

# Write up

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## **Understanding drivers of uncertainty in future loss projections**

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The global mean annual temperature has risen to more than 1.2°C above pre-industrial levels (Copernicus Climate Change Service 2022), resulting in widespread impacts on human livelihoods and the natural environment (Pachauri *et al* 2014). Alongside this change in the background mean climate state have been changes over the last 50 years in the frequency and magnitude of extreme weather and

climate events such as floods, droughts, heatwaves, storms and wildfires (Pachauri *et al* 2014). The climate will continue to change in the future due to anthropogenic greenhouse emission emissions and further changes in extreme events will result (Pachauri *et al* 2014). The sign and magnitude of these changes is uncertain and depends on the extent of international action taken to reduce those emissions. The insurance industry provides a method for spreading the risk of loss from extreme climate events, but uncertainty in the climate information itself is just one component of natural catastrophe underwriting risk assessment. Risk is defined as a combination of hazard, exposure and vulnerability, where the hazard component defines the frequency and magnitude of catastrophic weather and climate events, the exposure component defines the location and value of assets that could be affected by the hazards, and the vulnerability component defines the likelihood that those assets will be affected when exposed to a hazard. Property insurers use natural catastrophe (natcat) models to quantify the risk of insurance claims associated with extreme weather and climate events, with the hazard component typically being the only uncertainty considered (e.g. Jewson *et al* 2021, Mandel *et al* 2021).

The Shared Socio-Economic Pathways (SSPs) represent a conceptual framework for project societal futures within a changing environment. The scenarios look at how societies change in absence of climate policy and with the implementation of mitigation strategies. The scenarios are used to project and evaluate climate impacts and adaptation measures. The SPPs provide quantitative and qualitative descriptions of projected societal and environmental pathways for the 21<sup>st</sup> century.

The scenarios are intended to cover a range of five plausible futures picking up at different baseline worlds and predict social, economic, educational and technological patterns. The scenarios are further divided by the challenges they present to mitigation and adaption to climate change.

SSP1 “Sustainability – Taking the Green Road” represents a scenario with low challenge to mitigation and adaptation. In the United Kingdom, society would shift to more sustainable systems as a result of increased environmental pressure and catastrophe. Policies are developed to reduce environmental pressures, pollution and resource efficiency. The local level gains more importance and rural-urban divides are less pronounced, with less place-based employment and work from home. The population continues to grow until mid-21<sup>st</sup> century before it begins to decline.

SSP2 “Middle of the Road” sees medium challenges to mitigation and adaptation. Future trends do not differ substantially from historical social, economic and technological patterns. The pressure on public services results in increases in public-private partnerships that drive development in transport, energy, IT and infrastructure. The unsustainable use of resources, pollution and biodiversity loss result in a highly regulated rural and urban planning landscape.

SSP3 “Regional Rivalry – A Rocky Road” sees high challenges to mitigation and adaptation. Growing barriers to international trade and cooperation result in greater national focus and border control. In the United Kingdom, immigration decreases while job scarcity results in greater internal mobility, worker exploitation and low salaries. Increased nationalism results in a break-up of the UK into independent nations. Regional tensions also increase due to higher population density and competition for resources.

SSP4 “Inequality – A Road Divided” sees low challenges to mitigation but high challenges to adaptation. Inequalities increase with growing businesses and technological development. The UK welfare state is expected to collapse, general education levels decline, poverty increases and urban slums begin developing.

SSP5 “Fossil-fuelled Development – Taking the Highway” sees high challenges to mitigation but low challenges to adaptation. Little public support in sustainable development hinders transformation of infrastructure and economies. In the United Kingdom, large sources of shale gas is discovered and industries are built around it leading to increased urbanisation in Scotland. Land use changes and cities expand in size. Overall, the development of industries in the North, reduce national inequalities.

Future scenarios for population, urbanization, economic development and land use are also likely to result in changes in exposure, residential, commercial and industrial buildings.

<https://www.ukclimateresilience.org/wp-content/uploads/2021/05/UK-SSP5-ScenarioFactSheet.pdf>

## 2. Methods

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