**Institution: The University of Manchester**

**Unit of Assessment: 16 (Architecture, Built Environment and Planning)**

**Title of case study: Building Capacity for Urban Climate Change Adaptation**

## 1. Short summary of the impact

Research undertaken at the University of Manchester (UoM) has enhanced capacity for assessing and responding to climate change impacts and risks in urban areas, by moving from basic research around user requirements to the development of scaleable decision support tools. The needs of end users have been considered from the outset, with a co-production model of research – academics working in joint enterprise with stakeholders from the public, private and third sectors – leading to enhanced take-up of the resulting ideas, tools and techniques. Impacts are based upon supporting climate change adaptation responses within planning authorities, at local, regional, national and international scales, with the web-based climate change adaptation tools, developed at UoM, now freely available to municipalities worldwide.

## 2. Underpinning research

This research considers the implications of rapid climate change in urban environments, and the urgent need to develop decision-support tools and approaches that build adaptive capacity into urban decision making processes. It was undertaken by researchers within the Architecture and Planning discipline at UoM: Professor John Handley (1999-2010, now Emeritus); Professor Simon Guy (2005–); Dr Jeremy Carter (Research Fellow, 2004–); Dr Gina Cavan (2009-2012); Dr Susannah Gill (2003-2007, now visiting); and Richard Kingston (Senior Lecturer, 2003–). The research has benefited from linkages across UoM disciplines, including Geography (Dr Sarah Lindley), Engineering (Professor Geoff Levermore) and Life Sciences (Dr Roland Ennos).

Central to this work is a core of interdisciplinary research on the ways in which urbanisation modifies local climates, and the associated implications for urban planning and development [F]. Specifically, the research models how urbanisation modifies the natural environment by increasing the capacity for heat storage and accelerating surface water runoff. This framework is then applied to the context of rapid global climate change and its potential impacts on cities, a concern raised by the International Governmental Panel on Climate Change and the UK Government 'Adaptation Sub-Committee'. The research was tested thoroughly within the **Adaptation Strategies for Climate Change in the Urban Environment** (ASCCUE) project (2003-2006, EPSRC, £432k) and led by Professor Handley. ASCCUE provided the first integrated assessment of climate change impacts and adaptation in UK urban areas. It operated at nested levels of scale, utilising a novel methodology to explore the ways in which climate change amplifies the effects of urbanisation on local climate. This required:

- Developing a **new approach to urban characterisation** [B]
- The creation and application of a **distinctive approach to urban climate risk assessment**, based around the exposure and vulnerability to climate change hazards [E]
- An assessment of the **effectiveness of green infrastructure** as a powerful tool for urban climate change adaptation [C]

The need to develop new techniques for assessing and responding to climate change impacts and risks in urban areas, and their immediate hinterland, stimulated the development of practical toolkits within the **Green and Blue Space Adaptation for Urban Areas and Eco Towns (GRaBS)** project (2008-2011, INTERREG, €270.1k) and co-ordinated by Dr Carter in association with the Town and Country Planning Association (TCPA). GRaBS took the ASCCUE risk assessment framework to practitioners across Europe, utilising a co-production methodology in order to develop decision support tools to enhance capacity for urban and regional adaptation planning [A]. Underpinning the development of the GRaBS tools is work undertaken within the UoM 'Public Participation GIS Research Group' (PPGIS) funded via the ESRC (Virtual Society), FP5 (IntelCities) and EPSRC (SURegen) [D]. At the centre of the GRaBS project are two core tools, both freely accessible via the UoM website for use by European local and regional municipalities (and others) involved in adapting towns and cities to climate change:

- **The 'Adaptation Action Planning Toolkit'**: A user-friendly co-produced risk and vulnerability assessment tool that aids strategic climate change adaptation responses. The tool works at two spatial scales – European and GRaBS partner level – and operates as a platform

displaying spatial data, visualising vulnerability, exposure and climate hazards, and providing information to aid climate change adaptation planning and decision-making.
- **The Surface Temperature and Runoff' (STAR) tools**: Designed to assist users in assessing the potential of green infrastructure when adapting their areas to climate change.

ASCCUE's approach to identifying and reducing climate risk provided a basis for further projects, at a range of scales, that shared conceptual connections, including the **Bruntwood Initiative for Sustainable Cities** (Ecocites), led by Professor Guy and funded via the Bruntwood Property Group and the Oglesby Charitable Trust (2008-2012, £950k), and **Climate Change and Urban Vulnerability in Africa** (CLUVA), led by Dr Lindley and funded via EU FP7 (2010-2013, €342k).

**3. References to the research** (all references available upon request)

[A] (2012) Cavan, G. and Kingston, R. "Development of a Climate Change Vulnerability and Risk Assessment Tool for Urban Areas" International Journal of Disaster Resilience in the Built Environment 3(3) 253-269 (REF 2014) doi:10.1108/17595901211263648
[B] (2008) Gill, S. E., Handley, J, F., Ennos, R., Pauleit, S., Theuray, N. & Lindley, S. J. "Characterising the Urban Environment of UK Cities and Towns: A Template for Landscape Planning" Landscape & Urban Planning 87(3) 210-222 (REF 2014) doi:10.1016/j.landurbplan.2008.06.008
[C] (2007) Gill, S. E., Handley, J. F., Ennos, A. R., Pauleit, S. "Adapting cities for climate Change: The Role of the Green Infrastructure" Built Environment 33(1) 115-133 www.jstor.org/stable/23289476 (293 citations: Google Scholar)
[D] (2007) Kingston, R. "Public Participation in Local Policy Decision-making: The Role of Web-based Mapping" The Cartographic Journal 44(2), 138-144 doi:10.1179/000870407X213459
[E] (2007) Lindley, S. J., Handley, J. F., McEvoy, D., Peet E.,& Theuray N. "The Role of Spatial Risk Assessment in the Context of Planning for Adaptation in UK Urban Areas" Built Environment 33(1) 46-69 doi:10.2148/benv.33.1.46
[F] (2001) Whitford, V., Ennos A. R., Handley J. W. "City Form and Natural Process - Indicators for the Ecological Performance of Urban Areas" *Landscape & Urban Planning* 57(2) 91-103 (227 citations: Google Scholar) doi:10.1016/S0169-2046(01)00192-X

**4. Details of the Impact**

**Pathways**: The projects outlined provide a conceptual framework, an evidence base, and valuable decision support tools, for UK and overseas stakeholders to enhance their understanding of urban climate change impacts and adaptation, and to develop strategies and actions in response. A key characteristic of this research is its collaborative nature, with a specific focus on building capacity to adapt. The GRaBS tools were thus an attempt to seek out opportunities to support the development of adaptation strategies and responses, an approach subsequently adopted in the EcoCities and CLUVA projects; the latter seeking to assist African cities to manage climate risks, reduce vulnerability and increase climate change resilience.

More broadly, the collaborative methods employed across these projects have encouraged the development of policy-relevant and user-focused outputs. Accordingly, stakeholders who have been directly engaged in the research have acted as 'champions' for associated outputs, creating immediate and powerful pathways to impact, including The Mersey Forest's project director notes UoM's *"significant contribution to building the case for and assessing the effectiveness of green infrastructure as a powerful tool for urban climate change adaptation. These ideas are now incorporated into all of our green infrastructure plans and strategies that have been completed for a range of public bodies. We have also used the work to support international projects such as ForeStClim… These approaches continue to influence the work of the Mersey Forest."* [1]. At a national level, the TCPA have confirmed that UoM's *"work on urban climate change adaptation, coupled with ongoing stakeholder engagement, has helped to build capacity for assessing climate change impacts and risks in urban areas"* [2]. The work has become an exemplar of co-produced research, with academics working in tandem with public policy makers, urban practitioners, private sector interests and stakeholders. Working relationships and ongoing dialogue have been maintained over time, acting as a central platform for securing impact. The most significant include links with local councils throughout Greater Manchester [3] and ongoing engagement and

dissemination alongside the TCPA [2]. Research outputs have impacted on a range of sectors and policy domains such as spatial planning, flood risk management and green infrastructure, at the local, regional and international scales.

**Greater Manchester Impact:** The EcoCities project has fostered innovative collaboration between UoM and the public *and* private sectors in Greater Manchester. EcoCities was funded via a charitable donation from the commercial property company, Bruntwood. This funding route demonstrates the degree to which the adaptation agenda has become established in Greater Manchester, signalling that related research, driven forward by UoM, is sufficiently developed and relevant to attract interest and funding from non-public sources. EcoCities also stimulated the signing of a 'memorandum of understanding' (MOU) between UoM and Manchester City Council (MCC) committing the partners to work more closely on climate change issues. The leader of MCC recognises this as *"a central platform for our ongoing engagement with the University"*, further noting that UoM research has contributed to MCC's Core Strategy, and: *"provides us with the robust evidence base needed to make informed decisions at both a local level and city region scale. We can therefore confirm that research undertaken at UoM has substantially improved MCC's understanding of climate change, and has supported the development of adaptation strategies and responses to locally prevalent climate change impact… The key output to this will be the development of a Green Infrastructure framework for Manchester… put*[ting] *the City at the forefront of Climate Change research and help make Manchester a truly Green City."* [4]

EcoCities researchers have sat on steering committees tasked with developing adaptation strategies for the City of Manchester and the conurbation of Greater Manchester, with the resulting strategies referencing both the project and its role in progressing adaptation in the conurbation [3][4]. The Association of Greater Manchester Authorities (AGMA) Director of Environment has recognised the value of the research, noting that Ecocites *"has been successful in bringing academic research outputs closer to policy making audiences… Climate change adaptation research… including the ASCCUE and EcoCities projects, has supported the development of strategic adaptation responses in Greater Manchester… significantly influenc*[ing] *the development and content of the Greater Manchester Climate Change Strategy (2012) and Implementation Plan (2013)… Ecocities research in particular… was adopted by the GM Environment Commission as our baseline research in this field in July 2012….* [UoM] *is a key partner and stakeholder in Greater Manchester's Low Carbon Hub with representative's holding seats on several of the Hub Board's Sub-groups."* [3]. This work has been transmitted broadly, with the EcoCities website (www.adaptingmanchester.co.uk) receiving 4240 visitors, from a range of countries, between its launch in May 2012 and June 2013, and the BBC featuring EcoCities, successfully highlighting the issues it raises to an international audience [5].

**National Impact**: Accordingly, the research has attracted national interest. Citations include:

i. Referenced in the literature review supporting the UK Climate Change Risk Assessment.
ii. Data on urban heat islands cited in UK Planning Advisory Group advice.
iii. Utilisation within published consultation responses, including the House of Commons 'Environmental Audit Committee'.
iv. A CABE Space document on the role of public space in adapting to climate change.
v. The vital role of green spaces, cited by the Technology Strategy Board. [6]

The TCPA referenced ASCCUE heavily within their influential 2007 guide 'Adaptation by Design'; as their chief executive notes, *"this document remains influential and continues to be utilised by stakeholders… for example the TCPA used the outputs of the GRaBS project in 24 local authority councillor training workshops in Yorkshire and the Humber between October 2012 and February 2013"* [2]. The TCPA has also utilised UoM adaptation research for lobbying purposes, with the *"outcomes and insights that have emerged from the ASCCUE and GRaBS projects…. Instrumental in the TCPA campaigning for urban adaptation and green spaces… informing TCPA policy responses to consultations such as the* [UK Government's] *'Natural Environment White Paper"* [2]. Similarly, members of the UoM research team have made invited contributions in this field, for example to the 'Royal Commission on Environmental Pollution' and the UK Government's 'Adaptation Sub Committee'. Nationally, local authorities including the City of Southampton and the

London Borough of Sutton, have used GRaBS to inform the development and implementation of adaptation 'action plans' (www.grabs-eu.org/partners.php).GRaBS was recently included in DEFRA's 'National Adaptation Programme' – outlining the Government's responsibilities under Section 58 of the Climate Change Act (2008) – where it was noted that GRaBS *"was one of the first projects to recognise the crucial role of green and blue space infrastructure adaptation to help create more resilient urban areas"* [7].

**European Impact:** UoM research has been influential at the European level. Informed by the GRaBS decision support tools, eleven European municipalities and regions (including the Province of Genoa and the Amsterdam district of Nieuw-West) now have strategies in place to progress climate change adaptation responses, raise awareness and bolster local adaptive capacity, with adaptation plans and strategies available to view on the GRaBS website (www.grabs-eu.org). This strand of research is still productive, and associated impact is increasing. For instance, in June 2012 GRaBS won the European Commission's DG for Regional Policy 'RegioStars Award' as the best project in the Sustainable Growth category (one of 5 winners from 107 entries). The jury noted that: "*While there are many projects working on the environmental aspects of green and blue infrastructure, this project goes further in assessing the social and economic benefits…"* The European Commission has also utilised ASCCUE in their work on vulnerabilities inherent in the 'compact city' [8].

Yet further afield, GRaBS was presented at COP17, the UN's annual climate change conference (Durban, December 2011). Subsequently, the GRaBS approach to climate change adaptation in cities was adopted by the International Council for Local Environmental Initiatives (ICLEI), giving the project the potential to support urban adaptation planning in cities across the world. These themes are taken up within ongoing UoM research (including 'Adaptation Strategies for European Cities' and 'Climate Proof Cities'). The former, funded by the EC (2012-2013, €36.2k), is supporting the development of the forthcoming EU Strategy on adaptation to climate change. The project has been cited in recent communications from the EC on a European Adaptation Strategy, who note that: *"Building upon the success of its pilot project 'Adaptation strategies for European cities', the Commission will continue to promote urban adaptation strategies"* [8], with Dr Carter appointed as an international expert to support the Committee of the Regions on their submission to the EC on the EU Adaptation Strategy.

**5. Sources to corroborate the impact** (all claims referenced in the text)


[1] Testimonial from Project Director, The Mersey Forest (17th May 2013)

[2] Testimonial from Chief Executive, **TCPA** (15th May 2013); (2011) 'The GRaBS Project Issue: Green and Blue Space Adaptation for Urban Areas and Eco Towns, *The Journal of the TCPA* 80(6) (June); (2007) TCPA 'Climate Change Adaptation by Design'

[3] Testimonial from Director of Environment, **AGMA** (17th May 2013); (2008) TEP 'Towards a green infrastructure framework for Greater Manchester' AGMA, Natural England (September); (2010) AGMA 'Transformation, Adaptation & Competitive Advantage: The Greater Manchester Climate Strategy 2011-2020'

[4] Testimonial from Leader, **Manchester City Council** (12th September 2013); (2009) MCC 'Manchester: A Certain Future: Our Collective Action on Climate Change' (Dec)

[5] (2012) BBC Website 'Studies Offer Cities Advice on Tackling Climate Risks' (16th May)

[6] **National Impact**: (i)(2009) Watkiss, P. 'Literature Review: Scoping Study for a National Climate Change Risk Assessment and Cost-Benefit Analysis (v.3)', *Metroeconomica* (February) (pp.41, 103); (ii)Website: PAS 'Economic Development, Infrastructure and the Built Environment'; (iii)(2009) 'Adapting to Climate Change Memorandum submitted by Groundwork UK' (October); (iv)(2008) CABE Space 'Public space lessons: Adapting public space to climate change'; (v)(2010) Gething, B. 'Design for Future Climate' Tech. Strat. Board (June)

[7] (2013) DEFRA 'The National Adaptation Programme: Making the Country Resilient to a Changing Climate' (July)(p.21)

[8] **European Impact**: (2010) EC 'World and European Sustainable Cities: Insights from EU research' (p.28); (2012) 'RegioStars 2012 – 'Presentation of the Finalists' (p.26) & Project Videos; (2013) EC 'An EU Strategy on Adaptation to Climate Change' (April)(p.6)