



Farmed Shrimp Strategy Report



FARMED SHRIMP STRATEGY REPORT

Executive Summary

SFP's [Target 75 \(T75\) initiative](#) has set a goal to see that 75 percent of the world's seafood production in key seafood sectors is, at a minimum, either sustainable or making regular, verifiable improvements by 2020. This report assesses the current status of the farmed component of the large-shrimp sector (larger than 100 shrimp per pound) and presents a pathway toward achieving Target 75. Global farmed shrimp production has increased significantly over the past 15 years, and estimates show a further increase in production of 18 percent by 2020 is likely. As a result, the industry has become an important economic driver in many developing countries, providing both livelihoods and food security. However, the rapid rate of growth that has often occurred in under-managed and under-regulated environments has left the industry vulnerable to boom and bust cycles from widespread disease incidents. Analysis of Target 75 priority shrimp farming regions, which is based on a blend of data and expert opinion, shows that the sector is at high risk of supply chain disruption due to significant sustainability concerns across all major farmed shrimp production regions that were assessed (China, Ecuador, India, Indonesia, Thailand, Vietnam). Currently, only 8.8 percent of global production is classified as "improving," and none is classified as "sustainable" under Target 75.

Data availability and transparency need to be improved along the entire supply chain, from producer to retailer. This report identifies a number of recommendations for improvement for supply chain stakeholders, as well as for producers and governments. Most critical is that suppliers should be able to identify sources of shrimp to the province/state of origin, in order to better understand the risks in any given supply chain. There is also a great need and opportunity for industry to initiate and support aquaculture improvement projects that focus on coordinating practices among groups of farmers and enhancing governance and enforcement. Nascent improvement efforts are underway or under development in countries such as India, Indonesia, Thailand, and Vietnam that have predominantly export-focused industries selling into engaged markets. However, improvement efforts will have to expand into China to achieve Target 75, because China accounts for approximately 45 percent of production of the farmed large-shrimp sector.

Target 75 Sector Update: Farmed Shrimp

SFP's [Target 75 \(T75\) initiative](#) has set a goal to see that 75 percent of the world's seafood production in key seafood sectors is, at a minimum, either sustainable or making regular, verifiable improvements by 2020. To simplify achieving and measuring progress toward this goal, SFP has divided the world's fisheries and farmed seafood production into various "sectors," defined largely by species. While the sectors as a whole do not cover the entirety of the global seafood industry (e.g., some high-volume species groups such as carp, milk fish, and some shellfish are not included), those included represent a substantial proportion of the commercial seafood production of importance to markets currently demanding sustainability.

For the purpose of the current analysis, we define aquaculture production as "improving" if the product is certified to one of the three leading international standards: Aquaculture Stewardship Council (ASC), Global Aquaculture Alliance Best Aquaculture Practices (BAP, minimum 2-star), or GlobalG.A.P; or if it is from an [Aquaculture Improvement Project \(AIP\)](#) making regular, verifiable progress (Annex 1). We do not provide a specific definition of "sustainable," because a formal, agreed-upon definition of sustainable has yet to emerge in aquaculture.

The [FAO's Ecosystem Approach to Aquaculture](#) sets a minimum for what SFP would consider sustainable, and zonal management of aquaculture, as described by SFP in our [Framework for Sustainably Managed Aquaculture](#), is critical to establishing sustainable industries. We look forward to working with all stakeholders to determine an appropriate definition of sustainable aquaculture, as we work toward improvements in the industry and development of certification standards that would support a public-facing claim of sustainability.

This report provides information on the current status of the farmed component of the large-shrimp sector in terms of volume, and, most importantly, we map out a path to close the gap to Target 75. Critical improvements are required in all major producing countries. Shrimp buyers

What is an Aquaculture Improvement Project (AIP)?

An Aquaculture Improvement Project (AIP) is a multi-stakeholder effort that uses the power of the private sector to incentivize positive changes toward sustainability of aquaculture production. AIPs should operate at scales above farm level and focus on implementation of policies that ensure long-term sustainable aquaculture. An AIP should have the following attributes publicly available:

- A *commitment* from all AIP participants
- A *needs assessment* that identifies the scope of the AIP
- A *workplan* with time-bound objectives for addressing key issues
- *Progress reporting* of activities and outcomes

For further detail, see Annex 1.

should urgently identify sourcing areas at least to the province/state of origin and actively engage in improvement efforts.

We base the analysis on a blend of data and expert opinion on T75 priority shrimp-farming regions provided by the FishSource Aquaculture profiles and scores, as well as SFP's 2017 and 2018 T75 analysis for large shrimp (unpublished), which is based on 2014 production volumes from the FAO FishStat database. We also include data available on the websites of the three leading certification programs, plus additional information provided upon request by ASC and GlobalG.A.P. Trade data provided by SFP's 2017 T75 analysis and Chatham House's Resource Trade website also provide insights into the likely influence key markets may have on driving improvements.

SFP's Framework for Sustainably Managed Aquaculture

Sustainably managed aquaculture requires best practices at the farm level, production-zone level, and national-policy level. [SFP's Framework for Sustainably Managed Aquaculture](#) is based on the FAO's Ecosystem Approach to Aquaculture (EAA) and guided by five principles:

- National and regional regulatory frameworks based on zonal management
- Organized producers using and enforcing a code of good practice
- Resource management systems adequate to protect habitat and water quality
- Robust monitoring and reporting to demonstrate effective mitigation of shared disease risk
- Ensuring transparency and responsible sourcing of marine ingredients used in feed.

These principles form the core of the FishSource Aquaculture profiles and scoring methodology, which were launched in March 2018. FishSource Aquaculture assesses management and governance at the provincial/state level (along with national policy) and is designed to identify supply chain risks and opportunities for improvement through regional profiles of aquaculture production. For more information on the FishSource Aquaculture profiles and scoring, please visit <https://www.fishsource.org/how>.

SFP recognizes the value buyers place on farm-based certifications to provide a measurable target for corporate social responsibility programs and reporting the performance of individual farms. These standards are classified as "improving" under the T75 analysis, because they can serve as a stepping-stone toward zonal management by engaging farmers and encouraging organization of producers for broader-scale improvements. Standard holders also have a vital role in expanding the industry's approach to sustainable aquaculture by developing more comprehensive standards that could be applied at the zonal scale.

Large-Shrimp Sector Overview

Within Target 75, shrimp are broken into two sectors: large shrimp and small shrimp. The large-shrimp sector includes shrimp larger than 100 shrimp per pound (100 count class size). This distinction in size class recognizes the different market share held by the two commodity types. The large-shrimp sector consists primarily of farmed shrimp and wild warm-water shrimp, but also includes larger coldwater shrimp, such as Argentine red shrimp and spot prawns, that are used in a manner more similar to large warm-water shrimp than small coldwater shrimp. In terms of species and families this translates into:

Family	Species
<i>Aristaeidae</i>	All
<i>Pandalidae</i>	<i>Heterocarpus spp.</i> , <i>Pandalus kessleri</i> , <i>Pandalus montagui</i> , <i>Plesionika martia</i> , <i>Pandalus hypsinotus</i> , <i>Pandalus platyceros</i>
<i>Penaeidae</i>	All (except <i>Protrachypene precipua</i> , <i>Xiphopenaeus spp.</i> , and <i>Trachypenaeus spp.</i>)
<i>Sicyoniidae</i>	<i>Sicyonia brevirostris</i>
<i>Palaemonidae</i>	All freshwater/river prawns
<i>Solenoceridae</i>	All

Shrimp Product Forms

Shrimp products are sold to the market in a wide variety of forms, which can be raw (green) or cooked, fresh or frozen. Products may be sold shell-on, tail-on, peeled, deveined, or as value-added (e.g. breaded) (Miranda, 2010).

This report focuses only on the farmed-shrimp portion of the large-shrimp sector, which accounts for approximately two-thirds of the large-shrimp sector (SFP, 2017; 2018).

Global supply and patterns of trade

- Global farmed shrimp production in 2016 was more than 5.7 million tonnes (FAO, 2018). The top six producing countries account for 86 percent of production (SFP, 2017; 2018) and, in descending order of production volume, include China, Vietnam, Indonesia, India, Ecuador, and Thailand (FAO, 2018).

- Most countries show continued growth, with the exception of Thailand, where production fell by almost 50 percent from 2012-2013 (FAO, 2018).

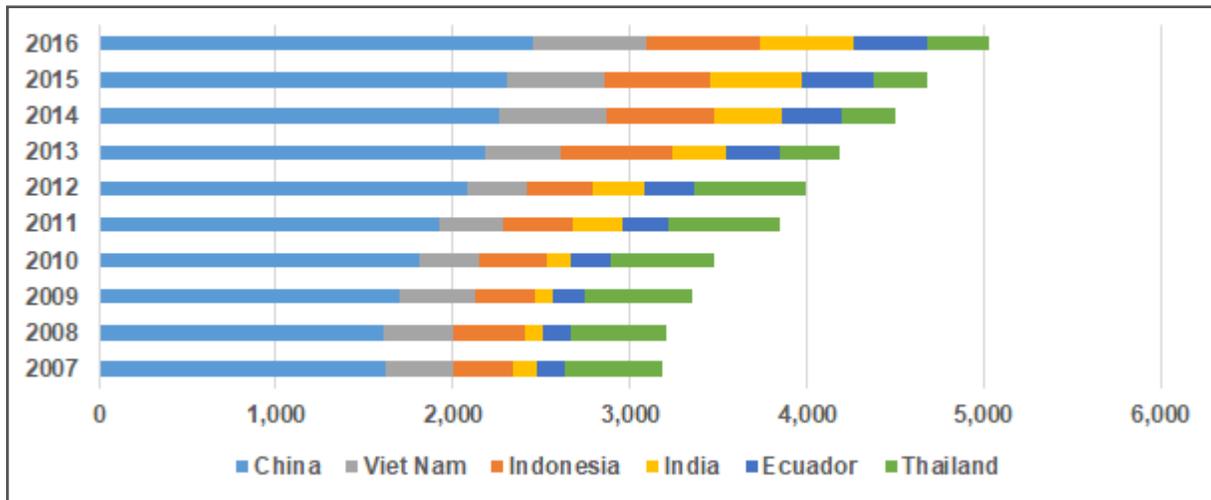


Figure 1: Top producing countries of farmed large shrimp ('000 mt) (Source: FAO, 2018).

- The industry is dominated by the production of whiteleg shrimp (*Penaeus vannamei*), which accounted for almost 75 percent of production in 2014, and giant tiger prawn (*Penaeus monodon*), which accounted for 14 percent. Other major species include Oriental river prawn (*Macrobrachium nipponense*), giant river prawn (*Macrobrachium rosenbergii*), and *Penaeus* shrimps not elsewhere included (nei) (FAO, 2018).
- The majority of farmed shrimp production from Ecuador, India, Indonesia, Thailand, and Vietnam is exported (Portley, 2016; SFP, 2017a). Significant amounts of production from these countries are exported to markets engaged in sustainability (e.g., the European Union and the United States) (SFP, 2017a¹).
- The majority of farmed shrimp produced in China remains in domestic markets (Portley, 2016; SFP, 2017a¹). However, some production is exported to markets engaged in sustainability (SFP, 2017a¹).
- The top importers of shrimp (both farmed and wild-caught) are the European Union and the United States (together these account for almost two-thirds of global imports).

¹ Trade data flows of large shrimp by producing country were inferred from FAO FishStatJ data (compiled by SFP) and International Trade Center trade data (compiled by California Environmental Associates as part of the OSMI initiative).

Other notable importers are China, Japan, South Korea, and Vietnam (Chatham House, 2018; SFP, 2017a²).

- The top exporters to the US are India, Indonesia, Ecuador, Vietnam, and Thailand. The top exporters to the EU are Ecuador, India, and Vietnam (Chatham House; SFP, 2017a³).

Improvement Progress to Date

- In 2017, 448 000 mt of large farmed shrimp were classified as improving (i.e., certified to international standards or in an AIP), which accounts for 8.82 percent of total farmed shrimp production (SFP, 2018). This is nearly a 62-percent increase from 2016, when 277,000 mt (or 5.5 percent) were classified as “improving” (SFP, 2017). This increase is due to an increase in the number of certified farms, as well as better-quality data being provided to SFP by ASC and GlobalG.A.P.
- Twenty-five FishSource aquaculture profiles for shrimp-producing regions are now publicly available on <http://www.fishsource.org>. Provincial- and state-level profiles cover the majority of large-shrimp production in Bangladesh, Ecuador, India, Indonesia, and Vietnam, while there is more limited coverage in China and Thailand. These profiles highlight existing efforts toward the introduction of zonal management (*strengths*), constraints to the industry (*weaknesses*), and actions to improve aquaculture management (*recommendations for improvement*).
- FishSource aquaculture scores for major farmed-shrimp-producing regions show consistently low scores (<6) across all five scoring criteria: 1) regulatory framework, 2) organized producers following code of good practice, 3) water quality management, 4) coordinated disease management, and 5) sustainability of marine feed ingredients. Although the overall scores are consistently low, there is variation seen in the sub-scores across the various province/state profiles within the same country. This suggests that there are clear paths that can be taken toward improvements at this scale. For a full list of the FishSource profiles for the farmed shrimp sector, please see Annex 2.
- Several efforts are underway to improve the environmental and social aspects of shrimp production and trade, including the Seafood Task Force, Sustainable Shrimp Partnership, and Asian Seafood Improvement Collaborative.
- There are currently no active AIPs that meet the definition outlined in Annex 1.

^{2&3} International Trade Center, 2014 data compiled by California Environmental Associates as part of the OSMI initiative.

Closing the gap to T75

An analysis of certified production and FishSource aquaculture profiles and scores for farmed shrimp show that there are significant sustainability concerns across all major farmed-shrimp production regions. The shrimp sector is at high risk of supply chain disruption in all countries, due to exceeding carrying capacity and the associated disease, environmental, and reputational risk this creates. Therefore, there is a critical need for improvement in management practices across the entire sector, as little has been done to date.

The primary target regions for improvement are those with predominantly export-focused industries that are selling into engaged markets. This includes Ecuador, India, Indonesia, Thailand, and Vietnam. Together, these production regions account for 2.1 million tonnes, representing almost 42 percent of global production (SFP, 2018).

Table 1. Key shrimp-producing regions for Target 75, based on existing supply chain leverage

Country	2014 production (000 tonnes) ¹	% global production 2014 ²	% production sent to export markets ³	% improving (national production) ⁴
China	2,265.7	45%	~18%*	1.3%
Indonesia	600.1	12%	~71%*	7.4%
Vietnam	492.2	10%	~63%*	8.6%
India	385.7	7.6%	>99%*	4%
Ecuador	340.0	6.7%	~80% [^]	19.9%
Thailand	300.3	6%	~99%*	2.7%

Notes

Production data reported include all species in the farmed component of the large-shrimp sector.

** Provided by estimates in country snapshots - "Ratio of farmed product that is exported: farmed product that stays on the domestic market" Portley (2017).*

[^] Provided by an estimate based on comparison between FAO Capture and Aquaculture statistics and shrimp export data provided by the National Aquaculture Chamber, Ecuador (FAO, 2018; CNA, 2018).

¹ SFP, 2018

² FAO, 2018

³ Portley, 2016; CNA 2018; FAO, 2018

⁴ SFP, 2018a

The Asia Farmed Shrimp Supply Chain Roundtable (SR) coordinates the joint efforts of major shrimp buyers to work with national industries and governments to reduce disease risks and environmental impact of the shrimp sector. Members use various tools, including initiating and tracking AIPs, to encourage zonal management. The current geographic focus of the SR is in major producing regions of Thailand and Indonesia, but members continue to explore how best to address improvements in other major producing countries, including India and Vietnam.

Urgent Supply Chain Engagement Required

Target 75 can only be achieved by expanding improvement efforts to shrimp production in China, which produces 2.2 million tonnes of large farmed shrimp and accounts for almost 45 percent of the sector (SFP, 2018).

Improvement opportunities and challenges

An analysis of the FS Aqua profile, strengths, weaknesses, and recommendations for improvement reveals that the main challenge to the sector is the lack of data and information needed to inform, implement, and monitor zonal aquaculture management. To address this, data collection, analysis, availability, and transparency needs to be improved along the entire supply chain, from producer to retailer. Top-level, cross-sectoral recommendations for improvement are identified below for different stakeholder groups. Country-specific recommendations for improvement can be found in Annex 3.

Recommendations for improvement to the supply chain

- Identify sources of shrimp to the province/state of origin.
- Support the Asia Farmed Shrimp SR. Suppliers should become formal participants in the SR, while retailers can encourage their suppliers to participate in the SR. More information can be found [here](#) or by contacting Anton Immink, SFP Global Aquaculture Director, at anton.immink@sustainablefish.org.
- Initiate and support AIPs in priority sourcing areas.
- Encourage leading aquaculture certifications to integrate the principles of zonal management into their standards.
- Request government agencies to adopt the principles of zonal management for aquaculture, including spatial planning and zoning, establishing waterbody carrying-capacity limits, coordinating disease management at the zonal level, and creating emergency disease management plans. This approach is outlined in the guide [Best Practices for Aquaculture Management - Guidance for implementing the ecosystem approach in Indonesia](#), which applies to seafood farming worldwide and uses Indonesia as a case study for implementation.

Recommendations for improvement to producers and governments

- Establish and implement a protocol for tracking, monitoring, and reporting key industry performance and enforcement indicators at the state/provincial level (e.g., the number and location of licensed farms, EIA outcomes, disease outbreak and control measures, waterbody and farm-level water quality, and compliance with industry standards).
- Governing bodies should develop and publish spatial plans that identify areas that are suitable for aquaculture development in relation to other uses and users.
- Governing bodies should identify carrying capacity limits for waterbodies, and use these to inform aquaculture siting, licensing, and production limits.
- Governing bodies should establish aquaculture management areas – clusters of farms where disease and production management practices are coordinated.
- The industry and regulators should immediately create emergency disease management plans at the national and zonal levels and make them publicly available.
- The industry should establish producer organizations that require and support members to use mandatory Codes of Good Practice based on practices for industry management.
- Feed manufacturers should increase public reporting of source fisheries and coordinate improvement plans by companies providing feed to the sector, and where necessary the introduction of Fishery Improvement Projects (FIPs).

Annex 1: Aquaculture Improvement Project (AIP) definition

An Aquaculture Improvement Project (AIP) is a multi-stakeholder effort to address environmental challenges in aquaculture production. AIPs utilize the power of the private sector to incentivize positive changes toward sustainability and embed these into policy. AIPs should operate at scales above farm level and focus on implementation of policies that ensure long-term sustainable aquaculture and improved performance at the farm and zonal level. The newly introduced FishSource Aquaculture methodology and scores provide tools to guide AIP development and measure progress.

An AIP should have the following attributes:

- *Participation*: An AIP should draw upon market forces and include supply chain actors and producer organizations. If producer organizations do not exist, their formation should be an initial goal of the AIP. All participants should publicly commit to supporting the AIP (including financially).
- *Needs Assessment*: The AIP should produce and publish a needs assessment, identifying the scope of the AIP and the main environmental challenges. While FIPs refer to the Marine Stewardship Council (MSC) standard to guide fishery assessment, no similar standard currently exists for aquaculture. SFP therefore recommends that the assessment follows the [SFP Framework for Sustainably Managed Aquaculture](#).
- *Workplan*: The AIP must develop and publish a plan containing time-bound objectives for addressing key issues identified in the needs assessment.
- *Progress Reporting*: The AIP must publicly report progress on activities and outcomes against the workplan at least every six months. Regular public reporting increases the credibility of AIPs throughout the supply chain and provides buyers with evidence of genuine progress.

Annex 2: List of FishSource aquaculture profiles for farmed shrimp

Country	Province	Production (000 tonnes)
Bangladesh	Khulna	57.93 (<i>P. monodon</i>) 7.40 (other)
China	Guangdong	n/a
Ecuador	Guayas	n/a
India	Andhra Pradesh	276 (<i>P. vannamei</i>) 2.96 (<i>P. monodon</i>)
Indonesia	East Kalimantan	10.88 (<i>P. monodon</i>)
	East Java	52.59 (<i>P. vannamei</i>) 11.04 (<i>P. monodon</i>)
	Lampung	78.99 (<i>P. vannamei</i>) 1.54 (<i>P. monodon</i>)
	North Kalimantan	n/a
	North Sumatra	10.73 (<i>P. vannamei</i>) 4.68 (<i>P. monodon</i>)
	South Sulawesi	15.25 (<i>P. vannamei</i>) 16.07 (<i>P. monodon</i>)
	South Sumatra	39.76 (<i>P. vannamei</i>) 4.63 (<i>P. monodon</i>)
	West Java	57.68 (<i>P. vannamei</i>) 37.86 (<i>P. monodon</i>)
	West Kalimantan	28.97 (<i>P. vannamei</i>) 2.89 (<i>P. monodon</i>)
Thailand	Chanthaburi	34.45 (<i>P. vannamei</i>) 0.21 (<i>P. monodon</i>) 0.06 (<i>P. merguensis</i>)
	Songkhla	13.34 (<i>P. vannamei</i>) 0.808 (<i>P. monodon</i>)
	Surat thani	18.20 (<i>P. vannamei</i>) 0.92 (<i>P. monodon</i>)
Vietnam	Ben Tre	39 (<i>P. vannamei</i>) 15.2 (<i>P. monodon</i>)

	Ca Mau	40.86 (<i>P. vannamei</i>) 99.11 (<i>P. monodon</i>)
	Kien Giang	1.91 (<i>P. vannamei</i>) 94.42 (<i>P. monodon</i>)
	Long An	13.11 (<i>P. vannamei</i>) 1.70 (<i>P. monodon</i>)
	Soc Trang	67.16 (<i>P. vannamei</i>) 15.04 (<i>P. monodon</i>)
	Tien Giang	16.96 (<i>P. vannamei</i>) 4.66 (<i>P. monodon</i>)
	Tra Vinh	22.33 (<i>P. vannamei</i>) 12.71 (<i>P. monodon</i>)

Annex 3: Country-specific challenges

The following summaries outline country-specific opportunities for improvements in the large-farmed-shrimp sector for the six top producing and T75 priority countries.

China

- Encourage the publication of state-level licensing and relevant EIA outcomes, greater water quality information at the waterbody/farm-level, disease outbreaks and control measures, and water quality and disease control enforcement actions.
- Encourage the inclusion of zonal management practices to siting and planning based on published carrying-capacity studies, for example, revisions of the Ministry of Agriculture (MoA)'s Order 31 - *Provisions on Quality and Safety Management of Aquaculture*.
- Ensure that environmental Impact Assessments (EIAs) are a requirement of the planning and licensing process (including small-scale producers).
- Encourage producer organizations (POs) to improve publicly available information on their membership and adherence to a Code of Good Practice (CoGP)/Order 31, and establish disease control plans for normal operations.

Ecuador

- Encourage the publication of waterbody/farm-level water quality and state-level disease outbreaks and control measures. Encourage the responsible authorities (the Undersecretariat of Aquaculture and the Ministerio del Ambiente) to publish information on state-level licensing and EIA/Environmental Management Plan (EMP) outcomes.
- Encourage the identification of aquaculture management areas based on carrying-capacity studies, as advocated by the Ministry of Aquaculture and Fisheries draft Fisheries and Aquaculture Law (2017).
- Encourage the inclusion of zonal management approaches to siting and planning based on carrying-capacity studies into the Ministerio de Agricultura, Ganadería, Acuacultura y Pesca (MAGAP)'s and Instituto Nacional de Pesca (INP)'s Plan Nacional de Control (PNC) and the Sustainable Shrimp Partnership (SSP) goals.
- Encourage the Sustainable Shrimp Partnership (SSP) to develop a mandatory CoGP that includes zonal better management practices (including disease management Best Management Practices – BMPs).
- Identify the competent authority for water-quality management and set aquaculture-specific standards.

India

- Encourage greater public reporting of waterbody/farm-level quality, disease outbreak, and control criteria at the state level. Encourage the publication of state-level EIA outcomes and enforcement of individual criteria under the Coastal Aquaculture Authority (CAA) Act and Guidelines (for large farms) and the NaCSA initiative (for small farms).
- Encourage large farms (>2 ha) to adopt coordinated approaches similar to those under the Marine Products Export Development Authority (MPEDA)'s National Center for Sustainable Aquaculture (NaCSA) coordinated Aqua Societies initiative.
- Encourage the inclusion of zonal management approaches to siting and planning based on published carrying capacity studies into Coastal Master Plans and aquaculture zones, as identified by legislation and government bodies.
- Encourage regular auditing of farms against CAA Act and Guidelines (i.e. at least every three years). Encourage the development and enforcement of coordinated approaches for disease management under normal and emergency situations.

Indonesia

- Increase public information on provincial EIA and license outcomes, producer organization (Shrimp Club Indonesia/SCI) membership and rules, compliance with CBIB standards, waterbody and farm-level water quality, and disease outbreak and control measures.
- Incorporate a zonal management approach to shrimp and aquaculture farm siting and planning based on published carrying-capacity assessments into the national Directorate of Aquaculture (DGA) and provincial Marine and Fisheries Offices (DKP) five-year Strategic Plans, provincial spatial plans produced by regional planning and development agencies (BAPPEDA), and revisions to the CoGP, known as the Cara Budidaya Ikan yang Baik (CBIB).
- Small-scale producers should be included in the licensing and EIA process.

Thailand

- Increase public information on provincial EIAs, waterbody and farm-level water quality, disease outbreaks, and control measures.
- Encourage the publication of provincial aquaculture management plans that include zonal management approaches to siting and planning based on published carrying-capacity studies and EIAs.
- Encourage the inclusion of zonal management approaches to siting and planning into subsequent revisions of legislation and the CoGP (ThaiGAP/CoC).

- Encourage producer organizations to include small- and large-scale producers, publish membership details and rules, and clarify whether members should follow a zonal CoGP. Develop and publish plans for coordinated aquatic disease management for both emergencies and regular production.

Vietnam

- Increase public information on EIA and license outcomes, Ministry of Natural Resources and Environment (VASEP) and Vietnam Fisheries Association (VINAFIS) membership and rules (including compliance with CoGP/VietGAP standards), provincial waterbody and farm-level water quality, and disease outbreak and control measures.
- To support zonal approaches to farm siting and planning at the provincial level, implement the Ministry of Agriculture and Rural Development (MARD)'s Decision No. 5528/QĐ-BNN-TCTS on the approval of brackish water shrimp production in the Mekong Delta until 2020 and MARD's Aquaculture atlas.
- Include zonal management principles into revisions to the CoGP (VietGAP).
- Implement the Ministry of Natural Resources and Environment (MONRE)'s Circular (currently unnumbered) to guide implementation of the National Assembly's Environment Protection Law No. 55/2014/QH13 (effective Jan 2015), and develop and publish carrying-capacity assessments to inform the siting and planning of aquaculture.

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