UK-SCAPE

UK Centre for Ecology & Hydrology

Case study: SPEED (SPatially Explicit projections of Environmental Drivers)

Leadership and transformation

Researchers from different disciplines can now use a common set of scenarios of climate, environment and society to explore UK futures to 2100.

The SPEED project has driven forward the field of scenario development. For the first time, it provides a set of spatially explicit scenarios for the UK covering multiple drivers of environmental change – social, economic, climate change, land use change, and pollution – that are internally consistent, and aligned with the Intergovernmental Panel on Climate Change (IPCC) community global scenario framework.

UKCEH's expertise in working with data at different temporal and spatial scales has enabled the creation of this integrated view of different drivers. SPEED scenarios provide an insight into how climate will affect society, and how society might respond. Climate and society influence how land use might change, which will alter pollution levels. All these drivers interact to affect biodiversity.

www.uk-scape.ceh.ac.uk/our-science/projects/SPEED

Did you know?

- £654,334 funding leveraged by external organisations, drawing on SPEED projections
- 185 article citations

Integration

In order to provide historically consistent UK climate change data that have high temporal and spatial resolution, and demonstrate a range of possible climate change scenarios, our scientists have developed the CHESS-SCAPE future climate data set. This is derived directly from UK Climate Projections 2018 (UKCP18) and includes a number of SPEED-specific add-ons such as downscaling to 1km resolution. Climate data is daily and provides five different scenarios.

The Shared Socioeconomic Pathways describe a set of alternative plausible trajectories of societal development which are based on hypotheses of which societal elements are the most important in terms of mitigation and adaptation. Outputs produced include storylines, system maps, trends and datasets at 10-yearly time steps for five different scenarios.

Together the climate and socio-economic datasets were used to create six plausible scenario combinations for which projections of land use change were produced. These were created by integrating statistical and process-based models within an agent-based modelling framework. Other models were then used to simulate the impacts of climate, socio-economics and land use on pollution and biodiversity.

The architecture of SPEED lends itself to integration with other complementary datasets such as those describing pesticide and fertilizer use, as well as with data that UKCEH curates on areas such as water resources, water quality and air quality.

> *The breakdown of socioeconomic variables and the semi-quantified projections of what these would look like under the five different scenarios were extremely helpful in the development of our land use change scenario narratives, and I particularly liked the animated system maps as a way of telling the narrative of each scenario.*
>
> Katie Manning, Land-Use Systems Scientist, DEFRA

www.uk-scape.ceh.ac.uk/our-science/projects/SPEED

Co-development, dialogue and engagement

UKCEH scientists have worked closely with other experts to maximise the ultimate usability of outputs.

- UKCEH has a long history of collaboration with the Met Office, and together we developed UK-specific climate scenarios.
- The UK versions of the Shared Socioeconomic Pathways were developed jointly with Cambridge Econometrics, the University of Edinburgh and the University of Exeter.
- The land use modelling products have been developed jointly through collaboration with the Data Science of the Natural Environment team at Lancaster University, Forest Research, University of Edinburgh and the Karlsruhe Institute of Technology.
- UKCEH engaged closely with Defra, the former Department for Business, Energy and Industrial Strategy and the UK devolved administrations to ensure that outputs meet the future needs of government.
- The climate and socioeconomic scenarios within SPEED are based on the IPCC community scenario framework. This means they can be combined with European or global scenarios to explore cross-scale climate change impacts and responses.

www.uk-scape.ceh.ac.uk/our-science/projects/SPEED

Engagement around the scenarios included:

- An online workshop with policymakers and practitioners to co-create UK socioeconomic scenarios
- An online workshop with policy makers and practitioners to inform the development of data products
- A workshop with stakeholders from academia, policy and industry focused to explore plausible environmental futures
- Expert dialogue among the authors of the third UK Climate Change Risk Assessment (CCRA3) looking at how the assessment could use the shared socioeconomic pathways
- A news item and a blog post published on the UK Climate Resilience Programme website, introducing the socioeconomic scenarios
- A blog post on creating UK socioeconomic scenarios for climate resilience, on a website hosted by Cambridge Econometrics
- A talk on the UK Shared Socioeconomic Pathways at a Defra meeting
- A talk on the SPEED scenarios at the Climate Impacts and Risk Assessment National Meeting

Impacts

SPEED delivers more accurate spatially explicit projections of how environmental drivers are predicted to change under a combination of plausible scenarios. The outputs empower researchers, consultants, agencies, and governments to better manage the environment of the future, and to reduce the risk of unintended consequences of interventions.

An example of the early adoption of outputs from SPEED is Reading University's study of pollinator futures and the fate of bees. The SPEED scenarios were presented to stakeholders who enriched them with information on pollinator dependent crops and agri-environment schemes. The enriched scenarios helped to improve understanding of how pressures on the environment could change in the future and how this might influence and inform what can be done now and in the years to come.

UKCEH also worked with BEIS to envisage possible futures that help to frame activities such as achieving net zero, conserving the environment, and developing agriculture.

Access SPEED data and data products on the UKSCAPE Data Assets Catalogue.

Behind the science: meet the experts

James Bullock

James is a conservation ecologist at the UK Centre for Ecology & Hydrology. He has worked for many years on developing solutions to the ecological emergency that are scientifically sound, yet are based in real world constraints and ambitions. His research focuses on ecosystem restoration, and developing new approaches to achieve complex, biodiverse systems that will be resilient to ongoing environmental change.

Professor Paula Harrison

Paula is Principal Natural Capital Scientist at the UK Centre for Ecology & Hydrology and Co-director of the Centre of Excellence in Environmental Data Science, a joint venture between UKCEH and Lancaster University. Her research focuses on the co-creation of scenarios and integrated models for addressing environmental challenges.