Exploring vegetation type, diversity, and carbon stocks in Sundarbans Reserved Forest using high resolution image and inventory data

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With global climate change, the conservation of mangrove biodiversity and the evaluation of ecosystem services (carbon sequestration) have become foci of concern. This thesis examined the spatial distribution of biodiversity indicators and carbon storage in the Sundarbans Reserved Forest (SRF), Bangladesh, the most diverse mangrove ecosystem worldwide, and modelled their relationship by coupling remote sensing and ground-based data. Carbon storage in the SRF varied by vegetation type and salinity zone. Stands dominated by *Heritiera fomes* within the freshwater zone contained the largest carbon stock (Chapter three). Nine dominant mangrove types with their average canopy height and five non-mangrove types in the Sundarbans East Wildlife Sanctuary (SEWS), as pioneers of large-scale mangrove ecosystems, were mapped with greater accuracy (89.33–89.89%) by combining high-resolution spatial (WorldView2) and vertical (TanDEM-X) imagery (Chapter four). Three dominant species covered 50% of the SEWS: *H. fomes* (44.54%), *Excoecaria agallocha* (3.02%), and *Sonneratia apetala* (1.41%). The finding of *H. fomes* as the dominant species in the SEWS (Chapter four) challenged the previous conclusion that *E. agallocha* was the dominant species. Mangrove species diversity (Shannon index) and canopy height positively influenced the aboveground carbon stock in trunks. Therefore, mangrove stands with high species diversity had high carbon storage (Chapter five). These findings can be used in the monitoring and evaluation of mangrove vegetation and carbon stock changes and formulating policy for Reducing Emissions from Deforestation and Forest Degradation and the Convention on Biological Diversity.