



Challenges in Cross-Domain Interoperability: BioEnergy Case Study

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The South African Department of Science and Technology has been funding the development and deployment of a BioEnergy Atlas for South Africa since 2012, and this work is nearing completion. The Atlas is unique from the perspective of moving beyond potentials and yields of biomass towards the establishment of feasibility. To do this, biomass potentials need to be evaluated from a techno-economic perspective, necessitating direct model interactions with data for demand (socio-economic data), competition from other alternatives (industrial and economic data), and impacts – these range from environmental impacts to social and economic benefits or costs.

SAEON (South African Environmental Observation Network) is the implementing agent for the Atlas, and is integrating it into an existing shared platform that is closely aligned with GEOSS and the ICSU World Data System. As such, all data is properly published as standardized services, and have accompanying standardized meta-data records. These arrangements, though necessary, are not sufficient for complete semantic interoperability.

A case study is developed to illustrate the two main challenges and to propose methods whereby these can be addressed. Modelling in the BioEnergy Atlas, which largely focuses on reconciling demand with supply, subject to techno-economic constraints, rely heavily on network models and subsequent allocation algorithms.

Firstly, it is illustrated that mapping of the input data for these models cannot be automated without some human mediation, and that the critical aspect is not the semantics of the input data, but the semantics of the model.

Secondly, it is demonstrated that semantic assertion of the role of a data set in the model is not adequate to guarantee successful execution – more information is required on the applicability or usefulness of the data in the context: based on prior experience, quality metrics, costs (monetary and computational), and similar considerations.

The question arises how the mediation knowledge gathered by a project such as this can be persisted – and a solution that includes a registry-type repository of successful mappings is proposed. In conclusion, it is illustrated that this approach will be useful in at least two other contexts known to the author: that of mapping of Biodiversity data from non-standardised data sources to global repositories such as GBIF, and the problem of automating the reporting of environmental indicators across different jurisdictions and scales.