Measuring potential effects of production peaks of global non-renewable key (GNoRK) resources within the concept of economic disasters

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Abstract

The phenomenon of Peak-Oil, is rapidly becoming a well known concept, which is currently creating an amplitude of popular books (E.g.: Campbell 2005, Deffeyes 2001, etc.) and a growing number of non-governmental organizations dedicated to the issue (E.g.: ASPO, Community Solutions, Crisis Energética, etc.). This remains in a stark contrast to the academic output related to the phenomenon. Meanwhile new possible resource peaks are becoming evident such as that of phosphorous (Cordell, et al., submitted), coal or uranium (Mason 2007, Heinberg 2007). In this paper the authors argue for an urgent need to design mitigation tools for the peaking of global non-renewable key (GNoRK) resources. This in return requires a thorough interdisciplinary study of the potential effects of peak phenomena. The author's contribution to this goal is a methodological analysis of alternatives to the traditional Leontief Input-Output model. For this purpose the framework of disaster impact analysis is employed, where resource peaks are seen as sudden economic crises in the spirit of the Hirsch reports (Hirsch et al. 2005) conclusions about the potential implications of Peak-Oil.

However the traditional IO model is considered inadequate for the study of supply constraints, as it assumes perfectly elastic supply of every input. The alternatives reviewed here are the supply driven quantity and price model, the supply constrained (or mixed model) and the demand driven price model. The mixed model and the demand driven price model emerge as the most promising candidates. A synthesis of a previous quantity and a price simulation of Peak-Oil (Kerschner & Hubacek 2008), using IO tables from the UK, Japan, Chile, China, India and the US is therefore presented and discussed. One important limitation encountered in these studies is that none of the models allowed the authors to provide an approximate measure of economic damage in terms of GDP. This is mostly due to the difficulties in controlling imports of petroleum. Nevertheless, the results provide a meaningful ranking of the potentially most effected sectors, which is an important indicator for the possible systematic changes of economies when faced with sudden resources limitations.

Keywords: Supply driven IO analysis, Supply constrained Input-Output Analysis, Price model, Disaster Impact Analysis, Peak-Oil,

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Campbell, C.J., (2005). Oil Crisis, Multi Science Publishing.

Cordell, D., J.-O. Drangert, et al. (submitted). "The Story of Phosphorus: Food security and food for thoughtInstitute for Sustainable Futures, University of Technology, Sydney, Australia, and Department of Water and Environmental Studies, Linköping University, Sweden." manuscript submitted to AMBIO Journal of the Human Environment.

Deffeyes, K.S., (2001). Hubbert's Peak The impending world oil shortage Kenneth S Deffeyes, Princeton University Press.

Heinberg, R. (2007). Peak Everything: Waking Up to the Century of Declines Gabriola Island, New Society Publishers.

Hirsch, H.L., Bezdek, R., Wendling, R., (2005). Peaking of World Oil Production: Impacts, Mitigation, & Risk Management. February 8, 2005. Report to US DOE. /www.aspo-australia.org.au//References/hirsch0502.pdf

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Mason, J. E. (2007). "World energy analysis: H2 now or later?" Energy Policy 35(2): 1315-1329.