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# Cost-effective measures for climate change adaptation in a drought-prone area in eastern Germany

**Beate Zimmermann**[1], Christian Hildmann[1], Sarah Kruber[1], Johanna Charlotte Witt[2], Astrid Sturm[2], Lutz Philip Hecker[2], and Frank Wätzold[2]

[1]Research Institute for Post-Mining Landscapes, Finsterwalde, Germany (b.zimmermann@fib-ev.de)

[2]Institute of Environmental Sciences, Brandenburg University of Technology Cottbus-Senftenberg, Cottbus, Germany

Adaptation to climate change is an inevitable challenge in many regions. In our study area, which is located in the state of Brandenburg in eastern Germany, land use is increasingly affected by long-lasting soil moisture deficits in the vegetation period. It is therefore important to implement measures for water retention at the landscape scale that postpone and mitigate the severity of these drought periods. Our objective is to identify cost-effective measures in a manner that maximizes expected ecological benefits for available budgets. For this purpose, we combine a scientific analysis of the determinants of land surface temperature with site-specific cost calculations.

The distribution of land surface temperature serves as a proxy for environmental conditions that favor water retention and, as a consequence, provide a certain cooling effect during hot and dry periods. Landsat thermal images from the vegetation seasons of 2013 to 2020 were rescaled (min-max normalization) and used as the response variable for a Bayesian multilevel model. Several parameters of the physical environment such as land cover, forest and crop type, soil water holding capacity, canopy cover and degree of soil sealing were used as explanatory variables. In addition, an antecedent moisture index and potential evapotranspiration at time of satellite overpass were incorporated into the model. First results highlight the importance of land use and canopy cover for land surface temperature distribution. In general, the analysis enables the identification of overheated landscapes. Moreover, model predictions after hypothetical implementation of adaptation measures provide an ecological benefit assessment based on the cooling capacities. We also determine the costs of the different measures in a spatially differentiated manner. An integrated modeling procedure combines the results from the ecological and economic assessments.

In this contribution, we will present the results of the Bayesian modeling and discuss a first example of the cost-effectiveness analysis in an agricultural landscape.