

## Unit-level environment template (REF5b)

<b>Institution: University of Manchester</b>
<b>Unit of Assessment: 14 (Geography and Environmental Studies)</b>
<p><b>Section 1. Unit context and structure, research and impact strategy</b></p> <p><b>1.1 Overview</b></p> <p>The Geography Department at the University of Manchester (UoM) is now the largest, most vibrant and most cohesive it has ever been. Our primary mission is to: (i) understand the drivers of environmental and urban change; (ii) shape related academic debate and methodological innovation; and (iii) drive action. Research foci bring together perspectives on key global challenges including: energy; carbon; infrastructure; sustainability; and nature-society relations. Our fundamental and applied research is manifestly influential and stimulates real change through deep and lasting partnerships with research users. Since REF2014 we have exceeded our strategic aims to grow our research base, develop early-career staff, and improve research structures. We have attracted a new generation of talented researchers from across the globe so that in 2020 we have 36.3 FTE academic staff, supported by the strongest, most diverse and best-resourced research environment in the Department's history.</p> <p>Key achievements since REF2014 include:</p> <ul style="list-style-type: none"> <li>• <b>Producing highly influential scholarly publications</b>, the 2020 QS Geography World Rankings place us =3<sup>rd</sup> and 6<sup>th</sup> in the world for Scopus h-index and citations/papers respectively (4<sup>th</sup> and =11<sup>th</sup> in 2019).</li> <li>• <b>Gaining external recognition for exceptional research impact</b>, e.g. the inaugural Jo Cox Prize for Public Service and Active Citizenship for innovative, early-career public engagement work on everyday austerity (2018), and the EU 'Ordinary Hero' award for influencing international energy poverty policy (2019).</li> <li>• <b>Transforming the size, diversity and achievements of our PGR community</b>, with PhD completions growing from 23 to 57. Our award-winning PGRs (e.g. Manchester Doctoral College PGR-of-the-Year, 2017, 2018) publish in top-rated journals, e.g. <i>Nature Geoscience</i>, attract prestigious external funding (e.g. IPCC, Commonwealth) and take up influential roles (e.g. Minister for Energy, Burkina Faso).</li> <li>• <b>Receiving the most prestigious commendations for our research</b>, e.g. Fellow of the British Society for Geomorphology (BSG), 2017; Honorary Doctorates (Roskilde, Denmark, 2018; Malmö, Sweden, 2018); and UoM-Humanities Researcher of the Year, 2017.</li> <li>• <b>Enabling a major step-change in grant income capture</b>, HESA research income expenditure has quadrupled from £1.5m to £6.1m, greatly exceeding the target set out in our REF2014 statement. We have also diversified funding streams to &gt;30 different sources.</li> </ul> <p><b>1.2 Unit context and structure</b></p> <p>Structurally, the Geography Department is a single UoA14 entity based in the School of</p>

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Environment, Education and Development (SEED) within the Faculty of Humanities (FoH). We organize our departmental research activities across **five inter-linked Research Groups** (RGs):

- Two in physical geography (**Environmental Processes** (EPRG) and **Quaternary Environments and Geoarchaeology** (QEG)).
- Two in human geography (**Society and Environment** (SERG) and **Cities, Politics and Economies** (CPEG)).
- One explicitly working across human and physical geography (**Mapping: Culture and Geographical Information Science** (MCGIS)). MCGIS was established as a dedicated hub to build on distinctive strengths in critical/digital cartography highlighted in REF2014 Panel feedback, to develop methodological innovation, and to accelerate impacts. MCGIS benefits from strategic staffing investment and membership from across the University, including from the Humanitarian and Conflict Response Institute (HCRI) and Digital Humanities (DH).

We have grown our capacity through leading involvement in **UoM's Research Institutes (RIs)**. Manchester's RIs represent major infrastructural support investments for interdisciplinary working. They are large-scale hubs working across Schools and Faculties and are designed to co-develop and deliver leading-edge research, often through academic-practice partnerships. RIs provide a second tier to how we structure our research activity, adding sustainable capacity. Geography staff members bring leadership to the **Manchester Urban Institute (MUI)** and **Manchester Environmental Research Institute (MERI)** with contributions to many others, e.g. the **Manchester Institute for Collaborative Research on Ageing (MICRA)**. We also benefit from an active role in UoM's over-arching **Digital Futures Research Platform** via its *Cities & Environment* Steering Group.

The MUI builds on research strengths highlighted in REF2014 Panel feedback, i.e. 'work on the city', 'capital and politics' and 'nature-society relations'. MUI's Director (**Ward**) also co-leads CPEG, and MUI's *Smart and Sustainable Cities* and *Energy* themes are led by **J.Evans** and **Bouzarovski** respectively (CPEG/SERG). Through its strategic aims, MUI is committed to supporting the next generation of urban scholars, activists and decision-makers. Its members produce >150 publications/year on the global urban condition. MERI's strategic aims emphasize solutions-orientated research to complex environmental challenges by combining insights from the natural, health and social sciences. **Clay** (EPRG) leads the *Our Changing Earth System* theme, and **Stone, Fletcher** (QEG) and **Bellamy** (SERG) are discipline champions within the *Earth* theme. MUI and MERI are also inter-connected, e.g. through MUI's *Green and Resilient Futures* strand. The RIs bring access to wider supporting frameworks and cognate disciplines, help stimulate and nurture new ideas, enhance working practices and support the realization of major new funding streams on urban and environmental research and impact agendas.

Sitting between our departmental research structures and those of the wider institution, SEED (headed by **M.Evans**) provides the principal management body for our research activity. Operationally, UoA14 has a single Research Coordinator (**Lindley**) reporting to the Department Head (HoD) (**J.Evans**) and School Research Committee (chaired by **Castree**). This structure facilitates progress monitoring of Geography's strategic research activity and supports reciprocal engagement on wider strategy. We contribute to all of SEED's priority research themes (**environmental change; governance, policy and practice; poverty and**

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**social justice**; and **urbanism**) and two of UoM's five research beacons (**energy** and **global inequalities**). We have used wider UoM structures and platforms to collaborate on the EPSRC Power Networks, Data Analytics and Society and 4IR Data Intensive Science CDTs to further grow and support Geography's PGR community.

RGs and RIs are the primary routes to achieving our research aims. Annual departmental research away-days enable further cross-fertilization of ideas, expertise and skills. They provide the means of ensuring that Geography's collective research vision also embodies the wider aspirations of UoM's institutional research framework, objectives and opportunities (embodied in the Manchester 2020 Vision; UoM's Research Strategy and Statement of Research Expectations). We hold a '*Talking Research*' seminar series exploring a range of research themes beyond our usual invited research seminars, e.g. good practice in Knowledge-Exchange.

RGs sustain Geography's active and stimulating research life. Groups provide fora for intellectual debate, mentoring for ECRs, PGRs and mid-career staff, and peer-review of proposals and outputs. Our RGs hold regular meetings as part of a varied programme of annual activities, e.g. specific sessions to bring learning from AAG, RGS-IBG, EGU conferences to the wider group and conference-preparation sessions where PGRs and ECRs can trial presentations. All groups receive an annual £2,000 budget to run away-days and cover day-to-day expenses, such as travel to UKRI 'Town Meetings' or visits to discuss collaboration. RG away-days take different forms, including spin-off meetings at major conferences (QEG/CPEG), writing retreats (CPEG/SERG/EPRG), research proposal generation (EPRG/MCGIS) and off-campus team-building activities (MCGIS/SERG). Additional PGR-focused –and frequently PGR-led– RG activities also take place, e.g. writing workshops.

Within Geography, we are proud of our innovative RG co-leadership model. The model works by pairing an experienced research leader (usually from the Professoriate) with a more junior one. The model has many benefits. It allows specific mentorship on research and associated strategy development for the junior staff member while increasing capacity, catalysing innovation and breaking down barriers to meaningful PGR engagement. It also formalises succession planning, laying the foundations for successful long-term realisation of RG aspirations.

These structures and mechanisms enabled us to exceed the strategic aims set out at REF2014 (Section 1.3) for instance through:

- Developing a supportive, diverse and inclusive research environment. Success is reflected in internal promotions, progression to UoM and external academic posts, hosting an international Council for At-Risk Academics (CARA) fellow and receiving our Bronze Athena Swan Award (Section 2).
- Leveraging internal strategic research investment. UoM made a £750k investment in Geography's research laboratories and we attracted three University Presidential Fellows. We have been able to translate even relatively modest internal investments into major areas of activity, for instance using £94k from the UoM-Humanities Strategic Investment Fund (HSIF) to stimulate nine different initiatives.

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- Ensuring existing investments and research excellence convert into major new interdisciplinary research and impact collaborations. For instance, EPRG's NERC-funded urban ecosystem research underpins EU projects worth £14.5m overall (**Rothwell, Lindley**) and the EU-Triangulum and Innovate UK-CityVerve 'smart-city' projects underpin UoM's UKCRIC Urban Observatory and an Impact Case (**J.Evans**).

### 1.3 Strategic aims for research and impact since REF2014

Our strategy is aligned with UoM's core goals, but with specific aims reflecting UoA14's particular context. RGs develop intellectual objectives and priorities supported by additional departmental and RI activities. Groups embed our ambitions for (1) delivery of intellectual objectives through fostering an inclusive, balanced and thriving research environment, and (2) significant and positive impacts on the wider society and environment. Our REF2014 statement set out our initial aims. They were to:

- i) Develop our cohort of ECR staff into world-class scholars.
- ii) Improve structures for multi-disciplinary collaboration and associated research activity.
- iii) Enhance the impact of our research on contemporary environmental and societal challenges.
- iv) Increase research grant activity by doubling grant expenditure compared to 2008-13.

Following internal review of REF2014 feedback, we approved (i)-(iv), developed detailed strategies for each, and introduced a further aim (v), to increase PGR numbers. We have now made root-and-branch changes in underachieving aspects of our research activity. There has been a conscious, collective effort to improve RG performance and cross-fertilise good practice. Although now adopting more standardised working practices, groups retain sufficient autonomy and flexibility to allow distinctive agendas and innovations to emerge.

Grant income has been a particular focus and we also responded to emerging external political contexts by extending aim (iv) to include diversifying income sources, while continuing to secure EU funds, in line with University guidance. We improved RG mentorship across all areas, building on identified thematic strengths, long-standing experience in Knowledge-Exchange, and high-profile international leadership (iii). We made strategic investments in staff and supporting structures for multi-disciplinary collaboration, e.g. via RIs (ii).

Impact is integral to our research activities, strategies and investments and thus appears throughout this statement. From our wealth of impactful activities, we selected Cases that showcase prize-winning impacts and the culmination of some of our long-term collaborations. We now summarise RG achievements since REF2014 and set out their future ambitions.

### 1.4 Research Groups

#### 1.4.1 Environmental Processes (EPRG)

EPRG focuses on **understanding fundamental environmental processes and how they relate to contemporary environmental challenges** through strong and collaborative policy-

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practice partnerships and working models. Led by **Allott** and **Shuttleworth**, EPRG has: ten CatA staff members comprising **Allott, M.Evans, Harris, Huck, Lindley, Rothwell**, REF2014-ECR **Clay** and REF2021-ECRs **Bispo, Dennis** and **Shuttleworth**; five PDRAs and 14 PGRs. Since REF2014, EPRG has developed a ~£3.6m portfolio of competitive grants (UoA14 application revenue) supported by strong intra-group mentoring. The group produced >100 academic journal articles, one monograph and two edited books (including policy-practice co-authors). EPRG's most significant achievements cover three areas:

1. **Peatlands and ecological resilience** multi-partner research has: (i) evolved understanding of pollutant 'hotspots' and geochemical transformations in peatland catchments (e.g. on organoarsenical formation and persistence (**Rothwell** - 2016 Editors' Choice in *Environmental Science and Technology*)); (ii) evaluated photosynthesis processes and geochemical determinants, including ecophysiology; (iii) revealed the fate of eroded particulate carbon in floodplains; and (iv) uncovered how upland management impacts hydrological processes. Strand (iv) provided the first experimental evidence of the hydrological benefits of UK blanket peat restoration, leading to further research on flood mitigation via upland management (e.g. £1.2m NERC-NE/R004560/1(**M.Evans, Shuttleworth, Allott**)).
2. **Wildfire and biomass-burning** research has deepened understanding of (i) drivers, processes and impacts from UK wildfire and (ii) impacts from and responses to tropical peatland biomass burning (**Clay, Lindley's** NERC-Newton projects). EPRG leads the UK wildfire research agenda through: NERC-funded research on impacts from the 2018 Saddleworth Moor wildfire; **Clay** helping shape NERC's 5<sup>th</sup> round of Highlight Topics (resulting in £2.5m NERC-NE/T003553/1); and **Clay** and **McMorrow's** membership of the *England and Wales Wildfire Forum*. **McMorrow's** NERC-Knowledge-Exchange fellowship was instrumental in wildfire being recognized in the UK's National Risk Register.
3. **Urban green infrastructure and nature-based solutions** (developed from REF2014 urban ecosystems work). **Lindley's** Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) role led to a 2018 *Science* paper that reshapes the 'ecosystem services' concept. Other achievements include (i) producing novel, replicable real-world evidence and tools for understanding how nature-based solutions influence urban water and climate regimes (£10.3m Horizon 2020-GrowGreen (**Rothwell, Lindley**)); (ii) linking urban physical geography to green infrastructure decision-making and innovative financing models (NERC-GreenGrowth £98k and EU-H2020-IGNITION £4.2m (**Rothwell**)); and (iii) developing interdisciplinary knowledge on urban green infrastructure and health (NERC-GHIA, £641k revenue (**Lindley**), NERC-EcoPoor, £448k (**Rothwell**)).

EPRG's 5-10 year ambitions are to: (i) produce a robust evidence base on trajectories of environmental change in upland ecosystems to inform sustainable management; (ii) catalyse a step-change in fire forecasting tools for risk management; and (iii) develop, evaluate and implement innovative models for green infrastructure decision-making. EPRG is developing a new theme on emerging pollutants, drawing on NERC-funded ultra-fine particle research and cross-RG work on micro-plastics in fluvial and marine systems published in *Nature Geoscience* and *Science* respectively.

#### 1.4.2 Quaternary Environments and Geoarchaeology (QEG)

QEG combines expertise in reconstructing and connecting cryospheric, lithospheric,



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hydrospheric and biospheric responses and their links with human populations to understand the **nature and drivers of past climatic change**. For instance, QEG researchers used cryospheric response to understand hydroclimatic change and the impacts of resultant water supply fluctuations on ecology and human activity in Morocco. They also linked hydrospheric fluctuations in dryland regions with Palaeolithic archaeological records. Led by **P.Hughes** and **Stone**, QEG has: six CatA staff members comprising **P.Hughes**, **Stone**, **Woodward**, REF2014-ECR **Fletcher** and REF2021-ECRs **A.Hughes** and **Darvill**; one PDRA, and seven PGRs. Former members include *Lane* (to 2016) and *Dortch* (to 2017).

QEG has a diverse funding portfolio of £345k as projects (UoA14 application revenue, e.g. Leverhulme, National Geographic) and ~£273k as competitively won grant-in-kind facilities (e.g. NERC laboratories, the Australian Nuclear Science and Technology Organisation (ANSTO)). QEG is highly active in public engagement, including through exhibitions (e.g. Manchester Museum), festivals (e.g. Blue Dot, with EPRG) and social media (e.g. @Jamie\_Woodward\_'s ~80k Twitter followers).

QEG's >100 publications showcase five complementary research themes:

1. **Glacial dynamics**: global-scale 100,000-year pacing; palaeoglaciology for data-modelling comparison; glacial trends in the British Isles, Mediterranean mountains, Eurasia, Canada, Greenland and Patagonia (**Darvill**, **A.Hughes**, **P.Hughes**, **Woodward**, *Dortch*, *Lane*).
2. **Dryland dynamics**: southern Africa, River Nile, High and Middle Atlas (**Stone**, **Woodward**, **P.Hughes**, **Fletcher**).
3. **Paleoecology**: especially in the Mediterranean region (**Fletcher**; **Allott** (EPRG)).
4. **Geoarchaeology**: Palaeolithic Sahara-Arabian belt and Holocene Nile settlements (**Stone**, **Woodward**, *Lane*).
5. **Fluvial dynamics**, including impacts of humans and micro-plastics in fluvial systems (**Woodward**, **Rothwell** (EPRG) collaborating with Manchester City Council).

Since REF2014 QEG has compiled state-of-science syntheses of Quaternary Mediterranean (**P.Hughes**, **Woodward**), Northern European (**A.Hughes**), American (**Darvill**) and global (**P.Hughes**) glaciations. The group has also **innovated methods**, e.g. developing the field-portable luminescence reader (**Stone**) and novel climate proxies from pollen geochemistry (**Fletcher**) and sand-dune moisture chemistry (**Stone**).

QEG's 5-10 year ambitions are to develop research agendas and public engagement around: (i) providing the highest-quality reconstruction data for validating numerical climate models, e.g. glacial reconstructions for sea-level projections, and Holocene moisture variability in the High Atlas; (ii) unravelling the structure and spatial variability of long-term glacial-interglacial cycles to better contextualise modern climate change and that of our hominin ancestors; and (iii) improving techniques, such as novel pollen geochemistry using species with a wide bioclimatic envelope, and field-portable geochronology tools.

### 1.4.3 **Cities, Politics, Economies (CPEG)**

CPEG consolidates and integrates insights from Geography's strengths in **economic, urban,**

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**political and social & cultural geography.** Led by **Ward** and **Doucette**, the group has: nine CatA staff members comprising **J.Evans, Hess, Lucas, Temenos, Ward, Warren**, REF2014-ECRs **Doucette** and **Hall** and REF2021-ECR **Henry**; two PDRAs; and 16 PGRs. Former members include *Darling* (to 2018), *Jayne* (to 2015) and *Wilson* (to 2017). CPEG has strong links with MUI and SERG, e.g. through **J.Evans** and cross-group activity with **Bouzarovski, Browne, Ernstson, Fredriksen, Millington, Petrova** and **Swyngedouw**. Application revenue of £2.5m comes from UKRI, EU-H2020, ISRF, Leverhulme, SSHRC, SSRC, NRFK, and USF. This includes fellowships (**Doucette** (Leverhulme), **Hall** (ISRF), **Warren** (AHRC Leadership Fellow (£172k revenue) and partnerships (e.g. with cultural organisations and the Women's Budget Group).

Since REF2014, CPEG has produced >100 articles and book chapters, and several monographs, edited anthologies, and policy reports. Its members also hold public engagement awards (**Warren's** UoM Outstanding Public and Community Engagement Award 2020, **Hall's** Jo Cox Award (Impact Case)). Successes stem from: ECR mentoring and collaboration through affiliated reading groups (e.g. The Political; Feminist geographies); internal peer-review; and annual writing-retreats. These activities have enabled CPEG to advance three interlocking research themes:

1. **Enacting Urban Transformations:** CPEG expanded its existing expertise on policy mobilities (**Ward**) to include new regions and challenges (e.g. sustainable transitions **Lucas, J.Evans** (Impact Case), healthy cities and everyday urban activism, **Temenos, Henry**). The group developed new understandings of emergent issues (devolution and austerity (**Hall**) and East Asian urban 'developmentalism' (**Doucette**)) and agents of change (including cultural producers, financial instruments and urban technologies (**Warren, Hess, Usher, Ward**)).
2. **Interrogating Economic Practice:** CPEG advanced its geographical political economy expertise and set new global production research agendas on emerging areas of labour governance, ethical consumption, and international development cooperation (**Doucette, Hall, Henry, Hess, Warren**). CPEG has broken new ground by connecting across political and cultural geographies to explore topics such as the nexus between territory and production, everyday financial struggles within austerity, creative communities and religious identity, and gendered labour geographies.
3. **Placing the Political:** CPEG leads debate on the geographical variation and variegation of political institutions and practices by interrogating the nature of the state and territory, emergent forms of migrant, labour, and city governance, and the nexus between protest, policy and political change. CPEG also challenged how the very meaning of 'the political' has been understood and researched within geography (**Temenos, Doucette, Hall, Ward**).

Themes have been explored primarily through qualitative methods with group members being particularly active in **methodological innovation and debate** (e.g. **Warren, Hall** on walking interviews and family ethnography, **J.Evans** on mobile methods to understand Kampala's motorcycle-taxi sector).

CPEG's 5-10 year ambitions are to: (i) deepen conceptual and methodological inquiry on global production, including more intense scrutiny of labour geographies and dynamics (e.g. in manufacturing, care, and creative work); (ii) expand contemporary urbanism and sustainable transition research partly through MUI leadership; and (iii) extend austerity,

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democratization, and policy impacts through external collaborations.

#### 1.4.4 Society and Environment (SERG)

SERG's shared focus is on **challenging dominant analytical approaches on climate, energy, water, waste and biodiversity and transforming them to promote socially just, democratically inclusive, and sustainable transitions**. Led by **Swyngedouw** and **Browne** SERG has: 12 CatA staff members comprising **Browne, Bouzarovski, Castree, Ernstson, J.Evans, Fredriksen, Swyngedouw**, REF2014-ECR **Petrova** and Fellows **Usher, Millington, Bellamy, Scott**; five PDRAs and 20 PGRs. *Kaika* was a former member.

Within a nurturing and supportive intellectual environment, SERG members produce agenda-setting and policy-informing socio-ecological research that is international in its coverage. Research significance is evidenced by prominent keynotes, major editorial roles and awards (e.g. **Castree, Swyngedouw**) (Section 4.3), sustained policy influence (**Browne, Bouzarovski, J.Evans, Petrova, Scott**) and substantial grant income (£5.1m application revenue; from ESRC, DFID, EPSRC, COST, Horizon 2020, ERC, AXA). Research is developed systematically through a combination of empirical, theoretical and applied inquiry. SERG researchers develop innovative public partnerships (e.g. **Bouzarovski's** energy policy work with the EU (Impact Case) and public outreach (e.g. **Ernstson's** cinematic ethnography 'One Table Two Elephants' (2018) (Section 4.2).

Two key research foci demonstrate the group's contributions:

1. **Power, participation, and inclusive environmental governance:** SERG researchers have identified how: (i) society-environment relations express multi-scalar injustices; and (ii) institutions and processes block as well as facilitate democratic engagements with designing and using built and natural environments. SERG provides key evidence and arguments for how and why more inclusive and egalitarian forms of environmental consultation, policy and practice can be achieved, including via: new geo-technologies and infrastructure (**Bellamy, Ernstson, J.Evans, Swyngedouw, Usher**); changing registers of expertise and knowledge co-production (**Browne, Castree, J.Evans, Fredriksen**); tackling environmental injustice and exclusion (**Bouzarovski, Petrova**) and harnessing citizen protest, government authority, and political legitimacy (**Ernstson, Swyngedouw, Usher**).
2. **Sustainable and just socio-ecological transitions.** SERG research illuminates the sites, actors, reasons and mechanisms involved in 21st century practices and fostering 'green' and equitable cities. Research ranges from urban sustainability experimentation (**Browne, J.Evans**) to urban exclusions (**Millington, Petrova**) and development of the analytical tool-kit of urban political ecology (**Ernstson, Swyngedouw**). It also considers how to change key elements of socio-ecological regimes, such as energy (**Bouzarovski, Fredriksen, Petrova, Scott**), water demand (**Browne**) and the disposal and re-use of commodities (**Ernstson, Millington**).

Over the next 5-10 years SERG aims to: (i) transform global theoretical debates on vulnerability, democratization, the non-human and the possibilities for emancipatory transformations; (ii) enhance strategic analytical tools, methodologies and observatories by building on SERG's leadership of water, waste, energy, and urban and environmental change research agendas; (iii) support Knowledge- Exchange and policy co-production in order to help shape ecologically-, and socially-just transitions in the pressing contexts of climate and



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environmental change.

#### 1.4.5 Mapping, Culture and Geographical Information Science (MCGIS)

MCGIS was established to focus upon **interdisciplinary approaches to mapping, cartography and GIS, placing impact at the forefront of its intellectual agenda**. Led by **Harris** and **Huck**, MCGIS has: seven CatA staff members comprising **Dodge, Harris, Huck Lindley** and REF2021-ECRs **Bispo, Dennis** and **A.Hughes**; one PDRA and nine PGRs. *Perkins* was a former member (to 2019). MCGIS brings creative, cultural and critical scholars together with geographical information scientists and bridges human and physical geography. ECRs from HCRI and a DH Presidential Fellow (spatial history) also actively contribute with wider collaborations drawn in from scholars based in Media, Design and Management (via *Perkins*) and the Institute for Cultural Practices (via **Lindley**). MCGIS was launched in 2017 as part of its hosting of the largest-ever in-person *Geographical Information Science Research UK* (GISRUK) conference (**Huck**). Application revenue totals £1.0m.

Methodological innovation drives much of MCGIS's core intellectual agenda. The group's diverse foundations stimulate novel and creative approaches that are informed by varied geographical theories and critical sensibilities. MCGIS's contributions cover participatory GIS, volunteered geographical information, ecosystem analysis and spatial ecology, cartography, and historical and literary mapping. Achievements include:

1. **Understanding nuanced patterns of segregation and inequality:** Perspectives from geography, psychology and anthropology were combined to find new ways to investigate segregation and sectarianism in Northern Ireland, going beyond traditional spatial primitives (**Huck**). State-of-the-art techniques (e.g. geographically-weighted-PCA) have also revealed new geographies of energy poverty (PGR-Robinson, **Lindley** with SERG).
2. **Creating new spatial data resources:** Collaborations with medical researchers, practitioners and the wider public (via 'mapathons') led to the first-ever detailed map of the Northern Ugandan Gulu region and supported post-conflict healthcare delivery. New map products are also assisting urban green infrastructure (**Dennis, Lindley**) and tropical forest (**Bispo**) research and practice.
3. **Co-producing tools for transforming sustainable decision-making:** For example working with: engineers and NGOs on the Water Stewardship Portal to improve water management in developing countries (**Harris**); and philosophers and planners on web-resources supporting socially-just climate action (**Lindley**) (Impact Case).

MCGIS has successfully placed impact at the forefront of its vision for research delivery. Its 'mapathons' attracted a UoM *Outstanding Contribution to Social Innovation* award (2018) (**Huck**). **Huck** was also awarded Honorary Chair in Geographical Information Science at Gulu University (2019) and opened a GIS-lab there to accelerate mapping efforts. Commended critical cartography research has been translated into a series of public exhibitions, online tools and the *Manchester: Mapping the City* popular book (2018) (**Dodge**) (Section 4.2).

MCGIS's 5-10 year aims are to: (i) extend volunteered and participatory geographical information research for humanitarian and wider decision-making; (ii) deploy remote and in situ mapping technologies, e.g. for healthcare in the Global South; (iii) develop multi-scale geospatial analyses for understanding sustainable human-environment interactions; and (iv) innovate Earth Observation and remote-sensing techniques for ecological, agricultural,

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geomorphometric and socio-demographic applications, including through **Bispo's** South American networks.

### 1.5 Cross-RG activities

In addition to individual RG achievements, we can point to successes from collaborative cross-RG working supported by Institutes, away-days and University seed-corn awards, for instance:

- Understanding micro-plastics in fluvial (**Woodward** (QEG), PGR-Hurley, **Rothwell** (EPRG) and later in marine systems (**Rothwell** with UoM's UoA7).
- Identifying the social benefits of 'daylighting' urban waterways (EPRG (**Clay**, **Shuttleworth**) and MCGIS (**Huck**) working with SERG (**Usher**) (HSIF-funded). **Usher** now holds a Simon Fellowship researching green infrastructure governance, landscape urbanism and the affective politics of place-making. This complements and extends wider EPRG green infrastructure research.

### 1.6 Forward Strategy

We will support the post-REF2021 delivery of the five RG agendas by:

- (i) Using internal investments and resources to build larger grant applications, including securing an externally-funded Research Centre.
- (ii) Maintaining strong levels of grant-seeking activity and further diversifying our funding base through international networking, visits and opportunities flowing from our grant portfolio.
- (iii) Boosting physical geography PGR numbers by seeking PGR block grants, building on our recent UKRI successes.
- (iv) Extending beneficial societal and economic impacts by increasing our portfolio of follow-on impact funding for key research achievements, growth areas and nascent impact cases.
- (v) Developing further interdisciplinary collaborations by leveraging our leading role in UoM RIs and related cross-cutting initiatives.
- (vi) Responding to COVID-19 impacts on our research environment, and continuing Equality and Diversity actions, including securing Athena Swan Silver.

## Section 2: People

### 2.1 Staffing strategy and staff development

Meeting strategic aim (i) from our REF2014 statement has been supported by our RG, departmental, School and wider UoM structures, investments and activities. REF2014-ECRs **Clay**, **Doucette**, **Fletcher**, **Hall**, and **Petrova** feature prominently in our research and impact achievements. They have secured large and prestigious grants in physical (e.g. **Clay**) and

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human (e.g. **Hall**) geography, and by 2018 all had been promoted to at least Senior Lecturer. REF2014-ECRs who continue their careers elsewhere have gone to other leading Universities (e.g. *Darling* (2018) and *Wilson* (2017) to U.Durham).

We have similarly developed our subsequent ECR cohort. For example:

- **Warren** won a prestigious AHRC Leadership Fellow award.
- **Browne** has held two ESRC-Nexus-Network awards and is now SEED's Associate-Director of Business Engagement and Internationalisation.
- **Huck** now chairs GISRUUK and has been commended for his social responsibility work
- *Lane* was appointed to a Chair at U.Cambridge (2016).

Our ECRs make distinctive and varied contributions across the breadth of the Geography discipline. Together with internally promoted staff (11 to SL, one to Reader and four to Chair), this new generation of scholars are ensuring the vibrancy and sustainability of our department as others retire (e.g. *Agnew*, *Perkins*, *McMorrow*), or take up promotions elsewhere (e.g. *Jayne*, U.Cardiff).

We maintain strong and mutually beneficial connections with many retired colleagues through Emeritus and honorary roles. Retired staff members remain a valued part of our departmental community. They attend Research Seminars and bringing their experience to projects (e.g. *McMorrow* with **Clay**) and publications (e.g. Braithwaite with **P.Hughes**).

Geography's CatA staff membership of 37 (36.3 FTE) is well balanced across career stages (Figure 2.1). Around 40% of our REF2021 staff were submitted to REF2014, including five REF2014-ECRs. Since REF2014 we have expanded significantly to appoint a Chair, four Fellows, and 10 lecturers. We have eight REF2021-ECRs (six lecturers and two Fellows). Of our REF2021 staff, 92% are on permanent contracts.

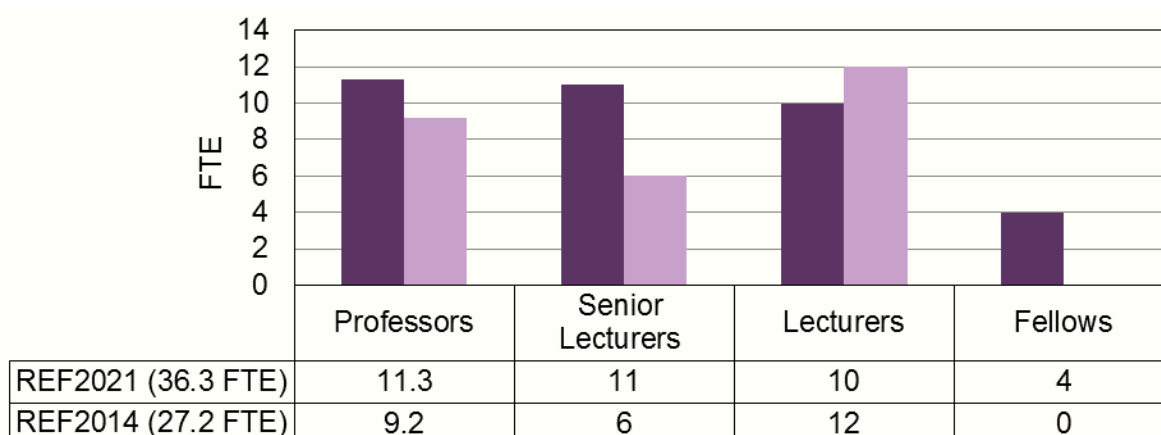


Figure 2.1: Changing FTE staff profile

Geography's research and related staffing strategies are overseen by the Head of Department (HoD) (**J.Evans**), informed by input from the departmental research coordinator (**Lindley**) and RGs. The School Research Committee directs wider research strategy and investment funds and liaises with Faculty, RIs and the University. It comprises administrative, impact and business and external engagement leads (**Browne**), departmental research coordinators, RI leads, communications specialists, library officers, and ECR representation.

## Unit-level environment template (REF5b)

The School runs dedicated initiatives, such as mid-career mentoring (**Allott**), impact showcases and engagement workshops to complement departmental, Faculty and wider University activities.

UoM is committed to the personal, professional and career development of all staff and PGRs. Our growing PDRA community benefits from UoM's award-winning implementation of the *Concordat to Support the Career Development of Researchers* (EC HR-Excellence-in-Research Award). The FoH Researcher Development Team funds researcher-led initiatives and uses the *Vitae Researcher Development Framework* to plan and design its annual programme of activities. Annual UoM *Research Staff Conferences* provide funding information, publication support and networking opportunities. More widely, the Staff Learning and Development team offers personal and professional development opportunities, e.g. project management workshops, and one-to-one developmental support. UoM also runs annual leadership training for mid-career and more senior staff and supports attendance at external training, where required (e.g. Heritage Lottery Fund's *Aurora programme*). In addition to developmental activities, UoM has a long-standing commitment to staff wellbeing and invests £227k/year in associated initiatives. The Department actively encourages engagement with these initiatives, especially UoM's extensive online offering in 2020.

Locally, all of our CatA researchers, 17 PDRAs and 41 PGRs, receive informal development support through RGs and RIs. Membership is not restrictive; staff and PGRs commonly belong to two entities and benefit from their different perspectives and varied personal career development opportunities. More formally, Geography runs an annual appraisal system for CatA staff and PDRAs. The system has separate research and confidential personal development elements. Led by senior staff, the annual process provides:

- A structure to manage staff performance against discipline norms and University expectations in a sensitive and supportive way.
- A means to identify personal skills and career development needs and match them to training opportunities.
- A vehicle to nurture the development of personal research visions and strategies, and to support their realisation, e.g. planning and positioning publications, realising impact, seeking funding and planning research sabbaticals.

All CatA staff members are eligible to apply for one semester of sabbatical leave after six semesters of normal duties. Applicants submit an initial planned programme of research and report afterwards on their achievements. This system ensures maximum benefit for participants and helps justify the ongoing retention of this important part of our research culture. Staff members also have access to the FoH-sponsored *Professorial Enhanced Research Leave* scheme (**Swyngedouw** 2018-19).

Further mechanisms support the career development of probationary and ECR staff. All new starters receive mandatory training (e.g. health and safety, data protection, information governance, diversity) with a formal induction by the HoD. Following School and UoM policy, we appoint dedicated academic mentors and operate a reduced workload system for new starters. The longstanding FoH New Academics Programme, accredited by the HEA, plays an important role in fostering the development of research careers. RGs also offer additional support, e.g. SERG's ECR 'Chats' (career development discussion groups) led from within the ECR community and supported by academic staff. Our well-established probation system normally lasts three years with the possibility of a fourth year extension.

Internal financial support is available through the annual School Research Stimulation Fund

## Unit-level environment template (REF5b)

(RSF) and FoH pump-prime investment (HSIF) schemes. They support small-scale projects up to £5,000 and larger interdisciplinary collaborative research applications, respectively. For both awards, special consideration is given to new starters to help with first grant applications, including through pairing with experienced researchers. Since 2013, Geography had six ECR-HSIF recipients. Their usefulness is illustrated by **Doucette's** 2014-15 award which developed research capacity on Asian GPNs, emerging donors and labour rights (with **Hess**). **Doucette** later secured funding from the National Research Foundation of Korea and produced two related 2018-9 publications on Urban 'Developmentalism'.

A Research and Conference Fund is allocated from the School Research Committee's annual budget, with priority given to ECRs. For example, in 2018 and 2019, Geography allocated £2,000 each to all new lecturers and £1,500 to established senior staff. We also allocated £1,000 to teaching-focussed staff since many on fixed-term contracts may aspire to T&R posts in the future (e.g. Wilmott was appointed to a tenure-track position at UC.Berkley).

Our staffing strategy remains to seek and attract the best global talent and support colleagues to realize their potential, both for UoM and the wider discipline. As a department running major teaching programmes (~150 new UGs per annum; 3 PGT programmes ~60 per annum) staffing decisions inevitably balance teaching with research requirements. However, research excellence is always the primary criterion for CatA academic appointments. Indeed, we are long-standing proponents of research-led teaching and this remains the keystone of our highly-respected teaching portfolio. We also seek to attract staff members with the potential to: grow and enhance our current research and impact activity (**Huck, Shuttleworth**); leverage overseas funding sources (**Bispo, Ernstson**); and help foster further strategic collaborations (**A.Hughes, Bispo, Ernstson**). RG members contribute to writing job specifications, short-listing and interviewing as well as using networks to reach the very best prospective candidates. Many new REF2021-ECRs have been attracted from overseas (including Europe, South Africa and the Americas). Our four new independent academic fellows include three UoM Presidential Fellows (**Scott, Bellamy, Millington**) who benefit from additional UoM networking, resources and training support. **Scott** also brings a £276k NERC-Industrial-Innovation award.

## 2.2 PGR support, training and supervision

We have grown our departmental PGR community in terms of completions, from 23 to 57 (aim (v)). As of 2019-20, we had a departmental PGR community of 41 students and the majority are active participants in RGs and departmental activities. Success has stemmed from actions associated with: recruitment; application support; training; supervision; PhD formats; and advice on publication strategies and career destinations. Wider UoM PGR wellbeing initiatives via 'PGR Life' also help to ensure a healthy PGR experience, something which has been particularly emphasised during 2020.

Departmental PGR completions were supervised by 32 different staff members, including some former staff for continuity. All PGRs belong to at least one RG, where they are very much considered to be integral research colleagues. For instance, **Usher's** work on daylighting hidden urban rivers involved ECRs and PGRs from four different RGs. Reading groups are inclusive with open membership, e.g. **Hall** and PGR-Larrington-Spencer selected a paper on glaciers for their inaugural reading for the Feminist Reading group. PGR representatives contribute to the School PGR Committee and departmental staff meetings, helping to influence institutional decision-making.



## Unit-level environment template (REF5b)

Our departmental PGR processes are co-directed by **Hall** and **Clay**, each with particular responsibilities for Human and Physical Geography programmes respectively. They have overseen a fundamental reshaping of application processes so that all applicants receive feedback on proposals and are interviewed prior to any short-listing for funding or issuing of offers. No PGR now arrives without having met their supervisors (even if only online) or benefitting from early recommendations for pre-sessional training. Two supervisors per student is the norm, but we allow wider teams, where appropriate, e.g. to cover specialist skills, cross-disciplinary research, and probationary ECR career development.

All PGRs undertake mandatory training in Year 1 and use UoM's online 'e-Prog' system throughout their studies. E-Prog helps structure activities, monitor attendance, report progress and record milestone achievements. This is always in addition to funder-specific requirements. Annual reviews are rigorous, but supportive. They are designed to give PGRs opportunity to have an early 'viva-lite' experience with an independent academic assessor. The Year 1 review is a major milestone which establishes that students have the foundation for successful completion of their studies within four years. We allow three years for the main PGR research period with an optional submission pending period for writing up (subject to approval).

PGRs may apply for interruptions, P-T status (if UK/EU) and paternity/maternity leave and we have clear procedures for dealing with any difficulties in the supervision process. PGRs can access a dedicated fund for fieldwork and conference support, in addition to funds and activities supported through the department, RGs and RIs. At School level, a PGR steering committee organizes annual PGR conference themes, chairs and speakers. PGRs can participate in a wide range of external as well as internal activities, providing fertile ground for peer-support and knowledge-sharing. The Faculty and University offer ongoing PGR training opportunities (e.g. social research methods summer schools) as standard.

We have a diverse student body, with a higher number of female PGRs compared to national benchmarks. Of our 'home' completions to date, around 80% studied FT. PGR funding has come from the IPCC, Commonwealth, Government studentships (e.g. Chile), NERC, ESRC and ESRC-CASE (through the NWSSDTC, where we have high success rates), EPSRC and dedicated CDTs, e.g. EPSRC Power Networks). We also attracted the first-ever MERI-PGR scholarship. The richness of our PGR funding sources and contexts feeds a vibrant PGR research environment by bringing in diverse perspectives, stakeholders, networks and collaborations. In addition, internal School scholarships allow us to support PGRs in research areas with limited access to external funds and attract the very best international talent. CatA staff probationary status precludes leading a supervisory team so we also use internal funds to help ECR development by facilitating opportunities for new supervisors to work alongside more experienced ones.

The supervisory skills of our staff are very highly regarded, e.g. **Browne** (2018) and **Hall** (2020) hold Manchester Doctoral College (MDC) awards. Our PGRs are high achievers, for instance:

- **Attracting awards**, e.g. poster (RGS-IBG, 2019), video (N8AgriFood, 2018) and MDC PGR of the Year awards (PGR-Wilmott (2017), PGR-Alda-Vidal (2018)).
- **Engaging with external organisations**, e.g. via the ESRC-NPIF Accelerating Business Collaboration scheme (PGR-Alda-Vidal).
- **Publishing PhD results in top journals**, e.g. *Nature Geoscience* (PGR-Hurley), *AAAG* (PGR-Robinson).

## Unit-level environment template (REF5b)

**2.3 Equality and diversity (E&D)**

In 2018, SEED was awarded Athena Swan Bronze for its thorough assessment of diversity challenges and its strategy for improving gender balance, representation and inclusion. The School was commended on its honest acknowledgement of gender diversity challenges and associated actions, including the lack of senior women in Geography (AP2.1). The awarding committee highlighted several existing strengths including SEED's promotion of E&D through standing items on departmental agendas, and its establishment of a Women-into-Leadership programme (WLP). The WLP programme was subsequently adopted across UoM.

Geography played a leading role in calling for the WLP programme, drawing inspiration from the HLF's Aurora programme in which **Lindley** participated (2015). Recognising the particular challenges in Geography, **Lindley** and **Shuttleworth** (then a PDRA) established a departmental female Physical Geography network in 2015 to provide informal peer-mentoring and a space to discuss relevant challenges. In enacting AP2.1, this scheme was formalised and extended to include all-female academic staff in the department. Meetings are held approximately quarterly and often feature invited contributions from senior female leaders from across UoM. This is complemented by:

- Visits from senior female human geographers e.g. Sofoulis' Simon and Hallsworth Professorial Fellowship and her two visits in 2017-2018.
- SERG's *Gender in the Academy* discussion group which connects academic interests in CPEG, e.g. through its Feminist Geographies reading group.

We have seen positive change in gender diversity at senior levels. Six female lecturers (**Browne, Hall, Harris, Petrova, Stone** and **Warren**) were all promoted to SL (one to Reader) and two female staff to Chair (**Lindley** as the department's first female Chair from Physical Geography and Smyth (Teaching-Focused)). We appointed a new female Chair in Human Geography in 2020 (**Lucas**), and **Lindley** is replacing **Castree** as School Research Director. We actively monitor the visibility of female staff in our research activities, e.g. invited research seminar speakers and award/recognition nominations. We will continue to improve gender inclusion as we progress SEED's Athena Swan Silver application, including further enhancing support for colleagues taking maternity leave (five during 2014-20).

As recognised by the Royal Geographical Society, UK Geography has very low proportions of BAME staff. Since 2019, we have appointed three BAME colleagues (a lecturer, a CARA fellow and a PDRA) but our CatA staff is still largely White (two-thirds White-British). A range of initiatives is helping with our aspirations to address the spectrum of diversity issues in staffing and leadership:

- **UoM's mandatory diversity training**, including unconscious bias in recruitment, promotion and PGR supervision.
- **UoM's guaranteed interview scheme** for disabled applicants meeting the minimum requirements for a post.
- **SEED's annual promotion workshop**, to demystify promotion processes and criteria (including impact) and ensure the availability of appropriate mentoring.

## Unit-level environment template (REF5b)

**Section 3. Income, infrastructure and facilities****3.1 Income**

In recognition of the fundamental role of research grant income for maintaining a vital and sustainable research base, strategic aim (iv) from our REF2014 statement was to double grant expenditure compared to 2008-13. Since 2013 we have achieved a dramatic culture shift, increasing HESA-recorded expenditure from £1.455m (REF2014) to £6.081m (REF2021), and tripling revenue per FTE (Figure 3.1).

More of our staff members are writing funding applications, and with greater success rates, than ever before. The number of funded investigators has increased from an average of 5-6 individual investigators per year before 2013, to 20-24 thereafter. By 2018 some 60% of our CatA roster (n=22) held at least one externally-won grant. Eleven major grants (>£200k) have been secured from six different funders. They were won by ten different individuals with at least one per RG. Avoiding over-reliance on particular individuals is important; especially given our UG and PG teaching commitments and major administrative contributions (e.g. **Allott** and **M.Evans** as the former and current Head of School, and our other major research leadership roles (Sections 1 and 2)).

Our research income culture is now one in which applying for and winning external grant income is the norm in all RGs (Section 1). Since 2013 we have enhanced our ability to identify opportunities, built the foundations to enable a rapid response, and established robust but supportive peer-support mechanisms. We have created a culture of 'leading by doing', where learning is shared and success celebrated. Colleagues at all career stages are encouraged to cross-fertilize and co-produce ideas, both internally and by drawing on our well-developed academic and practitioner networks (Section 4). We have used our membership of these networks, especially interdisciplinary ones, to allow us to respond to responsive-mode funding opportunities as well as to make applications to standard RCUK/UKRI calls. We frequently embed ECRs and -where possible- PGRs within the bidding teams, as well as encouraging the development of new hubs, both geographically and thematically. There are further complementary RG and 'Talking Research' activities which help to demystify grant preparation, including grant administration processes throughout the project lifecycle.

Importantly, we have responded to external threats to funding availability and have been able to diversify our income portfolio while also growing it (Figure 3.2). Funding types include: Open; Directed; fellowship; in-kind analytical support; and Knowledge Exchange/KTP drawing on 31 different sources, thereby reducing the risks of over-reliance on single funders. Overall, no single funder contributed more than 30% of our total funds and no REF-category funding group contributed more than 45% (Figure 3.2). Notably, within the RCUK/UKRI group, our grants come from AHRC, ESRC, EPSRC and NERC. This portfolio reflects: our strategic targeting of funders; the breadth of our research activity and its audiences; the partners we work with (including business); and the growing diversity of our researchers.

Significant post-REF2021 investment has already been secured, including:

- £1.5m UKRI Future Leaders Fellowship on Austerity and Altered Life-Courses (**Hall**).
- £7.5m NERC Digital Solutions programme (**Lindley, J.Evans**).
- £32.8m GCRF African Cities programme (**Ernstson**).

Unit-level environment template (REF5b)

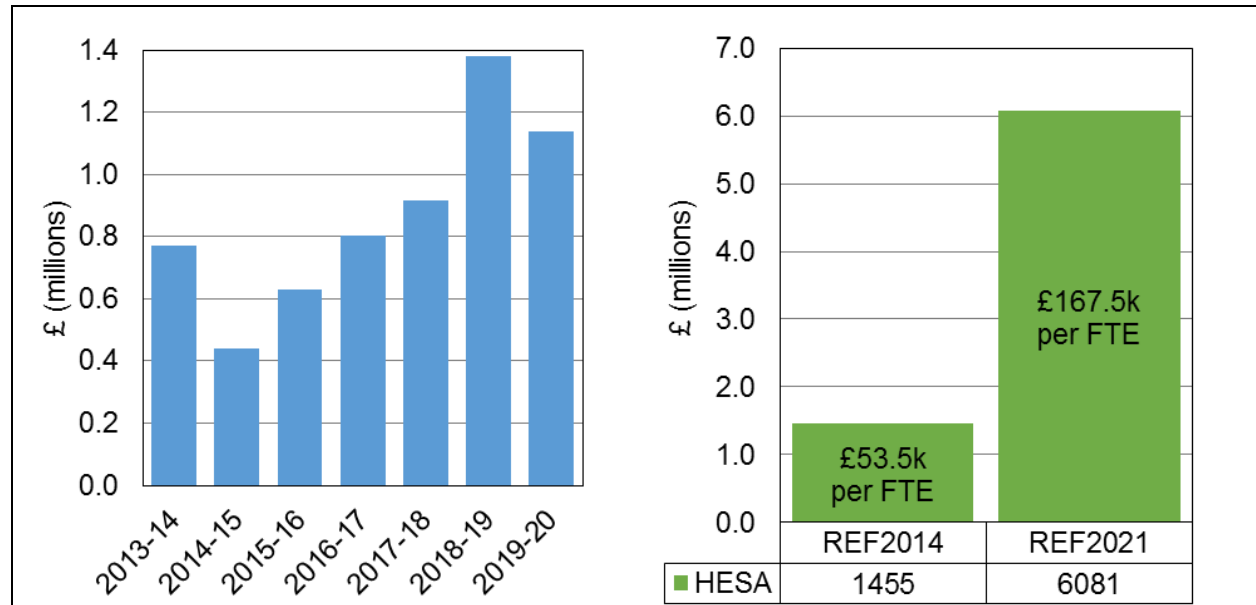


Figure 3.1: Change in HESA-REF4b income (£)

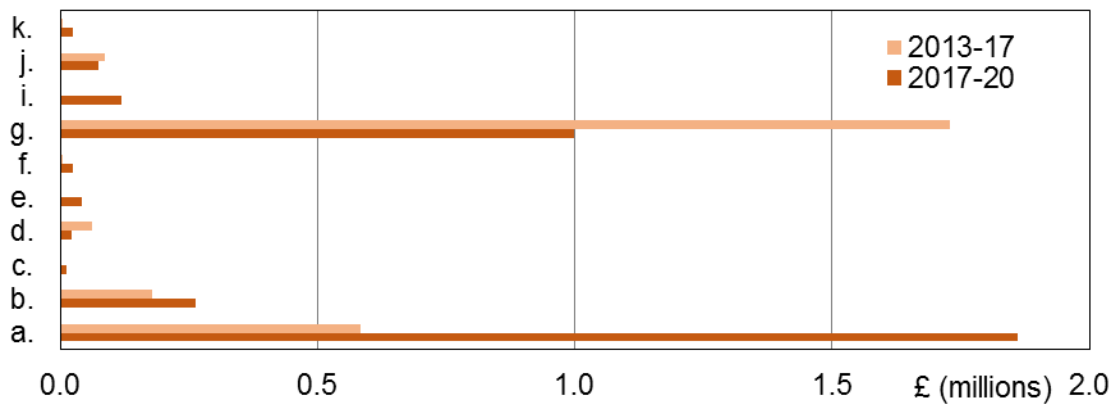
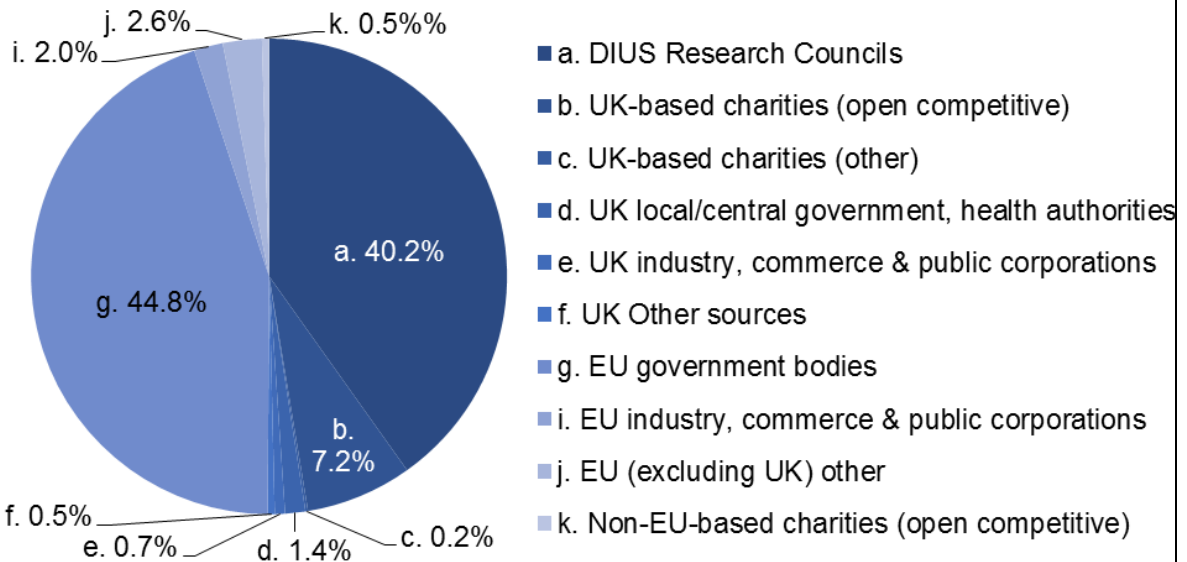


Figure 3.2: HESA-REF4b income by source (top) and period (bottom)

## Unit-level environment template (REF5b)

**3.2 Infrastructure and Facilities**

We receive administrative support through SEED's Research Support Services Hub, staffed by a Research Support Manager, four Research Officers (covering pre- and post-award), an Impact Officer, two Finance Officers and a Communications Officer. The team supports bid preparation, project management, dissemination and impact. Our Communications Officer has a specific remit to assist with research dissemination. The Hub liaises with further internal teams for additional strategic support, e.g. outreach campaigns, grant-writing advice and mock interviews.

More widely, we benefit from extensive UoM investment, including research-dedicated support from the UoM Library (a National Research Library). The Library supports publication and dissemination, training for research information management, plus access to research databases and >40,000 e-journals. The Library ensures Open-Access compliance (classing our submitted REF2021 publications as 100% compliant) and offers funding for Gold Open-Access publications, while helping academics to develop dissemination plans, e.g. using social media.

Locally, Geography researchers have access to a range of more specific infrastructure and facilities supporting individual, RG and wider collective research activities. Infrastructure covers dedicated physical laboratories, fieldwork equipment, substantial holdings of literary and archive materials, and access to digital infrastructure (e.g. high-performance servers). We also have a local library within one of SEED's two co-located buildings on campus.

The **Geography laboratories** offer a state-of-the-art facility directly supporting EPRG and QEG. A four-strong team of specialist support staff (two of whom have PhDs) and a field-support officer run six dedicated laboratories working with primary academic lead **P.Hughes**. Laboratories cover microscopy, X-ray, spectroscopy, and a range of other sediment and environmental analyses. Infrastructure ranges from preparation facilities for geochronological analyses (OSL and cosmogenic dating) to geochemical capabilities in peat and sediment analyses. The laboratories and their staff underpin successes in micro-plastics, C-cycling and wildfire research.

Since 2013 the laboratories have received >£750k in overall investment. Cutting-edge laboratory and field equipment includes an ITRAX™ Core Scanner able to scan at 200-micron resolution for high-definition imagery, X-Ray radiography and fluorescence spectroscopy. One of only three currently available in the UK, the £350k ITRAX™ allows unrivalled analysis of the physical and elemental composition of peat, river, floodplain, and lake sediments. In 2019 we secured £250k from UoM capital funds for laboratory investment. Subsequent building works improved facilities, increased capacity and created dedicated spaces to separate field sample processing from our high-end analytical equipment, thus ensuring the sustainability and reliability of our research data. We also created a new Sediments laboratory and darkroom for luminescence dating. Through the laboratories, we hold a DEFRA Foreign Soils Importation Licence (e.g. supporting REF2014-ECRs **Stone** and **Clay**) and a UoM Gold Green-Impact award.

In addition to laboratories, we also:

- Maintain dedicated field instrumentation in the Peak District including EPRG's long-standing research catchment (Upper North Grain); and
- Strategically invest in field equipment and training, including through an annual equipment grant. This secured: Unmanned Aerial Vehicles (e.g. a QuestUAV™ Q-PodQ-200) with



## Unit-level environment template (REF5b)

computer-controlled flight-pathing (**Harris**); UFP monitors (**Lindley**); a portable XRF unit; and equipment for coring, surveying, meteorological, pollutant and water analysis.

The School's specialist support staff members include a dedicated **GIS and Remote Sensing** Officer (GIS Officer) with cartography, desktop-publishing, graphics and illustration support also available. Our GIS Officer leads the management and administration of GIS and remote sensing (including software licenses, installing and testing upgrades, and overseeing equipment and rooms). Our software portfolio includes: ESRI products, Exelis-ENVI 5.1, Clark Labs TerrSet, Intergraph ERDAS-IMAGINE, DNRGarmin and the Terrain Analysis System.

The GIS Officer:

- Provides technical support (e.g. blogs and consultations).
- Assists with access to geospatial data-delivery channels (e.g. EDINA-Digimap).
- Supports outreach and impact (e.g. Manchester Museum's 'Climate Exchange' public engagement initiative and ECoS Open Labs).
- Liaises with external organisations, e.g. software and data providers. In 2016, activities included attending GeoBusiness & PolicyUK events securing industry sponsorship for our hosting of the 2017 GISRUUK conference.

With the increasing pervasiveness of geospatial and digital approaches in Geography, access to highly-skilled support staff is vital. Our current GIS Officer (Dr Millin-Chalabi, 2016-date) is a former Geography PGR, and SEED supports her continued engagement in research, e.g. on NE/T003553/1. Millin-Chalabi also leads technical infrastructure innovations, e.g. a pilot Spatial Data Infrastructure building on the award-winning <http://www.envirosar.com/> (Copernicus Masters Sustainable Living Challenge, 2016). Our strong infrastructure in this area underpins a range of research-related activities.

Aligned with wider UKRI/UoM policies, Geography is also committed to furthering data- and software-related aspects of Open Research, by:

- Increasing our use of existing Open Source software, e.g. QGIS.
- Developing new Open Source software e.g. **Huck's** GitHub resources.
- Providing Open Data via publications, local servers and UKRI repositories (e.g. **Bispo, Dennis, Fletcher, Harris**).
- Sharing geospatial data management expertise, e.g. NERC-UDARA helped pilot ITB's (Indonesia) adoption of Open Science Framework practices.
- Delivering publicly-available decision-support resources, e.g. <http://map-me.org/> (**Huck**) and <http://www.climatejust.org.uk> (**Lindley**) (Impact Case).

All research follows standard institutional level procedures and regulations, e.g. risk and ethics, research data management, research integrity, and Open-Access output management (via the PURE repository). In research ethics, we have led SEED's Ethics Committee (**Hall**) overseeing a streamlined, online system. We remain fully committed to research Health and Safety, with extremely rigorous laboratory and fieldwork procedures.

## Section 4. Collaboration and contribution to the discipline or research base

### 4.1 Research collaborations, networks and partnerships

Research collaborations are central to Geography's research and impact portfolio, with interdisciplinary working, policy-practice partnerships and knowledge-exchange being long-standing hallmarks of our work. Many of our achievements are directly attributable to this

## Unit-level environment template (REF5b)

working model whether formed locally, nationally or internationally. They reflect our commitment to research which yields positive environmental, social and economic benefits at each of these scales (Section 4.2). Example collaborations include:

- Locally, **M.Evans**' and **Allott**'s work on moorland restoration and nature-based solutions is founded on an association with the Moors-for-the-Future Partnership, from its conception. **Lindley**'s urban green infrastructure research joined 12 academic disciplines from across UoM, U.Salford and MMU with seven local non-academic organisations. **Rothwell**'s H2020 projects benefit from Manchester City Council acting as lead City-Partner. Funders recognise the special relationships generated through our partnerships, the inclusivity of our working practices and the opportunities to generate positive change through Greater Manchester's devolution agenda. MUI and MERI networks also yield fruitful local collaborations, e.g. **J.Evans**' UKCRIC Urban Observatory.
- Nationally, **Browne**'s investigation of the food-water-energy-environment interface uses collaborations from two ESRC-Nexus-Network Awards. For instance, the 'Reshaping the Domestic nexus' unites Defra, BEIS, the Food Standards Agency and Waterwise. **Clay**'s UK wildfire research involves a long-term science-policy partnership that has yielded joint publications, forum memberships and advisory roles (with *McMorrow*). Geography is well connected to disciplinary networks, e.g. via RGS-IBG, with prominent roles in multiple conference networks (Section 4.3)
- Internationally, **Bouzarovski**'s €600k EU-COST European Energy Poverty network and EU-Poverty Observatory cover both energy research and its translation into practice. In the latter, UoM is the core academic partner working with IT companies, consultancies think-tanks and charities to co-develop innovative policy-practice initiatives to combat energy poverty. **Rothwell**'s and **J.Evans**' EU-H2020 projects have strong Manchester foundations while also forging partnerships across Europe and China. Recent appointees bring further networks. **Lucas** leads the 20-partner academic-practice International Network for Transport and Accessibility in Low Income Communities and Co-Chairs the EU-NECTAR-Cluster 7 scientific research network on transportation impacts, and **Bispo** and **Ernstson** strengthen research connections with South America and Africa respectively. **Lindley**'s involvement in IPBES widens existing collaborations, and helps bring prospective partners to funding bids led by MERI and MUI. This is a reciprocal arrangement, with new international networks forming through RI membership (e.g. **Huck**'s Northern Uganda work). Collaborations frequently result in joint publications and attract PGRs. We bring PGRs to our international networks, e.g. through CPEG/MUI's regular Urban Studies Summer Institute, which in 2018 was held at NUS (Singapore and for which CPEG offered bursaries to participants from low-income countries. The UoM Simon and Hallsworth endowments also facilitate international collaboration for SERG/CPEG, and we regularly host prominent speakers (e.g. CPEG hosting Glassman, Keil, Katz, Lehrer).

#### 4.2 Relationships with non-academic audiences and wider contribution to economy and society

We have been able to develop strong and meaningful relationships with research users because we are pioneers and long-standing advocates of 'impactful' research, i.e. well before it was a formal means of assessing research quality. The late Emeritus-Professor Robson's Centre for Urban Policy shaped UK government policy and practice, and Honorary Senior

## Unit-level environment template (REF5b)

Knowledge-Exchange Fellow *McMorrow's* 30-years' work on wildfire are key examples. We carry this tradition with us today, e.g. via **Browne's** School-level Business Engagement role.

We have established internal funds of ~£6,000/year to support impact-related activities and won two NERC-Knowledge-Exchange fellowships, eight UoM ESRC-IAA awards and two Simon Industrial Fellowships. We make use of further UoM structures, such as Policy@Manchester which attracted an ESRC-Impact award in 2016. The quality and importance of our impact work is recognised through awards and prizes, including:

- PDRA-Thomson's ESRC-Early-Career-Impact award (2017).
- **Hall's** Jo Cox Prize for Public Service and Active Citizenship (2018).
- **Bouzarovski's** EU-Protects campaign 'Ordinary Hero' award (2019).
- Multiple UoM 'Making a Difference' Awards (e.g. **Hall, Huck, Warren**).

Our activities fit well with UoM's Strategic Vision for social responsibility including:

- *Engaging public audiences* – We delivered numerous local, national and international media contributions (e.g. **Doucette** to Korea Now's Extra-Territoriality podcast with nine media outlets covering **Rothwell** and **Woodward's** microplastics research in March 2018) and we maintain an active social media presence (e.g. @Jamie\_Woodward\_, @GeographyUoM and dedicated RG accounts). We have held honorary curatorships at Manchester Museum and worked closely with Whitworth Art Gallery (**Lindley** and **Warren**). **Warren's** 2019 co-curated research-based exhibition at The Whitworth was extended twice and attracted 200,000 visitors. Our interactive science stand at the BlueDot festival led to a programme feature piece, and we regularly write for *The Conversation* (e.g. **Bellamy, Browne, Petrova**). Section 1.4 highlights further public-facing activities:
  - **Ernstson's** 2018 film was screened at multiple European and African film festivals and attracted several award nominations at those events.
  - **Dodge's** historical map archival research was disseminated through exhibitions and his 2018 popular book. This engaging visualisation of untold urban histories attracted extensive local media coverage.
- *Taking up advisory roles* – for example, **Allott** and **M.Evans** are science advisors to EU-MoorLIFE and two IUCN (International Union for Conservation of Nature) commissions. We have presented to UK, European and Asian policy audiences and submitted evidence to statutory and government bodies, e.g. the Climate Change Committee (**Scott**) and the Department for Work and Pensions (**Hall**) (Impact Case). Our student alumni also provide opportunities to reach out to beneficiaries globally, e.g. Ouedraogo, Minister for Energy, Burkina Faso.

#### 4.3 Contribution to sustainability of the discipline and research base

Intellectual contributions to the research base are underscored by major esteem indicators, such as: **Woodward's** election as Fellow of the BSG (2017); and **Swyngedouw's** two Honorary Doctorates in Scandinavia and UoM-Humanities Researcher of the Year award (2017). Publications also feature as Editor's highlights (e.g. **Hall, Rothwell**) and attract awards, e.g. Jim Lewis Prize (**Bouzarovski**, 2018, **Petrova**, 2019).

Academic services contributing to the wider sustainability of the discipline comprise:

## Unit-level environment template (REF5b)

- **Supporting Journals**, including:
  - **Castree** *Progress in Human Geography* Managing Editor (2003-date).
  - **Hall Area** Co-Editor (2020-date).
  - **Ward** *Urban Geography* Editor-in-Chief (2018-date) and Editor (2015-17).
  - **Woodward** *Geoarchaeology* Editor (2007-2018).
  - Editorial and Advisory Board roles, e.g. *Local Environment* and *Frontiers in Sustainable Cities* (**J.Evans**), *The Holocene* (**Fletcher**), *Geology* (**P.Hughes**), *Computers, Environment and Urban Systems* (**Lindley**), *Journal of Transport Geography* (**Lucas**), *Environment and Planning C* and *Geography Compass* (**Temenos**), *Palaeogeography, Palaeoclimatology, Palaeoecology* (**Stone**), and *Antipode* (**Ward**). **Bouzarovski** sits on six Editorial Boards, including the interdisciplinary *Energy and Buildings* illustrating how we bring Geography to other disciplinary debates.
  - Guest-editing and leading Special Issues, e.g. **Woodward** (*Quaternary Science Reviews*) **Lindley** (*Landscape and Urban Planning*) and **Swyngedouw** via highly-cited editorials and symposium introductions (2016, 2017).
- **Supporting professional bodies and learned societies**, including:
  - **Castree** AAAG Board and Publications Committee.
  - QEG International Union for Quaternary Research and societies in Norway (**A.Hughes**) and South Africa (**Stone**).
  - **Harris** Remote Sensing and Photogrammetry Society Trustee (2012-18).
  - RGS-IBG Research and Working Groups (e.g. **Hall**, **Scott**).
- **Organising conferences**. Staff and PGRs regularly organise and convene conference sessions, including:
  - Four sessions at the 4-yearly 20<sup>th</sup> INQUA Congress (QEG).
  - Sessions at AAG, AAS, DSA, RGS-IBG, NGM and RC21 (SERG/CPEG).
  - Hosting conferences at UoM: Healthy Cities 2019 (**Browne**); GISRUK 2017 (**Huck**) and BSG 2014 (**M.Evans**, **Shuttleworth**).
- **Winning and hosting academic fellowships**. Fellowships across all RGs provide additional research capacity as well as indicators of esteem. For instance, CPEG has won fellowships from the Korea Foundation and Leverhulme Trust (**Doucette**); ISRF (**Hall**); and the Urban Studies Foundation (**Temenos**).

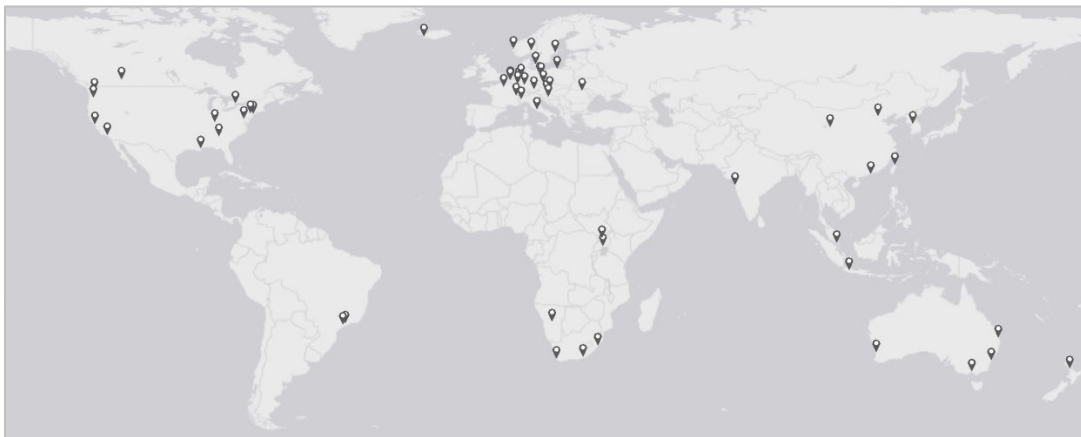


Figure 4.1: Reach of invited overseas presentations and visits 2014-2020

## Unit-level environment template (REF5b)

- **Delivering invited speeches.** We have an exceptional record of delivering keynotes and invited presentations in the UK and overseas (Figure 4.1).
  - SERG: **Castree** delivered a keynote to the 2019 German Geography annual conference and gave both the 2015 Stockholm Archipelago Lecture and 2015 Transactions of the IBG Lecture. SERG's >100 invited speaking engagements 2017-19 include:
    - **Browne** Chinese Academy of Social Sciences, CUFU, Geneva, Wageningen.
    - **Bouzarovski** Bergen, Berlin, Brisbane, Bruges, Erkner, Gdansk, Prague, Stockholm, Turin.
    - **Ernstson** African Centre for Cities.
    - **J.Evans** Graz, Kampala, Leuven, Prague.
    - **Hess** as panellist at the 2018 Global Conference on Economic Geography.
  - CPEG's invited presentations cover Antwerp, Brussels, Kentucky, Los Angeles, Melbourne, Munster, Mumbai, Paris, Seoul, Singapore and Taipei, with national seminars at Cambridge, LSE, Nottingham, Oxford, Sussex, UEA and York.
  - EPRG and QEG regularly deliver keynotes, e.g. **Lindley's** 2017 European Conference on Biodiversity and Climate Change keynote and QEG's 12 invited EGU keynotes in 2016 alone.
  
- **Hosting academic visitors.** Academic visits and honorary appointees continue to be an important part of academic life in Manchester. Indeed, we increasingly attract visitors, hosting 47 visitors (2013-2018) compared with 32 (2004-2013). Our global reach is shown by 91% of visitors coming from overseas (~53% Europe, ~13% North America, ~9% Asia, ~4% Africa and ~13% Australia). We mobilize internal (e.g. Simon/Hallsworth endowment) and external (e.g. China Scholarship Council) funding to support visits from talented researchers at all career stages. Senior visitors (e.g. Sofoulis, Prudham, Sultana, Christopherson, Agyeman) often provide group and one-to-one mentoring sessions for PGRs/ECRs alongside the usual research-exchange activities. Visits also yield follow-on activities, e.g. Hallsworth Visiting Professor Ibert's (IRS-Berlin) visit to CPEG led to a subsequent Spring Academy. In turn, collaborators benefit from institutional infrastructure investments, e.g. in our laboratories.
  
- **Making long-term academic visits.** Many staff members receive visitor invitations and have established overseas relationships that sustain their research. For example, **Clay** was Ida Pfeiffer Visiting Professor, Vienna (2018), **J.Evans** was Visiting Professor, Lund (2014-17) and **Castree's** links with U.Wollongong remain strong.
  
- **Delivering wider services to the discipline:**
  - **M.Evans** chairs the *Heads of Geography in Higher Education* group (2016-date) and led a major Geography A-Level review. **M.Evans**, **Castree** and **Woodward** co-edit the leading A-level magazine, *Geography Review*. **Castree** co-edits the AAG International Encyclopaedia of Geography and Routledge's Key Ideas in Geography book series.
  - We bring expertise to AHRC, ESRC, NERC and cross-disciplinary UKRI peer-review colleges in addition to scientific advisory and evaluation committees overseas, e.g. in Canada (**Harris**) and France (**Fletcher**).
  - National and international PhD examining, and grant and publication reviewing form part of our everyday activities. Quality indicators include: **P.Hughes'**



**Unit-level environment template (REF5b)**

Outstanding Reviewer acknowledgement, *Quaternary Science Reviews* (2015); **Hess'** Best Referee Award, *Journal of Economic Geography* (2016); and **Castree's** Taylor and Francis Lifetime Achievement Award (2019).

In sum, we have evidenced how Geography at the UoM has grown and thrived since REF2014. Our collegial environment supports people at all career stages, respects both tradition and innovation, and provides fertile ground to realise our future ambitions.