Examining the potential of Internet-based Geographical Information Systems for promoting public participation in wind farm planning in the UK

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1. Introduction

Public attitudes to the development of wind power schemes have been examined extensively in previous research (for example Bishop and Proctor 1994; Devine-Wright 2005). Landscape and visual impacts have emerged as the most far-reaching effects of onshore wind farm developments and the effects of most concern to the public (Hull 1995; Pasqualetti, et al. 2002; DTI 2006). Landscape effects refer to change in perception and character of the landscape whereas visual effects are concerned with the potential visual impact from individual receptors and viewpoints, such as houses, parks, and roads for example (LI-IEMA, 2002).

A Visual Impact Assessment (VIA) therefore, is usually the most comprehensive and important part of a wider Environmental Impact Assessment (EIA), which is normally required to be submitted to local planning authorities in the UK by wind farm developers as part of the planning application for commercial wind farms. The focus of our research is to examine the use of traditional and emerging GIS-based visual impact techniques and their role in the advanced stages of planning, i.e. when a specific proposal has been submitted for approval. Information relating to visual impact for specific wind farm plans derived from these techniques becomes of vital importance in determining the success of an application, particularly in terms of public acceptance. Our aim is want to evaluate emerging three-dimensional (3D) GIS –based landscape visualisation (LV) technologies alongside traditional map and photo-based methods to determine if such tools can be employed to enhance information dissemination and public participation in the wind farm planning process. The following section provides a brief overview of these techniques and draws attention to the strengths and limitations associated with each, examples of which will be shown at the conference. In section 3, we then go on to describe the results of a survey we produced to determine which techniques are currently being used by environmental consultancies and agencies concerned with wind farm planning in the UK context.

2. Techniques used in Visual Impact Assessment

2.1 Traditional VIA Techniques

The three main tools traditionally used in wind farm VIA are ZTV (Zones of Theoretical Visibility) maps (Fig. 1), showing the locations from which a wind farm is visible, photomontages (Fig. 2), which are created by superimposing wind turbines onto a photograph, and wireframe diagrams (fig. 3) which are black and white diagrams containing no landscape detail or texture other than lines, or ‘wires’, depicting the terrain in grid structure with the only additional detail being accurately scaled drawings of the proposed wind turbines. ZVI maps provide only an abstract representation of visual impact, while photomontages and wireframe

diagrams are only able to show 'views' from a limited number of locations. None of these techniques is unable to show the effects of the moving turbines, which has been shown to have an important influence on visual impact (Bishop, 2002).

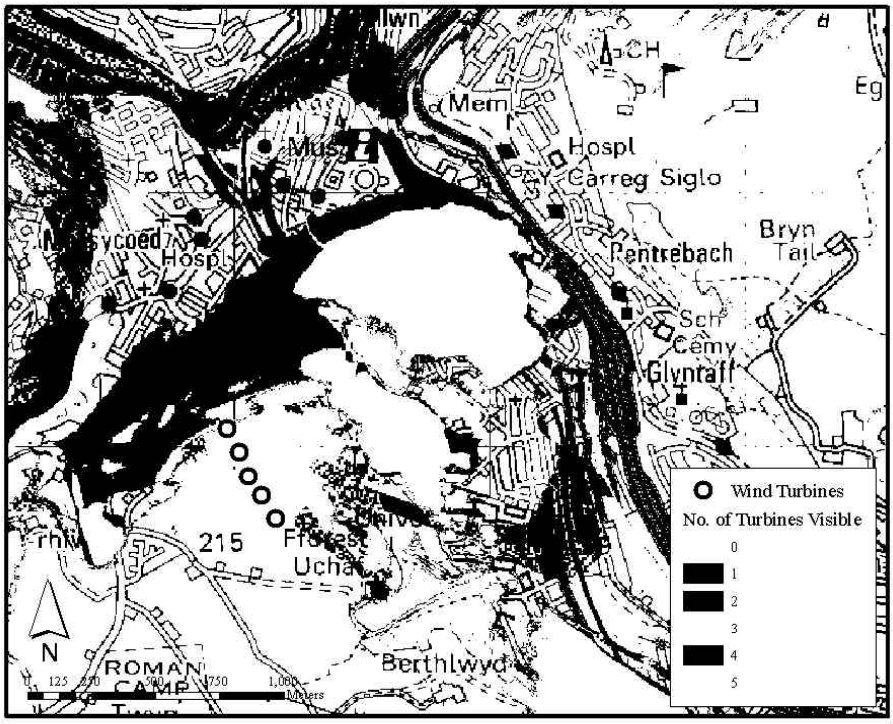

Figure 1. *ZTV Map for a theoretical 5-turbine wind farm development in South Wales.*

Figure 2. *Photomontage of wind farm shown in Figure 1.*

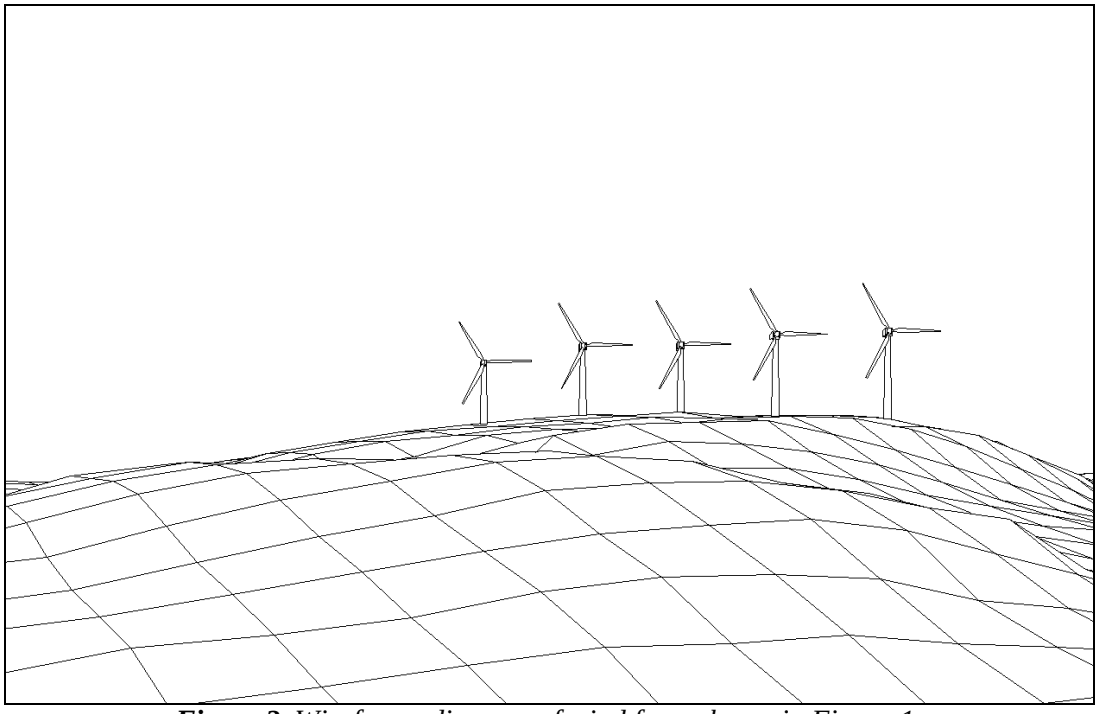

Figure 3. *Wireframe diagram of wind farm shown in Figure 1.*

2.2 Three-Dimensional Landscape Visualisation

Advances in computing and the growing quantity and quality of environmental information and spatial data has led to significant developments in GIS-based 3D landscape visualisations (LV) (MacFarlane, et al. 2005), which are increasingly being used in new areas of environmental, design and planning research (Bishop, 2000). In the context of the assessing the potential visual impact of wind farms, LV immediately offer a number of advantages over traditional VIA techniques. 'Views' towards a proposed development can be easily created from any location within the model, and the movement of the turbines can be shown. Most visualisation software allows real-time navigation within a LV and also has the capability of creating animated 'fly-throughs' or 'walk-throughs' where the user is taken through the 3D landscape along a predefined route. Output can also be provided in the form of more conventional static imagery. The availability of such outputs in digital form provides enormous opportunity for dissemination via the Internet, potentially widening public involvement in planning (Bishop and Lange, 2005).

However, despite the promise of the widespread use of LV in this context there has been less research on the current use of such techniques by professional consultants and wind farm developers for VIA and public consultation. An early study by Coles and Taylor (1993) suggested that the take-up of such techniques was low, but there is an urgent need to update their findings to take into account new developments in software and data. In the next section we draw on a questionnaire survey to gauge the current state of play with regard to the implementation of such tools in wind farm planning, and especially their use in public consultation scenarios.

In addition to the limitations associated with VIA outputs derived from traditional techniques, there has been much criticism directed towards current methods of public participation in the planning process. The benefits of effective public participation in planning decision-making are well documented (Petts & Leach, 2000). Access to planning information derived from VIA has been largely restricted to public exhibitions and meetings organised by developers as a way of informing the public and engaging them in the planning process. Factors such as the temporal and geographical constraints of such meetings and the often confrontational atmosphere which can

prevail are known to discourage participation in planning (Kingston et al, 2003). Information dissemination and public participation via the Internet has been suggested many as a means of overcoming some of these limitations (Kingston, 2003).

3. Survey Results

In October 2005, a postal questionnaire was sent to 151 environmental consultants, landscape architects, freelance consultants, planners, academics and other professionals that had been identified as being involved in VIA work. The aims of the survey were to gather information relating to the use of the VIA techniques in wind farm planning and to gauge the extent to which VIA information derived from such techniques is contributing to existing public participatory processes.

A full analysis of the results will be presented at the conference, but the main conclusions drawn from the survey are summarised as follows:

- Traditional VIA techniques still dominate, with 90% of respondents using ZVI maps and photomontages respectively and wireframes also used widely (79%), whilst over half (63%) of respondents have incorporated LVs into the VIA.

- Organisations deliver visualisations using a range of CAD, GIS and VR software types both in animated 'fly-through' form and as still images, with CAD software marginally more popular than GIS software.

- Photomontages are clearly the favoured means of displaying visual impact information to the public (96% of respondents) with ZVI maps (63%) and wireframes (58%) used to a slightly lesser extent than in the VIA stage. It appears that LVs are also used less in the public consultation although 38% of respondents employing the use of LVs at this stage in the planning process nevertheless represents a significant proportion considering the lack of use of such techniques in the past.

- Still images of 3D landscape visualisations are the most popular format (89%) closely followed by animations, usually in the form of a pre-defined 'fly-though' or 'walk-through'. Only one respondent indicated that they use interactive LVs in the consultation stage, whereby the user (e.g. a member of the public) is able to freely control navigation within a 3D environment.

- Only 2 respondents (8%) indicated use of the Internet for distributing VIA information. In one case this was simply a case of posting PDF documents of photomontages on a website, the other respondent had experimented with VRML but found it of limited value for disseminating LVs covering large areas.

4. Conclusions

Based on a literature review and our survey findings relating to the use of IT-based approaches in wind farm planning in the UK context, the main themes that have emerged from this research are three-fold. Firstly, we suggest that the issue of visual impact in wind farm planning is a contemporary and highly contentious one, and perhaps the single most important factor in determining the success of a planning application. This has been reinforced by some high profile decisions on recent wind farm proposals such as that of Whinash wind farm in Cumbria (BBC News, 2006). Secondly, our review suggests that there are limitations associated with traditional

techniques used to assess visual impact and that there are clearly shortcomings associated with the manner in which outputs from visual assessment techniques are incorporated into the planning process, particularly in the context of the dissemination of such information to the public and their use in public consultation scenarios. Thirdly, whilst there has been some recent work concentrating on public responses to different landscape visualisation tools (e.g. Dockery et al, 2006), there remains a lack of research focussing on evaluating the potential of interactive online visualisation tools for enhancing public participation in the planning process (Strobl, 2006), despite their undoubted potential. There is a clear need for empirical work to assess this potential, with particular emphasis needed on assessing public responses to the usability of such tools to determine if they are a viable means of promoting participation, as well as recording reactions to the output imagery/information produced using such techniques.

5. Further Work

During the next phase of this PhD project we intend to evaluate the use of Internet-based LV and other techniques (ZVI maps, photomontages) for overcoming some of the previously highlighted limitations inherent in existing methods of information dissemination and public participation in wind farm planning in the UK, using a web-based experiment based on an existing wind farm proposal near the town of Gilfach Goch, South Wales. An outline of the experiment, some preliminary findings, and a detailed review of the VIA techniques and public participation issues will be presented at the conference.

Though focussed on wind farm planning in this instance, the findings of our work will likely be applicable to all manner of projects which are perceived to have potentially negative visual and landscape impacts. If such tools are shown to be successful in engaging the public in the landscape planning process, they could form the basis of a future Public Participation Geographical Information System (PPGIS) on which a participatory framework can be built which fully incorporates public feedback into the decision making process.

Biography

Rob Berry is a 3rd year PhD student at the GIS Research Centre, University of Glamorgan. Rob graduated from the University of Glamorgan with an MSc in Geographical Information Systems in October 2004.

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