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A framework for the Integrated Assessment of SDG trade-offs in the Sundarbans Biosphere Reserve.

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The United Nations Sustainable Development Goals (SDGs) and their corresponding targets are significantly interconnected, with many interactions, synergies and trade-offs between individual goals across multiple temporal and spatial scales. We propose a framework for the Integrated Assessment Modelling (IAM) of a complex deltaic socio-ecological system in order to analyse such SDG interactions. We focus on the Sundarbans Biosphere Reserve (SBR), India within the Ganges-Brahmaputra-Meghna Delta. It is densely populated with 4.4 million people (2011), high levels of poverty and a strong dependence on rural livelihoods. It is only 50 km from the growing megacity of Kolkata (about 15 million people in 2020). The area also includes the Indian portion of the world's largest mangrove forest – the Sundarbans – hosting the iconic Bengal Tiger. Like all deltaic systems, this area is subject to multiple drivers of environmental change operating across different scales. The IAM framework is designed to investigate current and future trends in socio-environmental change and explore associated policy impacts, considering a broad range of sub-thematic SDG indicators. Integration is achieved through the soft coupling of multiple sub-models, knowledge and data of relevant environmental and socio-economic processes. The following elements are explicitly considered: (1) agriculture; (2) aquaculture; (3) mangroves; (4) fisheries; and (5) multidimensional poverty. Key questions that can be addressed include the implications of changing monsoon patterns, trade-offs between agriculture and aquaculture, or the future of the Sundarbans mangroves under sea-level rise and different management strategies, including trade-offs with land use to the north. The novel high-resolution analysis of SDG interactions allowed by the IAM will provide stakeholders and policy makers the opportunity to prioritize and explore the SDG targets that are most relevant to the SBR and provide a foundation for further integrated analysis.