



## Geochemistry Meets Community: Multispecies Mangrove Restoration Driving Blue Carbon Sequestration in the Indian Sundarbans

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The mangrove wetlands are recognized as very important in the process of carbon sequestration, but the fluctuation in salinity, the development of the aquaculture, and deforestation pose a threat to the ecological balance and the welfare of the local society. Our long term study at the Indian Sundarbans on restoration model of mangrove ecosystems revealed interconnectivity of community participation and multispecies mangrove restoration on blue carbon pool. In this study, five mangrove species (*Sonneratia apetala*, *Avicennia marina*, *Excoecaria agallocha*, *Portulaca caudata*, and *Dischidandra sp.*) were investigated in a degraded mudflats area of 102 hectares located on Satjelia Island on how they can be restored. The analysis of geochemical indicators of soil, including organic carbon (SOC) and organic carbon density (OCD), humic and fulvic acids, and the evaluation of community participation contribute to creating a comprehensive picture of what the ecosystem recovery process is all about.

It can be seen that introduction of *Sonneratia apetala* as a propagule, using a dibbling technique has been a notably successful one, as there is low cost per survivor and a notable growth rate in OCD of more than 90 per cent over a five-year time. An analysis of chronosequence suggests that the mangrove plantations have significantly increased the sequestration of carbon in the uppermost soils layers which provides a stark difference to the insignificant increases in the natural *Dischidandra* mudflats. Local communities involvement through forest committees has also played a big role in the survival of saplings, reduction of grazing pressures as well as the overall success of the restoration efforts. Study indicates a better blue carbon pool and survival rate of species (*Sonneratia apetala* and *Avicennia marina*) for community managed restoration site. This research highlights the need to integrate the ecological and community level interventions by means of a multisided approach for an effective mangrove restoration. The findings show that the recovery of the mangrove ecosystems can result in desirable modifications on the soil geochemistry, as indicates by geochemical carbon indicators such as humic acid, fulvic acid and blue carbon pool, which can contribute to the increase of the coastal resilience. Furthermore, the combination of these activities with participatory governance models is a scalable and powerful approach to a contribution to the global climate change mitigation agenda including REDD+ and SDG14 targets. The example of the Indian Sundarbans is the way in which mangrove can be restored as a two-fold solution to serve dual objectives, both environmental and

community development, and be a precursor to community-based climate action projects.