# Diversity, Equity and Inclusion research in environmental science

Funded projects from the NERC 'Making environmental science equal, diverse and inclusive' and 'Digital technologies to open up environmental sciences' funding call.

**- The following descriptions are provided by the project leads -**

## Making environmental science equal, diverse and inclusive

### Evaluating diversity and inclusion within the (geochemistry) academic ladder (E-DIAL)

Led by: Dr Pallavi Anand (The Open University)
Supported by: Professor Shonill Bhagwat (The Open University), Dr Pieter Bots (University of Strathclyde), Professor Bryne Ngwenya, Dr Amy Riches (University of Edinburgh), Dr Jessica Gagnon (The University of Manchester), Ms Anya Lawrence (The University of Birmingham), Dr Susan Little (University College London), Dr Elena Maters (University of Cambridge)

This project (E-DIAL) will provide a snapshot of diversity in the UK's geochemistry community, through an intersectional lens, with emphasis on the HEI academic ladder. As a multi-faceted discipline, geochemistry is central to Earth and environmental science. However, no specific workforce data exists with which to understand barriers and mobilise policies to improve representation of minoritised groups.

Our approach is only possible through timely collaboration of social scientists with UK serving members of a committee of the European Association of Geochemistry (EAG). Geochemistry community data, collected through an EAG survey, will be the first of its kind. Alongside, we will evidence past and recent rates of appointment, progression, and retention of under-represented groups across all levels of seniority within UK HEIs. In profiling geochemists' career pipeline(s) and evidencing lived experiences, understanding will be built to identify obstacles and inform prevailing policies, attitudes, and practice while assessing policy effectiveness at institutions with, e.g., differing Athena Swan certifications. Findings will test the hypothesis that "there is an erosion of diversity within geochemistry careers".

Project results will be disseminated via publication/reports, institutional seminars, conference presentations/networking, panel discussions and a NERC knowledge exchange virtual event; raising awareness and stimulating people at all educational stages to prompt wider participation. E-DIAL investigators interact at higher organisational levels and may submit evidence to inform the next All-Party Parliamentary Group report on Diversity and Inclusion in STEM. Hence, informing and shaping UK policy change to achieve improved diversity and inclusion while establishing practice for continued institutional level monitoring.

### Walking the Walk: Co-producing approaches to diversifying participation in Earth and environmental science education and careers

Led by: Dr Marcus Badger (The Open University)

Supported by: Professor Clare Warren, Professor Richard Holliman, Ms Janice Ansine, Dr Yoseph Araya (The Open University)

For many people working in the Earth and environmental sciences today, the first spark of interest came from childhood/youth experiences in nature. In the UK, green and rural spaces are often considered by many Black, Asian and minority ethnic (BAME) communities as places where they are not welcome. The result is that many BAME communities remain disconnected and isolated from nature. The spark never flickers for these families, and natural sciences are not seen as a career route for their children. Since climate change affects all of society, it is essential to open meaningful pathways for the inclusion of diverse voices in this discourse. Financial, social, cultural and structural barriers can be obstacles to accessing the outdoors, as recognised by both environmental and grassroots community organisations advocating for change.

This project will bring together environmental scientists and grassroot BAME community groups to identify and deconstruct nature access barriers through developing and road testing flexible and adaptable activities. The project will empower these community groups to lead their own journeys into appreciating and understanding the science behind natural spaces and share that knowledge with their audiences. We will co-design and test approaches to bring informal environmental science learning directly to group leaders trying to make the UK countryside a more inclusive environment for all to enjoy.

**A Virtual Environmental Geoscience Experience**

Led by: Dr Adam Booth (University of Leeds)
Supported by: Dr Jacqueline Houghton, Mr Benjamin Craven, Dr Taija Torvela, Dr Roger Clark, Dr Christopher Green, Dr Jon Mound (University of Leeds)

Geoscience faces a crisis of recruitment and retention: it urgently needs to remove the barriers to inclusivity that make it dominated by a privileged white-male demographic, while recasting the fundamental role of geoscientists in the energy transition. Fieldwork can be an inspirational component of geoscience training but can present barriers to inclusivity, excluding those (e.g.) with disabilities, vulnerable to ethnic- or sexuality-based harassment, or from disadvantaged backgrounds.

Our project uses a virtual field experience to overcome these barriers, sparking geoscience curiosity among disadvantaged/under-represented learners via the inspirational problem- solving challenge of geophysical data analysis. As a means of exploring the hidden subsurface, geophysical surveying presents a technological solution to a curiosity-led investigation. Our virtual geophysics experience will present the environmental challenge of windfarm construction, thus recasting the role of geoscience away from traditional oil- and-gas perception and highlighting its energy-future benefits. It will invite users to explore and critique a data archive, to optimise geophysical survey strategy and assess site geology for supporting wind turbines. Funding will support geophysical data acquisition at a site in North Wales, and the development of a user interface through which resources will be accessed.

The virtual geophysical fieldtrip will be widely available and adaptable for diverse instructors and learning communities for whom fieldwork would ordinarily be challenging. By bringing the field to the learner, delivering our virtual resource as part of outreach initiatives will catalyse the interest of diverse users at early stages of their educational career, ultimately increasing the diversity of the environmental geoscience sector

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**Amplifying our students' voice: the co-production of undergraduate field courses (residential and non-residential) to address EDI**

Led by: Dr Maria-Martina Quaggiotto and Dr Jo Clarke (University of Stirling)
Supported by: Dr Stella Mouroutsou, Dr Jennifer Dickie, Dr Christian Schroeder (University of Stirling), Dr Dominic McCafferty (University of Glasgow)

Research into co-design is a developed field but only recently is it being put into practice for EDI purposes. Co-design can be a successful method to improve equality, diversity and inclusivity, but only when participants are involved at every step and their lived experience is the main focus.

In this project we will support undergraduate students to identify environmental, structural, and attitudinal barriers in field work and co-produce a residential and a non-residential field course with the aim to improve access to field skills for all students. We first work towards identifying EDI barriers and solutions through questionnaires, workshops and interviews facilitated by a charity run by young people for young people. We then co-design, -develop and -produce the two field courses, exploring approaches and finding solutions to improve EDI in residential and non-residential field settings. All participants are compensated for their time, travel, subsistence. The project also covers any caring and equipment costs to promote inclusivity. Using our student networks, we will actively encourage students with diverse identity characteristics to attend the co-designed field course and provide feedback on their experience. Our results will be written up collaboratively with the students in the form of case studies published in peer-reviewed articles and presentations for an academic, policy and non-specialist audience.

Our current undergraduates are the next generation of environmental scientists, and field skills are essential for this role. Finding solutions and approaches to make fieldwork accessible, inclusive, and diverse is therefore our prerogative.

**Decolonising environmental sciences: An action research approach to develop practice-based guidance to support inclusive UG and PG teaching environments**

Led by: Dr Hannah Davis (Newcastle University)
Supported by: Dr Sharron Kuznesof, Professor Alison Shaw, Mrs Eleanor Farrington, Dr Amelia Magistrali (Newcastle University)

The participation of Black, Asian and Minority Ethnic (BAME) students in undergraduate environmental sciences programmes is amongst the lowest in the physical sciences and further deteriorates in postgraduate research where retention rates are 6.9% compared to the UK national average of 18.5%. Multiple factors contribute to these racial inequalities throughout the student life cycle, and initiatives to address them are centred around building a more inclusive culture.

This project aims to help foster a sense of belonging for BAME students through the training of environmental science educator role models and development of practice-based guidance to support inclusive undergraduate (UG) and postgraduate taught (PGT) teaching environments. The project will focus on curriculum decolonisation.

Curriculum decolonisation requires educators to recognise and address unconscious biases and to have the knowledge and confidence to make changes to their pedagogic practice. At present, practical advice on how to decolonise the environmental sciences is limited. This project takes a novel approach by addressing both the process and practice of curriculum decolonisation with a behaviour change intervention using the Influence Model of Organisational Change (IMOC) as a framework.

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Using constructive conversations based upon educator participants' choice of teaching materials evaluated against an Inclusive Curriculum Framework, this approach moves beyond 'deficit training' to an 'engagement' model to support sustainable decolonisation practices.
A co-created toolkit of teaching materials, module reviews and a case study to develop role modelling behaviours to leverage decolonisation practices for a more inclusive teaching environment are amongst the anticipated outputs.

**Building solid ground for racial diversity in Geography, Earth & Environmental Sciences postgraduate research**

Led by: Professor Natasha Dowey (Sheffield Hallam University)
Supported by: Dr Rebecca Williams, Dr Munira Raji (University of Hull), Dr Sam Giles, Anya Lawrence (University of Birmingham), Professor Christopher Jackson (University of Manchester), Dr Benjamin Fernando (University of Oxford)

The There is a well-documented racial diversity crisis in Geography, Earth and Environmental Sciences (GEES) subjects in the Global North, which leads to inequities in who does environmental research. This project aims to increase participation and retention of BAME (Black, Asian and minority ethnic) postgraduate research (PGR) students in GEES topics and therefore increase diversity in environmental research.

The project will link evidence-based interventions, each targeting a different barrier to racial diversity in NERC-facing GEES research. To improve engagement and participation of BAME students in GEES PGR we will deliver a research school bringing together BAME students, staff and alumni to (1) address GEES-specific negative perceptions around field research, colonialism and careers perceptions, (2) facilitate role model visibility and networking via careers events and a conference and (3) increase successful applications through PhD interview and fellowship writing workshops targeting NERC-funded opportunities. We will remove barriers to access by building a doctoral training (DTP/CDT) working group focused on making PGR application and interview processes inclusive and anti-racist; we will share findings and best practice with key stakeholders. We will improve the experience and increase retention of BAME students in environmental research by improving their sense of belonging and inclusion through a mentoring network of alumni, post-doc, academic, and industry mentors.

Through our novel, multidisciplinary adoption of action research (collaborative, self- reflective inquiry) in physical science, we will evaluate and demonstrate the impact of these activities in a UK context, enabling us to develop strategic and evidenced insights translatable to other UK HE disciplines.

**Making environmental and health equal, diverse, and inclusive: Reflections from a Centre of Environment and Human Health (REACH)**

Led by: Professor Lora Fleming (University of Exeter)
Supported by: Dr Musarrat Reza, Tinashe Verhaeghe, Rae Preston, Sabiha Allouche, Dr Barnett-Naghshineh, Dr Bethany Roberts, Dr Daniel Derbyshire, Dr Kath Maguire, Malcolm Richards, Riadh Ghemmour (University of Exeter), Dr Sheray Warmington (Independent Consultant)

The European Centre for Environment and Human Health (ECEHH; www.ecehh.org) (a WHO Collaborating Centre) in the University of Exeter Medical School has established a strong track record of interdisciplinary research and training around environment and human health interconnections working with diverse communities locally and internationally. Although there has been a health and environment inequalities theme to Centre research, only recently have Centre

members begun to critically examine issues of intersectionality, diversity, inclusion, colonisation and racism as they pertain to both research/training activities and to the Centre culture. Currently, the Centre (and in environmental sciences) are predominantly white, straight, able-bodied, middle class; ECEHH research and training activities lack an informed focus on decolonisation and racism in environment and health.

This proposal will allow the Centre to take stock of current and future research and training through a lens of decolonisation and anti-racism. Using existing work on intersectionality, diversity and inclusion, decolonisation and critical race theory, Centre members and partners will reflect on their research and work culture. Best practices, existing recommendations and key exemplars will be sought in the UK and beyond, involving our national and international partners.

This evidence will be used to create recommendations for EDI and how to integrate an ongoing reflective intersectional approach into Environment and Health research and training. A collaborative and iterative approach will be applied through co-creation with Centre members and an external EDI-expert Advisory Board. The results and findings will be shared with other national and international institutions working on environment and human health.

**REDRESS: Improving diversity and inclusiveness in the UK marine sciences**

Led by: Professor Alex Ford (University of Portsmouth)
Supported by: Dr Darren Mernagh, Dr Sarah Reynolds, Mr Rory Miles, Dr Yvonne Howard (University of Portsmouth)

The Protecting the planet from climate change, pollution, habitat destruction and resource exploitation requires contributions from diverse thought leaders. Marine Sciences in UK academia is currently failing to attract a diverse background of students at undergraduate level, subsequent transition to postgraduate education and at a senior leadership level.
The socioeconomic and cultural drivers for this are not currently clear and is likely to vary by ethnicity, communities and region. Consequently, the discipline is not reaching the full base of talent and potentially failing in its influence in educating and changing behaviours amongst the community. Driven by the UK Research, People and Culture Strategy, we are aiming ensure that youth from all backgrounds are inspired into careers in Marine Science.

REDRESS will bring together the UK's leading providers of marine science education, learned societies, student/community representatives and 'thought leaders' for a series workshops focusing on developing a roadmap to improving representation and inclusion of black and ethnic minorities communities in the Marine Science discipline. The workshop will define/refine the current landscape within the marine sciences and the drivers for career choices amongst ethnic minority groups. The workshop would be organised by the marine community but run by EDI culture change specialists. Participants will gain insight of best practice (e.g. TV programming, and armed forces) in attracting wider sectors of the community. The project will develop a UK roadmap which could be adopted by universities to support successes in the Race Charter for attracting students of diverse background through widening participation activities.

**GAIA (Geoscience Access, Inclusion and Attainment)**

Led by: Dr Beth Fox (University of Huddersfield)
Supported by: Dr Anna Davidson, Mrs Rukhsana Din, Dr Vicki Trowler, Ms Chidochemoyo Nyakonda, Ms Raphaella Ward (University of Huddersfield)

The Higher Education Statistics Agency data indicate that Geographical and Environmental Studies is one of the least diverse of all subjects surveyed. This lack of diversity is characteristic from early in the "pipeline".

Geography and Geosciences can be a gateway to influential careers that shape our physical and social infrastructures and environments and future research directions. It is vital that we have the breadth of our society represented in these sectors. However, a simple focus on increased representation is not sufficient without an understanding of the barriers to access that occur both at FE and at undergraduate level.

Our project tackles barriers to access in both the transition to university and the undergraduate experience through three integrated streams: a non-residential Spring School for 16+ participants from under-represented groups; a set of Role Model Profiles of diverse practitioners in the geosciences, co-created with participants in the Spring School; and the elaboration of a set of guidelines for an inclusive and socially-just geoscience curriculum and pedagogy, developed with current undergraduates, 16+ students and participants in the Spring School.

All participants in the three streams will be paid for their time, and travel, subsistence and childcare costs will be reimbursed. Involvement of members of underrepresented groups from the development of the proposal onwards will ensure that the project serves the communities it is intended for. In this way, we aim not just to encourage socially-just and participative practices, but to embed them in the project from the ground up.

**Enriching Inclusivity in Environmental Sciences with Virtual Fieldtrips**

Led by: Dr Matthew Genge (Imperial College London)
Supported by: Dr Rebecca Bell, Dr Emma Passmore, Dr Mark Sutton, Dr Valentin Laurent, Ms Sophia Quazi (Imperial College London)

The project will deliver a virtual Earth Science fieldtrip to enrich engagement and inclusivity of field courses in Earth Science internationally. The project addresses participation issues related to disability, socio-economic, gender, and race factors which are inherent in outdoors field courses. The course will be provided as a free, open access software package for universities and schools, with in-built networking allowing for student-educator interaction, within a computer-game like digital environment. The project will extend the development of one of our existing world-leading virtual fieldtrips. The project will develop new teaching materials for undergraduate and A-level students based on core EDI principles and perform new technology development to ensure accessibility and remove technical barriers to educator usage.

**Co-creating solutions to overcome the barriers that exclude students of Bangladeshi heritage from studying environmental sciences**

Led by: Dr Michelle Hale (University of Portsmouth)
Supported by: Dr Mo Hoque, Dr Heather Rumble, Dr Robert Inkpen, Dr Bryony Whitmarsh (University of Portsmouth)

Portsmouth is a diverse, densely packed, low-lying island city exposed to multiple climate risks (Portsmouth Climate Action Board 2021). As is common across the UK, students of Bangladeshi heritage are under-represented in the study of environmental sciences at the University of Portsmouth (UoP). Making assumptions from a position of privilege about how to engage with diverse communities has historically been (and continues to be) part of the problem.

We will convene a two- day Environmental Jam to co-create understandings that inform solutions to enable shared exploration of the barriers that exclude students of Bangladeshi heritage from studying environmental sciences. The Environmental Jam will have an emphasis on using creative methods (song, animation, street art, etc) to build new ways of understanding and communicating about environmental challenges in Portsmouth and Bangladesh. As meaning is co-constructed by participants, it also decolonizes both the outcomes of the learning and the pedagogic process itself. The Jam will provide a platform to exchange and develop proposals to overcome the exclusion experienced by students of Bangladeshi heritage from studying environmental sciences. Learning will be shared by Jam participants within the local and national environmental sciences and Bangladeshi communities to ensure local impact and to promote national scale-up.

**Increasing accessibility, diversity and inclusion in environmental science degree programs**

Led by: Dr Leanne Hepburn (University of Essex)
Supported by: Professor Alex Dumbrell (University of Essex)

The environment sector is the second least diverse sector for employment, with fewer than 1% of individuals identifying as a non-white ethnicity. Yet, in addressing the key challenge the environment sectors faces – solving the climate and biodiversity crises – a more diverse opinion base is likely to drive better and more inclusive decision making and potentially will identify novel (especially societal) solutions that have previously not been considered. However, we first need to engage with underrepresented young people to support and encourage access to environmental degree programs.

We will work with In2science, UK (a charity working towards diversity and inclusion in STEM) to provide opportunities to underrepresented groups of 15-17 year olds to attend inspiring local environmental placements and work with researchers and role models within our School. We will use the specific EDI challenges facing the environmental degrees in the School of Life Sciences as an ideal model system that can be expanded to other HEIs. Our School has above average BAME representation on non-environmental bioscience degrees (63%; average entry demographics 18/19-20/21), with consistent levels of 1st generation enrolment and students from similar socioeconomic background regardless of ethnicity across degree schemes. Thus, providing an ideal case study which controls for School/University effects, and social/financial status. We will challenge the environmental belief paradox and provide empirical evidence as to why, specifically in London, UK, non-white ethnic minority young people are less likely to choose to study an environmental degree than their white peers.

**Enabling equitable cultures of knowledge and practice in physical geography and environmental sciences**

Led by: Dr Naomi Holmes (Sheffield Hallam University)
Supported by: Professor Nichola Thomas (University of Exeter)

This project seizes the moment of the publication of the new QAA UK Subject Benchmark Statement (QAASBS) for Geography Undergraduate courses which, for the first time, explicitly sets expectations about EDI and decolonial thinking into the Geography curriculum. We will support the community, across departments and career stages, to embed decolonial and EDI measures into the praxis of knowledge production and departmental cultures, and to adopt pedagogical tools and resources addressing decolonising the curriculum and inclusive practices.

Studying geography is a direct pathway into an environmental sciences career. While there is evidence of change in who studies geography in schools (particularly at GCSE) there remains

significant underrepresentation, particularly in terms of BAME groups (which is more pronounced in physical geography); with special challenges in the context of fieldwork for those with disabilities, people identifying as LGBTQ+, and people experiencing economic disadvantage. While it is one of the most gender-balanced subjects at school, this is not the case in more senior ranks.

The roots of this systemic marginalisation lie in the histories of colonialism, which is systematically tied to geography as a discipline rooted in colonial science. The relationship between making transformative EDI practices and calls to decolonise the discipline are entangled. This project tackles this challenge for physical geography, acknowledging physical geography has been slower to address the ways in which cultures of colonial science continue to shape contemporary knowledge systems, practices and exclusions.

**A scientist just like me – portraits of scientists working in the Environmental Sciences**

Led by: Professor Dudley Shallcross (University of Bristol)
Supported by: Dr Anwar Khan (University of Bristol)

A scientist just like me is a project set up by the charity the Primary Science Teaching Trust. The project is designed to inspire young learners to consider science as a career by presenting role models to them who share similar characteristics and is directed towards groups that are commensurate with EDI. 60 research scientists were recruited in the first cohort and their research, what they like about the work they do, the journey they went on to get to this point in their career, what a scientist like them needs in terms of characteristics and qualifications, as well as other interesting information are all captured in an easy to read portfolio (see https://pstt.org.uk/resources/curriculum-materials/ASJLM). The second cohort for this project is being recruited and a focus on environmental sciences has been agreed with PSTT if this project is funded. About half (~ 30) of the first cohort work in the environmental sciences and so there is already a significant group of scientists to work with. The contrast with other disciplines is important. The 30 will be interviewed to determine in more detail their journey, identify barriers, how these were overcome and provide case studies to demonstrate ways to develop an EDI enhanced cohort of environmental scientists and celebrate their contributions to their fields.
The PSTT project we will invite scientists from NERC centres, the Met. Office, Environment Agency, UK HEI environmental research groups to take part in the project providing material for the second cohort of portfolios

**Using virtual fieldwork tools to support EDI initiatives by strengthening (not replacing) in-person fieldwork activities in the environmental sciences**

Led by: Dr Derek McDougall (University of Worcester)
Supported by: Dr Simon Hutchinson (University of Salford), Dr Lynda Yorke (Bangor University)

Fieldwork is a defining characteristic of most taught programmes in the environmental sciences. However, there is a growing realisation that traditional approaches can exacerbate broader equity, diversity and inclusivity issues within these subject areas. Strategies for making fieldwork more accessible and inclusive have been proposed by various workers. Unfortunately, the potential of virtual fieldwork to support EDI initiatives by supporting (not replacing) in-person fieldwork has been overlooked by most researchers. This project seeks to redress this.

Firstly, we propose to collate and disseminate (via workshops, web resources) case studies to illustrate the advantages of using virtual fieldwork to support real fieldwork for EDI purposes. For example, students with disabilities (seen and unseen) can greatly benefit from being able to explore virtually a field site before and after real fieldwork. The use of guided virtual field trips can also

provide outreach to under-represented communities (e.g. BAME) in schools and the wider community.

Secondly, we will develop an accessible 'how to' toolkit, as well as mechanisms to support networking and collaboration for the sustainable development of these resources. A complete step-by-step, virtual field trip will also be developed and shared as a pragmatic project legacy to facilitate widening the use of virtual field work tools for great inclusion.
These resources support and empower colleagues by enabling them to design and create their own resources.

**Evaluating perceptions of job roles in marine research and raising awareness of digital twinning of the oceans to promote diversity and inclusivity in the marine sciences**

Led by: Dr Anna McGregor (University of Glasgow)
Supported by: Professor Carol Robinson, Dr Gillian Damerell (University of East Anglia), Dr Chelsey Baker (National Oceanography Centre), Mr Ben Fisher (University of Edinburgh), Dr Cecilia Liszka (British Antarctic Survey)

This proposal intends to investigate perceptions about the requirements for field-based work in marine science and increase awareness of digital twinning as a way of improving access to this discipline for individuals from historically underrepresented groups.
Fieldwork is often perceived to be a requirement throughout marine science, and offshore fieldwork is typically a way of gaining experience to be competitive in this discipline.
However, because of the close confines of a ship or research station and the time spent away from home, this experience can be limiting to those from diverse backgrounds, particularly related to ethnicity, disability, gender identity and socio-economic characteristics, and those with caring responsibilities.

This proposal seeks to gather evidence about the perceptions of fieldwork as a requirement for a career in marine science and will raise awareness of the opportunities to participate in remote fieldwork via digital twinning. We then will bring together scientists from both field-based and non-field-based job profiles for a roundtable discussion to raise awareness about the equal importance of both types of roles and generate a memorandum of understanding that outlines the trajectory of this work and commitments by scientists.

The results of both evidence-gathering and roundtable discussions will then be added to a short, self-guided interactive course on data twinning so that established scientists are aware of this perception, can find data twinning alternatives to create opportunities and learn about examples of practice to increase inclusivity for individuals unable or uninterested in fieldwork to still pursue a career in marine science.

**Addressing overlooked risks faced by researchers from marginalised groups undertaking fieldwork and proposing evidence-based changes to institutional policies**

Led by: Dr Zarah Pattison (Newcastle University)
Supported by: Dr Louise Mair, Dr Tina Sikka, Professor Peter Hopkins (Newcastle University)

Field-based environmental sciences (FBES) are key to data provision across a range of disciplines and are valuable for engaging with varied communities and landscapes. Recent years have seen an increase in the reporting of risks associated with FBES, many by researchers with marginalised identities (gender, race, ethnicity, class, disability, sexuality) who experience disproportionate prejudice, harassment, and abuse in the field. Experience or fear of prejudice may deter marginalised groups from engaging in FBES.

Existing risk assessments fail to mitigate these risks by not adequately considering the abuse faced by marginalised groups. Although institutes have some risk mitigation strategies in place, these are not consistently applied across research institutions and can meet with financial constraints from funding bodies, meaning they are not implemented. Fair and equitable access to gathering data in the field is absent, and best practice protocols to reduce risks to all wishing to participate in FBES are required for everyone in society to undertake FBES safely.

This project will highlight overlooked issues surrounding the inclusion of marginalised groups in environmental sciences and propose evidence-based changes in policies with regards to field-based research. Our objectives are to identify best practice in FBES, assess FBES policies across UK institutions, raise awareness of these EDI issues with the wider FBES community, and recommend policy changes to ensure opportunities for- and safety of- marginalised groups in FBES. By identifying issues and informing polices, we can reduce barriers facing marginalised groups, to ensure their inclusion is maximised, promoting diversity in FBES.

**Understanding the lived experiences of neurodivergent early career scientists in order to create neurodivergent inclusive workplaces for environmental sciences**

Led by: Professor Katherine Sang (Heriot Watt University)
Supported by: Dr David Woolf, Professor Teresa Fernandes, Assistant Professor Clayton Magill (Heriot Watt University)

Inequalities in science careers are well-known, particularly in relation to the under-representation of women. However other stands of inequality, including disability, remain poorly understood and accounted for. It is therefore difficult for universities to develop strategies for more accessible and inclusive careers across the natural and environmental sciences. Previous research has suggested that disabled scientists at the early career stage (PhD to postdoc, postdoc to first lectureship) are particularly concerned at a perceived lack of career opportunities, including inaccessible laboratories and field work sites, but also general access to facilities and adequate means of engagement, which often are not understood and addressed.

This project aims to address this gap by undertaking a series of workshops with neurodivergent early career researchers to understand the challenges they have faced (and still do), and to co-design a set of strategies for more neurodivergent research careers across the remit of the environmental and natural sciences. Central to the project is ensuring that neurodivergent researchers are able to participate in the research in a way which most accommodates their needs. As such there will be synchronous and asynchronous methods to account for impairment effects such as fatigue, sensory overload and social anxiety. The project is rooted in the social model of disability which recognises that neurodivergent researchers are disabled by neurotypical working environments. The co-designed strategies will be disseminated via mixed media, including a report and a video of the project findings ensuring that findings are presented in an accessible manner.

**Challenging individuals, evolving teams and changing cultures to showcase environmental science research careers as open to all**

Led by: Dr Kathrine Yates (University of Salford)
Supported by: Dr Danielle Hinchcliffe, Professor Angela Lee, Dr Richard Armitage, Dr Robert Jehle, Dr Ursula Hurley, Mr Luke Dudley, Mrs Susan Clark, Ms Tara Leach (University of Salford), Dr Thomas Smyth, Dr Robert Allan (University of Huddersfield), Dr Kathryn Arnold, Dr Tamsyn Kiss, Dr Marco Sakai (University of York)

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Our Vision is of HEIs that actively portray diverse Environmental Scientists' identities, providing access to a variety of role models and encouraging students to see environmental science research careers as open to all. Currently academic teaching staff on Environmental Science programmes are overwhelmingly White and this lack of representation is compounded by known biases in academic publishing that favours White authors.

Whilst changing the composition of university departments and reducing the Whiteness of Environmental Science is the goal, it will not happen quickly. Immediate efforts are needed to both challenge the status-quo and showcase the diversity that does exist.

Our aim is to address the current lack of representation and diversify the Environmental Scientist Researchers that university students **experience.** People make change. Thus, we are focusing on people with a two-pronged approach: motivating change through disruptive intervention and providing resources to accelerate change. Resources will include: searchable database of self-identified Black Asian and Minority Ethnic environmental scientists; research case studies for teaching; invited speakers (filmed); researcher profiles and other short films. Concurrently, these resources will raise the profile of environmental scientists from minoritised groups. All resources, including database and workshop report, will be made freely available to facilitate enhanced diversity across the sector.

Success will be deep, permanent change within individuals, a legacy that far exceeds individual operational or procedural initiatives. These impassioned individuals will go on to set the tone within teams and organisation, to advocate for more diverse cultures, promote BAME researchers and encourage use of diversification resources.

## Digital technologies to open up environmental sciences

**High resolution 3D virtual geological outcrops, increasing accessibility to geological field skills**

Funded through: EDI Digital Sprint
Led by: Dr Anne Jay (Open University)
Supported by: Dr Marcus Badger, Dr Victoria Pearson (Open University)

Traditional geological fieldwork involves studying outcrops of rock in physical landscapes. Despite recent acceptance by many that field skills are a barrier to inclusion traditional fieldwork remains recognised as an important part of geological education and understanding, for students, professionals, and researchers.
However, fieldwork in the real world can be:

- impossible or difficult for many with disabilities (physical, mental and emotional)
- inaccessible or impractical for those with caring responsibilities
- in isolated or remote locations that demand substantial travel and unequally exposes participants to risk
- expensive

Virtual outcrops or field work should be able to overcome these barriers, but current virtual outcrops fail to replicate an authentic field experience, and do not take full advantage of a digital environment because they are either a passive video, a single 360 degree image, or a low-resolution 3D field area that the student can move around in. The problem with these is that although gross structure is visible, they lack the multi-scale experience essential to geological field work as zooming is possible but limited by the resolution of the original.

This project will pilot the development of a true multi-scale digital landscape for field learning. Multiple overlapping photographs can be turned into a 3D version of a geological outcrop. By creating multiple versions of these at different scales it will be possible to create a single digital 3D outcrop that allows seamless zooming right into the rock face so the rock type can be identified. Integrated with high quality teaching material these outcrops can allow anyone to experience realistic fieldwork from outcrops all over the globe

**'FindAScienceBerth': connecting underrepresented groups in marine science with available berths on scientific research vessels**

Funded through: EDI Digital Sprint
Led by: Dr Anna McGregor (University of Glasgow)
Supported by: Dr Katharine Hendry (University of Bristol), Dr Katrien Van Landeghem (Bangor University), Dr Alice Marzocchi (National Oceanography Centre), Ben Fisher (University of Edinburgh), Madeline Anderson (University of Southampton), Dr Siddhi Joshi, Katie Sieradzan (Bangor University), Dr Sophie Fielding (BAS), Dr Eleanor Darlington (National Marine Facilities)

The Challenger Society for Marine Science (the UK's main professional society for marine science) recently conducted a survey of its members, revealing that of those surveyed 92% identified as being from a white background compared to 86%of the population of England and Wales, while 38% identified as female compared to 51% of the general population. This disparity in both racial and gender representation suggest that marine science is a discipline lacking in diversity, partially through lack of access to practical experience.

With the aim of breaking down that barrier to diversity, this project proposes to build a web-based add-on software application called 'Findascienceberth.com' (FASB) that advertises available berths on scientific vessels out width the current networks aware of these available positions. Because much of marine science is conducted from large, oceangoing and expensive research vessels, the ability to connect with this work from outside one of the limited number of marine science institutions is very valuable and would benefit potential participants looking to gain seagoing experience while working on other projects so that they may be better equipped to pursue a career in this discipline. After development of this application and integration with the existing software used to organise seagoing research vessels, this project will design selection criteria and a monitoring scheme to enable those from underrepresented or disadvantaged backgrounds to fill these available berths and have the chance of participating in research cruises.

In order to publicise the application widely, this project will organise and deliver three outreach events during the pilot phase of the project. The goal of these sessions is to raise awareness of FASB by providing details on the aims, structure and benefits of FASB and answering any questions that future users of the system may have. Successful participants on the project will be asked to write a personal account of their involvement, to be showcased to future applicants from diverse backgrounds and encourage them to consider a career in marine science.

**GeoCoLab**

Funded through: EDI Digital Sprint
Led by: Dr Rebecca Williams (University of Hull)
Supported by: Dr Katherine Davies-Vollum (University of Derby), Dr Brian Thomas (Newcastle University), Dr Clare Bond (University of Aberdeen), Edward Lewis (British Geological Survey), Alice Butcher (The Natural History Museum), Dr Murina Raji (University of Hull), Dr Elliot Carter (Trinity College Dublin)

Natural Environment Research Council

The foundations of a discipline shape the way in which knowledge is created, by whom, for what, and dictate who is allowed to generate knowledge. Geoscience as an academic pursuit was born from colonialism, allowing for Western knowledge and scientists to dominate the discipline. This manifests in a number ways. In the Global North, there is a lack of diversity in those who pursue geoscience research, and marginalised researchers struggle to access quality mentorship, funding, networks and opportunities. They are more likely to be prevented from career progression and development and ultimately, leave their geoscience careers. However, the Global North dominates geoscience knowledge production. Geoscience publications regardless of the country in which the study is based, are mainly authored by scientists in the Global North and men from the Global North are disproportionately awarded Society honours and medals. The end result being that geoscience research is created by and for a small subset of the global population (white, cisgender, straight, able-bodied men in the USA, UK and Europe).

Geoscience research is essential to solving society's grand challenges. These global challenges require global solutions. Much geoscience research relies on funding to access analytical facilities to create the most fundamental datasets. During the 2021 NERC Digital Sprint we investigated inequities (in the UK and globally) in access to these facilities and the creation of and publication of analytical geoscience research.

An analysis of a global database of geochemical research (PetDB) found that the USA, UK and Europe produced the largest research output, but predominantly on samples from other countries. Less than 30% of this research involved local researchers. We conclude that parachute science is observed in igneous geochemistry and leads to inequities in published
research in this field. In this project we will expand this analysis to all global geochemical databases. We infer that this is an issue in the broader field of analytical geoscience.
An online survey of geoscience researchers identified an 'access gap' to analytical facilities. We reveal that some groups have preferential access to analytical facilities and associated funding and that those with minority identities in the UK and those from the Global South are more likely to be excluded from access to analytical facilities. The 'analytical facilities
access gap' disproportionately affects both minority researchers in the UK and those in the Global South, and it goes on to negatively affect success and retention in research impacting diversity in geoscience. In this project we will expand the reach of our online survey to include a larger, international sample size.

Our proposed digital technology solution to this EDI problem is an online collaborative research platform that aims to reduce inequities in geoscience research by closing the identified 'access gap' in analytical geoscience research. GeoCoLab 'match-makes' underserved Geoscience researchers (e.g. unfunded ECRs; minority researchers; those from the Global South) who need access to analytical services, with Collaborating Laboratory facilities who have agreed to offer a quota of pro-bono services. We will develop this platform with project partner the British Geological Survey. We will partner with UK analytical facilities, enabling those facilities to meet their own EDI strategic aims and opening new global collaborations.

GeoCoLab will lead to better support for currently underserved researchers, more equitable practises, greater representation of minority and Global South researchers in analytically-based geoscience publications, thus leading to better retention and recognition of historically excluded groups.

**CULTIVATE**
Funded through: EDI Digital Sprint
Led by: Dr Lynda Yorke (Bangor University)
Supported by: Dr Simon Hutchinson (University of Salford), Dr Elizabeth Hurrell (University of York)

February 2022

Natural Environment Research Council

Equality, diversity and inclusivity affects us all. In environmental sciences, a large part of our students' studies or academics' jobs involves being outside, in often physically demanding environments. These environments are seen as not being for all, whether that is due to the steep mountain sides or the lack of people of colour in the images we see of the countryside. Our project, CULTIVATE, wants to change how people see and interact with the environment. We want to work with everyone from schools up to universities, professionals and professional bodies in the environmental sector.

The pandemic has seen a digital revolution in our classroom teaching, that has transformed how students have been enabled to engage with their studies and their environments using a variety of online, digital and virtual approaches.

CULTIVATE wants to grow a better environment for everyone in environmental sciences. By providing the digital tools and resources to embed inclusivity in our teaching and research, and creating a community for teachers and educators, researchers and students, and the general public to interact and share knowledge on their best approaches to making the environment a place where everyone can experience it. We want to show that there are no barriers to studying the environment and sharing the digital tools to make that possible, and to transform how we teach, how students learn, and how the great outdoors is for everyone!

To be able to do this, we are asking two very simple questions:

1. How can digital technology make field work inclusive?
2. What can we do to help environmental sciences educators include the principles of equality, diversity and inclusivity in their teaching?

CULTIVATE aims to bring together people from within and outside of education and environmental sciences to work on this project to build a community that works together to achieve the same goals of an opening up environmental places and spaces. We will share our outcomes via a website, a booklet, and through storytelling. This a project for the community by the community.

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