What Does the Next Generation of Environmental Exposure Models Look Like?

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3.02.B.T-05 What Does the Next Generation of Environmental Exposure Models Look Like?

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Environmental models and software are essential tools for understanding the complex interactions of the natural world. They empower us to foresee potential futures, unravel intricate trends and expand our scientific knowledge, ensuring we make informed decisions for a sustainable future. This includes environmental emissions and exposure models, which tell us how chemicals and other potential pollutants enter, move around and behave in the environment. To achieve accurate, efficient, collaborative and integrative insights into this pollution and its sources, it is imperative that our models and software keep pace with scientific and technological advances, the increasing availability of data and a heightened importance on assessing complex, interconnected systems under a changing climate. But often our models follow outmoded programming paradigms and technological setups that makes this difficult. They are often monolithic codebases rather than flexible, standalone modules, making them difficult to adapt to emerging risks or integrate with other models to predict, e.g., the societal drivers and One Health impacts of pollution. Furthermore, modelling efforts often overlook ethical and sustainability issues, like the carbon footprint of running complex simulations or the societal impacts of using model predictions to inform policy. These considerations framed a workshop that took place in October 2024, bringing together interdisciplinary environmental modellers from around the world to discuss the question: what does the next generation of environmental models look like?

The focus was interactive sessions, where participants discussed this question by refererring to six pillars:

Software engineering and collaborative platforms; Interdisciplinary learning; Cloud-based and exascale computing; Citizen science; Artificial intelligence, and; Big data and better monitoring. In this presentation, we reflect on the outcomes, placing them in the context of emissions and exposure modelling.
The workshop was part of broader efforts to build an international community of practice around environmental modelling. A priority identified is that training, education and knowledge transfer are vital to ensuring that we empower the next generation of environmental modellers, as well as the models themselves, and we hope this community will provide a space to enable this.

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