Institution: University of East London (UEL)		
Unit of Assessment: 13 Architecture, Built Environment and Planning		
Title of case study: Nature-based solution co-creation innovation for sustainable and resilient green cities		
Period when the underpinning research was undertaken: 2011 – 2016		
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:**
Dr Stuart Connop Professor Darryl Newport Dr Paula Vandergert Dr Chloe Molineux Dr Caroline Nash	Senior/Research Fellow Director Senior/Research Fellow Senior/Research Fellow Research Assistant/Fellow	2005 - present 1997 - present 2011 - present 2012 - 2019 2011 - present
Period when the claimed impact occurred: 2013 – 2020 (ongoing)		
Is this case study continued from a case study submitted in 2014? No		

1. Summary of the impact (indicative maximum 100 words)

With humanity facing global sustainability challenges including climate change, biodiversity loss, pandemics, food shortages, and soil degradation, paradigm shifts in the stewardship of the planet's resources are essential. Our research from the EU FP7 project TURAS (Transitioning Towards Urban Resilience and Sustainability), engaged city-making stakeholders across Europe in a co-created exploration of how a nature-based solutions (NBS) approach to urban infrastructure design can represent such a paradigm shift. Our TURAS research **has underpinned the mainstreaming of urban nature-based solutions at local, national, EU, and global levels**, with NBS now embedded at the heart of the EU Biodiversity Strategy for 2030 and representing a globally-mainstreamed mechanism for delivering the United Nations Sustainable Development Goals.

2. Underpinning research (indicative maximum 500 words)

Responding to an EU FP7 Research & Innovation Call on Sustainable and Resilient Green Cities (**G1**), the Sustainability Research Institute (SRI) played a key role in the TURAS urban transitioning project (2011-2016). The SRI's involvement was a product of its transdisciplinary approach to research and focus on cross-sectoral collaborative partnerships. SRI researchers provided expertise to TURAS: Dr Connop (co/work package leader – Green Infrastructure); Professor Newport (co/work package leader – Manufactured Aggregates); Dr Vandergert (Short Circuit Economies and Adaptive Governance); Dr Molineux (Ecological Engineering); Dr Nash (Ecological Design).

TURAS research **pioneered a co-creation approach to shaping and delivering research on urban transitioning**, a process that now underpins nature-based solution research and development. The process 'twinned' academics, public authorities, development agencies, and SMEs across a series of EU case study cities to deliver solutions-based research and innovation, co-creating research approaches as equal partners. Research outputs addressed real-world challenges:

- developing new monitoring methods,
- changing landscapes through innovative multifunctional design,
- supporting communities,
- informing policy and planning,

- shaping future EU research and policy direction.

In London, the novel 'twinning' approach to sustainable urban design comprised a partnership at Barking Riverside, one of the largest brownfield regeneration projects in Europe, with the London Borough of Barking and Dagenham, the Institute for Sustainability and Barking Riverside Ltd.

As research leads, the SRI worked in partnerships across Europe in Ludwigsburg, Germany, Rome, Italy, and Brussels, Belgium. Within the overarching scope of TURAS, SRI research in these urban 'living' laboratories targeted sustainable urban development on these themes:

- *Exploring co-creative methodologies for addressing real-world sustainable urban strategies through the delivery of practical environmental, social and economic solutions to the impacts of urbanisation and climate change.*
- *Addressing environmental, social and economic challenges through multifunctional green infrastructure design, with a specific focus on Sustainable Drainage Systems (SuDS).*
- *Ecomimicy process development to deliver locally-contextualised biodiversity net-gain for urban development through the creation of ephermeral wetland green roofs, brownfield-inspired landscaping, and biosolar roofs.*
- *Sustainable ecological engineering using recycling and manipulation of aggregates to enhance the resilience and ecosystem service provision of urban greenspaces.*
- *Novel adaptive governance approaches for sustainable place-making including the development of community engagement strategies and community asset management to manage green infrastructure assets.*
- *Investigation/demonstration of the role that bridging organisations can play in addressing barriers to the delivery of multi-stakeholder co-creational urban transitioning processes.*

This TURAS research is now **supporting cities globally to using nature and natural processes to deliver NBS providing biodiversity, environmental, economic, and social benefits** for building resilience and sustainability into local communities.

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

R1. Co-creative methodologies theme: Collier, M., Nedovic-Budic, Z., Aerts, J., Connop, S., Foley, D., Foley, K., Newport, D., McQuaid, S., Slaev, A. and Verburg, P. 2013. Transitioning to resilience and sustainability in urban communities. *Cities* 32 (S1), S21-S28. http://dx.doi.org/10.1016/j.cities.2013.03.010.

R2. Multifunctional urban green infrastructure design theme: Connop, S., Nash, C., Gedge, D. Kadas, G, Owczarek, K and Newport, D. 2013. *TURAS green roof design guidelines: maximising ecosystem service provision through regional design for biodiversity.* TURAS FP7 Milestone document for DG Research and Innovation. London: University of East London. https://repository.uel.ac.uk/download/732c7a85845dc994707938dbe16e7cf218a450a3f22c47f49f6ea356bf4aa7c9/4798249/Green_roof_design_final.pdf.

R3. Biodiversity net-gain for urban development theme: Connop, S., Vandergert, P., Eisenberg, B., Collier, M., Nash, C., Clough, J. and Newport, D. 2016. Renaturing cities using a regionally-focused biodiversity-led multifunctional benefits approach to urban green infrastructure. *Environmental Science & Policy* 62, 99-111. https://doi.org/10.1016/j.envsci.2016.01.013.

R4. Ecological engineering for urban sustainability theme: Molineux, C., Gange, A., Connop, S. and Newport, D. 2015. Using recycled aggregates in green roof substrates for plant diversity. *Ecological Engineering* 82, 596-604. https://doi.org/10.1016/j.ecoleng.2015.05.036.

R5. Adaptive governance theme: Vandergert, P., Collier, M., Kampelmann, S. and Newport, D. 2016. Blending adaptive governance and institutional theory to explore urban resilience and sustainability strategies in the Rome metropolitan area, Italy. *International Journal of Urban Sustainable Development* 8 (2), 126-143. http://dx.doi.org/10.1080/19463138.2015.1102726.

R6. Barriers to sustainable transitions: Kampelmann, S., Van Hollebeke, S. and Vandergert, P. 2016. Stuck in the middle with you: the role of bridging organisations in urban regeneration. *Ecological Economics* 129, 82-93. https://doi.org/10.1016/j.ecolecon.2016.06.005.

G1. Darryl Newport 'TURAS (Transitioning Towards Urban Resilience and Sustainability)', European Commission DG Research and Innovation under the FP7 Theme: ENV 2011 – Sustainable and Resilient Green Cities, 2011-2016, EUR6.8 million EU FP7 funding (of which ~GBP600,000 came to UEL).

4. Details of the impact (indicative maximum 750 words)

"*The TURAS project was pioneering on several fronts, including on multi-stakeholder co-design to co-implementation processes, design and development of multifunctional green spaces in urban contexts, and innovative governance and community engagement processes to cite a few…. the UEL case study was used as an example in several of the EU publications and articles*" Testimonial letter from the European Commission (**S2).**

As stakeholders were co-production partners, impact was achieved locally, nationally and internationally, shaping the EU NBS agenda **(S1, S2)** and developing an EU evaluation framework for NBS, supporting NBS at the heart of the new EU Green Deal priorities. Direct changes to the environment; improvements to the health and wellbeing of communities; developing new local economies and enterprises; supporting social justice; upskilling green infrastructure practitioners;
and widening community participation continue to benefit localities where TURAS operated.

Changing biodiversity policy and practice

"The innovative approaches to ecomimicry and interdisciplinary design and governance that were demonstrated by the project have influenced forthcoming planning guidance to support the Mayor's London Plan1 on the design of urban greening to deliver net gains for biodiversity." Testimonial letter from the Greater London Authority **(S4)**.

Derbyshire St Pocket Park, *Green Living Room,*

The research was embedded into design guidance for developers working at Barking Riverside to ensure that green infrastructure at the heart of the development provides social, environmental and economic benefits for the community (e.g. through flood risk reduction).

Results from research were foundational for the development of an ecomimicry-based Sustainable Drainage Systems (SuDS) planning guidance for the London Borough of Tower Hamlets. This resulted in the development of the award-winning Derbyshire St Pocket Park, now a case study for SuDS design best practice for Susdrain and the Landscape Institute.

New monitoring methods for establishing the efficacy and ecosystem service provision of green infrastructure:

A novel green infrastructure monitoring methodology was used to support the Greater London Authority's Drain London project, and the EU LIFE+ project Climate-proofing Social Housing

Estates. Results from these projects assisted the work of the Committee on Climate Change (**S8)**, have supported Groundwork in securing funding for scaled-up SuDS retrofit projects, and supported the Greater London Authority in securing a pan-London SuDS initiative.

Regional policies including the London Assembly Housing Committee on encouraging biodiversity in new housing developments **(S3)**, the London Environment Strategy, and London's Infrastructure Plan 2020 were informed by research. It aided the development of a Royal Docks and London Borough of Barking and Dagenham Green Infrastructure Strategies (**S4)** and fed into international ICLEI/IUCN pollinator guidance for cities **(S5).**

Influencing policy debate on climate change adaptation:

The results were cited by the European Commission as bringing awareness to the importance of regional context and multifunctionality in shaping the new EU urban sustainability agenda's focus on NBS (**S1)**.

Recommendations from the research were embedded into the Horizon 2020 Innovation project, Connecting Nature (CN), to directly
support 11 cities in the EU to systematically upscale NBS for climate change adaptation.
The ICLEI 'Cities with Nature' UrbanByNature programme, a training programme for cities globally, educate city planners how to integrate the Connecting Nature research into city planning(**S6)**.
Dr Connop now sits on a European Commission Task Force, feeding these, and other nature-based solution monitoring methodologies, into the development of a global first NBS evaluation guidebook.

Influencing professional policy, product creation and development

Figure 2. TURAS research in action

Researchers' collaboration with green infrastructure professionals changed professional practice:
• supporting the development and monitoring of the 'Green Living Room' (GLR) in Ludwigsburg, Germany, and co-developing a mobile version of the GLR (**S7)** hosted in over 80 German cities and acts as an ambassador for Helix's green façade products leading to a substantial increase in sales.
• embedding ecomimicry design principles into the professional practice of landscape architects, Greenroof Shelters and Dermot Foley Landscape Architects.

• was the foundation of the GBP1m ERDF project ARENA. Built on TURAS outputs and collaborations, ARENA provides business support and product development for forty London-based resource efficiency and NBS businesses.
• underpinned a British Standard (**S9)** for the greenroof aggregate industry. This UK first provides protocols for testing and compliance values for substrates to ensure quality and effectiveness is achieved in the greenroof construction industry.

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

S1. Faivre N, Fritz M, Freitas T, de Boissezon B, Vandewoestijne S. 2017. Nature-Based Solutions in the EU: innovating with nature to address social, economic and environmental challenges. *Environmental Research* 159, 509-518.https:// doi:10.1016/j.envres.2017.08.032.

S2. Testimonial letter from Sofie Vandewoestijne, European Commission, December 2020, cites the contribution of TURAS research to the following EC publications: *Europe takes the lead in building urban resilience 2016* (Cordis article, 26 October 2016); *Integrated tools to better transition to more liveable cities* (Results in Brief, 8 August 2017); *Biodiversity and nature-based solutions - Analysis of EU-funded projects* (European Commission, 2020) *Directorate-General for Research and Innovation).*

S3. London Assembly Housing Committee on encouraging biodiversity in new housing developments, 14. https://www.london.gov.uk/sites/default/files/at_home_with_nature_-_encouraging_biodiversity_in_new_housing_developments.pdf

S4. Testimonial letter from Sam Davenport, Greater London Authority, December 2020 cites SRI TURAS research as influencing: *Mayor's London Plan*, *London's Species of Conservation Concern*, *the Drain London programme*, and *The London Sustainable Drainage Action Plan.*

S5. ICLEI/IUCN guidance on pollinator-friendly cities. ttps://www.iucn.org/sites/dev/files/local_authorities_guidance_document_en_compressed.pdf

S6a. UrbanByNature. https://connectingnature.eu/urbanbynature
S6b. UrbanByNature. https://www.youtube.com/channel/UCI24BLyUnvxq7aehGu-XMKw/videos

S7. Helix Pflanzen new product from TURAS research.
S7a. https://inhabitat.com/plant-covered-mobile-green-living-room-travels-through-europe/
S7b. https://www.helix-pflanzen.de/pflanzensysteme/produkte/mobiles-gruenes-zimmer
S7c. Confidential letter on sales figures.

S8. Committee on Climate Change report. https://d423d1558e1d71897434.b-cdn.net/wp-content/uploads/2018/11/Adaptation-actions-in-cities-what-works-final.pdf

Influencing professional practice

S9. BSI standard. https://uelsri.wordpress.com/2019/03/26/a-british-standard-for-green-roof-substrates/