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SCIENCE FOR A SUSTAINABLE DEVELOPMENT

A Multiscalar and Multiagent Modelling Framework for Assessing Sustainable Futures in a Globalised Environment

"MULTIMODE"

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SCIENCE FOR A SUSTAINABLE DEVELOPMENT
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FINAL REPORT PHASE 1
SUMMARY

A MULTISCALAR AND MULTIAGENT MODELLING FRAMEWORK FOR ASSESSING SUSTAINABLE FUTURES IN A GLOBALISED ENVIRONMENT
"MULTIMODE"

SD/TA/01A

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Meta-Model of Policy Options and Scenarios (WP1):

We obtain various sets of data for the 2007-2060 year period, which are needed as input into MultiMode's work package 3. Based on various methods of estimation we chose the one that resembles the "best educated guess" and apply those data to the baseline. We then obtain similar series of data for the four MultiMode scenarios. It needs to be stressed here that this is ongoing work that is by no means finalized. In light of the recent discussion on the accuracy of climate change predictions, we plan in 2010 we plan to review that issue in the scenarios developed. Further in the ongoing work we will look specifically at the internal consistency of each extrapolation developed. This will consist of a detailed analysis of each commodity, its historical price and yield data and recent market developments. From the historical developments we infer information about the feasibility of the extrapolations.

Multi-scale Constrained Cellular-Automata Model (WP2):

The availability of a first prototype of the Cellular Automata land use model has demonstrated the feasibility of setting up the kind of model for Belgium. Much effort is still needed for its calibration and validation. In scientific terms, the latter is a challenge as good calibration and validation methods for high resolution spatially-dynamic land use models are still missing. The model is currently available for test runs and for calibration. In fact elementary robustness and consistency tests have been carried out with success. The calibration will be dealt with in phase 2 of the project. It is also available to begin with the visualisation and analysis of the scenarios developed in WP1. This will involve a further elaboration of the methodology aimed at translating the scenarios into meaningful values for various variables and parameters of the model. The results of the first tests carried seem to show that the Variable Grid algorithm outperforms the traditional Fixed Grid CA applied in WP2. However more extensive testing will be required to confirm this, which include among others, e) in collaboration with WP3 the possibilities for the incorporation of the spatial behaviour of agents (obtained from exercises with the ABM model) in the cellular automata transition rules will be analysed. Vice versa, the coupling between the ABM model and the CA-land use model with a view to set the spatial constraints within which the agents can operate will be analysed. Again, the conceptual and empirical work carried out will be supported to the extent possible with the model (within the set limitations of the model definition and its software framework).

Landscape Scale Agent-Based Model of Decision Rules (WP3):

By specifying human behaviour in terms of inputs and outputs of the sub-model, it is possible to compare different approaches to the behavioural modelling. The strategy oriented approach of the initial farmer classification leads naturally towards a rule-based representation of the non-idealities of human behaviour; alternatively, the conjoint study of farmers attitudes and preferences allows for the idea of optimisation over a rich preference space. By having the possibility for entirely different modes of behaviour in the model, it is possible to see which most closely models observed behaviour, and draw conclusions about what aspects of human behaviour need to be represented.

A large part of the future work with this conceptual model will be the comparison and possible hybridisation of these approaches, to empirically determine appropriate models for the particular case studies and individuals within them. The typological assignment from interview transcripts can in itself can be considered a useful output building up a detailed picture of the reasoning behind land use decisions. In the context of model creation, this provides empirical support that the theoretical models of behaviour used to create the typology are relevant to modelling human behaviour. The benefit of working inductively within previously definned behavioural theories is that relatively general rules governing behaviour can be created | much as the Consumats (Jager et al. 1999) had clearly defined behaviours relating to the different cognitive strategies. However, in order to orient the model towards case study use, it should be possible to represent the needs and desires of individuals in a more continuous space, which is where results from the conjoint analysis will be used, to create a multidimensional preference space, and allow a complementary, deductive approach to understanding the behaviour of land managers.

Stakeholder Dialogue and Feedbacks (WP4):

Overall, the analysis demonstrates the potential of analysing AEM, and the networks it connects to, in the midst of development rather than explaining success or failure retrospectively. AEM is never a finished tool and its networks of support will never work in perfect unit. In this sense, mobilisation capacity is not another set of 'factors' that will automatically provide an explanation for the hows and whys of any course of action (e.g., whether or not farmers take up a given AEM package). Mobilisation capacity not only lies 'behind' any success of policy implementation, it is also gradually built-up and refined along the trajectories of that implementation. When it comes to performance, however, only hindsight can assess where the trajectories have led. Therefore, our approach cannot replace classical evaluations of the environmental effectiveness and economic efficiency of AEM, but is most relevant in practical settings where decisions must be made and actions taken in real time and no one can say, a priori, which of these will be really successful. As can be seen in the case of AEM in Belgium a lot of joint effort and artful combination is required to keep the whole system on track. Whereas supportive linkages are not always easy to trace (and often work in concert with one another), the need to take account of them is made clear. We suggested that, in evaluating these linkages, one should look at them in an open and fluid manner, that is, not to privilege any particular configuration or form of attachment over the other, not take intentions and objectives as a starting point but instead address the opportunities for synergies, and be aware that any network built around the instrument may change its content and the way it functions.