A New Theoretical Framework for Integrating Multiple Problems at Multiple Spatial Scales to Achieve Simultaneous Solutions to Global Environmental Issues

Reiichiro Ishii
Research Institute for Humanity and Nature, Kyoto, Japan

Abstract

Climate change and biodiversity loss are major global environmental challenges, yet their interactions with other environmental and social issues are insufficiently considered when policies are designed and implemented. These interactions vary across regions in type and magnitude, making it difficult to address multiple issues without transferring impacts elsewhere. To overcome this limitation, stronger trans-scale integration between top-down global management and bottom-up local action planning is required. Currently, global greenhouse gas reduction targets are typically set first and then allocated to individual countries, often neglecting ripple effects on ecosystems and human well-being at national and local scales. In contrast, national-level policymakers understand local societal constraints and capacities, but rarely account for causal interactions among issues or cross-border impacts.

This study proposes a Double PDCA-cycle framework to integrate bottom-up local action plans with top-down global evaluation. The first cycle conducts simulation-based assessments to examine global and external impacts prior to implementation. The second cycle focuses on post-implementation assessment and iterative modification based on observed outcomes. Using simple dynamic models representing a global system and two nations, three approaches were compared: top-down, bottom-up, and the Double PDCA-cycle. Preliminary results indicate that the proposed framework enables countries to design actions and assess integrated impacts.