



Identifying Suitable Bioeconomic Cluster Sites by Integrating GIS-MCDA and Operational Research Methods

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A transition to a bioeconomy implies an increased focus on efficient and sustainable harvesting and use of biological resources. A common, but often neglected feature of these resources is their location dependence. To optimize their use, for example in bioeconomic industrial clusters, this spatial aspect should be integrated in analyses. We suggest that optimal design and location of bioeconomic clusters can benefit from the use of a Multicriteria Decision Analysis (MCDA) in combination with Geographic Information Systems (GIS) and Operations Research modelling. Optimal design and localization of a bioeconomic cluster with respect to the various biological and non-biological resources required for the cluster, the composition of industrial facilities in the cluster, as well as the demands of the outputs of the cluster, is crucial for the profitability and sustainability of the cluster. The integration of MCDA and GIS helps to determine a set of candidate locations based on a set of criteria, regarding resource availability, accessibility and usability. A quantitative analysis of the flow of resources between and within the different industries is then conducted based on economic Input-Output analysis. Then, the cluster locations with the highest potential profit, and their composition of industrial facilities, are identified in an optimization model. A case study on forest-based bioeconomic clusters in the Østfold county of Norway is presented to exemplify this methodology, the expectation being that further implementation of the method at the national level could help decision makers in the planning of a smoother transition from a fossil-based economy to a bioeconomy.