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# Emergy Value of Mangrove Ecosystem Services in China

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Mangroves are woody plants that grow at the interface between land and sea in tropical and sub-tropical latitudes. These plants, and the associated microbes, fungi, plants, and animals, constitute the mangrove forest community or mangal. The mangal and its associated abiotic factors constitute the mangrove ecosystem. Mangrove ecosystem is a very important category of the wetland systems in China. It has important direct and indirect economic, ecological and social values to human being. However, the mangrove area of China has been severely reduced during the past fifty years by destroying mangroves as agricultural fields, aquaculture ponds, and urban construction and so on. An important reason why mangrove ecosystems continue to be used in unsustainable ways is that their economic value is not adequately represented in decision-making and often the economic valuations of mangroves only include the direct uses and products of mangroves, which only represent part of the total value of mangroves. The non-market values, such as biodiversity and nutrient export, are not easily quantified but have shown to be significant. Through a study of the energy flows, and using the method of emergy analysis, this paper estimated the emergy value of the mangrove ecosystem in China. The ecosystem services of mangrove in China used in our analysis include organic matter production, raw materials, habitat, disturbance regulation, waste treatment and education. The organic matter production is leaf litter and detrital matter, which are valuable sources of food for animals in estuary and coastal waters. The raw materials are the production of timber. The habitat is the capacity of mangrove ecosystem to provide refuge and reproduction habitat to wild animals, especially wild birds. The disturbance regulation is the capacity of mangrove ecosystem to protect and stabilize the coastlines. The wastewater treatment services can be assessed based on the data concerning the capacity of mangroves to remove nutrients from adjacent waters. The education relates to the unlimited opportunities for nature study. The results show that total emergy money value of mangrove ecosystem services in China, which covers (13 646)hm<sup>2</sup>, adds up to 12.6×10<sup>8</sup> Yuan (Chinese RMB), of which, about (2 826.58×10<sup>4</sup>) Yuan of litter fall, about (1 170.81×10<sup>4</sup>) Yuan of biomass, about (63 866.15×10<sup>4</sup>) Yuan of habit, about (10 473.30×10<sup>4</sup>) Yuan of storm prevention, about (47 567.13×10<sup>4</sup>) Yuan of waste treatment, and about 206.86×10<sup>4</sup> Yuan of scientific study. In addition, the concepts of the emergy flow value and the emergy storage value of ecosystem services were analyzed and discussed with the details of mangrove ecosystem in China.

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