



## Afterword

After reading the various articles about integrated models I feel the need to discuss some points.

The concept of “integrating models” in itself seems to have different connotations. It is a “fuzzy” concept. But it is clear that it is about models meant to clarify a certain policy issue (and to consider options) and that the problem involves various dimensions. Some see the integrated character mainly in the complexity, others in a wide range of disciplines, whereas again others especially see the interaction with stakeholders as an identification mark. One may very well live with these different meanings so long as it is clear what the main point is.

What conclusions can be drawn, apart from the observation that to many of us, the subject – integrated models as a bridge between science and policy – is very interesting?

In the first place, there is the conclusion that integrated models are instruments in a decision-making process. A tool, not a “truth” machine. A tool that is meant in the first place for the integration of knowledge from various sectors and disciplines. A tool that is meant for tackling the increasing complexity which policymakers are faced with (in their pursuit of an integral approach).

A tool that is deeply rooted in theory and that has its origin in the assumption of a rational decision-making based on as much knowledge as possible.

The political rationality often seems different from what was expected from the technocratic angle. We must find a balance between political rationality (to be seen as target rationality) and knowledge rationality. Just as with other instruments used in assessments (e.g., the Environmental Impact Assessment or the Life Cycle Analysis), the contribution that the integrated models make to the quality of the decision-making depends on the process itself and on the way in which scientific know-how is integrated into that model. If there is no prior discussion on the starting-points and the presuppositions of a scientific quest and the results do not fit in with the viewpoints of certain parties in that process, it is expected that the legitimacy of the results of the model are under discussion. This is the more so if the instrument for its complexity and poor transparency of how assumptions and uncertainties have been dealt with, creates an impression of a black box.

The employment of integrated models must therefore be linked to the decision-making process itself, and the question as to what parameters should or should not be taken into account must be answered beforehand. This calls for interaction with policymakers and other stakeholders, for designing models that are more focussed on the demand angle whereby, for that matter, competitive designs should not be shunned. There is a limit to modelling; it requires communication with the societal dialogue, interaction, (re)creation. These communications are of a parascientific or metascientific nature. In integrated models, linking with different segments is often a delicate point. Too little thought is given to interdisciplinary or transdisciplinary linking. For example, in linking ecology and economy, there are differences in dynamics (the short and long terms) and scale, but also differences in cognitive aspects. In research, more attention must be paid to these interdisciplinary links, also, and above all, in theoretical sense.

Integrated models are, in fact, an application of the system theory to the environmental issues, in this case. This is a clever way to get a hold of the environmental problems. However, systems theory is not a scientific theory in the sense of a theory that has explanatory potential and which is verifiable; it is rather a language. The question is whether environmental problems may be described in another way. From the scientific angle, there is no integrated theory for underpinning integrated models. From this point of view, they are merely backed up by parascience or metascience.

A separate point of attention in linking integrated models is the contribution of socio-scientific knowledge. Integrated models often contain comprehensive scientific/ecological items but are very limited as to socio-scientific knowledge. As they say: how to get a balance between “molecules and people”? Human behaviour is hard to model, and is partly even non-modelable. Reflexive behaviour, in which people react to whatever knowledge is available about their behaviour in similar contexts, shirks from modelling almost by definition. Nevertheless, some more generally formulated behavioural elements are indeed included in integrated models. It would be interesting to make further investigations into what behavioural components can and cannot be modelled and included in integrated models. Due to this, it is expected that the need for an extra result interpretation for policymakers will increase.

During the RMNO-seminar [2] it was suggested to draw up a state-of-the-art report in which the following points are dealt with:

- In what circumstances will integrated models give a clear added value in the policy-making? Here the suggestion must be included to call in an intermediary who studies how and under what circumstances an integrated model may give added value to decision-making processes.

- The selection of the suitable aggregation level for a certain decision-making process.
- What about aggregation in integrated models as to space and time?
- What conceptual designs are there for integrated models?
- The relationship between quality of the database and the results of calculations with integrated models.
- The balance between quality of the input data and the results and the balance between “molecules and people” in integrated models.

Furthermore, the RMNO is interested in the question under what (pre-)conditions and in which cases an intermediary function between science and policy may give added value to the quality of the decision-making process and under what (pre)conditions this is to take place. Finally, for further reading about how to optimise the input of environmental knowledge in policy-making, I would suggest the RMNO-publication *Willingly and Knowingly* [1].

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## References

- [1] Roel In 't Veld, ed., *Willingly and Knowingly. The Roles of Knowledge About Nature and the Environment in Policy Processes* (Lemma Publishers, Utrecht, The Netherlands, 2000).
- [2] Geïntegreerde modellen: brug tussen onderzoek en beleid? (Integrated models: bridge between research and policy? Report of the RMNO-seminar on March 29, 1999), RMNO nr. 139, Rijswijk, The Netherlands (1999) (in Dutch).