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1. http://ec.europa.eu/dgs/jrc/

European Commission

Science for Environment Policy

'Chemical footprint' in development

A measure of 'chemical footprint' is being developed by researchers to assess the environmental impacts of the toxic chemicals released by the production and consumption of goods. The methodology, based on life cycle and risk assessment, is also designed to be linked to the resilience of ecosystems to chemical exposure.

Environmental 'footprints', from carbon emissions to water use, are increasingly being used to assess the impact of human pressures on the environment. However, despite the widespread use of toxic chemicals in many products and services, no method of assessing a 'chemical' footprint has yet been designed.

In this study, researchers from the European Commission's Joint Research Centre[1], developed a conceptual framework for assessing chemical footprints that combines three concepts in sustainable chemical management: life cycle assessment (LCA), risk assessment for human and ecological exposure, and the precautionary principle that addresses uncertainties associated with the impacts of chemical pollution.

Based on these concepts, the researchers suggest there could be at least two steps to determining chemical footprint. The first step, based on LCA, assesses emissions of chemicals released directly and indirectly into the environment as well as the potential harm of these to the environment, as determined by a risk assessment.

The second step links the chemicals released into the environment with the capacity of affected ecosystems to recover from the harm caused (the 'carrying capacity' of the ecosystem). This capability is linked to the planetary or 'safe' boundaries for chemical pollution, although no targets have yet been set.

To illustrate the development of a chemical footprint, the researchers used the first step to assess the impacts on freshwater ecosystems in the EU-27, as a case study. This can be calculated using LCA from the perspective of production or consumption of a product. The assessment considers the domestic chemical emissions, as well as those related to the products imported to and exported from a single country.

Analysis revealed that impacts on freshwater ecosystems from domestic consumption in the EU-27 were mainly caused by pesticide emissions, in particular, endosulfan emitted to the water and air, and cyhalothrin and a-cypermethrin emitted to water. Metal emissions (e.g. copper and vanadium emitted to the air) were responsible for the majority of impacts on freshwater ecosystems from import and export-related consumption in the EU-27. Work on resolving uncertainties associated with step one and linking step one with the carrying capacity of ecosystems (step two) is on-going.

The study highlights a number of issues that must be resolved to further develop the chemical footprint concept. These include identification of which source types (e.g. point or diffuse sources) to evaluate; identifying priority chemicals and dealing with new contaminants.