Institution: University of Birmingham

Unit of Assessment: UoA 17 – Geography, Environmental Studies and Archaeology

Title of case study: Biodiversity in Cities: public engagement with the urban environment

1. Summary of the impact

Urban biodiversity supports the functioning of the urban ecosystem and provides recreational opportunities. This is a West Midlands-based public engagement case study demonstrating both environmental and social impact through a five-year BIG Lottery-funded project based on research into urban biodiversity led by Professor Jon Sadler. The project - OPALWM – focused much of its public engagement activity on some of the most economically-deprived areas of Birmingham and the Black Country, locations that the scientific research had identified as having unrealised environmental opportunities. OPALWM achieved extensive recorded reach (122 organisations; 26,000 people; 60,000 website hits) and active engagement from schools, volunteers and wildlife groups. It has a sustainability plan designed to maintain its impact after its BIG Lottery funding ends in November 2013.

2. Underpinning research

Urban biodiversity provides recreational opportunities and supports the functioning of the urban ecosystem, providing potentially valuable, if as yet poorly quantified, ecological services. The research underpinning this case study was led by Jon Sadler (Professor of Biogeography) and focused on the relationships between cityscape habitats and their biodiversity. Although sustainability features highly in urban planning initiatives, no clear vision existed of how to optimise urban space to maximise its value as perceived by local people, planners and ecologists.

The research sought to address this important knowledge gap and modelled the influence of habitat type, structure and spatial configuration on plant and animal biodiversity, using Birmingham and the Black Country as a model global conurbation. The work was funded through RCUK thematic programmes [NERC's URGENT (Urban Regeneration and the Environment; 1998-01, 2005-08) and EPSRC's SUE (Sustainable Urban Environments) programmes (2001-11)] and EU FP6 (SWITCH) (2006-11).

The results demonstrated that the type, location and quality of habitats and their surrounding matrix habitats are the key drivers impacting urban biodiversity. The focus on connecting features (or greenways) was innovative and one of the first multidisciplinary studies of what is now termed green infrastructure (GI). It showed that GI provides habitats as well as movement conduits, the latter being strongly species specific [1]. A key conclusion of the work was that habitat quality is an important criterion in determining species presence on sites (e.g. brownfields and wetlands). The research showed that brownfield sites were important local biodiversity hotspots [2], and like other local spaces they were highly valued by the people who live adjacent to them. In other habitats, (e.g. woodlands), the spatial configuration of the surrounding landscape was more important and habitat fragmentation plays a more central role in determining species presence and abundance [3].

Subsequent research carried out under the EPSRC Sustainable Urban Environments 2 programme (2007-2012) considered what features enhanced and/or impeded connectivity and linkage in the urban landscape, thereby improving spatial resilience. It identified treelines as important network features that linked roosts to foraging sites for bat species [4]. This key finding is unique and illustrates the importance of greenways in the cityscape. The work provided important data concerning the links between habitat composition and biodiversity and emphasised the significance of green infrastructure in providing key ecological functions, such as the support of pollinator communities [5]. The importance of building biodiversity into developments and cityscapes was expounded further, showing how designed spaces are species-poor replacements, which look and function very differently to the landscapes they supplant. This paper published *via* the Institute of Civil Engineers was awarded the Halcrow prize for best paper in 2005 [6].

The work described above led to: (i) the formulation of the idea that peoples' engagement and use of richly biodiverse spaces is important in their local environment, not something that is external to city living, and (ii) that greater engagement and understanding helps to formulate policies that have wide support, challenging established norms for the management of greenspaces.

3. References to the research (indicative maximum of six references)

[1] Angold, PG, Sadler, J.P., Hill, M.O., Pullin, A.S, Rushton, S, Austin, K, Small, E.C. Wood, B., Wadsworth, R., Sanderson, R. & Thompson, K. (2006) Biodiversity of urban habitat patches. Science of the Total Environment. 260, 196-204. DOI:10.1016/j.scitotenv.2005.08.035

[2] Small, E., Sadler, J.P. and Telfer, M. (2003) Carabid beetle assemblages and successional processes on urban derelict sites in Birmingham, UK. Journal of Insect Conservation, 6, 233-246. DOI:10.1023/A:1024491111572

[3] Sadler, J.P., Small, E.C., Fiszpan, H.A. and Telfer, M. (2006) Investigating environmental variation and landscape characteristics of an urban-rural gradient using woodland carabid assemblages. Journal of Biogeography. 33, 1126-1138. DOI:10.1111/j.1365-2699.2006.01476.x

[4] Hale, J.D., Fairbrass, A.J., Matthews, T.J. & Sadler, J.P. (2012) Habitat Composition and Connectivity Predicts Bat Presence and Activity at Foraging Sites in a Large UK Conurbation. PLoS ONE, 7, e33300. DOI:10.1371/journal.pone.0033300

[5] Bates, A.J., Sadler, J.P., Fairbrass, A.J., Falk, S.J., Hale, J.D. & Matthews, T.J. (2011) Changing Bee and Hoverfly Pollinator Assemblages along an Urban-Rural Gradient. PLoS ONE, 6, e23459. DOI:10.1371/journal.pone.0023459

[6] Donovan, R., Sadler, J.P. and Bryson, J.R. (2005) Urban biodiversity and sustainable development: an ecological perspective. Engineering Sustainability, 158, 105-114. DOI:10.1680/ensu.2005.158.2.105

4. Details of the impact

This is a West Midlands-based public engagement case study demonstrating environmental and social impact through delivery of a six-year BIG Lottery-funded project that drew specifically on the scientific findings of the University of Birmingham research.

The findings from the Birmingham research were used by Sadler and twelve collaborators from other UK higher education institutions to design an innovative proposal: Open Air Laboratories (OPAL). OPAL was a national programme primarily delivered through regional projects and a series of national surveys [source 1]. The OPAL proposal was backed by the BIG Lottery following a rigorous assessment process; it was awarded £12 million in 2007, with its initial success leading to a further £6 million award in 2010 to support the regional teams for an additional two years. Sadler and his colleagues at the University of Birmingham led the implementation of the West Midlands regional component (£599,000; December 2008 to November 2013) and it is the impact of this activity, which is described here.

Design of OPAL West Midlands

The OPALWM project was primarily concerned with urban ecology, focusing much of its public engagement activity on children and adults in some of the most economically-deprived areas of Birmingham and the Black Country. The findings from the University of Birmingham research were specifically mapped into the design of the OPALWM public engagement activities and delivered through four themes. The relationship between the research findings and the OPALWM themes is shown below:

Research finding	OPALWM theme
Brownfield sites demonstrated extensive biodiversity	Getting 'biodiversity science' out of the classroom into the city
Brownfield biodiversity hotspots were valued by local residents	Adoption of local wildlife patches by residents
Treelines were important linking networks	Promoting biodiversity in Birmingham parks (linear features)
Gap in quantification of biodiversity and urban ecological function/services	Training informed citizen scientists to record and monitor their local environment

Reach of OPALWM

OPALWM was intended to engage a diversity of West Midland communities including black and minority ethnic groups as well as deprived communities rarely associated with natural history and environmental initiatives. A particular feature of the work of OPALWM was engaging with "hard to

reach groups" in inner urban areas, which was precisely where the scientific research had indicated there were unrealised environmental opportunities. The resulting engagement was rigorously monitored and reported to the BIG Lottery on a quarterly basis throughout the project. The monitoring showed that OPALWM met its aims and associated milestones. [source 2]

An extensive range of agencies were engaged with this work to make sure that it reached the targeted communities: these included 41 primary schools, six secondary schools and one special school; ranger services; local Wildlife Trusts and other third-sector organisations; voluntary bodies, such as amateur national history groups and allotment societies; businesses such as environmental educationalists; and local councils. There was also a website (http://www.opalwestmidlands.org/) that showed users how they could get involved with this activity and has received more than 60,000 hits. Media coverage through radio, television and the press, is estimated to have reached 450,000 people. [sources 2 and 3].

In total, OPALWM worked directly with 122 groups and organisations and engaged with over 26,000 people through more than 370 public engagement events and activities. Events included work to support the science associated with bird and bat research, with 62 bird and 25 bat training and monitoring events and an OPALWM patch network was created using 151 events to help people record and appreciate biodiversity in local spaces and places, especially linear parks. Monitoring returns showed that 10.3% of those engaged were from hard-to-reach groups, achieved through co-operation with particular voluntary groups and through schools in deprived areas and/or who worked specifically with those children. [source 2]

Public response and significance

There is strong evidence set out below to show that OPALWM is leaving an extensive legacy in terms of participant's changed attitudes to their local spaces; improved environmental education in schools through new curriculum materials, demonstrations and, in some cases, enhancement of school grounds, and through new trained citizen scientists.

In general terms, responses to programme surveys, event evaluations and website responses show that engagement has reached new groups and suggested that this was prompting further involvement. Half of the people surveyed said that they had never been involved in this kind of activity before and 43% said it had influenced the way they viewed the environment; 37% of people stated it would lead to changed behaviour and greater involvement in environmental activities; 90% of the people completing national surveys said they had learnt something new; and 83% stated they had developed new skills [source 1].

The specific response to the West Midlands activities can be seen through the work with schools; with volunteer recorders; and in its community engagement, particularly with children. There is both empirical and testimonial evidence to support this; much of the latter was gathered as part of an independent external evaluation of OPALWM which is currently in progress [source 4].

Schools: Schools and individual teachers became enthusiastic participants in the project. Pollinator activities were particularly successful in generating this response. 44 primary schools entered a competition run by OPALWM to win a pollinator education pack, with 3 of the 12 winning schools in locations which were amongst the most deprived areas in the country. To support this work, the project created a factsheet on bee hotel construction and use which was downloaded 1100 times from the website. The project also created the impetus for ongoing activity, such as working with a local voluntary group to provide an outdoor biodiversity space for a primary school in Bearwood in Birmingham with a wildlife pond, a bee hotel and bee-friendly plants. [source 5] Typical of the testimonials gathered was a response from a school where OPALWM ran lessons and practical activities: "*Thank you so much for your visit, talk and science kit on Thursday. The children were really enthused about Science at school and are looking forward to setting up the bee hotels. …. your visit has really enhanced our curriculum*" [source 6].

Volunteers and local wildlife groups: Many of the West Midlands activities were based around engaging with citizens to observe, collect and record species in their local spaces. This produced

an extensive response, including encouraging over 4,500 people to submit data for the seven surveys in the region [source 7]. OPALWM has also engaged 56 volunteers who have been trained to a high skill base (moths, bats, birds). Four of these now hold full BTO C ringing licences, allowing them to work independently of their trainer; this is an important and long-term contribution to the citizen science base in the Midlands.

The project has co-operated with voluntary bodies to ensure that its impact connected to national initiatives. For instance, OPALWM has worked closely with the Garden Moth Scheme (GMS), a national grass-roots group that record moths in gardens. OPALWM purchased 26 moth light trap starter kits, loaned them to first time moth recorders and supported five training events with 20 people per event; and created three guides to help people start moth recording (>2,000 downloads). The GMS national coordinator welcomed this activity and said that: "… *analyses of the dataset are also illustrating the importance of citizen science showing that managing your garden can help attract moth species, but also that urbanisation has a significant impact on local moth diversity*." [source 6].

Activities with local wildlife trusts and other groups helped take forward their work to align with the team's scientific findings. For instance, the Friends of a major Birmingham park said that OPALWM moved their neighbourhood bat programme "..*to a wider level of seeing and recording the urban countryside patchwork. We have brought 1000s of people together with seasonal nature discoveries and resulting in a strong sense of natural identity with their local patch*". [source 6].

Community engagement: Children have featured highly in OPALWM community-based activities, and they have co-created films to document their thoughts on the activities [source 8]. The project was successful in targeting children from hard-to-reach communities, increasing both their appreciation and enjoyment of the environment: A typical reflection on this activity noted "*The community's been very, very damaged by what's going on, and it remains so, and I thought something like OPAL could help heal it, something with the children in the natural world, it would be some way of just lessening the tension…it was a different way of engaging people and it was so much healthier."* [source 6].

Sustainability

The impact of the project will be sustained in a number of ways. OPALWM had a sustainability plan to ensure that all teaching and science outreach materials remain on the national and regional websites for five further years from November 2013. The websites will be maintained to provide additional feedback to the user communities through storage of existing materials, new and forthcoming papers, lessons learned from the OPAL experience and new teaching and activities materials for use by schools. Trained volunteers will continue to be able to apply and develop their new skills. Wildlife groups and other local agencies will be able to continue to apply and extend the expertise they have developed from engagement with the project and its underpinning science. The OPAL programme also has led to the development of a European Citizen Science Association (formed March 2013), which seeks to engage 5 million people across Europe over the next 4 years in citizen science.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. OPAL Community Environment Report (2013) http://www.opalexplorenature.org/CEreport
2. OPALWM MEV returns to the BIG Lottery; available from the University.
3. Information on bees on "Bang Goes the Theory" (http://www.opalexplorenature.org/BangGoesTheoryNews) and Midlands today (http://news.bbc.co.uk/local/birmingham/hi/front_page/newsid_8703000/8703839.stm)
4. External interviews / focus group responses collected by Dr Glyn Everett to evaluate the impact of OPALWM activities available from the University
5. OPALWM Year end (3) report to the BIG Lottery. Case Study 1; Appendix III
6.Testimonials to OPALWM on the value and impact of their activity; available from the University
7. Total number of national survey results uploads/returns to the OPAL national website for the West Midlands region. Spreadsheet created by OPAL Dec 2011
8. Film – [redacted]: http://www.youtube.com/watch?v=eEfKlKaTGT0 and local films made by children at Castle Vale: http://www.environmentaltrust.org.uk/Media.html