Urban Ecosystem Accounts

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Introduction

ONS and Defra are currently in the process of developing ecosystem accounts for urban areas. This paper focuses on two new areas of development:

i) Defining the urban habitat to include large areas of natural capital in the centres of cities and towns, and
ii) Valuing cultural services based on house prices

The first section seeks to explain the difficulties of defining the urban habitat and the solution that has been implemented. The second section details the hedonic pricing method, how it will be used and any issues that may come with its application.

The urban ecosystem account adds to the development of complete accounts for the UK covering all eight broad habitat, as set out in the UK's Natural Capital Accounting 2020 roadmap.

Definition of the Urban Habitat

The definition of the urban area for ecosystem service accounts purposes differs between nations. This is largely due to there being no agreed specification of the defining characteristics of urban areas, nor any scientific criteria by which the urban habitat can be identified. The UK's National Ecosystem Assessment Technical report (2011) highlights how urban areas are normally defined as human settlements with high population densities and the associated features of a built environment with a physical infrastructure, but doesn't provide guidance on how the urban boundary should be defined or the extent to which areas of green space within that boundary should be included.

Defining the urban boundary is clearly a vital first step in compiling ecosystem accounts for urban areas. Depending both on the boundary used and the spatial resolution at which land cover or ecosystem types are recorded in the accounts, any particular urban area will include differing estimates of the extent of woodland (e.g. of street trees), grassland (e.g. playing fields), open water (e.g. reservoirs, canals, urban rivers), cropland (e.g. allotments and gardens), etc. These considerations will affect not only the volume and value of the ecosystem services relating to the habitat but also the selection of indicators relevant to measuring its condition. By the nature of its location, the ecosystem services provided by urban green and blue infrastructure tend to feature regulating and cultural services more strongly than those in more rural areas, with air filtration, local climate control, noise protection and recreation being particularly important. The condition indicators associated with these services may also be different

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compared to those applicable to areas with similar land cover in more natural areas. For example litter and air quality are important indicators of the condition of urban parkland.

This consideration applies equally to larger areas of green space which might be viewed by urban inhabitants as part of the natural capital of their town or city, but which might – on certain definitions of urban boundaries – be excluded from the accounts for urban habitats.

In order to address this problem, it was necessary to adjust the boundaries of one of the established measures of urban and rural areas. The measure used as the base was the Built-Up Areas boundaries (ONS, 2011). This had been created using an automated approach based on 50 metre grid squares being transformed into polygons based on land-use percentages. Polygons must have a minimum size of 20ha and settlements within 200 metres of each other are linked.

This source effectively excludes large natural capital assets in the centre of towns/cities (e.g. urban parks) outside the defined urban boundary because they are not densely populated and/or do not have a neatly confined boundary within the urban area (e.g. the River Thames, which is estuarine where it flows through London).

In order to 'fix' this problem, the consultants (eftec2017) 'enhanced' the urban boundary by applying a variable sized buffer to each polygon; redrawing each polygon to account for overlaps; then shrinking back the new boundary by the same buffer width (i.e. where the new outer boundaries did not meet and capture entire new areas). Hence the buffer was used to draw in any areas newly enclosed by the buffer and works to include patches of land e.g. large parks in central London) that are mostly surrounded by urban built-up areas.

The buffer size applied was variable depending upon the size of the polygon, so that villages have a much smaller buffer than large cities. The equation used, based on a few trials, was 'Buffer width = 0.012 * √Polygon area'. This gave a buffer of approximately 500m for Greater London and one of just five metres for small villages. This methodology has the advantage of being completely automated and can readily be applied consistently in future iterations of the account.

Estimating the value of cultural services using the Hedonic pricing method

We wish to estimate the value of cultural services provided by natural capital within the urban boundary defined by the above methodology. Examples of cultural services include nature based recreation and nature based education. To achieve this we plan to employ the hedonic pricing method.

The hedonic pricing method is based on the premise that a class of differentiated products can be broken down in to a number of characteristics. A combination of these characteristics and the external factors that affect the product is what is deemed to then determine the price. In this case the product is a residential property, where the market price of a property is determined by a combination of structural characteristics (floor area, number of bedrooms, garden, garage etc.) and the socio-economic and environmental characteristics of the surrounding area (quality of schools, access to retail, levels of water/air pollution, proximity to green space etc.)

The hedonic pricing method can be used to estimate the extent to which the characteristics/ factors affect the price through a regression of house prices on explanatory variables (the structural and socio-economic/ environmental characteristics). Working on the assumption that nature is implicit in property prices, this methodology can therefore be used to extract values for environmental goods/services from market-based transactions.

The main attraction of using the hedonic price method for the purposes of the natural capital accounts is that it returns market-based marginal prices of environmental goods and services comparable to those used for standard market goods (Day, 2013). An additional strength of the method includes the fact that it estimates value based on real life choices rather than hypothetical ones, which from a policy perspective is desirable. Also, data on property transactions and characteristics is readily available.

It is also worth noting that the method is also recognised as suitable for valuation of ecosystem assets which provide a range of services by the System of Environmental-Economic Accounting (SEEA). Additionally, it has been suggested that the hedonic pricing method may be capable of capturing the value of free trips to natural capital in the form of recreational opportunity, something that previous studies (ONS, Ricardo 2016) using the travel cost method has failed to represent.

Drawbacks include that for accurate and robust estimates to be obtained from the method, large datasets are required and environmental goods/ services that don't exhibit spatial variation or relate to house prices can't be measured. Another issue with using the hedonic price method is that the results depend heavily on the model specification used. Furthermore, different property markets exhibit different characteristics and conditions for supply and demand, implicit prices in one property market should not therefore theoretically be transferred to another (Day, 2013). From an accounting perspective it is also difficult to interpret the results as the price represents a bundle of services (e.g. amenity, health views etc.) that cannot be separated and therefore there risks double- counting. The values produced will also not be annualised in the first instance.

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