

Why considering climate-human system interaction is important?

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In the past climate change studies, in many cases the interaction of climate and human system has been dealt with by each-way separately. A typical such example is to carry out future climate projection experiments with emission scenarios developed with socio-economic model, and to implement impact assessment by using climate model outputs. Integrated assessment models are counterexamples, considering the mutual interaction, but they carry out that very simply by using a “damage function” where total cost of climate change is expressed as a simple, although non-linear, function of global mean surface temperature anomaly. Recently, a solution for that, a coupled Earth system model with socio-economic model has been developed, but at present only limited process, i.e. land use, is considered as two-way interaction.

Meanwhile, recent studies revealed that not only the changes in agricultural productivity which would change the area needed to cover food supply and then land use, but also there are many other processes through which climate system gives influence to human activity. Such examples include change in labor productivity, in energy supply/demand, land loss by sea level rise, health impact, and increase in inter-personal/-group violence. These lead economy-wide impact, e.g. in GDP, and that in turn affects the emission of CO₂ and other greenhouse gasses.

These strongly indicate that for advanced future climate projection we should consider the mutual interaction of these systems simultaneously, and it is expected that by taking more sophisticated, e.g. process-based, approach rather than using a simple damage function, we can evaluate diverse impacts of climate change to human society.

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