Institution: University of Salford

Unit of Assessment: C17 Geography, Environmental Studies and Archaeology

Title of case study: Socio-ecological systems: natural assets and people

1. Summary of Impact

Complex and adaptive socio-ecological systems (consisting of a 'bio-geo-physical unit' and its associated social actors) are critically important to our well-being and economic prosperity. Urbanisation, in particular habitat fragmentation and loss, affects the services provided by ecosystems - which have been consistently undervalued in decision making. Socio-ecological systems research at the University of Salford, in partnership with communities, landowners, local authorities, governments, environment and planning agencies, voluntary sector organisations, and their service users, is focused on providing leadership in:

- Developing improvements in the management of ecosystems;
- Enhancing capacity for valuing ecosystems in policy and decision making mechanisms;
- Developing innovative methods of implementing green infrastructure frameworks.

2. Underpinning research

The key researcher and position held at the institution at the time of the research is: Professor Philip James, Professor of Ecology, Head of Ecosystems and Environment Research Centre (from 1994).

The impact of *socio-ecological systems: natural assets and people* is underpinned by the following research:

- **1999-2003:** The Cheshire Life ECOnet project **[14]**, which was later funded by the EU's *Life* programme, integrated economic, social and environmental objectives. The study combined local ecological knowledge with modelling (the Landscape ecological Analysis and Rules for the Configuration of Habitat model [LARCH]), which was used to assess the functionality of ecosystems within the networks) and land use options, identified in partnership with public and private landowners, leading to the establishment of ecological networks in Cheshire, UK, and in two areas of Italy: Emilia-Romagna, and Abruzzo. The study demonstrated that the creation of an ecological network has significant socio-economic benefits to the local and wider regional economies in terms of wealth generation, employment creation, and quality of life improvements. In all three regions the Life ECOnet project was followed by an implementation phase (James et al., 2000; James & Boothby, 2002).
- **2006-2009:** The concepts developed in the Life ECOnet project were transferred to an urban location in developing an ecological framework for Greater Manchester, funded by the Greater Manchester Ecology Unit **[11]**. James developed an approach which identified broad areas sharing similar ecological and land-use characteristics, rather than concentrating on the recreation and connection of selected habitat types **[8,9]**. Following this approach 'Biodiversity Opportunity Areas' were identified and options relating to policy mechanisms, actions, and interventions to achieve effective habitat creation and repair were identified **[3]**. Today, this work continues to inform the development of ecological interventions across Greater Manchester, and influences the work of the Local Nature Partnership.
- **2006-2010:** James identified a multi- and inter-disciplinary framework for research in urban green space and investigated the links between health and green spaces **[2,5]**. The latter addressed the important links between health and well-being and the natural habitat in urban areas, and resulted in a conceptual framework drawing these aspects of the socio-ecological system together.
- **2005-2013:** While the research described above was leading to establishing networks, frameworks and conceptual frameworks, a second strand of work was being undertaken in the Borough of Halton, North West England, investigating, at a finer level, aspects of

its socio-ecological system **[7]**. From 2005-2010 James investigated the ecological and social aspects of the pondscape in the borough **[4]**. Overlapping with this James explored the potential for species movement through the terrestrial environments of the Borough. The ecosystem system services associated with the urban tree infrastructure in Runcorn were identified and valued during a third phase of research (2008-2012). The fourth phase of research (2010-2013) focuses on the social-ecological system associated with the salt marsh that is a significant feature of the Mersey Estuary in the urban areas of Widnes and Runcorn and a focus of concern due to the imminent construction of the £2 Billion MerseyGateway.

- The further important focus of research is in China (2002-2013) where research has investigated the economic and social development of Shanghai and Chongming Island **[6]**, the green infrastructure of Nanjing **[1]** and is currently directed to the design and development of regeneration areas in Beijing.

3. References to the research

Key outputs

1. Kong, F., Yin, H., Nakagoshi, N. & James, P. (2012). *Simulating urban growth processes incorporating a potential model with spatial metrics.* Ecological Indicators, 20 82-91. DOI
2. James, P., Tzoulas, K. Adams, M.D., Barber, A., Box, J., Breuste, J., Elmqvist, T., Frith, M., Gordon, C., Greening, K.L., Handley, J., Haworth, S., Kazmierczak, A.E., Johnston, M., Korpela, K., Moretti, M., Niemelä, J., Pauleit, S., Rose, M.H., Sadler, J.P. & Ward Thompson, C. (2009). *Towards an integrated understanding of green space in the European built environment.* Urban Forestry and Urban Greening 8 65-75. DOI **(REF 2)**
3. Kazmierczak, A.E. & James, P. (2008). *Planning for biodiversity conservation in large urban areas: the Ecological Framework for Greater Manchester*. Salzburger Geographische Arbeiten. 42 129-149. URL
4. Gledhill, D.G., James, P. & Davies, D.H. (2008) *Pond density as a determinant of aquatic species richness in an urban landscape*. Landscape Ecology 23 1219-1230. DOI **(REF 2)**
5. Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemela, J. & James, P. (2007). *Promoting ecosystem and human health in urban areas using green infrastructure: A literature review.* Landscape and Urban Planning 81(3) 167-178. DOI
6. Yuan, W., James, P., Hodgson, K., Hutchinson, S.M.& Shi, C. (2003). *Development of sustainability indicators by communities in China: a case study of Chongming County, Shanghai.* Journal of Environmental Management 68 (3) 253-262. DOI

Key grants

7. **2010 and 2012:** Halton Borough Council Project, Halton Borough Council, £96,144 PI James (100%).
8. **2008:** Urban Green Space, Natural England, £2,000, PI James (100%).
9. **2007:** Support for development of an Urban Green research portfolio, Natural England, £2,080, PI James (100%).
10. **2007:** SURegen - Integrated Decision Support System for Sustainable Urban Regeneration, EPSRC, £2,311,086 Co-PI James (2%)
11. **2006:** An ecological framework for Greater Manchester, Greater Manchester Ecology Unit, £57,500, PI James (100%).
12. **2004:** Enhancing the Decision Making Process in Urban Spatial Planning Using Advanced ICT, Office of the Deputy Prime Minister, £21,280, PI James (60%)
13. **2000:** Implications of environmental legislation/policy for North West Water, North West Water, £23,565, PI James (100%)
14. **1999:** A demonstration model which integrates environmental considerations in sustainable land use planning and management through the use of ecological networks, Cheshire County Council, £97,573 PI James (100%)

4. Details of impact

Context: The Life ECOnet project has brought benefit to the three study areas: Cheshire, UK; Emilio-Romagna, Italy; Abruzzo, Italy.

- The ecological network created in Abruzzo featured as a case study in an ECNC (European Centre for Nature Conservation) report **[a]**. Since 2008 the key impacts of the research have been seen in the development and implementation of planning policy in the UK and China.
- The work in Cheshire on the ECOnet, the original concept for which was developed by James, has been included in a report by The Parliamentary Office of Science and Technology **[b]** as a case study indicating good practice in developing local ecological networks. The wider ECOnet work in Cheshire led to a £3 Million investment in the Sandstone Ridge ECOnet Partnership (SREP): the implementation phase of the project covering a potential chain of interconnected woodland networks, alternating with two interconnected heathland networks and two isolated peatland networks.
- The ideas developed in this work are now embedded within the Lawton Report, *Making Space for Nature* **[c]** and in the *Natural Environment* White Paper. A direct result of the Life ECOnet project was the inclusion in the North West Regional Planning documents that all local authorities covered by the plan should develop an Ecological Framework. The Greater Manchester Ecological Framework (GMEF), completed in 2008, was adopted into the planning system of Greater Manchester, for example by incorporation into the Greater Manchester Minerals Plan and was a forerunner of work on the Green Infrastructure of Greater Manchester **[d]** and in work informing the Natural Economy Northwest initiative (NENW) **[e]**.
- Working in partnership with Red Rose Forest (RRF), a Community Forest serving Greater Manchester, the Forestry Commission and Natural England, James's work from the Greater Manchester Ecological Framework (GMEF) has been used to develop the overall approach to the Greater Manchester Green Infrastructure (GI) Framework **[f]**. This work has shown how different datasets may be brought together to model the benefits GI could bring to the City-Region. It also highlighted the importance of ways to improve the 'urban matrix', work Red Rose Forest pursues with street tree planting **[g,h]** and other interventions (including green roof creation).
- The GMEF approach has been used in two major area strategies, the Trafford Forest Plan and the Manchester City Centre Green and Blue Infrastructure Plan. The University joined with the Red Rose Forest's Greater Manchester Tree Audit Consortium, helping this ambitious idea become a reality, and the use of the Greater Manchester Tree Audit is yielding useful data to develop the Audit as a 'live' project. The work on ecosystem services has also helped formulate the approach for a new piece of work identifying and prioritising Ecosystem Services for the Mosslands area to the west of Salford. This work is informing the development of a Local Nature Improvement Area (the Great Manchester Wetlands) and a significant funding application to the Heritage Lottery Fund which is currently being written.
- The research programme in Halton began in 2005 and as a result of the early work the management of the ponds and urban trees within the borough has been modified. Since 2008 the work has focussed on the movement of species in the borough and on the saltmarsh. The outputs of the work on species movement was used in informing the decision making process related to the planning approval for the £600 million second Mersey Crossing bridge. The work on the saltmarsh focused on the ecosystem services associated with the environmental mitigation over 1,700 ha of land and estuary which will flow from the construction of the bridge **[i]**.
- In China, the main impact of Professor James's work is seen in the planning and design of a new development in the Xicheng District in the centre of Bejing. Xicheng is a major commercial district in central Beijing. Professor James's work is breaking new ground as this is the first time that urban eco-system services and urban ecological concerns have

been incorporated so prominently in a practical masterplan project in China. This work has established the principles of integrating urban eco-system services into the masterplanning agenda for this area. In particular, the proposal for creating a series of linked urban green spaces (some of which span an existing urban ring road) has attracted keen interest from the Xicheng government. At the time of the writing the proposals are being further studied by the policy makers in Xicheng.

5. Sources to corroborate the impact

a) European Centre for Nature Conservation (2003) European Corridors: Strategies for corridor development for target species ECNC, Tilburg, the Netherlands & Alterra http://www.ecnc.org/uploads/2012/10/2004-european-corridors.pdf
b) Postnote (2008) *Ecological Networks* The Parliamentary Office of Science and Technology (POST), London February 2008, Number 300. POST is an office of both Houses of Parliament, charged with providing independent and balanced analysis of public policy issues that have a basis in science and technology http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-300.
c) Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., & Wynne, G.R. (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra. p15. http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf
d) Hodcroft, D. & Alexander, D. (2010) Ecological frameworks in North West England *Planning Practice and Research,* 19 (3) 307-320 http://www.tandfonline.com/doi/pdf/10.1080/029745042000323238.
e) The Environment Partnership (2010) *Greater Manchester's Green Infrastructure: next steps towards a Green Infrastructure Framework* TEP, Warrington. http://www.greeninfrastructurenw.co.uk/resources/1547.058_Final_Report_September_2008.pdf
f) Association of Greater Manchester Authorities (2011) Green Infrastructure Framework, Final Report March 2011http://www.agma.gov.uk/cms_media/files/110506_final_gi_framework_may_2011.pdf.
g) Red Rose Forest, Green Streets http://www.redroseforest.co.uk/web/content/view/43/143/
h) Red Rose Forest, Little Green Roofs http://www.redroseforest.co.uk/web/content/view/244/400/
i) http://www.merseygateway.co.uk/2009/11/biodiversity-seminar-set-to-showcase-gateway-nature-reserve-plans/