



Exploring Scenarios for Sustainable Bioeconomic Resource Use and Industrial Cluster Locations

Svein Olav Krøgli (1), Vibeke Nørstebø (2), Misganu Debella-Gilo (1), Gerardo A. Perez-Valdes (2), and Wenche E. Dramstad (1)

(1) The Norwegian Institute of Bioeconomy Research (NIBIO), Ås, Norway, (2) Department of Applied Economics, SINTEF, Trondheim, Norway

A key aspect of the revised bioeconomy is a profitable, efficient and sustainable use of biological resources. This will require a thorough understanding of a number of aspects regarding the resources to be exploited, including their location, qualities, economy of harvest and use, coproduction of ecosystem services, etc. Simultaneously, understanding these aspects of the bioeconomy requires a cross-disciplinary approach, integrating economic, environmental and social aspects towards a triple-bottom-line objective. A preliminary test of such approach has demonstrated that combining Multicriteria Decision Analysis (MCDA), Geographic Information Systems (GIS) and Operations Research (OR) has a lot of potential. This methodological integration enables us to include aspects such as resource location, qualities, economy of harvesting and optimizing resource use, as well as local knowledge, population and market information, to mention but a few. Clustering of facilities enables a more efficient use of resources, in that resources can be exchanged and shared between industries thus providing maximal (economic and environmental) sustainability. Scenarios of alternative utilization and combinations of biological and non-biological resources can be modeled through changing how the input parameters are weighted and allowed to influence the model outcome, e.g. by introducing a strict constraint on road transportation. Another option is to rearrange the spatial distribution of resources, or use future hypothetical industries that will use the different resources available. Current locations of existing industrial bioeconomy clusters may be directed by historical events or input factors no longer as relevant, e.g. ownership of land or access to cheap local energy. However, current societal challenges such as climate change, resource scarcity, environmental pollution, etc. call for a greater consideration of sustainability and environmental wellbeing. We expect that different combinations of location and resource input and output will differ in their main challenges in terms of achieving a more sustainable system. Our overall objective is to explore different scenarios of resource availability, type, quality and accessibility and their impacts on bioeconomic cluster site selection and sustainable resource use. We believe the presented type of analyses can provide important information for decision-makers and policy. The outcome of these models may guide future investments as well as prioritization of continued development. It will also illuminate the major factors in making certain productions and production systems more or less sustainable, thus focusing on the potential for improvement.