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Indonesia, Fisheries Decline

Indonesia: Fisheries Decline Due to Damaging Fishing Practices

Indonesia is a Southeast Asian archipelago comprising 17,500 islands (Yomtov 9). It is a presidential republic, with three branches of government. Regional and central governments share power (CIA, 2022). Located along the equator, between the Indian and Pacific Oceans, its climate is tropical, with large amounts of rainfall year-round. This provides ideal conditions for agriculture, which uses thirty-one percent of the land in Indonesia. Together, the farming and fishing industries employ one third of the population of 277 million people. Major crops include palms, whose oil is a major export, as well as rice and corn, staple foods in Indonesia (CIA, 2022). An important share of the Indonesian diet comes from fish, which is a relatively cheap source of protein.

The average Indonesian family has two children (CIA, 2022). In rural Indonesia, people live in traditional wood homes with thatched roofs, often raised on stilts to protect from insects and flooding. In cities, apartment buildings are the most common form of housing (Yomtov 117). Community is very important to Indonesians, who often consider others from the same village or neighborhood to be their kin, and help to support their extended family (Mirpuri et al. 70). There are roads in most parts of the larger islands, though many are in poor condition, and congestion makes travel slow (Eimer et al. 798). Most Indonesians have access to telephones, electricity, and the internet (CIA, 2022). However, there is a general lack of refrigeration for perishable foods (FAO, 2022).

Crowded conditions and poverty in Indonesia exacerbate existing sanitation deficiencies (Yomtov 118). Toilets or properly constructed latrines are available to 97.2% of urban dwellers and 86.5% of rural Indonesians, while safe drinking water is available to 93.3% of the population, leaving 1.8% of urban Indonesians and 13.2% of rural Indonesians with unsafe water sources (CIA, 2022). Additionally, healthcare, while more accessible in urban areas than rural, is often of low quality, and, according to the World Health Organization, there are an insufficient number of physicians relative to Indonesia's population and healthcare needs (Eimer et al. 801; CIA, 2022).

Literacy among Indonesian adults is high, but the education system is not very effective. Teachers often lack proper training, decreasing the quality of education (Pisani 160). Tuition and school supplies are too expensive for many families, and children frequently begin working at an early age to help support their families. As a result, only 60% of children complete secondary school (Yomtov 119).

Indonesia is located in the Coral Triangle, an area of the Pacific Ocean that supports over 120 million people, including 12 million Indonesians working in the fisheries industry (Coral Triangle at Risk, 2018; Gokkon, 2021). The average Indonesian consumes over 30 kilograms of fish per year, mainly tuna, sardines, and crustaceans (FAO [Country Profiles], 2022). This dependency on fish is endangered by irresponsible fishing practices and illegal fishing that threaten the biodiversity of the area and endanger the future availability of fish.

Foreign fishing vessels frequently illegally fish in Indonesian waters, often using damaging fishing equipment, contributing to billions of dollars of economic losses for Indonesia each year (Farhan et al. 10). Trawling, an illegal practice in which nets are dragged behind a fishing vessel, greatly contributes to overfishing and has led to a 95% decline in some species' populations in the past 80 years. Adult and young fish are caught indiscriminately, preventing depleted fish populations from renewing themselves. Fishing in this way also damages coral reefs, which provide shelter to numerous marine species, including

many that are fished for food. Other harmful—and also illegal—fishing practices include cyanide and dynamite fishing, which kill large numbers of marine organisms at one time (Coral Triangle at Risk, 2018). Fish stocks are not being allowed to recover, despite conservation efforts from the Indonesian government and various organizations. These efforts include the establishment of a Ministry of Marine Affairs and Fisheries (MMAF) in 2001 and the Coral Triangle Initiative, a partnership with neighboring countries to protect marine biodiversity (Farhan et al. 2; TDA 3). Possible solutions to overfishing include aquaculture, protecting spawning grounds, and ending illegal unreported unregulated (IUU) fishing.

Aquaculture is a common response to overfishing, but it can be problematic if not properly undertaken. Indonesia is the fourth biggest producer of farmed fish in the world, utilizing both marine and freshwater aquaculture, some forms of which have been in place for hundreds of years (FAO [Country Profiles], 2022; FAO [Sector Overview], 2022). While increased aquaculture decreases pressure on wild fish populations, fish farms are often placed close to shore, destroying coastal ecosystems such as mangroves, which are crucial habitat for many young fish. Nutrient pollution is also associated with aquaculture, causing algal blooms that kill both wild and farmed fish (TDA 7). Solutions to coastal habitat degradation and nutrient pollution could include shifting the location of fish pens further offshore or increasing the production of freshwater fish away from coastal ecosystems.

There are concerns about the accumulation of fish waste and uneaten feed below fish enclosures in aquaculture, as well as habitat degradation due to the placement of aquaculture systems near shore. Organic sediments, along with crowded conditions on fish farms, can pollute surrounding waters and allow diseases and parasites to spread between farmed and wild fish. The addition of bivalves and plants to filter water, as some researchers in Canada have done, could mitigate this issue, as well as maximize the productivity of the farm (Bourne 111). Another solution, sometimes employed by fish farmers, is to place enclosures further offshore, where strong currents circulate water, keeping fish pens clean and diluting waste. This decreases disease, and therefore, antibiotic costs, saving a lot of money for farmers, while also protecting mangrove ecosystems. The downsides to this approach, as opposed to placing farms nearer to shore, are the increased need for maintenance due to powerful waves and the cost of fuel to access the farm (Bourne 103). However, compared to operating a fishing boat for months at a time, aquaculture requires much less fuel.

Freshwater aquaculture can make use of natural or manmade bodies of water. Tanks of water can also be used, though the amount of energy and maintenance needed to circulate and filter the water makes this method infeasible in Indonesia, especially in the rural communities that would most benefit from increased aquaculture development (Bourne 102; FAO [Sector Overview], 2022). Even so, without some type of intervention, algae can quickly overtake an aquaculture system, creating a dead zone and halting the production of fish, forcing farmers to restart their cultures (EPA 2022). As previously stated, bivalves and aquatic plants can be used to filter water organically and prevent such setbacks. For farms located in still water, farmers could also place fabric below enclosures to collect detritus, and sell fish waste as a natural fertilizer, much as is done with manure from cattle or horses. For densely stocked farms, this might be a feasible way to manage nutrient pollution and supplement income from fish, especially when combined with the parallel culture of filter-feeders.

The composition of fish feeds is another important issue facing aquaculture. Indonesia spent nearly 143 million US dollars on imported fishmeal for aquaculture feed in 2007 (FAO [Country Profiles], 2022). Decreasing dependency on wild-caught fish, whose populations are also endangered by overfishing, would make aquaculture in Indonesia much more sustainable (Bourne 110). There are two main ways to achieve this: increasing the culture of herbivorous fish, and finding alternatives to fish meal in aquaculture feeds.

Traditional aquaculture in Java makes use of flooded rice fields to raise herbivorous fish, mostly carp, tilapia, and gourami (FAO [Country Profiles], 2022). These fish can be fed grains, poultry feed, and even kitchen waste, requiring no fish in their diet (Dela Cruz, 2001). The Indonesian Ministry of Agriculture could encourage Indonesian rice farmers to raise fish in this way, increasing yields from agriculture and aquaculture. The side-by-side farming of rice and fish, both major food sources in Indonesia, has the added benefit of being sustainable for the environment and for the farmer. Fish waste takes the place of artificial fertilizers, and ducks are sometimes added to the system to eat golden snails, a common pest in rice agriculture, decreasing the need for chemical pesticides (Dela Cruz, 2001). Raising fish and ducks alongside rice reduces the farmer's expenses for fertilizers and pesticides, empowers farmers by providing an income from duck eggs and fish, and reduces runoff that can cause algal blooms and dead zones in waterways and the ocean, which further harm aquatic ecosystems (EPA, 2022). However, this solution does not address the job security of those currently employed by the fisheries industry, as it would likely be implemented on existing farms.

Even carnivorous fish do not require their diet to consist completely of fish. The proportion of fish ingredients in aquaculture feeds has been decreasing in recent years, with some species of carnivorous fish, such as trout, being farmed without any fish in their diet (Bourne 110). Replacing much of the fish are grains, including soybeans, rice, and corn, as well as algae and seaweed, whose oil can be used to replace fish oil in feed, providing important omega-3 oils while reducing dependence on imported fish (NOAA). MMAF's Agency of Research and Development could look into such alternatives to fish-based feeds as a way to decrease dependence on unsustainable fisheries.

Habitat conservation is paramount in rebuilding collapsing fisheries. Indonesia is surrounded by mangrove forests and coral reefs, both of which provide shelter to fish eggs and young fish. These habitats are also susceptible to damage from irresponsible fishing methods (Fernandes et al. 10). Protecting these ecosystems would benefit many species facing declining populations, and could help preserve coastal communities that depend on fishing (FAO, 2021). Protected areas should implement practices such as establishing minimum catch sizes, prohibiting damaging equipment and boats, and, in particularly vulnerable habitats, creating no-fishing zones. Regulations such as these could allow overfished populations to recover. Prioritizing the involvement of local government and community members would help to ensure that different stakeholders' needs are addressed when planning a protected zone (Gombos et al. 6).

For Indonesian fisheries to be sustainable, fish stocks cannot be chronically overharvested. There are regulations in Indonesia regarding minimum size of mesh for nets and the use of fish aggregating devices that are meant to prevent overfishing (FAO [Country Profiles], 2022). Illegal fishers do not obey these regulations, damaging marine ecosystems. MMAF has made many efforts to stop IUU fishing, including authorizing the navy to sink illegal fishing vessels, detected by radar satellite, in 2014 (Farhan et al. 2). Fish stocks recovered slightly in the next few years, but IUU fishing continues to occur (Gokkon, 2021). So far, Indonesia has partnered with Australia to protect the region's waters, and has cooperated with the EU to ensure that fish imported into the EU were not fished illegally (FAO [Country Profiles], 2022). Similar regulations could be put in place with other major importers of fish from Southeast Asia, such as the United States. This would require increased scrutiny on sources of imported fish from US customs.

Exacerbating the IUU fishing problem is an international dispute over fishing rights in the South China Sea. The United Nations Convention on the Law of the Sea defines the rights of coastal countries to areas of the ocean that are within 200 nautical miles of their shore. This zone, for Indonesia, overlaps with those of Vietnam and Malaysia, as well as parts of the sea which historically belonged to China, and extend much further than 200 nautical miles from China's shore. China ratified the Convention on the Law of the Sea in 1996, relinquishing historically-based claims of ownership. In 2016, the Permanent Court of Arbitration, which settles disagreements between countries, ruled that China no longer has rights

to this area (Bale 84). However, China has not respected this ruling and continues to fish and assert military force throughout the South China Sea, antagonizing five other countries who have a legal claim to parts of these waters: Indonesia, Brunei, Malaysia, the Philippines, and Vietnam (Bale 78, 84).

In order for Indonesia to settle disputes with Vietnam and Malaysia peacefully, the Indonesian president and MMAF should make agreements with the two countries that would allow shared use of resources in contested areas without over-exploiting fish stocks. Policies put in place could include minimum sizes for fish caught, maximum catch per year based on the size of fish stocks, and restrictions on damaging fishing equipment. Indonesia and Malaysia are both part of the Coral Triangle Initiative (TDA 3). This existing partnership could facilitate further efforts to protect marine resources.

With respect to China, the United Nations should get involved, as China has shown no sign of stopping its destructive use of other nations' waters, threatening the availability of fish in these areas, and even building military installations on reef-based artificial islands near the Philippines (Bale 84-5). While the UN cannot necessarily act directly to resolve conflict, they can facilitate the cooperation of many countries to encourage China to recognize the rights of other countries in the South China Sea, by imposing sanctions, for instance.

Given the diversity of stakeholders who depend on fisheries, solutions to unsustainable use of marine resources will necessarily be complex. Replacing fishing with large-scale aquaculture would require Indonesians employed by fishing companies to make a conscious decision to change their occupation. Concurrent claims to marine resources render resolution of international disputes difficult. Increased awareness of declining fisheries will need to play a large role in enacting any type of solution, as will cooperation with neighboring countries and involvement from coastal communities, local governments, and fishing companies, both large and small.

Protecting wild fish stocks and increasing the sustainability of the fishing industry will help Indonesia ensure food security for the future. Overfishing is a multifaceted issue that will take international cooperation to resolve. It is crucial that it be resolved for the millions of people in Indonesia who rely on fish and the ocean for food and work. Their futures depend on it.

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