

# A NEW COMPUTATIONAL PARADIGM FOR ASSESSING ENVIRONMENTAL HEALTH IMPACT OF POLICIES

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**Background and aims:** Present problems in assessing the environmental health impact of policies include the multitude and complexity of exposure pathways, data paucity and mechanistic understanding of the interactions across the chain from policy down to health impact and economic costs associated. Many models of different complexity exist. They are currently applied to address parts of the full-chain but their full integration in a single comprehensive system poses additional difficulties.

**Methods:** This work introduces the concept of a multi-layered distributed computational platform consisting of an integrated set of stand-alone ('loosely-coupled') modules, designed to be linked together seamlessly, in order to demonstrate the impact of a range of policies on health. It covers emissions of all relevant substances into air, water and soil with multi-media modeling capabilities to capture the fate of chemicals across environmental media and micro-environments that could significantly alter actual exposure profiles to toxicants. Combining the information from environmental fate modeling, biokinetics/dynamics and epidemiologically-derived data the impact on human health could be estimated. Linking the latter to the societal economic cost through the introduction of DALYs and/or monetary valuation functions the societal cost of the policy measures considered is reckoned.

**Results:** The system harnesses the power of cloud computing through a distributed architecture in order to maintain a high level of precision in results and the necessary sophistication of the models employed. Thus the models addressing each part of the full-chain are operated as a seamlessly interoperable system, even though they are spread all over Europe. The individual modules are linked via fast internet based data exchange protocols.

**Conclusions:** This integrated assessment system allows for a full exploration of trade-offs and synergies of individual policy options. The paper concludes by giving specific examples of successful implementation of the complexity analysis paradigm delineated above.