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Developing a value function for nature development and land use policy in Flanders, Belgium

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ABSTRACT

In densely populated regions such as Belgium where land is a scarce resource, nature areas are under increasing pressure of urban and infrastructural development. Decisions regarding land use changes usually do not fully account for the associated environmental impacts and the related social welfare changes.

This paper aims to provide a generic monetary value function to assess the public benefits of amenity, recreation and biodiversity values associated with land use changes from agricultural land to different types of nature. This function can be used in cost–benefit analyses to inform decisions on land use changes, including the creation, restoration and compensation of nature areas. The ecosystem services values can be compared to the financial costs of such projects and accounted for in policy-making and planning decisions aimed at maximising social welfare. Important criteria for the development of this value function are that: (1) it should be transferable across sites and able to account for relevant characteristics of both the nature areas and the population of beneficiaries, and (2) it should control for spatial variables, such as size of the area and distance to the respondent's home.

The value function of our case study is based on a large scale choice experiment, as part of a survey to capture public preferences, focusing on land use changes among a sample of 3000 households in the Flemish region in Belgium. In the choice experiment, respondents were asked to choose between different hypothetical nature development scenarios, described in terms of their ecological quality (nature type, species richness) and a set of spatial characteristics, including, size, accessibility, adjacent land use and distance to the respondents' residence. The model estimates are used to monetise public preferences for land use changes. The results show that the public attributes significantly different values to the different nature types, with highest values for forests. A distance decay effect was clearly observed, meaning that willingness to pay reduces when nature areas are situated further away from the place of residence. The size of the area was also significant but much less significant than would be expected. The application of the value function is demonstrated in two examples.

Introduction

The role of nature in land use policies in Flanders

In densely populated countries where land is a scarce resource, nature areas are under increasing pressure of urban and infrastructural development (e.g. Di Giulio et al., 2009). After the Netherlands, the Flemish region in Belgium has the highest population density in Europe (459 persons per square km).[1] Whilst this population requires ever more space for housing and industrial activities, Flanders also intends to conserve its nature and has designated 8% of its total land area as protected area. This includes 24 Special Protection Areas (SPAs) designated under the 1979 Birds Directive (http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm) (2009/147/EC) covering a total area

[1] The neighboring region Wallone (Belgium) has a population density of 205 people per km^2. Other relatively high density countries in Europe include for example the United Kingdom (250 people/km^2), Germany (230 people/km^2), and Italy (201 people/km^2) (Eurostat, 2010).

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of 98,243 ha, and 40 Special Areas of Conservation (SAC) established under the 1992 Habitats Directive (http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm) (92/43/EEC) comprising 104,888 ha. These areas are protected by law. In practice, the nature conservation objectives imply that if nature loss cannot be avoided because of the expansion of necessary infrastructure, it needs to be compensated elsewhere, and this is very often at the expense of agricultural land.

In addition, the Flemish Decree for Nature Conservation requires the government to delineate an effective area of 125,000 ha of nature areas as part of the Flemish Ecological Network 'VEN' and 150,000 ha of areas as part of the Integral Interrelation and Support Network 'IVON' (Ministerie van de Vlaamse Gemeenschap, 2004). VEN is a consistent and coherent network of ecologically functional units. In addition to the VEN areas, the IVON-network consists of (a) large, contiguous buffer areas that surround the core VEN-Natural Units to give them a better protection, usually multifunctional areas with high nature values, and (b) units that are important for migration of fauna or flora, and can be of any size, such as a series of stepping stones or a contiguous corridor. Until January 2009, only 87,073 ha of VEN areas were protected as such and 1529 ha of IVON areas, which means that further expansion of nature areas and buffer areas is required. This will be done by regional and local spatial planning processes ('Ruimtelijke uitvoeringsplannen') and local nature directives ('Natuurrichtplan') where an integral vision on rural land use is needed (combining nature, forest and agricultural needs). A decision support tool taking into account ecological, economic and social assessments is needed here to value different alternatives in land allocation for nature areas and support networks, supporting the Decree for Nature Conservation.

The role of monetary valuation in land use policy

Despite the political commitment to the designation of additional nature areas, ecosystems in Flanders are still deteriorating (MIRA, 2010). In addition to disappearing biodiversity, changes in natural land use result in changes in the ecosystem goods and services that provide social benefits, such as water provision, recreation amenities and carbon sequestration (Balmford et al., 2008; EASAC, 2009; TEEB, 2010b). These changes have received considerable attention in the land use policy, urban economics and geography literature (e.g. Munroe et al., 2005). These research areas focus on supporting decisions over land use changes, where a trade-off has to be made between the benefits of increasing the built environment and protecting or expanding the natural environment.

An important reason why nature areas are gradually disappearing is that typically environmental impact assessments and cost–benefit analyses used to motivate investments in the built environment, hardly ever take the value of the loss of nature into account. Often when investments in green infrastructure have to be made, only the direct investment costs are expressed in monetary terms. The benefits of nature areas are usually at most considered on a qualitative basis, which makes a direct comparison of all costs and benefits difficult, and may make it less likely that the balance will tip towards nature conservation. Disregarding the value that ecosystems contribute to social welfare may result in inefficient land use or a distorted picture of the distribution of costs and benefits of land use changes across stakeholders. If the benefits of nature conservation or improvements can be accounted for in economic decision-making criteria, policy making can better optimise social welfare.

To bring this trade-off between nature and infrastructural development into a wider social welfare context, land use planners increasingly search for information about the value of nature and landscapes to support their decisions and policies. Monetary valuation of ecosystem services aims to contribute to this literature by providing information about the values that society attributes to nature, including non-marketed (non-financial) environmental goods and services, taking account of uncertainty about its future uses and the location specificity of values. Examples include the Millennium Ecosystem Assessment (2005), the UK National Ecosystem Assessment (2011), TEEB (2010a,b) and subsequent national TEEB assessments, e.g. in the Netherlands (Davidson et al., 2011).

Monetary valuation can offer two benefits for land use policy:

- "*Monetary value data*: The empirical evidence of environmental values expressed in monetary terms can be used as inputs in policy instruments that address existing policy and market failures. Policy instruments include taxes, for example, for changes that damage land (e.g. the UK aggregates tax), or payments for ecosystem services (e.g. agri-environment schemes). The monetary estimates could also be used for the appraisal of allocating land to different uses (e.g. by cost–benefit analysis of infrastructure investments or the cost-efficiency of agri-environment funds. More information on the use of economic data in cost–benefit analysis can be found in Hanley and Barbier, 2009).
- *Monetary valuation framework for decision making*: Even in the absence of quantitative data on economic values, the valuation framework can be useful for decision-making. The concept of what value means, who holds value and who gains and who loses from changes in land use, all help to ensure transparency of project or policy appraisal and can help to identify priorities for allocation of land to different uses." (Eftec, 2009).

Environmental valuation in Flemish land use policies

Land use planning in Flanders is only partly informed through consideration of full economic costs and benefits. Most existing land use planning procedures and associated studies incorporate the effects on nature areas using qualitative approaches that focus on conservation objectives, in compliance with article 6.3 of the Habitat Directive. In Flanders, there is not a long tradition of using monetary valuation of environmental costs and benefits into cost–benefit analysis. In addition there are few empirical studies estimating the economic value of ecosystem services provision in Flanders (e.g. Eggermont et al., 1999; Ruijgrok and Lorenz, 2004; Liekens et al., 2006; Broekx et al., 2010). But demand for information about the costs and benefits of nature and landscape to support environmental policy decisions is growing. Therefore, the Environment Administration launched a study to set up generic value functions to support land use policy and decision making in Flanders related to the restoration, rehabilitation and compensation of nature areas in the context of European policy and legislation such as Natura2000 and the Flemish Decree for Nature Conservation, following experiences in the Netherlands (e.g. Ruijgrok, 2001; van der Heide et al., 2008; Koomen et al., 2008).

Aims and objectives

This paper presents an approach to develop a generic value function for estimating the willingness to pay or value citizens attach to land use changes from agricultural land to different types of nature areas (i.e. their amenity and non-use value). Important criteria for the development of this value function are that: (1) it should be transferable across sites and able to account for relevant characteristics of both the nature areas and the population of beneficiaries, and (2) it should control for spatial variables, such as size of the area and distance to the respondent's home.