write in score ☐ % **(NOTE: score should be different to Q13)**

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Q29. Looking at the photos again, would this affect your decision – either positively or negatively – to visit **another part of SCOTLAND again**?

Yes ☐ **Go to Q30** **No** ☐ **Go to Q31**

Q30. Please indicate how this would affect your decision to visit **another part of SCOTLAND again**?

SLIDE RULE

ALLOW RESPONDENT TO MOVE SLIDE TO INDICATE CHANGE IN OPINION FROM BASELINE

Write in score [%] **(NOTE: score should be different to Q15)**

SHOWCARD 8 (ATTITUDE STATEMENTS TOWARDS WIND FARMS)

Q31. I would now like to read out some statements made by other visitors and tourists about the development of wind farms in Scotland. Please indicate the extent to which you agree or disagree with each of them using the scale indicated on this card.

	Agree Strongly	Agree Slightly	Neither agree nor disagree	Disagree Slightly	Disagree Strongly	Don't Know
I prefer wind farms when they are visible on the sky line.	1	2	3	4	5	Y
I think that wind farms should be painted different colours, rather than always being white.	1	2	3	4	5	Y
A wind farm, if correctly sited, does not intrude or ruin the landscape.	1	2	3	4	5	Y
Wind farms can enhance the landscape.	1	2	3	4	5	Y

Q32. Have you ever seen a wind farm anywhere else?.

Yes ☐ **No** ☐

Q33. Did you know about the wind farm before you decided to make your visit?

Yes ☐ **No** ☐

Thank you for your valuable time and I hope you enjoy the rest of your trip

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Appendix II

The Internet Survey

The Value of Scotland's Landscape

GLASGOW CALEDONIAN UNIVERSITY

Caledonian Business School

On the following pages we will be showing you views of Scotland as if taken from the picture window of a double/twin room in a 3 or 4 star hotel. You will be asked about how much you, as a potential tourist, would be willing to pay to obtain the view shown.

On the first page we ask a few general questions about you. This information will be anonymous and will be used only to ensure that we have a result that represents tourists in general.

Finally we ask a three short questions about how you perceive developments in the scenery of Scotland.

If you have any queries or would like more information about the survey please email; g.riddington@gcal.ac.uk

About You

Q1	Gender	Male	Female
Q2	Your Age?	16 - 25 26- 45	46-65 Over 65
Q3	Where do you live? --Click Here--		
Q4	Have you ever visted Scotland?	Yes	No

Q5 **Normal form of accommodation in Scotland (if away from home)**

- Hotel
- Bed and Breakfast, Hostel
- Hired Caravan
- Caravan, Campervan, Tent
- Self Catering
- Other

Q6 **Number of Adults (over 16) in the holiday group you would pay for**

- Alone
- 2
- 3 or 4
- More than 4

Q7 **Number of children in this holiday group**

- None
- 1
- 2
- 3 or 4
- More than 4

Q8 **Typical Daily Expenditure for group when on a trip in Scotland**

- More than £500
- £250-£500
- £150-£249
- £0-£149

Q9 **On your most recent overnight visit, which of the following describes best your reason for visiting Scotland?**

- To see Scotland
- To see friends and relatives
- To go shopping
- Business trip
- To see Scotland as an extension of a business trip
- Personal business (appointment with doctor, dentist, solicitor, interview etc.)
- To undertake a cultural activity (theatre visit, concert, art gallery etc.)
- To participate in a sporting or outdoor activity
- To watch a sporting activity
- Other

This is the view of a standard room from a window of a double/twin room in a 3 star hotel. What is the maximum you would pay for a twin/double room per night without breakfast in a 3 star hotel in a rural area with this view (staying two days)?

--Click Here--

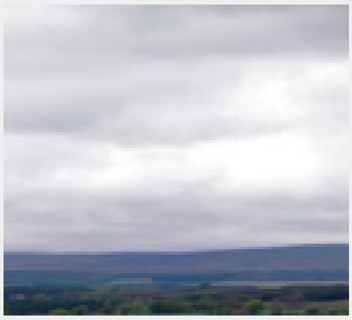
Now assume that at that same hotel there is another room available.

The rest of this survey will ask you to compare the carpark view with an alternative view. You will be asked to state the MAXIMUM amount you would be willing to pay to upgrade to a room with the view offered. Please note that the money paid for an upgrade will be charged on top of the fee you stated you would pay in the previous question

Please be aware that some of the views are very similar to each other, though there are differences between them.

What is the maximum extra you would pay for a twin/double room in a 3 or 4 star hotel to upgrade to the view on the right?

--Click Here--



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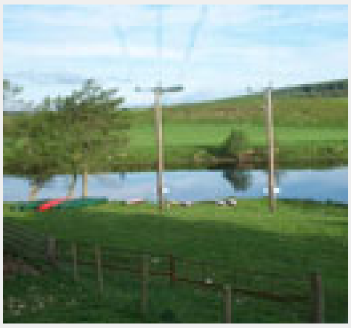

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 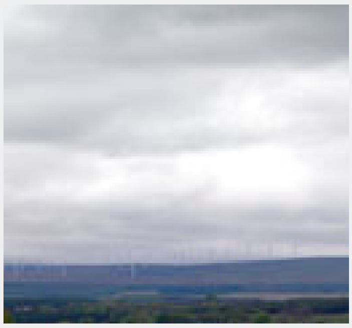

What is the maximum extra you would pay for a twin/double room in a 3 or 4 star hotel to upgrade to the view on the right?

--Click Here--

Q24 **On a 2 hour journey in a non scenic area of Scotland how likely do you think you are to see a wind farm?**

- *Very likely*
- *Quite likely*
- *likely*
- *Not very likely*
- *Not at all likely*

Q25 **On a 2 hour journey in a highly scenic area such as Glencoe, Loch Lomond, Skye or the far North West, how likely do you think you are to see a wind farm?**

- *Very likely*
- *Quite likely*
- *likely*
- *Not very likely*
- *Not at all likely*

Q26 **If the number of wind farms in non scenic areas increases, what will be your likely response?**

- *Go to see them*
- *No response*
- *Avoid the areas*
- *Avoid Scotland*

Thank you for your assistance. Please click submit to complete the survey.

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