Serious gaming to support stakeholder participation and analysis in Nordic climate adaptation research

Introduction

While climate change adaptation research has advanced significantly in recent years, we still lack a thorough discussion on maladaptation, i.e. the unintended negative outcomes as a result of implemented adaptation measures. In order to identify and assess examples of maladaptation for the agricultural sector, we developed a novel methodology, integrating visualization, participatory methods and serious gaming. This enables research and policy analysis of trade-offs between mitigation and adaptation options, as well as between alternative adaptation options with stakeholders in the agricultural sector. Stakeholders from the agricultural sector in Sweden and Finland have been engaged in the exploration of potential maladaptive outcomes of climate adaptation measures by means of a serious game on maladaptation in Nordic agriculture, and discussed their relevance and related trade-offs.

The Game

The Maladaptation Game is designed as a single player game. It is web-based and allows a moderator to collect the settings and results for each player involved in a session, store these for analysis, and display these results on a 'moderator screen'. The game is designed for agricultural stakeholders in the Nordic countries, and requires some prior understanding of the challenges that climate change can pose on Nordic agriculture, as well as the scope and function of adaptation measures to address these challenges.

The gameplay consists of four challenges, each involving multiple steps. At the start of the game, the player is equipped with a limited number of coins, which decrease for each measure that is selected. As such, the player has to consider the implications in terms of risk and potential negative effects of a selected measure as well as the costs for each of these measures. The player is challenged with four different climate related challenges – increased *precipitation*, drought, increased occurrence of *pests and weeds*, and a *prolonged growing season* - that are all relevant to Nordic agriculture. The player selects one challenge at a time. Each challenge has to be addressed, and once a challenge has been concluded, the player cannot return and revise the selection. When entering a challenge (e.g. *precipitation*) possible adaptation measures that can be taken to address this challenge in an agricultural context, are displayed as illustrated cards on the game interface. Each card can be turned to receive more information, i.e. a descriptive text and the related costs. The player can explore all cards before selecting one.

The selected adaptation measure then leads to a potential maladaptive outcome, which is again displayed as an illustrated card with an explanatory text on the backside. For each measure, there is a number of maladaptive outcomes which are selected at random for each individual game session. The player has to decide to reject or accept this potential negative outcome. If the maladaptive outcome is rejected, the player returns to the previous view, where all adaptation measures for the current challenge are displayed, and can select another measure, and make the decision whether to accept or reject the potential negative outcome that is presented for these. In order to complete a challenge, one adaptation measure with the related negative outcome has to be accepted. After completing a

challenge, the player returns to the entry page, where, in addition to the overview of all challenges, a small scoreboard summarizes the selection made, displays the updated amount of coins as well as a score of maladaptation-points. These points represent the negative maladaptation score for the selected measures and are a measure that the player does not know prior to making the decision.

The game continues until selections have been made for all four challenges. At the end of the game, the player has an updated scoreboard with three main elements: the summary of the selections made for each challenge, the remaining number of coins, and the total sum of the negative maladaptation score. The scoreboards of all players involved in a session appear now on the moderator screen. This setup allows the individual player to compare his or her pathways and results with other players. The key feature of the game is hence the stimulation of discussions and reflections concerning adaptation measures and their potential negative outcomes, both with regard to adding knowledge about adaptation measures and their impact as well as the threshold of when an outcome is considered maladaptive, i.e. what trade-offs are made within agricultural climate adaptation.

Analytical approaches to participant and game interaction

During autumn 2016, eight gaming workshops were held in Sweden and Finland. These workshops were designed as visualization supported focus groups, allowing for some general reflections, but also individual interaction with the web-based game. Stakeholders included farmers, agricultural extension officers, and representatives of branch organizations as well as agricultural authorities on the national and regional level. Focus group discussions were recorded and transcribed in order to analyze the empirical results with focus on participants´ interactions and meaning constructions of agricultural adaptation and potential maladaptive outcomes.

Given the multiple character of possible game session interactions, the analysis of the Maladaptation game differed between three types of interactions: 1) interactions between two or more co-located players, 2) interactions with narratives, images, and representations as expressed in the game or by the players, or 3) between culturally embedded traditions as expressed in and around the game.

Preliminary conclusions from the visualization supported gaming workshops

Preliminary conclusions from the visualization supported gaming workshops point towards several issues that relate both to content and functionality of the game. While, as a general conclusion, the stakeholders were able to quickly get acquainted with the game and interact without larger difficulties, some few individual participants were negative to the general idea of engaging with a game to discuss these issues. The level of interactivity that the game allows, where players can test and explore, before making a decision, enabled reflections and discussions also during the gameplay. Stakeholders frequently tested and returned to some of the possible choices before deciding on their final setting. While the game-player interaction allowed for a more individually oriented interaction, we found the combination of game - player interaction and player - player interaction to produce benefits in terms of communicative activities and richness in material. Hence, with the increase in digital and online games we anticipate an intensified discussion on the challenges of analyzing interactivity in digital gaming.

The combination of the three types of interaction, generated a large number of issues regarding the definition of maladaptive outcomes and their thresholds. The analysis found the game mediated research on climate change maladaptation to inform participant sense-making in relation to contextual aspects, such as temporal and spatial scales, as well as reflections regarding the relevance and applicability of the proposed adaptation measures and negative outcomes.