GIS-Based Visualization Of The Potential Impacts Of Climate Change On Rural Landscapes

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Biography

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Introduction

Climate change is an issue that will increasingly require policy consideration but for which knowledge and information at the local or landscape scale, is either lacking or largely inaccessible. This paper explores the scope for reinterpreting climate impacts information and presenting it through GIS-based visualisations in a manner that might assist decision-making at the local level. Such initiatives are possible because improvements in computer technology and the availability of digital databases have made it practical to generate realistic landscape views and virtual environments in much easier (and cheaper) ways (Ervin and Hasbrouck, 2001; Appleton et al., 2002).

Humberhead Levels Case Study

Options for visualising potential landscape changes have been explored in a study of three sites within the area covered by the Humberhead Levels Land Management Initiative (LMI). The national Land Management Initiative consists of nine projects funded by the Countryside Agency to examine how farming systems can respond to the changing demands on agriculture in ways that will generate economic, environmental and social benefits (see http://www.countryside.gov.uk/farming/farming_04.htm). As part of the Humberhead Levels study, Ordnance Survey MasterMap and Panorama data were used to construct initial GIS databases for three sites (two farms and a wetland area of archaeological interest) that were then supplemented by land use details derived from field surveys and agricultural records. Figure 1 shows an example of the data for one farm.

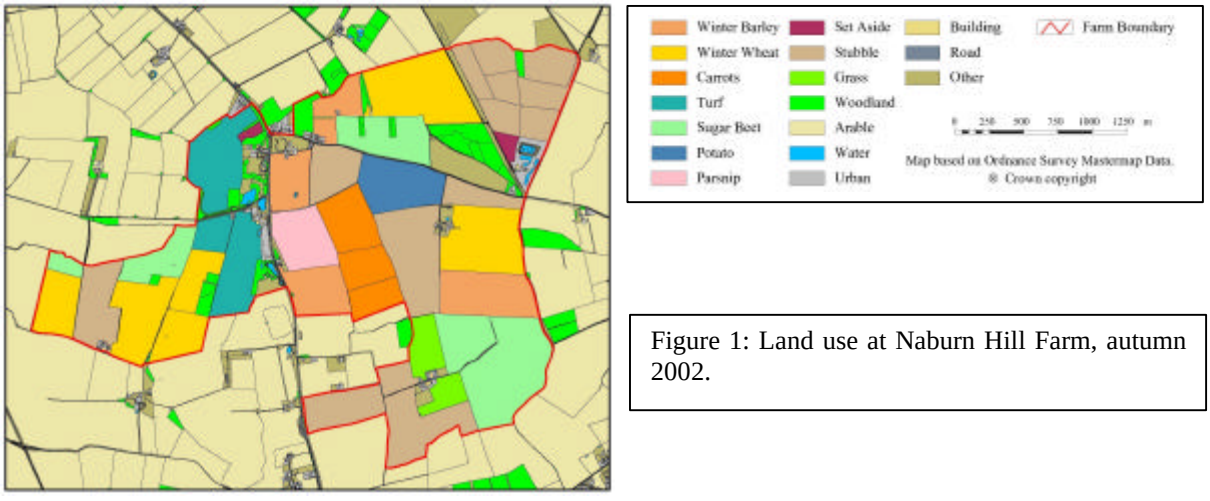

Figure 1: Land use at Naburn Hill Farm, autumn 2002.

Future land use changes were projected from reports on 'Positive Water Management' produced by the LMI, national socio-economic and climate change scenarios (e.g. Hulme et al., 2002), and output from the Climate and Land Use Allocation Model (CLUAM) developed by Parry et al. (1999). The results of different scenarios were stored as sets of attributes for features in the GIS databases (e.g. different crops in fields) and then used to produce 3D visualisations though GIS-linked software such as Visual Nature Studio (http://www.3dnature.com) and the SiteBuilder3D extension for ArcView (http://www.sitecbuilder3d.com). Figure 2 shows views produced from Visual Nature Studio looking east towards the farm in Figure 1 with land use in autumn 2002 and under a B2 'local stewardship' scenario in the 2020s. The main projected changes are a replacement of cereals and row crops with maize, linseed and sunflowers.

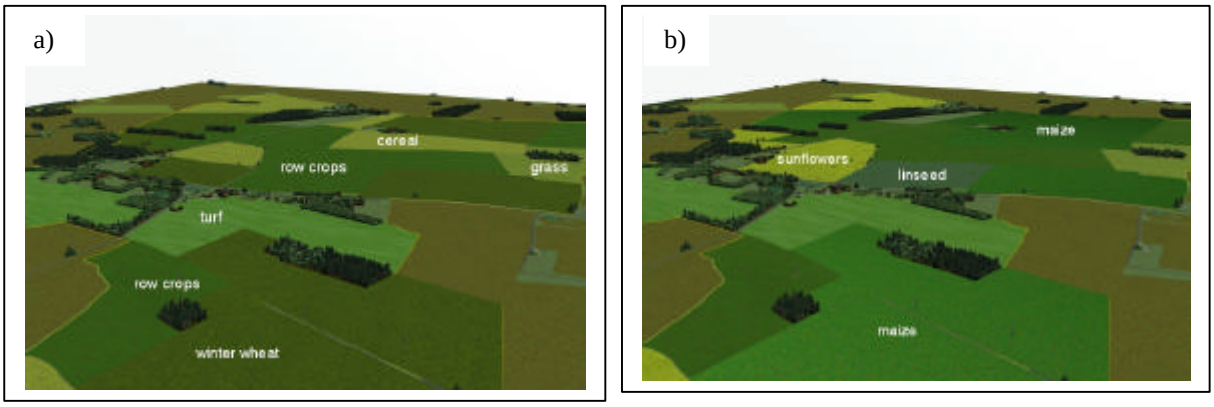

Figure 2: VNS visualisations looking east towards Naburn Hill Farm, a) 2002 and b) 2020s.

Current work is investigating the use of animations and other techniques to convey the uncertainties associated with climate change impacts. It is also intended to develop virtual landscapes that will provide a greater degree of interactivity for the viewer. These developments have considerable potential to improve the public communication and understanding of complex issues such as climate change, and may also enhance decision support systems related to many other aspects of planning and environmental management. Nevertheless, it is important to be aware that there is still much to understand about how the public may respond to and interpret such visualisations (Orland et al., 2001; Sheppard, 2001). As a consequence, there is a need for research on issues of perception bias or usability, and also to support the development of design guidelines, before the full practical benefits of these technical innovations will be realised.

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