



Understanding Multiple Hazards and Risk from Climate Change on Interdependent Infrastructure: a Serious Game Approach

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Given the climate change humankind has already committed to by past greenhouse gas emissions, adaptation to these changes on a regional and local scale is crucial. Identifying optimal adaptation strategies, however, is a complex task, which requires not only an understanding of the changing risk of hazards locally, but also of the interdependencies between different adaptation realms. Infrastructure, essential to sustain societal living conditions and vulnerable to a variety of natural hazards, is a key target area of adaptation measures. It also exhibits various interdependencies amongst different components, the responsibility for which is often shared among different stakeholders, be it government departments, levels, and agencies or private enterprises. Identifying climate change risks and opportunities on infrastructure and facilitating cooperation among stakeholders is thus a priority among adaptation efforts.

We present results from the process of developing and playing a serious game, which aims at encouraging discussion on expected climate change risks among infrastructure stakeholders, informed by climate projections. The serious game approach emphasises reflective learning through an experiential process, and is increasingly being used in the disaster-risk and climate adaptation communities. The game was developed involving infrastructure stakeholders in a series of workshops, using as a case study the Inverclyde area of Scotland which the stakeholders had identified as a hotspot of multiple environmental risks to infrastructure with potentially significant socio-economic implications. The game board represents key infrastructure in the area and was designed together with the stakeholders and illustrators.

Over the course of the game, a series of weather events happens, as plausible for the 2050s. The players represent the operators of different types of infrastructure and are expected to know vulnerabilities of their infrastructure elements on the game board. The playing rounds consist of an event card drawn and subsequent discussion of the impacts, which will identify potential cascading effects of a weather event on different infrastructures. The discussion will be further stimulated by game material informing on impact of past events as well as socio-economic changes which might have taken place by the 2050s. The series of weather events for the playing cards were extracted from the UKCP09 global projections, and will be readily applicable to the state-of-the-art UKCP18 projections. The purpose of UKCP18 is to inform risk assessment and adaptation in the UK, and we contribute to the translation of complex climate projections.

The game is a prototype to explore the potential of its application in infrastructure adaptation efforts. As part of the game, a set of programming tools has been developed which can be used to derive playing cards for different regions, decades, or event definitions, so that this work can be transferred to anywhere in the UK or globally.