Sustainable Earth Institute

RESEARCH EXPERTISE
SUSTAINABLE EARTH INSTITUTE

The Sustainable Earth Institute is about promoting a new way of thinking about the future of our world. We bring researchers together with businesses, community groups and individuals to develop cutting-edge research and innovative approaches that build resilience to global challenges. We link diverse research areas across the University including science, engineering, arts, humanities, health, business and education.

If you’re an academic looking for a connection to industry, an organisation looking for academic research support or an individual who is inspired to work towards a sustainable future then contact us to find out how we can help.

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Researchers in science and engineering are investigating community resilience in remote mountain communities in Austria.

Biogeochemistry and environmental analytical chemistry

Biogeochemistry is a scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment. In Plymouth, we have a long established, internationally recognized, active research programme to understand the environmental behaviour, fate and impact of nutrients, organics and metal contaminants on land, in the air and in the aquatic environment. These studies contribute to decision support tools for environmental management. The group have an ISO-certified Consolidated Isotope Facility (for the analysis of natural and enhanced radioactive materials and applications of radioactivity in material analysis), and state of the art analytical instrumentation to determine nutrients, organics and trace metals in all environmental matrices.

Coastal, ocean and sediment transport

This area of expertise includes a team of coastal and ocean engineering researchers who carry out both fundamental and applied research which is focused firmly on major problems facing society regarding rising sea levels, flood risk, and marine renewable energy. Research also includes hydrodynamics, coastal structures, sediment dynamics, port engineering and artificial intelligence applied to coastal engineering.

Earth sciences

Plymouth University brings together an outstanding research team that spans the spectrum of Earth science disciplines. The team researches key Earth science issues that are of broad concern to society. For example, plate tectonic processes that impact upon the shallow subsurface, controlling natural resources and natural hazards, understanding the environmental factors that caused past extinction events in order to provide important insights on how to tackle present-day environmental challenges (such as climate change), as well as ways of mitigating and managing environmental damage.

Ecology, behaviour and evolution

Ecology is a broad discipline dealing with the interactions and interrelationships between organisms and the environment, tackling big questions, such as what determines the number of species in natural ecosystems, why most species are rare, and how biodiversity may contribute to ecosystem function. Whilst working on a wide range of questions, organisms and ecosystems, an over-arching theme within this area of research is that fundamental and applied approaches to ecology can be closely linked.

Engineering and society

Research in this area is concerned with the interface between engineering and the wider social, environmental and political contexts in which it is situated. Current work is focused on UK strategic needs that would benefit from an analysis of the cross-over between engineering and society, and hence focused both on the impact of engineering solutions on society and the impact of society on the success of engineering solutions.

Catchment and river science

This area of research undertakes research relating to environmental processes within catchments and river systems, and stresses the importance of linkages between hydrology, geomorphology, hydrochemistry to river health and ‘source-to-sea’ understanding of the aquatic system. Understanding such processes, over short and long timescales, is a necessary step towards creating catchments and rivers that are resilient to environmental change (e.g. increased frequency of extreme storm events) and that maximise the value of ecosystem services for society.
Quaternary environments
This cluster of expertise focuses on researching into past global environmental change through linking the biological and physical sciences, along with science-based archaeology. A major focus of recent research has been the improved understanding of rapid environmental transitions, notably during periods - such as the Late-Glacial/Holocene transition - when the Earth System has readjusted to abrupt climatic shifts. Another key period is the late Holocene, whose study allows actual and projected 21st-century warming and sea-level rise to be put into a longer context. Researchers in this area undertake international projects around the world including the USA, Canada, New Zealand, Turkey, Spain, Morocco, SW Africa, Argentina, Chile and in the UK.

Environment, development and governance
Research in the group focuses on the complex interlinkages between environmental problems caused by human actions, development challenges in both the developed and developing world, and issues surrounding governance structures at various scales and in different geographical settings. Researchers in this area have strong links with several universities in the UK and with many international institutions in countries including Austria, New Zealand, Thailand, Singapore, the USA and Australia, and have received grants from ESRC, NERC, AHRC, the European Commission, the Leverhulme Trust, British Academy and the Nuffield Foundation and from other national and international research funders.

Society, culture and mobility
Research in this area draws upon and contributes to geographical thinking to provide an understanding of issues affecting contemporary society, such as: social and cultural geographies of artistic and everyday practices; the use of urban public spaces; citizenship; rural life; transport and travel; and the relationship between the armed forces and society. Current and recent projects have been supported by grant funding from the Economic and Social Research Council, the European Union, the French National Research Agency, the Royal Geographical Society (with IBG), the British Academy, the Leverhulme Trust and the UK Government.

Environmental science
Environmental sciences offer research into the sources, fate and behavior of chemicals in the environment, marine eco-engineering and ecology, and upland catchment management. This area has well developed research and work placement links with the environmental sector and successful, professionally accredited programmes at both undergraduate and postgraduate level.

Interactive Systems Studio
The Interactive Systems Studio is an open research and development studio, which investigates current technologies, platforms and working processes to innovate in the field of interactive systems and 3D environments. This ranges from entertainment systems on mobiles right through to serious games simulations, virtual and augmented reality environments. The team investigates new approaches and develops real world solutions both for undergraduate programmes and working in collaboration with external partners. The studio are members of TIGA, the industry trade body for the UK games industry.

Marine and coastal policy
Research in this area focuses on the science-policy interface, where natural, social and economic sciences meet. The aim is to develop an innovative interdisciplinary approach to marine and coastal management and conservation that provides crucial information that can be fed into the political decision making process. This area of research has four research themes which include: marine and coastal governance, conservation, ecosystems services and economics, and society and the sea.

Marine biology and ecology
This research address a broad range of research questions, from the effects of environmental stress on microbes and developing embryos to the management of large scale impacts, such as global climate change. Although this research has a marine biological focus it also draws on ideas and theories from other realms. This area has six research themes including: animal behaviour, ecology and conservation, ecophysiology and development, marine pollution, resources management and marine vertebrates.

Petroleum and environmental geochemistry
Environmental organic geochemistry is a scientific discipline used in understanding the impact of organic material on the environment. Some key areas of research in Plymouth University include the fate of pharmaceuticals and plastics in the environment, and the environmental toxicology of petroleum hydrocarbons. The group has strong links with Universities in France, Netherlands, Canada, Australia, Germany, USA, Ireland, Russia and Portugal. Examples of recent research include identifying a marine pollution spill in San Francisco Bay, characterizing and quantifying plastic microbeads from cosmetic products and developing a cost effective and environmentally sustainable soil for the Eden project.

Environment, food and biotechnology
The United Nations, the Organisation for Economic Co-operation and Development and national governments recognize the importance of research and education to address the global challenges posed by energy, food, minerals and water security. This area of expertise at Plymouth University draws together a multi-disciplinary team of experts in environmental analysis, biotechnology, food science, ecotoxicology, nanotoxicology and risk assessment. Current research projects are funded by BBSRC, NERC, the European Union, UK government, international philanthropic organisations and industry.
Professor Jon Shaw is the Associate Head of School (Geography) for the School of Geography, Earth and Environmental Sciences. Jon has a BSc (Hons) in Geography, a PG Dip in Social Science Research, a PhD in Human Geography and is a Fellow of the Royal Geographical Society.

Jon has come full circle in his career – starting out gaining a BSc (Hons) in Geography from Plymouth University, he then spent time in America, Scotland, Australia and Germany, before returning to Plymouth in 2006 and gaining professor status in 2008.

Jon’s research work has a common thread of transport policy. Together with Dr Andrew Seedhouse from South West Smart applications Ltd, they have been awarded more than £4m of government funding for the nationwide introduction of smart ticketing (similar to the Oyster Card). Now almost all the buses in the South West England have been equipped with ticket machines compatible with smart ticketing, and an increasing number of smart ticketing options are starting to appear. This work was judged as a 4* Impact Case Study in the 2014 REF.

Jon’s latest book, *The Transport Debate*, written with Professor Iain Docherty of Glasgow University, takes a completely novel approach to analysing transport issues, taking as its starting point the journeys – the very aspects of the transport system with which we are all most familiar – made by ‘Motorway Man’ Paul Smith and his family. The Smiths’ experiences during the commute, the school run, the business trip, the family visit and the summer holiday, reveal the many shortcomings, occasional successes, and various opportunities for improvement evident in UK transport policy.
HEALTH, HUMAN SCIENCES, MEDICINE AND DENTISTRY

A research collaboration between the School of Nursing and Midwifery and Peninsula Dental School investigated dental practices and their approach to sustainability, with a focus on procurement and waste processes.

Dietetics, human nutrition and health
The dietetics team has a strong background in research and the team are working on diverse themes, including: clinical nutrition; professional education and communication skills; promotion of nutritional health in communities; paediatric dietetics; and nutrition from childhood through to older age. An example of recent research promoting social sustainability, is the ‘Food as a Lifestyle Motivator’ (FLM) project which explores the use of creative methods to engage ‘marginalized’ communities in food activities to enhance their health, well-being and life skills. Further pedagogic research is currently underway to scope the importance of ‘sustainability principles’ for dietetic practice and how this can be better streamlined into the dietetic curriculum.

Psychology and sustainability
This area investigates how humans affect the environment and how the environment can affect us, using a behavioural science perspective. The two main research interests are ways to increase sustainable behaviour in individuals and the influence the environment, in particular the marine environment, has on our health and well-being. Researchers in this area have a very interdisciplinary approach, with members from various areas of psychology as well as members from other fields and institutions. The group has a strong track record in studying energy demand reduction, specifically focusing on householder understanding and behaviour. For example, projects funded by the EPSRC and H2020 have used energy visualisation such as thermal imaging and virtual environments / gaming. Other work has focused on marine litter and ocean microplastics.

Sustainability, society and health
This area explores issues and seeks solutions to the challenges that climate change, fossil fuel dependency, food security and other threats to sustainability present to society and health. Topics in this area include: building sustainable and resilient healthcare systems, reducing healthcare waste, using IT to reduce the carbon emissions of healthcare facilities and using outdoor space for health and wellbeing.

Clinical trials and population studies
With an ageing population and increasing obesogenic disease (diabetes, cancer, CVD, Stroke) the sustainability of health care as we know it is under threat. Expensive technologies save lives and add quality of life but also place huge burden on our health and social care services. Researchers in CTPS conduct large trials and systematic reviews funded particularly by the NIHR to seek ways to promote healthy living which can prevent a wide of chronic diseases, or delay the need for health and social care. Other strands of research seek to improve collaborative care, disinvestment in inefficient health care technologies, and early detection of disease to reduce complications.

Dentistry research
Research in this area covers basic science, oral and dental health-related science as well as key themes in dental education and clinically related research. Plymouth Dental school offers outstanding opportunities for graduate research in well-equipped laboratories and clinics as well as a unique and flexible approach to learning. Research in this area is delivered according to the Dental School values of working in partnership with patients, public, health care providers and policy makers, to undertake research that makes a real difference in the real world.
FEATURED RESEARCHER: PROFESSOR JANET RICHARDSON

Professor Janet Richardson is a Professor of Health Service Research within the School of Nursing and Midwifery. Janet has been a member of numerous editorial boards including the Journal of Alternative and Complementary Medicine Research, Evidence-Based Integrative Medicine (New Zealand) and the National Library for Health Complementary and Alternative Medicine.

Janet’s research interests are primarily focused on sustainability in society and health and evidence-informed decision-making in health care. A recent project Janet has been the driving force behind is ‘Nursing Sustainability by Design’. This project confronts challenges in the health sector through an interdisciplinary teaching approach that brings together students from nursing and the health professions with their contemporaries in 3D Design. In 2014 this work won a national Green Gown Award which recognises the exceptional sustainability initiatives being undertaken by tertiary education.

A project that has involved collaboration with international partners is NurSus. The project will enhance the sustainability literacy and competency in nursing education through the development of a teaching and learning resource, the NurSusTOOLKIT (www.nursus.eu). The £359,039 project is funded through Erasmus+ and involves Plymouth, Esslingen (Germany), Jaen (Spain) and Maastricht (the Netherlands) universities.
Culture, community and society

This research team focuses on issues related to culture and community with respect to health and education. Some core areas of research include: creativity and well-being, communicating environmental sustainability, early childhood, equality and learning through the life-course and rural issues and community. The team edits the international peer-reviewed journal Environmental Communication - this is published by Routledge and the official journal of the International Environmental Communication Association. An example of recent research is the “Beating the microbead” project which provides an in-depth examination of people’s awareness, attitudes and action in relation to microbead pollution.

Environment and marine law

With close links to regulatory bodies, academic networks and local practitioners, research within the Environment and Marine theme complements the wider research strengths of the University and is both interdisciplinary and applied in its focus. Leading edge work from contributors to the theme has informed policy and practice within regulatory bodies including Heritage England and the Devon & Severn Inshore Fisheries and Conservation Authority. Additionally, advice provided to Government departments and work with third sector organisations including wildlife bodies, such as Wild Futures and heritage bodies such as the Nautical Archaeology Society and the Maker Trust ensures an applied and practical dimension to our work. Practical application of research into the natural and built environments both on and offshore is group’s primary focus so as to contribute to effective and visible contribution to wider environmental sustainability and resilience.

Sustainability and surfing

Research in this area explores the key challenges relating to sustainable development and surfing. Whilst evidence of the impacts have increased in recent years very little research has been conducted in this area. Researchers adopt a sustainable development perspective that explores the interconnections between the economic, social and environmental dimensions of surfing. Areas of interest include: sustainable development governance of the surfing world; sustainable tourism; transformations within the industry; market transformation; behavioural change and technological advancement.

Sustainable leadership, governance and policy

There are six key themes within this research area: governance, decision making and risk, human resources and leadership, international business, politics and international studies as well as social and public policy. Research undertaken closely identifies with sustainable governance and leadership as well as impacts of policy on the economy, community and organisational activity. Researchers exemplify strong interdisciplinary links within the social sciences and areas of interest include: the single market and European politics, foreign, public and social policy as well as normative and instrumental issues regarding global, national and regional policy impacts on business. Researchers in this area are involved with a range of organisations in the public, private and third sectors.
FEATURED RESEARCHER:
PROFESSOR ALISON ANDERSON

Professor Alison Anderson is a professor of sociology in the School of Law, Criminology and Government. She is also an Adjunct Professor in the School of Social Sciences at Monash University. Alison has a BA (Hons) in Sociology from the University of York and a PhD from the University of Greenwich.

Alison holds various roles on external bodies including being the Editor-in-Chief of Environmental Communication, the official journal of the International Environmental Communication Association, a board member for the International Environmental Communication Association and a member of the International Advisory Board for the International Journal of Climate Change: Impacts and Responses.

Alison’s research expertise is in the area of science communication including mass media and culture, risk, nanotechnologies, marine pollution and environmental sustainability. In her most recent book, Media, Environment and the Network Society, Alison discusses the news media and how it has become a key stage for environmental conflicts. Through a series of examples from climate change to oil spills, this book provides an analysis of media politics and environmental debates.
Sustainability education

The UN Global Action Programme on Education for Sustainable Development (ESD) has highlighted the importance of developing more interdisciplinary, active and participatory pedagogical approaches within ESD, and the need for pedagogical research that provides a deeper evidence base of the impact and outcomes of such approaches. Towards this aim, the Centre for Sustainable Futures in PedRIO, and in collaboration with the Sustainable Earth Institute, links staff and students seeking to develop and improve the quality of Sustainability Education, through pedagogical research, research events, and services.

Learning outside formal education

This area of expertise brings together researchers with shared interests in education and culture, outdoor learning, community-based learning, work-based learning, learning in the home, informal learning and learning through volunteering and activism. A key focus is how bridges can be made between these forms of learning and Higher Education, in order to foster social justice and widening participation.

Outdoor and experiential learning

Based at the Plymouth Institute of Education, the outdoor and experiential learning team are part of a growing movement that aims to get people of all ages outside in ways that will benefit their learning, health and wellbeing. They welcome all with a practical, research or recreational interest in the outdoors, and hope you enjoy taking part in our activities. Research in this area looks at learning outside the classroom, learning outdoors and elsewhere, informal and non-formal learning contexts, distinctions between outdoor learning and outdoor education, fieldtrips and technology and sustainable education and communities.

An exciting co-curricular programme ran in June 2016 by the Centre for Sustainable Futures for undergraduate and postgraduate students. The week-long programme explored what it means to be a ‘global citizen’ in the 21st century and focused on personal development in the following areas: awareness, knowledge, skills and contribution.
FEATURED RESEARCHER: PROFESSOR STEPHEN STERLING

Stephen is Professor of Sustainability Education in the Centre for Sustainable Futures (CSF) at Plymouth University. A former Senior Advisor to the UK Higher Education Academy on Education for Sustainable Development (ESD), and National Teaching Fellow (NTF), he has worked in environmental and sustainability education in the academic and NGO fields nationally and internationally for over three decades, including as a consultant and advisor on UNESCO’S education for sustainable development (ESD) programmes.

His research interests lie in the interrelationships between ecological thinking, systemic change, and learning at individual and institutional scales to help meet the challenge of accelerating the educational response to the sustainability agenda. His work at CSF includes leading the research team on sustainability education, and developing strategies to support curriculum change across the institution, and he is also chair of the university’s Sustainability Advisory Group.

Stephen’s book (with David Selby and Paula Jones, 2010), Sustainability Education: Perspectives and Practice Across Higher Education was acclaimed by the University of Cambridge Programme for Sustainability Leadership (CPSL) as one of the ‘Top 40 books of 2010’. This was followed by ‘The Sustainable University: Process and Prospects’ (Routledge 2013) which was partly based on Plymouth’s sustainability work. He was commissioned by UNESCO to write one the three papers informing the UN high-level World Conference on Education for Sustainable Development, November 2014, and is currently co-chair of the International Jury for the UNESCO-Japan ESD Prize. His latest book ‘Post-Sustainability and Environmental Education: Remaking Education for the Future’ will be published by Pivot/ Palgrave in early 2017.
3D design
Research in 3D design is conducted with and for people, products, places and their interactions. Researchers work with a variety of organisations to provide fresh perspectives on real-world issues. Research in this area covers a wide variety of practice-led activity, delivering new design solutions for community, cultural policy and environments. It contributes to new knowledge in human experience, agency, identity, architectural theory and design knowledge, as constructed and understood through artefacts, exhibitions, literature and interventions.

Architecture
Cities are the sites of global challenges that demand local change. At Plymouth University urban challenges are being addressed through collaborative approaches to research. For example we are working with local villages in Cornwall to look at how superfast broadband can support social inclusion and more sustainable communities, and a project in Plymouth is working with housing providers to reduce energy consumption through the use of a game platform for householders.

Arts Research Collective
The Arts Research Collective actively promotes research developed around, from, and within, the processes of artistic production. A core aspect of the collective is an artist residency programme and regular group discussion of work in progress. The aim is to provide a supportive environment where PhD students, post-docs and researchers carry out art practice led projects that test experimental and innovative ideas as a platform for future development and collaborations.

English and creative writing
Researchers in the environment cluster within English and Creative Writing team have expertise in issues including the concept of sustainability, the representation of community, the relationship between local and global, the history of landscape, and ecology and the sea. These interests inform their teaching and their work across a range of literary modes, including environmental criticism, poetry, journalism, nature writing and fiction; and this work reaches both interdisciplinary scholarly audiences and the general public.

Environmental building
The main research concentrations of this area are in the fields of building science and technology and construction management. Individual researchers also provide excellent contributions in fields like construction law and sustainability literacy. Projects deal with a breadth of sub-topics, like for instance thermography, laboratory and in-situ measurements of thermal and humidity properties of building materials, building performance simulation, off-site construction, low and zero carbon technologies, Post Occupancy Evaluation, building operational conditions and control and values and attitudes regarding sustainability.

i-DAT
i-DAT is an Open Research Lab for playful experimentation with creative technology.
i-DAT co-creates and shares technological prototypes and practices, that push and challenge the boundaries of digital arts and creative media practice. Their main focus is on making ‘data’ tangible, playable and readily available as a material, to generate new meaning and inform participation, audience engagement and innovation in the arts. i-DAT also manages the development of the Immersive Vision Theatre, delivering shows, productions and research into immersive fulldome environments.

Land, water and visual arts
This research area consists of artists, writers and curators who embrace a diversity of creative and critical practices. It operates as a forum for interrogation of nature and culture, aesthetics and representation. Researchers generate work that addresses a range of issues which include environmental change, sustainability, journey, site and regional specificity.

Kelly Soper is an artist and a graduate of Plymouth University who researched our relationship with, and the decline of bees. This artwork, titled Parasites, represents the poisoning effect pesticides have on bees and the attack of the Varroa mite. Kelly said “I read that if a human being were to carry the equivalent of the Varroa mite around on their backs all day, it would be like carrying a blood-sucking monkey, slowly pumping you full of deadly viruses. I attached figures onto the honeybees, riding them like parasites.”
FEATURED RESEARCHER:
PROFESSOR STEVE GOODHEW

Steve is a Professor of Environmental Building in the School for Architecture, Design and Environment. Steve is a Fellow of the Royal Institution of Chartered Surveyors, the Chartered Institute of Building, the Royal Society of Arts and the Higher Education Academy. He is a drafting member of ISO 9869 “Thermal insulation - Building elements - In-situ measurement of thermal resistance and thermal transmittance”.

Steve is an expert in the use of thermography and its use in relation to improving the building performance of homes and commercial properties. He also works in the areas of sustainable construction materials, thermal measurements and wider issues in relation to the energy use in buildings. His research interests include building science/physics, fire in buildings, sustainable construction, in-situ thermal measurements of building materials, earth buildings, and moisture monitoring.

Steve has been the lead for a piece of research which links health, clinical expediency and building physics. James Melcalfe, Paul Moor and Matthew Boyd have supported Professor Steve Goodhew and Professor Janet Richardson in an on-going project that is designed to assess the impact of the built environment upon the possible reductions in patient core temperature. Low core temperature can cause complications in surgery and in extreme cases cause cancellations, with risk of fatalities in operations.

The ward environment and patient journey between a ward and operating theatre have been investigated in Derriford Hospital, Plymouth. Air temperature and humidity have been monitored over many months, and the immediate thermal impact of the patient journey has been investigated using a bespoke trolley with sensors, alongside thermographic surveys along the route to the operating theatre.

The work has currently shown that whilst the air temperature is consistently within acceptable limits on the ward, the impact of cold surfaces in certain positions may have ramifications for varying patient core temperatures.
SUSTAINABLE EARTH 2016
23 AND 24 JUNE 2016

Sustainable Earth 2016 was a two day event for researchers, businesses, community groups and individuals to come together to hear inspirational speakers and join in with creative workshops designed to spark and encourage collaborations for a sustainable Earth.

The event featured two days of key note speakers including Sir Mark Walport (UK Government Chief Scientist), Wendy Darke (True to Nature Ltd, former BBC Natural History Unit), Craig Bennett (CEO, Friends of the Earth), and Anthony Hobley (CEO, Carbon Tracker), as well as presentations from University researchers and external organisations.

Over 230 delegates attended the event to hear the key note and plenary speakers which included representation from the Salvation Army, Plymouth Energy Community, Westcountry Rivers Trust, Langage Farm and University of Iceland. Over 30 organisations presented at the 48 marketplace sessions held to encourage discussion and share knowledge.

More information about the event, including videos and presentations can be found on the website: www.plymouth.ac.uk/research/institutes/sustainable-earth/sustainable-earth-2016.
The University is committed to providing information in accessible formats. If you require information from this guide in an alternative format, please contact:

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