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Uncertainty is essential! How to manage a world that doesn't fit into Newtonian models

K.P. Freier (1,2)

(1) Bavarian Environment Agency, Augsburg, Germany (korbinian.freier@lfu.bayern.de), (2) Research Unit Sustainability and Global Change, Hamburg University, Hamburg, Germany

Without debating the justification of Newtonian models in spheres where they clearly have proven their power, it can be conjectured for reasons of limited access to data [1], fundamental limits [2,3] and - more pragmatically - a scarcity of non-trivial predictions that the Newtonian paradigm is exhibiting clear limitations when it comes to highly complex and living systems such as the earth system. Still, the Newtonian paradigm is erroneously regarded as more powerful by principle than non-Newtonian approaches. This prejudice often prevents adequate management decisions [4,5,6] and makes it necessary to clarify a) the characteristics, b) the strengths c) the relevant types of problems and d) the limitations of Newtonian and non-Newtonian paradigms in order to achieve a better management of global change phenomena.
Based on a literature review [7], I want to clarify characteristics of a non-Newtonian modeling paradigm which can be described as "relational approach". Out of principle, this paradigm doesn't allow the reduction of knowledge to algebraic formulas and universal laws. Instead, knowledge in this approach depends essentially on empirical engagement and the accumulation of experience. The transfer of knowledge in this paradigm is achieved by history dependent data storages (narratives, heuristics and strategies). In contrast to the explanatory power of Newtonian models, the relational paradigm emphasizes qualitative and quantitative pattern recognition and classificatory power. This contrast most often leads to severe misunderstandings, if both paradigms are mixed within one setting. The striking advantage of the relational paradigm is that uncertainties and unpredictable properties are accepted as essential for living systems. This advantage explains a much more pronounced risk-avoiding planning under a relational paradigm [8] and leads to a critique of Newtonian/"rational" decision making within ecological and socio-economic settings.
As a consequence of these insights, a) global climate change must be seen as a serious problem of knowledge-loss and b) within ecological and socio-economic systems the experimental character of policies has to be taken much more into account. To achieve the latter, the limits of Newtonian models should be emphasized in science as well as in public.

Literature:
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[6] Nida-Rümelin, J. 2011 Die Optimierungsfalle, ISBN-978-3-424-15078-0
[7] see Footnotes 1-6 and Hauhs and Trancón y Widemann 2010: Applications of algebra and coalgebra in scientific modelling. DOI: 10.1016/j.entcs.2010.07.016 as well as Ingold, T. 2003 The perception of the environment, ISBN-0-415-22831-x (among others)
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