Institution: University of the West of England, Bristol

Unit of Assessment: 13

Title of case study: Improving the quality of green infrastructure in towns and cities in the UK

Period when the underpinning research was undertaken: 2013 – 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Professor Jessica Lamond	Professor	2011 – present
Dr Danielle Sinnett	Associate Professor	2009 – present
Dr Glyn Everett	Research Fellow	2013 – present
Nick Smith	Associate Head of Department	2007 – present
Dr Louise King	Senior Lecturer	2015 – 2017, 2018 -present
Dr Tom Calvert	Research Associate	2016 – present

Period when the claimed impact occurred: 01.08.2013 – 31.12.2020

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact

Green infrastructure, broadly defined as a multifunctional network of green and blue spaces, including measures to achieve flood resilience, is recognised globally as an essential component of healthy, liveable and sustainable places. UWE research between 2013 and 2020 addressed the challenges of defining its quality, planning and delivery. This had impact through the development of a national benchmark for green infrastructure, formal industry guidance, training and techniques, and widespread dissemination of knowledge and practical implementation. Initial development of a local benchmark supported by a Knowledge Transfer Partnership (KTP) expanded, with funding from the Natural Environment Research Council, into national benchmarking and support for green infrastructure with the establishment of a new body, *Building with Nature*. This led to the implementation of standards, promoting and supporting best practice on a national scale. Across the UK, benchmarking and accreditation through *Building with Nature* has extended to 30 local authorities, over 30,000 new homes, a hospital and other building developments, and has been promoted by both the UK government and professional bodies.

2. Underpinning research

There is now a substantial evidence base outlining the benefits of green infrastructure for people and nature (**R1**, **R2**). Despite this, it is often challenging to define and deliver high quality green infrastructure, particularly in new developments, and there has been no overarching approach to standards. UWE research between 2013 and 2020 focused on working with stakeholders to understand what the challenges are, how they can be overcome, and developing tools to enable built environment professionals to raise the quality of green infrastructure.

The underpinning research revealed:

- The long-term performance, perception and quality of green infrastructure is often compromised due to shortcomings in planning policy, lack of enforcement, poor

understanding amongst built environment professions and poor quality delivery of specific features, for example sustainable drainage systems and landscaping (**G1**, **G2**, **G3**, **R3**, **R4**);

- The importance of articulating the multiple benefits of green infrastructure to secure buy-in from different sectors and stakeholders (**G1**-**G5**, **R1**, **R3**, **R4**);
- That lack of expertise and guidance for planners and other built environment professionals responsible for designing and implementing schemes at building, neighbourhood and city scales, was hampering progress towards the delivery of high-quality green infrastructure in new developments (**G1**, **G3**, **G4**, **G5**, **R4**, **R5**, **R6**);
- That it is essential that local communities are involved during planning and maintenance stages of green infrastructure to ensure effective long-term performance, and that social learning among professionals can overcome barriers to implementation by creating shared knowledge (**G4**, **G2**, **R3**, **R6**);
- The importance of long-term maintenance and education activities and the role of different communities and practices in sustainable spaces (**G4**, **G2**, **R3**, **R6**);
- That existing built environment assessment systems do not adequately address green infrastructure, because they: a) do not have mandatory requirements for green infrastructure; b) miss opportunities for the additive benefits that can be provided through a multifunctional network by focussing on individual features; c) fail to require the delivery of a multifunctional network operating at the landscape-scale; d) are awarded design masterplans, failing to recognise that the planned green infrastructure is often not delivered (**G1**, **G3**, **G4**, **R1**, **R6**, **R7**);
- That, in order to overcome some of the barriers identified above, there was both a need and an appetite for a national benchmark for green infrastructure in the UK (**G1**, **R6**).

Using this body of research, UWE researchers developed and tested a number of tools to enable professional stakeholders to improve the quality of green infrastructure, including a conceptual model of potential benefits for stormwater management and a methodology for evaluation of green roof retrofit potential in city centres (**R1**). Building on this research, a replicable framework for initiating Learning and Action Alliances for setting citywide multi-stakeholder vision for **G1** was developed in Newcastle (**G5**, **R6**) and tested in Ebbsfleet (**G2**). In addition, a KTP with Gloucestershire Wildlife Trust supported initial locally-focused work to develop a new framework of principles, standards and two user guides for policy and new development, and their application to demonstration projects (**R2**, **G3**, **S1**). Follow-on funding from NERC then enabled further development of standards and benchmarking in collaboration with stakeholders and end-users to ensure that it was suitable for use nationally (**R6**, **G1**). Internal funding from UWE provided support for further stakeholder consultations and demonstration projects in Scotland (**S2**, **S11**).

3. References to the research

R1 Lamond, J.E., Wilkinson, S.J., Rose, C.B. & Proverbs, D.G., 2014. 'Sustainable urban drainage - retrofitting for improved flood mitigation in city centres.' RICS research report. London: Royal Institution of Chartered Surveyors. Available on request.

R2 Jerome, G., Sinnett, D., Smith, N., Burgess, S., Mortlock, R., 2019. 'A framework for assessing the quality of green infrastructure in the built environment in the UK,' *Urban Forestry and Urban Greening* 40, pp. 174-182. https://doi.org/10.1016/j.ufug.2019.04.001.

R3 Everett, G, Lamond, J.E, Morzillo, A.T. Matsler, A.M. & Chan, F.K.S., 2018. 'Delivering green streets: An exploration of changing perceptions and behaviours over time around

bioswales in Portland, Oregon.' *Journal of Flood Risk Management*, 11(52) pp. S973-S985 https://doi.org/10.1111/jfr3.12225

R4 Calvert, T., Sinnett, D., Smith, N., Jerome, G., Burgess, S., & King, L., 2018. 'Setting the Standard for Green Infrastructure: the need for, and features of, a benchmark in England.' *Planning Practice & Research* 33(5), pp. 558-573. https://doi.org/10.1080/02697459.2018.1531580.

R5 Wilkinson, S., Lamond, J., Proverbs, D.G., Sharman, I., Heller, A. & Manion, J., 2015. 'Technical considerations in green roof retrofit for stormwater attenuation in the central business district.' *Structural Survey*, 33, pp. 36-51. https://doi.org/10.1108/SS-07-2014-0031

R6 O'Donnell, E.C., Lamond, J.E. & Thorne, C.R., 2018. 'Learning and action alliance framework to facilitate stakeholder collaboration and social learning in urban flood risk management.' *Environmental Science & Policy*, 80, pp. 1-8. https://doi.org/10.1016/j.envsci.2017.10.013.

R7 Sinnett, D., Calvert, T., & Smith, N., 2019. 'Do built environment assessment systems include high quality green infrastructure?' In F. Lemes de Oliviera, & I. Mell (Eds.), *Planning Cities with Nature: Theories, Strategies and Methods*. Springer. pp.169-186 https://uwe-repository.worktribe.com/output/855790

Evidence of the quality of the supporting research

G1 Sinnett, D. *A national benchmark for green infrastructure*, NERC, 2016-2017, £29,200
G2 Lamond, J. *Delivering and Evaluating the Multiple Benefits of Blue-Green Cities*, EPSRC, 2013-2016, £156,697
G3 Sinnett, D. *Knowledge Transfer Partnership with Gloucestershire Wildlife Trust*, Innovate UK, 2015-2018, £179,857
G4 Lamond, J. *Urban Flood Resilience in an Uncertain Future*, ESPRC, 2016-2019, £282,101
G5 Proverbs, D. *Retrofit of Sustainable Urban Drainage (SUDS) RICS research trust*, 2013-14, £7,400

Building with Nature was the winner of the 2018 Royal Town Planning Institute Planning Research Excellence Award – Sir Peter Hall Award for Wider Engagement.

The KTP between UWE and Gloucestershire Wildlife Trust was a finalist in the 2019 Innovate UK KTP Awards in the 'Best of the Best' category, where our work was recognised as an exemplar of the voluntary sector developing a new business.

4. Details of the impact

The underpinning research leading to the development of *Building with Nature* (BwN) and other guidance has:

- increased knowledge and certainty about the characteristics of green infrastructure;
- enabled more effective planning policies to implement green infrastructure;
- ensured high quality green infrastructure is delivered in new developments and through retrofitting existing places;
- benefited residents and communities through provision of high-quality infrastructure - improving quality of life, health and well-being and environmental quality;
- improved environmental quality, biodiversity and climate-change resilience.

Building with Nature leads to better knowledge and certainty regarding the characteristics of high-quality green infrastructure

Impact and the findings of UWE research with stakeholders (**R4**) established a framework of principles for high quality green infrastructure (**G1**, **G3**, **R2**). The KTP with Gloucestershire Wildlife Trust (GWT) supported the initial development of the *Building with Nature* framework and two *BwN* user guides; one focussed on benchmarking policy, and the other on new developments and a set of demonstration projects. This resulted in a benchmark for green infrastructure in the UK. This included a suite of standards, along with detailed criteria for planners, development surveyors, landscape architects and ecological consultants (**S1**, **S2**). It also positioned GWT and the wider wildlife trust movement as leaders in green infrastructure, planning and delivery. BwN's Director noted that:

> *'It has triggered a complete turnaround in our approach to the built environment and the quality of our [GWT's] engagement with planners and developers'* (**S2**).

Follow-on funding to UWE from NERC (2016-17) supported the expansion of this initial work with GWT into a national benchmark for green infrastructure, working with end users to ensure fitness for purpose. This led to the establishment of *Building with Nature*, a dedicated charitable organisation, owned by GWT, with core employees, a board of trustees chaired by Professor Peter Madden OBE, former CEO of Future Cities Catapult and Forum for the Future, and a Standards Board of industry and public sector professionals to oversee robust standards. In 2017, further consultation with end-users and demonstration sites, funded by UWE, led to the adoption of *BwN* in Scotland (**S3**, **S4**, **S5**).

Operating nationally, *BwN* (**S5**) has developed standards, best practice guidance, training and accreditation processes based on UWE's initial research, UWE's partnership with GWT, and subsequent collaboration with wide-ranging partners and stakeholders. BwN aims, nationally, to support and encourage planning authorities, professional experts and developers, to deliver high quality green infrastructure in wide-ranging development contexts.

UWE research extends the reach of green infrastructure quality improvement

Since 2019, *BwN* is referenced in the *English National Design Guide* by the Ministry of Housing, Communities and Local Government (**S6**). It has been highlighted as a tool for achieving high quality design in garden communities by Homes England (**S7**) and climate action by the Royal Town Planning Institute (**S8**). It has also been recommended for use by housing associations by Linc Cymru (**S9**), and formed the basis of a review of the planning policies across the Central Scotland Green Network (**S3**).

Policy makers have used UWE's research to develop more effective policies, enabling them to specify their expectations for green-blue infrastructure at a local level in a range of contexts. Newcastle City Council (NCC) issued a declaration, along with multiple actors, in which they committed to changing their approach to infrastructure development in the city to include a greater focus on green infrastructure and more emphasis on listening to local voices (**R6**, **G5**). In this they explicitly acknowledged UWE's research in making a distinct and material contribution to this declaration (**S10**). In December 2020, Newcastle City Council became the first local authority to undertake *BwN* training.

UWE's work also impacted directly on the inception of Learning and Action Alliances (LAAs) and city redevelopment plans in both Newcastle and Ebbsfleet (**R6**, **S10**).

> The '*research supported us [NCC] in beginning to develop a £87.5m transformative surface water management plan for the urban core*' between NCC and Northumbrian Water Limited, informed by the LAA and Blue-Green cities research (**S10**).

The report *Sustainable urban drainage - retrofitting for improved flood mitigation in city centres* (produced by UWE for the Royal Institution for Chartered Surveyors (RICS) research trust **G4**, **R1**), contributed to the development of a business case for Sustainable Drainage Systems (SuDS) (**S10**). A leading figure for several years in NCC praised the report as:

> '*the first independent evidence that this was a potential game changer for the city...invaluable in making the case for implementing blue-green infrastructure in Newcastle'* (**S10**).

Thirty local authority planning policies are being certified with *BwN* (**S2**, **S12**). For example, West Cheltenham's Cyber Central Garden Community Supplementary Planning Document and West Dunbartonshire's Local Development Plan have been awarded BwN 'Excellent' accreditation as '*an exemplar in policy making with regards policy commitment and clear policy requirements for high-quality green infrastructure through the planning and development process*' (**S4**, **S11**, **S12**). The framework is also referenced as supplementary guidance in the Essex Design Guide, covering fourteen local planning authorities (**S12**).

By the end of 2020, *BwN* had certified fourteen developments in Scotland and England, with a further 44 underway across the UK (**S2**, **S5**, **S12**). The certified developments amount to: 9,158 homes, where green infrastructure is a key aspect of the design; 108 hectares of employment land, including a 10 hectares new business park and two motorway service areas; and an 860 inpatient bed hospital with 28 hectares of woodland (**S2**, **S5**, **S12**). The additional 44 developments will bring this total to over 30,000 new homes (**S12**), and include those delivered by volume housebuilders. The benchmark is now also supported by a training package for *BwN* Assessors to further increase knowledge in the sector, resulting in a network of 50 assessors in the UK (**S2**).

5. Sources to corroborate the impact

S1 Jerome, G., Sinnett, D., Mortlock, R., Burgess, S., Studholme, C., Calvert, T., Smith, N., Bloomfield, S., 2019. *Building with Nature User Guide*, version 1.4. Gloucestershire Wildlife Trust, Gloucester, UK
S2 Testimonial from the Director, Building with Nature
S3 Scottish government: Green Infrastructure Policies in the CSGN – A Review of Local Authority Policies on Green Infrastructure in Built Development
S4 West Dunbartonshire Local Development Plan August 2020
S5 Building with Nature Case Studies.
S6 Ministry of Housing, Communities and Local Government: *National Design Guide*.
S7 Homes England Garden Communities Toolkit
S8 Royal Town Planning Institute: Guide to Climate Action Tools.
S9 Linc Cymru and National Resources Wales: *Green Space and Wellbeing*: A good practice guide for Housing Associations.
S10 Testimonial from the former Policy and Communications Business Partner, Newcastle City Council
S11 West Cheltenham Cyber Central Garden Community Supplementary Planning Document July 2020
S12 Building with Nature Funding Progress Report to Esmée Fairbairn Foundation, February 2021