ICYESS2013-20-1
Interdisciplinary Conference of Young Earth System Scientists
Hamburg, Germany, 22 – 25 September 2013

Uncertainty recognition, understanding and assessment supporting the climate change adaptation in forest management

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Our research focuses on the climate change adaptation in forest management and planning with the main emphasis on climate change uncertainty understanding and management in the decision-making process. Climate change is one of the key drivers affecting forests, such as reduction of tree growth due to extreme drought, but how forest managers interpret, understand and make decisions with climate change uncertainty is still limited. We therefore investigated first changes in forest planners' perceptions of climate change risks over time to support long-term robust and adaptive forest management. Planners' perceptions mostly influence whether or not they will apply adaptive measures, such as a choice of resilient tree species on suitable sites, or follow business as usual approach. Our findings show that forest planners are very concern about pests, drought and wind risks as climate change progress. Not only risk perceptions but also what climate impacts they might expect in the future will influence their decision-making. For example, impacts of extreme heat waves and droughts, such as in 2003 caused 30% reduction in primary productivity (Ciais et al., 2005). Hence, second we assessed the drought risk as one of the expected climate change hazards which can cause large reductions of tree growth rates. Our findings indicate a large decrease in forest production for the major tree species in British forests with diverse responses in different locations and futures represented by emissions scenarios (SRES) (Nakicenovic, Alcamo, & Davis, 2000). This information is crucial for the sustainable forestry and adaptation process helping forest managers target vulnerable locations and apply appropriate adaptation measures at national and regional scales. Better understanding of risk perceptions and drought impacts in British forestry should provide manageable information to forest managers for the climate change adaptation endeavour, support development of new decision support systems and provide information for new climate change forestry policies.
Uncertainty, described as a limited knowledge about a system under study (Brugnach, Dewulf, Pahl-Wostl, & Taillieu, 2008) remains a challenge in climate change adaptation endeavour with salient questions how, when and where to adapt. This uncertainty, represented either from a decision-maker or from a modeller's perspective (Walker et al., 2003) will change how researchers should address it and communicate to the stakeholders and policy-makers. We investigated uncertainty using an analytical uncertainty framework within the forest planning process in which planners indicated different recognition of diverse uncertainty types with high uncertainty understanding about climate change and diverse risk perceptions. With the drought risk assessment we investigated how climate change uncertainty from the probabilistic climate change projections UKCP09 (Murphy et al., 2009) changes the tree growth rate. Furthermore, our limited knowledge about trees response especially to extreme drought conditions influences what degree of risk trees might be exposed to in the future.
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