

SOCIO-ECONOMIC AND ECOLOGICAL CHARACTERISTICS OF AQUACULTURE IN VILLAGES THREATENED BY THE SEA IN DEMAK DISTRICT, NORTH JAVA.

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Demak district in Northern Java has a shoreline that suffers from erosion due to various factors. The clearance of mangrove forests almost up to the coastline, mostly for shrimp farming, leaves most of the coast unprotected, and reduces sedimentation needed to counteract on-going and expected sea level rise. Moreover, groundwater extraction by intensive shrimp farmers and households, and the nearby industry and urban areas leads to land subsidence, worsening the impact of sea level rise. Together with the Indonesian government institutions, the *Building with Nature* project started actions to stop further erosion. To quantify the benefits of the project interventions, we assessed the socio-economic and ecological baseline in this area.

In this study, we observed the landuse and social-economic characteristics in seven coastal villages of Demak district. These villages were selected in three zones with severe, non-severe, and no-effect from erosion. Data for the social economic survey were collected through close interviews with farmers, open interviews with government staff and other stakeholders, and government statistics. The landuse was assessed by using satellite image GeoEye acquired in 2015 and SPOT acquired in 2013, and a field survey; the collected data were analyzed by using Geographic Information System (GIS).

Until the mid-20th century Demak's economy was based mostly on dry-land crops and rice. In the 1960s, part of the landscape was transformed in rice paddies. Canals for irrigation and drainage were built, and some creeks straightened, but the coastal mangrove belt was left intact. In the 1980s, the demand for shrimp increased and the green revolution decreased world market prices for rice, which pushed the transformation of both paddy fields and mangrove forests into shrimp ponds. Shortly after 1990, seawater intrusion started and gradually rice culture had to be abandoned. By 1995 these processes resulted in the almost complete clearance of mangrove along waterbodies. After 2000, the submersed area gradually increased, and in 2012 two communities had to be evacuated.

In 2015 most of the coastal lands in the villages were still used for aquaculture (4268 ha), but 767 ha of ponds were abandoned or dysfunctional. Human settlements covered 291 ha, while former mangrove area and paddy fields covered 136 ha and 269 ha, respectively. Some farmers used their submerged land by replacing/completing eroded pond dikes with nets or by installing fishery devices. The incomes were from aquaculture and fishing (70%), farm labor (25%), temporary and industrial employment (10%), trading (8%) and government functions (2%). Yields of shrimp and milkfish culture were 43 and 192 kg ha⁻¹ year⁻¹, respectively. The average incomes from aquaculture and fishing were 1,400 and 96 USD yr⁻¹ household⁻¹, respectively. Considering the average household size (5), the income from aquaculture provides an income far below the poverty standard.

Keywords : socio economic, ecological, aquaculture, erosion, Demak