Environmental risk governance, Sustainable production and consumption

Environmental systemic risk governance

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Abstract

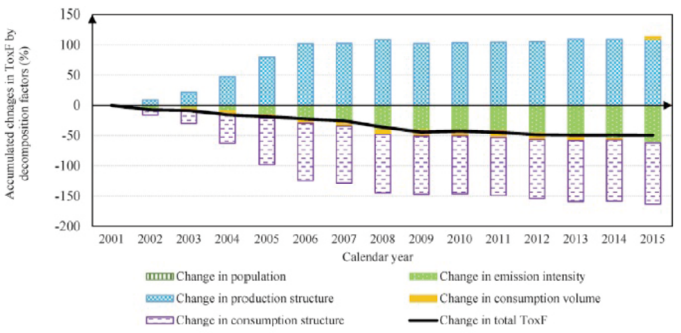
The intensive production and use of toxic chemicals have resulted in adverse impacts on human health and the ecosystem. Understanding the drivers of chemical pollution can allow more targeted strategies to be developed to reduce the toxicological footprint (ToxF) of economies. In Japan, no comprehensive quantitative research on analyzing the main factors of ToxF has been done previously. This study examines the period between 2001 and 2015 using production and consumption-based perspectives at the sectoral level.

Background & Results

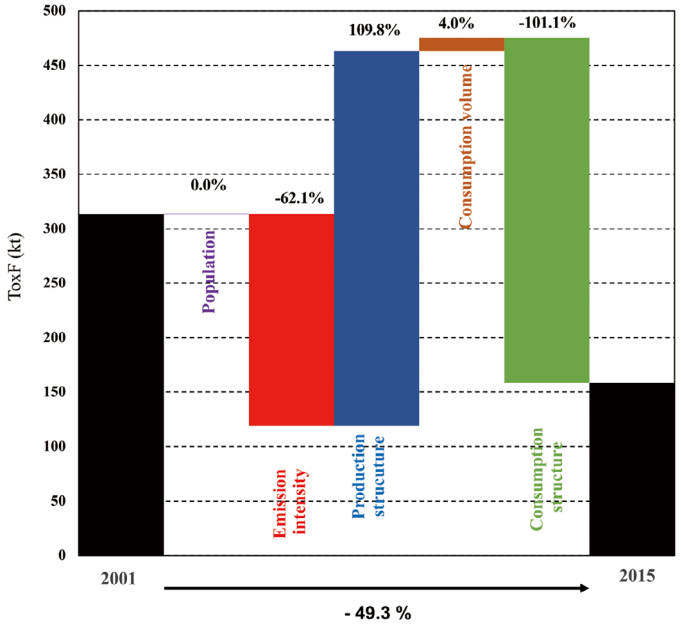
The global production and use of chemical substances have increased rapidly in recent decades. It is estimated that there are now over 100,000 different chemicals used in everyday life. These chemicals have contributed to adverse environmental impacts (e.g., air, water, land) because of poor control and management, complicated transboundary properties, and complex global supply chains. The Secretariat of the Convention on Biological Diversity (2010) has identified chemical pollution as one of five main pressures which adversely affects global biodiversity. Thus, in terms of toxic chemical pollution, adequate toxic chemical control and management are necessary to protect the environment and to develop economies sustainably. The results indicate that the overall ToxF from the Japanese industrial sectors decreased by 49% (−154 kt) during the period analyzed. The consumption structure and emission intensity have significantly contributed to the mitigation of ToxF, corresponding to 317 kt (−101%) and 194.5 kt (−62%), respectively. The production structure and consumption volume were the main driving forces for the increase in ToxF contributing 344 kt (110%) and 12.4 kt (4%), respectively. However, population growth had an insignificant effect on ToxF. These insights can be used in developing policies for the management of toxic materials and for establishing less toxic supply chains. Furthermore, insights from this work can be utilized to further develop specific indicators for monitoring the environmental impact of toxic chemicals.

Significance of the research and Future perspective

Contributing components include population, technology (emission intensity), production structure, consumption structure, and consumption volume. Such a time-series analysis is helpful for manufacturers, decision makers, and relevant partners in understanding why industrial toxic chemical releases have varied over time. These results can be applied to determine sustainable and effective chemical toxic mitigation strategies and management protocols for short and long-term plans, and to define more sustainable supply chains. Concrete strategies can be given based on the analysis of the result of each factor. More details have been mentioned in the section on policy implication.



Accumulated changes in ToxF by decomposition factors (%)



Contributions of driving factors to ToxF changes between 2001 and 2015 (kt)

Social innovation

Patent	
Treatise	Hoa Thi, Nguyen; Ito, Lisa; Tokai, Akihiro et al. Decomposition analysis of annual toxicological footprint changes : Application on Japanese industrial sectors, 2001-2015 Journal of Cleaner production, doi: 10.1016/j.jclepro.2020.125681
URL	https://www.meti.go.jp/policy/chemical_management/other/kasseika/daigakurenkei.html https://prtr.unece.org/ https://www.oecd.org/chemicalsafety/pollutant-release-transfer-register/
Keyword	input-output analysis, structural decomposition analysis, toxicological footprint