Wind farms and tourism in Scotland:

A review with a focus on mountaineering and landscape

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I am grateful to a number of reviewers who gave their time and expertise to improve this report and to critics at wind farm planning inquiries who also made me think and improve the review, even though that was not their intention. Any errors remain my responsibility.

After completing a PhD in Geography, Dr Gordon worked for over 30 years in information analysis and interpretation, retiring in 2009 as Head of the Public Health Observatory Division of NHS Health Scotland. He was an elected Board member of Mountaineering Scotland, holding the remit for Landscape and Planning matters, from 2012 to 2016. He is now a planning volunteer with it.

Mountaineering Scotland (also known as The Mountaineering Council of Scotland) represents, supports and promotes Scottish mountaineering and is a not-for-profit company, limited by guarantee, with 14,000 members. Mountaineering Scotland also acts for the 80,000 members of the British Mountaineering Council on matters related to landscape and access in Scotland.

"*You can't place a value on the feeling of wellbeing you get from a beautiful landscape.*" [1]

1 Introduction

1. In the course of public debate on contentious topics, especially when large sums of money and politics are involved, 'evidence' is often collateral damage. Statistics are more often than not used, as the old joke has it, as a drunk uses a lamp-post: for support not for illumination.

2. This paper is the product of frustration and dismay at the misuse of evidence, particularly statistical evidence, by a powerful pro-wind lobby to create a confused, unbalanced and complacent picture of the possible impact of the growth of onshore wind electricity generation in Scotland on tourism and recreation, particularly mountain-linked tourism and recreation. Hyperbole by opponents of wind energy in the face of this well-organised and well-connected lobby is understandable, but equally fails to illuminate.

3. Proponents of wind farms would have us believe that tourism impacts are negligible. Opponents would have us believe that the destruction of tourism in Scotland is nigh. Neither position is at all tenable. The real position is much more subtle and complex. That is an uncomfortable message for all sides in a polarised debate.

4. This paper is an independently-written attempt to assess, as objectively as possible, what is really known about the possible impact of wind farms upon mountain-linked tourism and recreation within Scotland. This is set in the context of tourism in general, not least because there is no data specifically on mountaineering other than that produced by Mountaineering Scotland itself. It is foregrounded by a brief setting out of my personal and Mountaineering Scotland's positions so that readers can judge whether these have biased my interpretation of the available evidence.

The key findings are:

5. There is no simple answer to the question of whether wind farms affect tourism (or recreation). It depends on
   - the characteristics of the proposed development, both individually and as part of regional and national patterns;
   - the nature of the local tourism offer and market, and that of competitors;
   - and the characteristics of local tourists.

6. The hypothesis that best fits the available, far from perfect, data is that wind farms do have an effect on tourism but the effect is experienced predominantly in areas where large built structures are dissonant with expectations of desired attributes such as wildness or panoramic natural vistas, and where a high proportion of visitors come from the 25% of tourists in Scotland who are particularly drawn by the quality of upland and natural landscapes, with mountaineering visitors prominent amongst these. In much of Scotland, and for most tourists, wind farms are no serious threat to tourism: the nature of the local tourism offer, and good siting of wind farms, mean they can co-exist.

7. The main adverse effect of wind farms on tourism, thus far, is displacement within Scotland from areas perceived as 'spoilt' to areas seen as still retaining the desired sense of naturalness. The GCU Moffat Centre study, relied upon by developers and the Scottish Government, estimated the likely level of tourism displacement across Scotland by wind farms to be around 1-2%. The estimates in the present paper range up to 5%. This difference is modest given the five-fold increase in onshore wind farm capacity in Scotland between the data points for the two studies (2007 & 2015).

8. Tourism in Scotland is not thriving, with standard indicators of tourism volume in 2016, the latest available consistent data, still below pre-2008 levels. Positive media coverage of a 'thriving' tourism sector, typically based on statistically selective press releases, is seldom supported by the full figures. In a competitive world, it is foolish to put at risk any segment of Scotland's tourism market.

9. Five per cent of Scottish tourism spend would be £250m. This is well within the range of fluctuation seen in national tourist spend from year to year and therefore undetectable, even if it was all lost to Scotland and not simply displaced within Scotland. Since the true figure could well be smaller, attempting to find evidence in national or regional tourism statistics of the effect of any particular change is almost certainly futile. It is statistically illiterate to think the lack of detection of a modest effect in volatile regional and national tourism statistics is evidence of no effect.

10. But any effect of wind farms will be much less visible in routine statistics because the income is not lost to the national tourism economy but displaced and relocated within Scotland. Even the lowest level estimated – 1% or £35m – would have a marked impact if concentrated in a limited number of places. It is still doubtful if such an effect could be detected in routine statistics since much tourism economic activity does not feature in statistics (e.g. many tourism business are below the VAT registration level) and it is such activity that might be most likely to be affected by a local drop in visitors.

11. BiGGAR Economics has attempted to look at impact in the vicinity of a general cohort of wind farms and has found no effect. Setting aside several methodological concerns about this study, the sample included only one wind farm in an area where a tourism effect would be predicted based on the conclusions of the present paper. The post-construction outcome data for this wind farm was confounded by continuing wind farm construction locally, making it impossible to separate any tourism effect from the effect of construction worker accommodation and expenditure.

12. The evidence on wind farms and tourism in Scotland relates to the present pattern of development consented under a rigorous planning system. Mountaineering Scotland does not agree with all planning decisions, but the process is certainly exacting. This makes it difficult to assess impact on mountaineering or wild land tourism empirically because few wind farms that might be expected to have an adverse effect have been consented and most are not yet built. Insofar as Mountaineering Scotland objections can be used to identify planning applications in areas important for mountaineering and related tourism, there have been only eight wind farm consents in such areas and only two were operational by 2016. When wind farms are refused planning permission in mountain or wild land areas the reasons given are typically landscape and visual, but an unrecognised side-effect has been to limit potential for tourism impacts.

13. Despite the clearly inadequate nature of the present evidence base on wind farms and tourism, the Scottish Government remains content with reviews of old research with almost no primary research later than 2008, despite the substantially changed context. That the government and its agencies have little interest in commissioning research to better define and understand the interaction between specific segments of the tourism market and wind farms is to be regretted and serves the public interest poorly.

14. Strategic and local planning decisions on the extent and pattern of wind farm development in Scotland should take better account of the potential for adverse impact in areas important for landscape-dependent tourism, and safeguard sufficient such areas in each part of Scotland. It is not enough to protect only those landscapes within the small number of National Parks and National Scenic Areas.

2 Statistics and evidence wars

15. Outside science and academia, statistics are rarely deployed neutrally. They are usually presented to create a favourable impression in the mind of the reader and interpreted by the reader according to a predetermined position. There are many ways in which this can be done.

    - It begins with the choice of data to collect, or not collect. It is, for example, remarkable how little original research there has been on wind farms and tourism or recreation in Scotland given the dramatic change they are bringing to Scotland's landscapes.
    - Selective presentation of data is common: for example, press-releasing chosen figures without making full results public.
    - Highlighting certain statistics is inevitable when summarising large data sets but this can also be done systematically to manipulate opinion: for example, there are many components to national tourism statistics and every year or quarter at least one component is likely to show improved performance and can be highlighted as 'evidence' of how well the sector is performing.
    - Posing a question and then presenting data related to but not directly addressing the question can create an inaccurate impression: for example, the citing of general data on public preferences for different forms of electricity generation to support the contention that wind farms have no effect on tourism.

16. The public is susceptible to being misled by such corporate tricks.[2] Relatively few people are adept with statistics. Partial statements, failure to contextualise, invalid extrapolation, and authoritatively-delivered weakly evidenced or unevidenced statements are all commonplace.[3] Often it is sufficient simply to manufacture doubt or confusion about 'scientific' evidence. There is also a natural tendency for people to accept statistics that support an emotionally-preferred position ('*clean green energy*') while finding reason to reject those that do not.

17. There is often good reason to criticise statistics. Even when they are being analysed and presented scrupulously, there will be mistakes and errors. Research and data collection are often, to some degree, a step in the dark (otherwise it is administration not research). There is no survey or research undertaken that cannot be criticised in some way. The pages of quality scientific journals demonstrate this amply. Getting good data is usually challenging and often expensive. This is particularly the case in a diverse field such as tourism. Science advances by making mistakes and then making improvements. Advocacy, however, takes a very different approach. Even when the inevitable mistakes are relatively inconsequential, they will be highlighted and emphasised by those who feel their agenda is threatened by particular findings and whose primary concern is to undermine any such research and often also the organisation associated with it.

18. It might be thought that government and its agencies, as protectors of the public interest, are immune from this. That only developers and pressure groups engage in evidence wars. On the contrary, the public sector is no respecter of evidence. The technical stages of data gathering, analysis and initial presentation may well be carried out professionally and dispassionately. However the preceding stage of what evidence-gathering to fund and the following stages of how to present the results publicly are deeply influenced by the preferences of those responsible for formulating, presenting and evaluating public policy (see Box 1).

Box 1

Two examples of how the flow of public information is controlled, whether intentionally or not, can be drawn from SNH.

SNH produces data on the Visual Impact of Built Development.[4] This was published roughly annually for 2008 to 2013, about a year in arrears – a reasonable delay for assembling and analysing the data. It showed the rapid growth of wind farm visibility in Scotland (from 20% in 2008 to 46% in 2013) and the steady decline in the proportion of Scotland's land area from which built development could not be seen (from 34% in 2008 to 27% in 2013). Ministers no doubt found these figures inconvenient since they could be used to question the drive to develop wind farms across Scotland. It has not been published since November 2014.

SNH produced annually a map of onshore wind farms (approved, application and scoping) until August 2013. This was not without difficulties with data, but it provided the only public national mapping of the pattern of wind farm development in Scotland. Although the raw data remains available on the SNH website, it can only be used by specialists with GIS software. There is no longer a published map useable by the general public. There is no longer the potential for adverse publicity for the government attendant on the publication of such a map.

19. With so many reasons not to trust statistics, why should we bother with them? Because, used properly, they can inform debate, promote democracy, and give a voice to those who would otherwise be overlooked.

    - First, just because statistical evidence is often misused for support does not mean that it cannot also be used properly to illuminate, even if only dimly and partially.
    - Second, statistical evidence generally comes from or is transmitted by those with money, skills and time to invest. This is usually those with a commercial or political interest to promote. It is in the public interest that there is good decision-making and that requires challenge and debate, or the statistical case goes by default to those with resources, power and influence.
    - Third, the public interest involves many 'publics'. We are all, as individuals, simultaneously members of many publics. Am I characterised solely by being a hill-walker, a grandfather, a car driver, a cyclist, or by all of the above and much more? In most major decisions, there are competing public interests, each of which should have its voice heard and that voice is stronger when it is informed by statistical evidence as well as by emotion.

3 About the author, climate change and energy

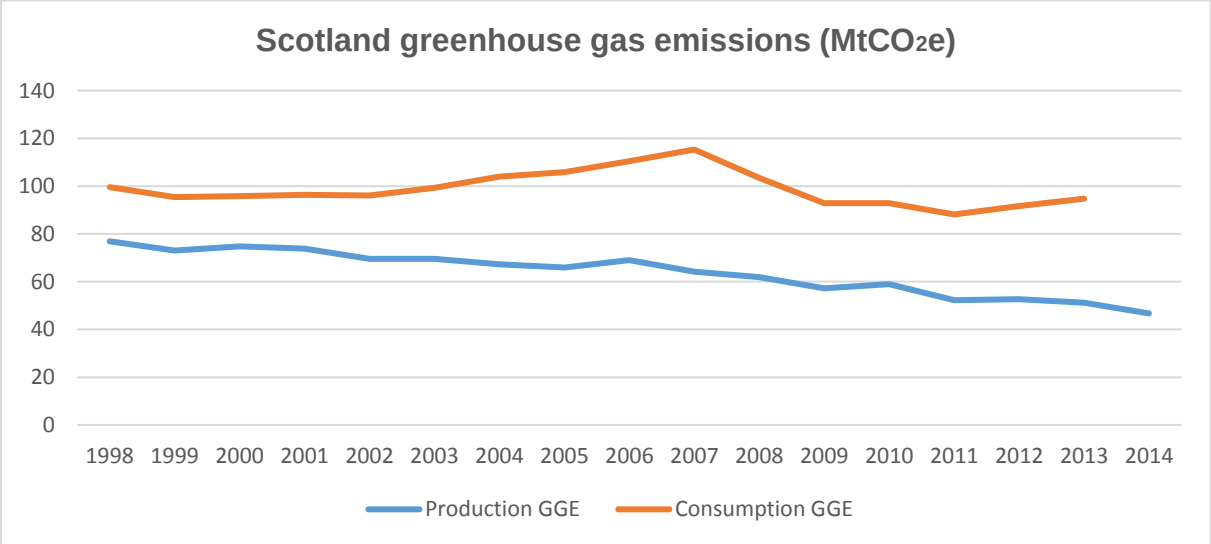
20. Why should you want to know about me? First, because you need to know that I have the professional competence to undertake this review. Second, because you need to know something of my values and views so that you can judge if they have biased this paper.

21. My entire professional career, mainly spent in public health intelligence, had at its core collecting, interpreting and reporting on a wide range of statistically-based evidence. I graduated from Edinburgh University in 1975 with an MA(hons) in geography and then took a PhD in agricultural geography at Sheffield University. This was followed by jobs in the NHS, the voluntary sector, academia and then for the final 20 years the NHS again. All these jobs involved collecting, interpreting and reporting on a very wide range of statistical evidence. I retired as head of the Public Health Observatory Division (i.e. statistics and intelligence) of NHS Health Scotland, the health improvement arm of the Scottish NHS. I am the author of over 60 published papers and peer-reviewed reports.

22. I have been a hill-walker for over 45 years. In that time I have completed many of the well-known lists of hills in Scotland and Britain. As a stravaiger as well as a bagger, my love of the uplands is deeply rooted in the landscape. Modest experience walking abroad has strengthened my sense that here in Scotland we have an upland walking environment that is distinctive and special, but whose quality is being rapidly eroded.

23. I find the political use of statistics by the Scottish Government deeply frustrating, creating an impression of concern for the environment but failing to target the key driver of our climate and environmental impact: not the territorial emissions *produced* in Scotland but those attributable to Scottish *consumption* (Figure 1). The former show the desired downward trend and are issued annually with congratulatory publicity. The latter show Scotland's carbon footprint rising and are infrequently reported without fanfare.

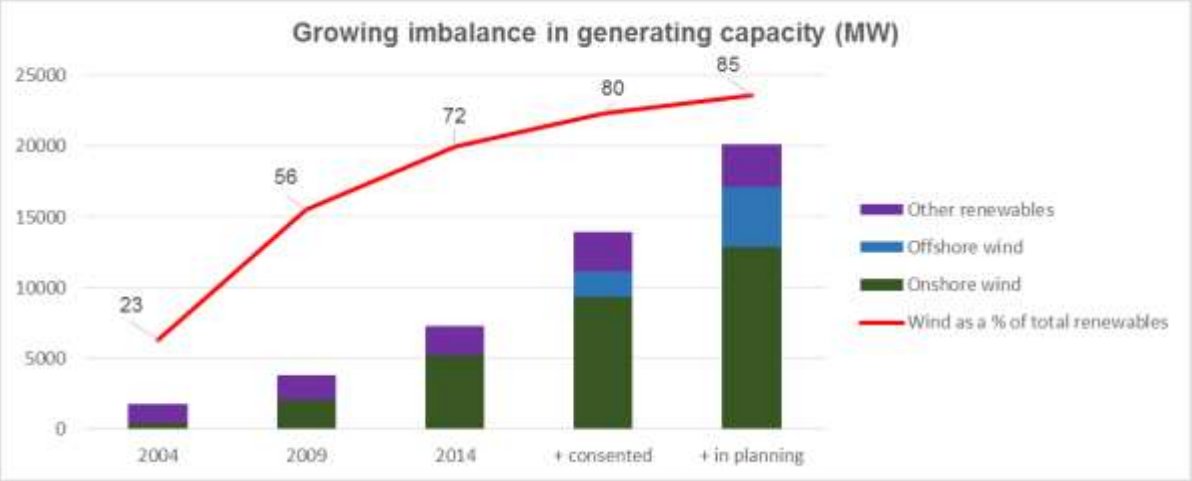
Figure 1[5]



24. I want to see a mix of low-carbon electricity sources in Scotland, which politicians and renewables lobbyists also claim to want.[6] But the Scottish Government's "sustained, national economic mission around energy development"[7] only has wind available at the

scale needed, and predominantly onshore wind in the timescale needed, to meet its politically-inspired target on renewable electricity generation. So what is being built is an over-dependence on wind – by its nature uncontrollable and variable – leading to reliance on importing fossil-fuelled (largely gas) electricity from England to keep the system balanced (Figure 2).

Figure 2[8]



25. In my view, there are many places in Scotland where wind farms are acceptable from a landscape perspective, though they are rapidly being used up. There are many places where they are not, though some have nonetheless been approved for development. Other people will hold a different view and landscape, though the focus of this paper, is most certainly not the only planning consideration. Nonetheless, our hills and wild places are small and finite. They deserve better than yet another short-term wave of degradation and exploitation (coming in sequence after sheep, deer and grouse, and forestry) to produce profit for often-distant companies and shareholders.

26. My own views are consistent with Mountaineering Scotland policy, set out below, but with my personal opposition triggered at a lower threshold of impact and on a wider range of landscapes, such as wild but not mountainous landscapes.

4 Mountaineering Scotland position

27. I played a key role in drafting the most recent Mountaineering Scotland policy on wind farms[9], which was then endorsed by the Mountaineering Scotland Board and by the membership. It was informed by a prior membership survey to ensure that the position being set out was one that reflected the majority view of the membership. Mountaineering Scotland, established in 1970, is not an anti-wind or a conservation organisation but a pro-mountain one. Its membership is united only by their interest in mountaineering sports and its remit in regard to wind farms, or to other developments on the hills, is to act to safeguard and promote the landscape in which hill-walking, climbing and ski-mountaineering take place.

28. The Mountaineering Scotland policy can be summarised as opposing only those proposals regarded as potentially most damaging to Scotland's mountains and to the mountaineering experience.

29. It is stated at more length in *Respecting Scotland's Mountains*[10] :

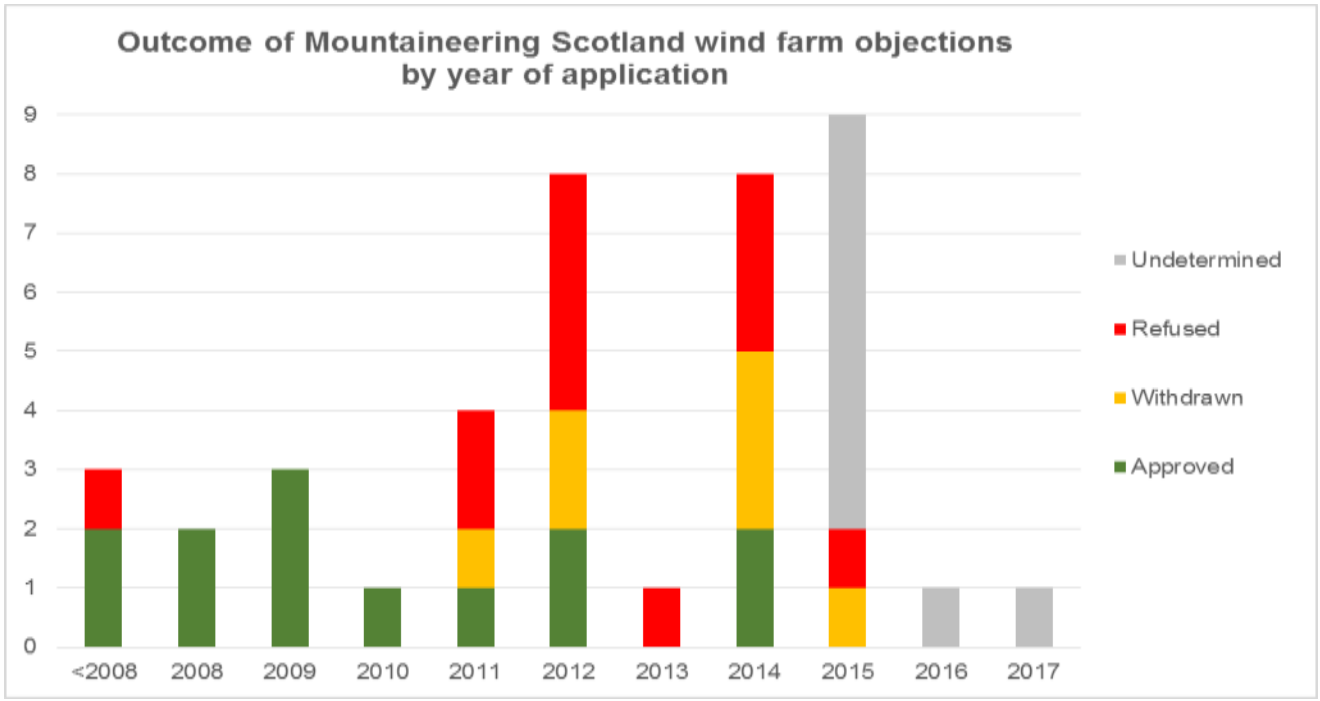
> The MCofS [Mountaineering Council of Scotland] supports the Scottish Government's aim of developing clean, renewable energy sources but opposes developments that threaten the wild landscape of Scottish mountains. The protection for wild land in Scottish Planning Policy 2014 is welcome but falls well short of the absolute protection required.
>
> Our approach to proposed wind farm developments is based on a detailed assessment of each individual proposal taking into account a number of factors:
>
> **Position:** Proposals affecting areas of mountaineering interest, for example Munros and Corbetts (summits higher than 2500ft) or other iconic hills, are largely unacceptable, as are those in Wild Land Areas.
>
> **Scale:** Large clusters of turbines are highly intrusive and destroy a wild landscape. Small clusters in less sensitive areas can deliver environmental benefits and also benefit communities.
>
> **Size:** Scottish mountains may appear high but their grandeur is relative to their surroundings and a function of their setting in the landscape. Large turbines, often with ground-to-tip heights of over 120m, diminish the relative scale of the mountains and dominate the landscape. Small turbines are much less intrusive.
>
> **Siting:** Ridge and hilltop developments are most obvious. Careful positioning can sometimes reduce the impact, but usually they remain visible for miles in many directions.
>
> **Associated infrastructure:** Wind farms require access tracks for heavy equipment. These can stretch for miles, are wide, and scar the landscape. They are highly intrusive and add to the impression of industrialisation.
>
> **Pioneer and cumulative impact:** The first development in an area can be particularly harmful. Once approval has been granted for one wind farm in a sensitive area, further applications often follow in quick succession. Developers claim that, as one has been approved, those that follow will have a limited impact.

30. Mountaineering Scotland made a total of 41 formal objections to wind farms between its first in 2005 and June 2017 (Figure 3).[11] The number rose as the number of wind farm applications rose, the latter surging in 2014-2015 as the future of financial incentives for wind generation became politically insecure, and as applications pressed towards core mountain areas. There had been 856 planning applications for onshore wind farms (≥1MW capacity) in Scotland to December 2016.[12] Of these, 519 were for schemes of

10MW or more. Mountaineering Scotland had therefore objected to 4.7% of all applications and 7.7% of larger applications to the end of 2016.

31. These numbers confirm that Mountaineering Scotland takes a discriminating approach to wind farms. Since 2010, when clear criteria for its objection decisions were introduced based on visual and experiential impact, prior to which decisions had been ad hoc and more influenced by conservation and access considerations, it has objected to only those judged to be potentially seriously damaging to mountain landscape and experience. It is of note that many recent planning decisions (mostly involving schemes submitted in 2012-2014) have gone in Mountaineering Scotland's favour (Figure 3), suggesting that its judgement about which schemes to oppose is broadly consonant with landscape valuations also present more widely in the planning system.

Figure 3



5 The importance of landscape to Scottish tourism

32. It might seem that the importance of landscape for Scottish tourism is self-evident. The Scottish Government has stated:

> Tourism is a significant component of Scotland's economy, particularly in rural areas, and is founded on the unique qualities of the country's natural landscape and cultural history. There is substantial international competition for tourist spend and Scotland needs to ensure that it maximises its potential to maintain a share of this global market. [13]

33. Surveys by VisitScotland show that 'the scenery and landscape' were an important attraction for 49% of all visitors to Scotland in 2015[14], marginally down from 55% in 2011-12.[15] In these surveys, those undertaking long walks were particularly likely to find scenery and landscape important: in 2015, 39% of tourists had undertaken a 'long walk/hike/ramble' (>2 miles or >/1 hour) compared with 33% in 2011-12.

34. Landscape is particularly important for upland tourism.

> Scotland is not a mass-market destination and the strength of the tourism market will depend primarily on visitors who come to upland Scotland because of the quality of the outdoor environment and good access to enjoy it.[16]

The importance of 'repeat business' to Scottish tourism is of note, with 65% of visitors in 2015 having been to Scotland more than once previously. [17]

35. What people find attractive in the landscape will be as diverse as people themselves are. "It is the experiences, thoughts and feelings that are generated by being in a landscape that people value, not simply the objective, quantifiable features of a landscape."[18]

36. However, landscape is not important for all tourists. It is unlikely to be significant in the 40% of overseas visits and 24% of British visits undertaken for business or to visit friends and relatives.[19] Much tourism is urban: 40% of Scottish gross value added by tourism was in the four large cities – nearly half of this in Edinburgh alone – and this rises to nearly 50% if one adds in other predominantly urban central belt local authorities.[20]

6 Mountaineering tourism and recreation

37. Although "Tourism is the most important source of employment in Scotland's mountain areas"[21], it is not known how much mountaineering sports currently contribute to tourism in Scotland. Figures often quoted are given below and the level of uncertainty around the tourism and recreation activity and spend attributable to mountaineering activities is very apparent.

    - HIE estimated that 767,000 mountaineers visited the Highlands and Islands in 1996 with an estimated expenditure of £162m.[22]
    - SNH estimated in 1998 that tourists participating in hiking/walking generated £257m, accounting for 15% of tourist expenditure.[23]
    - George Street Research & Jones Economics estimated that in the Highlands and Islands in 2002/03 walking and mountaineering generated revenue of £246 million.[24] £104m of this came specifically from walking above 2,500 feet, technical climbing and high level cross-country skiing.
    - VisitScotland found for 2003 that 4% of visitors to Scotland came specifically to go walking and spent £125 million but 33% of holidays included a walking element and these visitors spent a total of £952 million.[25]
    - In 2011-12 and 2015, 33% and 39% respectively, of tourists had undertaken a 'long' walk, defined as a minimum of 2 miles or 1 hour, but this could include a range of environments, not just upland ones.[26]
    - In 2015, UK tourists undertaking a 'long' walk (as defined above) during their holiday in Scotland spent £776m.[27]

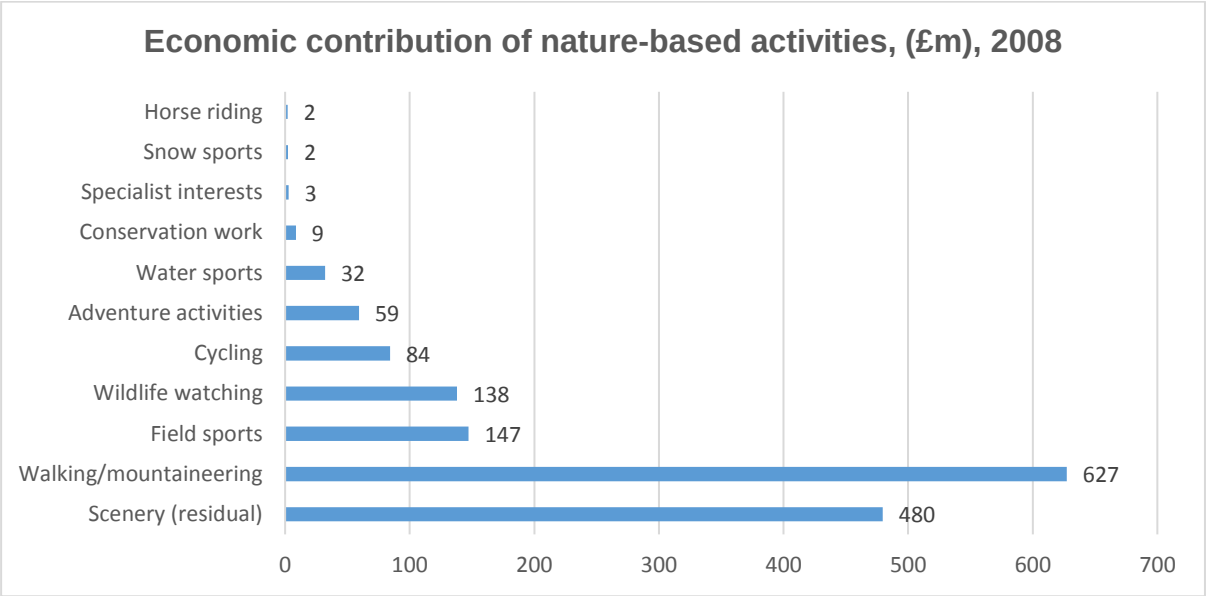
38. Day recreation is not tourism (which is defined as involving an overnight stay) but it is similar in many respects and also important for the economy of upland Scotland.

    - There were 16.1 million day trips to mountain, hill and moorland in 2003-4, valued at £332m.[28]
    - VisitScotland cites £1,300 million per year spent by day walkers in Scotland.[29]
    - In the Scottish population, approaching half of adults visit 'the outdoors' at least once a week (with no trend from 2006 to 2014), but this is even vaguer and less connected with mountaineering than the tourism survey definition of a long walk.[30]
    - In 2008-12 there were an estimated 297 million visits per year to the outdoors by Scottish residents of which 9 million involved hill-walking.[31]
    - In 2013-14, there were an estimated 28.6 million visits to hill/moor by Scottish residents (cf 179 million walks of 2-8 miles).[32]
    - In 2015, UK resident day visits for a 'long' walk (a minimum of 2 miles or 1 hour) spent £136m.[33]

39. Mountaineering contributes to year-round tourism with 77% of hill-walker/mountaineer visitor-days in the Highlands in October-June compared with 53% of all visitor-days.[34]

40. In a comprehensive study of nature-based tourism in Scotland for SNH, it was estimated to account for 40% of all tourist spending in Scotland in 2008.[35] This study assessed a range of activities on a common basis. Walking/mountaineering was the most important specific activity, accounting for 40% of nature-based tourism spend – more than all other activities combined excepting a residual category of 'scenery' (Figure 4). Later studies for individual sports have produced higher values – with shooting alone valued at £200m in 2012-13[36] – but none has been undertaken for walking/mountaineering.

Figure 4[37]



41. The results from this study would suggest that walking/mountaineering accounts for around 16% of all tourist spend in Scotland (40% of tourism spend is nature-based and 40% of this is walking/mountaineering) with a further 12% attributable to 'scenery', which will often involve upland landscapes as a backdrop if not more directly. A not dissimilar figure for mountain walking (12%) can be derived from VisitScotland data showing 22% of Scottish UK-derived tourism revenue – i.e. excluding overseas visitors – came from visitors going walking, with 56% of them undertaking hill and mountain walks.[38] In 2015, 12-16% of all tourism spending amounted to £600-800m.

42. It can be concluded that:
    - 12-16% of tourism spend in Scotland is from visits that involve walking/ mountaineering;
    - at least 25% of total tourism spend depends directly on the quality of upland or other natural landscapes;
    - a further 25% relies upon scenic landscapes as a (less important) backdrop to other activities, including general touring.

7 Tourism trends in Scotland

43. Tourism (defined as involving one or more nights away from home) can be described in terms of trips, nights or spend. It can be divided into markets based on visitor origins, often summarised as Scottish, British and Overseas. Statistics can be issued for whole years or for part years. Other sets of data include visitors to paying tourism attractions. With such a wealth of data available, it is not surprising that those charged with promoting tourism can create a positive headline for any statistical release.

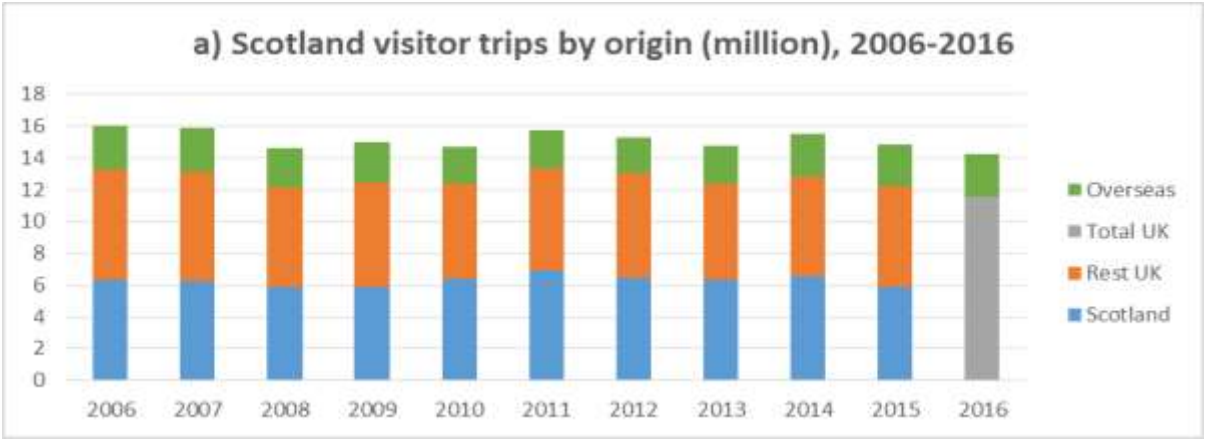
44. Despite ever-optimistic press releases by those responsible for promoting tourism, a more sober view of Scottish tourism statistics suggests that the position is broadly stable. Visitor numbers, bed-nights and expenditure fluctuate but have not returned to the level prior to the 2008 recession if one adjusts for inflation (Figure 5 a-d). Recent years, though, do suggest a possible rising trend in inflation-adjusted spend.

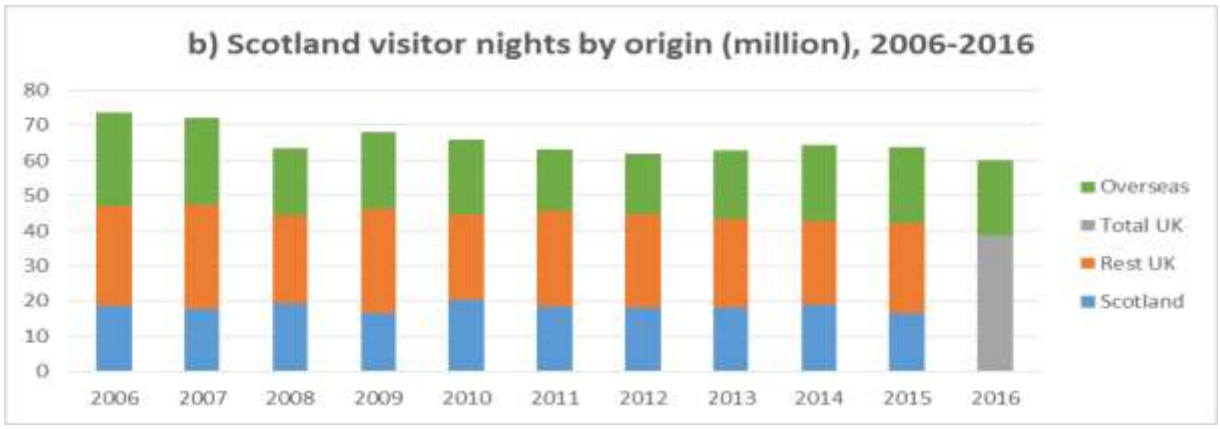
45. There may have been an increase in tourism employment in Scotland in recent years (Figure 5e). Comparing the two periods 2013-2015 and 2009-2011 shows an increase of 10%. However, the standard measure of 'sustainable tourism' used in Scotland includes a wide range of employment activities, many of which are used by residents as well as visitors, such as restaurants, beverage-serving and the operation of sports facilities. Employment related to accommodation would seem less ambiguously related to tourism activity and it shows a more modest increase of 3% between the two periods.

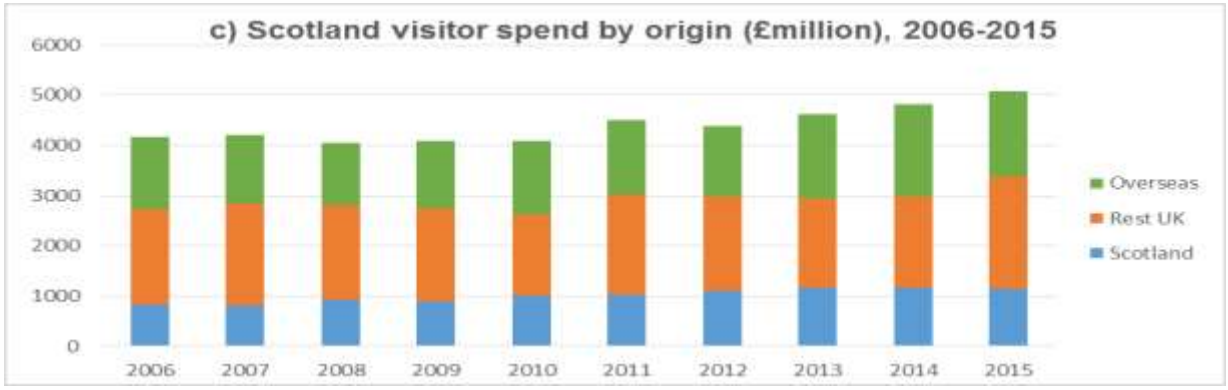
46. Tourism in Scotland is just a small part of a global market and success in attracting domestic and foreign tourists to Scotland depends not only on the attractiveness of the Scottish offer but on many other factors (e.g. safety concerns, prosperity in the originating countries, currency exchange rates) over which Scottish tourism promoters and providers have no control. Sometimes these will work to Scotland's advantage, sometimes not. Identifying the contribution of any one factor to tourism trends is more a matter of faith than of statistical interpretation.

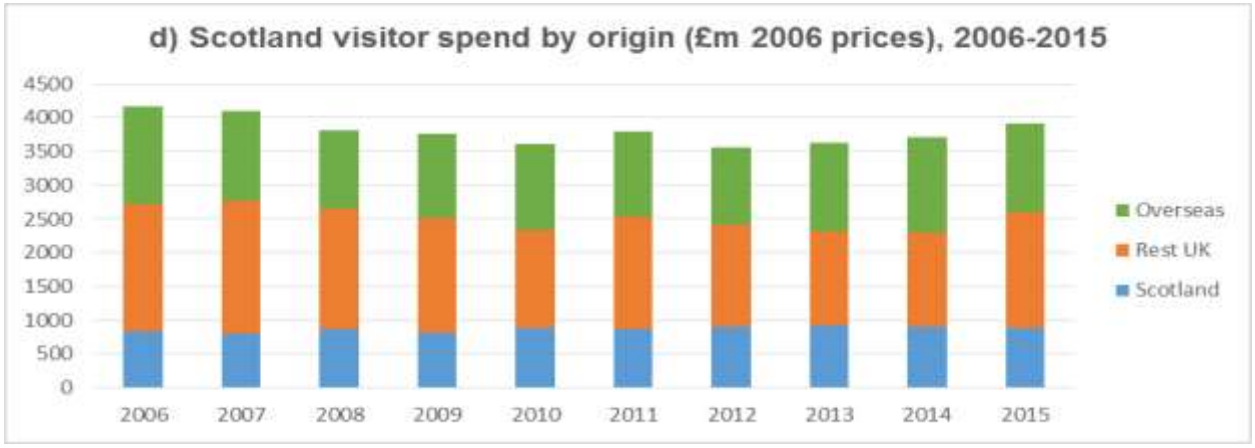
47. Statistics are always out of date and this is particularly so with tourism statistics for 2016, full publication of which has been delayed by data problems. Mindful of a spate of media stories during summer 2017 about tourism pressures in certain areas, notably Skye, it is worth noting that official data for the first quarter of 2017 compared with 2016 shows no change in numbers of overseas-origin trips and a substantial (but probably misleading) decrease in UK-origin trips (probably due to the timing of Easter).[39]

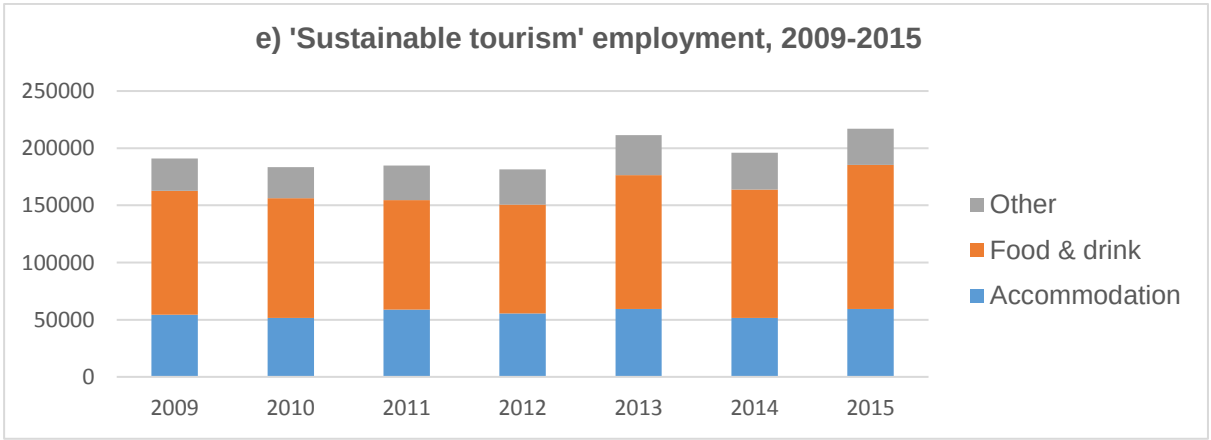
Figure 5[40]




b) Scotland visitor nights by origin (million), 2006-2016
80
70
60
50
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Overseas
Total UK
Rest UK
Scotland


c) Scotland visitor spend by origin (£million), 2006-2015
6000
5000
4000
3000
2000
1000
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Overseas
Rest UK
Scotland


d) Scotland visitor spend by origin (£m 2006 prices), 2006-2015
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Overseas
Rest UK
Scotland


e) 'Sustainable tourism' employment, 2009-2015
250000
200000
150000
100000
50000
0
2009
2010
2011
2012
2013
2014
2015
Other
Food & drink
Accommodation

8 Wind farms and tourism: the literature

48. This section is mainly a review of reviews. There have been several reviews of wind farms and tourism published in recent years covering much the same shallow pool of studies.[41] [42] [43] [44] Indeed, there seem to have been as many reviews as new studies, in what might almost be perceived as an attempt to close down debate on the basis that the 'fact' of no impact has been established beyond doubt. Contrary to the impression given of a substantial body of work, the most substantial of the recent reviews states:

> The literature which explores the potential impact that wind farms could have on tourism activity is not extensive.[45]

49. The overall message from the reviews is that *most* tourism is unaffected by the presence of wind farms. (Summaries extracted from the three main recent reviews are given in Appendix 1.) A large amount of tourism is driven by city attractions, cultural and sporting events, business links or ties to family and friends. Other tourism is mildly influenced by the landscape as a backcloth but it is not a critical factor in decision-making. For tourists from parts of the world where onshore turbines are uncommon, including extensive parts of England, there may, at least initially, be a novelty factor.

50. But *most* tourism is not *all* tourism. There is a minority, most likely those for whom landscape is a primary driver, who are potentially affected by the presence of wind farms. The size of this minority is contended. It is generally downplayed in planning applications as a 'small' minority of no economic (or other) significance. It is also assumed to be a fixed minority – that is, regardless of the changing level of visibility of wind farms in the landscape, the proportion of tourists affected is presumed to stay the same. (It is sometimes suggested by developers that as more tourists see wind farms this will lead to "conditioning visitors to expect their presence while visiting Scotland" [46], but while there is some evidence of *residents* becoming more accepting of a local wind farm over time, no study has looked at this in *tourists*.[47])

51. In her influential evidence to the Scottish Parliament's Economy, Energy and Tourism Committee inquiry into Scotland's emission reduction targets[48], Aitchison included a table of surveys undertaken between 1996 and 2008 at a variety of locations across Britain, showing an average of 91% of visitors 'not discouraged' (her wording) by the presence of a wind farm.[49]

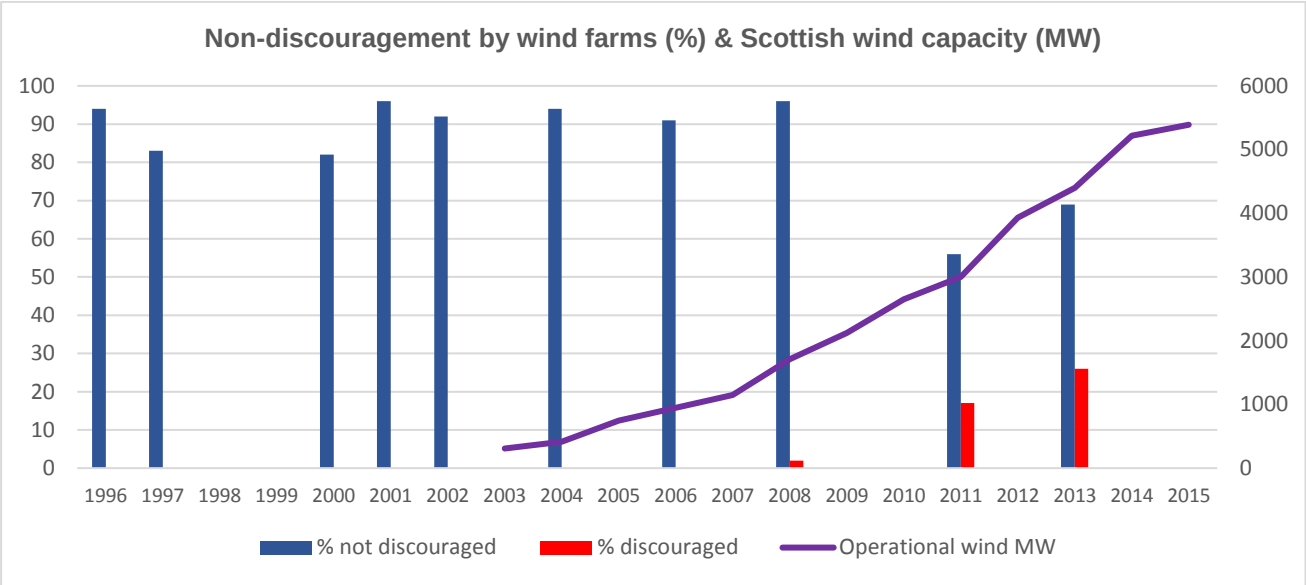
52. Since then there have been two national surveys that have asked directly about the effect on holiday decisions of the presence of a wind farm. VisitScotland research undertaken in 2011 found that 17% of Scottish and 18% of UK respondents would be discouraged by the presence of a wind farm.[50] A YouGov survey commissioned by Scottish Renewables in 2013 found that 26% would be discouraged.[51] Both these surveys were professionally undertaken and together might suggest that the level of discouragement had doubled from earlier surveys. (Note that 'discouragement' is used by me as an omnibus term since every survey uses different wording.)

53. I know of no other national surveys of the population at large since that of Scottish Renewables in 2013. Although Scottish Renewables ran a similar survey on attitudes to renewables in early 2015, it omitted the question on discouragement. There may well be local surveys but I have not sought them out since they are likely to be specific to the particular situation and methodologically weaker than these two national surveys.

54. When graphed against the rising level of operational wind farms visible in the landscape, the pattern of survey results is suggestive of a lagged adverse response by tourists to wind farms (Figure 6). In 2007, when the fieldwork was probably[52]

undertaken for the latest survey cited by Aitchison, the installed capacity of onshore wind farms in Scotland was 1,150 MW. At the end of 2012 it was 3,934 MW.[53]

Figure 6[54]



55. One anomalous early (2002) study showed 25% discouraged (not included in Fig. 6).[55] This study was criticised in the Scottish Government's landmark study commissioned from Glasgow Caledonian University (GCU) for selective recruitment of those most likely to regard landscape as an important aspect of their visit, repeating verbatim the criticisms made by the British Wind Energy Association.[56] The criticism is something of an exaggeration[57] but it is indeed the case that the sample was restricted and cannot be used to assess possible impacts on tourism as a whole. (That is why it is not graphed here – it is 25% of a smaller denominator than the general tourist population.) However, with care it can be interpreted as identifying the views of a subset of tourists potentially more sensitive to wind farm development and thus, used appropriately, as giving a clearer picture, through in-depth interviewing, of the views of that particular subset.

56. Other relevant but non-comparable surveys were undertaken by YouGov for the John Muir Trust in 2012, 2013 and 2017.[58] In 2012, of over 2,000 GB respondents who ever visited scenic areas for their natural heritage and beauty (91% of the sample), 43% were less likely and only 2% more likely to visit "a scenic area which has a large concentration of wind turbines". In 2013, a Scottish sample of over 1,100 gave similar responses to an unfiltered question about visiting "a scenic area which contains large scale developments (e.g. commercial wind farms, quarries, pylons etc.)": 51% were less likely and 2% more likely to visit such an area. In 2017, the corresponding figures from a Scottish sample of 1,028 were 55% and 3%. The JMT surveys do not match the general surveys on tourism intentions because they add a focus on scenic areas and wild land. But, again, this more specific focus begins to drill down towards those types of places where tourism may be adversely affected by wind farm development.

57. To return to the evidence reviews themselves. Reviews are seldom definitive. Like any scientific work, they can contain errors that nonetheless do not affect the overall outcome. For example, the ClimateXchange review of methodologies states of the Mountaineering Scotland 2013/14 survey (covered in the next section):

> Two further studies included offshore wind farms, although the differential effects of offshore developments on tourism in relation to onshore developments were not examined (Mountaineering Scotland, 2014; Aitchison, 2012c).[59]

It is difficult to see how this conclusion could be drawn for a survey focussed on mountaineering, with the very first question setting the tone by referring to "places in Scotland's mountains", even though the survey did not explicitly state that it excluded offshore turbines (of which there were none in Scotland at the time).

58. Sometimes errors can be minor in the context of a large report but take on a greater significance by being amplified through repetition. The key such example for mountaineering is the drafting error in the GCU study that wrongly stated (contrary to its own statistical analysis) that hill-walkers were more positive towards wind farms than general tourists.[60] (For full detail see Appendix 2.) Had the error remained buried in the detail, probably no one would ever have noticed. However, the error was included in the executive summary. It then took on a life of its own, being repeatedly cited in development applications as 'fact'. Even reviews have repeated the error, showing that reviewers' diligence in examining original sources cannot be assumed.[61] [62]

59. Notwithstanding these points, the reviews considered here provide a reasonable representation of the available evidence (ignoring the misguided attempt by climateXchange to extract meaning from short-term tourism statistics). Problems arise not so much with the content of the reviews as with the selective way that they are used to support prior positions, especially pro-wind positions. For example, the caution expressed in the two Welsh reviews is ignored or the careless phrasing of the climateXchange report – "there is no new evidence to contradict the earlier findings that wind farms have little or no adverse impact on tourism in Scotland"[63] - is used to imply mounting new evidence showing no impact of wind farms when it should more accurately have been written that there was an absence of new evidence.

60. A study by BiGGAR Economics is of a type that, undertaken properly, could have promise in assessing the impact of wind farms in local areas.[64] Originally published in July 2016, it studied a cohort of 18 wind farm locations in Scotland. Given that it fitted the desired development narrative, it has been used to support wind farm applications without any critical engagement. The updated version published in October 2017 increased the cohort size to 28 (though one appears to be a duplication) and was otherwise unchanged in its essentials. The study is methodologically flawed and, more importantly, conceptually weak but that appears irrelevant when the goal is support rather than illumination. The fundamental weakness is that all bar one of the wind farms in the expanded 2017 cohort are ones that would not be predicted (from the conclusions of the present review) to have an impact on tourism. And the one where an effect would be predicted has the outcome data confounded by ongoing local wind farm construction worker accommodation and expenditure. A fuller critique of this study is given at Appendix 3.

61. In conclusion, the published evidence on wind farms and tourism is limited, of variable quality, inconclusive and often misused by selective use for support rather than illumination. The more robust literature reviews suggest that the general impact of wind farms upon tourism is muted, with potential impact selective by both visitor type and landscape type. The size of this potentially disenchanted minority differs between studies, with most falling within the range of 20-30%, but regardless of its exact size it is not a trivial number.

9 Wind farms and mountaineering: the literature

62. Just as not all tourists are the same, neither are all mountaineers. A market segmentation of the hill-walking tourism market would identify a range of overlapping markets, each with different implications in terms of the potential for and consequences of any displacement by wind farms. One segmentation for Scotland, for example, divided walking tourists into *committed explorers* (23%), *part-time explorers* (18%), *committed wanderers* (7%) and *part-time wanderers* (33%), plus a mixed group (19%).[65] Although explorers, making up 41% of the market, were defined as walking in 'mountains and hills', 56% of all walking tourists had gone on at least one hill/mountain walk.

63. Despite their status as potentially significant receptors and the utility of segmentation to reflect different interests and responses to wind farms, no study of mountaineers/hill-walkers and wind farms has taken place other than those undertaken by Mountaineering Scotland itself (described in the following section).

64. The GCU study reported statistically non-significant results broken down by activity which included hikers/hill-walkers (see Appendix 2 for critique). The only other 'literature' about impacts of wind farms on hill-walking is opinion pieces by individuals, which might have influence on potential visitors but are clearly not scientific.

> Whereas up to now, as a route-vetter for the [Great Outdoors] Challenge, I always encouraged Challengers to explore the Monadhliath and discover its unique qualities for themselves, in future my advice [following the consenting of the Stronelairg Wind Farm] is more likely to be to avoid the area." [66]

65. The lack of attention to mountaineering within the literature on wind farm impacts prompted Mountaineering Scotland to undertake its own research.

10 Wind farms and mountaineering: Mountaineering Scotland research

66. In the absence of research on mountaineering, and conscious of strong majority member pressure to oppose wind farms likely to be damaging to mountains and mountaineering, Mountaineering Scotland embarked in 2013 upon its own research. This was based upon an on-line survey publicised to Mountaineering Scotland (then known as MCofS) members and British Mountaineering Council (BMC) members, with the results published in 2014.[67]

67. The key points relevant to this review were summarised in the report thus:

- The MCofS undertook a survey to identify if the growing number of wind farms and their increasing reach into mountainous areas was having any impact upon mountaineering activity and whether the MCofS position on the areas of Scotland that should be protected from development properly reflected the collective view of its members.
- There were 970 respondents. Two thirds (66%) were MCofS members and 159 were members of the BMC (including 53 who were members of both). Nearly one quarter (23%) did not state an affiliation. Three quarters (77%) lived in Scotland.
- A substantial majority of MCofS respondents believed that wind farms were having an adverse effect on Scotland's mountains, outnumbering those who believed there was no effect by three to one. The same was true of BMC respondents and those not stating affiliation, though with smaller majorities, reducing to two to one for the last group.
- The survey suggested that the majority of mountaineers were discouraged by wind farms and their main behavioural response would be to avoid areas with wind farms. Responses to all of the questions and across all affiliations and places of residence were consistent. Wind farms made mountaineers living outside Scotland less likely to visit Scottish mountains. A maximum of one quarter of respondents were unconcerned about wind farms in mountain landscapes.
- This survey provided empirical evidence from a niche market important for tourism in remote areas of Scotland. It was concluded that the results sounded a warning of reputational damage that could reach much wider than mountaineering and affect Scottish landscape-based tourism more generally as the distinctive local landscape characteristics of large areas become homogenised into "landscape with turbines".
- The survey was criticised for not enabling people to express the view that wind farms could be a positive attraction for mountain-goers. However only 5% of respondents expressed a preference for accommodation with a wind farm in view. When compared with the 73% who did not want such a view and the 56% whose hill-going behaviour was changing to the detriment of areas with wind farms, the net balance was clear. Wind farms were likely to attract few mountaineers but repel many.

68. As might be expected with research challenging the ‘no effect’ position strongly maintained by developers and government, this study attracted criticism. Some was justified – no survey is perfect. Much was not and a variety of ‘evidence wars’ tricks were used to downplay the results.

69. One important question on expected response to wind farms in the future justifiably attracted a small amount of criticism from MCofS members – with one of the quickest off the mark being employed in the renewables industry – for not having a response option that wind farms would encourage more visits to the hills. The most positive response category was that ‘it won’t have any impact’. A disinterested observer would agree that this was a flaw, but would also note that the literature would not suggest it

was a significant one. Those seeking to diminish the standing of any research suggesting potential harm to tourism from wind farms are, however, not disinterested.

70. The opportunity was taken to revisit this important question in spring 2016 when a survey of Mountaineering Scotland's membership was undertaken. A single question on response to wind farms was embedded within an on-line general membership survey publicised only to members. As well as addressing previous criticism of the question by including a positive response option, a very important improvement was made by switching the question wording from expected change in future behaviour to actual current behaviour.

71. The key points in the survey report relevant to this review are[68]:

- Respondents who were encouraged by wind farms (2%) – the omitted option previously – were outnumbered more than ten to one by those who avoided areas with wind farms (22%) or went less often (1%) (Table 1). (NB the confidence limits for 2% and 1% overlap, indicating the difference is not statistically significant.)

Table 1

Does the increasing number of wind farms in Scotland's mountain landscapes affect your plans for walking and climbing? Please give the answer that best describes your position.

Membership issues survey 2016			Wind farms and behaviour survey 2013-14		
	N	%	%	N	
It encourages me to go more often, I like to see wind farms when in the mountains	25	**2**	**28**	273	It won't have any impact on my plans and I will still enjoy the mountains
It has no impact	450	**31**			
It does not affect my plans, but I prefer not to see wind farms when in the mountains	632	**44**	**15**	150	It won't affect my plans, but I don't expect to gain the same level of enjoyment.
I go to the mountains just as often, but avoid areas with wind farms	320	**22**	**40**	388	I will go to the mountains just as often, but will avoid areas with wind farms.
			9	90	I will still go to the Scottish mountains, but will take more trips to mountains outwith Scotland.
I go to the mountains less often	12	**1**	**4**	36	I will still go to the mountains, but not as often as I would have.
			3	29	I will stop visiting the Scottish mountains
Total responses	1439	100	100	966	

- Most mountaineers (75%) had not currently (spring 2016) changed their behaviour in response to wind farms, though more than half of these preferred not to see wind farms on the hills (44%).
- The two surveys suggested very different levels of avoidance (by various means) of wind farms: in 2013-14 there was 56% *expected* avoidance and in 2016 there was 23% *actual* avoidance.
- Various factors may have contributed to this change but the main ones were likely to be the change in question wording from *expected future* behaviour to *actual curren*t behaviour and the fairly slow increase in visibility of wind farms in mountain areas between the surveys years because of the very slow roll-out of consented

wind farms and some (though not all) of the most damaging proposals having failed to gain planning permission.

- Between the two surveys we might have a pessimistic scenario (2013-14) and an optimistic (or realistic?) scenario (2016). These could give rough limits to the possible impact of wind farms upon mountaineering behaviour. One quarter of mountaineers already avoid areas with wind farms and up to half may do so if wind farms are built in inappropriate places.

72. To my knowledge, this is the only research on expected behaviour and reported actual behaviour in a sensitive population of 'visual receptors' in the context of the existing moderate but not insubstantial level of visibility of wind farms in upland Scotland. It begins to move the research agenda on from what people theoretically might do to what they actually are doing. Because of the significance of this pioneering research – undertaken voluntarily on a shoe-string budget – it merits an extended discussion here.

73. There are some substantial differences between the two Mountaineering Scotland surveys in the stated degree of behaviour change (Table 1). All are statistically significant.[69] The 2016 survey shows much the same level of impact on enjoyment (i.e. wind farms diminished enjoyment for 67% of respondents in 2016 compared with 72% in 2013-14). The combined 33% in 2016 for 'encouraged' and 'no impact' can be compared against the previous survey's 28% 'no impact'. Although these proportions are narrowly statistically significantly different[70], it is wise not to over-interpret them given the methodological differences between the two surveys. The most important and substantive difference between the surveys is in behaviour change: in 2016, 23% were avoiding wind farms/walking less compared with 56% who reported in 2013-14 that they expected to do so in the future.

74. What might explain these differences?

    1. Question wording: This is almost certainly the main contributor to the difference. The 2013-14 survey was phrased in terms of future reaction to wind farms whereas the 2016 survey was phrased in the present tense. A lower level of action than intention is commonplace in behavioural research.
    2. Different samples: the 2016 survey was a general membership survey in which the single question on response to wind farms was embedded and had a higher response rate. It could have obtained a more representative sample of members than the 2013-14 survey which was specifically about wind farms and behaviour, though it is of note that the reported impact on enjoyment was similar in both.
    3. Genuine change in response/impact due to limited visibility: Mountaineering Scotland has had a fair degree of success in its selective opposition to the most damaging wind farm proposals, with several near to National Parks and in or near to mountainous Wild Land Areas being refused planning permission or withdrawn. Across much of Scotland north of the Highland Boundary Fault – though not in most of the Southern Uplands – it is possible to have a weekend on the hills without experiencing close views of turbines. The current level of wind farm visibility from the most popular mountain areas may thus be regarded by many hill-walkers as tolerable (perhaps an acceptable trade-off to reduce CO_2 emissions) and not at a level that would trigger behaviour change.
    4. Genuine change in response due to greater acceptance of wind farms in the uplands: This cannot be excluded as a reason, but if true it sits oddly alongside other responses to the 2016 membership survey (intended to assess whether Mountaineering Scotland's policy of selective objection to wind farms still accorded with members' wishes) where:

- 72% were personally ‘opposed to some wind farms with a visual impact on mountains’
- 89% regarded ‘support for campaign activity to protect mountain landscapes’ as an important reason for membership
- 87% wanted the same or increased Mountaineering Scotland action on ‘protecting mountain landscapes from insensitively-sited wind farms’.

75. There is seldom a single reason why results differ between surveys. In this case, the major factor is undoubtedly the switch in question wording from intention to action. It is also plausible that the 2013-14 survey attracted rather more respondents with a heightened level of concern about the speed and location of wind farm construction in and around Scotland’s mountains. They anticipated a future level of behaviour change that, so far, most mountaineers have not found necessary. The roll-out of consented wind farms was very slow between the surveys and some particularly unsatisfactory and high profile proposals failed to gain planning permission. Respondents in 2016, with their worst fears not realised, reported less effect on their actual behaviour.

76. That is not to suggest that those more pessimistic a few years ago did not at that time have grounds for being so. And their pessimism may prove justified. Many consented schemes have yet to be built and highly intrusive schemes continue to be proposed for the diminishing area of undeveloped upland not nationally protected. This is perhaps most acute in the Southern Uplands where the small extent of undeveloped upland remaining is rapidly shrinking. There are parts of the Highlands where the same can be said, such as the uplands either side of the northern half of the Great Glen.

77. The two surveys/scenarios may give rough limits to the possible impact of wind farms upon mountaineering behaviour. If so, this suggests that up to half of mountaineers may go elsewhere if wind farms are built in the wrong places. Nearly one quarter already do so.

11 Analysis and discussion

a) The impact of wind farms on tourism

78. Mountaineers (who are predominantly hill-walkers) are likely to be sensitive consumers of landscape. They are therefore a potential 'canary' in terms of identifying possible tourism impacts from wind farms. They may respond earlier than other landscape-sensitive tourists to increasing visibility of wind farms in Scottish landscapes. Can we quantify what this means for Scottish tourism in terms of diverted tourist expenditure?

79. Half of tourists state that landscape is an important reason for choosing to holiday in Scotland and, in Section 6 above, 25% of tourist spend was identified as being specifically dependent upon the quality of upland and other semi-natural landscapes. It is unlikely that all these would react adversely to wind farms. The most recent general population survey (2013) showed 26% discouragement by wind farms (which should be interpreted as indicating sensitivity rather than behaviour). This falls within the general 20-30% discouragement range found in the literature. These figures cover all tourists, however, and it is a reasonable assumption that those not interested in landscape are very unlikely to be discouraged by wind farms. If all the reported discouragement is from the 50% of tourists for whom landscape is an attraction, it suggests that around half of such visitors could be discouraged by wind farms.

80. The only data available on the extent to which 'discouragement' translates into actual behaviour comes from the Mountaineering Scotland surveys. In round numbers, over 50% were discouraged but only a net 20% had changed their behaviour to avoid wind farms: an intention:action ratio of 5:2.

81. This ratio can be used to estimate the possible displacement effect of wind farms on tourism more generally, but only with caution. Nothing is known about the nature of the displacement reported in the Mountaineering Scotland surveys. Some of it will be day trips, some short-stays and some longer holidays. The sample is also mostly resident in Scotland and may preferentially seek substitution opportunities in Scotland whereas visitors from further afield may switch to alternative locations outwith Scotland.

82. With those cautions in mind, Table 2 provides estimates of possible displacement levels for different market segments using the Mountaineering Scotland surveys' 5:2 intention:action ratio and half that ratio (5:1) to give more conservative estimates.

Table 2 Estimates of displacement by market segment

Market segment	Market segment as % of all Scottish tourism *	Discourage-ment rate	Displacement rate		% of total Scottish tourism displaced #		Value of Scottish tourism displaced (midpoint £m) ^	
			5:2	5:1	5:2	5:1	5:2	5:1
Half of mountaineers (with rest assumed to be day trips)	6-8%	50%	20%	10%	1.2-1.6	0.6-0.8	71	35
All mountaineers	12-16%	50%	20%	10%	2.4-3.2	1.2-1.6	142	71
All landscape-dependent tourists	25%	50%	20%	10%	5	2.5	254	127
All tourists	100%	20-30%	4-6%	2-3%	4-6	2-3	254	127

* By value, see paragraph 42 for source ^ 2015 data (source as Fig 5). 100% = £5071m

Shows displacement from the specified market segment with other segments' behaviour assumed unchanged. Note that each market segment includes those above it in the table. E.g. 'all landscape-dependent' includes 'all mountaineers'.

83. If only mountaineers are displaced, and only half the number at half the rate reported in the Mountaineering Scotland surveys, then the displacement as a proportion of all Scottish tourism could be as low as <1% (£35m value). If all landscape-dependent tourists are displaced at the rate reported by Scottish mountaineers, then the displacement as a proportion of all Scottish tourism could be as high as 5% (£254m). Note that the displacement for all tourism is the same as for landscape-sensitive tourism since it is assumed that tourists who are not landscape-sensitive will not change their behaviour.

84. The GCU study, much cited by developers and the Scottish Government, estimated the likely level of displacement by wind farms to be around 1-2% (an authoritative single number is elusive because of the multiple measures and complex methods used).[71] Table 2 suggests a wider range, up to as high as 5%. Such a difference appears entirely reasonable in the context of onshore wind farm capacity in Scotland having risen five-fold between the data points for the two studies (2007-2015).

85. While £250m is a large amount, it is within the range of fluctuation seen in national tourist spend from year to year and therefore even if it was all lost to Scotland (and not simply displaced) would be undetectable against the constantly changing background of tourism. Since the true figure could well be smaller, attempting to find evidence in national or regional tourism statistics of the effect of any particular change is almost certainly futile. It is also statistically illiterate to cite the lack of detection of an effect in volatile regional and national tourism statistics as evidence of no effect, as some analysis has sought to do.[72]

86. But any effect of wind farms will be even less visible in national statistics because the main effect is not a loss to the national tourism economy but displacement of spend within Scotland. Even the lowest level estimated – £35m – would have a marked impact if concentrated in a limited number of places. It is still doubtful if such an effect could be detected in routine statistics since much tourism economic activity does not feature in such statistics (e.g. businesses below the VAT registration level) and it is just such activity that might be most likely to be affected by a drop in visitors.

87. The estimates presented here are only for displacement within Scotland. Without a much larger survey covering all tourist origins, displacement from (and attraction to) Scotland by wind farms cannot be estimated. At present levels of wind farm visibility it appears that any net loss to Scotland is likely to be so low as to be unmeasurable. For example, if we assume that the 1% visiting Scottish mountains less go outwith Scotland instead, that would equate to only 0.25% of tourism spend. (This assumes that the 2% encouraged by wind farms to visit the hills more often are Scottish residents, which most Mountaineering Scotland members are, and that any additional hill-related expenditure by them is substituted for other expenditure within Scotland.)

88. With such small numbers, any calculation is notional. However, it is of the same order of magnitude as the GCU study reached: "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."[73] It might be observed that the GCU study's figure is hardly less notional than that calculated here since, despite the sophistication of the econometric tools deployed, their analysis of tourist spend lost to Scotland was derived from only five respondents and excluded all Scottish respondents since it assumed that they would always be displaced and never lost.

89. The important point is not the exact size of the figure for loss (or gain) to Scotland except to emphasise that even if it could be measured accurately it appears likely to be

extremely small at current levels of wind farm visibility. The key issue is displacement within Scotland, whether of Scottish residents or of visitors.

90. Is there any triangulating evidence that tourism expenditure has been displaced within Scotland? There is not. The problem is that the areas for which routine statistics are compiled, often local authority or larger areas, are completely unsuited to detecting any displacement effect from wind farms. The local authorities in Scotland that cover the major mountain areas all have both extensive areas with wind farms and extensive areas without wind farms. Any analysis using such data that expects to detect an impact is misguided. Nonetheless, it has been done three times by BiGGAR Economics (BE) with no apparent understanding of the unsuitability of the method.[74] Since this simplistic exercise is bound to produce a conclusion that conveniently fits the desired 'no impact' narrative, it is quoted in planning applications and inquiries as evidence of no impact without any regard to the impossibility of such analysis ever detecting anything other than an implausibly extreme impact.

91. Although the more recent BE study[75] using datazones appears superficially promising, and is clearly regarded by BE as unproblematic, it suffers from significant methodological problems, all of which lead to uncertainty and a lack of precision, as well as the major conceptual problem that it treats all wind farms in all areas as the equivalent. In other words, its thinking is influenced by the standard industry narrative that there is a blanket lack of effect regardless of context. This contrasts with the present author's thinking that underlies this paper, that there may be some effects from some wind farms in some places. One cannot extrapolate from a study of wind farms in areas where a tourism effect would not be predicted to areas where such an effect would be predicted. A fuller critique of this study is given in Appendix 3.

92. What does (or would) relocation of expenditure within Scotland mean? Small losses are significant in economically fragile areas whereas diverse economies with a wider tourism offer are more resilient.

> Although these areas [remote rural] account for a small proportion of tourism employment in Wales as a whole, the narrow economic base in these areas means the sector is an important source of local employment and income. The businesses in these locations may be sensitive even to small changes in visitor numbers as a result of wind farm development. They may have a particular challenge for businesses replacing those visitors which are deterred in areas where there may be limited appeal for other visitor markets.[76]

93. To pursue this further here would move from science to anecdote. The evidence is lacking and there seems to be little interest amongst research funders in pursuing such questions. This lack of interest is considered further later in this section.

94. It has been suggested in various publications that wind farms might attract tourists, though hard evidence is lacking.

> Although a number of studies point to the potential of the wind farms in their own right to attract visitors, these are often based on visitors' stated intentions in surveys rather than any observed positive impacts. There is little evidence that these positive effects occur in practice, and this was borne out by the case studies where there are established wind farms.[77]

95. Scottish Renewables appears to have looked at some relevant data. It issued a press release on 26 December 2015, timed to catch the post-Xmas news famine slot, entitled "Scots use green energy routes to conquer great outdoors".[78] This reported a selection of statistics from 82 routes at 23 energy sites "with significant levels of activity" (even

though one had only one user). The total distance cycled and run over "less than four years" is given, but the total number of individuals is not and, more importantly, no breakdown of use is given by site though the sites themselves are fully listed. Without the full data being published, it is impossible to know how much of this activity is attributable to the single multi-route peri-urban site of Whitelee Wind Farm. Nor is it possible to identify if users are tourists or local. Clearly this press release was intended to foster an image in the public mind rather than to illuminate. It was no doubt successful since it was unquestioningly reproduced in the media, with the influential Scotsman newspaper printing the entire release word for word. [79]

96. Whitelee wind farm has certainly been very successful in developing recreation. The number of people visiting Whitelee Wind Farm is repeatedly cited in planning applications as if to imply that the same could happen at any wind farm, and without regard to any distinction between (overnight) tourism and (day visit) recreation. Whitelee is the only Scottish example of a wind farm visitor centre, capitalising on its location adjacent to a large urban population to function as a peri-urban day-trip destination. An internet search in 2016 identified only three other wind farm visitor centres in Britain: two in Norfolk for offshore wind farms and the Green Energy Centre, also in Norfolk, with a single turbine.[80] A visitor centre at Delabole Wind Farm in Cornwall

> In its first year ... brought in 100,000 visitors who were able to look around the turbines freely on tourist walks. In 2001, there was an attempt to attract 150,000 tourists annually ... by building the Gaia Energy Centre ... [to] educate the people of Cornwall about energy conservation and the benefits of renewable energy. Inside they had an auditorium, café and shop, as well as interactive exhibits and a resource library. ... [£5 million funding mainly from public sector.] ... It closed down just three years after opening since less than a tenth of the projected visitors actually came.[81]

Whitelee Wind Farm appears to be a well-marketed one-off in a particular location, not a precedent for wind farms in general proving an attraction to tourists.

97. An alternative view, consistent with the evidence examined in this paper, would be that as peri-urban wind farms become a feature in an increasing number of people's everyday lives – seen from a commuter route, visited in the evening for a cycle run – the value of places from which wind farms are not visible or only distantly so might increase for weekend breaks or longer holidays.[82]

98. The natural qualities of Scotland's mountains, their spacious open vistas, their perceived wildness and 'otherness' compared with everyday urban life, are central to the enjoyment of mountaineering activities. They are not just an incidental add-on to the physical activity involved. Areas that retain, and even enhance, these qualities are likely to benefit from any perceived unattractiveness of other parts of Scotland due to wind farm development.

b) The evidence base

99. It is hoped that this review, couched in cautious and conditional terms, acts as some counterbalance to the uncritical interpretations of the literature and data offered in planning applications. The most important impression that I have after immersing myself in this evidence and the evidence wars it feeds, is of its inadequacy for the task. Time and again reviewers comment on the unsatisfactory evidence base with most original studies being out of date, partial or methodologically weak – and sometimes all three together.

100. It is not as if research methods to carry out good quality studies to better inform decision-making are lacking. I can illustrate this with some simple examples using different methods.

    a) To test the hypothesis of local impact, GIS could be used to delineate areas typical of different tourism markets (particularly whether landscape-sensitive or not); and more strongly, weakly and not at all affected visually by wind farms. Relevant tourism statistics could be compiled for these areas. The challenge would be identifying suitably robust, geographically-precise and consistent tourism data. Local fieldwork would be needed to fill gaps, and that would rely on local small businesses (some of which will have ceased trading) having retained relevant records.

    b) To track attitudinal and behavioural change, a cohort study could be undertaken with subgroups of (a) mountaineers, (b) others who engage in potentially landscape-sensitive activities, (c) those who engage in outdoor activities that are unlikely to be landscape sensitive, (d) those who passively view upland landscapes and (e) a 'control' group who do none of these. The challenge would be constructing and maintaining the cohorts – this is not a cheap method as the samples have to be sustained for years at a size sufficient to enable authoritative results to emerge.

    c) To track general population attitudes, annual population surveys could be undertaken of a sufficient size to enable analysis by relevant characteristics to identify established and emerging patterns of attraction and discouragement by wind farms by market segment. This has to be done by general population surveys because post-development visitor surveys in areas where wind farms have been built do not, by definition, include those no longer visiting that area.

    d) Some of these methods could also usefully be used to track attitudes in resident populations. In my wind farm work for Mountaineering Scotland, I have encountered a number of planning applications where communities have objected after being receptive to earlier wind farm activity but now find themselves facing continuing applications for additional wind farms/extensions, often with taller turbines.

101. One concern, however, must be that it is becoming late for research to *anticipate* harm to Scottish tourism in time for planning and policy decisions to take this into account.[83] Instead it may end up simply documenting it. This is especially the case if the demand is for 'conclusive' evidence – almost an impossibility outside the physical sciences. And especially if any research that does suggest a degree of caution is merited is treated not as contributing to an unfinished debate but as a challenge to be countered and discredited.

103. Why is the evidence base lacking, and in particular why is it lacking in recent studies? Even accepting that good quality primary research is neither easy nor cheap, why is it so sparse? The cynical answer must be that the Scottish Government and the wind

industry want the GCU report to be accepted as the last word on wind farm impact, even though circumstances have changed substantially from when it was written. It gave an answer - of no material impact on tourism - with which they are content. Commissioning new research would open up the risk that a noteworthy level of impact might be found. The easiest way to be able to say that there is no evidence of an effect, is not to seek such evidence. It appears that those public bodies with the resources to commission such research would prefer not to ask the question in case the answer is unwelcome.

104. This can be illustrated with reference to the aftermath of the Scottish Parliament's Economy, Energy and Tourism Committee's *Report on the Achievability of the Scottish Government's Renewable Energy Targets* which, *inter alia*¸ commented on the absence of evidence of tourism impacts.

> Whilst care always needs to be taken in terms of the planning process and decisions on the siting of individual projects in areas popular with tourists and in our rural and wild land areas, no one has provided the Committee with evidence, as opposed to opinion, that tourism is being negatively affected by the development of renewable projects. However, given the importance of this issue, the Committee recommends that VisitScotland and the Scottish Government continue to gather evidence on this from visitors to Scotland.[84]

105. This wording was unfortunately open to interpretation. The Scottish Government appears to have taken it to mean that they should review research but not commission new research. There has been no new primary research on tourism and wind farms commissioned by the Scottish Government or its agencies since the Committee reported.

106. The Committee heard evidence from January to June 2012 and drafted its report from September to November 2012. The Scottish Government commissioned a rapid review of extant research in May 2012 and published it in September 2012.[85] The Committee report makes no mention of this review, the timing of which suggests it may have been commissioned for political rather than illuminative purposes. In 2014 the Scottish Government commissioned a review of methods used in published studies:

> The Scottish Government asked ClimateXChange to compare approaches used in a wide variety of studies that have considered the impact of onshore and offshore wind farm development on tourism.[86]

Again, the Scottish Government sought merely to review a largely static pool of published research rather than seek to add to the evidence base.

107. A reply by VisitScotland in 2014 to a letter from Mountaineering Scotland (which enclosed its first report on mountaineering and wind farms), after indicating that no action was thought necessary, ended:

> We will, however, continue to review research which becomes available to ensure that our position remains consistent with our core purpose of attracting visitors to Scotland.[87] [added emphasis]

108. When Mountaineering Scotland wrote to the Scottish Government in 2015 urging that fresh primary research be carried out, the Tourism and Major Events Division's reply concluded:

> In their response to the 2012 Scottish Parliament's Energy, Enterprise and Tourism Committee report SG undertook to look at the need for "further research into the impact of wind farms on tourism" and it was clear that it was necessary to look at all

the research to date in order to see whether there had been any issues around the research methodology used.

The latest CXC report shows that are *(sic)* already sound methodologies (such as Moffat in 2008) and principles that can be used by stakeholders who wish to conduct research. The Scottish Government will therefore not be conducting or commissioning further research on renewables and tourism in the manner you suggest.[88]

It is odd that the government does not appear to regard itself as a stakeholder with regard to the impact of wind farms upon Scotland's scenic attractiveness and tourism economy.

109. Continually ploughing the field without ever sowing seed will not produce a crop. Repeatedly reviewing extant research without undertaking primary research is equally unproductive. Without new primary research, such as that indicatively suggested above (par. 100), not only is the current position unknown but it is also impossible to know to what extent the results of earlier studies may still be applicable.

110. The irony is that fears of what new research might show are most probably misplaced at current levels of visibility. It seems unlikely that any robust independent research would conclude that wind farms are a threat to more than a minority of the tourism market in Scotland. The size of that minority is uncertain, though I have used what evidence there is to estimate here that it may currently be in the range of 1-5% of total tourism spend displaced within in Scotland. If that order of magnitude is correct, it is not difficult in principle to take it into account in decision-making with regard to development proposals, not least because it is specific to particular types of location. That the Scottish Government shows little interest in better defining and understanding these issues and their implications is to be regretted.

12 Conclusion

111. Proponents of wind farms would have us believe that tourism impacts are negligible. Opponents would have us believe that the destruction of tourism in Scotland is nigh. Neither position is at all tenable. The real position is much more subtle and complex. That, of course, is a difficult proposition to 'sell' compared with a simple 'all or nothing' position since it is a message neither side in a polarised debate wishes to hear.

112. It is highly likely that wind farms do have an effect on tourism if located in the wrong places. This is probably restricted to the 25% of visitors who are particularly drawn by the quality of upland and natural/wild landscapes, with mountaineering visitors among those highly affected. It affects particular areas, where large built structures are dissonant with expectations of desired attributes such as wildness or panoramic natural vistas. The main effect is likely to be displacement within Scotland, benefitting areas seen as still retaining the desired sense of naturalness. The total displaced business within Scotland may currently be of the order of 1-5% of Scottish tourism spend. This could rise in future depending on strategic and local planning decisions on the individual siting and collective spatial pattern and extent of wind farms.

113. Such displacement was anticipated in the GCU study, though those promoting wind farms never mention it.

> "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."[89]

114. The estimates here are more modest figures than some might like, while being higher than others would wish us to believe, but they merit attention because the impact is likely to be focussed upon specific tourism sectors in terms of both tourist type and geography. While perhaps unimportant at a national level, displacement of up to £250m of tourism expenditure within Scotland is certainly not unimportant at the local level.

115. While the evidence base sorely needs improvement, that alone will not provide an off-the-shelf answer on the tourism (or recreation) impact of any specific development proposal. Each must be judged based on three sets of characteristics[90]:

- those of the development, including how it fits into the regional and national pattern of wind farms;
- those of the tourism economy of the area, its offer and potential competitor offers;
- those of the tourists (and recreationists) who come to the area.

An appropriate definition of the 'area' in question is also crucial. Too widely drawn and it will fail to have the appropriate local focus; too tightly drawn and it will fail to have the necessary regional perspective.

116. If the level of impact estimated here is of the right order of magnitude it is not difficult in principle to take it into account in decision-making with regard to development proposals, not least because it is specific to particular types of location. Indeed, despite Government planning officials repeatedly refusing to accept the possibility of an adverse tourism impact, their decisions implicitly recognise that there may be such an effect when they refuse consent for wind farms in mountains and wild land on grounds of visual impact. Tourists and recreationists would be among the receptors – often the primary receptors - of this visual impact.

117. The planning system is not perfect and has consented a number of very badly located wind farms. But it has also refused consent for many others. From a mountaineering perspective, there are perhaps no more than ten wind farms that have been consented that really should not have been. But the pressure continues to build large wind farms, with ever-taller turbines, at altitudes that give them a very long visual reach. Scotland's precious mountain and wild landscapes deserve better.

118. Strategic and local planning decisions on the extent and pattern of wind farm development in Scotland should take better account of the potential for adverse impact in areas important for landscape-dependent tourism, such as mountain and wild land areas, and safeguard sufficient such areas in each part of Scotland. A more robust approach is needed to the protection of all of Scotland's many important landscapes in line with that accorded to the few National Parks and National Scenic Areas.

Appendix 1 – Reviews of wind farms and tourism, 2012-2014

The appendix gives the main findings and a critique of the three most frequently cited reviews.

The Tourism Company. The impact of wind turbines on tourism – literature review. Prepared for Anglesey County Council, February 2012.

The key findings are summarised under the heading 'Some observations' on pp10-11.

> It is important that the information contained in this review is read in its entirety, as it is already a summary of evidence, often in itself summarised from fuller material. However, a small number of observations are made below which may be of use to readers in making their own assessment of what has been presented.

- The positive attitude of most tourists to green energy, including wind, is an important factor and could be used to advantage. However, attitudes to energy generation and the issues involved may change over time and it is important to keep abreast of this.
- Only a minority of tourists appear to be negative about wind turbines and believe that they spoil the landscape. However, this is a significant minority. [18-32% (or 38% prompted) p.5*]
- Tourists' reaction to wind turbines appears to be affected by how and where they see them. Certain images have stimulated a majority negative reaction. Proximity may be an issue. In general, they prefer to see them in the distance and preferably off-shore.
- Generally tourists prefer smaller windfarms to larger ones. However, there is no firm evidence to judge their likely reaction to having a lot of individual turbines or small clusters dotted across a landscape. The impression from the research is that they may prefer to see them in one place rather than everywhere.
- Wind turbines are not seen as negatively as some other structures in the countryside, notably pylons.
- General sightseers, who come because of the attractive scenery, are equally as likely to be negatively affected by wind turbines as more active tourists. Visitor profiles appear to make little difference.
- Evidence is mixed on the proportion of tourists who may choose to stay away from areas with wind turbines in future. While this may be a relatively small minority it could be quite damaging to markets in certain locations.
- While few tourism enterprises are opposed to wind energy generation in principle, many have concerns about the future effect of wind turbines on their business. A few have based this concern on testing this with guests and more evidence of this kind would be helpful.
- The negative effect on tourism performance where windfarms have already been established may not be as great as some people fear. However, far too little firm longitudinal evidence on this is available.
- Evidence from the UK and Ireland on reaction to existing wind turbines may not be a reliable guide to the future, given the very great expansion that is planned over coming years.

Commentary

This review, despite its 2012 date, contains only three references after 2008, only one of which is an original study of tourist attitudes and that was in Czechoslovakia. It is cautious in its conclusions, aware of the inadequate and context-related nature of the evidence in a situation of continuing development of wind farms. It repeats the canard from the GCU study about hill-walkers being more positive towards wind farms (p.6), but in other places is rightly cautious about accepting the GCU results uncritically. It is properly independent, hence perhaps the authors' preparedness to recognise the need for caution.

* In the Dinnie review (described below) this is quoted as 18-32% without identifying that it is the range in a single Irish study, albeit that results from most studies cited are within this range.

Dinnie, E. The Impact of Wind Farms on Scottish Tourism. climateXchange: 2012.

'Key Points' are given on page 1 as follows:

- The main source of data on the impact on tourism of wind farms in Scotland is the 2008 Moffat Report [GCU report] which focused on four geographical regions in Scotland.
- Our analysis of recent tourism data on visitor numbers and spend in regions comparable to the four Moffat Report regions presents a mixed picture. However, there is no evidence to suggest that subsequent wind farm development in these areas has had an adverse effect.
- A 2012 UK survey of tourists' attitudes to wind farms found that:
    - 80% of UK respondents, and 83% of Scottish respondents said their decision on where to visit or where to stay would not be affected by the presence of a wind farm;
    - 52% of all respondents disagreed that wind farms spoil the look of the UK/Scottish countryside, with a further 29% neither agreeing nor disagreeing.
- Our conclusion is that there is no new evidence to contradict the earlier findings that wind farms have little or no adverse impact on tourism in Scotland

Commentary

This is an unexpectedly weak paper given its provenance.

It finds an absence of new evidence – which is very different from there being new evidence of no effect - and draws on the literature review undertaken for Anglesey Council (which itself contained no UK studies post 2008) but without any of its caution. Only three new papers are reviewed: one on Czechoslovakia from which no results are given and two papers on Scotland that – insofar as they can be accessed on-line without cost – require a stronger critique than the uncritical approach taken (e.g. one covers residents and tourists in two different locations with a total sample size of only 106).

It gives a precis of the VisitScotland survey published in 2012 but fails to set it in temporal context and thus observe that it showed a distinctly higher level of discouragement than previous surveys, which might be regarded as at least hinting at the possibility of a changing effect.

Perhaps to compensate for the absence of substantive new literature, the study then provides a misjudged new analysis of short-term trends in tourism in Scotland from routine statistics. This is critiqued in the main text and that is not repeated here.

Regeneris Consulting Ltd & The Tourism Company. Study into the Potential Economic Impact of Wind Farms and Associated Grid Infrastructure on the Welsh Tourism Sector. Report for the Welsh Government. February 2014

The 'Key Findings' are given on pp1-3. I have omitted those relating to construction and associated infrastructure.

Negligible impact on the national tourism sector

iv. The current scale of wind farm development in Wales is modest, especially when compared with other European countries, including Scotland. National studies of tourism impacts of wind farms have shown that, where negative effects do occur, these are often in the form of displaced tourism. This is likely to be the case in Wales, where substantial areas of the country will remain unaffected by wind farm development.

Limited evidence of local tourism impacts to date.

v**.** There are a number of areas in Wales where wind farms have been an established presence on the local landscape for a relatively long time. These include Powys, Anglesey and the South Wales Valleys which were all the subject of case studies. The case studies have not revealed any evidence of significant impacts on tourism to date. The few local studies which are available have shown the majority of visitors are positive or indifferent about wind farm development. Although there was some anecdotal evidence of visitors staying away due to wind farms, the vast majority of consultees believed there had been no impact on total visitor numbers and hence on the visitor economies as a whole.

Wind farms are remote from Wales's key visitor assets and tourism locations

vi. The study has shown that the areas most affected by wind farms (currently and in the next decade) account for a very small proportion of Wales's total visitor economy. This is likely to be an indirect consequence of planning policy focusing development away from Wales's key natural assets and visitor attractions, including areas of outstanding natural beauty and national parks.

Reactions to wind farms are complex and may change over time

vii. The evidence base shows a clear majority of people do not react negatively to wind farm developments or change their visiting behaviour as a result. However it also shows that visitor responses and reactions to wind farms are highly subjective and depend on the individual's own judgements and perceptions of the relative merits of onshore wind as a means of energy production.

viii. While current levels of support for onshore wind are strong, there are a diverse range of factors which could influence public perceptions over the next ten years which could then change visitor behaviour. The greatest risk is that the increased rate of development in some parts of Wales could change the value judgements made by some visitors, especially if they feel a tipping-point is reached. However, the study has not found any evidence to suggest this could occur in practice.

ix. This risk also needs to be weighed against the fact that wind farms will become a more common sight in the UK and across Europe. This increased familiarity with turbines is likely to mean that many visitors become more tolerant of turbines as a feature of rural landscapes, and their visiting behaviour may change little as a result.

Higher sensitivity to wind farms for certain visitor markets

x. There are examples of certain locations which are more sensitive to wind farm development on account of their landscapes, types of visitor, limited product diversity and proximity to wind farms. This is particularly the case where the key visitor markets are older people visiting for the tranquillity, remoteness and natural scenery offered in some parts of Wales. Remoter parts of Powys are the most notable examples of where this may be the case. In these locations, the study has concluded that the potential negative effect on visitor numbers may still be low overall, but in some circumstances could be moderate. But these findings are still subject to various aspects of uncertainty and need to be explored on a case by case basis for schemes going through the planning system.

xi. Although these areas account for a small proportion of tourism employment in Wales as a whole, the narrow economic base in these areas means the sector is an important source of local employment and income

Some potential for positive impacts, often requiring further investment

xii. Although a number of studies point to the potential to attract visitors to areas containing turbines, there is little evidence that these positive effects occur in practice. There may, however, be some instances where wind farm development could enhance existing visitor attractions or be an attraction in their own right through investment in related visitor facilities. There may be particular opportunities for areas which attract a large number of day visitors and have large catchment populations in close proximity such as the South Wales Valleys or North Wales. The case studies showed there was enthusiasm for these types of projects among local stakeholders and an opportunity to make better use of community benefit funds to achieve economic development goals.

No evidence that wind farms on visitor routes deter tourists

xiii. There are a number of visitor routes which will be in close proximity to large concentrations of turbines. The general survey evidence presented in this study offers the only proxy for how visitors would react to these wind farms. This shows that small minorities of visitors would be encouraged, whilst others would be discouraged. Overall, however, there is no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere.

Commentary

Like the Anglesey review, this review is also cautious in its conclusions, noting the modest scale of wind development in Wales and the likelihood than any adverse effects on tourism will vary by type of tourist and location and may change over time as development expands or attitudes change.

> Although most local tourism economies will face minimal or no threat from wind farm development, the nature of visitor economies in some areas does mean they are at greater risk of negative impacts. ... there is the potential for future wind farm development to have minor or even moderate negative impacts on the visitor economies of some localities. However, this conclusion is nevertheless subject to a degree of uncertainty ... (p.4)

Given the degree of common authorship between this and the Anglesey review, similarities are to be expected. It is notable that hardly any recent studies were found for the review. In that sense the review itself codifies, helpfully, the existing evidence base but adds little to it.

As the authors note, context is important. At the time of fieldwork for this report, the total Welsh operational onshore wind capacity (c.530 MW) was similar to the current size of Whitelee wind farm alone (539MW) and turbine density was half that of Scotland (p.21). The applicability of the sanguine conclusions from their case studies to Scotland needs to be considered in this context. A careful, independent application to Scotland of their framework - which assesses potential sensitivity/robustness to development based on the characteristics of development, of the local tourism area and of local tourists – would be valuable.

Appendix 2 –The myth that hill-walkers are more positive towards wind farms

The Glasgow Caledonian University (GCU) 2008 report on wind farms and tourism highlighted a particular finding in the Executive Summary which derived from a drafting error in the text. [91] Disappointingly the impact of this error has been compounded by it being repeated in literature reviews, which gives it a new lease of life since most compilers of Environmental Statements will, perfectly reasonably, rely on reviews rather than look at the detail of original studies.[92] [93]

The report states that hillwalkers view wind farms more positively than the general public.

> "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)." (Executive Summary p8)

The full relevant text in the analysis section of the report reads:

> "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 [*sic*]) 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." (p116-7, added emphasis)

It is clear that these paragraphs are contradictory. If no subgroups 'deviated significantly', as written in the first paragraph, then the second paragraph should never have been written.

Reanalysis of the data in the report confirms that the GCU's statistical analysis was correct – there were no significant differences between the subgroups. The original analysis is not well presented in the report. The base numbers for percentages are often missing, making it impossible to know the actual numbers involved. The total sample size is 380 (p107) but the breakdown by main activity has only 357 respondents (p113). We have assumed that all 380 respondents gave a view on wind farms and that the 20% of respondents who gave hiking/will-walking as their main activity is 71 (20% of 357).

On that basis, the 95% confidence intervals – a standard measure of whether subgroups within a sample survey are likely to be truly different – for attitudes to wind farms are:

	Positive		**Negative**	
All respondents as published	39%		25%	Assumed n=380 (Table 4-11, p.115)
Hikers, hill-walkers as published	45%		19%	Assumed n=71 (Table 4-14, p.117)
All respondents 95% ci	**34-44%**		**21-29%**	
Hikers, hill-walkers 95% ci	**33-57%**		**10-28%**	

The overall sample size, and even more so the hiker subgroup size, is small. The 95% confidence intervals are correspondingly wide and overlapping, indicating no statistically significant differences between the overall sample and the hiker sample. Indeed, the only conclusion that can be drawn is that the sample sizes are too small to draw any conclusions.

Notwithstanding this, an inept drafting error in the original report, perpetuated in review papers, has created and sustained a myth that hill-walkers are more positive about wind farms than other tourists.

Appendix 3 Critique of BiGGAR Economics. Wind Farms and Tourism Trends in Scotland: A Research Report. October 2017.[94]

BiGGAR Economics (BE) includes among its clients wind farm developers and its work includes acting as an expert witness for them at planning inquiries. Some might be concerned that this could predispose it towards their interests. No such concern is raised here: my concern is the conceptual, methodological and data weaknesses of the study.

The October 2017 study is an update of one published in July 2016. The only substantive difference between the two studies is that the 2017 one increases the number of wind farms studied. My criticisms of the 2016 study are familiar to BE through public sharing of drafts of the present review at several planning inquiries during 2016-2017. The updated report contains an appendix responding to the criticisms made by Wynn[95], some of which were shared with my critique, but it offers no response to those criticisms unique to my critique. Even to the non-economist, some of the responses to Wynn appear inadequate.

The approach taken by BE is analyse routine data on tourism employment compared with wind farm development in Scotland, local authorities and more local areas, defined by aggregating datazones, around 28 wind farms supposedly constructed between 2010 and 2014. The analyses are presented as unproblematic when there are significant problems with them.

The analysis of data at Scotland and local authority level can receive short shrift because the basic unit of analysis – the country and local authority area – is simply wrong. Scotland and each local authority area contain places with wind farms and places without. It is entirely unsurprising that an analysis for these geographies shows no relationship between tourism employment and wind farm construction because displacement could happen within Scotland and within individual local authority areas without any effect on total Scottish or local authority tourism employment. This is facilitated by the large size of most local authorities with the highest quality mountain landscapes. This analysis simply shows that the planning system has, to date, worked reasonably well, albeit with some notable exceptions, to prevent wind farms in the wrong places, consenting only half of all applications.[96] It cannot be extrapolated to suggest that every future planning application should be assumed to be incapable of impacting on tourism.

The analysis of areas around recently-constructed wind farms is much more interesting since in theory a study of this design could be used to identify any effect (including an absence of effect) on tourism. However, as simplistically operationalised by BE it was both methodologically flawed and conceptually lacking. The critique by Wynn cited above focussed on the data source and its operationalisation and I touch only lightly on these points below since my expertise is in research design and statistics, not economic data sources and their limitations.

Conceptual design of study

The conceptual difficulty is fundamental. The study treated all wind farms as the same. This follows a standard wind industry narrative, that there is a blanket absence of effect from wind farms – any wind farm, anywhere. This approach can be contrasted with the present author's thinking that underlies this paper, that there may be some effect from some wind farms in some places. On my reading of the evidence, all wind farms are not of equal importance for tourism impact. It depends on the nature of local tourism markets and the siting of the wind farms. If wind farms are in areas where the tourism market is not landscape-sensitive, then no impact on tourism can be expected. Mountaineering is a landscape-sensitive sport so it is of some significance that Mountaineering Scotland had objected to only one of the 28 wind farms in BE's cohort. Nearly all wind farms in the study cohort are located in areas where the landscape sensitivity of tourism is limited or not directed to the uplands.

Furthermore, the study used a mixed cohort that confuses three distinct questions – the impact of introducing the first wind farm to an area; the impact of adding more (separate) wind farms; and the impact of repowering or expanding an existing wind farm. As Table A3.1 shows, of the unique wind farms in BE's cohort only 11 were the first wind farm within 10 km; eight were within 10 km of a prior wind farm; and eight were extensions or repowering.

Definition of study cohort

The study includes wind farms of 10MW or greater. There are 28 listed but one of these appears to be duplication arising from an error in the *Renewable Electricity Planning Statistics for Scotland* database. The consented 7.5MW wind farm of 3 turbines called Easter Tulloch was amalgamated with other consents prior to construction and they were constructed together. The planning database includes Easter Tulloch at 25MW (actually 7.5MW) and also Tullo South (10MW) and Tullo North (Shiels) (7.5MW). These are all one single 25MW Tullo extension, built and operated together (and now renamed Twinshiels by the operator to add further confusion). Easter Tulloch and Tullo South are listed separately by BE. The study thus includes 27 unique wind farms (listed in Table A3.1), not 28. For the avoidance of doubt, I do not consider this error to materially affect the analysis.

Time period

The baseline is set at 2009. "All of the wind farms were constructed in 2010-14, and became operational during the time period to 2015."(p.29) It is extremely difficult to find information on when wind farm construction took place. The date a wind farm became operational is readily available through the internet. To know when construction began appears to be almost impossible without unlimited resources or insider knowledge. However, one of the cohort was under construction by mid-2009 and two others began before the end of 2009, contaminating the baseline year (Table A3.1).

All of the cohort became operational prior to 2015. However, that does not mean construction stopped in their vicinity. Every wind farm could be checked for this but I have only resources to consider two examples (Table A3.2).

Table A3.2 The impact on ongoing construction confounding 'tourism' employment

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Clyde						
% change in employment between years*	-11.9	4.3	-11.0	4.6	-13.2	16.1
Construction $	X	X				
Extension construction $						X
Lochluichart						
% change in employment between years*	-1.1	49.5	12.2	24.4	-4.6	19.5
Construction $		X	X	X	X	
Corriemoillie construction $						X

* BE 2017 Table 5.3
$ In second year of each period

Clyde wind farm began construction in 2009 and became operational in 2011. Work began on-site for the Clyde Extension in May 2015. Clyde shows a substantial decrease in tourism employment in the period between the construction of Clyde and Clyde Extension – the time when tourism employment might have been generated by genuine tourists rather than transient construction workers – then rose in 2015 as work on the Extension began.

Lochluichart wind farm began construction in November 2011 and became operational in June 2014. The neighbouring Corriemoillie wind farm began construction in September 2015. It is notable that the largest percentage increase in 'tourism' employment took place in the year during which construction began, which may be an unconnected coincidence or reflect gearing up for construction workers' expenditure, or be a fluke from small sample numbers. Nothing at all can be said about any tourism impact of Lochluichart since there is no 'outcome' period without construction-related expenditure confounding any view of tourism.

Lochluichart is of particular interest since it is the only one of BE's cohort to which Mountaineering Scotland had objected to the planning application. It is also striking as showing the highest increase in 'tourism' employment of any of the cohort. A remarkable increase of 135% is shown between 2009 and 2015, an increase from 100 to 200 in the rounded absolute numbers. As well as the issue of confounders such as construction expenditure, the sampling error could be large with such small numbers (this is discussed more generally below).

Considering the cohort as a whole, there are some deficiencies in the baseline and almost certainly greater contamination of the outcome period. This reduces the confidence one can have in the results. Even without contamination, a single baseline year for many of the 2016 study's cohort and a single outcome year for those added to the cohort in the 2017 study is too short a period to rely upon.

Geography of local areas

No information is given by BE on how "Data Zones that lie within a 15km radius of the wind farm" were defined (BE 2017 p.11). The geography of data zones can be extremely convoluted and there are various possible definitions, such as data zones lying wholly within 15km, those lying mostly within (by area or population), those with any part lying within 15km, or those with the population centroid within 15km. The data zones used for one wind farm are mapped (BE 2017 Figure 5-2) but this is unenlightening since it shows included data zones extending well to the north and east of the wind farm but the data zone only 3km to the south not included. Any local effect of a wind farm could be significantly diluted by the inclusion of areas a long way from the wind farm, especially if much closer areas are left out. In the absence of a clear and precise definition, it is impossible to know whether the data zone selection was appropriate or what the implications of the geography selected might be for the validity of the results.

'Sustainable tourism employment' definition

BE used a standard but over-inclusive measure of tourism employment. The report itself refers to earlier work by BE that found around half of 'tourism' employment in Stirling was attributable to residents' spending rather than to tourists (p.4). The resident/tourist balance in spending would be expected to vary by location. It may also vary over time. Without specific studies of this, there is an unknowable diminution of precision in the proxy outcome measure relative to actual tourist-generated employment. (The ideal outcome measure might be tourist-generated expenditure rather than employment since in small businesses, such as croft B&B, the tourism income may be sustaining a household's standard of living and thereby general commercial services in an area rather than overt tourism service employment. There is no such data at small-area level.)

As already noted, there will also be confounding from transient construction crew expenditure on accommodation and subsistence during varying construction periods on the cohort wind farms and on other construction ranging across the full period from 2009 to 2015.

'Sustainable tourism employment' data source

BE used data from the Business Register and Employment Survey, a reputable survey of a large sample of all businesses registered for VAT and/or PAYE across Great Britain. Small businesses below the VAT threshold and with no employees (such as seasonal B&Bs and other enterprises below the VAT threshold of £83,000) would not be included in the sampling frame. It appears a plausible assumption that small businesses in an area will follow the same trend as large businesses, but it would be preferable to see some empirical evidence for this. Different areas might have a very different balance and/or composition between large and small businesses. Having to make such an assumption does not invalidate the use of this data source, which is in any case the best available, but it adds another element of uncertainty to the results.

Sampling error

All sample surveys have what is technically called 'sampling error' attached to their results. This is not 'error' in the normal meaning of the word but a measure of uncertainty because one is dealing with a sample. Any sample survey analysis should report the uncertainty, preferably in the form of a 95% confidence interval – the wider the interval the less sure one can be of the statistics. Sampling error is

a direct function of sample size. Given the UK sample size of the Business Register and Employment Survey, the average Scottish data zone (N=6,505) would be represented in the sample by only one business, not necessarily a tourism one. Even aggregating data zones will still give a very small number of tourism businesses – on average one for every 11 data zones aggregated.

BE does not report any measures of sampling error. It dismisses it as a problem by claiming that "most surrounding areas examined are made up of 10 or more data zones ... therefore the risks associated with potential sampling errors have been reduced" (p.13). This is disingenuous. Sampling errors are not 'potential' they are a statistical fact of all sample surveys. That they are 'reduced' by data aggregation does not eliminate them. It is true that a full statistical reporting can become almost unreadable and outside scientific journals a balance has to be struck, but that is no reason not to provide a sufficient number of confidence intervals for a representative range of results so that readers can assure themselves that the statistics being reported are adequately robust for the use being made of them. The absence of such reporting adds still more uncertainty around the BE study.

Minor matters

Figure 3-1 (BE, 2017) shows 'Density of sustainable tourism employment by local authority'. The shading is inconsistent with the report's data on the proportion of local authority employment that is tourism employment. There is no legend on the Figure and it is not referred to in the text so it is not clear if there is an error or, if not, what is actually being shown.

Tables 7.1 and 7.2 (BE, 2017) show the wrong data against the rows from Comhairle nan Eilean Siar to City of Edinburgh. The mismatch results from the name Comhairle nan Eilean Siar being moved up several rows but the accompanying data rows not being moved to match.

Both these matters are presentational and of no material consequence.

Conclusion

The study claims to show that "wind farms do not cause a decrease in tourism employment either at a local or a national level." (p.20) That is too general a statement. A fairer conclusion is that wind farms located in areas where the tourism market is less sensitive to landscape and/or where there are existing wind farms have no net effect on tourism jobs. Even that, although a plausible and reasonable conclusion, must be qualified by the uncertainties arising from the limitations and flaws in the study. Most importantly, the study cannot be extrapolated to claim that there would be no effect in areas where the tourism market is sensitive to landscape since it included only one such wind farm and the outcome data for that wind farm is confounded by continuing construction expenditure in the area.

Table A3.1 Status of 27 unique wind farms included in BiGGAR Economics 2017 study

Name	Location	Size (MW / N turbines)	Construction	Status
Spurness	Orkney	10 MW 5 turbines	? – Oct 2012	Existing wind farm repowering
Kilbruar Extension	E Sutherland	20 MW 8 turbines	? – Sept 2011	Existing wind farm extension
Millenium Extension	Great Glen	15 MW 6 turbines	? – early 2011	Existing wind farm extension
Novar Extension	Easter Ross	37 MW 16 turbines	? – Sept 2012	Existing wind farm extension
Whitelee	S Glasgow	217 MW 75 turbines	Nov 2010 – Mar 2013	Existing wind farm extension
Beinn an Tuirc 2	Argyll & Bute	38 MW 19 turbines	April 2010 – Sep 2014	Existing wind farm extension
Mid Hill 2	Aberdeenshire	18MW 8 turbines	? – Aug 2014	Existing wind farm extension
Tullo 2 (incl. Easter Tulloch)	Aberdeenshire	25 MW 10 turbines	? – June 2014	Existing wind farm extension
Gordonbush	E Sutherland	72 MW 35 turbines	Autumn 2010 – June 2012	Prior wind farm within 10 km (Kilbruar 2008)
Kelburn	N Ayrshire	28 MW 14 turbines	2010-2012	Prior wind farm within 10 km (Dalry 2006; Ardrossan 2004 & 2009)
Millour Hill	N Ayrshire	6 MW 18 turbines	? – May 2012	Prior wind farm within 10 km (Dalry 2006; Ardrossan 2004 & 2009)
Muirhall	W of Pentlands	12 MW 6 turbines	Mar – Dec 2010	Prior wind farm within 10 km (Black Law 2006)
Berry Burn	Moray	67 MW 29 turbines	Dec 2012 - May 2014	Prior wind farm within 10 km (Rothes 2005; Paul's Hill 2006)
Carscreugh	Dumfries & Galloway	15MW 18 turbines	? 2012 – Jan 2014	Prior wind farm within 10km (Artfield Fell 2005)
Harestanes	Dumfries & Galloway	136 MW 68 turbines	? - Sep 2013	Prior wind farm within 10 km (Dalswinton 2008). Note also Clyde (2011) 11km
West Browncastle	S Lanarkshire	30 MW 12 turbines	Aug 2012 – Feb 2014	Prior wind farm within 10 km (Whitelee 2010)
Clyde	S Lanarkshire	350 MW 152 turbines	Apr 2009 – June 2011	Under construction by mid-2009
Mark Hill	S Ayrshire	56 MW 28 turbines	Oct 2009 - Jun 2011	First in area (but Hadyard Hill (2006) 11km)
Arecleoch	S Ayrshire	120 MW 60 turbines	Sep 2009 - Jun 2011	First in area
Allt Dearg	Argyll & Bute	10 MW 12 turbines	Sep 2011-Dec 2012	First in area
Drone Hill	Borders	29 MW 22 turbines	Apr 2011-Sep 2012	First in area
Glenkerie	Borders	22 MW 11 turbines	Apr 2011-Feb 2012	First in area
Griffin	Perthshire	156 MW 68 turbines	July 2010 - Feb 2012	First in area
Hill of Towie	Moray	48 MW 21 turbines	2010-Jan 2012	First in area
Little Raith	Fife	25 MW 9 turbines	Aug 2011 – Sep 2012	First in area
Earlseat	Fife	16 MW 8 turbines	? – Jul 2014	First in area
Lochluichart	Highland,	69 MW 23 turbines	Nov 2011 – June 2014	First in area

References and Notes

Prior to Mid-2016 Mountaineering Scotland was known as the Mountaineering Council of Scotland (which remains its formal company name), referenced here as MCofS

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