decoin

Development and Comparison of Sustainability Indicators

POLICY BRIEF
The DECOIN toolkit

Structure of the integrated DECOIN toolkit

The DECOIN toolkit has been developed with the explicit goal to keep the relative procedure semantically open. For this reason, the conceptual tool of *multipurpose grammar* is used, which has the explicit goal to provide an aid in the delicate phase of coupling: (A) a given issue definition of sustainability (semantic definition of a problem associated with a semantic definition of the relevant attributes) – a narrative about a sustainability problem; to (B) a given formalization in terms of proxy and data inputs required for the quantitative results. By a wise choice of a combination of semantic and formal categories, it becomes possible to develop integrated set of indicators, which can be effectively employed to deal with the particular sustainability issue which has to be investigated. The raw data referring to the interaction of the socio-economic system with its context are collected and entered into the SUMMA procedure. SUMMA provides an analysis of the relevant flows that enter into and get out of the ´black box´ of socio-economic metabolism. The upstream indicators account for the requirement of environmental resources - the pressure on ecological systems on the input side – at different levels. The downstream indicators account for environmental consequences that arise because of emissions – the pressure on ecological systems on the output side – at different levels. The DECOIN toolkit can provide an overview of both the ecological constraints and the biophysical (technical) constraints limiting the performance space of socio-economic systems. This is obtained by tracking the embodied input and output, using a system of accounting capable of tracking: (i) the free services provided by the environment; and (ii) the thresholds of environmental loading that should not be passed to respect ecological compatibility. An overview of the rationale behind this combination is given in Figure1.
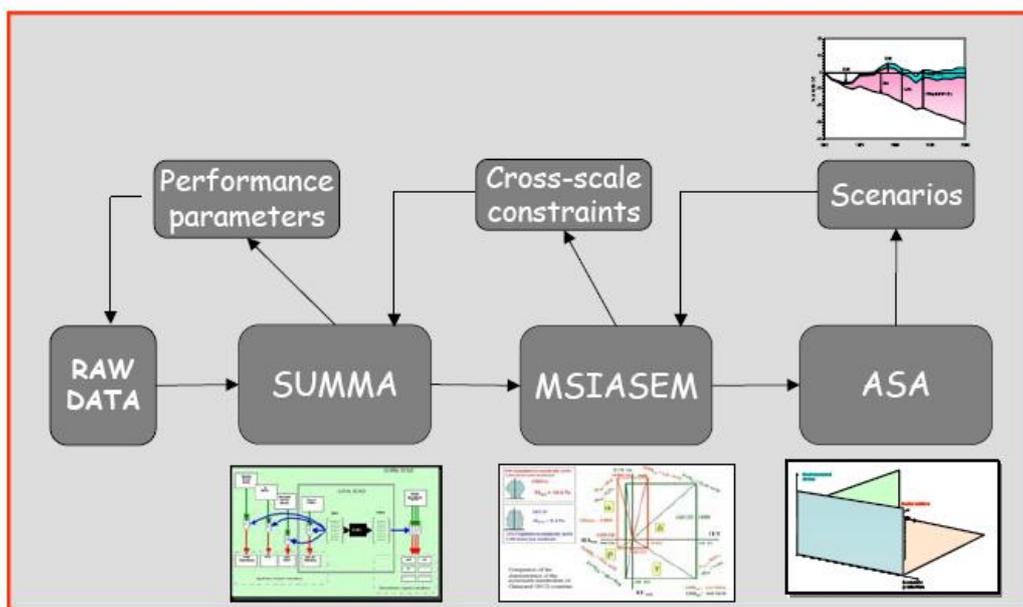

Figure 1. Interlinking of the frameworks of the ASA, MUSIASEM and SUMMA tools

The MuSIASEM approach complements the gathering of the required data (tokens), in relation to a characterization of the interactions of internal parts (compartments) of the socio-economic system. Then by using these data and some of the data gathered by the SUMMA approach the MUSIASEM approach can generate a representation of the metabolism of socioeconomic systems across different *hierarchical levels*.

The quantitative characterization generated by the combination of SUMMA and MUSIASEM can be used to generate characterization of sustainability issues, at different levels and in relation to different points in time. Then the resulting datasets can be fed into the ASA approach. The last step of the ASA analysis, looking for explanations of the represented changes across levels and dimensions, can be used for developing scenarios and make projections in relevance to the main areas of focus. It should also be noted that the ASA approach provides a direct bridge with econometric analysis by making it possible to: A) verify hypotheses over historic series or large samples, B) look for benchmarks values, and C) verify proposed mechanisms of scaling, by effectuating the decomposition analysis over historic series at different levels.

DECOIN toolkit usage

The extensity of the required database varies between the different tools, i.e. SUMMA, MUSIASEM and ASA. Generally speaking in the SUMMA approach, the pre-defined data requirement is the largest while the MUSIASEM approach and especially the ASA approach are more "flexible" and more case-specific, and thus are capable of providing interesting results with less input data. In all three approaches, time series data can be utilized, but only in the ASA approach the focus is on change over time. Interpretation of the data and results is important and the sensitivity of the results has to be taken into account in the assessment of the results. Even though the toolkit calculations are based on existing data they can discover potentially new unsustainable trends by new combinations of the data. This is especially true for the scenario building, which, although based on existing historical data, can provide new interesting results and reveal potential unsustainable development paths.

Benefits and development needs

The basic idea of integration of MUSIASEM, SUMMA and ASA models provides valuable development direction as the environmental statistics need more statistical computing and analysing in the future. The DECOIN toolkit can quite easily produce information about unsustainable trends. These findings can be produced also by other methods or deep expertise, but the toolkit eases the analysis greatly and provides new indicators of sustainability.

The integration of the models is still unfinished and there is need to use more time and resources for the finalisation of the DECOIN toolkit. This development work is continuing within the FP7 SMILE project. One challenge is to reconcile the spatial and cross-section perspectives of SUMMA and MUSIASEM models with the time-series and dynamic perspective of ASA model. This still requires additional work. The integration of the DECOIN toolkit models should be continued and more time and resources for the further development of the promising tool are needed. The tool is based on new inventions of combining existing data in order to provide new ways of assessing the sustainability. This valuable work should be continued in order to provide new policy relevant information for the planners and decision makers.