

## **Cost Benefit Analysis of SUDs**

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### **Introduction**

The purpose of this research was to see if the Harrow Way SUDs benefits outweigh its costs and whether the net present value (NPV) is positive. The analysis can be a useful reference for professionals interested in SUDs, as this work is believed to be the first Cost-Benefit Analysis of SUDs environmental and monetised benefits in the UK. This paper is an attempt to analyse the costs and benefits involved, thus providing an initial framework to assess the financial implications of the scheme over time.

SUD as a constructed ecosystem provides a number of services and therefore benefits. As part of a Cost Benefit Analysis (CBA), this work is believed to be the first attempt to identify the value of SUDs benefits which includes the amenity and biodiversity creation/enhancement benefits, as well as the more obvious benefits, such as: flood control and water quality improvement.

Identification of costs associated with designed SUDs is relatively straightforward. The costs cover the design works, construction works (including labour) and maintenance costs. At the same time, there are a number of reasons why putting monetary value on the benefits provided by SUDs is rather challenging. One of the main reasons is that no formal market for SUDs services and similar designed ecosystems exists and therefore society cannot put a price on them reflecting their value. There is a widely accepted challenge of putting an appropriate price on an environmental service or good, and this contributes to the reason why environmental valuation of ecosystem benefits is so interesting and challenging at the same time.

This work examines the Harrow Way SUDs (HWS) which is a designed pond. Due to lack of resources, a comprehensive survey with one of the stated preferences method (for example, contingency valuation survey) was not possible. At the same time, the revealed preferences methods are difficult to apply to small local SUDs which, due to their size, do not create opportunities for family trips, or recreational activities for which people are prepared to pay (i.e. bird watching).

### **Methodology and Research**

The difference between the positive (benefits) and negative factors (costs) will indicate whether the SUD system has a positive value and therefore indirectly contributes to a more desirable neighbourhood and local environment.

Due to lack of valuation studies of SUDs benefits in particular (i.e. monetary value studies), the author looked into benefits valuation studies where the ecosystems considered demonstrated similar and relevant characteristics. As we are only “borrowing” the closest attributes values and do not have reliable data on SUDs benefits in particular, detailed explanation was given and conservative estimates were applied where the transfer of benefits from other studies was considered to be possible.

## **Cost Benefit Analysis**

CBA is one of the ways to analyse a potential investment. The approach to this work was to collect data on the Harrow Way total costs, including the capital and maintenance costs, and based on literature analysis, derive the economic (monetary) values for the benefits. Cost data has been provided by the local Borough Council specialists and the data on benefits was derived from a literature review and this presented a number of challenges.

Based on the methodology, the total annual benefits of the Harrow Way SUDs were estimated as £113,037 in 2008 prices. Total construction cost of the Harrow Way SUDs was £351,500 in 2008 prices (as a one-off cost) and annual maintenance costs are £6,033 in 2008 prices.

The analysis has proved how challenging it is to put a financial value on potential ecosystem benefits. Most meta-analysis studies used in this work analysed the value of wetland ecosystem services from different angles.

Despite the fact that two different studies in the UK and Sweden on property premium for waterside location gave fairly similar results of 3-5% (Willis & Garrod) and 4% (Luttik), the use of this variable is full of challenges. Not only it is difficult to untangle this variable from the location, size, condition of interior and other factors, but it creates further difficulties in SUDs benefits calculations when, and if, property values are affected by the global economic downturn, i.e. the recent economic conditions in 2008-2011.

At first glance the results of the CBA demonstrated that the annual benefits of the Harrow Way SUDs outweigh the construction and annual maintenance costs. However, the results require a closer look. Benefits can be measured in more than one way. One can argue that as SUDs prevent intangible cost of flooding and significantly improve general recreation and walking facilities, the value of properties in the areas covered by the Harrow Way SUDs has already been enhanced. With reduced flood risks and an aesthetically improved neighbourhood, it seems that to include the increased value of properties (amenity) would be double counting. Amenity would have been a vital element if we consider substitutions or alternative projects, where it would be possible to compare alternative outcomes. However, as the Harrow Way system has already been developed and the property prices increases are influenced by many reasons rather than amenity boost resulting from SUDs only, it is sensible to consider what happens with the results if we reduce the property premium or ignore it completely.

If we reduce amenity premium to 2% which will be a half of the figure obtained as a result of the literature review, then the value of median annual benefits falls but still gives a healthy NPV over the next 20 years. Similarly, a amenity premium of 1% also demonstrates a positive NPV over the same period of time.

However, Present Value of the key benefits of SUDs without any property premium creates an entirely different picture and gives a negative NPV over next 20 years. Significant differences in the NPV between the scenarios reveal how important property premium is as a variable and being excluded, it creates a negative NPV. The decisions makers should be wary of property premium as a variable which ultimately impacts on the outcome of the analysis.

## **Summary & Conclusion**

The literature review on SUDs costs revealed some excellent research studies which contrasts with a distinctive lack of research done on SUDs environmental and amenity benefits thus preventing the comparison of the results of this work with other studies within in SUDs-related benefits field.

Harrow Way SUDs cannot be classified as a typical SUD system because the technical part of the design required engineered controls and chambers underneath it and complicated design requires regular examination by a number of specialists, thus increasing the maintenance costs. High maintenance costs achieved as a result of unusual or complicated SUDs design can affect cost benefit analysis and are likely to result in a negative NPV.

Lack of historical research on SUDs environmental and amenity benefits did not leave a lot of choice but to look into existing research on wetlands and inland waterways, and their benefits where these were appropriate and similar. These included flood control benefits, water quality, informal recreation/walking, amenity and biodiversity. Clearly, “borrowing” the benefits values from wetlands and inland waterways, and trying to apply them to the Harrow Way SUDs leaves a lot of room for poor matches for the Harrow Way SUD ecosystem, benefits errors and the so called “generalisation error”. The literature review undertaken for this analysis highlighted and underlined an ambiguity of carrying out the analysis of different wetlands and waterways where they vary considerably by the country, continent, type, availability of data on substitute sites, similarities in property rights, etc.

The studies that have been used, are the best currently available basis for estimation of environmental economic values of wetlands and inland waterways. The key question should be not whether a meta-analysis and other type of studies (international or otherwise) can produce accurate values for ecosystem services but if correctly done analysis can give a useful insight into decision-making.

The key benefits included in this analysis were: flood control, water quality, recreation/walking, amenity, prevention of intangible costs of flooding and biodiversity. The results highlighted that decision-makers need to be aware of property premium in their SUDs Cost-Benefit Analysis calculations, as it can ultimately impact on the outcome of the analysis. Amenity, unlike unusually high maintenance costs, can contribute to overestimation of ecosystem benefits thus skewing the results towards more favourable NPV. At the same time, the results of this potential analysis are likely to be affected by currently depressed property prices in the UK.

Since only key benefits were “borrowed” from wetlands and inland waterways studies, the present CBA does not claim to be a definitive analysis of the ecosystem services provided by SUDs. Nonetheless, the paper is an attempt to look at the costs and benefits involved, thus providing an initial framework to assess financial implications of the schemes over time. As

SUDs become an obligatory requirement to obtain planning permission in the UK, more research is needed to examine benefits provided by SUDs ecosystem in particular, where the benefits have been estimated by different valuation approaches. For example, more SUDs services willingness to pay surveys in the future could help to identify not only the marketable value of SUDs but also an acceptable level of payment which local residents find acceptable to contribute to SUDs maintenance costs.

These study results are not definitive and in fact are aimed at raising the discussion of the valuation of environmental and amenity features of SUDs. The work revealed a few good and thorough SUDs cost research studies which contrasts with a distinctive lack of research done on valuation of SUDs environmental benefits. “Borrowing” the benefit values from wetlands and inland waterways, and trying to apply them to the Harrow Way SUDs leaves a lot of room for poor matches for the Harrow Way SUD ecosystem, benefit errors and the so called “generalisation error”. The literature review undertaken for this analysis highlighted and underlined an ambiguity of carrying out meta-analyses for a number of different wetlands and waterways where they vary considerably by the country, continent, type, etc.

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