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Management of carbon sinks in the coastal zone: A case study of Chiku, Taiwan

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Given that the global carbon problem results mainly from human activities, the best path to eco-sustainability is carbon neutralization. Although the Chiku coastal region is the largest aquaculture area in Taiwan, it is also characterized by its dynamic agriculture and tourism sectors. Land use in this area include: A lagoon, wetlands, aquaculture ponds, salt evaporation ponds, agriculture lands, buildings and green spaces. Over time, local people have developed a unique way of integrating coastal development with conservation of the lagoon ecosystem. Recent research efforts have focused on Chiku's carbon absorption capacities and the relationship between the aquaculture industry and the lagoon. However, these studies mostly consist of static assessments of specific land uses or industries and do not present an integrated view of the dynamics at work in this area. Exploring land-use dynamics in Chiku would make it possible to integrate these recent studies into a more comprehensive framework and enable us to better estimate the actual carbon balance. We propose using the System Dynamics method to build a simulation of changes in land use in the Chiku area. The model reflects human activities in the area (aquaculture, agriculture, tourism, etc.), mimics their synchronous development in the long term and thus provides a solid basis for estimating the carbon balance of the coastal area as a whole. Finally, by combining Monte Carlo simulation and decision tree analysis, the model serves as a platform for the design and testing of policies that could sustainably enhance Chiku's carbon absorption capacity, while still supporting the local economy and environment.

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