Marine and Coastal Aquaculture in the Asia-Pacific Region: Balancing Sustainable Growth and Conservation Sri Lanka, Indonesia, Vanuatu, Solomon Islands, and Papua New Guinea.

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Objectives of this policy brief:

- **Assess aquaculture's impact on environmental, food, and economic security, highlighting key issues.**
- **Link social impacts of aquaculture to human rights, inclusion, and poverty alleviation.**
- **Analyze policy gaps in regional aquaculture regulations.**
- **Propose sustainable policies balancing ecological and socio-economic well-being.**
- **Recommend strategies to promote aquaculture as a nature-based solution to climate challenges.**

Aquaculture in the Asia-Pacific region has a long history, with countries like China, Indonesia, and India pioneering fish culture. Over the past two decades, technological advances, feed development, and chemical treatments have boosted its economic impact. The region's vast coastal and inland waters provide rich resources for aquaculture, which has become essential for meeting the growing demand for food. In 2022, global aquaculture production hit a record 130.9 million tonnes, surpassing capture fisheries. This included 94.4 million tonnes of aquatic animals and 37.8 million tonnes of algae, with an industry value of around USD 312.8 billion. Asia leads the sector, producing 92% of the total, with China contributing 57.8%, the Pacific region is lagging behind with an estimated value of USD 90 million, despite its vast ocean and a lucrative export market on its doorstep. Aquaculture is also a major contributor to people's livelihoods and communities. Around 21 million people are involved in aquaculture globally and a further 7.5 million are employed in hatcheries, feed production, processing, and retail. The coastal and marine aquaculture practiced in Sri Lanka, Indonesia, Vanuatu, Solomon Islands, and Papua New Guinea are rich in marine biodiversity, possess extensive coastal areas and species that are ideal for aquaculture. However, the industry faces many challenges in environmental security, climate security, food security, economic security, and social aspects like human rights, social inclusion and poverty alleviation. Addressing these issues is essential for promoting sustainable and resilient aquaculture in the Asia-Pacific region.

Security issues closely linked to aquaculture

Security Themes: Economic Security

Governance challenges like resource competition, unfair market practices, communication gaps, and challenges in implementing WTO standards.

Marine aquaculture is the most lucrative environment segment registering the fastest growth in 2024. APEC economies contribute about 85% of worldwide production. Six of the top ten aquaculture producers are APEC members: China, Indonesia, Vietnam, Korea, the Philippines, and Chile. China leads with 36% of global production, followed by India (8%), Indonesia (7%), Vietnam (5%), and Peru (3%).

Aquaculture in APEC has seen benefits from collaboration on knowledge, infrastructure, investments, science, and business. While challenges remain, the network component has improved the region. However, small-scale aquaculture (SSA) in APEC economies faces governance challenges like resource competition, unfair market practices, and communication gaps.

Despite efforts, aquaculture governance at the economic level is not optimal, with unresolved issues like policies and strategies. Effective governance fosters a stable environment for SSA, attracting investment, promoting collaboration, and empowering farmers. Aquaculture is expected to grow by 2030 placing a strong demand on sustainable practices, technological advancement and market expansion.

In 2022, 24% of aquaculture employment was full-time, with women making up 25% of this. Regional workforce distribution is 95% in Asia, 3% in Africa, and 2% in Latin America. Aquaculture provides crucial employment in remote and rural areas, with 90% of APEC fish harvesters and farmers engaged in small-scale activities, supporting the livelihoods of 24.2 million people. (FAO, 2024)

Security Themes: Environmental security: **Biodiversity loss and habitat destruction**

Environmental security is the **protection of living and non-living natural resources or ecosystems to safeguard the well-being and stability of communities.** The loss of biodiversity interrupts aquatic food chains, leading to destabilizing ecosystems and causing species extinction. Coral reefs, seagrass beds, and mangroves act as carbon sinks and buffer against storms and tsunamis.

The mangrove destruction for shrimp farming has disturbed biodiversity, carbon sinks, and coastal protection in many coastal regions in Sri Lanka and Indonesia. The inadequate waste management from fish farms in Papua New Guinea and Sri Lanka has deteriorated the quality of water bodies and reduced fish stock via eutrophication. The demand for aquaculture fishmeal has increased the overexploitation of small pelagic fish in Indonesia. The native fish populations in the Solomon Islands and Vanuatu are already at risk due to the introduction of invasive species via aquaculture operations.

However, the destruction of these ecosystems speeds up global warming by emitting stored carbon back into the air and causing coral bleaching. As a Solution Integrated Multi-Trophic Aquaculture (IMTA) can minimize habitat degradation by farming multiple species at different trophic levels, promoting nutrient recycling, reducing pollution, and easing pressure on wild fish stocks. Scaling up IMTA can enhance both ecological and economic sustainability, making it a vital strategy for environmental security.

Security Themes: Climate Security: Sea level rise and Ocean Acidification

Climate security in aquaculture refers to strategies and processes to buffer aquaculture from climate change-related challenges, which include rising sea levels, increase in sea temperature, ocean acidification, and extreme weather events (Kibria et al.2017).

Rising sea temperatures are expected to produce both negative and positive impacts on aquaculture production as tropical regions/countries like the Asia Pacific will experience losses in species. (Kibria et al. 2017) to escape the tropical warm weather and coral bleaching. Ocean acidification would also cause a decrease in seafood organisms such as shellfish and finfish. Sea level rise would lead to saltwater intrusion into inland aquaculture facilities and damage coastal ecosystems such as those of mangroves which are literally breeding grounds for marine life.

Extreme weather events in the form of storms, typhoons, and droughts can damage aquaculture infrastructure and disrupt production.

Security Themes: Social & Human Security: Gender equity, safety, forced labor, and a safe & healthy working environment

Small-scale fishers, fish workers, and their communities are increasingly challenged by the "blue economy" initiatives related to the exploitation of the marine environment, including commercial aquaculture. As with any industry, if not carried out with proper care and attention, aquaculture can have negative impacts on people's well-being such as poor working conditions, child labor, social exclusion, unsustainable environment, and land/ocean grabbing (Errico, et.al. 2023).

Regarding social inclusion, there are issues regarding gender equity and women's rights in the aquaculture industry. While women are increasingly entering the field and leading in aquaculture, opportunities have generally not kept pace with industry growth, despite aquaculture being the fastest-growing food production sector globally. This dearth is attributed to inequities in training, financing, and decision-making power, among other institutional and systemic socio-cultural, economic, and political factors.

There was an earlier wave of effort to promote the role of 'women in fisheries', especially in the Pacific region (Barclay, 2021). Today there is renewed interest in the area of 'gender and fisheries'. This focus on gender equity, equality, and social inclusion comes from awareness of women's critical role in fisheries and management of marine resources, and the importance of everyone benefiting equitably from technical and scientific interventions designed to achieve development outcomes.

Meanwhile, occupational safety and health in aquaculture is important because globally there are 19 million workers in the industry, a large proportion working in lower and middle-income countries, often faced with various hazardous tasks and environments.

Security Themes: Food Security - Undernutrition, food insecurity, & malnutrition

Food security refers to availability of sufficient quality food through domestic production or imports. Access to adequate entitlements (such as common resources) for acquiring food. Utilization of food through diet, water, sanitation, and healthcare to meet all physiological needs. Stability (access to adequate food at all times, and not risk losing it to sudden or gradual risks (including climate and economic reasons).

Asia and the Pacific region represent half of the world's undernourished people. The prevalence of undernourishment in Asia and the Pacific region decreased to 8.4 percent in 2022 from 8.8 percent of the previous year, equivalent to around 12 million fewer undernourished people than in 2021, but 55 million more than in 2019, prior to the COVID-19 pandemic (FAO, 2023).

Moreover, the demand and consumption of aquatic food from aquaculture is expected to rise due to various factors such as limitations in capture fisheries management, economic development, urbanization, increased middle income group, higher demand, changing consumer preferences, technological advancements, population growth, and rapid aging in some countries. Therefore food security and sustainable aquaculture are the major concern for both the region and globally. One interesting case is how industrial aquaculture has caused adverse impacts on the accessibility of food for fishing communities, as many farmed fish are fed with marine fish (Errico, et.al. 2023)

Table 01: Comparative analysis of existing policies, best practices from the policies and initiatives, and policy gaps in Asia and Pacific regions.

Major Aquaculture Policy, Initiatives, and Strategies	Policy Analysis	Policy Gaps
National Aquaculture Development Plan (NADP) **Indonesia:** Ocean and Fisheries Regulations (PP no 27/2021) **Sri Lanka:** Aquaculture Development Authority Act No. 53 of 1998. **Solomon Islands** National Aquaculture and Management Plan 2018 – 2023. **Vanuatu**: National Ocean Policy **PNG**: A roadmap for coastal fisheries and marine aquaculture for 2017–2026	Papua New Guinea (PNG) does not have a separate National Aquaculture Development Plan or Policy though the government is keen on developing one. Most of the national plan is promoting sustainable aquaculture practices. Vanuatu was the first Pacific nation to adopt a national ocean policy in 2016, allowing for cross-sectoral coordination to protect and sustain the ocean's health.	**Inadequate support** for small-scale and community-based aquaculture hinders the opportunity for job creation and economic security **Lack of regulation** regarding aquaculture biosecurity technology creates environmental risks **Inadequate innovative aquaculture** approaches and methods, such as Integrated Multi-Trophic Aquaculture (IMTA).
FAO Initiatives Regional strategy and action plan for sustainable intensification of aquaculture in the Asia-Pacific region 2016 FAO's Blue Transformation Initiative adopted by COFI in 2022. FAO & NACA. 2023. Aquaculture transformation – Innovation and investment for sustainable intensification and expansion of aquaculture in Asia and the Pacific region. **Network of Aquaculture Centres in Asia Pacific Strategic Plan 2025+**	These efforts are primarily coordinated through regional collaborations and frameworks established by organizations such as the FAO and the Network of Aquaculture Centres in Asia-Pacific (NACA). There is no specific initiative that has been taken independently by Asia Pacific countries outside of the FAO Framework. Asia-Pacific Fishery Commission (APFIC) - 1948 under FAO also has been suspended in 2023 to 2028 in its 37th session. NACA is an intergovernmental organization that promotes rural development through sustainable aquaculture and aquatic resources management	The consultations that were made in coming up with the **Regional Strategy were not inclusive** of Pacific Island countries though it seeks to cover the Pacific region as well. **Inclusive Membership** to extend to Pacific Island countries since NACA strategic Plan is for both Asia and Pacific. **Funding and Resources:** The plan relies heavily on the personnel and facilities of participating centers.

Asia Pacific Economic Cooperation Initiatives (APEC) APEC- Ocean and Fisheries Working Group (OFWG) Road Map on small-scale fisheries and aquaculture 2022 - 2027	Promotes regional cooperation among 21 Asia Pacific economies, with a clear roadmap on aquaculture focusing on toolkit development, collaboration, and regulation simplification, leading to real project developments. Free trade and economic cooperation align with FOIP Leaders' goals. Some Asia Pacific countries, like Sri Lanka, Solomon Islands, and Vanuatu, have observer status in APEC, while full members include PNG, Indonesia, China, and others.	**Inconsistent Data Collection and Management** to inform decision-making. **Inconsistency in Regulatory Frameworks** hinders the growth and sustainability of small-scale fisheries. **Inadequate support for Coastal Communities:** including the integration of native cultures and gender equality. Special consideration is needed for the unique challenges faced by these communities. **Inadequate strategies for Climate Change Adaptation** and resilience to ensure the long-term sustainability of these sectors, especially small-scale producers **Inadequate Market Access and Infrastructure:** Small-scale producers often face challenges in accessing markets due to a lack of infrastructure and market information. Policies should aim to improve market access and support infrastructure development
Environment & Aquaculture **Indonesia:** Fish Welfare Regulations by the Ministry of Marine Affairs & Fisheries (Permen KKP no. 6/2020) Boe Declaration on Regional Security (2018) Environmental Rule of Law and Human Rights in Asia Pacific (2021) **Sri Lanka:** Fisheries and Aquatic Resources Act (1996) National Environmental Act No. 47 of 1980	There are good best practices such as the environmental safeguards in Indonesia or the ecosystem-based management of aquaculture systems in the Solomon Islands This report highlights trends in applying the environmental rule of law and human rights in the region, focusing on protecting environmental human rights defenders and achieving the Sustainable Development Goals.	**Inadequate regulation** for disease outbreaks, environmental degradation, sharing of transboundary stocks, and related conflicts lead to biosecurity, biodiversity loss, ecosystem fragmentation, climate change, and extreme events. Limited resources and varying national priorities among member states impede cohesive implementation and enforcement.
GEDSI in Aquaculture • SAMOA Pathway on gender equality and women empowerment • Pacific Platform for Action on the advancement of women and gender equality	The Pacific Islands have advanced more in the topic of gender equity and human rights, emphasizing local customs that are bound by certain fundamental rules. Meanwhile, in Asian nations, only some countries have gender equity matters in their aquaculture policy and initiatives.	**Lack of substantial policy** regarding gender equity and inclusivity in Southeast Asia and South Asia, leading to a vulnerable condition for certain groups. Occupational health and safety policies and legislation should be more comprehensive and legally underpinned by constitutional recognition of people's rights at work.

Recommendations

Short term

Advocate to our respective government to

1). Review legislation, policies, initiatives, and programs to make sure they respect and protect the economic, environmental, and social-cultural rights, and do not jeopardize the rights of local communities that depend on aquaculture for their livelihood.

2) Reactivate the suspended Asia Pacific Fisheries Commission (APFIC) to enhance cross-regional collaboration.

3) Ensure Pacific Island governments are members of the Network of Aquaculture Centers in Asia Pacific (NACA) to ensure full representation and participation of rural small-scale operators and research institutions.

4) Track the implementation of aquaculture policy and regulations through existing national mechanisms for reporting and follow-up.

Mid - Long term

The countries can **amend statutory legislation** and the constitution to include economic, environmental, and social-cultural rights in the aquaculture sector.

Strengthen existing Asia Pacific regional cooperation and partnerships regarding aquaculture, advocating inclusivity, support for its governance bodies and systems, and mobilizing adequate financial commitments for the regional initiatives and programs.

Develop a regional policy that emphasizes **GEDSI** in the Asia region, benchmarking from the Pacific region.

Promote sustainable and environmentally friendly aquaculture technology, tailored to the diversified needs of the region and country-specific. This initiative includes using renewable energy and implementation of innovative systems such as integrated multi-trophic aquaculture (IMTA); and increasing seaweed farming.

Establish a network of regional laboratories in the Indo-Pacific region dedicated to aquaculture, providing timely support and responses to emerging challenges in the sector. (for example, Network of Aquaculture Centres in Asia-Pacific - NACA)

Strengthen aquatic food systems to withstand the impacts of climate change and biodiversity loss to secure food security in the Asia-Pacific region.

Moreover, invest in aquatic food system transformation and taking an integrated whole-of-government, civil society, and private-sector approach to improving food security is paramount.

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