

Coastal and estuarine blue carbon stocks in the greater Southeast Asia region: Seagrasses and mangroves per nation and sum of total

ABSTRACT

Climate Change solutions include CO₂ extraction from atmosphere and water with burial by living habitats in sediment/soil. Nowhere on the planet are blue carbon plants which carry out massive carbon extraction and permanent burial more intensely concentrated than in SE Asia. For the first time we make a national and total inventory of data to date for "blue carbon" buried from mangroves and seagrass and delineate the constraints. For an area across Southeast Asia of approximately 12,000,000 km², supporting mangrove forests (5,116,032 ha) and seagrass meadows (6,744,529 ha), we analyzed the region's current blue carbon stocks. This estimate was achieved by integrating the sum of estuarine *in situ* carbon stock measurements with the extent of mangroves and seagrass across each nation, then summed for the region. We found that mangroves ecosystems regionally supported the greater amount of organic carbon (3095.19Tg Corg in 1st meter) over that of seagrass (1683.97 Tg Corg in 1st meter), with corresponding stock densities ranging from 15 to 2205 Mg ha⁻¹ and 31.3 to 2450 Mg ha⁻¹ respectively, a likely underestimate for entire carbon including sediment depths. The largest carbon stocks are found within Indonesia, followed by the Philippines, Papua New Guinea, Myanmar, Malaysia, Thailand, Tropical China, Viet-Nam, and Cambodia. Compared to the blue carbon hotspot of tropical/subtropical Gulf of Mexico's total carbon stock (480.48 Tg Corg), Southeast Asia's greater mangrove–seagrass stock density appears a more intense Blue Carbon hotspot (4778.66 Tg Corg). All regional Southeast Asian nation states should assist in superior preservation and habitat restoration plus similar measures in the USA & Mexico for the Gulf of Mexico, as apparently these form two of the largest tropical carbon sinks within coastal waters. We hypothesize it is SE Asia's regionally unique oceanic–geologic conditions, placed squarely within the tropics, which are largely responsible for this blue carbon hotspot, that is, consistently high ambient light levels and year-long warm temperatures, together with consistently strong inflow of dissolved carbon dioxide and upwelling of nutrients across the shallow geological plates.