

Transitions towards sustainable innovations: Linking resource efficiency and new technologies

Justus von Geibler, Wuppertal Institute for Climate, Environment and Energy, Germany

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

Holger Rohn, Trifolium, Germany

Nico Pastewsk, Fraunhofer Institute for Industrial Engineering IAO, Germany

Frieder Schnabel, Fraunhofer Institute for Industrial Engineering IAO, Germany

Technological innovations including information and communication technologies, bio- and nanotechnologies offer surprising solutions to a number of problems and are discussed as a possible key to achieve global sustainability goals. Nevertheless, there is growing evidence that technological innovations do not automatically contribute to sustainable development. A number of questions arise: How can contribution of technological innovations to sustainability be assessed in the light of limited data availability and uncertainties of future developments and application scenarios? How can information on promising innovations be integrated within decision-making processes? How can new products and technologies be mainstreamed in future markets?

This paper addresses these questions and focuses on transition strategies for sustainability of new technologies. Based on the theoretical concept of transition management, a methodological framework for identifying technological innovations and assessing their sustainability potential is presented. Results from applied research in specific technological fields, such as biotechnology, nanotechnology and the ICT sector, are illustrated. The results highlight the relevance of early stages of technology development as key phase to assess risks and opportunities with regard to sustainability issues. Additionally, the role of participatory and life cycle approaches as well as tailor-made assessment tools is discussed to reduce arbitrary selection of aspects for analysis.

The paper will specifically present results from interdisciplinary research on crosscutting different technological fields, from the project called "Resource Efficiency Atlas". This project is conducted at the Wuppertal Institute in cooperation with Trifolium and the Fraunhofer Institute for Industrial Engineering and funded by the German Federal Ministry of Education and Research. The project aims at the development of guidelines for improved mainstreaming of innovative resource efficient technologies and products. It is among other methods based on an international survey of good practice examples and an intensive expert discourse. In the paper, the authors reflect their experiences of applied sustainability research on technological innovations.

Keywords: sustainable technologies, resource efficiency, sustainability assessment, transition management.