

# SUSTAINABLE FISHERIES AND AQUACULTURE



## Wild Capture Fisheries and Aquaculture

Countries of East Asia region account for 63% of total world fisheries production, contributing 40% of global wild fisheries production and 80% of global aquaculture production. The estimated value of capture fisheries to region is US\$35B, while aquaculture production is valued at US\$100B.

East Asia is both a massive producer and consumer of seafood. As wild capture fisheries taper off, aquaculture is rapidly growing to fill the demand for seafood, and has recently made up nearly half of the seafood consumed by humans worldwide.<sup>1</sup>

From 2000-2015, Indonesia, Thailand and Vietnam invested heavily in intensive inland aquaculture, and output grew by 460% at these farms.<sup>2</sup>

China is the largest wild capture and aquaculture producer in the world.<sup>3</sup>

The average Southeast Asian consumes 36 kg of seafood per year, which is double the global average.<sup>4</sup>

## International Efforts to Manage Fisheries and Halt IUU

The U.N. Sustainable Development Goal (SDG) 14.4<sup>b</sup> and Targets 6<sup>c</sup> and 7<sup>d</sup> of the Aichi Biodiversity Targets are two international instruments directly relevant to fisheries management and

## Challenges and Concerns

Blue economy growth in the capture fisheries sector requires a central focus on ecological sustainability, as 58% of monitored global fish stocks are fully exploited, and an additional 31% of stocks are overexploited.

Policy-makers must also place a stronger emphasis on law enforcement, as illegal, unreported and unregulated (IUU) fishing worldwide is estimated at somewhere “between 13% and 31% of reported catches, and over 50% in some regions,” and valued at up to US\$23 billion per year.

The region is the aquaculture hub of the world, but at a cost to ocean health and food security. Instead of relieving fishing pressure, many global forage fish stocks and so-called “trash fish” can be overfished in an effort to derive fish oil and fish meal to feed farmed fish. There are also unresolved concerns with effluent discharge, the use of chemicals, disease transfer and the destruction or alteration of important ecosystems to create fish farms (such as the destruction of mangroves to create farmed shrimp ponds).

As a 2016 study found, the conversion of mangroves to aquaculture farms is a leading cause of deforestation in Southeast Asia. Each year, 450 million metric tons of CO<sub>2</sub> from blue carbon ecosystems are released from land use change, costing US\$18 billion in economic losses. Policy-makers should consider the role that certain forms of aquaculture have on altering coastal ecosystems and blue carbon. To that end, the **U.N. Food and Agriculture Organization (FAO)** has promoted policies to support innovative closed-loop aquaculture practices like aquaponics.

<sup>a</sup> PEMSEA's definition of blue economy is a practical ocean-based economic model using green infrastructure and technologies, innovative financing mechanisms and proactive institutional arrangements for meeting the twin goals of protecting our oceans and coasts and enhancing its potential contribution to sustainable development, including improving human well-being, and reducing environmental risks and ecological scarcities (Changwon Declaration, 2012).  
<sup>b</sup> By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics  
<sup>c</sup> By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.  
<sup>d</sup> By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

sustainable aquaculture. In addition to UNCLOS, the closest mechanism resembling international management of fish stocks would be the collection of seventeen regional fishery management organizations (RFMOs) scattered across the globe, which primarily manage the high seas where there are significant deep-sea fisheries.<sup>6</sup> The **Organization of Economic Co-operation and Development (OECD)** has proffered best practices for RFMOs to adopt and become more effective.<sup>5</sup>

**FAO's Blue Growth Initiative** emphasizes the ecosystem approach to capture fisheries and aquaculture, and promotes sustainable livelihoods for coastal fishing communities, supports small-scale fisheries and aquaculture development, and "fair access to trade, markets, social protection and decent work conditions along the fish value chain."<sup>6</sup> In addition to tracking global fish capture and trade-related data, FAO also implements the **Code of Conduct for Responsible Fisheries, the Ecosystem Approach to Fisheries and the Port State and Flag State Measures Agreements to Prevent, Deter and Eliminate IUU fishing (PSMA)**<sup>7</sup>. The PSMA, the FAO Code of Conduct for Responsible Fisheries and improved monitoring, control and surveillance are key tools in combating IUU fish, but there is far more work needed worldwide.

### Port State and Flag State Measures Agreements to Prevent, Deter and Eliminate IUU Fishing (PSMA)

The **PSMA** has become binding law as of 2016, among countries that have ratified the agreement (East Asian members include **Indonesia, South Korea and Thailand**). The PSMA seeks to stop fish pirates from "port shopping" for a safe haven, a practice where they can unload their illegal catch at ports with little oversight. Its provisions include a "denial of access to ports, port inspections, prohibition of landing, and detention and sanction," in order to prevent IUU fish from reaching national and international markets. Some countries have also decided to prohibit trade with countries that do not have port state measures in place. The PSMA also requires "the flag State to take certain actions, at the request of the port State, or when vessels flying their flag are determined to have been involved in IUU fishing...[even] over vessels flying their flags in areas beyond their national jurisdiction."

## Regional and National Policy Efforts to Address Obstacles to Legal, Sustainable and Equitable Fisheries

### Leading Regional/National Policies

In response to potential trade sanctions leveled by the **EU** to major seafood exporting countries for taking insufficient measures to combat IUU, countries of the region have implemented positive reforms. For example, the **Philippines** passed Republic Act No. 10654 in 2015, which amended the Philippine Fisheries Code to increase penalties for IUU violators and implement MCS on all Philippine-flagged vessels. **Thailand** has made progress in this area by creating a Command Centre for Combatting Illegal Fishing, which inspects fishing piers in Thailand.<sup>8</sup> Illegal seafood still finds its way into countries associated with tighter border controls. Up to a third of wild-caught seafood imported into the **United States** (by weight) is IUU seafood,<sup>9</sup> in spite of the Lacey Act, a longstanding law that prohibits trade in illegal wildlife, fish and plants. In response, the U.S. plans to improve seafood traceability via the **Seafood Import Monitoring Program**, which would require importers to more accurately report traceability metrics for twelve popular seafood species; the rule resisted industry challenge and will go into effect in January 2018.<sup>10</sup> In 2015, **USAID** also launched **The Oceans**

### Indonesia's technological transparency in fighting IUU

National governments are joining technology providers in casting wider transparency on illegal fishing activities. In June 2017, the head of Indonesia's Ministry of Marine Affairs and Fisheries made an incredibly transparent and "unprecedented move" by allowing Global Fishing Watch, a joint project of SkyTruth, Google and Oceana, to have access to all of the country's vessel monitoring system data. While few countries allow the public this level of access, the ministry head "believes that making government fisheries data visible to the public is a powerful way to engage civil society in the fight against...IUU fishing."

Given Global Fishing Watch's standing offer to process and analyze this data for free, other East Asian countries may want to take them up on this unique offer to "leapfrog" and rely on free, cutting-edge technological services to tackle IUU fishing in their territorial waters.

<sup>6</sup> RFMOs in the East Asia region include: the tuna-specific Western and Central Pacific Fisheries Commission (WCPFC), Indian Ocean Tuna Commission (IOTC), Commission for the Conservation of Southern Bluefin Tuna (CCSBT); the general RFMOs in East Asia include the North Pacific Fisheries Commission (NPFC) and The South Pacific Regional Fisheries Management Organization (SPRFMO)

**and Fisheries Partnership** in the Asia-Pacific Region, and partnered with the **Southeast Asian Fisheries Development Center (SEAFDEC)** and the **Coral Triangle Initiative for Coral Reefs, Fisheries and Food Security (CTI-CFF)**, which relies on an ecosystem-based approach to fisheries management. USAID's program collaborates with technology companies and "supports the development of a transparent and financially sustainable [electronic] catch documentation and traceability [CDT] system"<sup>11</sup>, and currently has two demonstration sites in the region, General Santos, Philippines and Bitung, Indonesia.<sup>12</sup>

### Improved Sustainability of Resource and Fishing Community via Science-based Fishery Management

A 2016 study<sup>13</sup> "found that the most effective fisheries management relies on science-based catch and fishing limits."<sup>14,f</sup> A 2015 study surveyed over 4,000 fisheries worldwide and found that those with sustainable management plans were more profitable than those without, and that the benefits associated with effective fisheries management were ten times larger than the costs.<sup>15</sup> Furthermore, sustainable management could increase global fish production by 14% and increase economic benefits by US\$51 billion each year over the next decade.<sup>16,17</sup> There is a strong case for nations' fisheries agencies to invest more in better fisheries data, management and enforcement to protect this valuable resource from theft and overfishing, and to safeguard the economic security of coastal communities.

To boost environmental quality and economic opportunity in fisheries, one innovative policy approach is to create **well-managed marine**

**protected areas (MPAs)** or no-take zones, where fishing, aquaculture and other exploitative activities are not allowed. Currently, "the global community is less than halfway to achieving the Aichi Target 11 of conserving 10% of the oceans by 2020."<sup>9</sup> Economic benefits associated with well-managed MPAs overwhelmingly outweigh the costs associated with managing the MPA itself,<sup>18,19</sup> and tourists are willing to pay more money if there is greater marine biodiversity.<sup>20</sup> (The substantial ecotourism benefits derived from MPAs is further explored in a separate policy brief from this series.) **Australia** led the world in 2012 by creating the largest marine reserve network encompassing sixty marine reserves of roughly one third of its territorial waters (or 3.1 million km<sup>2</sup> total);<sup>21</sup> unfortunately, the government plans to significantly reduce coverage.<sup>22</sup>

**China** boasts a large "Special Marine Protected Area" (SMPA) Network that addresses the funding problem up front by establishing a user fee and payment system that all ocean users must pay (from which the money goes to both the provincial and national governments).<sup>23</sup> The SMPA Network is a collection of MPAs that allow some extractive uses and others that do not, and since the creation of the first few MPAs in the 1980s, there is a clear improvement in enforcement and local respect for rules regarding permitted activities.<sup>24</sup> It is guided by an overall national planning model, and is only partially administered at the local level. Enforcement was found to be more successful because the national government had a direct role in enforcement and coordination across several MPAs. Indeed, the key for a successful MPA anywhere is that it be both large enough and *well-managed*. When a national government does

#### MPAs with Impact

A global review of marine protected areas (MPAs) demonstrates that they can, on average, increase fish size by 28%, density by 166%, species richness by 21% and fish biomass by a whopping 446%. This increased productivity can spill over into adjacent areas where fishing is allowed, thereby boosting the income of coastal fishermen.

After the creation of a marine reserve in Apo Island, Philippines, surgeonfish and jackfish populations tripled. In the Torre Guaceto protected area off the coast of Italy (co-managed by the fishermen), sea breams were able to spawn 15 times more eggs and larvae, which meant that even up to 100km away from the area, the fish catch doubled.

#### Well-intentioned fisheries policy can have unintended outcomes

China implemented a well-intentioned fleet-reduction plan via a 2002 vessel buyback program that led to a 31% reduction in commercial fishing vessels from 2002 to 2014. Unfortunately, since the government also sought to control the engine power of each vessel, the vessel tonnage and horsepower increased, offsetting the reduction of vessels on the water (because bigger engines allowed for more fishing). Indeed, the marine catch actually rose by 1.6% per year over that same period. This example serves to demonstrate the need for reevaluating if a particular policy is yielding an unintended outcome.

<sup>f</sup> Of the thirteen characteristics of management systems surveyed, the three most effective were the extensiveness of stock assessments, strength of fishing pressure limits and the comprehensiveness of enforcement.

<sup>9</sup> This goal was adopted by the Parties to the Convention on Biological Diversity in 2010.

not holistically plan MPA siting<sup>h</sup> or allocate sufficient funds for enforcement, one does not see any material benefits from MPAs, and they become what is known as “paper parks.”<sup>25</sup> Policy-makers may want to delegate enforcement at the national level, given the disparities in funding, conflicts of interest, and level of effort among local municipalities.

### Equity – Policies that Ensure Fishing Communities Receive the Benefits of the Resource

**Namibia** provides an instructive policy model for fisheries management. Its fish stocks were once decimated by foreign vessels. After achieving independence from South Africa in 1990, the new government moved swiftly to establish a fisheries administration, passed a series of fisheries laws and expelled foreign vessels from its EEZ.<sup>26</sup> Namibia rebuilt its fish stocks over time, and implemented a fair, non-privatized, resource-rent based quota system.<sup>27</sup> These non-transferable rights are limited by a certain year duration, depending on level of ownership of Namibians, and is coupled with a TAC for all, wherein quotas are divided out to each of the rights holders. The non-transferability of quota among private actors<sup>i</sup> is a key element that preserves the legitimacy of the system. This has led to healthier stocks and greater economic wealth for Namibians.<sup>28</sup> Another critical element of the Namibian system is the complete absence of fisheries subsidies. Finally, the costs to the government and industry of monitoring, control and surveillance “have been kept commensurate to the value of the sector.”<sup>29</sup>

### Making Aquaculture Blue

Most finfish aquaculture still typically relies on inefficient and unsustainable fish in/fish out ratios (i.e., the amount of fish fed to farmed fish is more than is what is grown, a net loss of biomass for human consumption), or depend on intensively grown soy or corn as a main feed component, which can be a source of marine pollution from the land. The **EU** provides some hard standards for aquaculture by controlling the input of nutrients and chemicals in the water via the Water Framework Directive,<sup>30</sup> managing invasive species risk through the EU Regulation on the prevention and management of the introduction and spread of invasive alien species,<sup>31</sup> setting up organic aquaculture standards,<sup>32</sup> and requiring member countries to achieve good environmental status for their marine waters across 11 criteria (of which aquaculture

### Governments aid community-led efforts to achieve sustainable fisheries

If communities demonstrate success at turning around their fisheries, they then become prime candidates for external (usually NGO) financial support to pay for the process of certification by a third party eco-certifying scheme, thereby allowing small-scale fishing communities to achieve a higher price on the global market. One such scheme is the **Marine Stewardship Council (MSC)**, which evaluates sustainability across four criteria and permits the usage of its blue logo on products that meet its specifications.

In the Ben Tre province of Vietnam, the local clam fishery became the first ever MSC-certified fishery in Southeast Asia. With support from the Ben Tre Department of Agriculture and Rural Development, the fishery has spurred greater protection (and replanting) of the mangrove swamps, in order to expand the habitat of the clams.

impacts several) via the Marine Strategy Framework Directive.<sup>33</sup> Third-party certifiers, such as Best Aquaculture Practices (BAP), have stepped in to address sustainability standards for aquaculture operations, including feed ratios. Some countries are investing in startups and research labs that explore more sustainable yet highly nutritious alternatives for proteins and fatty acids, such as insect larvae, algae or spent brewing grains. For example, the UK recently invested in an insect growing lab to feed farmed salmon.<sup>34</sup>

To support aquaponics development, FAO has produced a technical manual on small-scale aquaponics food production.<sup>35</sup> It has also run training workshops on aquaponics for countries in the Near East and North Africa region.<sup>36</sup> FAO has been making a strong case in East Asia for countries to implement policies that facilitate the adoption of innovative agro-aquaculture, through its South-South cooperation program in **China**.

### Regional and National Policy Efforts to Promote Smarter, more Sustainable Aquaculture

Canada provides policy suggestions for best practices in aquaculture, including the usage of integrated management, the precautionary approach,<sup>37</sup> which is coupled with national legislation

<sup>h</sup> Siting considerations include taking into consideration species spawning grounds, the presence of other industrial activities nearby, and ensuring that MPAs are large enough to provide a safe haven for spawning.

<sup>i</sup> Norway also uses non-transferable quotas to regulate some species.



## Vietnam's climate-smart aquaculture

Vietnam partnered with international research groups to pioneer an innovative project called “Enhancing community resilience to climate-change by promoting smart aquaculture management practices along the coastal areas of North-Central Vietnam” (ECO-SAMP). After two years of pilot trials, this rotational fish farming method of alternating tilapia with shrimp (and other “cleaning” species) boosted household incomes by 12%, saved over US\$300 per household in reduced pond cleaning, and enhanced gender equity by increasing women’s incomes.

that delegates leasing and licensing at the regional level.<sup>38</sup> The **U.S.** finalized regulations in January 2016 to authorize for the first time ever a commercial permitting scheme for offshore open-water aquaculture operations in federal waters. These regulations are currently being challenged in federal court by fishing and environmental groups for insufficiently considering socioeconomic and environmental impacts.<sup>39</sup> This challenge serves as a reminder that all stakeholder groups should be sufficiently consulted (and their concerns more fully addressed) to avoid delays in enacting regulatory policy in the future.

At a June 2014 FAO Committee on Fisheries, the **Cook Islands, Indonesia, Kenya** and **Mexico** cited aquaponics as an opportunity for growth.<sup>40</sup> **Indonesia's** Ministry of Marine Affairs and Fisheries has pursued a lower-cost homegrown form of aquaponics tailored for the Indonesian climate, *bumina* and *yumina*, and has published a how-to book to encourage citizens to pursue this practice at the household level to promote food security. Aquaponics may not fit all contexts. **RO Korea** and **China** have invested money into integrated multi-trophic aquaculture (IMTA) as a way of co-growing a “fed” animal such as fish or shrimp along with something that processes their waste (such as invertebrates or seaweed).<sup>41</sup> In 2017, the Scottish government issued a policy statement covering commercial seaweed cultivation development and IMTA development.<sup>42</sup> Finfish aquaculture is regulated by a separate technical set of standards issued by the Scottish government in 2015,<sup>43</sup> so both policies inform IMTA.

Seaweed farming might be a profitable route for much of East Asia, given that it is a US\$6 billion global industry that has the potential to earn farmers US\$1,000 per ton of dried seaweed<sup>44</sup> and provide beneficial impact on the marine environment. A World Bank study predicts that seaweed farming could reach 500 million dry tons by 2050 (which could create 50 million jobs).<sup>45</sup>

## Seaweed farming initiatives driven by East Asian governments

Indonesia is the second-largest seaweed farming country in the world, boasting “close to 200,000 smallholder farmers” and “accounting for more than half of the aquaculture commodities produced in the country.” To capture a greater share of the value chain (and not merely be a provider of the raw goods alone), the government is investing in processing seaweed domestically to create value-added products.

The Philippines launched nationwide training courses to teach better disease prevention and farm management practices.

RO Korea's Aquaculture Disaster Insurance (ADI) scheme offers government-supported coverage terms for natural disasters and disease loss. A knock-on effect of this policy is that RO Korean sea farmers now more readily report disease outbreaks and participate with the government in identifying disease strains, thereby bolstering the success of the entire sector.



## RECOMMENDATIONS

At its most basic level, fisheries and aquaculture involve the harvesting of a renewable resource, with an enormous caveat: if done responsibly. In both of these systems, the world has seen a rise in popularity of private sector initiatives (such as sustainability certification schemes) and NGO support for environmentally-promising fisheries or fish farms (e.g., through mechanisms such as Fisheries Improvement Projects or Aquaculture Improvement Projects). These initiatives undoubtedly have their role in creating a sustainable seafood system. But at its core, the management of a public resource (fish) or the land use/ conflicting use issues tied up with coastal aquaculture requires a strong role for the national government, from both a legal and practical point of view.

As identified in this policy brief, countries have pursued a variety of policy tools to address and bolster the coastal fisheries and aquaculture sector in a “blue way.” East Asian policy-makers may consider the following elements when designing or reforming a fisheries/aquaculture management scheme:

- Investing in **strong data on fisheries management** to make well-informed management decisions for more resilient fish stocks (examples in the U.S., Norway, and increasingly so, China)
- Facilitating and supporting **locally-initiated efforts** to improve coastal fisheries, and **promoting those efforts** at a higher level to ensure a broader impact (Vietnam, The Gambia)
- Improving **scientific soundness of MPA/MPA networks**, including their socio-economic and ecological objectives, impacts and benefits, and enhancing the **management effectiveness of MPAs and MPA networks**, thereby improving fish populations and generating more fish to be harvested outside the boundaries (Australia, EU, U.S., China)
- **Eliminating subsidies** to prop up unsustainable elements of a sector (SDG 14, China, Namibia)
- **Equitably** reshaping the way fishing is done that puts its **people and the environment first**, instead of succumbing to outside pressure to grant foreign fishing access (Namibia)
- Considering how non-marine sectors, such as **land use policy**, can be oriented towards geographically-appropriate, sustainable and highly **productive aquaculture** (e.g. FAO aquaponics; rice-fish farming in China)
- **Investing in innovative and promising R&D** that addresses key challenges in a sector (UK – insect larvae feed)
- Offering **government-supported disaster insurance schemes** that not only reinvigorate a sector but also promote greater cooperation of industry with government officials (RO Korea – ADI)
- Investing in a more vertically-integrated supply chain that includes **value-added processing to generate more wealth for locals** (Indonesia processing seaweed)



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