

<p>Institution: University of Manchester</p>
<p>Unit of Assessment: 17a (Geography)</p>
<p>a. Overview</p> <p>Geography at Manchester has developed significantly during 2008-2013. We have expanded our research base (27.2 staff FTE returned compared to 22) and strengthened our position as a generator of world class geographical research. We have enhanced our research group culture to support a high quality of outputs through co-working, mentoring, early-stage peer-review of grant applications and outputs, direct involvement of postgraduates and support mechanisms for research time and research leave. Geography is organised into two human geography groups (<i>Geographical Political Economy</i> and <i>Urban Transformations</i>) and two physical geography groups (<i>Environmental Processes</i> and <i>Quaternary Environments and Geoarchaeology</i>). We are based in the interdisciplinary School of Environment, Education and Development (SEED), one of five Schools in the vibrant 1000-strong Faculty of Humanities. The continued improvement in our research environment is exemplified by: recent acceleration in research income (>£1.5 million in 2012-13); an increasing proportion of funding (32%) from international sources; a doubling of research student numbers compared to RAE2008, along with an increase in externally funded scholarships; and by 11 promotions against rigorous University of Manchester research criteria. The vitality of our research is shown most clearly, however, in a sustained ability to publish foundational agenda setting outputs (Geography staff have been cited >24,000 times since 2008), by the richness of our external networks and by the esteem and influence outlined below.</p>
<p>b. Research strategy</p> <p>Our primary objective, stated in RAE2008, was to reinforce the major transformation of Geography at Manchester which occurred in that period, aiming for excellence in our four research groups. This was to be achieved by continued investment in the three existing research groups in which we had established international research status and the strategic reorientation of the Space, Culture and Society research group towards a more focused urban research grouping to lead the emerging research agenda at the School, Faculty and University levels (e.g. <i>cities@manchester</i>, www.cities.manchester.ac.uk). A post-RAE external review emphasised these strategies, and identified requirements to: (i) increase our research power through growth in staff numbers, (ii) increase research student numbers and enhance support for PGR students, and (iii) rebalance our staff demographic which was becoming increasingly dominated by mid-career scholars. Since RAE2008 our key strategies to improve our research environment have therefore been to:</p> <ul style="list-style-type: none"> • Invest in early career staff to build further research capacity around our established research foci. In the light of this, twelve lectureship appointments have been made since 2008; • Improve research support for new and early career staff, including a focused mentoring programme, and supporting staff through the probation process; • Develop the research agenda in urban geographies outlined in RAE2008, with three new lectureships, and a Professorial appointment to provide additional leadership and bridge with our internationally leading work in political economy of environment; • Further strengthen our PhD training and supervision structures. <p>We have achieved these objectives, as outlined below, with the research groups remaining the primary mechanism for both nurturing a vibrant, intellectually rigorous and collegial research culture, and driving the development of our research strategy. These groups: have a nominated co-ordinator; meet regularly via reading groups and/or workshops; act as the focus for our weekly seminary series; peer review each other's grant applications and outputs; and provide research support through the mentoring of Early Career Researchers (ECR) and PhD students, including block attendance at key international meetings (e.g. AAG, EGU, INQUA) where staff and PGRs attend as a group.</p> <p>Our principal strategic aims and goals for 2014-2020 are now to:</p> <ul style="list-style-type: none"> • Develop our cohort of ECR staff into world class scholars; • Improve structures for multi-disciplinary collaboration and associated research activity; • Enhance the impact of our research on contemporary environmental and social challenges;

- Increase research **grant activity** with a doubling in grant expenditure compared to 2008-13.

These strategies will be facilitated through (i) our research group culture and the associated disciplinary support and monitoring mechanisms described in section c; (ii) the leadership of new cross-disciplinary research centres at the University of Manchester (UoM), including a Centre for Urban Resilience and Energy (CURE, directed by **Bouzarovski**) focusing on socio-economic resilience, energy flows and urban structures, and the establishment of the *cities@manchester* initiative (directed by **Ward**) as a formal UoM Research Institute; (iii) an expansion of resources and support for impact activities as described in REF3a. Research Group achievements during 2008-13, alongside specific strategies for the 2014-2020 period, are as follows:

Geographical Political Economy Research Group

This group focuses on economic and social governance, energy vulnerability, environmental politics, political ecologies, the political economies of labour, and the post-political. Additionally, interaction has been nurtured through the Group's leading role in the trans-disciplinary UoM Society-Environment Research Group (SERG). Priority areas identified in 2008 have been worked on over the census period, generating world leading research (e.g. the high citation impact of **Castree, Swyngedouw, Ward**) with specific research highlights including: (1) Geographies of energy vulnerability and insecurity (**Bouzarovski**); (2) Work by **Castree** and **Swyngedouw** to improve the understanding of the effects of capitalism on the biophysical environment; (3) Political economies and sociologies of labour restructuring and everyday life (**Doucette, Hall, Ward**); (4) New environmental configurations, governance, and politics (**Castree, Swyngedouw, Petrova**); (5) Post-political transformations (**Doucette, Swyngedouw, Ward**) and (6) Social justice analysis of socio-environmental transitions and transformations (**Petrova, Swyngedouw**). During the next census period the Research Group will be focusing on the following issues: (i) The social constitution of time, with particular references to environmental change and financialisation (**Castree**); (ii) Energy poverty and socio-ecological transitions, with an emphasis on social justice, resilience, and de-carbonization (**Bouzarovski, Petrova**, European Research Council grant); (iii) Political and economic financial and developmental restructuring in South-East and East Asia (**Doucette**, book monograph in production, Hess); (iv) Infrastructure and financialisation (**Ward**, book monograph in production); (v) Neo-liberalisation and transformations in environmental governance (**Castree, Petrova**); and (vi) Dynamics of politicisation and de-politicisation (**Swyngedouw**) (co-edited volume, in production). The interrelated themes inspiring this program revolve around critiques of post-neoliberalisation, emancipatory political struggles and democratising transformations.

Urban Transformations Research Group

Over the course of the census period the Space, Culture and Society Group has been reconfigured and rebranded, and is now the Urban Transformations Research Group. Building on existing strengths in urban research at RAE2008, the last five years have seen a significant investment in existing staff through promotions (**Dodge, Evans J, Jayne, Kaika**) and the hiring of new staff in this area (**Bouzarovski, Darling, Kurtz, Petrova, Wilson**). Its key achievements in the census period have been: **Ward's** work on urban policy mobilities offers theoretical nuance and empirical substantiation to our understanding of the construction of urban 'models'; **Jayne** has developed new methods for analyzing relational territorial urbanism, and his social and cultural analysis of cities and drinking cultures challenges the ontological and epistemological impasse of 'alcohol studies'; **Kaika** and **Kurtz** have empirically documented and improved our theoretical understanding of the link between financialisation, crisis and the built environment; both **Darling** and **Wilson** have developed new methods that further our understanding of urban diversity and exclusion, and reconceptualise the city as a site of social and spatial justice; **Kaika** has developed new agendas on understanding the politics of representations of nature in historical urban imaginaries; **Bouzarovski's** work conceptually frames and empirically substantiates the importance of buildings and urban infrastructures in low carbon urbanism and urban transition; **Evans J** has developed new methods for conceptualising the role of cities as learning environments in urban transitions; **Dodge and Perkins'** work conceptualises the socio-spatial power of digital technologies and the theorisation of cartographic knowledge. During the next census period the Research Group will build on its existing strengths, emphasising: geographies of

forced migration (**Darling**, ESRC grant), software space and geography of pervasive computing (**Dodge**), cities as sites of comparison and learning (**Evans J, Ward, Wilson**), the political ecology of the urban atmosphere (**Bouzarovski, Kaika**), policy mobilities, conflict management networks and community intervention programmes (**Wilson**, British Academy grant), and policy mobilities and financing infrastructures (**Ward**).

Environmental Processes Research Group

EPRG's research tackles some of the most challenging inter-disciplinary questions associated with environmental risk and response, and the associated roles of supporting and regulating ecosystem services. A hallmark is close collaboration with research users (e.g. with CEH, Moors for the Future, NERC QUEST programme and public bodies in the UK and overseas). The Group has generated three of Geography's REF3b impact cases, and by the end of 2013 will host two NERC KE fellows. UK and international academic research partnerships cover atmospheric science, medicine, engineering and ecology. Key research achievements since 2008 focus on two main themes: (1) *Advancing understanding of natural biogeochemical cycling* in upland and peatland environments and its modification by human activity, including: improved understanding of upland geochemical and pollutant cycling (**Agnew, Allott, Rothwell**); demonstrating the key role of erosion flux and particulate C to fluvial C fluxes, and the incorporation of new terrain analysis approaches to assess the role of fire (**Allott, Clay, Evans M**); and the development of novel satellite sensor derived chlorophyll indices for the estimation of C flux (**Harris**); (2) *Developing monitoring and modelling approaches to understand anthropogenic impacts on urban environments*, including: improved estimates of long-term air pollution exposures (**Lindley**); ambient particulate matter patterns and vegetation capture efficiencies (**Lindley, Rothwell**) and new estimates of anthropogenic heat emissions contributing to sensitivity testing of climate models (**Lindley**). The core of EPRG's five year strategy is further to develop its role as a centre of expertise in upland and urban environments emphasising interdisciplinary working and user partnerships. Prioritised cross-cutting themes are: (i) Assessing the impact of standard restoration approaches across a range of ecosystem services (runoff, water quality, carbon loss) (**Allott, Evans M, Rothwell**, Environment Agency funding); (ii) Establishing controls on terrestrial carbon cycling including work on (a) the fate and climatic warming contribution of fluvial C, (b) estimating C flux through remote sensing, and (c) using oxidative ratio analysis to estimate terrestrial carbon sequestration (**Clay, Evans M, Harris**); (iii) Evaluating the role of urban ecosystem services for climate change adaptation and risk mitigation (**Agnew, Lindley, Rothwell**, with green infrastructure stakeholders); (iv) urban pollution loadings and controls (**Lindley, Rothwell**).

Quaternary Environments and Geoarchaeology Research Group

This Group has expertise in geomorphology, palaeoecology, and geochronology. This is channelled into three inter-connected research strands: (1) Landscape evolution and global climate change; (2) Mediterranean Quaternary Environments and (3) Geoarchaeology. International collaboration is extensive and fundamental to QEG activity and field campaigns have been conducted on five continents since RAE2008. Key research achievements include:- (1) *Landscape evolution and global climate change*: Exploring large landslide occurrence and catastrophic lake drainage related to variable monsoon intensity in the Himalaya (**Dortch**); Importance of dynamic thinning at the ocean margins of the Greenland and Antarctic ice sheets (**Edwards**); Exploring dune system dynamics in hot (Australia) and cold (Antarctica) deserts using OSL (**Rhodes**); linkages between climate, glacier ELA and topographic elevation in India (**Dortch**); Using OSL-thermochronology to explore relief development in New Zealand during glacial cycles (**Rhodes**); Establishing cosmogenic exposure geochronologies for the last British ice sheet (**Hughes**); A new synthesis of fluvial system response to climate change and the long-term response of the Nile to changing monsoon intensity (**Woodward**). (2) *Mediterranean Quaternary Environments*: Recognition of extensive Middle Pleistocene glaciations with extreme cold during MIS12 (**Hughes, Woodward**); Recognition of millennial-scale climate events in the Middle Pleistocene (**Fletcher**); Linking high resolution terrestrial and marine records of rapid environmental change (**Fletcher**). (3) *Geoarchaeology*: Exploring human responses to rapid environmental change in the desert Nile, with a high-resolution OSL dating framework for the Holocene (**Woodward**). OSL dating of new records of Neanderthal marine mammal exploitation from cave sediment records in the western Mediterranean (**Rhodes**). In the next five years, with its critical mass of Quaternary scientists and

in-house expertise in geochronology, the group aims to increase understanding of landscape, ecosystem, and human response to rapid climate change. QEG group research will further expand into high mountain and high latitude regions by integrating remote sensing and field survey.

c. People, including:

i. Staffing strategy and staff development

Since 2008 we have expanded, returning 27.2 FTEs compared to 22 and 9.2 Professors, 6 Readers/Senior Lecturers and 12 Lecturers (*cf.* 4:9:9 in 2008). Staff retention has been strong, with the majority of the RAE2008 submission remaining at Manchester. However, a small number have left for permanent posts or significant promotions at other institutes: Lindsay moved to Guelph, Payne to Stirling, Bridge to a Chair at Durham (2013), Blackford to a Chair and Head of Department (HoD) at Hull (2013) and Coe to a Chair and HoD at the National University of Singapore (2012). New staff appointments have been central to the development of our research environment, and our key strategy since RAE2008 has been the appointment and support of Early Career Researchers of exceptional promise as judged by their research output. The following lectureship appointments have been made during the census period:- (1) *Geographical Political Economies*: political economies of labour (**Doucette**, UBC PhD, permanent); political ecologies of energy (**Petrova**, Prague PhD, fixed-term); ethics of consumption (**Hall**, Liverpool PhD, fixed-term fellowship); (2) *Urban Transformations*: cultural and social geographies (**Darling**, Durham PhD, **Wilson**, Durham PhD, both permanent); economic and political geographies (**Kutz**, Clark PhD, fixed term); (3) *Environmental Processes*: remote sensing of peatlands (**Harris**, Cardiff PhD, permanent); pollutant dynamics (**Rothwell**, Manchester PhD, permanent); carbon/fire dynamics (**Clay**, Durham PhD, fixed term); (4) *Quaternary Environments and Geoarchaeology*: ecosystem response to rapid climate change (**Fletcher**, Cambridge PhD, permanent); long-term landscape evolution (**Dortch**, Cincinnati PhD, permanent); remote sensing and ice sheet processes (**Edwards**, Bristol PhD, fixed-term). This significant investment in future research leaders is emphasised by the fact that we return 10 ECR staff. In addition to these lectureship appointments, a new professorial appointment (**Bouzarovski**, formerly Birmingham) provides leadership for a new research theme on urban resilience and energy, designed to integrate research from our Geographical Political Economy and Urban Transformations Research Groups and interface with cognate disciplines in SEED and the wider University. A recent strategic 0.2FTE professorial appointment (**Rhodes**, UCLA) will provide focus for developing new opportunities in Quaternary chronology within the QEG Research Group. These appointments have built on existing research leadership provided by our internationally established cohort of senior staff, facilitating the expansion and deepening of our research base and balancing our demographic profile.

We are strongly committed to staff development and equality, regardless of rank, tenure status or background. Staff are supported in their research activities through the annual School Performance and Development Review (PDR) procedure, and through Geography's Research Reviews in which individuals meet with the Geography Research Director and their Research Group Leader, providing focused opportunities to monitor individual and Group progress, review achievements, discuss both short and long-term individual research action plans and assess these against the Geography Research Strategy. The review process includes a baseline research workload model, with a high 'expectation threshold' based on a combination of research inputs (research students and grants) and outputs (peer-review papers in international journals, monographs, presentations at conferences of international standing, conference session organisation). Research activities are also facilitated by our 1-semester-after-6 sabbatical policy, with applications and plans tightly vetted by the School sabbatical committee to maximise delivery of research quality. The Geography research and conference fund provides c. £600 p.a. allowances for all staff and substantially higher sums for ECR staff. Support for new and early career staff has been a key priority of this REF period. All new staff follow School and University induction programmes, are integrated into Geography's research environment through participation in Research Group activities, and benefit from mentoring by a senior colleague. All of this occurs over the three-year probationary period and includes regular meetings to agree action plans. Newly appointed and ECR staff are given workload protection to allow development of their research trajectories and benefit from access to School and Faculty research stimulation funds which support research proposals to 'pump prime' new projects in advance of large applications to the Research Councils.

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In 2011-13, for example, six RSF awards averaging £4.5K were made to ECR staff in Geography, one of which led to a successful 2012 bid to the NERC New Investigator scheme (**Fletcher**).

The University has developed a *Concordat Implementation Plan to Support the Career Development of Researchers* and received an *HR Excellence in Research Award* from the European Commission in recognition of this work. Accordingly, Geography has a strong record in developing staff on fixed-term posts with, for example, **Dodge** and **Jayne** moving to permanent positions and securing promotions within the census period. Fixed-term and permanent ECR staff benefit from the identical support structures described above. All staff have access to academic and technical training courses offered by the UoM's Staff Training and Development Unit (STDU): Geography staff attended >150 STDU courses within the census period. Staff members are given specific training in Equality and Diversity issues with periodic updates (e.g. 14 Geography staff attended E&D training/update courses in 2012-13). The University guarantees interviews to job applicants with disabilities through its 'two ticks' scheme and offers substantial support to colleagues with disabilities. 33% of our academics are female, and women are represented at all levels (Professor to Lecturer). Our research ethics procedures are governed by a *University Code of Good Research Conduct* and projects involving human interaction must receive approval from a Faculty/University Research Ethics Committee, with pre-vetting at the SEED Research Ethics Committee. Research performance is central to academic staff promotions at all levels, and the research strength of our senior staff is demonstrated by internal promotions within the census period (**Allott**, **Coe**, **Evans M**, **Kaika** and **Woodward** to Chair; **Blackford** and **Jayne** to Reader; **Hughes**, **Lindley**, **Dodge**, **Evans J** to Senior Lecturer). Prestigious fellowships reflect the strength of Geography at Manchester and have further enhanced its capacity. For example: **Swyngedouw** received a Senior Research Fellowship of the British Academy/ Leverhulme Trust (2012) and was granted a Leverhulme Visiting Professorship (Prof. Andy Merrifield, 2011-14); **Bouzarovski** received European Research Council funding for a fellowship on energy vulnerability (ERC, €1.4 million, 2013-18) and **Hughes** won the 2008 *Thesinger-Oman* Fellowship of the RGS-IBG. In the 2013 UoM staff survey (71% return rate), 94% of respondents said that the University is a good place to work, 92% feel proud to work at the University, and 91% agree that facilities for research are good. This places UoM highest of the 28 HEIs surveyed by Capita.

ii. Research students

The census period has seen a significant increase in PGR student activity. We currently have 44 registered PhD students (of whom 9 are part-time), which represents a doubling of student numbers from the RAE2008 census date and an average intake of 10 students per year since 2009. This expansion is associated with: (i) increased application rates (51 applications in 2012 representing a >200% increase from the applications in 2008); (ii) improved success in securing external and competitive University scholarships (32 in the census period); and (iii) targeted improvements in procedures, pastoral care and student facilities that together have enhanced our PGR community and culture. Twelve students have been awarded scholarships by ESRC or NERC in the census period, including six CASE awards (partners include: ARUP, Manchester City Council, Natural England and OurLife). Since 2011 Geography has benefitted from the Geography and Environment pathway within the ESRC North West Doctoral Training Centre (NWDTC). Additional scholarships gained from external sources include: Alexander S Onassis Public Benefit Foundation (Greece), Commonwealth Foundation, EU Marie Curie, Mimas Landmap, Rothmere Foundation (Canada) and Social Sciences and Humanities Council of Canada.

Enhancements to our PhD procedures and supervision practices since 2008 include:

- Improved training for supervisors and new academics in supervision practice, and the introduction of a formal student-supervisor agreement at the start of the PhD programme;
- Roll-out of the University's new *eProg* online PhD support system, facilitating progress monitoring and formalising important student milestones across all three years;
- Introduction of an annual skills review for all PGR students supported via a Faculty-funded Post-Doctoral Training Officer, this has allowed the development of a customised programme of skills acquisition for the specific needs of individual students;
- Introduction of (i) a series of PGR master classes within Geography for both human and physical geography students, creating a space for leaders in their research fields to discuss

- critical themes with first year PhDs, and including a session on publication and the peer review process with experienced journal editors (see section e); (ii) a School course on research methodology and the University level *methods@manchester*, providing students with state of the art training across the full range of approaches to data collection, processing and analysis;
- Affiliation where appropriate of Geography students with other University initiatives, such as the Geography led *cities@manchester* and the ESRC Centre for Research on Socio-Cultural Change (CRESC). Both offer a forum for interdisciplinary research. Beyond the University, UoM Geography students are part of the EU ENTITLE project that includes tailored training and attendance at international summer schools, and aims to produce the next generation of leading international scholars in political ecology. Manchester PhD students also regularly secure funding to attend the prestigious RGS workshops/conferences and the Antipode summer schools;
 - Use of a formal continuation panel and 'viva' procedure, for continuation at the end of Year 1;
 - Introduction of an annual school-wide post-graduate research conference, which fosters a community of scholars and promotes a culture of constructive peer review;
 - Increased uptake of the University's 'thesis by papers' format for PhD theses.

PhD students are fully integrated into Geography's Research Groups, attending meetings and seminars, giving paper presentations (including support for co-attendance with staff at major international meetings) and working on joint publications with staff (42 published within the census period). Similarly, graduate students benefit from the experience of contributing to undergraduate teaching across all three years of the degree programmes. Students can only undertake teaching after a tailored training day and confirmation from supervisors that research progress is satisfactory. The vibrancy and collegiality of the Geography PhD community and its full integration into the discipline can be evidenced in a number of ways. In 2012/13 for example, the PhD students organized a series of **workshops where early-career staff offered advice on job applications and interviewing, publishing strategies, etcetera**. Another example is **Open Space**, an interdisciplinary forum where PhD students share their work in a critical yet supportive environment. Funded by *cities@manchester*, Open Space hosts annual academic events with tailored PhD workshops, as well as widely advertised highly attended guest lectures from internationally leading academics, such as Professors Ed Soja and Neil Smith. We have graduated 23 PhDs (FTE) since 2008, and over 50% of these graduates have secured academic positions including posts in Aberdeen, Liverpool, Manchester, Oslo, Oxford, Pittsburgh and Toronto.

d. Income, infrastructure and facilities

Our 2008-13 research income profile is characterised by:

- A high proportion (67%) of staff generating external research income, with the remainder almost entirely ECR staff appointed since 2011;
- A high proportion (47%) of income from RCUK;
- Very significant growth in funding from international sources, with 32% of income in 2008-13 generated from the European Commission and EU government bodies (<2% in RAE2008);
- A major acceleration in grant success towards the end of the REF period, with over £1.5 million secured during 2012-13;
- Success in RCUK (NERC and ESRC) grant schemes for Early Career Researchers.

Research expenditure in 2008-13 totalling £1.45 million (including in-kind RCUK funding) was associated with diverse sources including NERC, ESRC, AHRC, Leverhulme Foundation, British Academy, European Commission, EPSCR, European Research Council (ERC), Higher Education Academy, Joseph Rowntree Foundation, Cheshire Lehmann Fund, French Institute for International Relations, Czech Ministry of Education, DAAD, *Berlin-Brandenburg Akademie der Wissenschaften*, Japan Society for the Promotion of Science, Environment Agency, Australian Research Council and RGS-IBG. Major grants to 2013 include: AHRC on prehistoric deforestation (Blackford); DEFRA grants for work on fluvial carbon fluxes and peatland hydrology (**Evans M and Allott**); European Commission grants for postgraduate training (Maria Curie Framework VII ENTITLE project, **Kaika** and **Swyngedouw**), work on air pollution (ESCAPE project, **Lindley**), urban climate change effects (e.g. CLUVA project on climate change and urban vulnerability in

Africa, **Lindley** and **Agnew**), the political ecology of desalinisation (**Swyngedouw**), social cohesion in cities (Social Polis project, **Swyngedouw**), and the ecological politics of modernity (**Swyngedouw**); NERC support for projects on peat restoration and wildfire (**Evans M** and **McMorrow**), Quaternary glacial chronologies (**Hughes**) and air quality (**Lindley**). Significant awards won and started in 2012-13 include: British Academy for community intervention research in US cities (**Wilson**); Environment Agency for work on urban diffuse pollution (**Rothwell**); EPSRC funding for an energy security project (**Bouzarovski**); ESRC Future Research Leaders award for research on urban asylum (**Darling**); a European Research Council fellowship on energy vulnerability and urban transitions (**Bouzarovski**, €1.4 million); Joseph Rowntree funding for climate justice research (**Lindley**); a NERC New Investigators Grant on abrupt climate change (**Fletcher**). Additionally, two of the seven 2013 RGS-IBG small research grants were won by Manchester ECR staff (**Petrova** and **Wilson**).

The infrastructure and research facilities available to Geography continue to improve. Geography is based in the Arthur Lewis building, purpose built and opened in 2007, which houses the School of Environment, Education and Development (SEED) and the School of Social Sciences (SoSS) and associated School and Faculty administrative support. The building provides co-location of Geography staff, postdoctoral researchers and PhD students, and facilitates interaction with cognate disciplines across SEED (Architecture, Planning and Environmental Management, Development Studies and Education) and SoSS (Economics, Philosophy, Politics, Social Anthropology, Social Statistics and Sociology). All PhD students have a dedicated work-space and computer. Geography is supported in its research activity by the Arthur Lewis Research Support Hub, which provides professional support for all aspects of research activity. The Hub is a team of three Research Support Managers, six Research Support Officers and two Research Finance Officers, keeping staff informed of research opportunities and offering pro-active expertise in all aspects of bid preparation and project management. Geography research is further supported by a dedicated computer officer to support spatial modelling/GIS, and two full-time cartographic illustrators/web designers. Laboratory and field equipment investment since 2008 totals ~£450K, with enhancements including advanced particle size analyser, rock crushers as the first stages for cosmogenic isotope analysis, ion chromatography and improved facilities for environmental magnetism (RM, SIRM and ARM). These add to our existing systems for water and sediment analysis (ICP-OES, carbon analyser, microscopy suite, etc) to provide facilities of international standard for our physical geography research. We have access to further specialised equipment in aligned UoM laboratories, for example Wavelength-Dispersive microprobe, SEM and ICP-MS in the School of Earth, Atmospheric and Environmental Sciences. An extensive range of field equipment for environmental monitoring and soil, peat and lake sediment coring has been augmented with portable XRF, a 'COBRA' piston corer, new data loggers, a wide range of sensors, automatic water samplers and telemetry for our experimental catchment in the South Pennines. Data from this catchment have supported 8 PhD projects, and contributed to 20 journal publications. Thermal cameras have been acquired to be used in our new human geography initiatives on energy. Laboratory and field activities are supported by two research technicians. A workshop allows bespoke manufacture of equipment, for example for periodic water sampling, and for model making, laser cutting of materials and 3D printing. Geography also benefits from the wider UoM infrastructure. It has access to an outstanding library, designated National Research Library and hosting the widest range of electronic resources of any HE library in Europe including over 40,000 e-journals and several hundred research databases. The Library also delivers a range of bespoke training services to researchers and oversees Manchester's Research Data Management policy and service, with the Manchester e-Scholar system providing a premium resource for depositing and disseminating research outputs as an open access repository.

e. Collaboration or contribution to the discipline or research base

Our contributions to the wider discipline are demonstrably international and influential, as outlined below.

Journal roles: A key indicator of Manchester's standing in and contribution to the discipline is our extensive editorial involvement in leading journals. During the REF period staff members have held

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42 positions in 32 journals with roles in 6 of the top 10 Geography journals as ranked by ISI. Chief editorships include *Antipode* (**Castree** until 2009), *Area* (**Ward** 2010-), *Geoarchaeology* (**Woodward** 2007-), *Geoforum* (Bridge 2008-11), *International Journal of Urban and Regional Research* (**Kaika** 2011-) and *Progress in Human Geography* (**Castree** 2009-) with additional editorial positions in, for example, *Annals of the Association of American Geographers* (**Swyngedouw** 2004-, **Castree** 2007-), *Antipode* (**Ward** 2004-), *European Urban and Regional Studies* (**Bouzarovski** 2011-), *Geography Compass* (**Jayne** 2007-), *Geology* (**Rhodes** 2010-), *Human Geography* (**Swyngedouw** 2008-, **Kaika** 2008-), *Journal of Economic Geography* (Coe 2010-12), *Journal of the Geological Society* (**Hughes** 2012-, **Woodward** 2001-2011), *Professional Geographer* (**Castree** 2007-11), *Quaternary Geochronology* (**Rhodes** 2005-09) and *Transactions of the Institute of British Geographers* (**Castree** 2013-, **Evans M** 2009-13).

Books: Our leadership of the wider discipline is also exemplified by editorships of landmark reference works. For example, **Castree** co-edited *Human Geography* (Sage, 2012), *The International Encyclopaedia of Human Geography* (Elsevier, 2009) and the *Companion to Environmental Geography* (Wiley-Blackwell, 2009) and co-authored the first *Oxford Dictionary of Human Geography* (OUP, 2013), **Hughes** co-edited *Quaternary Glaciations* (Elsevier, 2011), **Swyngedouw** co-edited *Can Neighbourhoods Save the City?* (Routledge, 2010), **Ward** co-edited *Mobile Urbanism* (Minnesota University Press 2011) and **Woodward** edited *The Physical Geography of the Mediterranean* (OUP, 2009).

Our influence and esteem are also shown by **invited national and international roles**, with selected examples (only) outlined here. Six staff have served on RCUK peer review colleges during the REF period, and Manchester geographers have routinely been called on for significant international advisory roles including the US-Israel bi-national Science Foundation (**Hughes** 2011), the International Evaluation Panel for the National Academy of Finland (**Kaika** 2010), Research Programme Assessor for the Georgian Science Foundation (**Kaika** 2008) and the international DFG Excellence Initiative Panel assessing Geoscience research proposals and graduate schools in German Universities (**Woodward** 2011). We have conducted a total of 26 non-UK PhD examinations. **Bouzarovski** was appointed Member of the UK Department of Energy and Climate Change panel on 'Energy efficiency and behaviour'. **Castree** was chair of the 2009 annual IBG/RGS Conference hosted by Manchester, author on the 2012 report on 'Society-environment research 2000-10' for the ESRC-AHRC benchmark review of British human geography and was appointed Academician of the Academy of Social Sciences in 2011. **Evans M** was core expert and member of the International Union for Conservation and Nature (IUCN) Commission of Inquiry on Peatlands (2009-2012). **Fletcher** is a member of the IUCN Commission on Ecosystem Management. **Lindley** was invited expert for the Dutch Climate Proof Cities project. **Swyngedouw** is a member of the Flemish Science Foundation Commission, was invited to be Ambassador for the EC European Citizens' Initiative (ECI) and similarly acted as an assessor for the research initiatives programme of the Regional Government of Wallonia/*Universite Libre de Bruxelles*.

Invited presentations: During the REF period returned staff gave 373 oral presentations at major national and international conferences, presented 265 invited seminars and gave 111 invited keynote presentations. Particularly prestigious examples include **Bouzarovski** at the Fuel Poverty in Europe Conference (London 2012) and the European Network of Housing Researchers (Prague 2009), **Castree** at the Annual Conference of Belgium Geographers (Leuven, 2011), Jonathan Murdoch Memorial Lecture (Cardiff, 2013) and the opening plenary of the RGS-IBG conference (London, 2013), **Evans M** at the International Peat Society Conference (Quebec, 2011), **Hughes** at INQUA (Bern 2011), **Jayne** at the Chinese Academy of Social Sciences (Zhejiang, 2012), **Swyngedouw's** James Blaut Memorial Lecture (AAG, Boston, 2008), the annual Atwood Lecture 2012 (Clark University), the *Documents d'Anàlisi Geogràfica* lecture (Barcelona, 2013) and the Innovation and Engagement Lecture (University of Wales, Cardiff, 2013), **Rhodes** at the Geological Society of America (Minneapolis, 2011), **Ward** at the International Conference on Spaces and Flows (Italy, 2011) and Distinctiveness of Cities Conference (Darmstadt, 2011) and **Woodward** at the 39th Annual Binghamton Geomorphology Symposium (Austin, Texas, 2008), the 7th International Meeting on Global Continental Palaeohydrology (Jerusalem, 2009) and the International Conference on Landscape Archaeology and the Mediterranean World (Cairo, 2010).

Networks and cross disciplinary influence: We are exceptionally well networked both within the discipline and for interdisciplinary research, and at local to international levels, and a review of the unit identified 101 national and 116 international research collaborations. Key examples (only) include: (1) **Evans M and Allott** were partners in the 2007-11 NERC QUEST/Environment Agency interdisciplinary network on climate change in the UK uplands, involving over 20 UK and international research groups; (2) **Fletcher** co-ordinated the Abrupt Climate Change working group of the NERC/INSU-funded QUEST/DESIRE Anglo-French project (2007-2011) with key partnerships at the universities of Bristol and Bordeaux I and involving 26 participants from 11 countries, and is currently a member of the EU COST (Cooperation in Science and Technology) Action Programme ES0907INTIMATE (Integrating Ice Cores, Marine and Terrestrial records) involving over 57 participants from more than 15 countries; (3) **Kaika and Swyngedouw's** partner roles in a €3.5 million EU Marie Curie Funded Doctoral Training Program (ENTITLE, 2012-2015), an international consortium (Universities of Berlin (Humboldt), Barcelona (Autonomous), Coimbra, Lund, Athens, Santiago di Chile) to train 12 doctoral candidates (2 in Manchester) and 4 post-docs in the field of political ecology and environmental conflict; (4) **Lindley's** multi-disciplinary EU CLUVA (CLimate change and Urban Vulnerability in Africa) project with 13 partners including Technical University of Munich; Ethiopia Institute of Architecture, University of Addis Ababa; Ardhi University, Dar Es Salaam and University of Ouagadougou; (5) **Rhodes** is a member of the International Dune Atlas Project to compile chronological data on global sand seas in all parts of the world, funded by INQUA and involving scientists from four continents; (6) **Swyngedouw's** partner role in Social Polis, a EU Framework VII program setting the EU research agenda on urban cohesion and the environment, now the basis for subsequent Framework VII calls for research on European urban environmental matters; (7) **Swyngedouw's** role in WATERLAT, an international research network on Governance and Citizenship in Water Management and Environmental Health (with Prof. E. Castro, University of Newcastle, funded by Leverhulme Trust, 2009-2011); (8) **Ward's** leadership and development of *cities@manchester*, a major cross-disciplinary university initiative involving over 150 researchers from over 10 disciplines. This brings academics and students together to address some of global society's most pressing challenges and in the last three years has organised major international academic seminars and workshops involving, amongst others, Ash Amin, Colin McFarlane, Andy Merrifield, Sue Parnell, Neil Smith, Ed Soja, Vanessa Watson; (9) **Woodward's** role in the Leverhulme Trust British Museum consortium on Health and Diet in Ancient Nubia through Climate and Political Change, and the Australia Research Council Discovery Award consortium on impacts of climate change in the Nile Basin (with the Universities of Adelaide, Aberystwyth and Bergen); (10) Leadership of RCUK funded seminar series, including the ESRC 'Changing Cultures of Competitiveness' series (2008, Hess) and the interdisciplinary ESRC/NERC FIRES seminar series on wildfire and climate change (2009, McMorrow); (11) Organisation of sessions at major conferences including 60 at the Association of American Geographers Annual Meeting or European Geosciences Union during 2008-13.

Our contributions to the wider discipline are also demonstrated by the invited external positions during the census period. For example, visiting professorships were held at: Charles University Prague, Humboldt University, College of Europe-Bruges, University of Gdansk (**Bouzarovski**), Queen's University, Ontario (**Castree**), Vienna and Leuven (**Kaika**), the Universities of Leuven and Ghent, UNAM (Mexico), Lund, Trondheim, Alghero, and *Universite de Quebec*, Montreal, Leibniz Institute – Brandenburg, Berlage Institute, Rotterdam, and elected in 2013 to hold the 2013-14 Vincent Wright Visiting Professorship at *Sciences Politiques*, Paris (**Swyngedouw**). Research fellowships have been held at the University of Queensland (**Bouzarovski**), Sodertorn University College Stockholm (**Bouzarovski** and **Petrova**), Sungkonghoe University, Seoul (**Doucette**), UCLA (**Evans J**), University of Chicago (**Hall**), University of Alberta (**Harris**), International Labour Organization, Geneva and University of Osnabruck (Hess), Nanjing University and University of Wollongong (**Jayne**), and Berkeley and Toronto (**Ward**). We received two Hallsworth Fellows (**Hall** and **Wilson**), a Canadian Research Fellow (Furlong) and two Fellows funded by the Catalan Government (March and Pares). We are a major hub for visiting researchers, and a scheme to involve visiting professors is in place that brought, among others, Olivier Graefe (Freiburg), Nik Heynen (Georgia), Juan Martinez-Alier (Autonomous, Barcelona) and Andy Merrifield to engage in research activities for a sustained period of time.