

When Ecosystem Services Compete: Participatory Assessments of Trade-Offs in Agricultural and Mangrove Landscapes

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Ecosystems provide multiple services, yet the use of one service often constrains or degrades others, giving rise to conflicts shaped by human decision-making, governance, and production practices. This study examines trade-offs, synergies, and conflicts in ecosystem service (ES) use through a comparative, participatory assessment of two LL SYSTAIN pilot regions: crop-based agricultural landscapes in Berlin–Brandenburg (Germany) and mangrove-based crab harvesting systems in the Amazon coastal region around Bragança, Pará (Brazil).

Using a combination of scientific modelling, empirical indicators, and stakeholder and grassroots dialogues, the study applies a conflict-oriented ecosystem services lens to assess how provisioning services interact with regulating, supporting, and cultural services. In Berlin–Brandenburg, integrated climate impact assessments of crop yields, biomass production, and water availability reveal growing conflicts between agricultural production, freshwater regulation, soil functions, and climate regulation under increasing drought and land-use pressures. Participatory workshop was used to jointly interpret model projections, assess their relevance for regional actors, and identify adaptation strategies—such as regenerative agriculture, water-sensitive practices, and circular bioeconomy approaches—that can reduce ES conflicts and enhance agricultural resilience.

In the Amazon coastal region, small-scale mangrove crab harvesting highlights both synergies and conflicts between provisioning services and regulating services provided by mangrove ecosystems, including biodiversity support, carbon storage, and pollution regulation. While well-functioning mangroves enable sustainable livelihoods, the accumulation of crab-processing waste emerged as a locally significant socio-environmental issue, generating pollution risks and undermining regulating ES when inadequately managed. These pressures are exacerbated by overharvesting, governance gaps, and expanding cold-chain market connections, illustrating how human decisions can shift ES relationships from mutually supportive to mutually threatening.

By foregrounding co-produced knowledge and participatory validation, the study presents a methodological approach for identifying conflicts, evaluating model-based assessments with stakeholders, and exploring context-specific pathways for conflict mitigation. The findings contribute practical insights and examples of good practice for more effective and balanced use of ES in agricultural and coastal landscapes.

Keywords: dialogues, food provisioning, carbon regulation, water yield, biomass production

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