

The effects of human populations on the earth now dominates much of the global system, to the extent that multiple planetary boundaries (in terms of exceeding available capacity) seem to have been overstepped. The pressing problems of our time, such as pandemic disease, anthropogenic climate change, deforestation, over-fishing, pollution, habitat loss, over-extraction of resources, poverty and inequality, economic fragility, food security, warfare and geo-political manoeuvring are global in scope, and cannot be effectively addressed using models that only cover small fractions of the global system. While global models of the atmosphere have existed for more than 50 years, earth-system models are still largely focussed on the physical climate and interaction with vegetated ecosystems: even animals have only recently been incorporated at this scale. Integrated assessment models have been largely aimed at economics, typically not dynamic, and miss feedbacks into the rest of the global system. This lack of global-scale social-systems models accounting for the full complexity of human societies, leaves us ill-prepared to anticipate global scale disasters such as the 2008 financial crisis, or the recent pandemic, and incapable of developing meaningful-scale policy either to handle events as they unfold, or to deal with post-disaster recovery. However, we have the available computing power and techniques to develop such global social systems models: agent-based models can be run with billions of agents, and simulate the transmission of disease, for example, across the globe. Large-scale data sets on human population, infrastructure, impact on vegetation and land-use are becoming steadily more detailed down to metre-scale resolution. A focussed international effort is needed to combine this modelling and data potential, and build sets of shared and collectively developed models that begin to approach for social systems what the models underpinning the IPCC and IPBES have done and are doing for climate change and eco-systems. While this process may be very difficult, at the very least the it will lead to learning, and to demonstration of how such models might help us to make better decisions, or where they might be too complicated or too uncertain to be useful. The key will be develop and run global models continuously over time, as has happened with climate, and not to be tempted to use models for decision making too early, before model capabilities have been sufficiently tested. An illustration will be given of the simple beginnings that can be used for such development.