

Muara
Research

Independent Research Report

The Case for Deep-Water Aquaculture in Southeast Asia

Disclaimer

This report is independent research produced by Muara Research and is provided for general informational purposes only. It does not constitute investment, financial, legal, or business advice, and it should not be relied upon as the sole basis for any decision. Readers should conduct their own due diligence and consult qualified professionals before acting on any information contained in this report.

Muara Research has made reasonable efforts to ensure the accuracy and completeness of the information presented, based on the sources cited. However, no warranty, express or implied, is made regarding the accuracy, completeness, or reliability of this information. Data and conditions may change after publication, and Muara Research undertakes no obligation to update this report following its release.

To the fullest extent permitted by law, Muara Research and its author accept no liability for any loss or damage, direct or indirect, arising from reliance on this report or its contents.

This report is copyright Muara Research, 2026. It may be shared in full, unaltered, with attribution to Muara Research. It may not be reproduced, in whole or in part, for commercial resale or redistribution without written permission from Muara Research.

Any forecasts, projections, or estimates contained in this report are based on assumptions believed reasonable at the time of writing. They are estimates, not guarantees, and actual outcomes may differ materially.

Reference to any company, organization, or trademark in this report is for identification and analytical purposes only. It does not imply that the named party endorses, sponsors, or was involved in the preparation of this report.

Questions, corrections, or licensing requests regarding this report can be sent to enquiries@muararesearch.com.



[04]	Executive Summary
[06]	Background and Scope
[08]	Market Scale and Growth
[10]	Benchmark Markets
[14]	Risk and Capital
[16]	Evidence and Analysis
[19]	Considerations Against
[21]	Conclusion
[23]	References and About

Executive Summary



Offshore aquaculture, commonly defined as farming fish and shellfish in submersible or semi-submersible cages positioned in open, deep water rather than sheltered coastal zones, has moved from experimental technology to a live commercial proposition over the past decade.

This report examines whether offshore aquaculture represents a lucrative investment and industrial opportunity for Southeast Asia. The region has the biological and market fundamentals in its favour. It does not yet have the financing infrastructure, regulatory clarity, or storm-hardened engineering track record that the leading offshore markets built over the past fifteen to twenty years.

Executive Summary

Key Insights

China Is Leading at Scale

China operates the only offshore aquaculture fleet at meaningful industrial scale in the region. Deep Blue 1 produces roughly 1,500 tonnes of salmon annually; follow-on projects like Guoxin 1 and Sea Granary 1 are designed for 3,000–6,000 tonnes each.

Capital Commitment Is Multi-Year

Norway's SalMar spent roughly NOK 1 billion, close to USD 100 million, developing Ocean Farm 1 before its production licences were converted to standard commercial licences.

Market Scale

Asia-Pacific aquaculture is valued at roughly USD 83B–USD 93B (2025/26). Marine water production is the fastest-growing segment, expanding faster than freshwater aquaculture, which still holds the larger overall share.

Southeast Asia Is at Pilot Stage

Vietnam, Indonesia, and the Philippines are at the pilot stage, not the commercial stage. Vietnam's Khanh Hoa project, approved in early 2025 and running through 2029, is a government-backed pilot, not a private commercial venture.

No Domestic Supply Chain Yet

Southeast Asia has no domestic equivalent yet of the engineering, mooring, and vessel-support supply chain that Norway and China built around their offshore programmes. Early movers will likely depend on imported technology.

Background

Aquaculture has been the primary source of new seafood supply growth for more than a decade, as wild capture fisheries have plateaued globally. Vietnam, Indonesia, Thailand, and the Philippines are among the largest aquaculture producers on earth and are built almost entirely on coastal pond and near-shore cage systems for shrimp, tilapia, and milkfish.

However, pond-based shrimp farming has been linked to extensive mangrove loss across the region. Near-shore cage culture concentrates waste, disease, and antibiotic use in confined, slow-moving water. Buyers in the EU and North America have grown more attentive to traceability and environmental certification, pressuring producers toward a cleaner production model.

In an attempt to solve this issue, decisions are made such as moving cages further from shore, into deeper and faster-moving water, is supposed to dilute waste concentration, reduce disease transmission, and free up coastal space. China has invested heavily in proving this model over the past eight years; Norway pioneered it for salmon specifically; Southeast Asian governments are now exploring the same approach for their own waters and species.



Scope and Method

What This Report Covers

Open-water and semi-submersible cage aquaculture in Southeast Asian waters, benchmarked against the two markets that have taken the model furthest: China and Norway.

What It Does Not Cover

Land-based recirculating systems, near-shore net pens, and capture fisheries. RAS figures appear only to establish an adjacent market boundary.

How Sources Were Weighted

Platform specifications and government decisions are taken from named primary or state sources. Market sizing is drawn from commercial research providers and reported as a range.

Period and Currency

Market data reflects 2025 and 2025/26 publication years, with forecasts to 2033 and 2035. Currency figures are reported as the sources state them, with no conversion applied here.

Limits of the Analysis

No source isolates offshore aquaculture as a discrete revenue segment. Every market figure here describes a broader category within which offshore is a minority component.

Market Scale and Growth Trajectory

Insight

Asia-Pacific already accounts for roughly three-fifths to three-quarters of global aquaculture revenue depending on the dataset, and marine water production is consistently the fastest-growing sub-segment within it. The region is not choosing between growth and no growth. It is choosing which production method captures the growth already underway. RAS is land-based, closed-loop technology addressing a different problem than offshore cages, and its growth should not be read as evidence that open-water projects follow the same trajectory. They are adjacent markets, not the same market.

Sources

Grand View Research; Straits Research; Global Market Insights; Deep Market Insights.

Global Aquaculture

USD ~320B 2025

Rising to USD 450B to 510B by 2033 or 2034
CAGR 4.4% to 5.4%

Asia-Pacific Aquaculture

USD 83B to 93B 2025/26

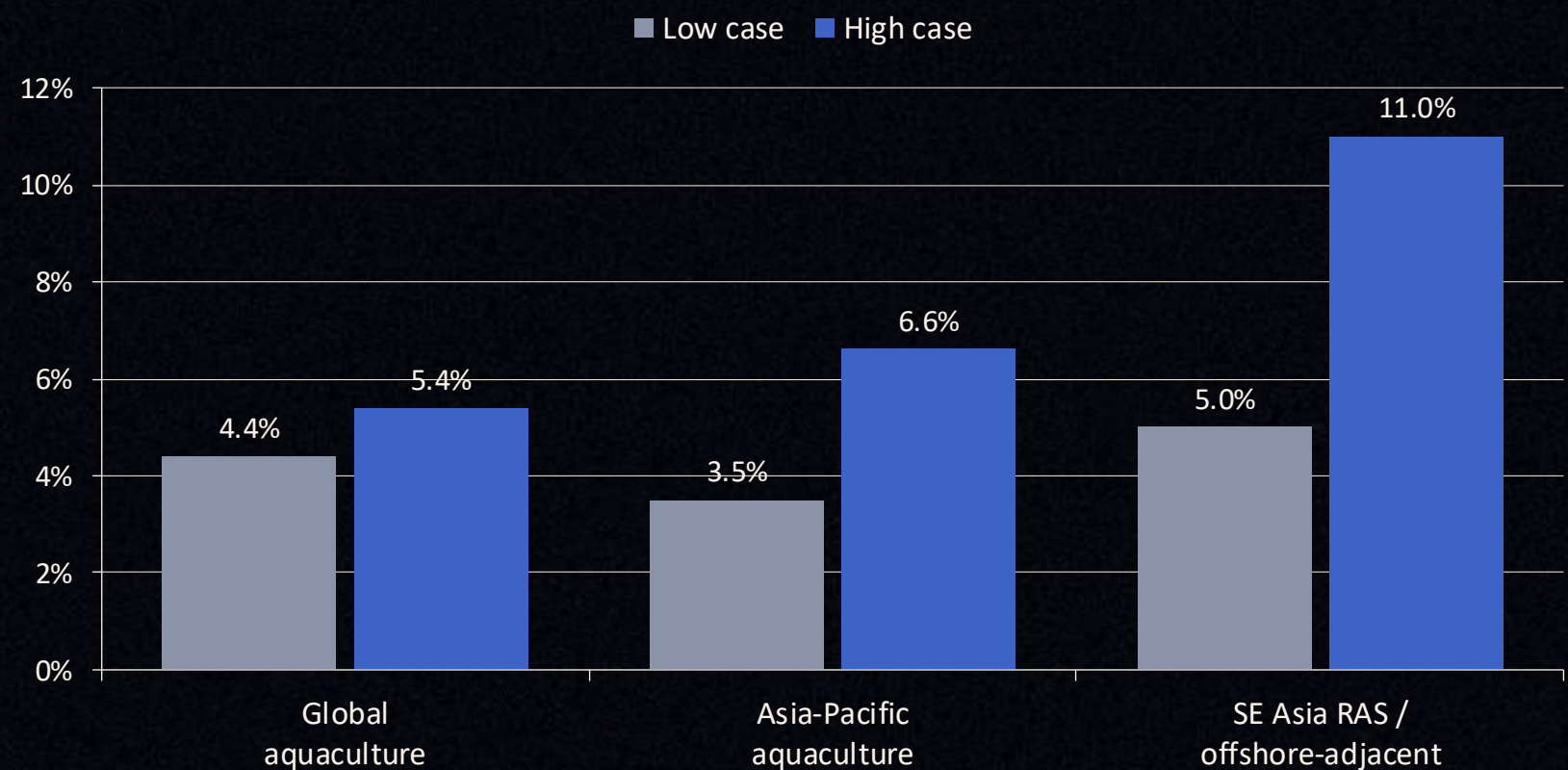
Rising to USD 132B to 164B by 2035
CAGR 3.5% to 6.6%

SE Asia RAS and Offshore-Adjacent Tech

USD 1.6B to 1.7B 2025/26

Rising to USD 2.6B by 2035
CAGR ~5% to 11%

Growth in Context



Reading the forecast spread. Each segment below is quoted by more than one provider, and the gap between the low and high case is as informative as the midpoint. Asia-Pacific is the largest regional base in the set and, in its high case, grows faster than the global market. The RAS band is wider still, which reflects a small denominator and methodological disagreement rather than greater certainty about demand.

What the ranges do not show. None of these series isolates offshore production. An offshore project competes for capital against near-shore expansion inside the same forecast, so a high headline CAGR is not evidence that open-water capacity is the segment capturing it.

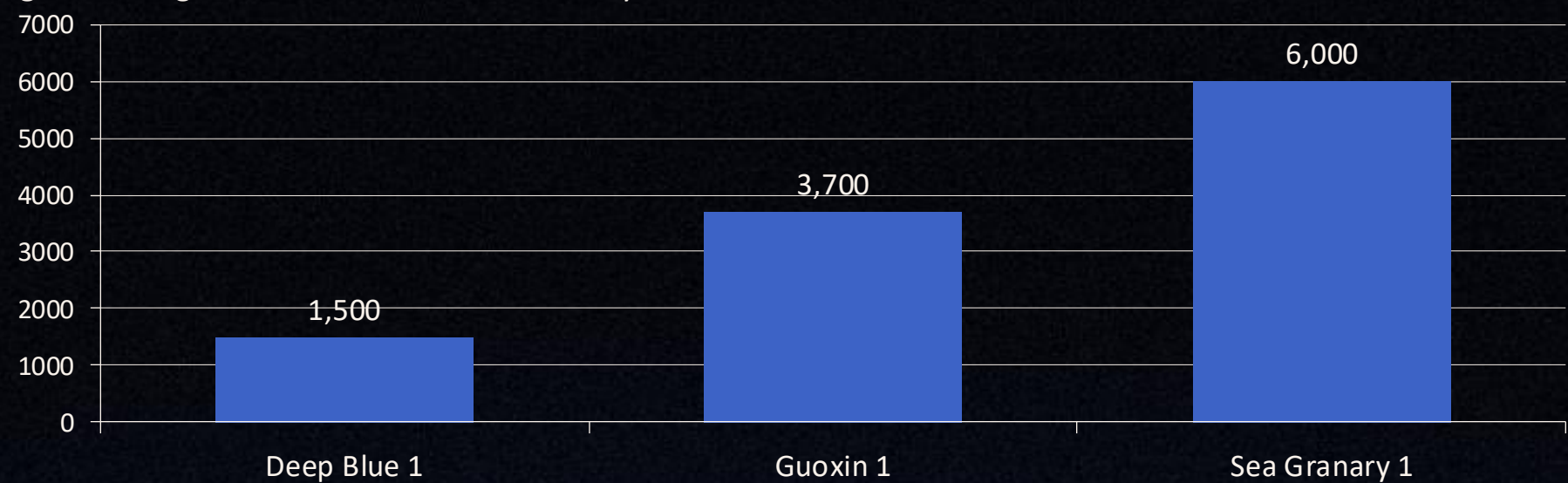
Forecast CAGR ranges as published. Sources: Grand View Research; Towards Chem and Materials; Straits Research; Market.us; Global Market Insights; Deep Market Insights.

China's Offshore Programme

National offshore output

~400,000 t today

against a target above 600,000 t within five years



Sources: SeafoodSource; ICSF; The Fish Site; Dialogue Earth.

Insight. Capacity roughly quadrupled from the first platform to the largest, and the mobile vessel model is the most transferable element for Southeast Asia. A platform that can relocate ahead of a typhoon track carries materially less risk than a fixed cage anchored in a storm corridor.

[1] Deep Blue 1

Submersible steel cage. Capacity for 300,000 fish, sited 130 nautical miles offshore in the Yellow Sea.

[2] Guoxin 1

Aquaculture vessel, mobile between the Yellow and South China Seas to avoid typhoons and red tides.

[3] Sea Granary 1

Six intelligent cages. Cost CNY 300M, roughly USD 41M. First harvest recorded in 2024.

Seven Years From Prototype to Fleet

The Chinese programme is the only offshore build-out in the region with a multi-year record. It was underwritten by municipal and state capital, including investment on the order of CNY 1 billion in Rizhao alone, and sustained across the years between first deployment and first harvest.

2018	Deep Blue 1 enters sea trials A submersible steel cage sited 130 nautical miles offshore in the Yellow Sea, designed to hold 300,000 fish.
2022	First salmon cohort harvested Roughly 1,500 tonnes a year, confirming a cold-water species could be carried to market in Chinese offshore waters.
2024	Sea Granary 1 takes first harvest Six intelligent cages built for CNY 300M, roughly USD 41M, and designed for 6,000 tonnes a year.
2024	Guoxin 1 milestones reported A mobile aquaculture vessel designed for 3,700 tonnes a year, relocating between the Yellow and South China Seas.
Today	Roughly 400,000 t national output Against a stated national target above 600,000 tonnes within five years.

Southeast Asia's Early Pilots

Country	Project	Status	Structure
Vietnam	Khanh Hoa offshore pilot	Launched 2025, runs to 2029	Government-approved pilot (PM Decision 231/QD-TTg), two designated zones
Indonesia	Eco-Ark (Batam Island)	Deployed, closed-containment	Private technology venture (AME2 Pte Ltd, Singapore-linked)
Regional	Small-scale grouper and finfish net cages	Widespread, near-shore	Largely small to medium-scale, 10 to 100 cages per farm, not true offshore

Sources: VietnamPlus; ScienceDirect (Fish Cages overview); The Fish Site.

Insight. Southeast Asia has not yet produced a commercial-scale offshore project comparable to China's Sea Granary 1 or Norway's Ocean Farm 1. What exists today is a government-backed pilot in Vietnam still in its early years, and a single closed-containment technology demonstration in Indonesia. The region sits roughly five to eight years behind the point China had reached with Deep Blue 1, which argues for pricing the opportunity as early-stage infrastructure rather than as a mature production model with a track record.

Benchmark Comparison

	China	Norway	Southeast Asia
Flagship assets	Deep Blue 1, Guoxin 1, Sea Granary 1	Ocean Farm 1 (SalMar)	Khanh Hoa pilot (Vietnam), Eco-Ark (Indonesia)
Disclosed capital	CNY 300M (~USD 41M) for Sea Granary 1; ~CNY 1bn municipal in Rizhao	~NOK 1bn (~USD 100M) for Ocean Farm 1	Not disclosed in the source base
Design capacity	1,500 to 6,000 t per year per platform	Not stated in the source base	Not stated in the source base
First harvest	2022 (Deep Blue 1); 2024 (Sea Granary 1)	Not stated; licences converted July 2020	None reported
Capital source	Municipal and state	Profitable listed producer	Government pilot and one private venture
Storm exposure	Yellow Sea; typhoons and red tides avoided by relocation	Sheltered fjords	20-plus typhoons a year in the Philippines

Insight. The two benchmark markets solved different problems. Norway proved unit economics for a single high-value species in sheltered water, financed from the balance sheet of an already profitable producer. China proved industrial scale and platform variety in exposed water, financed by the state. Southeast Asia faces the harder version of both problems at once, with neither capital structure available to it, which is why the region is better read as a third case than as a follower of either.

Climate and Storm Risk Exposure

Academic wave-risk modelling of Southeast Asian aquaculture sites shows that failure probability for net cage structures rises sharply above specific significant wave height thresholds. Storm risk is concentrated in identifiable high-exposure zones rather than spread evenly across the region.

20+

Typhoons per year on average in the Philippines



~64M

People, close to 60% of the population, living near the Philippine coast



USD 2.2B

Damages, and roughly 6,300 deaths, from Typhoon Haiyan in 2013



2025

First known parametric typhoon cover arranged for offshore aquaculture, South China Sea



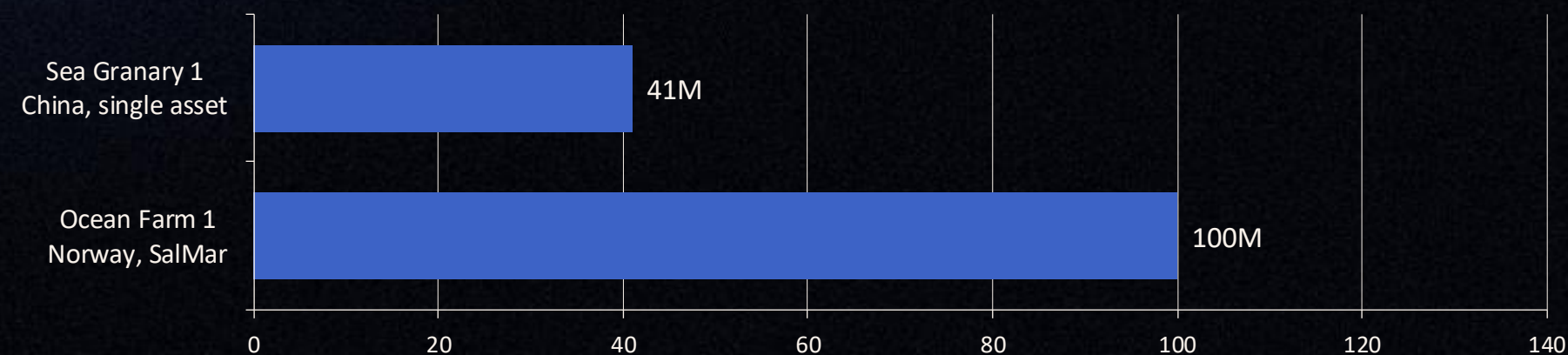
Insight. A functioning parametric insurance market is usually a sign that an asset class has become financeable, since insurers do not build structured products around risks they consider unquantifiable. That this cover emerged only in 2025, described by its own broker as among the first of its kind, places the offshore aquaculture insurance market in Southeast Asia at its very beginning. Site selection will matter more here than in the Yellow Sea or in Norway's fjords, and commercially viable zones will be a narrower subset of the coastline than headline maritime area statistics suggest.

Disclosed Capital Commitments

Cost of one proven platform

USD 41M to 100M

The disclosed range for Sea Granary 1 and Ocean Farm 1. No Southeast Asian project publishes a comparable figure.



Single-platform capital as disclosed, USD millions. Sources: Safran; GlobeNewswire; SeafoodSource; Dialogue Earth.

Insight. These are the only single-platform figures the source base discloses, and both belong to markets with a state or corporate balance sheet behind them. Norway committed roughly two and a half times as much per platform. The absence of any comparable Southeast Asian number is itself the finding.

[1] Committed Before Proof

SalMar carried its spend for years before development licences converted to standard commercial licences in 2020.

[2] Programme, Not Platform

Rizhao committed on the order of CNY 1 billion at municipal level, a programme rather than a single asset, and the level at which Chinese capacity was actually built.

[3] Unit Cost Falls With Scale

Sea Granary 1 delivers four times the design capacity of Deep Blue 1 for a disclosed cost well below the Norwegian platform.

Grading the Evidence Base



High Confidence

China platform figures for Deep Blue 1 and Guoxin 1. Widely corroborated, though they describe design capacity and stated targets more often than realised production.

Mixed Methodology

Market sizing from commercial providers using different methods. Asia-Pacific is quoted from USD 83B to over USD 90B. None isolate offshore as its own segment.

Thin or Single-Source

The Vietnam pilot rests on one state media source; the Indonesian Eco-Ark reference comes from an academic overview. Directional only, and worth verifying.

Flagged Source

SalMar risk commentary from Simply Wall St community narratives, which are user-submitted rather than licensed analyst research. Included to show the concern exists.

Figures cited elsewhere in this report should be read against these gradings. Where the evidence is thin or single-source, verify independently before committing capital.

What Would Have to Be True

The investment case does not rest on the market forecasts, which describe a category far wider than offshore. It rests on five conditions, none of which is yet demonstrated in Southeast Asian waters.

A Storm-Survivable Design

A platform that withstands or relocates ahead of 20-plus typhoons a year, proven across seasons rather than one deployment.



A Tropical Species That Performs

Grouper, cobia, or pompano reaching commercial weight offshore at rates that justify the capital, given salmon does not transfer.



Risk Transfer at a Priceable Cost

Parametric cover moving from a first-of-its-kind 2025 transaction to a repeatable market with observable pricing.



A Legible Licensing Path

A regime as dear as Norway's development licences, which converted to commercial licences once the asset was proven.



Domestic Supply Chain Formation

Engineering, mooring, and vessel support established locally, rather than imported for the life of every project.



Additional Points to Consider

Five considerations that sit outside the core market and risk analysis, but bear directly on how an offshore position in the region should be structured.

Regulatory Fragmentation

Maritime jurisdiction, licensing, and environmental permitting differ by country and are less codified than Norway's development licence system.



Species Selection Constrains Transfer

Salmon is a cold-water fish poorly suited to most regional waters. Grouper, cobia, and pompano are untested offshore at comparable scale.



Financing Structure Matters as Much as Technology

China's programme is underwritten by state capital, Norway's by a profitable listed producer. Early regional projects will likely depend on FDI.



ESG-Linked Capital Is a Genuine Tailwind

Marketed, correctly in some respects, as a lower-impact alternative to coastal ponds, opening a route to green bond or blended finance.



Workforce and Skill Gaps Are Underdiscussed

Submersible cages, moorings, and remote monitoring demand a different skill set, and the regional training pipeline is early-stage.



Considerations Against

Set out directly here rather than folded into caveats elsewhere in this report. Each of the five points below would, on its own, materially change how an offshore position should be sized and structured.

- [01]

Capital Intensity May Be Too High

SalMar's roughly USD 100M single platform, and China's tens of millions per unit, rest on capital bases most regional operators do not have.
- [02]

Offshore Relocates Risk, It Does Not Remove It

Concentrating large biomass in undisturbed deep water carries its own concerns, including criticism of Deep Blue 1's siting.
- [03]

Even Norway's Model Carries Execution Risk

Community commentary on SalMar flags heavy offshore investment as an execution risk, echoing Ocean Farm 1's own cost-overflow disclosures.
- [04]

Typhoons May Rule Out Fixed Infrastructure

Philippine storm frequency has no analogue in Norway or the Yellow Sea. Mobile systems are more resilient but also more expensive.
- [05]

Technology Dependency Is a Strategic Risk

Reliance on Chinese or Norwegian equipment and genetics may make regional value capture resemble a licensing relationship.

A Narrower Entry Point Than the Market

Engineering and Mooring Supply

The clearest near-term gap. Every regional project must import this capability today, and the source base records no domestic equivalent.

Mobile and Relocatable Platforms

The Guoxin 1 model is the most transferable element of the Chinese programme, and the design class that speaks directly to typhoon exposure.

Risk Transfer and Insurance

A market that began in 2025. Early participants help set the pricing terms for the asset class that follows them.

Direct Farm Operation

Highest capital intensity and the longest proof cycle. Norway committed roughly USD 100M before its licences converted.

Ordered by how soon a position could plausibly be taken, not by size of eventual prize. The ordering shifts where a government backs the project itself, as Vietnam has done at Khanh Hoa.

Final Insight and Conclusion

Offshore aquaculture in Southeast Asia is a real trend, not a manufactured one. What does not hold up as cleanly is the idea that the region stands at the same point in the story as China or Norway. It is closer to where China stood between 2016 and 2018, before Deep Blue 1 produced its first harvest.



Typhoon exposure across much of the region is a materially harder engineering problem than either benchmark market faced. The region's version of offshore aquaculture will likely lean more heavily on mobile or relocatable platforms than on fixed cages.

[1] Global Investors

The opportunity is real but early, and best approached as infrastructure and technology risk rather than as an established production asset.

[2] Maritime Firms

Near-term opportunity is arguably stronger in engineering, mooring, and vessel support than in aquaculture operation itself, since that supply chain barely exists domestically.

[3] Industry Participants

Not a near-term replacement for coastal farming livelihoods, but a parallel, higher-capital track developing unevenly over the next five to ten years.

Conclusion

Offshore aquaculture in Southeast Asia is a real trend rather than a manufactured one. The biological and market fundamentals sit in the region's favour, and the record in China and Norway shows the model can be made to work at industrial scale.

What does not hold up is the idea that the region stands at the same point in that story. Southeast Asia is closer to where China stood between 2016 and 2018: one government-backed pilot in Vietnam, a single closed-containment demonstration in Indonesia, no domestic engineering and mooring supply chain, and an insurance market that only began to form in 2025.

The conclusion is therefore neither a simple yes nor a simple no. Offshore aquaculture in Southeast Asia is a genuine opportunity with a narrower and more technical entry point than the marketing around it suggests, and it is best priced as early-stage infrastructure and technology risk rather than as a proven production asset.

All References

[1 of 3]

Grand View Research. Aquaculture Market Size, Share & Trends Report, 2026 to 2033.
grandviewresearch.com

Grand View Research. Asia Pacific Aquaculture Market Size & Outlook, 2025 to 2030.
grandviewresearch.com/horizon

Towards Chem and Materials. Asia Pacific Aquaculture Market Size, Share (CAGR of 6.55%).
towardschemandmaterials.com

Straits Research. Aquaculture Market Size, Share, Growth, Analysis, Report, 2034. straitsresearch.com

Prophecy Market Insights. Asia Pacific Aquaculture Market Size and Revenue Analysis 2035.
prophecymarketinsights.com

Market.us. Aquaculture Market Size, Share (CAGR of 5.4%). market.us

Global Market Insights. Southeast Asia Recirculating Aquaculture System Market, 2035. gminsights.com

Deep Market Insights. South East Asia Recirculating Aquaculture System Market Size, Share & Growth Report by 2034. deepmarketinsights.com

Research and Markets. Aquaculture Market Report 2026. researchandmarkets.com

VietnamPlus (Vietnam News Agency). High-Tech Offshore Aquaculture Pilot Launched in Khanh Hoa. Feb 2025. en.vietnamplus.vn

ScienceDirect Topics. Fish Cages, an Overview (Eco-Ark, Batam Island, Indonesia). sciencedirect.com

The Fish Site. Current Practices of Marine Finfish Cage Culture in China. thefishsite.com

All References

[2 of 3]

The Fish Site. China Harvests First Cohort of Salmon from Submersible Pens. June 2022. thefishsite.com

SeafoodSource. Guoxin, Wanzefeng Celebrate Offshore Yellow Croaker, Salmon Farming Milestones in China's Yellow Sea. May 2024. seafoodsource.com

SeafoodSource. China Shifting Aquaculture Production to Higher-Value Species. May 2020. seafoodsource.com

SeafoodSource. SalMar Betting Big on Offshore Salmon Farming. seafoodsource.com

ICSF. China Is Bringing Aquaculture to Deep Offshore Waters. icsf.net

Maritime Executive. China Is Bringing Aquaculture to Deep Offshore Waters. Oct 2023. maritime-executive.com

Dialogue Earth. China's Offshore Fish Farming Grows Amid Environmental Concerns. June 2025. dialogue.earth

SalmonBusiness. China's Offshore Salmon Rig, Deep Blue No. 1, Starts Sea Trials. May 2018. salmonbusiness.com

SalmonBusiness. China to Build Offshore Salmon Farm That Dwarfs Deep Blue 1's Cage. Feb 2019. salmonbusiness.com

Haosail Mariculture. Description of China's Deep and Open Sea Aquaculture Industry. haosailmariculture.com

Aquaculture North America. Offshore Farming: It's All About Economics. July 2021. aquaculturenorthamerica.com

Safran. SalMar Case Study, Ocean Farm 1. safran.com

All References

[3 of 3]

GlobeNewswire. Approval for Conversion of Development Licenses for the Ocean Farm 1 Project. July 2020. [globenewswire.com](https://www.globenewswire.com)

Floating Economy. Offshore Fish Farming: Open-Ocean Aquaculture for a Sustainable Future. Sept 2025. floatingeconomy.com

Simply Wall St. SalMar community narratives (user-submitted, not sell-side analyst research). simplywall.st

Bioengineer.org. Assessing Tropical Cyclone Wave Risks for Aquaculture. May 2025. bioengineer.org

Artemis.bm. Kairos and CHAZ Brokers Develop Parametric Typhoon Cover for Offshore Aquaculture Firm. Feb 2025. artemis.bm

eFeedLink. Kairos, CHAZ Finalise Insurance Solution Which Covers Offshore Aquaculture Firm Against Typhoons. Feb 2025. efeedlink.com

Singapore Green Finance Centre. Typhoon Risk in Southeast Asia. singaporegreenfinance.com

Frontiers in Marine Science. Risk Level Assessment of Typhoon-Induced Wave Fields Around a Large-Scale Suspended Mussel Farm. frontiersin.org

CSIS. Oceans of Opportunity: Southeast Asia's Shared Maritime Challenges. csis.org

Yale E360. In Search of New Waters, Fish Farming Moves Offshore. e360.yale.edu

Yale E360. Can Deepwater Aquaculture Avoid the Pitfalls of Coastal Fish Farms? e360.yale.edu

About Muara Research

Muara Research is an independent research practice covering maritime, aquaculture, and resource industries across Southeast Asia. Our work is published for institutional investors, industry operators, and policy audiences who need primary-source analysis of markets where reliable data is thin and unevenly reported.

Every report is produced independently. We accept no sponsorship, commission, or payment from the companies, governments, or projects we write about, and we grade the strength of our own evidence base within each report so that readers can see where the analysis is well supported and where it remains directional.

This report was prepared in July 2026 and reflects information available at that date. Conditions in the offshore aquaculture sector are moving quickly, and the figures cited here should be re-verified before they are used as the basis for a capital decision.

Enquiries, corrections, and licensing requests

enquiries@muararesearch.com

muararesearch.com

