



# Sustainable Places Research Themes: Co-evolving interactive systems

Our researchers explore the relationship between ecological systems and social processes across different temporal and spatial scales, examining the ways in which place-based sustainable futures can be created in the context of global environmental change.

The 'places' we study emerge through interactions between four interrelated systems and processes:

- physical (landscape)
- ecological and ecosystems
- technical and built
- social and governance

Integrative research that takes account of the evolving relationship between all four systems is lacking. Our programme is developing theoretical models and analytical frameworks to better understand the co-evolving relationships between all four systems and processes.

Specifically, it examines the relationship between natural and physical change, their likely ecosystem consequences, and how societal responses both shape, and are shaped by, governance arrangements and the technical and built infrastructure.

Going from theory to practical engagement, our work explores specific places, including urban, extra-urban and human modified rural and forested landscapes and including coastal regions.

## Ecological restoration

Ecological restoration has taken on new policy significance in the face of climate change and biodiversity loss. This new area of research is investigating what ecological restoration can do to promote both social and ecological improvements and influence governance arrangements. Using case studies drawn from soil restoration practices on the Aran Islands and Iceland, community led forest restoration initiative in Borneo, Malaysia and from the EU Life funded Vindel River in Northern Sweden, research will be used to build new criteria for evaluating the success of ecological restoration.

## Projects contributing to this work

**Kinabatangan:** Building upon our earlier work in the Lower Kinabatangan floodplain, Sabah and with the support of Cardiff University's Danau Girang Field Centre, our research focuses on restoration initiatives focusing on societal participation, governance enforcement and capability and economic impacts, alongside environmental physical science, ecology and biodiversity. From a natural sciences perspective, this research examines fragmented forest ecosystems, their viability and interactions with dramatically altered rural landscapes – especially that produced by oil palm monoculture. Our research provides new opportunities to carry out parallel analysis on soil stability, erosion, sediment transfer processes and related far-field marine (reef) impacts. From a social science perspective, we are evidencing the socio-economic multiplier effect of community forest restoration initiatives and their social impacts.

**Brecon Beacons National Park:** A collaboration between the Institute and the Brecon Beacons National Park, this place-based research focuses on spatio-temporal changes in biodiversity within the Fforest Fawr Geopark. Enhancing the Park's Management Plan and increasing resilience to future stressors, this research is analysing the landscape and its biodiversity and the impact of tourism throughout the Park.

**Venda, South Africa:** Our research in the Vhembe Biosphere Reserve explores the role of local and indigenous knowledge for understanding environmental and social change in sacred forests, as well as identifying the threats and provisioning ecosystem and cultural services of indigenous tree species. We adopt an interdisciplinary perspective to explore the utility of integrating indigenous knowledge, ethnobotany, participatory mapping and species distribution models to inform forest conservation and restoration efforts on communal land.

**Ecological Restoration and Building Sustainable Communities:** Our research in this research domain is currently represented by a PhD project funded by ESRC and the Scottish Forestry Trust, focusing on how community led restoration in Scotland may improve understanding of ecosystems and develop human relationships with nature.

**Biodiversity and the Sustainable Management of Natural Resources:** Working together with RSPB and Bridgend Council, we are exploring how Area Statements proposed under recent Welsh legislation, can be an effective means of ensuring that Wales meets its biodiversity objectives. The research will provide recommendations on what needs to be incorporated into the development of Area Statements to ensure biodiversity is considered fully and appropriately at local and national scales.

**Land2Coast:** Is it possible to incorporate sea and land borne impacts in coastal zone management? Policies addressing land use, coastal zone food security and marine conservation are fragmented and institutionally uncoordinated, unable to address the linkages and interplay between these dynamics. Our research addresses this gap by conducting an assessment of private and public governance operating across land and marine sectors to identify integrated pathways for management actions that address impacts on land based-economic development, fisheries management, livelihoods and conservation.

**Seagrass as Coupled Socio-ecological Systems:** Seagrass meadows provide an excellent model system for studying clear social-ecological interactions. Seagrass is a widespread yet underappreciated habitat globally that is suffering increasingly from degradation. Our work focusing on monitoring, education and restoration of these vital habitats aims to protect the myriad of ecosystem services they provide including their significant role in food security and carbon sequestration. Our work takes place in multiple locations with active study sites in Europe, SE Asia and South America.

**Ecosystem Services:** This research examines place-based ecosystem services and the challenges involved in their valuation, including cultural services. It also examines the problems associated with the governance of river catchments for multiple users, and the consequential impacts of environmental change on ecosystem service delivery within freshwater ecosystems. Our work includes assessing ecosystem services tools to understand which of these toolkits are best suited to both full and appropriate delivery of ecosystem resilience and achievement of biodiversity priorities. This includes their use in natural resource management area statements in a Welsh context.

## Research team



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