

Mitigate risk for Malaysia's mangroves

Malaysia is the third largest mangrove-holding nation, with 4691 km² of mangroves (1), despite the reported losses including 278 km² between 2000 and 2014 (1). Mangrove habitat loss in Malaysia is mainly attributed to land conversion for agriculture, aquaculture, and urban development (2). Malaysia's mangroves are also affected by severe erosion, aggravated by anthropogenic disturbances along with the rising sea level (3). The combined effect from these disturbances jeopardizes the role of mangroves as a functional habitat that provides vital ecosystem services and connectivity and secures the livelihoods of Malaysia's coastal communities (4). The remaining mangroves are now fragmented and are susceptible to further disturbances, putting the ecosystems at a greater risk of collapsing (5).

To mitigate the risk, a comprehensive governance framework for resource management and habitat conservation should control anthropogenic influences (6). An intertidal habitat, mangroves lie between terrestrial and marine ecosystems. Land and natural resources are protected by a variety of state by-laws and inconsistent implementation and enforcement of national policies by the states (7). Meanwhile, the primary law pertaining to Malaysia's marine biotic resources—Fisheries Act 1985—focuses largely on the management of fisheries, aquaculture, and marine parks and provides no protection for intertidal habitats (8). As a result, mangroves fall into administrative loopholes; they are partially conserved and governed through various federal laws and policies, which are being enforced at the state level by multiple agencies with differing interests and priorities (9). With such piecemeal protection efforts, mangroves continue to be indirectly disturbed or directly exploited regardless of whether they are deemed a legally protected site.

To ensure the sustainability of Malaysia's mangroves, state authorities—with scientists' input (10)—must streamline their priorities. Flaws in the planning, approval, and project implementation processes must be minimized. Environmental impact assessments must be improved to prevent setbacks such as insufficient data and inadequate baseline studies, poor reporting by incompetent personnel, and the lack of public participation in the review process (11). Existing laws must be strictly enforced. Given the increasing threats from global climate

change, and considering mangroves' outstanding ability to efficiently fix and store atmospheric carbon (12), Malaysia must waste no time in making plans to fully conserve all remaining mangroves.

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