Institution: Bournemouth University

Unit of Assessment: 14 – Geography and Environmental Studies

1. Unit context and structure, research and impact strategy

a) Unit Context and Structure

UoA 14's submission comprises 27.7 FTE in the Department of Life and Environmental Sciences (LES) plus Zhang (Deputy Dean Research and Professional Practice) in the Faculty of Science and Technology (Figure 1.1). Data across the census period refers to these staff.
In REF2014, we submitted 21 FTE staff to UoA 17 together with the Department of Archaeology and Anthropology (A&A), who now submit to UoA 15.

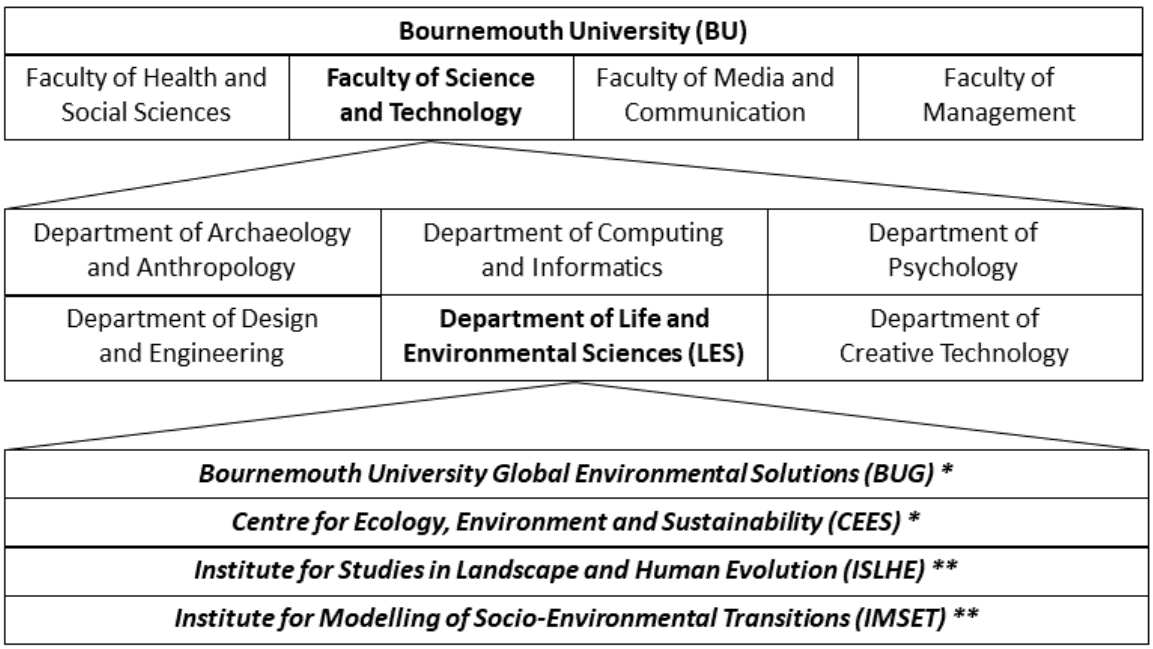


Figure 1.1: Organisational setting of the Department of Life and Environmental Sciences (LES). Cross-university research and impact foci relevant to UoA14 are shown in italics: * = led by LES; ** = led by Department of Archaeology and Anthropology.

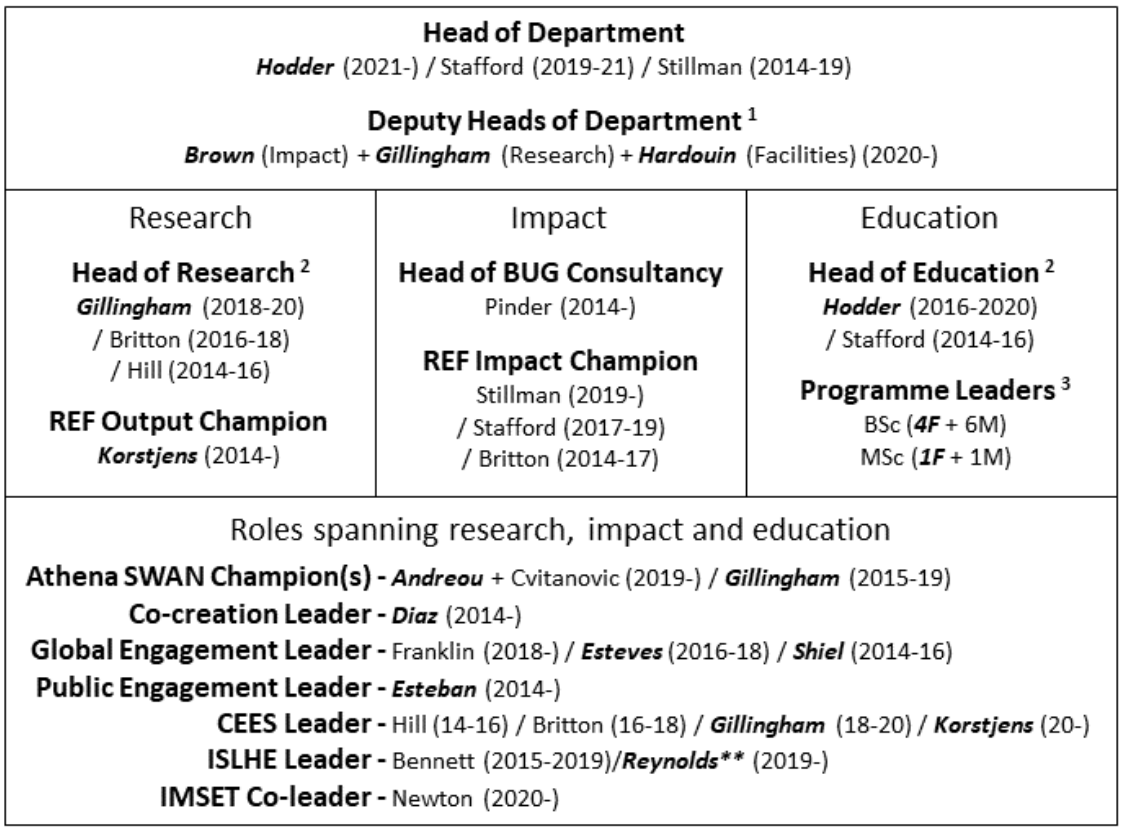
UoA14 research addresses past and present changes within the natural and human worlds to develop sustainable solutions for the future. All UoA members work across disciplines: 90% of staff publish within environmental sciences, 90% in agricultural and biological sciences, 59% in earth sciences, 66% in molecular biology and genetics, and 59% in social sciences (publications by members between 2014-2020 (SciVal® database, Elsevier B.V., http://www.scival.com (downloaded on 10/01/2021)). This multi-disciplinarity allows global challenges to be addressed successfully internationally, nationally and locally. Cross-cutting techniques of genetics, remote sensing and modelling enable collaboration across the UoA to promote a strong culture of interdisciplinary problem-solving leading to societal impact.

Since REF 2014 we maximised research and consequent impact by:

- Developing (in 2018) a university-wide Strategic Investment Area (SIA) in Sustainability, Low-carbon Technology & Materials Science, following institutional strategy (BU2025). Ten UoA 14 academics are on the Steering Group (of 18 total), including the deputy convenor (Stillman). The SIA led to the creation of a new institute (Section 2): the Institute for

Modelling of Socio-Environmental Transitions (IMSET, co-lead Newton) supported by competitive cross-university funding, and a new 3-year post to amplify research excellence in sustainability (Jones)(Figure 1.2).

- Defining clearer roles to prioritise and facilitate research and impact (Figure 1.2) using a transparent workload planning model. This recognised and valued research and knowledge exchange by ring-fencing time, plus encouraging engagement in leadership.



1. Deputy Heads of Department roles created in 2020. Main areas of research and impact responsibility indicated. Also have education responsibilities.
2. Prior to 2020, Heads of Research and Education acted as department deputies.
3. Individual programme leaders not listed due to number (number led by female and male staff shown).

Figure 1.2: Organisation of research, impact and education leadership in the Department of Life and Environmental Sciences. "+" indicates roles undertaken by more than one person simultaneously. "/" indicates changes in person undertaking role since 2014, with most recent first. Years show dates during which a person occupied a role. ***Bold italics*** indicates a female member of staff, ** indicates role in A&A

- Leading the Centre for Ecology, Environment and Sustainability (CEES, Korstjens) and co-leading the Institute for Studies in Landscape and Human Evolution (ISLHE, Bennett, Section 2), providing communities for collaborative working (Figure 1.2).
- Growing our departmental consultancy (founded in 2013), Bournemouth University Global Environmental Solutions (BUG), which plays a key role in our impact strategy, being crucial to two of our case studies.
- Maintaining stable income (Section 3) from a wider range of international, national and local funding agencies, as well as clients fostered by BUG.

b) Review of post-REF 2014 research and impact strategy

We have strengthened research and impact through five priority actions:

(i) Encouraging and recognising the research and impact potential in all by promoting collegiality and inclusiveness. Having been awarded a bronze Athena Swan award in 2019 (the second at BU), we undertake (since 2016) bi-annual staff interviews to identify problems and synthesise ideas for improvements. We introduced workload planning in 2016, preserving 50% of time for research and professional practice, leading to impact and staff development. The remaining time is divided between teaching, collegial contributions and academic leadership, such as REF leads and Athena SWAN Champions. Staff satisfaction increased markedly, prompting more staff to volunteer for leadership roles and intensifying research activity. Our departmental funding schemes (~£15k QR annually) give priority to interdisciplinary teams, further fostering collegiality (Section 2). We promote equality across the university through active membership of BU's Athena SWAN Self-Assessment Team (Andreou, Cvitanovic, Gillingham, Stillman) and Steering Group (Stillman deputy chair), and Race Equality Charter Self-Assessment Team (Stillman).

(ii) Capitalising on our breadth of expertise through interdisciplinary collaboration within LES (seeded by LES QR funding), across the faculty, university and externally. Since REF 2014 our focus on interdisciplinary research led to four EU Interreg grants (Esteban, Herbert, Stafford, Franklin, total >£1M) integrating innovative ecological and remote sensing tools, with a strong emphasis on impact via public outreach and engagement. A range of successful interdisciplinary projects since 2014 have linked ecology and remote sensing (Ford, Hill, Korstjens), ecology and social science (Diaz, Stafford, Britton), and environmental science and psychology (Newton, Stewart), furthering institutional investment to create two interdisciplinary research institutes, ISLHE and IMSET.

(iii) Capitalising on our unique location in one of the richest areas for biodiversity in the UK, by focusing on globally significant issues that can be addressed locally or as part of wider networks. Evidence of success includes projects on biodiversity improvements to marine structures in Poole Bay (Herbert, Stafford, 2 x EU Interreg; >£500K), impacts of invasive algae on intertidal habitat in Poole Harbour (Franklin, EU Interreg; >£300K), impacts of land-use change on biodiversity in Dorset and the New Forest (Newton, NERC), impacts of climate change on migratory salmon in a Dorset chalk stream (Britton, Gillingham, Andreou, NERC CASE) and match-funded PhDs on long-term biodiversity change at Studland (Diaz, Ford, Gillingham, Green, Stafford, alongside the National Trust). To promote research and engagement, in 2014 Esteban established the Wessex Portal (www.wessexportal.co.uk) supported by one project officer, which has greatly strengthened our collaboration with local authorities and organisations to promote research and environmental understanding on the local to global scale (Section 4).

(iv) Maximising our academic reputation by prioritising global networking and agenda setting outputs (Section 4). We created a Global Engagement Champion role in 2014 to identify opportunities, facilitate networks and engage with university-level global engagement initiatives, resulting in an increase from 49% international collaboration in outputs in 2014 to 69% in 2020. We created a UoA Output Champion role in 2014 to organise workshops on publication strategies for achieving high-profile outputs (from 35% in 2014/2015 of publications occurring in the top 10% Journal Percentiles by CiteScore to 47% in 2019/2020 across current UoA 14 staff) and promote open-access publishing (100% of in-scope outputs). Our staff development budget allows conference attendance and has further enabled networking, research engagement and organisation of international conferences (Section 4). We also developed a Leverhulme-funded international network of microclimate scientists leading to agenda-setting publications (Gillingham). Other international projects have been supported by AHRC Global Challenges Research Fund (Esteves, Korstjens), EU Interreg (see above) and EU Marie-Curie fellowships (Andreou, Britton, Hill). The research underpinning our Impact Case Studies (ICS) also had significant global reach, spanning North America, Europe and Asia.

(v) Maximising our societal impact by forging strong relationships with international and local organisations, facilitated by investment in BUG. We created a Public Engagement Leader role in 2014 to facilitate and promote public engagement activities, including overseeing the Wessex Portal website. Our UoA Impact Champion (created 2014) fosters impact through a three-step process: (1) targeting research towards societal challenges, (2) engaging with and disseminating to key audiences and beneficiaries, and (3) monitoring impact in light of emerging challenges. Success was aided by BU's investment in a dedicated UoA Impact post-doctoral fellow (Brown), who worked alongside the impact champion to organise workshops to scope beneficiaries and support networking, alongside promoting BU funding to generate and monitor impact (Section 4). BUG has become self-sufficient and profitable (income over £100K p.a.), despite reductions in available funding to the sector. In addition to staff members' individual networks, BUG acts as a catalyst for research impact through conservation stakeholders and industry to complement wider engagement by liaising directly with 28 stakeholders across the private (12), governmental (10) and NGO (6) sectors. These clients and partners (partners underlined) include international (World Bank, Tata Power, Ducks Unlimited), national (DEFRA, JNCC, Natural England, Natural Resources Wales, Environment Agency, CEFAS, Forestry Commission, Woodland Trust, IMERYS, Tidal Lagoon Power, DP World, Royal Society for the Protection of Birds, British Trust for Ornithology, Wildfowl and Wetlands Trust, Zoological Society of London) and regional (Southern Inshore Fisheries Conservation Authority, South West Water, Wessex Water, Bournemouth Water) bodies and companies. One of our ICS is co-led by BUG (Pinder / Britton), with another largely developed through contract research facilitated by BUG (Stillman). Our strategies have further facilitated research and impact through 16 match-funded PhD studentships with external partners (Section 2).

c) Future strategic aims and goals

We will focus on the following priorities:

(i) Strengthen collegiality and inclusiveness. Continue building a culture that is inclusive, supportive, and realises staff potential for research and impact. We will achieve this by enhancing openness and bottom-up staff participation in decision-making, especially workload planning that values research time and recognises academic leadership. We will also continue to use our departmental QR funding to support interdisciplinary teams, including ECRs, thereby providing leverage for external funding. We will continue to play an active role in university initiatives for Athena Swan and the Race Equality Charter, applying for a departmental silver Athena SWAN award in 2022.

(ii) Target interdisciplinary research towards sustainability. Sustainability will continue to be at the core of our research. This aligns closely to the university's BU 2025 strategy to build capacity within the field of sustainability, via an interdisciplinary Strategic Investment Area based on the track record and potential of staff, strongly based on the excellence within UoA 14. A new centrally-funded 90% research role in Sustainability, Consumption and Impact (Jones, started 2020) will further foster interdisciplinary collaboration. Our research on coastal and freshwater sustainability (including terrestrial impacts on these) comprises one of the university's five new Strategic Narratives, aligned to BU 2025 and designed to highlight core research and impact strengths to government and funding bodies. We plan to create an aligned Institute for Aquatic Sciences in future. We will continue to support interdisciplinary research through departmental QR funding, weekly seminars and away days, building on the success of existing projects delivered by our breadth of expertise.

(iii) Capitalise on our unique location. We will continue to capitalise on our location in one of the most biodiverse areas of the UK through our established field sites (Section 3) and collaborations, and by continuing to fund the Wessex Portal. These activities will receive new stimulus through our recent increased role at the River Laboratory, an internationally renowned facility for freshwater research (Section 3), which provides infrastructure to enhance our activities.

(iv) Maximise our societal impact. Policy- and practice-relevant research, and building close links with international, national, regional and local stakeholders, is a collective strength across our UoA (Section 4), giving a direct route to impact. Gaining the best possible understanding of user needs through continued user engagement, performing the highest quality research to meet these needs, and communicating this research and how it can be adapted to promote societal impact are core principles of our strategy. We will achieve these goals through active pursuit of impact by BUG, by including impact within criteria for employing new staff and by our continued enthusiasm for developing public engagement activities (Section 4). Exciting new channels for enhanced public engagement include recent involvement in BU's Animation, Simulation & Visualisation SIA fostering collaborations with sound artists and award-winning artists (Invisible Flock) to develop acoustic recording systems for biomonitoring and art installations (Korstjens, Newton, Hodder, Section 4).

(v) Enhance our academic reputation for research leading to impact. Priorities (i) to (iv) will further accelerate our academic excellence by appointing further excellent staff and facilitating and enabling staff to undertake high quality research and deliver impact on international, national and local stages. This research will inform resilience to global anthropogenic change and its interaction with regional and local impacts and hence enhance sustainability.

2. People

Staffing strategy

LES leadership of BU's sustainability-focused SIA and other strategic staffing decisions have resulted in a 20% growth in academic staff since 2014 in areas of importance to the university. The establishment of ISHLE in 2015 supported one new post and six PGRs. This was initially led by Bennett with five of eight academic staff from UoA 14, working closely with UoAs 15 and 32. We also benefitted from BU's Targeted Academic Research Scheme with the 2020 appointment of Jones in Sustainability, Consumption and Impact. Growth will continue with one recently appointed (Social Sustainability, to start June 2021) and four currently advertised lecturer posts to be filled in 2021. We will continue to attract and develop the careers of Marie-Curie and other international fellows (ten since 2014, of which four Marie Curie).

Our staffing strategy is to ensure complementary recruitment to strengthen research excellence and enhance collaboration, whilst bringing new perspectives, cross-cutting skills and techniques. We have attracted high-quality applicants: 94% of our academic staff hold a PhD, with recent recruits being international (U. Zagreb), from prestigious UK organisations (U. Southampton, UCL, U. Edinburgh), or relevant stakeholders (Marwell Zoo). Our recent departmental growth in biological and forensic sciences means we will look to submit to an additional UoA in the next REF.

We develop leadership skills via roles such as programme leader before uptake of general leadership positions (e.g. Hardouin and Gillingham were programme leaders, now DHoDs). Our strategic imperative to promote equality has resulted in a high proportion of women in leadership and professorial positions: since 2014, 43% of senior staff (Principal Lecturer and above) have been female, shifting from no female professors in 2014 to three by 2020. Although we occasionally recruit temporary and/or part-time staff for teaching or research roles, we work with them to achieve either permanent academic or fixed-term research positions (e.g. Gillingham, Brown, Gutmann-Roberts, Hall – all female). BU provides up to 6 months bridging funds to all research staff (RA and PDRA) between research grants. We ensure awareness of this via our checklist for managers of fixed-term staff as part of implementing the Concordat to Support the Career Development of Researchers. Success in departmental staff development is evidenced by low numbers of leavers (eight since 2014, seven were research staff) and promotion success (79% applications successful since 2014).

Staff development

New lecturers have half the standard teaching and administrative loads in their first year to allow them to build their research profiles. All new starters were allocated a mentor from 2016 (covering their probationary period, outside supervisory team for post-docs) with the mentoring scheme opened to all staff in 2018. Whilst explicit research targets are not incorporated into probation, mentors help staff identify opportunities in line with BU promotion criteria.

Since 2016 our workload planning model has allowed all staff time for development and research. Although teaching time temporarily increased in 2020 with the move to online teaching in response to Covid, workload planning ensured this was equitable. Staff can agree sabbaticals for research; e.g. a 3-month Promoteo fellowship from the Ecuadorian government helped Stafford develop two publications, whilst a 5-month BU funded sabbatical helped Korstjens reinitiate external collaborations to develop the Landscape Ecology and Primatology (LEAP) research programme (Sections 3,4).

Our annual appraisal checklist ensures all staff discuss promotion, outlining development needs to progress. This resulted in an improved perception of appraisals in 2018 compared to 2016 (from neutral to satisfied). All staff have participated in university-funded training to support their research career (e.g. grant and publication writing). Attendance at external training courses, conferences and networking opportunities is facilitated by our dedicated staff development fund**.** Following feedback from our bi-annual Athena Swan interviews, we opened the fund to post-doctoral staff and RAs. In 2018 we further committed to fund all activities identified during staff appraisals, including for dependants where needed.

Research development is fostered at departmental level by a gender-balanced Research Committee, encompassing research and knowledge exchange leading to impact. It is further facilitated at Faculty level by a full-time, centrally funded Research Facilitator and Funding Development Officer, together finding funders for research ideas, costing and helping submit projects. PIs can access external grant development support for bids to high priority funders, particularly for ECRs, with six bids from four colleagues supported since 2017. Additionally, all grants with FEC >£50,000 receive feedback from UoA 14 subject experts before submission. In 2015 LES responded to a perceived lack of seed-funding by instigating pilot project funding from QR money, with twice-yearly calls and prioritization of ECRs and interdisciplinary projects, judged by our Research Committee. Our staff have also benefitted from a BU scheme to return 5% of the recognised income from grants > £35k (£5k for ECRs) to PIs to foster further research development (nine colleagues since 2017). We are actively involved in developing and maintaining the integrity of our research, with a representative on the university ethics panel. All research projects go through ethics and health and safety checks, with all staff and PGRs completing regular ethics and safety training modules.

Support mechanisms for PGR supervision

Panel members for PGR recruitment have mandatory unconscious bias training, resulting in a good gender balance of recent recruits (60% and 69% female respectively of 48 PhD and 35 MRes starters from 2014), with 20 being international from 13 countries: China (2), Iran (2), USA (2), Canada (2), Italy (2), France (2), Ghana, Kenya, India, Vietnam, Turkey, the Netherlands, Spain, and Norway.

New supervisors attend a mandatory Doctoral College course on supporting and supervising PGRs, with top-up training every three years to keep up to date with current university policies and supervisory best practice, with compliance monitored by HoR/DHoD. All PGRs are allocated a team of supervisors, usually three individuals from a mix of career stages with gender balance. This allows new supervisors to learn from more experienced colleagues and ensures continuity of supervisory support. Thus, 86% of our staff supervised a PhD during the assessment period.

We have had two NERC CASE studentships since 2014, six fully-funded PhD studentships from central BU funding to ISHLE and a further four by direct application or via BU's prestigious funder scheme, which has lower income requirements for ECRs. Additionally, we supported 16 PhDs alongside 11 external organisations via successful bids to BU's match-funded studentship scheme, which funds half of the research, training and stipend costs of PhDs. In 2018 the scheme was extended to employ a post-doctoral fellow where two match-funded studentships were brought together to create research synergies, resulting in the recruitment of Gutmann-Roberts in October 2018.

The Faculty supported career development of four staff (two permanent demonstrators and two research assistants) and provided two further fee waivers for external candidates to study PhDs. Finally, supervisors have supported candidates to achieve full funding directly from external funders (e.g. Fisheries Society of the British Isles, Erasmus, Earthwatch). In 2013/14 BU launched an MRes (a fully research-based Masters programme, two have subsequently studied PhDs at BU), which provides a route into supervision for new staff. A fee reduction of £2,000 is automatically applied for any MRes applicant with a 2:1 or above and BU graduates receive a further 25% discount on fees. Our high number of PGRs help staff continue research and create a research-active environment.

Training and supervision of Postgraduate Research Students (PGRs)

All PGRs (MRes, MPhil, PhD) are members of BU's Doctoral College, which supports students academically, creating an inclusive community within which PGRs can network. Supervisors devise an individualised training programme based on PGR needs on arrival, subsequently updated at annual monitoring reviews via an online progress repository (ResearchPad). This includes modules from LES taught MSc programmes (usually in spatial and/or statistical analysis) and courses from the Doctoral College's Researcher Development Programme. Following the *Vitae* framework, this offers over 150 workshops, online modules and webinars covering: knowledge and intellectual abilities; personal effectiveness; research governance and organisation; and engagement, influence and impact. PGRs additionally have a training budget of £3,000 to support attendance at external training courses and international conferences. LES provides PGR offices alongside A&A, to foster a diverse and supportive culture. Our PGRs also benefit from bespoke laboratories (Section 3) that allow work alongside academics for at-the-bench training. Feedback on cohort needs is regularly received from the department PGR representative. This resulted in additional statistical support from 2019 via a bespoke course led by Golicher, now repeated annually, and costed extensions (from BU QR funding) providing up to 6-months stipend for projects delayed by Covid lockdown.

The Doctoral College runs an annual PGR conference at BU, operates regular social events and oversees PGR annual monitoring and milestones. These (probationary review at 3 months, major review at 15 months) check progress and provide advice from an independent panel of academics with relevant expertise. We support PGRs with these milestones (and before *viva*) by inviting them to present at our research seminar series. We provide a dedicated PGR mental health representative (Gillingham) to champion PGR issues centrally. We also support our students to run an annual Faculty PGR conference, supplying judges for talks and poster presentations. We contribute to faculty-wide weekly PGR seminars, including careers sessions and annual unconscious bias training. PGR satisfaction with career development planning increased to 'very useful' by 2018 and four were subsequently employed by LES as post-doctoral fellows.

Annual PhD completions have increased since the last REF (REF2014 UoA17 now in UoAs 14 and 15: mean 5 per year; UoA 14 mean 9 per year since 2014). To support PhD students into research careers, in 2015 we launched departmental funding (from QR funding) for PhD students to write papers between submission and viva, applications judged by our Research Committee. To July 2020 we supported 29 PhD students (19 female, 10 male, 100% of BAME applicants supported) with 38 peer-reviewed papers published and a further nine under review. We also provide paid demonstrating opportunities for PGRs following education training,

advertised at the start of each semester, which can contribute to application for HEA associate fellowship (one successful since opened to PGRs in 2018).

Supporting and promoting equality and diversity

Having helped drive BU's attainment of an institutional Bronze Athena Swan award via SAT membership (Section 1), LES was BU's second department to attain a departmental Athena Swan Bronze award in 2019 and intends to apply for a silver award in 2022. Although this scheme concentrates on gender equality, our team developed initiatives to improve equality for all protected characteristics, with Stillman sitting on both the BU Race Equality Charter Self-Assessment Team and LES SAT. Initiatives include consultation, development, implementation and dissemination of our workload planning model and developing an appraisal checklist to negate any unconscious bias staff (particularly females and BAME) have against putting themselves forward for promotion. This resulted in a marked increase in female staff applying for promotion with a subsequent increase in female professors from zero to 9% above the benchmark for our sector (benchmark 21% female, LES 30%). All staff must attend unconscious bias training before being allowed to interview at any level, with annual departmental training sessions for new staff and PGRs.

Equality and diversity are embedded across LES and considered in all decisions about staffing, allocation of internal funding streams and promotion. We have gender balance in leadership roles (Figure 1.2), attained and maintained since 2018, resulting in balance across our Research Committee and for shortlisting/interview panels. UoA 14 staff are international; although 83% are currently listed as British, 35% of our staff originated internationally from: China (x2), Brazil, Croatia, France, Cyprus, Italy (x2), The Netherlands and Spain, with several staff subsequently becoming British Citizens. We support LGBTQ+ rights, and several recent appointments identify within this group. People with disabilities and caring responsibilities are supported by offering flexible working hours/working from home to take people's circumstances into account. Thirty staff have reported working flexibly, with eight formal agreements to restrict timetabled hours, and 100% of disabled staff applied for external research grants in 2019/20. LES leadership at institutional level in Athena Swan was influential in BU agreeing to new sector-leading maternity/paternity/adoption leave and policies to permit flexible working and career breaks. Within LES, we go beyond this by providing six months research-only time following return from career breaks (including maternity leave), benefiting Andreou in 2018. We have raised the profile of diversity internationally by identifying steps to improve representation of women in geoscience and engineering (Vila-Concejo et al (2018) *Palgrave Communications* 4, Article 103) and recommended actions for gender equality in HE during Covid lockdown (Ashencaen et al (2020) *J. Furth. High. Educ*. DOI: 10.1080/0309877X.2020.1853687).

To ensure equality within submissions to REF, we ran three mock exercises overseen by a review panel. Panel membership was opened to all staff from the department, with an explicit equality statement included when recruiting members, which include ECRs and staff across all grades with gender balance (mean five male and six female). All panel members completed Equality and Diversity training as outlined in our Institutional Code of Practice. In addition, all staff and PGRs were invited to attend REF training in 2018 to understand scoring of outputs.

3. Income, infrastructure and facilities

<u>Income</u>

Our development strategy (Section 2) resulted in >83% of submitted staff involved as PI or Co-I on successful external bids due to our vibrant, supportive and interdisciplinary research environment, encouraging colleagues to engage in bidding collaboratively. We have had steady external funding income across 2014-2020 (averaging £436k p.a) with a total of >£3m over the whole period. Since 2014 we increased the proportion of our funding from large EU bids, due to

our training and support for EU bidding activity (a goal from our REF2014 strategy). The international network we have established through these grants will support continued engagement, research and impact. We have also been successful in securing internal funding from BU (>£147k p.a. including GCRF and HEIF) and in-kind funding through access to external collaborative projects, facilities and field sites, alongside logistic support for match-funded PhD students (Sections 2 and 4).

Departmental QR funds led to the formation of the Temperate Reefs Research Group (Herbert, Hall, Jones, Stafford & PGRs) in 2014. This was a springboard for two successful EU Interreg bids (3DPARE -Atlantic Programme and Marineff – Channel Programme). Research group LEAP (Landscape Ecology and Primatology) formed during a departmental away day designed to facilitate internal collaboration. Internal funding to LEAP (>£75,000, plus 2 fully-funded PhD studentships) led to external grants (EU Marie Curie Fellowship £180,000, PTES £15,410, independent fellowship of £65,000 for visiting fellow Wilson), as well as funding in kind worth >£50,000 through collaboration with art charity Invisible Flock (museum exhibitions, fieldwork, equipment development, staffing for arts projects) and 13 publications (2015-2020), 7 MRes and 2 PhD theses.

Our connection with the NERC Airborne Research & Survey Facility (via Hill) and long-term in-kind bidding successes have resulted in extensive remote sensing datasets (airborne laser scanning and multi/hyper spectral data) which have supported two international post-doctoral fellowships (Marie Curie and Säätiöiden Post-doc Fund) and three PhDs since 2014. In-kind support worth £33,579 was also achieved for use of the NERC Life Sciences Mass Spectrometry Facility, supporting one PhD.

Infrastructure and Facilities for Research

Facilities and Major Equipment

Our intra-faculty collaboration with departments A&A, Product Design and Creative Technology means all staff benefit from a breadth of shared interdisciplinary state-of-the art equipment and resources, funded by external grants, internal capital bids, success in bidding for internal university research grants (>20% of BU funding since 2014 awarded to UoA 14). Our interdisciplinary institutes also came with university investment in equipment and space. Shared facilities include extensive anthropological and zooarchaeological collections with a dedicated demonstrator curating the collections and ensuring reference and measuring materials are up to date, used within UoA 14 for comparative anatomy research and archaeological sample analyses (Stewart). Several staff collaborate with colleagues from the departments of Creative Technology and Product Design using the new mixed reality development laboratory and music and sound laboratories to develop Passive Acoustic Monitoring of biodiversity (Newton, Hodder, Korstjens).

Laboratories shared with A&A underwent a £1.2 million refurbishment in 2013, then were expanded with a total investment of £4.55m (equipment budget £1.39m) across two phases by December 2020. They are equipped with a wide variety of industry-standard equipment and supported by ten technical staff. Our Molecular Biology Laboratory gives capability to study gene expression and molecular cloning (Andreou, Liang, Hardouin). Our Toxicology Laboratory enables separation of complex mixtures such as compounds in bodily fluids, river water, forensic samples, and identification and quantification of those compounds (BUG). Our Spectrophotometry Laboratory includes equipment to analyse the elemental composition of samples and structure of organic compounds, used for testing soil, water and invertebrate samples, as well as carbon sequestration studies (Green, Franklin, Esteban). Our Cytometry Laboratory allows counting and analysis of microbial cells in liquid suspension (Esteban, Franklin). We also have extensive microscopy facilities, including an Electron Microscope Suite and an Optical Microscopy and Digital Imaging Suite. Our Crime Scene Science Facility includes equipment for visualisation of body fluids and fibres, fingerprints, shoe imprints and handwriting, contributing to our ICS on digital preservation of ancient footprints (Bennett).

The internationally renowned River Laboratory at East Stoke has been a permanent BU base since 2011, used extensively by BUG, Britton, Esteban, Franklin, many PGRs and foreign and national guest researchers, with growing BU presence over this REF period. It has state-of-the-art microscopy facilities and digital imaging software, temperature/light-controlled incubators and environmental sampling equipment. The facilities at the River Laboratory are key to the success of the SAMARCH project with UK and French partners (€7.8m between 2017-2022 part-funded by the Interreg Channel programme) in which Esteban leads the Educational and Science Dissemination work package that offers paid work placements to ~15 BU UG and PGR students every year. We have also run NERC training workshops, outreach to schools and public engagement events from the River Laboratory in collaboration with stakeholders including the FBA, EA, GWCT, Newcastle University and Uppsala University.

LES has a light and climate-controlled experimental facility for research under replicated aquaria conditions. The lab has Home Office accreditation to conduct regulated procedures, licensed under the Animals (Scientific Procedures) Act 1986, ensuring full compliance with strict ethical and animal welfare requirements. Automated video and electronic tag recording systems allow study of the ecological impact of non-native invasive fish and fish/parasite interactions. These aquaria have supported 6 PhD projects and >24 publications since 2014. In 2019, BU also invested £45k to develop our Marine Laboratory on Brownsea Island, alongside the National Trust. We also have a DEFRA-approved Environmental Sample and Foreign Soil Store and a Biodome: a controlled environment to investigate plant growth patterns under varying conditions, which houses our carnivorous plant collection.

Field Equipment

Our strategic aim has been to ensure that new equipment, funded by faculty and departmental money, benefits a large proportion of the staff and is accessible to all staff and PGRs. Thus, our joint store with A&A has a dedicated manager to ensure equipment is accessible and maintained for fieldwork, with annual opportunities to purchase new equipment from BU funding. At the end of externally funded projects, any equipment purchased goes into this store and internal recovery from research grants covers replacement and maintenance.

We are well-placed to create remotely-sensed and spatial datasets, with ground penetrating radar, electro-conductivity and tomography extensively used (e.g. Bennett ICS). We have differential, navigation grade and handheld GPS devices alongside total stations, laser scanners and two Unmanned Aerial Vehicles, with a thermal imaging camera. The store includes a multitude of devices for monitoring terrestrial, freshwater and marine environments, as well as equipment that can be left *in situ* such as temperature loggers, camera traps and acoustic recorders.

Our aquatic research benefits from shared investment in resources with the maritime archaeology group at BU, with state-of-the-art equipment in our newly refurbished dedicated Marine Store. Our underwater monitoring equipment (e.g. Remote Operating Vehicle, Baited Remote Underwater Videos) provides capability for monitoring the seabed and underwater structures and their biota including adjacent Marine Protected Areas, optimising biodiversity using artificial rock pools and resulting in considerable impact (Section 4). Other capabilities include water quality sampling for consultancy work with Natural England (SSSI Condition Assessment 2018) and Poole Borough Council (Poole Park Lagoon).

Computing

The need to analyse large, often spatially-explicit datasets is supported by our dedicated RStudio server. Expert quantitative analyst Golicher runs this and helps staff and PGRs develop their statistical and spatial analyses, writing and running R code. The platform includes a server running Shiny that enables applications with web-based graphical user interfaces for research, including analyses using our spatial database with over 200 GB of stored data (constantly

updated). The registered user base has expanded to include over 30 PGRs in three faculties. We also use a faculty-led Linux-based server for the most demanding modelling or analytical tasks (e.g. creating 3D orthomosaics from drone survey images and acoustic files; Newton, Hill, Korstjens) and a powerful departmental computer with specialist software running on Windows to allow complex modelling tasks with large maps or datasets. Our geospatial computing laboratory has the latest versions of specialist spatial software and an A1 colour printer. An online Geomatics community enables access to open and proprietary data and GIS software both on and off campus.

Agreements to access field sites

We maintain long-standing field sites internationally, and within our uniquely diverse local environment, to support PhD students and attract external and internal funding:

- **Sikundur, Sumatra Indonesia** Research group LEAP have conducted fieldwork alongside Indonesian charities (Sumatran Orangutan Conservation Programme, Forum Konservasi Leuser) and Syiah Kuala University at a tropical rainforest site since 2015 to link microclimatic conditions to forest structure and biodiversity.

- **New Forest** (Newton, Diaz, Hill, Gillingham, Cantarello). Collaboration with the Forestry Commission resulted in long term bird and vegetation transects (since 1970s) and Lidar data.

- **Studland** (Gillingham, Diaz, Stafford, Ford, Green). BU funding pump-primed projects and undergraduate research teams with the National Trust. This led to research using their historic (1930s) and recent monitoring datasets from the unique Cyril Diver project.

- **Brownsea & Furzey Island** (Hodder, Hardouin, Liang, Diaz). Conservation management and the genetic origins of an isolated population of red squirrels is studied here alongside the National Trust (Furzey since 1994, Hodder NE Schedule 5 licence).

We also regularly work at the Jurassic Coast World Heritage Site, Poole Harbour Special Protection Area and Dorset Heathlands National Nature Reserves.

BU Infrastructure Used Regularly

The university invests in workspace and community facilities for PGRs and staff to promote interdisciplinary collaborations, including recent investment in PGR facilities within our building and a communal staff centre that combines a canteen, meeting space and computer desks for collaborative meetings. In 2015, the Student Centre was built through an investment of £10.5m to provide social collaborative and meeting facilities for all students, including PGRs. BU secured planning permission for a new 7,000m^2 academic building in 2020 (estimated investment £40m) including unallocated flexible spaces to provide opportunity for new research and impact activities, which we will access via our involvement in BU's SIAs.

Infrastructure for research impact

BU supports impact through the Charities Impact fund (>£16k to Pinder/Britton since 2014 supporting work on Mahseer conservation leading to an ICS), HEIF funding (>£23k to Stillman supporting methods to communicate individual-based modelling outcomes to stakeholders to support their decision making leading to an ICS and >£167k to Bennett supporting DigTrace software development and communication used in an ICS), and a dedicated research impact fund (>£3k Bennett in 2018 and £2k to Stillman in 2019). This funding was crucial to development of impact for our three case studies and supported nine further staff (Cantarello, Diaz, Esteban, Gillingham, Hardouin, Herbert, Hodder, Korstjens, Newton) to generate impact from their research (Section 4).

A QR-funded Faculty Impact Officer (2018-) links and seeks opportunities to network researchers with industry and other external stakeholders. Best practice was demonstrated through impact training to all staff and PGRs, including 1-to-1 briefings, internal seminars, engagement opportunities, external consultancies and national leaders (e.g. parliamentary POST training). This appointment was reinforced through a post-doctoral research fellow (Brown, 2018-2020, now DHoD) to educate and assist academic staff to maximise their impact, leading to further consultancy and research opportunities for: Herbert, Stillman, Pinder and Britton (see impact case studies).

Our encouragement of Open Access (OA) publication and funding from BU (we extensively benefit from BU's OA agreements with Springer, SAGE, Wiley and BMJ) led to 100% of in-scope submitted outputs being OA compliant or having a permitted exception, allowing wider access to our research. We actively engage with BU's OA data storage facility BORDaR (Gillingham is Faculty open data champion). The department also has bespoke library support to ensure access to all relevant journals and research books, with extensive e-access.

4. Collaboration and contribution to the research base, economy and society

Collaboration, Networks and Partnerships

We develop international partnerships via our Global Engagement Champion**,** a leadership role created since REF2014. LES maintains international collaborations in several ways, including through large grants (Section 3), long-term research in Indonesia (Section 3) and competitive BU funding for visiting fellows (e.g. Dr. Silva, Universidade Federal do Rio Grande do Sul, with Esteves), with 56% of outputs with international co-authors across the REF period. Gillingham, Korstjens, Hill, Newton and Cantarello created a Leverhulme-funded international network in 2017 in the emerging field of microclimate research, via workshops held at BU supported by the British Ecological Society (BES), with attendees from 11 countries, resulting in highly cited recommendations for microclimate research (DOI: 10.1016/bs.aecr.2017.12.005), a special issue in the journal *Methods in Ecology and Evolution*, and ongoing research collaborations.

We maintain international and national collaborations by visiting organisations directly, with positions including: Adjunct Professor at Queen's University, Canada (Hill); External research panel member, Kiel Marine Science Cluster of Excellence, Christian-Albrecht University of Kiel (Brown); Affiliation to the Tyndall Centre for Climate Change Research (Brown); collaborator with Harbour Branch Oceanographic Institute, USA (Esteban, via match-funded PhD) and Visiting Professor, Université Paul Sabatier, Toulouse, France (Britton). We are also active in the ERASMUS+ programme and have established exchange partnerships with and hosted staff from U. Patras (Greece), U. Malta and U. Jaen (Spain), all leading to research links. Our involvement in the cLINK Erasmus Mundus programme enabled research leading to joint publications with PhD students from Malaysia and Vietnam.

We further maintain international and national collaborations via our visiting professors and fellows, who are carefully chosen to complement our research expertise, to collaborate with our staff, co-supervise PhD students and maintain links with influential national organisations (e.g. Prof Maggs, Chief Scientist JNCC; Prof Bullock, CEH; Prof Copp, CEFAS; Prof Humphreys, Southern Inshore Fisheries & Conservation Authority; Dr Lucy, Director, Centre for Environmental Research Innovation and Sustainability; Dr Caffrey, Director, INVAS Biosecurity Ltd; Dr Goss-Custard, ex-CEH). We actively support previous BU post-docs and PhD students to further their academic careers as visiting fellows (e.g. Baltazar-Soares, Gleed-Owen, Papworth, Shedden-Gonzalez).

Our research has been further strengthened by our national partnerships with the Environment Agency and Game & Wildlife Conservation Trust (via NERC CASE studentships), the National Trust (via a Memorandum of Understanding for research and research-based education on Dorset heathlands leading to two match funded BU studentships), Natural England, the Forestry

Commission, Royal Botanic Gardens Kew, the National Oceanography Centre and the British Association for Shooting and Conservation (via match-funded BU studentships). More regionally, we have collaborated with the Severn Rivers Trust, the Southern Inshore Fisheries and Conservation Authority, Suffolk Coastal District Council and private companies ArtEcology, HR Wallingford, Mott MacDonald, Surescreen Diagnostics and Almagrove Ltd (also via match-funded BU studentships).

Contribution to learned organisations

We hold leadership roles within relevant learned organisations. For example, Stafford chairs the BES Policy Committee and has been a trustee and director since 2019, while Gillingham Chairs their Climate Change Ecology Special Interest Group (with two BES workshops held at BU) and Britton has reviewed grants for them since 2013. Stafford was also a committee member of the environmental statistics group of the Royal Statistical Society. Esteban is University Representative of the Royal Society of Biology and Britton is honorary treasurer of the FSBI. Franklin is a member of council of the British Phycological Society, while Esteves and Cvitanovic are Southern Committee members of the Royal Geographical Society. We are also active within professional membership organisations; Herbert is a member of the training and careers committee of the Chartered Institute of Ecology & Environmental Management.

Contribution to research base

International Expert Advisory Roles

We have successfully shared our expertise with several international bodies. Brown was Lead Author for the Intergovernmental Panel on Climate Change (IPCC) Special Report on the impacts of a 1.5°C rise in temperature and expert reviewer for the Sixth Assessment Report. We hold several roles within the International Union for the Conservation of Nature: Newton is Vice-Chair of the Global Trees Specialist Group; Pinder is a South Asia Expert Advisor, leading to our ICS on conservation initiatives to save a critically endangered giant freshwater fish in India; Korstjens is a member of the Primate Specialist Group Species Survival Committee; Bennett is an advisor to White Sands National Park in the USA, stemming from the ICS on digital preservation of early human footprints. To promote the international use of spatial analysis in forestry, Hill is a co-director of ForestSAT. Within Europe, Stafford is an expert member of EU Scientific, Technical and Economic Committee for Fisheries and Britton is an expert panel member for the European Food Safety Authority.

National Expert Advisory Roles

Brown and Gillingham actively advise the UK Climate Change Risk Assessment and Biodiversity Climate Change Impacts Report Card respectively. Stewart is on the British Ornithological Union's Category F panel for ascertaining the native status of British birds. Korstjens is a conservation working party member of the Primate Society of Great Britain. Andreou is an advisor on non-native parasites to the Environment Agency and Herbert is on the Planning and Environment Committee of the Royal Yachting Association.

External Grant Committees

We are extensively involved in international and national peer review. Internationally, Esteban is a European Commission expert evaluator and reviews Marie Curie fellowships. We have also reviewed grants for the Norway Research Council and the Russian Ministry of Education and Science (Esteves), National Geographic, the Polish and Portuguese national grant academies (Stewart), the Australian Antarctic Division (Gillingham), the Czech Science Foundation, the German Academic Exchange and NASA ROSES Biodiversity (Hill), the US NSF (Franklin) and Canadian NSF (Zhang) and the International Primatological Society (Korstjens).

Nationally, many staff have been members of NERC's peer review college during the census period (Bennett, Cvitanovic, Esteves, Franklin, Gillingham, Hill, Newton, Stewart, Zhang) and Hill was a member of the NERC ASRF Steering Committee from 2009-2016, reviewing all applications for deployment of the NERC ARSF aircraft for research purposes in the UK and abroad. Staff have also reviewed grants for the Leverhulme Trust (Stewart, Gillingham), BBSRC (Hill, Zhang), ESRC and EPSRC (Esteves), STFC (Hill) and reviewed UKRI Future Research Fellowships (Bennett and Esteves).

Conferences organised

We are active in conference organisation, being main organisers for 14 in the census period, including international conferences e.g. European Society for Environmental History (2017, Zagreb), European Congress of Protistology-ISoP (2019, Rome), International Symposium on Cryobiology and Living Biobanking (2019, China), and national conferences at BU (the British Phycological Society annual meeting and Protistology-UK, both in 2016). We led sessions at eight international conferences including: the European Climate Change Adaptation Conference, International Primatological Society, the Krakow Society of Sedimentologists, Estuaries and Coastal Seas in the Anthropocene and the BES. We have also delivered ten workshops and research training events at BU, including five NERC PGR training courses (Freshwater Survey and Identification; Marine Survey and Identification; Aquatic Data Analysis; Predictive models and Programming; Synthesising, Analysing and Interpreting Data) and two workshops alongside the BES. Finally, we have delivered short courses for researchers in Colombia (microclimate ecology, Gillingham) and Brazil (Esteves).

Journal Editorships

During the census period, we contributed to PLoS one as Academic Editor (Britton), to four international journals as Associate Editors (Biological Invasions and Journal of Applied Ecology, Britton; Marine Biodiversity Records, Herbert; Primate Biology, Korstjens), and 13 as Editorial Board members (Animal Behaviour, Primates, Korstjens; Animal Reproduction Science, Cryo-Letters, Journal of Aquaculture Research & Development, Zhang; Ecological Informatics, Stafford; Ecology of Freshwater Fish, Britton; Frontiers in Microbiology, Esteban; Journal of Biogeography, PLoS One, Quarternary Science Reviews, Stewart; Journal of Coastal Research, Esteves; Marine Biology Research, Franklin). We also edited three special issues: "Microclimate matters: the ecological relevance of quantifying and understanding local climatic conditions" in Methods in Ecology and Evolution (Gillingham); "Marine protected areas: Science, policy & management" in Estuarine, Coastal and Shelf Science (Herbert) and "Neanderthals: Ecology and Evolution" in Quarternary Science Reviews (Stewart).

Academic recognition

Bennett received an award from the Polish Branch of National Geography, Zhang was awarded outstanding contribution to the Society of Cryobiology in 2016 and Esteban received STEMNET certificates of recognition of the UK's Most Dedicated STEM Ambassadors in 2016 and 2017. Other awards include best technical paper of 2017 from the Colegio de Ingenieros Civiles de Mexico (Esteves), 5th most read paper in the Earth and Planetary Sciences category of Nature Communications in 2018 (Brown) and a top-downloaded paper in Methods in Ecology and Evolution 2018/19 (Gillingham).

Keynote invited talks

Our excellence is recognised internationally by frequent invitations to provide keynote talks at conferences and to international organisations. Notable examples include: the United States Geological Survey (Stillman), Coastal Hazards in Africa (Esteves), Dynamics, Management and Biodiversity of Temperate Forests (Copenhagen, Newton), Footprint Conference (Munich, Bennett, related to ICS), the International Conference of the Microbiology Society (Esteban), South African Society for Aquatic Sciences and South African Zoological Society (Britton, related

to ICS) and the European Forest Institute (Cantarello). Presentations include international (Sweden and Belgium) and national dissemination of the IPCC's 1.5ºC Special Report (Brown) and nine keynotes at national conferences (e.g. PalMeso, Stewart; BES, Gillingham).

Contribution to economy and society

Research Impact

Our research has delivered impact via public engagement, consultancy, licencing, proof of concept, industry boards, advisory roles, presentations, responses to government inquiries and workshops. We contributed and delivered benefit to the economy and society through three channels:

1. *Policy advice, guidance and support to international, national and local government organisations*. We provided advice from international to local levels, through our networks in consultancy, for example:

- Disseminating climate change impacts timed with the Intergovernmental Panel on Climate Change's Special Report on 1.5°C of warming and the impact of sea-level rise from 1.5ºC to 3ºC in 2020 (Brown) to over 140 UK civil servants and High Commissioners in four African nations, to prepare for the climate negotiations at COP in Glasgow in 2021.
- Continuing to act in an advisory role (Bennett, following ICS on discovery and preservation of footprints) to White Sands following its re-designation as the 62nd US National Park in December 2019.
- Bennett improved pattern matching algorithms in the UK National Footwear Database (via KTP with Bluestar Software Ltd.) to improve search times, provide more effective provision of investigative intelligence and inform the FBI's footwear database development (candidate ICS for next REF).
- Leading responses to UK Parliament inquiry into flooding (Brown, https://committees.parliament.uk/writtenevidence/4949/pdf/).
- Innovative research alongside consultancy Mott McDonald has informed coastal management decisions (Thorpeness Detailed Option Assessment & Outline Design Reference: PROC 2072 TEN DPS) in Suffolk instigated by Coastal Partnership East, a joint venture between local authorities in Norfolk and Suffolk (Esteves and PGR).

2. *Responding to international and national conservation policies to advise practice*. We directed our research to respond to international conservation policies and government plans to inform action and practice including:

- Influencing the uptake of ecosystem-based planning by the Secretary of Environment and Urbanism of Natal, Brazil, by providing the sole evidence through co-creating new methods to calculate 'compensation' for environmental damage (Esteves). This resulted in new lines of research for at least three postgraduate programmes in Brazil.
- Pioneering methods to ecologically enhance coastal engineering infrastructure to restore marine biodiversity by adding 250 novel artificial crevices and rock pools in Ireland, France, Gibraltar and the UK (Herbert, Hall) which increased species richness by 300%. Working with DEFRA, Natural England, local authorities and an external consultancy, this work has won three national biodiversity and construction awards (candidate ICS for next REF).
- Providing evidence to DEFRA, MMO, Natural England and industry for a national strategy to adopt a risk-based approach to the management of invasive Pacific oysters in aquaculture applications. Regionally we also provided evidence to Natural England/DEFRA on the impact and management of green algal mats and the ecology and management of Poole Harbour.

- Providing novel modelling evidence of the effect of development and shellfisheries on coastal bird populations to Natural England, Natural Resources Wales, London Gateway, Wildfowl and Wetlands Trust and others (Stillman ICS). Evidence has been instrumental in understanding whether development or changes to shellfisheries can occur and what mitigation measures are needed.
- Influencing management interventions affecting the ecological resilience to climate change of the New Forest National Park (Newton). Our research directly informed their management plan, which represented a radical departure from previous approaches by committing to remove all non-native trees and expand native woodland.
- Providing the sole evidence that restricted the cull of UK eagle owls following advice in a risk assessment to DEFRA (Stewart, http://britishbirds.co.uk/wp-content/uploads/article_files/V100/V100_N08/V100_N8_28_33.pdf). This relates also to the sub-committee F of the BOU's Records Committee who maintain the list of Native British Birds (established in 2007).

3. *Working with governments, businesses, NGOs, charities, and volunteers to improve conservation outcomes*: Our work has been international to local in scope, at times in traditionally hard-to-reach conservation sectors. We have:

- Identified and 'red listed' a critically endangered giant freshwater fish with the International Union for Conservation of Nature (IUCN) (Pinder and Britton ICS), influencing major international companies (TATA) and government (India) in supporting or changing breeding and stocking policies, plus fostering uptake of numerous education programmes.
- Newton's research (doi:10.1017/S0030605315000137) recommended a global assessment of the world's tree species and showed how it could be undertaken in practice, contributing to a global assessment for the world's 60,000 tree species (https://globaltreeassessment.org/index/).
- Shared mitigation strategies for primate and elephant conservation activities via workshops with charities, government organisations and universities in Indonesia to reduce negative human-wildlife interactions at the edge of national parks (Korstjens, Hodder).
- Created a novel system for integrating information from conservation organisations (e.g. National Trust, Dorset Wildlife Trust) on traditional and rewilding landscape-scale management of the new Purbeck Heaths National Nature Reserve (Diaz). Our Nature Volunteers website (https://www.naturevolunteers.uk/) supports citizen scientists in over 100 other projects across the UK.
- Collaborated with 200 Dorset businesses to innovatively link biodiversity trends, economic development and employment (Newton). This demonstrated the high dependency of the economy on local environmental conditions. Dissemination to Dorset's Local Nature Partnership directly informed development of strategic economic development plans.

Outreach, training and public engagement

We strategically engage with society via our Public Engagement Champion (Esteban). LES staff engaged in >150 outreach events between January 2018 and July 2020. Many were to international audiences, for example: seminars and workshops on the CoastSnap project in Mozambique and Kenya (Esteves), workshops at the Oceanographic Research Institute in Durban, South Africa (Esteves), talks to the Falkland Islands Chamber of Commerce and British Overseas Territories Conservation Forum (Haywood, PGR), to the Bombay Natural History Society (Gutman-Roberts), a talk about Mahseer Conservation at WWF India HQ and in Dehradun, India (Pinder, based on ICS) and a workshop at ACEF Brainhouse Academy, Mathare, Kenya (Esteban).

UK events include Café Scientifique talks (Bennett, Diaz, Herbert, Gillingham, Stafford) and research outreach to schools, including Science Family Fun Days (Esteban), Bioblitzes (multiple

staff members across >5 events, including one with Chris Packham), and biannual events with the Dorset Geographical Association, one per year hosted at BU by Hill, who is President. We provide judges to Soroptimist International's annual STEAM challenge for girls (Cvitanovic, Gillingham, Hardouin, hosted at BU). We are also active within BU's public engagement initiatives; our free events at the annual BU Festival of Learning since 2014 have included biological recording, climate change, primate-human evolution workshops and sessions themed on Alfred Russell Wallace (attracting c. 650 people). Finally, we took part in outreach activities organised by external organisations, such as the Dorchester Festival of Science (Esteban), Eden Project Festival of Discovery (Franklin), Norwich Science Festival (Winter, PGR), and set up Discover Science Christchurch (Buchan, alongside local engineers and businesspeople) to inspire future generations in science, technology & engineering. Our outreach continued during the Covid-19 pandemic with the conversion of our Family Science Festival Activities to an online format via our Wessex Portal, featured on NERC's Engage blog series (https://engage.nerc.ac.uk/2020/11/02/going-virtual-for-environmental-science-and-public-engagement/).

UoA14 staff have made over 270 media appearances in the last three years, including newspapers/online (e.g. Pinder, Britton, Stewart, Korstjens, Brown); popular magazines (e.g. (Bennett, Green, Stewart, Britton); TV (e.g. News (Bennett, Pinder, Brown); BBC's One Show (Pinder); documentaries (e.g. Bennett, Newton); radio (e.g. Bennett, Britton, Diaz, Herbert, Stafford, Stewart, Brown) and articles in The Conversation (Stafford, Brown, Bennett, Stewart).