

Quantitative benefits of sustainable innovation: resource efficiency potentials of technologies, products and strategies

Holger Rohn, Trifolium, Germany

Michael Lettenmeier, Wuppertal Institute for Climate, Environment and Energy, Germany

Nico Pastewski, Fraunhofer Institute for Industrial Engineering IAO, Germany

Klaus Wiesen, Wuppertal Institute for Climate, Environment and Energy, Germany

Despite price increases for natural resources during the past 30 years, global consumption of natural resources is still increasing. Although resource use leads to ecological, economical and social problems, limited effort has been done so far to assess the quantitative resource efficiency potential of technologies, products and strategies in order to facilitate dematerialisation. This paper is based on results from a joint effort of 10 German research institutions for assessing resource efficiency potentials in the framework of work package 1 of the project "material efficiency and resource conservation" (2007-2010).

The paper deals with the identification and evaluation of innovative technologies, products and strategies having the potential to increase resource efficiency and presents the results of a resource efficiency potential analysis. The identification of topics with great resource efficiency potential is described in the first part. It is based on an extensive desk research and a nationwide survey, which resulted in appr. 1000 nominations of single topics promising in terms of their resource efficiency potential. During a criteria-based selection process together with experts from different fields, 20 topics were chosen to be assessed in terms of their resource efficiency potential. The selected 20 topics cover a broad field of relevant technologies, products and strategies like energy supply and storage, Green IT, transport, foodstuffs, agricultural engineering, design strategies, lightweight construction and "utility instead of possession". In the second part, the paper gives a summary of the resource efficiency potential analyses of these "top 20" topics based on material flow analysis. Also additional qualitative sustainability assessments were included in the analysis. The analysis includes general outcomes as well as a more detailed description of selected cases with focus on sustainable design, technologies and chain management.

The results show that there is a remarkable resource efficiency potential to be released by sustainable innovations. However, the actual potential depends on the specific technology, product and strategy studied and material flow analysis also provides some surprising results. In order to address a real dematerialisation, the focus on sustainable innovation should be broadened and the consumption side as well as rebound effects must not be neglected.