

# SUDs Cost Benefit Analysis

Harrow Way SUDs, Kent

Environmental Economics Valuation

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## Rationale for Economic Valuation of SUDs and Ecosystems

- When markets do not exist;
- 3 valuation methods: Revealed Preferences, Stated Preferences and Benefit Transfer;
- Benefits Transfer (BT) method has been used;
- Environmental Economics principles and BT method are used in the GI Valuation Toolkit and Value Transfer Strategy by DEFRA (2010);
- Different from National Green Values Calculator by Centre for Neighbourhood Technology (CNT, USA) – covers: air pollutants, value of trees, reduced energy use and reduced treatment benefits.



## Connection between Natural Environment projects and Economic Benefits, examples

Benefit	Natural Environment Project	Economic Outputs, example	Economic outcomes, example
Flood alleviation and water management	<ul style="list-style-type: none"> <li>•SUDs</li> <li>•Storm Balancing</li> <li>•Flood control &amp; storage</li> </ul>	<ul style="list-style-type: none"> <li>•Land are improved</li> <li>•New planting &amp; habitats</li> <li>•New wetlands created</li> </ul>	<ul style="list-style-type: none"> <li>•New sustainable developments and sustainable communities</li> <li>•Savings in capital flood defence schemes (coastal &amp; rivers)</li> </ul>
Quality of place	<ul style="list-style-type: none"> <li>•Greener &amp; safer green space</li> <li>•High quality green space</li> </ul>	<ul style="list-style-type: none"> <li>•New civic amenities</li> <li>•New green space for formal/informal recreation</li> <li>•Improved visual amenity</li> </ul>	<ul style="list-style-type: none"> <li>•Attractive, safer places</li> <li>•Improved community cohesion, less crime</li> <li>•Higher property prices</li> </ul>
Health & wellbeing	<ul style="list-style-type: none"> <li>•Reduced pollution of soil, water, air</li> <li>•New places for walking &amp; cycling</li> <li>•Reduced risks of downstream flooding</li> </ul>	<ul style="list-style-type: none"> <li>•New and improved green space &amp; habitats</li> <li>•Increased participation in outdoor activities</li> <li>•Improved outdoor environment</li> </ul>	<ul style="list-style-type: none"> <li>•Healthier community</li> <li>•Fewer costs of to health-care providers</li> <li>•Sustainable transport schemes, incl. non-motorised.</li> </ul>



# Methodology

- Lack of **economic valuation** studies of SUDs benefits in particular;
- This study used the benefits studies where the ecosystems considered demonstrated similar and relevant characteristics. (i.e. some ecosystem services provided by small urban wetlands and natural small ponds);
- Based on the recent Environment Agency Report on “*Cost Benefit of SUDs retrofit in urban areas*”, SUDs ecosystem services were broadly identified as **DIRECT** (flood control prevention, water quality) and **INDIRECT** (amenity, recreation, biodiversity, intangible costs of flooding = psychological trauma, etc);
- Data on Benefits – taken from published reports and scientific papers (mainly European). The data was in different formats and currencies. All economic values were converted into £2008 values via a purchasing power parity (PPP) exchange rate for the original currency and year. Benefit per household/year v hectare/year.
- Data on costs have been kindly provided by the local Borough Council Engineer, historical estimation of original costs. Total Cost = Construction + Materials + Labour + Admin Costs + Maintenance. 2008 prices.
- Data on the average property values in 2008 in the Harrow Way area – [www.upmystreet.com](http://www.upmystreet.com) and <http://www1.landregistry.gov.uk/house-prices>



## Benefits Transfer (BT)

- Involves taking the results from previous valuation studies in different locations, and modifying and transferring those values to the project being evaluated.
  - Advantage: BT has been advocated as a quick, low-cost approach to the valuation of environmental services.
  - Disadvantage: might show considerable variation between transferred values and the value derived from an original study.
  - Long time spans; "embedding" effects; the specification of the ecosystem service to be valued; and the WTP of individuals vs. households seem to be particularly important.
  - Detecting and controlling for such factors is not easy. While BT is certainly quicker and less costly than an original study, it does not eliminate the need for considerable skill and experience on the part of the analyst.
  - Easier & acceptable when revealed and stated preferences methods of NON-MARKET valuation are not available or possible



## Studies Used

- ✓ Environment Agency. *Cost Benefit of SUDs retrofit in urban areas*. Science Report SC060024.
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- ✓ Penning-Rowsell, E. et al. *The Benefits of Flood and Coastal Risk Management: A Handbook of Assessment Techniques*. Flood Hazard Research Centre, 2005
- ✓ Defra and Coastal Erosion Risk Management Programme, *The Appraisal of Human related Intangible Impacts of Flooding*, R&D Technical Report FD2005/TR, 2004.
- ✓ Eftec, *Flood and Coastal Erosion Risk Management: Economic Valuation of Environmental Effects*, revised 2010.
- ✓ Woodland, R.T and Wui, Y. S. The Economic Value of Wetland Services: A Meta-Analysis. *Ecological Economics*, 37, 2001, pp. 257–270.
- ✓ Brander, L.M., Florax, R.J.G.M. and Vermaat, J.E. The empirics of wetland valuation: a comprehensive summary and a meta-analysis of the literature. *Environmental and Resource Economics*, 33, 2006, pp. 223-250.
- ✓ GHK, *The Bedford Milton Keynes Link – Cost-Benefit Appraisal Draft Final Report*. Report for British Waterways, London, 2005.
- ✓ Carlsson, F., Frykblomb, P. and Liljenstolpec, C. Valuing Wetland Attributes: An Application of Choice Experiments. *Ecological Economics*, 47, 2003, pp. 95-103.
- ✓ Garrod, G. and Willis, K. An Economic estimate of the effect of a water location on property values. *Environmental & Resource Economics*, 4 (2), 1994, pp. 209-217.
- ✓ Luttik, J. The Value of Trees, Water and Open Space as Reflected by House Prices in the Netherlands. *Landscape and Urban Planning*, 48, 2000, pp. 161-167.
- ✓ Brouwer, R., Langford, I.H., Bateman, I.J. and Turner, R.K. A meta analysis of wetland contingent valuation studies, *Regional Environmental Change*, 1 (1), November 1999, pp. 47-57.
- ✓ Hanley, N. *Cost-Benefit Analysis*, p.104-130. Principles of Environmental and Resource Economics: Guide for Students and Decision-Makers, II Edition. (2000).
- ✓ **Mainly Europe + Meta-analysis valuation studies of environmental benefits**



## Why Cost-Benefit Analysis?

- CBA analyses weighs the costs and benefits of SUDs systems, better suited to consider an investment.
- What are the alternatives? Other methods: i.e. cost-effectiveness and environmental impact assessment.
- However, they avoid putting monetary values on the ecosystem services. EIA - policy choice, focuses mainly on environmental impacts. CEA - does not examine if the prospective benefits are greater than costs.
- CBA is a better suited technique to compare costs and benefits of projects with ecosystem services.



# Costs & Benefits for HW SUDs (2008 prices)

Average annual values

## Benefits

- Flood control = £ 4,685
- Prevention of intangible costs of flooding = £10,733
- Water quality = £2, 023 😬
- General Recreation/Walking = £2,340
- Amenity, view of canal-facing garden = £90, 255
- Biodiversity value = £2, 960 😬
- Total benefits (range of services) = £113k

## Costs

- Construction + materials + labour + admin costs = £351,489 (one-off cost)
- Maintenance cost = £6, 033 (😬 7 times higher than average maintenance costs of Scottish SUDs)



## Results & Discussion

- UK & Dutch studies on property premium for waterside locations (3-5% and 4% respectively).
- At first glance, over the next 20 years,  $B > C$  (£1,681,711 > £441,247) if we include flood control, water quality, biodiversity, intangible cost of flooding, recreation & amenity.
- However, if SUDs prevent flooding and improve recreation and walking facilities, then the value of the HW properties was already enhanced, so to add amenity = double counting?



## Results & Discussion, cont

- **Scenario 1:** Amenity premium = reduced to 2% =  $\frac{1}{2}$  of the figure obtained from other studies - 2% property premium still gives  $B > C$  over next 20 years, or  $\pounds 1,018,915 > \pounds 441,247$
- **Scenario 2:** 1% property premium also gives  $B > C$  over next 20 years, or  $\pounds 687,517 > \pounds 441,247$
- **Scenario 3:** With property premium =  $\pounds 0$  (not used as a benefit), then a picture is very different:  $B < C$  or  $\pounds 338,936 < \pounds 441,247$ . What about Scottish SUDs though?
- One of Sustainability principles: able to pass it to next generation! Local BC will have to find a long-term solution to maintaining this system, especially in these economic conditions.



## Limitations of the study

- Lack of economic valuation of SUDs ecosystem services prompted the use of studies on benefits provided by small urban wetlands and ponds as a sub-type of ecosystems providing similar services;
- Benefits studies used vary considerably by the country, type, availability of data on substitutes, similarities in property rights etc;
- We had to factor for different currencies, different measurement of wealth versus income, differences in culture and many other issues;
- HW SUDs is not a typical SUD system. Engineered controls and chambers underneath it require a regular examination by a number of specialists = high maintenance costs .



## Suggested Value of the Study

- The studies used are the best currently available basis for estimation of economic values of small urban wetlands and ponds. Done correctly, CBA based on the environmental economics approach will give a useful insight into decision-making.
- Amenity can contribute to overestimation of ecosystem benefits thus skewing the results towards more favourable NPV.
- CBA analysis of ecosystems can be used to demonstrate the economic, social and environmental benefits to funding bodies, investors and planners to gain support for their proposals.
- Contributes to the discussion on the economic, social and environmental benefits of SUDs. More research is needed!



# Thank you!

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