

UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

A collaborative platform that brings together Member States, UN entities, research institutions, industry stakeholders, and civil society to accelerate the safe, and sustainable development of the seaweed sector.



June 29



Geneva

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNESCO (IOC) and GSC.



Urgency of UNGSI as Strategic Seaweed Partnership Platform : Indonesia's Perspective to Enhance Collaboration in Establishing the Integrated Seaweed Development and Its Value Added

Mohamad Rahmat Mulianda
Director for Marine and Fisheries
Ministry of National Development Planning/Bappenas, Indonesia

on behalf of
Leonardo A.A. Teguh Sambodo
Deputy Minister for Food, Natural Resources, and Environment,
Ministry of National Development Planning/Bappenas, Indonesia



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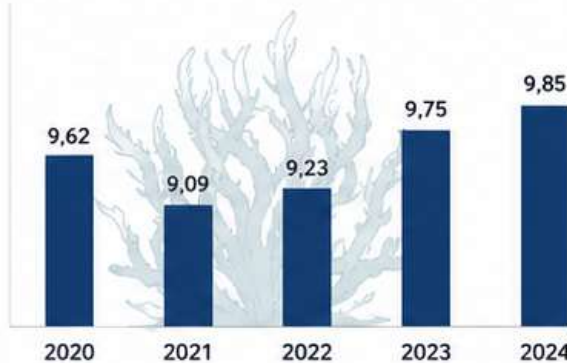
Kementerian PPN/
Bappenas

Production, Value, and Global Market Position

Indonesia's next challenge is transforming production volume into higher economic value



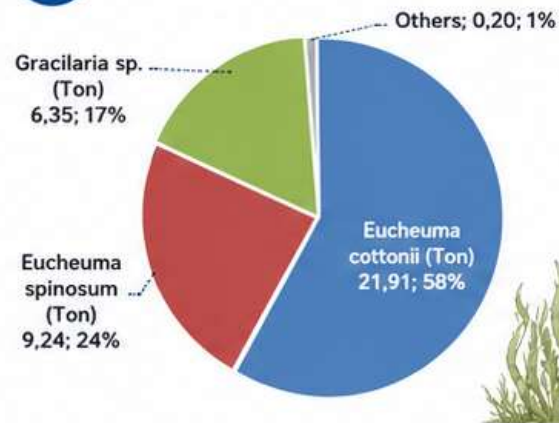
Seaweed Production Volume 2020–2024
(Million tons)



Indonesia's seaweed production increased from 9.62 million tonnes in 2020 to 9.85 million tonnes in 2024, reflecting continued growth in seaweed farming and sustained production efforts by both the government and the private sector.



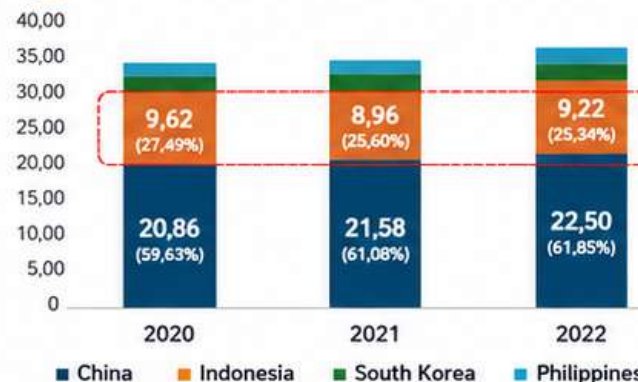
Major Seaweed Species Cultivated in Indonesia



Eucheuma cottonii dominates Indonesia's seaweed production and contributes the largest share of seaweed export value. However, this heavy reliance on a single species underscores the need for greater diversification to enhance resilience to changing market demands and environmental conditions.



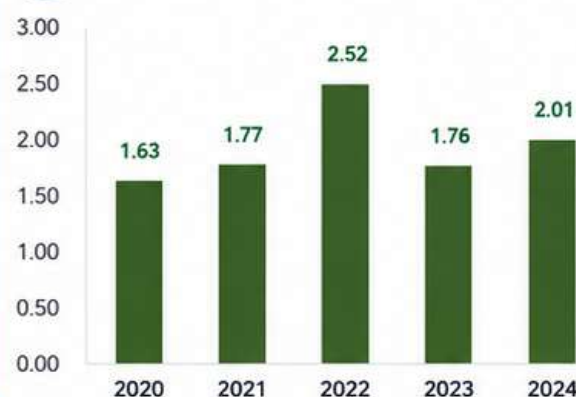
Global Seaweed Production 2020–2022
(Million tons)



Indonesia was the world's second-largest seaweed producer in 2022, with a production volume of 9.22 million tonnes. Significant growth opportunities remain through improved efficiency, value addition, and downstream industry development.



National Seaweed Production Value, 2020–2024 (USD Million)



While seaweed production continues to grow, value creation remains limited due to the dominance of raw material exports and insufficient domestic processing capacity. Seaweed prices also remain volatile, influenced by processing industry dynamics in China, seasonal production cycles, and fluctuations in global demand.

Why Diversification Matters



Reduce dependence on a single species



Enhance resilience to market & environmental changes



Capture new market opportunities



Support sustainable seaweed industry growth



Kementerian PPN/
Bappenas

Indonesia's Seaweed Sector at a Glance

A leading producer with strong coastal livelihood base and value-added potential



Indonesia is among the world's leading seaweed producers, supported by extensive coastal areas, strong cultivation traditions, and smallholder-based production systems.

KEY MESSAGES

1



Indonesia remains one of the largest seaweed producers globally. → **Improving Production Technology and productivity is a key**

2



Seaweed cultivation supports thousands of coastal households and communities → **Enhancing Coastal Livelihood**

3



The sector has strong potential to move beyond raw material production towards higher value-added products → **High Economic Benefit**



Indonesia Rank

2

World seaweed producer



63

Thousand

Seaweed Cultivation
Households in Indonesia



11.65*

million tons

Seaweed production
volume in 2025



Source : KKP, 2025

*provisional figures



Indonesia's next opportunity is to transform production strength into sustainable, inclusive, and higher value-added seaweed value chains.





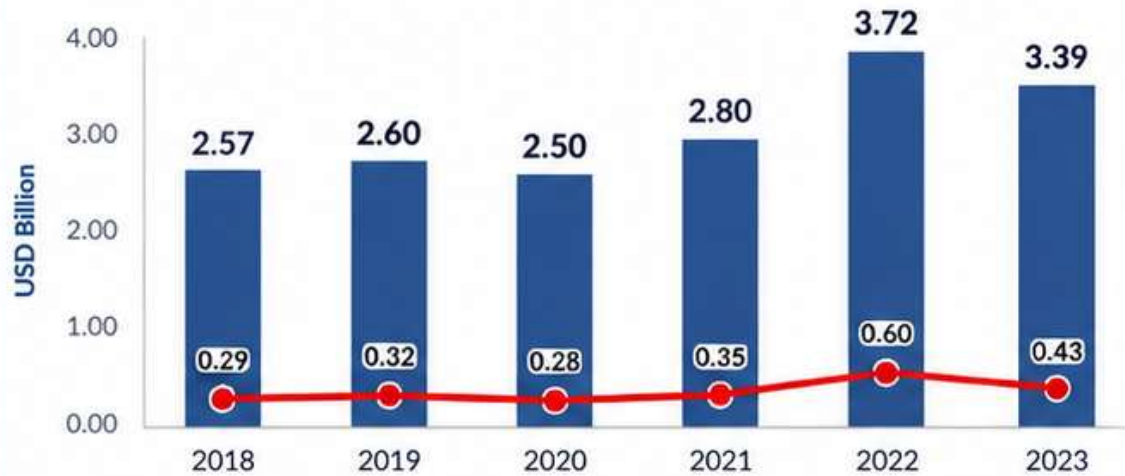
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Indonesia Seaweed Export Contribution to Global



Global Seaweed Imports and Indonesia's Contribution

■ Global Imports (USD Billion) ◆ Indonesia's Contribution (USD Billion)



Indonesia's contribution to global seaweed imports has grown consistently, reaching USD 0.43 billion in 2023, highlighting Indonesia's strategic role in meeting global seaweed demand.



Global Import Value

2023

USD 3.39 Billion

▼ -8,3% (YoY)



Global Import Volume

2023

0.83 Million Tonnes

▲ 4,7% (YoY)



Global Seaweed

Import Trend

(2018-2023)

6,6 %



Indonesia's contribution to global seaweed exports can be further enhanced through **greater value addition, accelerated downstream processing, product diversification, and stronger competitiveness** of seaweed-based industries. These efforts are increasingly important as the global seaweed market is projected to reach **USD 11.8 billion by 2030** (World Bank, 2023).





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Bappenas

Challenges Across the Value Chain

Unlocking Indonesia's seaweed potential requires coordinated action from upstream to downstream



Despite its strong production base, Indonesia's seaweed sector still faces some challenges on value chain.





Kementerian PPN/
Bappenas

Progressing Good Seaweed Governance

through Integrated Seaweed Development
Action Plan (ISDAP) 2026–2030:



01



Enhancing Seaweed
Production Quality and
Farming Productivity
(Upstream)



02



Developing the Seaweed
Industry, Value Addition,
Market Access, and
Exports (Downstream)



03



Advancing Research,
Innovation, and
Technology Development



04



Strengthening the
Regulatory and
Institutional Framework



05



Enhancing Access to
Financing and
Investment



In Collaboration with



PROSPERA



WORLD BANK GROUP



and other relevant
institutions



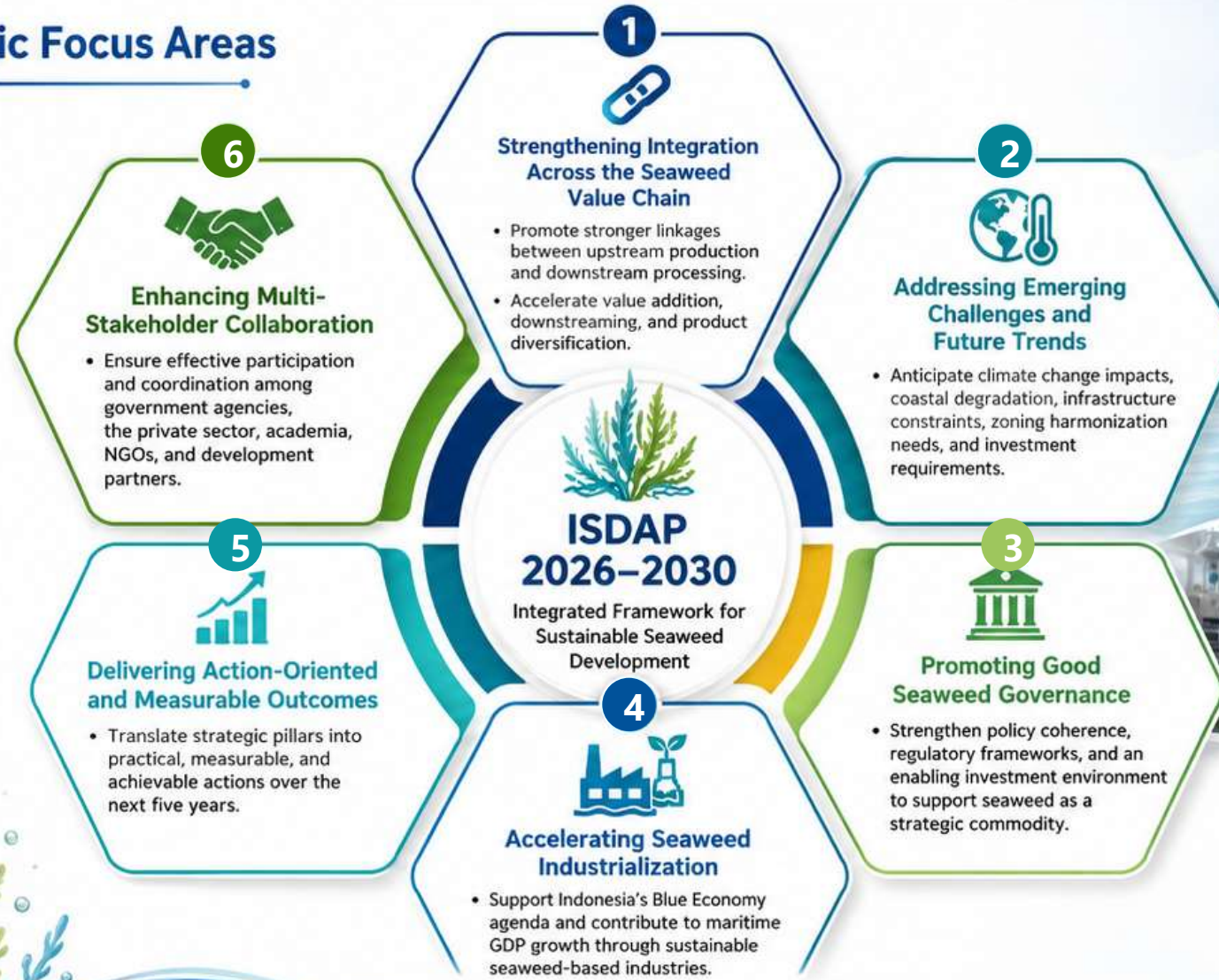
Integrated governance, strong partnerships, and coordinated action are key to building a sustainable, competitive, and inclusive seaweed sector in Indonesia.



Kementerian PPN/
Bappenas

Key Considerations on the Need of Integrated Approaches

Strategic Focus Areas



Sustainable
Environment



Inclusive
Growth



Economic
Value Addition



Stronger
Partnerships



ISDAP 2026–2030 is designed not merely as a planning document, but as an **integrated, measurable, and actionable framework** to accelerate the sustainable development of Indonesia's seaweed sector.



Kementerian PPN/
Bappenas

Alignment with UN GSI Implementation Priorities

Indonesia's National Action Plan for Seaweed Development (ISDAP) 2026–2030 is closely aligned with the implementation priorities of the UN Global Seaweed Initiative.



UNGSI Implementation Priority



Indonesia's National Response



Opportunity for Joint Action



Policy Integration

Seaweed as a strategic commodity in Indonesia's national development planning and Blue Economy agenda.



Collaboration on Seaweed Project, Gender, and Youth inclusiveness



Production

Indonesia is strengthening upstream productivity, and pregressing downstreaming seaweed industry, seaweed value added, bio refineries, from seaweed, cosmetic pharmachetical



Join in Tropical Seaweed Center Program, Developing Seaweed Gene Bank, R&D, technology, and climate issue. Empowering small holder farmer, collab industry and farmer



Trade, Regulations & Standards

Establishing good seaweed governance program, coastal planning, and quality standards and improving export capacity



Mutual agreement, harmonizing development international standard and trade, value addition, export competitiveness, and diversification market access



Finance and Investment

Indonesia is preparing opportunities for financing and investment of the seaweed value chain.



Mobilizing investment and blue financing, access to finance , encouraging industrial partnership





Kementerian PPN/
Bappenas

Recommendations for UN GSI Collaboration

Moving from dialogue to joint action: production, innovation, standards, and inclusive value creation.



Empowering Tropical Seaweed

1. Share certified trainers and practical know-how
2. CoE Tropical Seaweed and Inclusive smallholder-based collaborative farming models
3. Climate-resilient seed and farming productivity, Eco-friendly cultivation materials



Trusted Global Platform to Connect science, policy, and investments



Strengthen Partnership Across Regions



Inspire New Generation of Innovators, Researchers, and Entrepreneurs

Mobilize Global Seaweed Financing

1. Mobilizing global support on blue finance for seaweed programs related to production, value added, inclusivity and coastal welfare

Co-develop Standards and Market Pathways

1. Shape standards suitable for tropical seaweed and smallholders
2. Support value-added products, market access, and price stability





INTEGRATING SEAWEED Into Brazil's Nationally Determined Contributions Into the Global Climate Action Agenda

EDUARDO SFOGLIA

Head Advisor for International Affairs
Ministry of Fisheries and Aquaculture of Brazil
internacional@mpa.gov.br

MINISTÉRIO DA
PESCA E
AQUICULTURA



Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNESCO (IOC) and GSC.

CLIMATE PLAN 2024-2035

Sectoral Mitigation Plans

- | | |
|--------------------|-------------------|
| 1. Public Land use | 4. Industry |
| 2. Agriculture | 5. Transportation |
| 3. Energy | 6. Cities |
| | 7. Waste |

Sectoral Adaptation Plans

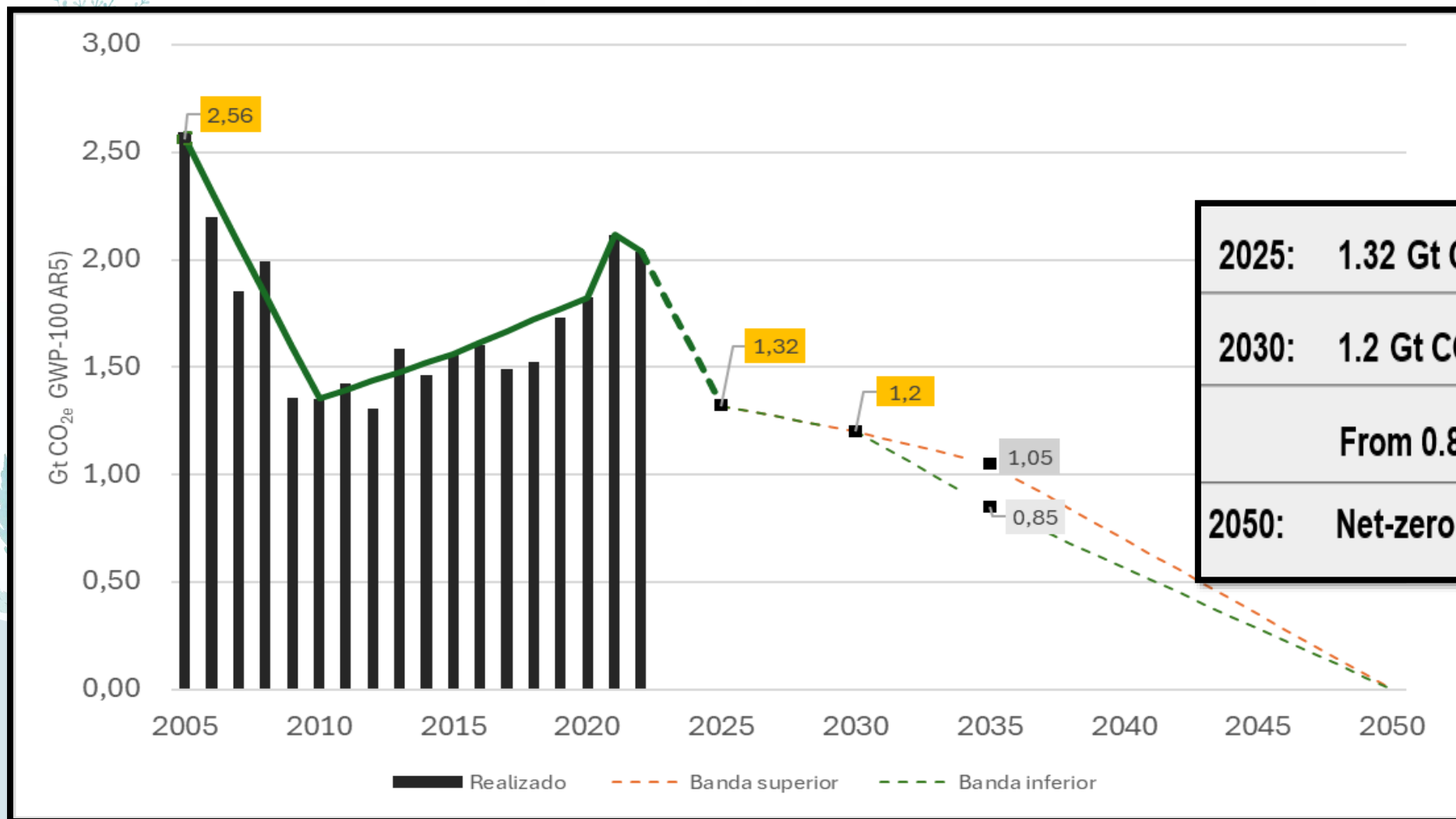
- | | |
|-----------------------------|---------------------------------|
| 1. Agriculture | 9. Racial Equality |
| 2. Family Farming | 10. Traditional Communities |
| 3. Biodiversity | 11. Indigenous Peoples |
| 4. Cities and Mobility | 12. Water Resources |
| 5. Disaster Risk Management | 13. Health Food and Nutritional |
| 6. Industry | 14. Security |
| 7. Energy | 15. Ocean and Coastal Zones |
| 8. Transportation | 16. Tourism |



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

EMISSIONS TRAJECTORY AND MITIGATION TARGETS



2025: 1.32 Gt CO_{2e}

2030: 1.2 Gt CO_{2e}

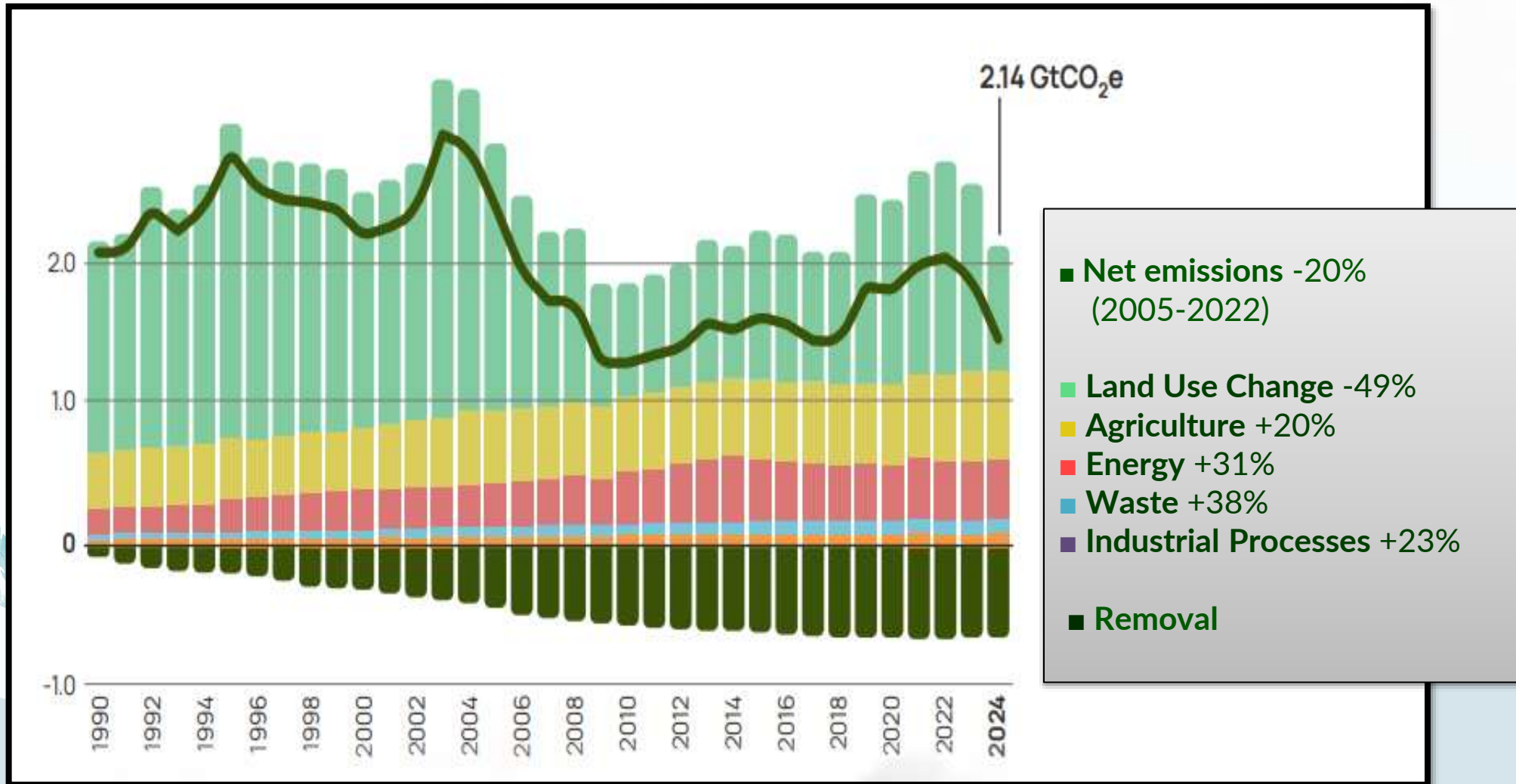
From 0.85 to 1.05 Gt CO_{2e}

2050: Net-zero GHG emissions

INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

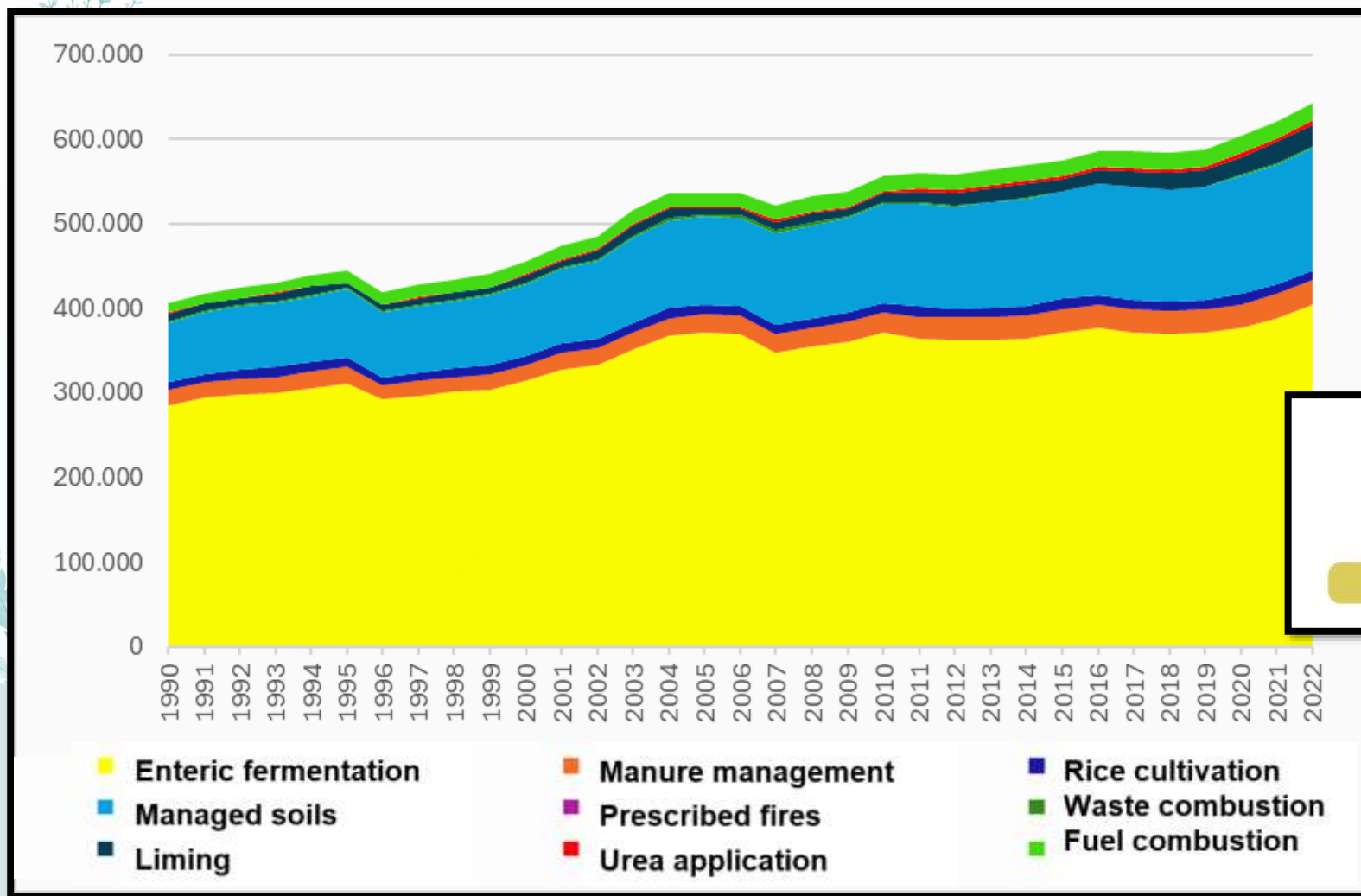
EMISSIONS TRAJECTORY BY SECTOR



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

EMISSIONS TRAJECTORY BY AGRICULTURAL SECTOR



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

SECTORAL PLANS FOR AGRICULTURE

- 1.Conservation of natural ecosystems
- 2.Restoration of native vegetation
- 3.Environmental regularization of rural properties
- 4.Territorial planning and land regularization
- 5.Control of legal deforestation
- 6.Bioeconomy and sustainable productive alternatives
- 7.No-till farming
- 8.Restoration of degraded pastures and sustainable pasture management
- 9.Integrated systems
- 10.Planted forests
- 11.Intensive finishing
- 12.Bio-inputs and biological nitrogen fixation
- 13.Irrigated systems
- 14.Animal waste treatment and family and community biodigesters, biogas
- 15.Migration to high-productivity technological systems in agriculture and livestock
- 16.Agroecological systems, organic production, family, urban, and peri-urban agriculture
- 17.Biofuels, biomass, and PGPM-Bio
- 18.Financial mechanisms and payments for environmental services
- 19.Local governance, socio-bioeconomy, and market access
- 20.Research, technological innovation, and technical assistance for low-carbon agriculture and livestock
- 21.Resilient low-emission aquaculture and fisheries**
- 22.Sustainable technologies for vessels
- 23.Environmental liability and productive restoration in agrarian reform settlement areas



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

RESILIENT LOW-EMISSION AQUACULTURE

- **Promote sustainable aquaculture production by scaling up low-GHG emission models**

Integrated Multi-Trophic Aquaculture (IMTA), Aquaponics
Mitigation : potential reduction of 1,700,000 tons of CO₂eq/year across an area of 46,000 hectares

- **Expand the use of sustainable aquaculture practices more resilient to climate variations**

Recirculating Aquaculture Systems (RAS), excavated ponds, bioflocs, net cages
Inland aquaculture (e.g. inland brackish water shrimp farming)
Adaptation & Mitigation : potential reduction of 1,000,000 tons of CO₂eq/ha/year

- **Strengthen the development of seaweed farming**

Promote seaweed farming, enable adaptive cultivation of macroalgae
Adaptation & Mitigation : 250,000 hectares potentially absorb/sequester 2,340,000 tons of CO₂eq/year



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

RESEARCH, TECHNOLOGICAL INNOVATION, AND TECHNICAL ASSISTANCE

➤ Technical Working Group on Low-GHG Aquaculture

Integrated Multi-Trophic Aquaculture (IMTA)

Recirculating Aquaculture Systems (RAS)

Excavated ponds

Seaweed farming

Mitigation : develop diagnostics and inventories

Draft **METHODOLOGY REPORT FOR AQUACULTURE**
(IPCC-FAO)

Brazilian Agricultural Research Corporation (EMBRAPA)

Literature review: drivers and production-specific emission factors

Methodologies to measure and report sectoral emissions

Excavated pond-fish and shrimp ✓

Bivalves ✓

Seaweeds (seeking financing)



INTEGRATING SEAWEED

Into Brazil's Nationally Determined Contributions

RESEARCH, TECHNOLOGICAL INNOVATION, AND TECHNICAL ASSISTANCE

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Integrated Multi-Trophic Aquaculture (IMTA)

Recirculating Aquaculture Systems (RAS)

Excavated ponds

Seaweed farming

Mitigation : develop diagnostics and inventories

SUSTAINABLE TECHNOLOGIES FOR FISHING VESSELS

➤ Incentivize the use of sustainable technologies for fishing vessels

Decarbonization of the fishing sector

Vessels equipped with hybrid engines or powered by sustainable biofuels by 2035

Adaptation & Mitigation : replace (*tbd* %) of the artisanal and industrial fishing engines and fleet



SEAWEED FARMING DEVELOPMENT

Integrated bivalves and seaweed farming

Kappaphycus alvarezii; spirulina; inland aquaculture of native microalgae & macroalgae

More resilient, adaptive, and sustainable diets

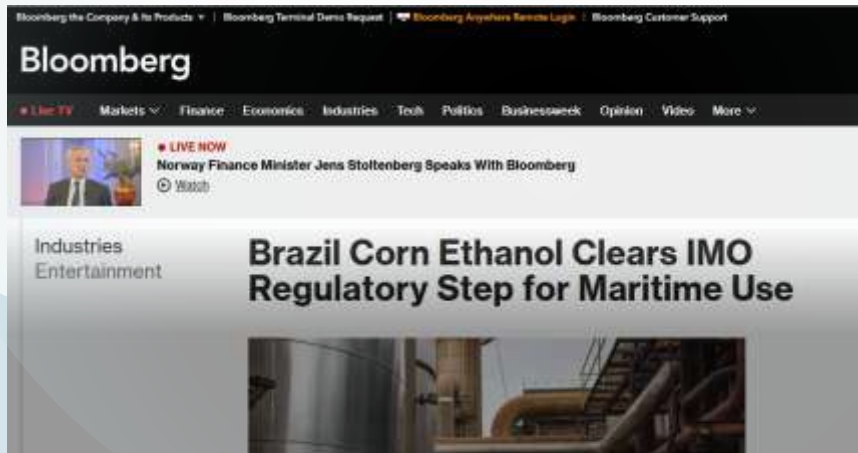


ADAPTIVE, SUSTAINABLE, AND RESILIENT AQUATIC FOOD SYSTEMS

Energy transition in the seafood value chain

Vessels with solar power, biofuels, and hybrid engines and equipment

Inland brackish water shrimp aquaculture to reduce pressure on mangroves



INTEGRATING SEAWEED

Into the Global Climate Action Agenda

COP30
BRASIL
AMAZONIA
NOVEMBER 2025



United Nations
Climate Change

Climate
High-Level
Champions

Marrakech
Partnership



INTEGRATING SEAWEED

Into the Global Climate Action Agenda



30TH CONFERENCE OF THE PARTIES (COP30) TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

Belém - November 2025



COP30 ACTION AGENDA

Plans to Accelerate Solutions (PAS)

PAS MULTIPLE BENEFITS OF ALGAE AQUACULTURE UNITED NATIONS GLOBAL SEAWEED INITIATIVE



- Provide global leadership, coordination, and strategic direction for sustainable seaweed development
- Foster inclusive sector growth, addressing standards, sustainability, trade, scientific research and innovation
- Strengthen international and regional cooperation
- Reflect the perspectives of small-scale producers and marginalized groups in policy

TARGET: to double global seaweed production by 2030 by promoting trade standardization, innovation, genebanks, aquaculture diversification, capacity-building and adaptation of coastal populations.

Host initiatives: United Nations Global Seaweed Initiative (UNGSI)

Implementing initiatives: UN Trade and Development (UNCTAD), UN Global Compact-Global Seaweed Coalition (UNGC-GSC), UN Industrial Development Organization (UNIDO), UN Educational, Scientific and Cultural Organization's Intergovernmental Oceanographic Commission (UNESCO-IOC), and UN Food and Agriculture Organization (FAO)



United Nations
Climate Change



EN ▾



[Documents](#) > Global Climate Action Agenda 2026–2030: A five-year vision for accelerating implementation

Global Climate Action Agenda 2026–2030: A five-year vision for accelerating implementation

9. More resilient, adaptive, and sustainable food systems

Build resilient, adaptive, and sustainable food systems by supporting smallholder and family farmers, reducing food loss and waste, promoting aquatic food solutions, and building diversified, resilient supply chains, with supportive policy, regulations, and incentives to scale action faster.

Multiple Benefits of Algae Aquaculture

To double global seaweed production by 2030 by promoting trade standardization, innovation, genebanks, aquaculture diversification, capacity-building and adaptation of coastal populations.

Axis III: Transforming Agriculture and Food Systems

Key-objective: (9) more resilient, adaptive, and sustainable food systems

Host Initiatives:

United Nations Global Seaweed Initiative (UNGSI)

Implementing initiatives:

UN Trade and Development (UNCTAD), UN Global Compact-Global Seaweed Coalition (UNGC-GSC), UN Industrial Development Organization (UNIDO), Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO-IOC), Food and Agriculture Organization of the United Nations (FAO)

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PAS Aquatic Food Systems as Climate Solutions

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PAS Multiple Benefits of Algae Aquaculture

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Images available on gov.br domains, cop30.br, climateaction.unfccc.int, climatechampions.net, and Google Images

Environmental credits for seaweed aquaculture and the EU Algae Declaration

Maris Stulgis
Policy officer for Blue Bioeconomy, Algae
and Aquaculture, DG MARE A2

Maris.STULGIS@ec.europa.eu



Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNESCO (IOC) and GSC.

EU Algae Initiative Report to EP&Council end 2027

To unlock the algae potential in the EU 23 policy actions are implemented by the Commission in collaboration with relevant stakeholders. Focus areas:

- Improving governance and legislation
- Creating business support mechanisms
- Raising awareness
- Driving research, knowledge, and innovation

Awareness raising and acceptance of algae in EU

- Euronews
- Communication campaigns
- Eurobarometer

EU Algae awareness summits

European Algae Stakeholder Platform (EU4Algae)

- Share business-related information
- Access funding calls and events
- Collaborative space for algae stakeholders
- Share best practices
- 7 industry-relevant working groups

> 1250 stakeholders

Working together with EU national authorities

- To inspire & inform
- Collaborate
- Share best practices (licensing procedure, access to marine space)

What has the EU ever done to support the algae sector?

ENVIRONMENT - Marine and Water protection, waste and nutrients management, etc.

CLIMATE - Blue carbon, carbon farming, sust. carbon cycles

BLUE ECONOMY - Blue Bioeconomy, Sea Basin Strategies, EU4Ocean, EMODnet

FINANCE - Blueinvest

Synergies with other Commission policies and initiatives

RESEARCH - Mission Ocean

AGRICULTURE - Land based cultivation, organic regulation

HEALTH - Contaminants, iodine content in algae

INDUSTRY - Plant biostimulants

Common Fisheries Policy - Common market organization

Research, innovation and investments

- EU funding and investments are instrumental for the emerging algae sector to derisk investments - More than 850 projects have been funded. Funding allocation from EU funds will continue.

> 1,5 bn EUR

Nature and blue carbon credits

Recent EU policy developments on environmental credit schemes:

[EU Nature credits roadmap](#) (7/7/2025) to incentivise private investments into actions that protect and preserve nature, and reward those who undertake these actions and invest in them.

[Coastal communities strategy](#) to support prosperous, resilient, and liveable coastal communities

To enable blue carbon credits to be issued and traded, the Commission will support the **development of a certification methodology** of blue carbon ecosystems (starting with tidal marshes and seagrass meadows and followed up by seaweed) under the 2024 Carbon Removal and Carbon Farming Regulation (CRCF). A draft Delegated Act for this methodology is planned by 2028.



What are nature credits?

Nature credits are certificates confirming that a project or restoration activity has delivered real improvements for nature—such as restoring habitats or increasing biodiversity—which can be purchased by companies or organisations to help financing nature restoration and regeneration.

Verified, science-based outcomes

Measured or proxied, context-adapted, and independently assessed, with flexibility across ecosystems and alignment with recognised condition and assessment approaches in EU and international frameworks

High-integrity framework

Built on sustainability, transparency, traceability, and inclusiveness, with clear separation of roles to support credibility and trust

A new financial tool

A standardised and verifiable format to help channel private investment into nature-positive action, as part of a broader toolbox rather than a standalone solution

EU-aligned and policy-coherent

Embedded in the EU policy landscape, connected to sectoral and nature policies, and consistent with broader international frameworks such as the Kunming-Montréal Global Biodiversity Framework

Certificate

Recognise that a nature-positive project meets high-quality standards

Issued after assessing project design, methods, and expected outcomes

Provide upfront assurance serving as a mark of quality and credibility to investors and funders

Assigned revenues to unlock early-stage finance

Credit

Represent verified biodiversity outcomes over time

Issued based on monitoring of actual results

Quantified units that can be traded or reported by buyers

Enable result-based payments for nature restoration

Turn ecosystem improvement into transferable value

Not a commodification of nature but a framework to recognize, verify and channel investment into nature-positive action!

Marine/coastal ecosystems: opportunities for nature credits

Marine and coastal ecosystems are within the scope

- High ecological value with public-good characteristics, hence key for high integrity approaches
- Address gaps left by carbon markets, especially in systems with low carbon storage but high biodiversity

Contribute to EU marine and water legislation goals

- Complement the [Marine Strategy Framework Directive \(MSFD\)](#) – Good Environmental Status across 11 descriptors
- Align with the [Water Framework Directive \(WFD\)](#) – status assessments cover ecological and chemical condition of coastal and transitional waters

Possible integration of nature-positive marine farming actions

- Some seaweed and bivalve farming practices can enhance ecosystem condition
- Certificates and credits could monetise actions like nutrient removal, habitat creation, and water filtration

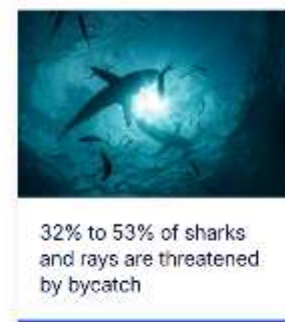
Mobilise private finance for blue nature

- Credits can narrow the marine biodiversity funding gap
- Attract corporate, philanthropic and blended finance
- Potential project types: habitat restoration, marine protected enhancement, low-impact aquaculture
- Link to EU [Blue Economy](#) and [BlueInvest](#) strategies



[EIB-Global Seaweed Coalition report \(2025\)](#)

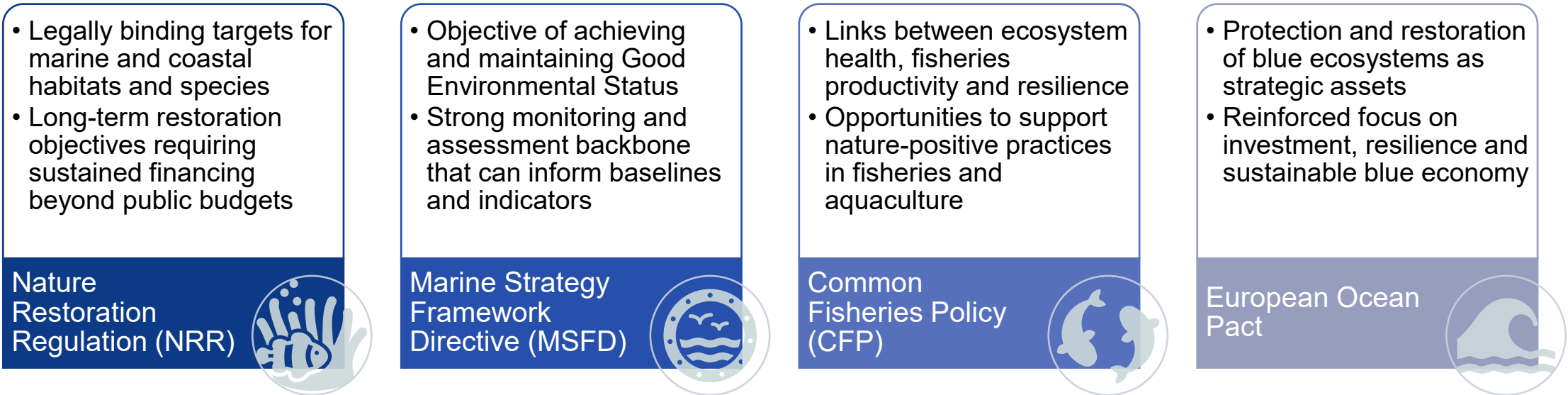
In the EU



[Marine environment - European Commission](#)



Nature credits in the EU policy landscape for blue ecosystems



Positioning of nature credits in Commission's communication

As part of the “EU’s roadmap for nature credits”, the Commission will launch pilot projects to test different options, using funding from Horizon and LIFE.



EU MEMBER STATES ALGAE DECLARATION

Advancing the EU algae sector for a sustainable, resilient and circular blue bioeconomy



1



STRATEGIC RESOURCE FOR EUROPEAN UNION

Recognise algae as a key resource for the European Union's green and blue transitions, contributing to biodiversity, climate resilience, sustainable food systems and the circular blue bioeconomy.

2



IMPLEMENT THE EU ALGAE INITIATIVE

Support the implementation of the EU Algae Initiative and strengthen policy coordination to accelerate the development of a competitive and sustainable European Union algae sector.

3



COLLABORATE AND ALIGN

Promote collaboration among Member States, the European Commission and stakeholders through initiatives such as the EU Algae Member States Network, facilitating knowledge exchange and regulatory alignment.

4



SHARE SOLUTIONS AND SCALE UP

Encourage national algae strategies and best practice sharing; integrate algae into national policy agendas and supporting innovation, investment and market development.

France,
Germany
Finland,
Spain,
Greece,
Belgium,
Italy,
Portugal



Together, we will build a stronger, more coordinated algae ecosystem in the European Union and accelerate the transition to a sustainable and circular blue bioeconomy.



Next steps for algae

Turn ambition into action

- Moving from commitment to implementation through coordinated EU-level follow-up on algae and blue bioeconomy e.g. via EU4Algae and Blue BIP

Build credible evidence and verification

- Support recognition of real environmental benefits, such as carbon sequestration and habitat restoration, through credible verification

Position algae in the EU policies

- Link algae development with investment approaches (e.g. nature-positive finance) and broader EU Blue Bioeconomy policies connecting them with blue carbon credits developments

Mobilise stakeholders and delivery

- Keep governments, industry and other organisations engaged around shared priorities and practical next steps e.g. via EU4Algae



UNITED NATIONS

Global Seaweed Initiative

SESSION 1: Integrating seaweed/algae into national planning

Michele Quesada, UNESCO-IOC, MSPglobal Coordinator



29 June 2026



m.quesada-da-silva@unesco.org



www.mspglobal2030.org



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Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.

IOC-wide Strategy on Sustainable Ocean Planning & Management



Unifying 'umbrella' for ocean-related governance at all scales (...) integrating existing and future management frameworks (such as **marine spatial plans**, marine protected area management plans, integrated coastal area and watershed management plans, sectoral plans)



Strategic Objectives:

- Enhance **integration and mainstreaming of SOPM approaches**
- Increase visibility and facilitate use of improved observations, data and knowledge
- Strengthen cross-sectoral and transboundary coordination and collaboration
- Expand capacity development



Marine Spatial Planning (MSP)

UNESCO-IOC definition:



"The public process of analyzing and allocating the spatial and temporal distribution of human activities to achieve ecological, economic, and social objectives that are usually specified through a political process."



MSP is a multisectoral and participatory **process**.



The marine spatial plan is the **instrument**.



MSPglobal Programme

Global ⇔ Regional ⇔ National ⇔ Local



marine
spatial
planning
global



At Global level:

- Co-development of new knowledge & tools
- Development of new capacity development materials (*online and F2F*)

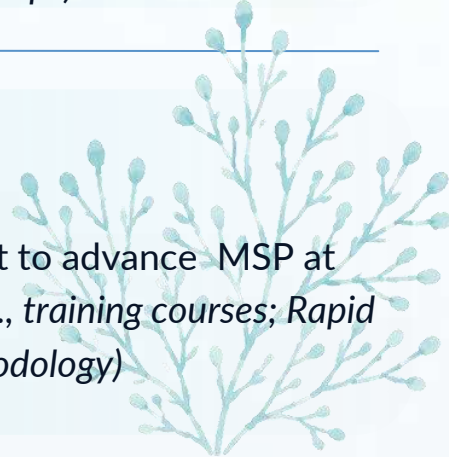


At Regional level:

- Technical support to strengthen regional dialogue and partnerships towards coherent plans across borders (e.g., *regional expert groups*)



At National level:

- Technical support to advance MSP at national level (e.g., *training courses; Rapid Assessment Methodology*)
- 

MSPglobal Guides on Biodiversity inclusive & Climate-smart MSP

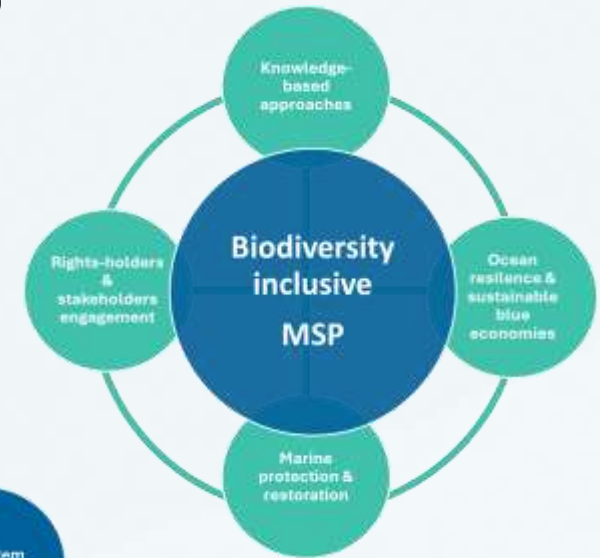
Knowledge-based approaches, providing a deeper understanding of biodiversity, ecosystem elements and function.

Ocean resilience and sustainable blue economies should guide the vision of biodiversity inclusive.

Marine protection and restoration efforts, essential to guarantee biodiversity and ecosystem health in the present and for the future.

Engagement of rights-holders and stakeholders, crucial for the overall success.

MSP & KMGBF



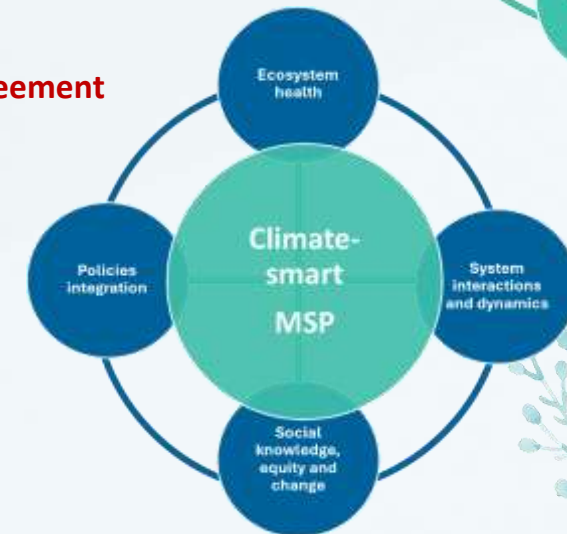
MSP & Paris Agreement

Ensuring ecosystem health, essential for a functioning marine environment that can support the achievement of social and economic objectives.

Understanding systems interactions and dynamics, including cumulative impacts and cascading effects of climate change and other human induced.

Considering social knowledge, equity and change will contribute to a more inclusive planning process.

Aligning and integrating climate and marine policies that can strengthen coherent governance and action at multiple scales.

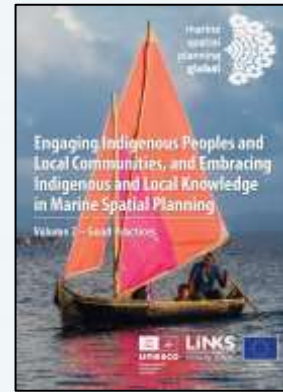
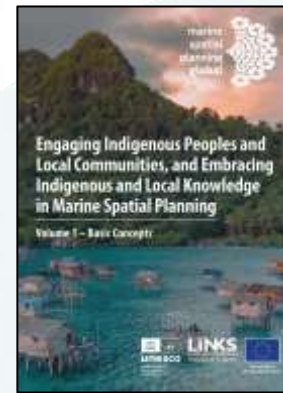


Good practices for stakeholder engagement

Good Practices are relevant as MSP requires that planners are familiar with the key characteristics of the socio-ecological system that will be planned, understanding aspects such as **users' needs, challenges, spatial characteristics, spatial demands and sustainable practices.**

What are the sectoral considerations regarding the MSP principles 'biodiversity inclusive' & 'climate-smart'?

Volume 1 = Basic Concepts
Volume 2 = Good Practices



UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

Indonesia perspective of seaweed aquaculture



PRESENTED BY

Nono Hartanto

Director of Seaweed

Directorate General of Aquaculture

Ministry of Marine Affairs and Fisheries of the Republic of Indonesia



DATE

29 June 2026



VENUE

**UNGSi 1st Annual Meeting,
Palais des Nations – Geneva**

MEMBERS AND PARTNERS:

Members of the UNGSi (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.



nonohartanto69@gmail.com



kkp.go.id

GLOBAL SEAWEED INITIATIVE

**THE UNTAPPED POTENTIAL IS
THE BLUE ECONOMY:**

INDONESIA IS THE WORLD'S LARGEST ARCHIPELAGIC COUNTRY

with Abundant Natural Resource Potential



**Exceptional Marine
Biodiversity:**
8,500 Marine Biota



**Marine Fisheries Production
Potential:**
>50 Million Tons/Year



**Strategic Geographic Location
in Global Trade Routes**



**Sustainable Fisheries
Production Potential:**
12 Million Tons Per Year



High Blue Economy Potential:
USD 1.33 Trillion Per Year
(Source: KKP, 2023)



**Blue Carbon Potential and
Renewable Energy**

BLUE ECONOMY POLICY FOR GOLDEN INDONESIA 2045



Protecting the Ocean and Its Resources

1

Expanding Marine Protected Areas

- Strengthen marine biodiversity conservation.
- Protect critical habitats such as coral reefs, seagrass beds, and mangrove ecosystems.
- Support sustainable fisheries and ecosystem resilience.



Reducing Pressure and Environmentally Harmful Fishing Activities

2

Quota-Based Fisheries Management

- Implement science-based catch limits.
- Ensure sustainable utilization of fishery resources.
- Improve stock recovery and long-term productivity.



3

Sustainable Aquaculture Development in Marine, Coastal, and Inland Areas

- Promote environmentally responsible aquaculture practices.
- Increase seafood production while minimizing ecological impacts.
- Support food security and coastal economic growth.



Preserving Marine Ecosystems and Coastal Areas

4

Monitoring and Management of Coastal Areas and Small Islands

- Strengthen surveillance and governance of coastal resources.
- Protect vulnerable coastal ecosystems.
- Improve resilience to climate change and human activities.



5

Marine Plastic Waste Reduction Through Fisher Participation

- Encourage community-led coastal clean-up programs.
- Engage fishers in collecting and reporting marine debris.
- Reduce plastic pollution and improve marine environmental quality.



KEY OBJECTIVE

Expand marine protection, reduce negative human impacts, preserve ecosystem integrity, and maintain the quality of marine ecosystems and their ecosystem services.

INDONESIA'S SEAWEED PRODUCTION



Production continues to grow, and higher targets have been set for 2025–2029 to strengthen Indonesia's position as the world's leading seaweed producer.



SEAWEED PRODUCTION 2020–2025*



* 2025 data are provisional.

KEY SEAWEED AQUACULTURE INDICATORS

INDICATOR	2020	2021	2022	2023	2024
Cultivation Area (Ha)	99,549	160,673	175,967	178,008	185,730
Productivity (Ton/Ha)	96.62	56.69	52.48	54.79	53.05
Farmers (Persons)	253,271	254,422	240,367	254,068	237,829
Farming Households (RTP)	111,245	112,969	101,194	96,806	94,370

MAP OF INDONESIA'S MAJOR SEAWEED PRODUCTION CENTERS (2024)



TOTAL NATIONAL PRODUCTION (2024)

9,853,604 TONS



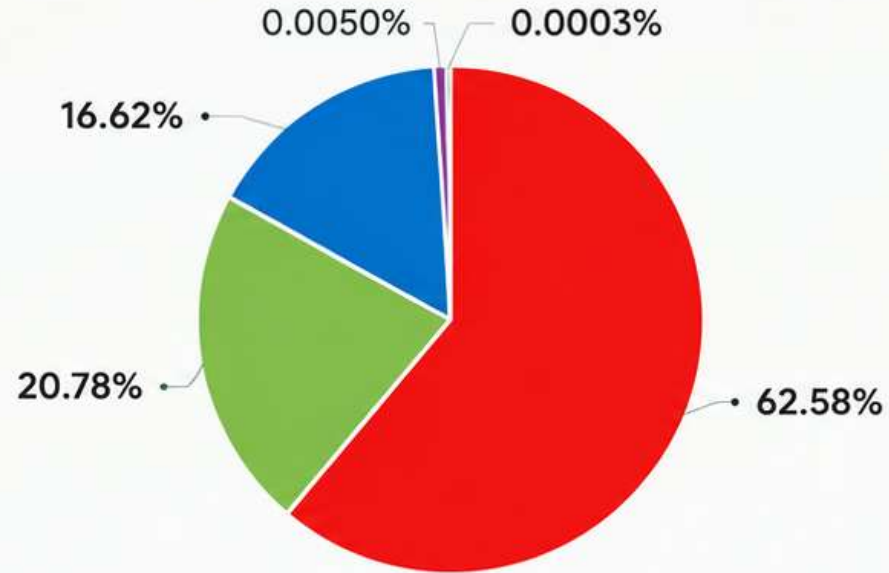
TOP SIX SEAWEED-PRODUCING PROVINCES

1	South Sulawesi	4,018,691 Tons		40.75%
2	East Nusa Tenggara (NTT)	1,467,663 Tons		14.89%
3	North Kalimantan	857,797 Tons		8.71%
4	East Java	755,460 Tons		7.66%
5	Central Sulawesi	752,242 Tons		7.63%
6	West Nusa Tenggara (NTB)	691,574 Tons		7.02%

*Percentage of total national production (may exceed 100% due to rounding).



SEAWEED SPECIES CULTIVATED IN INDONESIA



- *K. alvarezii* & *K. striatus*
- *E. denticulatum* (spinosum)
- *Gracilaria* sp.
- *Caulerpa* sp.
- *Ulva* sp.



K. alvarezii



K. striatus (sakol)



Caulerpa sp.



E. denticulatum
(spinosum)



Gracilaria sp.



Ulva sp.



Indonesia has
1,006
species of seaweed

6 species are cultivated by
local communities

Dominated by:

62.58%
K. alvarezii &
K. striatus

20.78%
E. denticulatum
(spinosum)

16.62%
Gracilaria sp.

CONDITIONS AND CHARACTERISTICS OF SEAWEED CULTIVATION ACTIVITIES IN INDONESIA



Seaweed cultivation is still carried out using equipment that is not environmentally friendly.



Long-term Seaweed Seed Gardens are not yet available and farmers still use seeds continuously year after year.



Seaweed farming is mostly run on a micro and small scale by local communities.



Cultivation sites are often in small islands with limited access and far from main transportation routes.



Cultivation methods are still simple and traditional.



Seaweed farming facilities do not yet meet safety, security, and hygiene standards.

KEY BOTTLENECKS

IN SEAWEED PRODUCTION AND COMMERCIALIZATION

Addressing key challenges to unlock the full potential of Indonesia's seaweed industry



ECONOMIC ASPECTS

KEY CHARACTERISTICS



Indonesia is the largest producer of tropical seaweed.



Main product: dry seaweed.



Cultivation is dominated by small-scale farmers with limited capital.



Farming locations are in remote areas.



MAIN CHALLENGES



Fluctuations in seaweed prices.



Production volume does not match production value.



Value chain is too long.



Limited access to capital and insurance.



Domestic processing industry has not been able to absorb total production.



Limited investment in downstream processing and logistics.

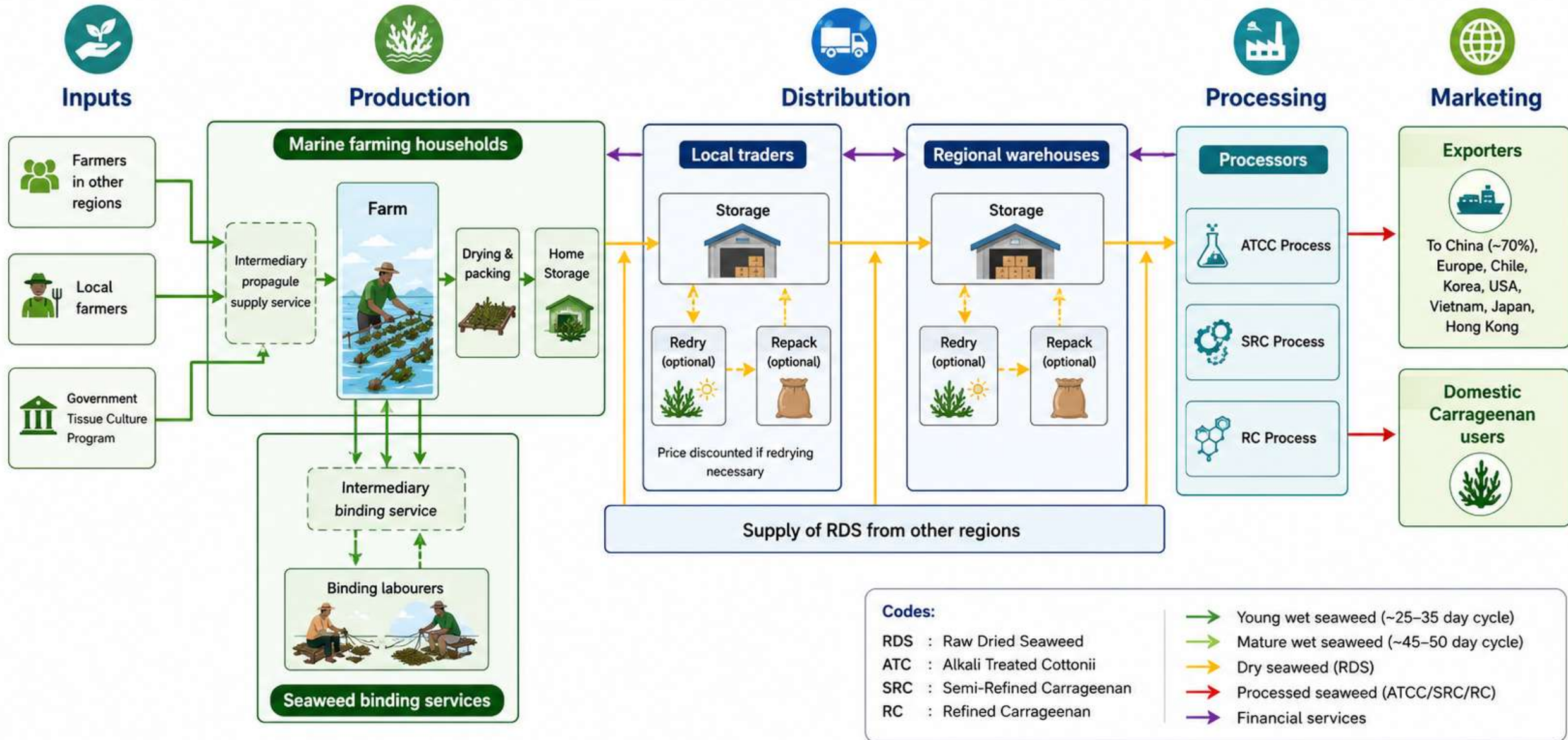


Strengthening collaboration, investment, and innovation are key to building a resilient and competitive seaweed industry in Indonesia.



Empowering coastal communities through better opportunities, skills, and sustainable practices.

ROLES OF STAKEHOLDERS IN INDONESIA'S SEAWEED INDUSTRY





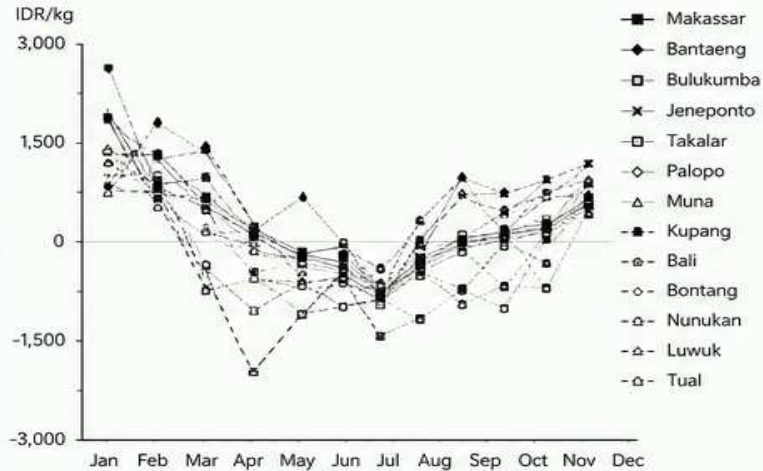
SEAWEED PRICE FLUCTUATIONS IN INDONESIA



Seaweed prices in Indonesia are subject to significant fluctuations influenced by location, seasonality, and long-term events. Key producing regions see varying average seasonal prices and longer-term trends impacted by events like infrastructure openings, the **COVID-19** pandemic, and price hikes.



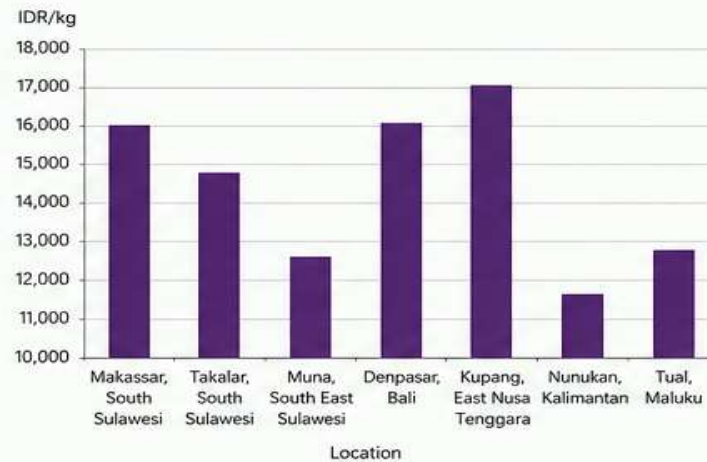
1 SEASONAL PRICE DECOMPOSITION BY CITY (2022)



Source: Langford et al. (2022)



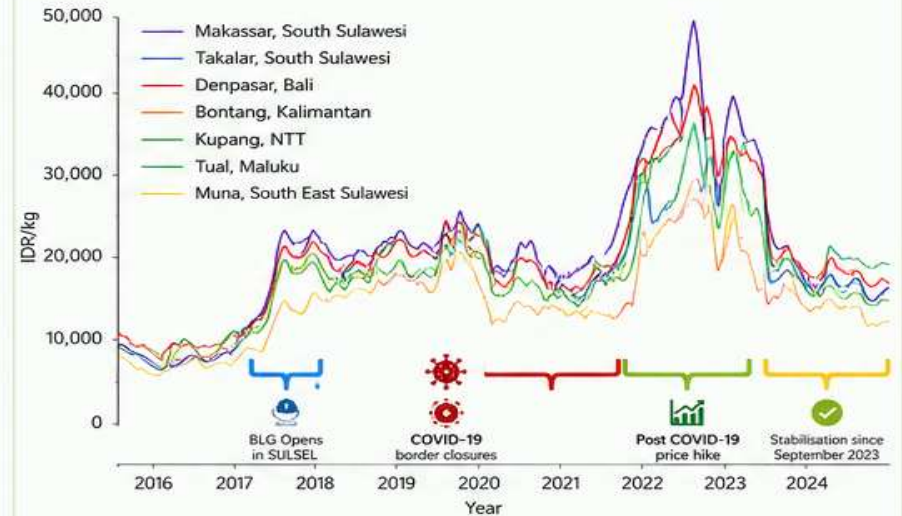
2 AVERAGE PRICE OF DRIED SEAWEED BY REGION (IDR/KG) (JAN-OCT 2024)



Source: Jasuda (2024)



3 LONG-TERM PRICE CHANGES IN THE INDONESIAN SEAWEED INDUSTRY



Source: Jasuda (2024), Langford et al. (2022, 2024)



SEAWEED FARMING CONDITIONS

SOCIAL ASPECT

Seaweed farming plays a vital social role in Indonesia's coastal communities. It serves as a major source of livelihood, creates employment opportunities, and contributes to community welfare. However, several social challenges continue to limit the sector's long-term sustainability and competitiveness.



SOCIAL CONDITIONS



1 Primary Livelihood for Coastal Communities

Seaweed farming is one of the main income-generating activities for many coastal households.



2 Managed by Households and Farmer Groups

Production activities are predominantly conducted by family-based enterprises and local farmer groups.



3 Significant Role of Women

Women contribute substantially to cultivation, harvesting, post-harvest handling, drying, sorting, and marketing activities.



4 Supports Community-Based Coastal Development

The industry strengthens local economies and helps reduce poverty in remote coastal areas.



SOCIAL CHALLENGES



1 Low Farmer Regeneration Rate

Younger generations are increasingly reluctant to enter the seaweed farming sector.



2 Weak Farmer Organizations and Institutions

Many farmer groups still face limitations in management capacity, governance, and business development.



3 Limited Collaboration Across the Value Chain

Coordination among farmers, collectors, processors, financial institutions, and government agencies remains insufficient.



4 Limited Access to Training and Technology Transfer

Many farmers have not yet received adequate technical assistance and capacity-building programs.



5 Vulnerability to Market and Environmental Changes

Coastal communities remain highly dependent on fluctuating market conditions and environmental factors.



6 Unequal Distribution of Economic Benefits

Farmers often receive a relatively small share of value compared to intermediaries and downstream industries.



TECHNICAL ASPECT



TECHNICAL CHARACTERISTICS

- Cultivation is still dominated by simple, nearshore systems.
- Seed supply relies on conventional cutting from mature thallus.
- Offshore areas with large-scale potential remain underutilized.



WHAT INDONESIA HAS DONE

- High-quality seed through tissue culture and selective breeding.
- Adoption of clipping systems, mechanized workboats, and integrated platforms.
- Automation from seeding to harvesting drives efficiency and productivity.



OFFSHORE POTENTIAL

- Vast and high-quality waters suitable for industrial-scale cultivation.
- Reduced pressure on nearshore ecosystems and coastal space.
- Significant opportunity to strengthen national production and competitiveness.



KEY TECHNICAL BOTTLENECKS



GENETIC DEGRADATION

- Declining seed quality due to limited supply of superior broodstock and absence of centralized seedbanks.



BIOSECURITY VULNERABILITY

- Lack of traceability and standardization leads to frequent ice-ice disease and epiphyte outbreaks, causing crop failure.



MODERNIZATION GAP

- Low mechanization and technology adoption; high-cost infrastructure remains limited to private sector.

KEY BOTTLENECKS

IN SEAWEED PRODUCTION & COMMERCIALIZATION



ENVIRONMENTAL ASPECTS



KEY CHARACTERISTICS



Large potential farming area



Cultivation is still carried out in coastal areas (tidal zone)



MAIN CHALLENGES



Use of plastic bottles as floats that has the potential to contribute to marine litter



Climate change increasing sea surface temperature



Declining water quality due to sedimentation and pollution



Conflicts over marine space with other sectors (tourism, shipping, conservation)



CAPACITY ASPECT

CHARACTERISTICS RELATED TO CAPACITY



Production is based on **small-scale farmers** in an archipelagic region with highly **diverse geography**.



Structural capacity challenges encompass **human resources, institutions, knowledge infrastructure, and innovation dissemination systems**.



Capacity gaps among production centers directly result in **inconsistent quality**.



WHAT INDONESIA HAS BEEN DONE



Provision of **production inputs** (seeds, equipment, access to finance, etc.) and **on-site technical support** for farmers.



Development and operation of seaweed laboratories through **UPT network** as centers for producing and distributing high-quality tissue culture seedlings.



Collaboration among farmers, government, academia, and local NGOs is in place.

EVIDENCE

1. Government support for seaweed tissue culture seedlings (Profil UPT RL)



UPT laboratories across seaweed centers produce quality tissue culture seedlings to ensure availability and accessibility for farmers.



Empowering farmers

2. Collaboration: Farmers – KKP – UNDP (AIS Forum)



Pilot development of integrated *Gracilaria*-milkfish polyculture in Sidoarjo, East Java.

- ✓ Revitalizing underutilized ponds
- ✓ 82 farmer members benefit
- ✓ Stronger productivity and quality
- ✓ Foundation for value addition and zero-waste approach



Increasing productivity & quality

3. Collaboration: Farmers – KKP – UNIDO



Karawang cooperative processes seaweed into agar-agar and noodles. Annual profit reaches IDR 6 billion.



Creating value & improving livelihoods



CONSTRAINTS & BARRIERS – CAPACITY DIMENSION



The number and distribution of extension officers and technical staff are **not proportional** to the vast territory and number of farmers served.



Inconsistent quality of raw materials can hinder compliance with export market quality standards.



Advanced farmer institutions remain limited, as not all farmers can adopt innovation and technology due to **limited tech literacy, access to capital, and networks**.



Applied research that responds to real field needs is still **not sufficiently developed**.



SEAWEED AQUACULTURE VILLAGE

(Ministerial Decree No. 111 of 2023)

Based on the Minister of Marine Affairs and Fisheries Decree No. 111 of 2023,
41 designated seaweed farming areas have been established across Indonesia.



TOTAL SEAWEED
AQUACULTURE VILLAGE

41

Designated Locations
Across Indonesia



WHY SEAWEED AQUACULTURE VILLAGES MATTER



Supports Coastal Communities

Provides income opportunities and improves livelihoods.



Boosts Local Economy

Strengthens regional economies and creates new jobs.



Sustainable Development

Promotes environmentally friendly and sustainable seaweed farming.



High-Value Commodity

Seaweed is in demand for food, cosmetics, and pharmaceutical industries.



Contributes to Blue Economy

Supports national goals for ocean-based economic growth.



Modelling of Seaweed Aquaculture



2023 📍 Wakatobi, Southeast Sulawesi

50 Ha

2024 📍 Southeast Maluku, Maluku

50 Ha

2024 📍 Rote Ndao, East of Nusa Tenggara

50 Ha

2026 📍 Karimunjawa, Jepara, Centra Java

50 Ha

Seeding Preparation



Seaweed tissue culture laboratory



Seeding & Farming

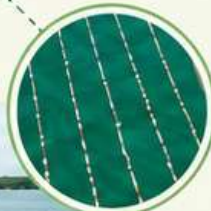
Seaweed farming facilities



wooden boat



Starter nursery



Environment friendly buoys



floating house for tying seaweed



Harvesting



Drying House



Warehouse



Benefits



Increased productivity



Increased seaweed exports and state revenue of the country



Increased employment



Improved welfare of seaweed farmers



Regional Economic growth



LABORATORY OF SEAWEED IN INDONESIA



THE ROLE OF UPT SEAWEED LABORATORIES

A strategic network of laboratories that support the availability of high-quality seaweed seeds and the development of sustainable seaweed cultivation technology.

MAIN FUNCTIONS OF THE LABORATORIES



TISSUE CULTURE

Improving the quality of strains under optimal culture conditions.



PLANTLET PRODUCTION

Mass plantlet production sustainably and continuously.



SELECTION OF SUPERIOR STRAINS

Selection and evaluation to increase growth and disease resistance.



QUALITY CONTROL OF SEEDS

Pre-distribution testing for cleanliness, viability, and uniformity.



PLANTLET ACCLIMATIZATION

Acclimatization of plantlets ready for field conditions.



TECHNOLOGY TRANSFER

Dissemination of knowledge and training for farmers and stakeholders.

UPT SEAWEED LABORATORIES NETWORK



LABORATORY FACILITIES AND EQUIPMENT

LABORATORY BUILDING



TISSUE CULTURE ROOM



ACCLIMATIZATION ROOM



SEAWEED CULTIVATION DEVELOPMENT SCHEME



Government (Research Institution)

Provincial / District / City Government
or Private Sector

Farmers / Stakeholders

GOVERNMENT (RESEARCH INSTITUTION)

- Plantlet production
- Seaweed Nursery Garden (2 ha)



GOVERNMENT / PRIVATE SECTOR

- Seaweed Nursery Garden



FARMERS / STAKEHOLDERS

- Seaweed Farming Area



KEY BENEFITS



High-quality and disease-free seaweed seeds



Increased productivity and better income



Stronger collaboration among researchers, government, and farmers



Sustainable and resilient seaweed industry



An integrated scheme that ensures the availability of superior seaweed seeds and supports sustainable cultivation for a stronger seaweed industry.

Enabling Sustainable Seaweed Aquaculture

Strengthening seaweed aquaculture through clear regulations, reliable standards, and capacity building



REGULATIONS

Provide the legal framework and policy direction to ensure responsible, sustainable, and well-managed seaweed aquaculture in Indonesia.



MINISTRY OF MARINE AFFAIRS AND FISHERIES
OF THE REPUBLIC OF INDONESIA

REGULATION OF THE
MINISTER OF MARINE AFFAIRS AND FISHERIES
OF THE REPUBLIC OF INDONESIA
NUMBER 17 OF 2021
CONCERNING
THE SEAWEED FARMING BUSINESS

Considering : In view to implement the mandate of Article 41
of the 1945 Constitution of the Republic of Indonesia, the
Minister of Marine Affairs and Fisheries of the Republic of
Indonesia has the authority to issue regulations in the field of
seaweed farming business.

Decision : To issue the Regulation of the Minister of Marine
Affairs and Fisheries of the Republic of Indonesia concerning
the seaweed farming business.

To enact : REGULATION OF THE MINISTER OF
MARINE AFFAIRS AND FISHERIES CONCERNING
THE SEAWEED FARMING BUSINESS.



MINISTRY OF MARINE AFFAIRS AND FISHERIES
DIRECTORATE GENERAL OF AQUACULTURE

Consideration : The seaweed farming business is one of the economic
activities that can contribute to the sustainable development of
the coastal community and the environment.

Decision : To issue the Regulation of the Minister of Marine
Affairs and Fisheries of the Republic of Indonesia concerning
the seaweed farming business.

To enact : REGULATION OF THE MINISTER OF
MARINE AFFAIRS AND FISHERIES CONCERNING
THE SEAWEED FARMING BUSINESS.

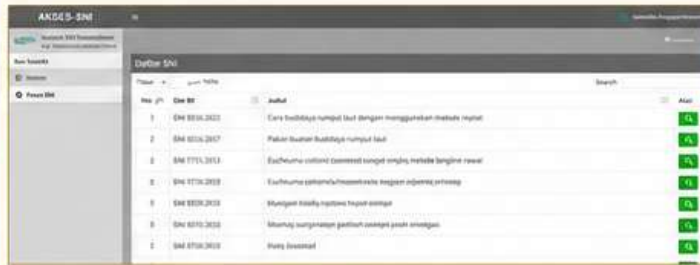


Ensure compliance, protect the environment, and support the growth of a competitive seaweed industry.



STANDARDS

Ensure quality, safety, and sustainability of seaweed products through nationally recognized standards.



No.	SN	Judul
1	SN 8124.2021	Cara budidaya rumput laut dengan menggunakan teknologi regasi
2	SN 8124.2021	Pelaksanaan budidaya rumput laut
3	SN 7715.2013	Kelembutan (softness) rumput laut sebagai indikator kualitas
4	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
5	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
6	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
7	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
8	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
9	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas
10	SN 8124.2021	Kelembutan (softness) rumput laut sebagai indikator kualitas



Cara budidaya rumput laut (CBBL) -
Bagian 2: Rumput laut



Sarana pengemasan bibit rumput laut kotoni
(Kappaphycus alvarezii) sistem kering terutup

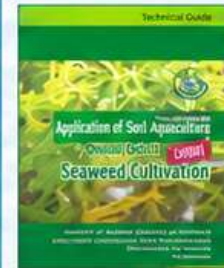


Build trust, add value, and open access to domestic and global markets.



TRAINING MODULES

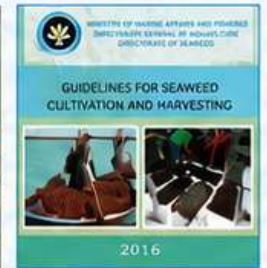
Build knowledge and skills of seaweed farmers and stakeholders through practical and up-to-date training materials.



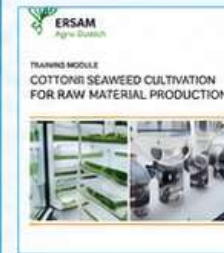
Application of Seaweed Cultivation



Seaweed Cultivation Technology
for Kotoni and Cottonii
(Kappaphycus alvarezii)
in Integrated
Multi-Trophic Aquaculture



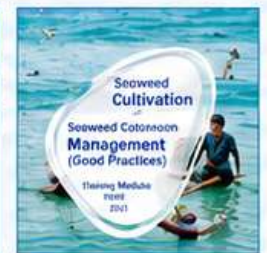
GUIDELINES FOR SEAWEED
CULTIVATION AND HARVESTING



TRAINING MODULE
COTTONII SEAWEED CULTIVATION
FOR RAW MATERIAL PRODUCTION



Seaweed Cultivation
Management
(Good Practices)



Seaweed Cultivation
Management
(Good Practices)



Empower communities, improve productivity, and promote sustainable livelihoods.

Quality Assurance & Certifications

Ensuring safe, high-quality, and sustainable seaweed products from farm to market

Indonesia implements a comprehensive system of certifications and standards to ensure the seaweed industry meets national regulations, safeguards the environment, and delivers high-quality products to global markets.



Good Aquaculture Practice – CBIB (Cara Budidaya Ikan yang Baik)

- A certification that ensures aquaculture activities follow Good Aquaculture Practices to guarantee food safety, environmental sustainability, and animal welfare.
- Issuing Authority: Ministry of Marine Affairs and Fisheries (MMAF)



Phytosanitary Certificate

- An official certificate confirming that plant-based products (including raw seaweed or dried biomass) are free from pests, diseases, and comply with the phytosanitary requirements of the importing country.
- Issuing Authority: The Indonesian Quarantine Authority (Barantin)



Good Manufacturing Practices (GMP) & Sanitation Standard Operating Procedures (SSOP)

- GMP ensures that products are consistently produced and controlled according to recognized quality standards.
- Issuing Authority: Ministry of Marine Affairs and Fisheries (MMAF)



Health Certificate (HC)

- An official document declaring that seaweed products have been inspected, meet food safety requirements, and are safe for human consumption.
- Issuing Authority: The Indonesian Quarantine Authority (Barantin)



Hazard Analysis and Critical Control Points (HACCP)

- An internationally recognized food safety management system that identifies, evaluates, and controls significant hazards to ensure product safety throughout the production process.
- Issuing Authority: Ministry of Marine Affairs and Fisheries (MMAF)



Indonesian National Standard (SNI)

- A national quality standard that may be voluntary or mandatory. For seaweed, specific SNIs exist for various products, such as dried seaweed and carrageenan.
- Issuing Authority: The National Standardization Agency (BSN)



Sustainable
Cultivation



Quality
Control



Certification &
Compliance



Market
Access



Consumer
Trust

REVITALIZING SEAWEED FARMING FACILITIES

REPLACING PLASTIC BOTTLE BUOYS WITH ECO-FRIENDLY HDPE BUOYS

📍 Replacing plastic bottle buoys with eco-friendly HDPE buoys in Sulamu, Kupang, East Nusa Tenggara Province, Indonesia

BEFORE

Using Plastic Bottle Buoys



AFTER

Using HDPE Buoys (Eco-Friendly)

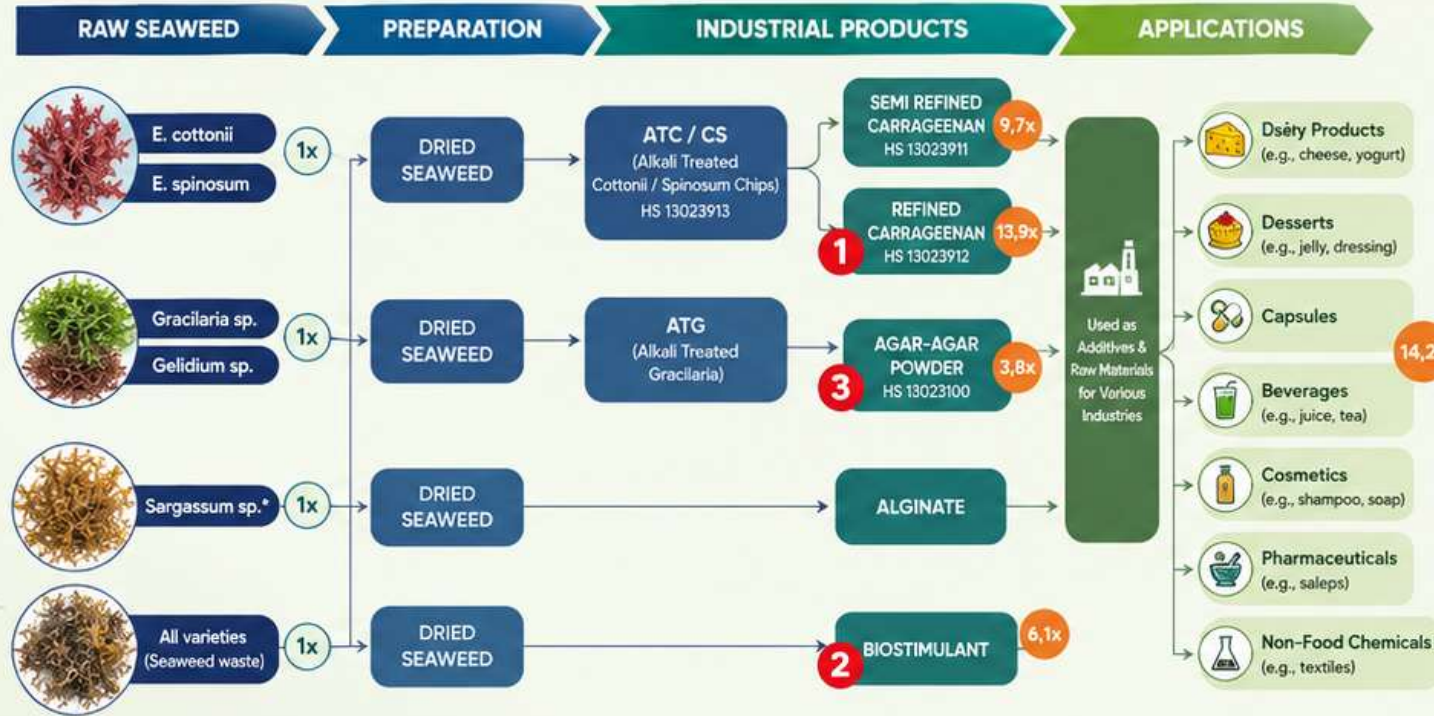


SEAWEED INDUSTRY TREE

FROM NATURE TO VALUE

Innovating seaweed, empowering Indonesia

Indonesia's seaweed industry ranges from raw materials to high-value products used in food, pharmaceuticals, cosmetics, agriculture, and many other sectors.



SEAWEED DERIVATIVE PRODUCTS

INDUSTRIAL SCALE PRODUCTS



HOUSEHOLD / CONSUMER PRODUCTS



FROM RAW SEAWEED TO END PRODUCTS



KEY INFORMATION

- Added Value Multiplier (Compared to raw dried seaweed)
- Priority downstream product for development
- Emerging & potential product for the future
- High potential product with growing demand



Sustainable Utilization

Every part of seaweed has value. From raw material to high-value products, supporting a circular and sustainable economy.

WHY SEAWEED?

- Abundant natural resources
- Environmentally friendly
- High economic value
- Wide range of industrial applications
- Empowering coastal communities

*Sargassum is processed into alginate. Seaweed waste and all varieties can be developed into biostimulant products.

DISTRIBUTION OF INDONESIA'S SEAWEED PROCESSING INDUSTRY



40 Seaweed
Processing Industries



Industry Utilization
55,01 %

BANTEN

1. PT Agarindo Bogatama
2. PT Bola Dunia Walet
3. PT Gumindo Perkasa Industri
4. PT Makcessen Foodatech Indonesia
5. PT Tara Rasa Boga

WEST JAVA

1. PT Agar Swallow
2. PT Buenatama Fajar Abadi
3. PT Galic Artabahari
4. PT Hydrocolloid Indonesia
5. PT Quantum Alpha Cemerlang
6. PT Aneka Dasuib Jaya
7. PT Dasaeng Food Indonesia
8. PT Kwangcheon Kim Indonesia

NORTH SUMATRA

1. PT Indoking Aneka Agar Agar Industri

CENTRAL JAVA

1. CV Karagen Indonesia

EAST JAVA

- | | |
|---------------------------------------|---|
| 1. CV Agar Sari Jaya | 11. PT Hakiki Donarta |
| 2. CV Carrageenan Indo Mandiri | 12. PT Hongxin Algae Internasional |
| 3. CV Sari Mutiara Abadi | 13. PT Indoflora Cipta Mandiri |
| 4. CV Sumber Sari Alam | 14. PT Indonesia Life Algez Karaginan Internasional |
| 5. PT Algalindo Perdana | 15. PT Indonusa Algeamas Prima |
| 6. PT Amarta Carrageenan Indonesia | 16. PT Kappa Carrageenan Nusantara |
| 7. PT Asia Prima Konjac | 17. PT Satelit Sriti |
| 8. PT Bestagar Puriendo Internasional | 18. PT Sri Gunting Pratama |
| 9. PT Centram | 19. PT PT Surya Indoalgas |
| 10. PT Fuyuan Biologi Technology | |

SOUTH SULAWESI

1. PT Biota Laut Ganggang
2. PT Cahaya Cemerlang
3. PT Bantimurung Indah
4. PT Giwang Citra Laut

BALI

1. PT Sea Six Energy

EAST NUSA TENGGARA

1. PT Rote Karaginan Nusantara

Source: SIINas, Kemenperin

*) Data obtained from companies that reported to SIINas in 2025



Strengthening Seaweed Production and Commercialisation by Addressing Key Value Chain Bottlenecks

UN Global Seaweed Initiative First Annual Meeting

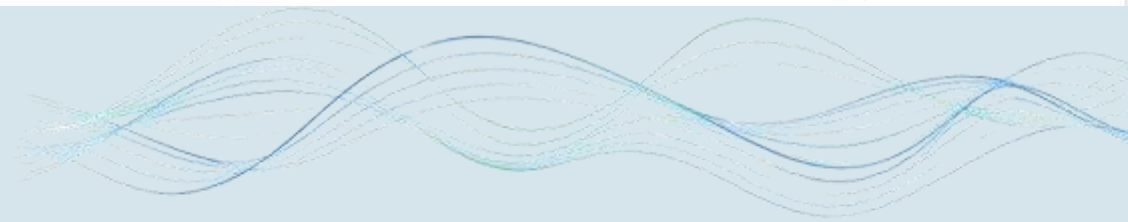
Siti Maftukhah

Associate Planner / Coordinator for Maritime Affairs and Value Added
Directorate for Marine and Fisheries
Ministry of National Development Planning/Bappenas, Indonesia

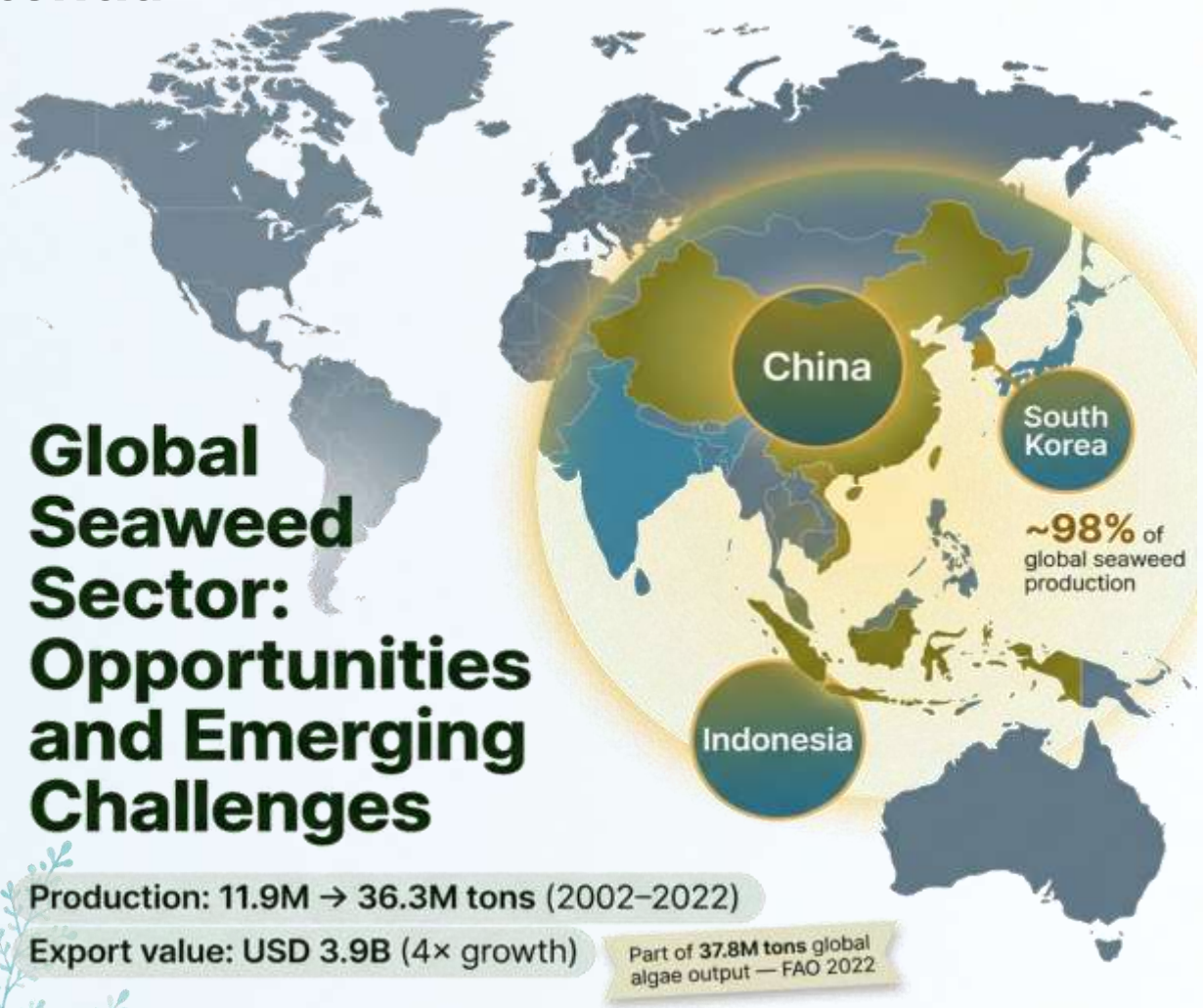
29 June 2026 | Palais des Nations, Geneva

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.

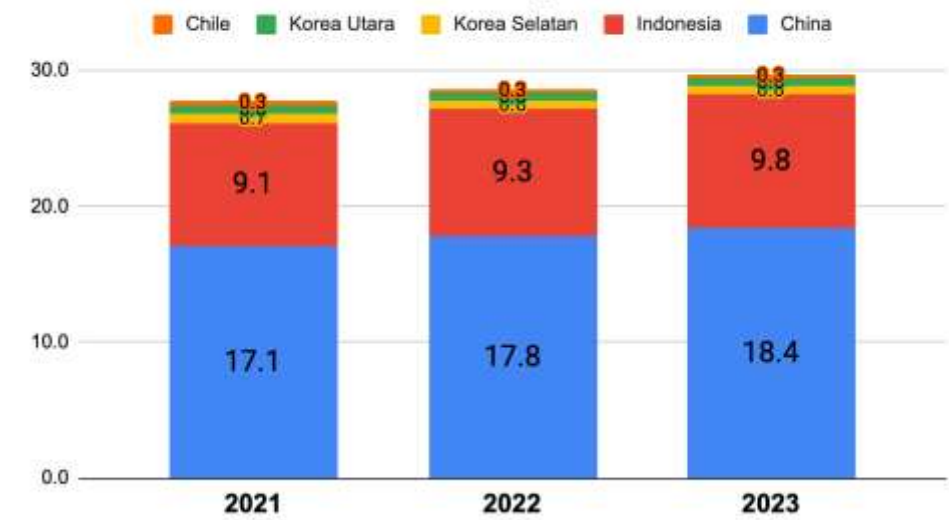


Global Seaweed Production: Scale, Concentration, and Growth Potential

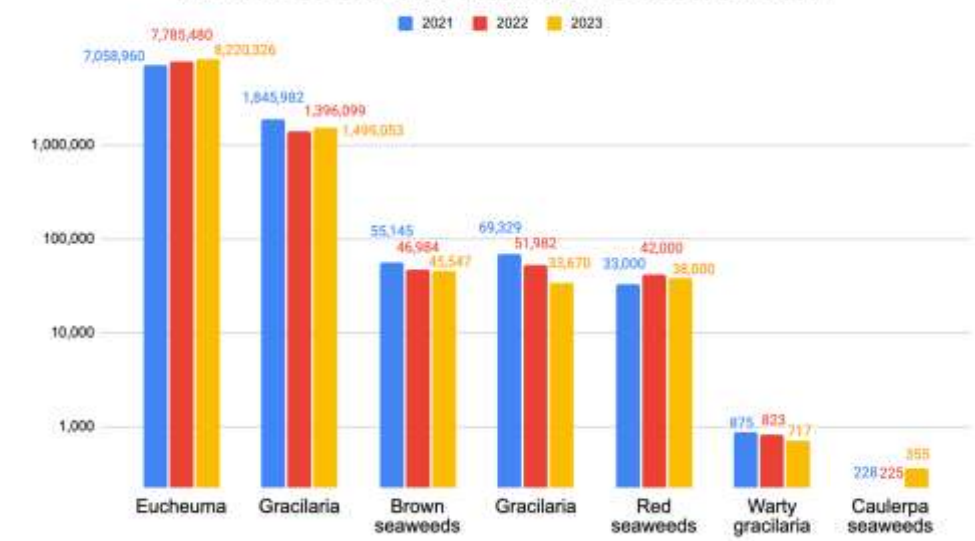


Key message: Indonesia is a major tropical seaweed producer, but the next challenge is shifting from volume to value through species diversification, quality consistency, processing depth, and market positioning.

Global Seaweed Production Volume, 2021–2023 (Million Tonnes)



Indonesia's Seaweed Production by Species (2021–2023)



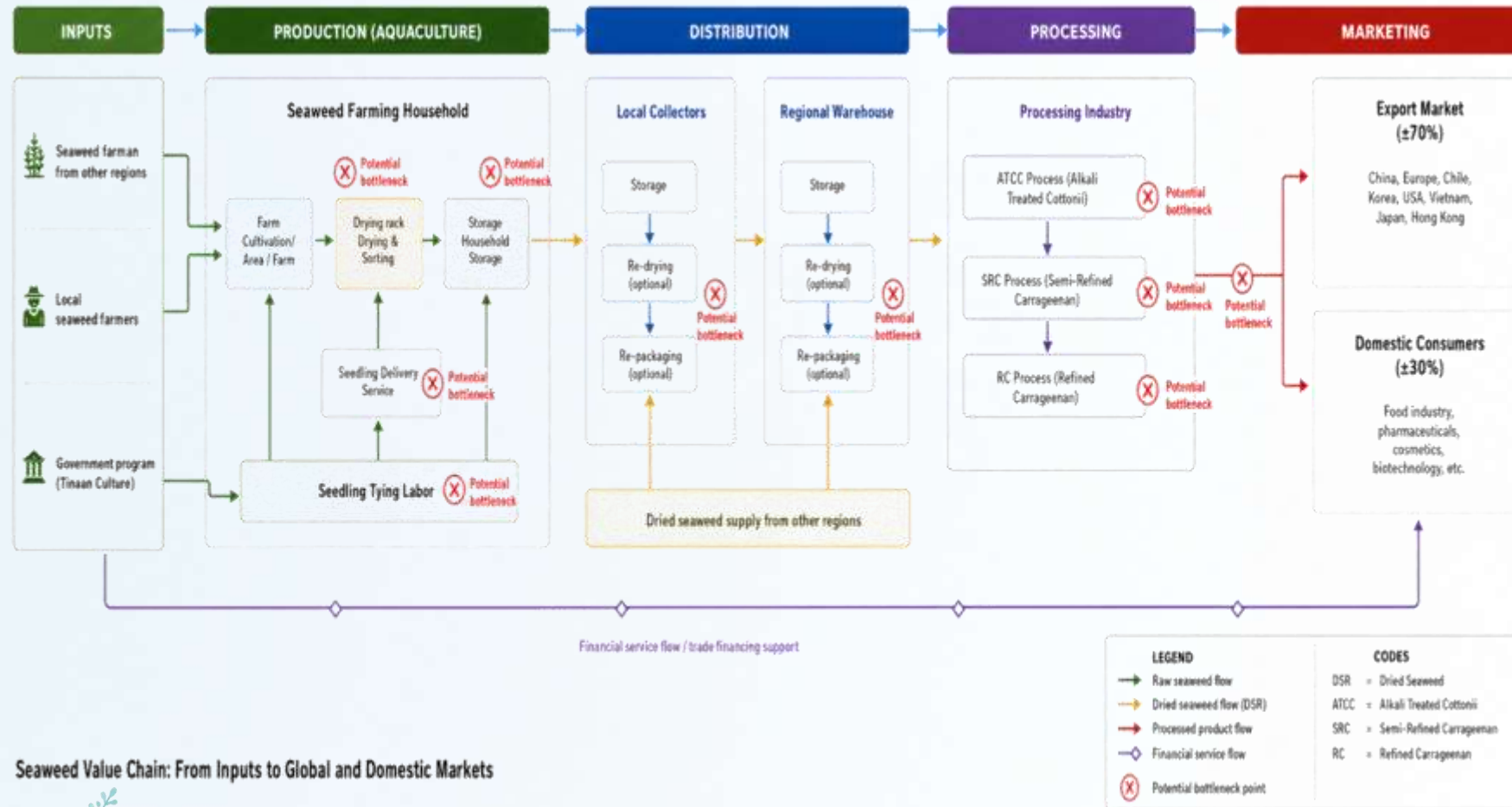
Data Sources: FAO (2024), processed through FishStatJ

Indonesia's Experience: Lessons for Global Seaweed Development



Seaweed Value Chain: Where Are the Bottlenecks?

Illustration of Indonesia's Seaweed Value Chain from Upstream to Downstream



Seaweed Value Chain: From Inputs to Global and Domestic Markets

1. Seedling Supply Bottleneck

Limited access to high-quality seedlings, delayed delivery, and inconsistent seedling quality can reduce productivity from the beginning of the cultivation cycle.

2. Labor Bottleneck

Shortage of skilled workers for seedling tying, harvesting, drying, and sorting can delay production and reduce output quality.

3. Post-Harvest Drying and Sorting Bottleneck

Weather-dependent drying, limited drying facilities, and inconsistent sorting can result in high moisture content, contamination, and lower product grades.

4. Storage and Quality Control Bottleneck

Poor household, collector, or warehouse storage can cause mold, quality deterioration, inconsistent grading, and rejection by processors or buyers.

5. Processing Capacity Bottleneck

Limited capacity and technology for ATCC, SRC, and RC processing can restrict value-added production and keep exports concentrated in raw or semi-processed seaweed.

6. Market Access and Financing Bottleneck

Limited trade financing, weak traceability, export requirements, and low domestic industrial absorption can slow market expansion and reduce value capture along the chain.

Key Production Constraints: Quality & Resilience for Downstream Competitiveness

Production constraints are the primary determinant of downstream competitiveness. Unstable output, inconsistent quality, disease vulnerability, and climate sensitivity directly undermine global market positioning. Indonesia's 2024 seaweed output reached 10.80 million tonnes (KKP) – a 10.82% year-on-year increase – yet scale alone cannot substitute for quality, standardization, and supply continuity.

Three Priority Constraints

1. Seed quality & genetic resilience

- Unimproved seed stock reduces productivity and gel strength.
- Need seed banks, nursery systems, tissue culture, strain selection, and genetic mapping.

2. Climate, disease & biosecurity

- Temperature, salinity, rainfall, waves, and water quality shape planting seasons and harvest quality.
- Ice-ice and other disease risks require practical biosecurity and site-suitability guidance.

3. Technology, infrastructure & extension

- Smallholders need better ropes, anchors, buoys, drying, storage, and basic processing tools.
- Certified trainers and extension services are the multiplier for consistent practice and quality.

Action

What UNGSI collaboration can collaborate:

- Climate-resilient seed and nursery systems
- Oceanographic-based site suitability and adaptive farming calendar
- Farmer training and certified trainers for tropical seaweed
- Low-cost post-harvest facilities and quality control
- Eco-friendly cultivation materials to reduce plastic leakage

Strategic Implication: Indonesia's 10.80 million tonne output represents significant potential – but converting volume into higher value-added products requires resolving all five constraints simultaneously. Scale without quality is not a competitive advantage.

Key Commercialisation Constraints

The greatest challenge is not producing seaweed — it is ensuring products meet market standards, are processed into high-value goods, and enter global supply chains competitively.



Quality Inconsistency

Dried seaweed quality varies across regions, farmers, and seasons. Moisture, impurities, harvest age, color, and carrageenan/agar content determine price and industrial acceptance.



Limited Value Addition

Most producers export raw or semi-processed materials. Highest value lies in processed products: carrageenan, agar, alginate, biofertilizers, cosmetics, pharmaceuticals, and biomaterials. UNCTAD reports agar at **USD 18.7/kg** vs. raw seaweed at **USD 1.4/kg** — a 13× difference.



Fragmented Standards & Regulatory Barriers

Of 109 trade-related measures on plant and animal products, only 18 directly regulate seaweed and derivatives — a significant regulatory gap creating market barriers.



Traceability & Certification Gaps

Global markets demand origin data, sustainable practices, food safety, and social compliance. Smallholders struggle with certification costs, documentation, and institutional capacity.



Weak Market Linkages

Farmers depend on middlemen, weakening bargaining power. Without clear industry contracts, prices fluctuate and quality improvement incentives remain low.



Financing & Investment Constraints

Investors need supply certainty, quality data, standards, and controlled risk. Informal supply chains deter financing.

"Commercialization is where production becomes economic value. Without quality assurance, standards, processing capacity, traceability, and market linkage, seaweed-producing countries may remain raw material suppliers rather than value creators."

Policy and Governance Responses

From fragmented production to an integrated, traceable, and investment-ready tropical seaweed ecosystem

99%

smallholder-based production
needs inclusive governance

**10.80M
tonnes**

2024 output must be
converted
into quality and value

**ISDAP
2026–2030**

Policy platform to align
production–industry–
finance

**Government builds
the ecosystem –
not just the rules.**



Expansion must be sustainable · inclusive · traceable · investment-ready

What Governance Must Solve ?

- Smallholder-based production makes scale, quality uniformity, and price stability difficult.
- Climate stress, disease, and weak seed systems reduce supply reliability.
- Post-harvest handling, storage, data, and traceability remain uneven across regions.
- Global standards and certification are often costly and not fully adapted to tropical seaweed realities.

Integrated policy response

- 1 Align spatial planning, production zoning, and cluster development.
- 2 Build climate-resilient seed systems, nurseries, GAP, and biosecurity.
- 3 Upgrade drying, grading, storage, data, monitoring, and traceability.
- 4 Co-develop standards suitable for tropical seaweed and smallholders.
- 5 Make pilot clusters bankable through financing, market linkage, and off-takers.

Priority Areas for International Collaboration



Indonesia's UNGSI proposition: offer leadership in tropical seaweed while seeking support to solve shared bottlenecks

1 Tropical seaweed knowledge hub

Share Indonesia's smallholder-based farming experience; formalize certified trainers for tropical seaweed cultivation and simple processing.

2

Climate-resilient seed & farming tech

Collaborate on resilient strains, nursery systems, tissue culture, genomic research, biosecurity, and adaptive cultivation technologies.

3

Eco-friendly cultivation materials

Joint R&D on safer farming materials to reduce marine debris and microplastic risks from ropes, bottles, floats, and other inputs.

4

R&D–industry linkage & value addition

Learn from Korea's R&D–industry ecosystem and France/SEVA's commercial research to develop bio-based products, biomaterials, biostimulants, and packaging.

5

Inclusive standards for tropical seaweed

Strengthen Indonesia's role in global standard-setting so requirements reflect tropical species, smallholder realities, quality, traceability, and market access.

6

Pilot country, financing & scale-up

Position Indonesia as a pilot location for UNGSI project ideas linked to TSIN, donor/grant/loan opportunities, and downstream investment pipelines.

Proposed UNGSI Collaboration Modality

Joint pilots in Indonesia • Technical assistance • Certified Training • TSIN-supported research • Standards Workstream
• International Knowledge Exchange • Investor/Off-Taker Engagement

Key message: UNGSI should move beyond dialogue by connecting tropical seaweed production, science, standards, finance, and market pathways into practical joint action.

Recommendations & Way Forward

Strengthen Sustainable Production Systems

Develop climate-resilient farming, quality seed systems, good aquaculture practices, biosecurity measures, and environmentally sound site selection.

Improve Post-Harvest Quality and Traceability

Upgrade drying, sorting, grading, storage, quality control, and traceability systems to ensure consistent raw material quality for downstream industries.

Accelerate Downstream Value Addition

Support producing countries to move from raw seaweed supply toward higher-value products such as carrageenan, agar, alginate, food ingredients, biostimulants, cosmetics, pharmaceuticals, and biomaterials.

Mobilise Inclusive Financing and Investment

Expand access to finance for small-scale farmers, cooperatives, SMEs, and processors through public investment, private capital, and blended finance mechanisms.

Strengthen Global Collaboration through UNGSI

Use UNGSI as a platform to harmonise standards, share technology, strengthen research, build capacity, expand market access, and ensure that small-scale producers benefit from global seaweed growth.

Suggested UNGSI Deliverables

Joint pilot in Indonesia • tropical seaweed standards workstream • certified trainer program • TSIN-supported R&D • investment concept notes
• off-taker and donor engagement

Seaweed cultivation and processing practices in Makassar, Indonesia



Seaweed Seedstock Ready
for Cultivation



Warehouse storage of dried
seaweed



Examples of Value-Added
Seaweed Products



Promoting women's economic empowerment through
participation in seaweed farming activities, particularly seedling
preparation and tying.



Traditional sun-drying of seaweed

UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

PRODUCTION AND COMMERCIALIZATION CONTRRAINTS FOR SEaweeds

Alessandro LOVATELLI
Aquaculture Officer, FAO, Rome

29 June 2026 | Geneva



Alessandro.Lovatelli@fao.org

www.fao.org

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.



FAO **SOFIA 2026**

Status within the total global aquatic organism production

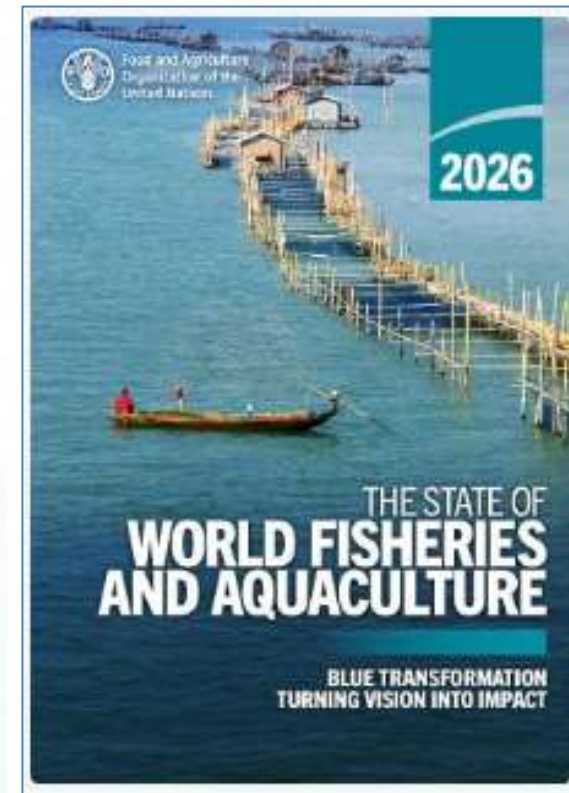
**Seaweeds are no longer a niche sector:
algae accounted for about 40 million
tonnes in 2024, representing roughly 17
percent of global fisheries and
aquaculture production.**



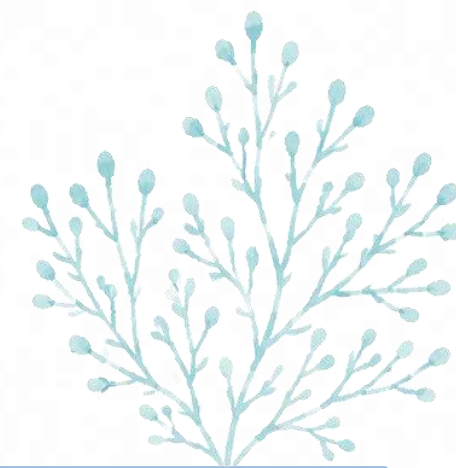
FAO **SOFIA 2026**

The State of World Fisheries and Aquaculture 2026

- Algae/seaweeds reached **~40 million tonnes** globally in 2024
- This represents **~17% of total** fisheries and aquaculture production (235 m. t.)
- Almost **all seaweed** production comes from aquaculture, not capture
- **Total aquaculture** production (animals + algae) reached 142 m. t.
- Aquaculture is the **main driver** of global aquatic food growth
- Growth in aquatic production is increasingly dominated by **farmed systems**
- **Production is highly concentrated** in Asia, which dominates aquaculture output
- Algae/seaweed **trade remains small** but recognized (~USD 2 billion)
- **Future expansion** of aquatic foods will rely mainly on aquaculture growth
- Sustainability, value chains and innovation are **key priorities** for sector development



<https://doi.org/10.4060/cd8357en>



CONTINENT WIDE STUDY

Latin America

Estado y perspectivas del cultivo de macroalgas en América Latina

[Status and prospects of macroalgae cultivation in Latin America]

Taller Técnico Regional de la FAO, 24-26 de junio de 2024, Puerto Varas, Chile

<https://doi.org/10.4060/cd5237es>



Safe products



Safe working conditions



Environmental protection



Inclusive growth

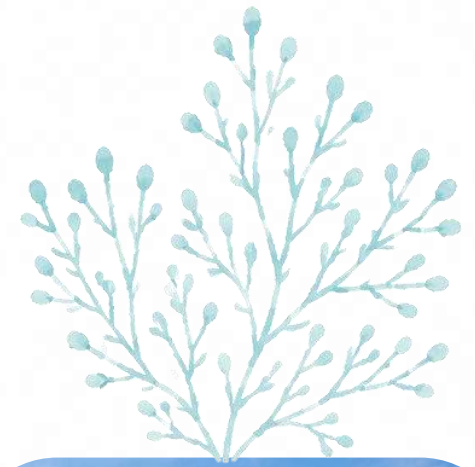


Sustainable industry

PRODUCTION CONSTRAINTS

Technical and biological limitations

- **Low technological maturity and small-scale**
Seaweed aquaculture in the region is still incipient and largely small-scale
- **Limited development along the production chain**
Insufficient progress from seed, genetic selection and cultivation to post-harvest
- **Loss of biological performance and disease risks**
Reliance on vegetative propagation reduces growth and increases susceptibility
- **Environmental variability and climate effects**
Production is exposed to climate variability, contamination, affecting yields
- **Limited species diversification**
Few species cultivated at scale, while many native species remain underutilized



COMMERCIALIZATION CONSTRAINTS

Value chain weaknesses

➤ Low value addition

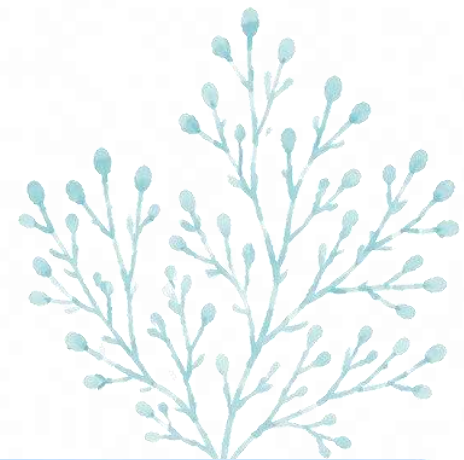
The sector is largely oriented toward raw or minimally processed products (e.g. dried biomass) rather than high-value derivatives

➤ Limited development of downstream processing

Weak technological capacity and investment constrain the production of value-added products (nutraceuticals, cosmetics, food ingredients)

➤ Insufficient diversification of products and uses

Despite high potential, many applications (e.g. bioproducts, functional foods) remain underdeveloped or unexplored.



MARKET ACCESS BARRIERS

Value chain weaknesses

➤ Weak linkage between production and markets

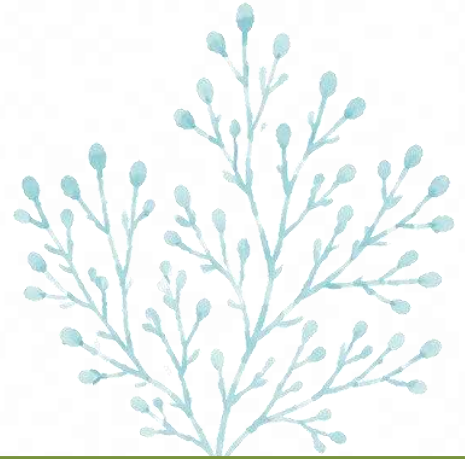
There is insufficient alignment between species cultivated, product forms and market demand, due to limited market intelligence.

➤ Limited development of local and regional markets

Consumption remains low in many countries, requiring new marketing strategies and consumer awareness efforts)

➤ Barriers to entering high-value markets

Access to international markets is constrained by quality standards, traceability requirements and technological gaps.



NEED TO LEARN FROM EXPERIENCES

China & Indonesia



CHINA's seaweed sector: 100 Q&As for global insights

- FAO: preparation of this report in partnership with Chinese and international experts.
- The report presents China's seaweed experience in a practical Q&A format.
- Covers issues such as spp., seed, farming systems, processing, trade, consumption, ecosystem services and climate change.
- The Q&As draw on inputs from Chinese experts and questions raised by specialists.
- The report support knowledge sharing, policy dialogue, partnerships and sustainable seaweed development globally.

INDONESIA seaweed sector assessment

- FAO: preparation of a seaweed sector assessment for Indonesia.
- Assessment aims to generate evidence-based insights on Indonesia's seaweed sector and its development potential.
- Covers key issues along the value chain, including farming, post-harvest handling, processing, markets, trade, livelihoods and policy support.
- Will help inform Indonesia's seaweed development planning and support the implementation of the national seaweed roadmap.
- The assessment also aims to share Indonesia's experience as one of the world's leading seaweed producers, highlight lessons learned from its sector development, and generate insights that can support sustainable seaweed development in Indonesia and beyond.



NEED TO LEARN FROM EXPERIENCES

GLOBAL STUDY



Global Seaweed Aquaculture Legal Study

This report will provide an overview of seaweed aquaculture legislation worldwide

- ❖ A global assessment of seaweed aquaculture legislation, examining how countries regulate seaweed farming and which national legal instruments are relevant to the subsector.
- ❖ An analysis of the extent to which national legal frameworks are aligned with FAO's Guidelines for Sustainable Aquaculture (GSA), with attention to sustainable governance, policy, legal and institutional arrangements.
- ❖ A practical reference for FAO Members and stakeholders seeking to strengthen legal and governance frameworks that support the sustainable development of seaweed aquaculture across different regions.

- Lack of specific regulatory frameworks
- Complex and slow permitting systems
 - Weak coastal spatial planning

NEED TO LEARN FROM EXPERIENCES

REGIONAL STUDY



Seaweed breeding for marine aquaculture and restoration

Advancing sustainable growth for the global seaweed sector



UNITED NATIONS
UNIVERSITY

In collaboration with



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29.06.26



Palais des Nations, Geneva

www.globalseaweedcoalition.org

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.

Melanie Cueff, Scientific Officer, Global Seaweed Coalition
Melanie.cueff@sb-roscoff.fr



Why seaweed breeding ?

Global Seaweed Challenges

- 
1. Climate change, heat waves
 2. Pest and diseases outbreaks
 3. Price competitiveness
 4. Restoration opportunities

Key question :



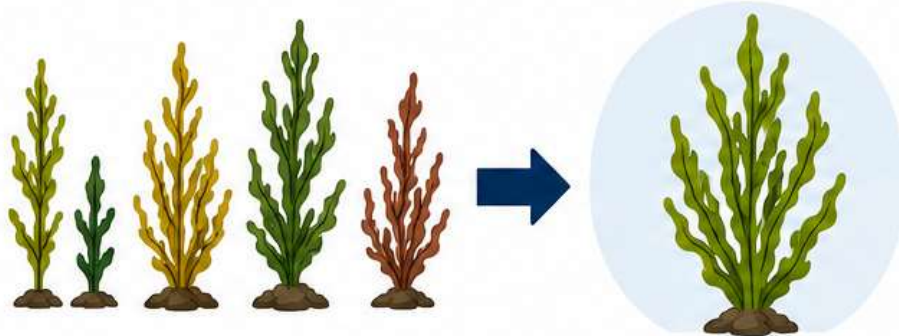
How can we develop more **resilient** and **productive**, **climate-adapted** seaweed cultivation systems at sea without compromising genetic biodiversity?



Main aquaculture methods

SEAWEED SELECTION

Choosing the best natural individuals



Natural variation exists within wild populations

Select and cultivate the best performers

WHAT IT INVOLVES



Screen natural populations



Evaluate key traits

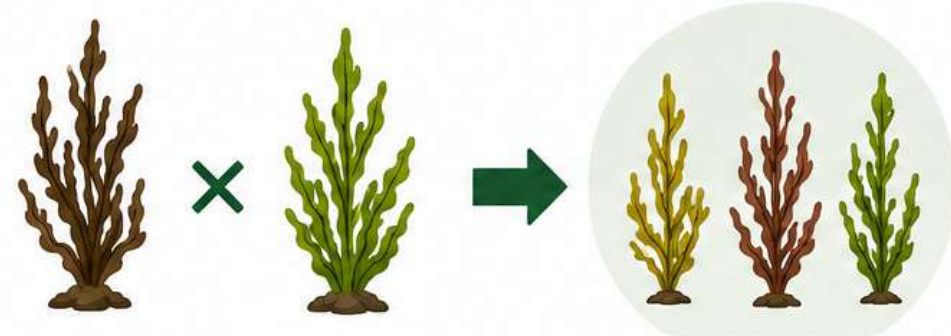


Select top individuals

> VEGETATIVE REPRODUCTION

SEAWEED SELECTIVE BREEDING

Crossing parents to create new combinations



Choose parent seaweeds with desirable traits

Produce offspring and select the best

WHAT IT INVOLVES



Select and cross parents



Grow and test offspring



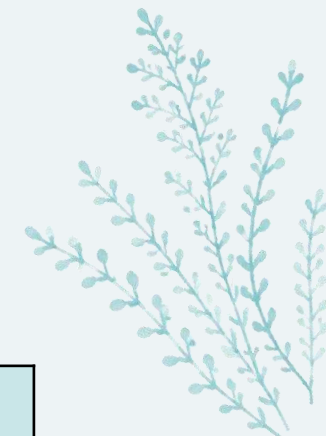
Evaluate traits and performance



Propagate best strains

> SEXUAL REPRODUCTION

Objective : enable sustainable science-based seaweed selective breeding at sea



Phase 1 : Kick-off March – May 2026	Phase 2 : Consolidation June – July 2026	Phase 3 : Policy impact August 2026	Final Output Mid September 2026
-Literature review -One-to-one meetings with experts, policymakers, and scientists -Workshop 1: May 19, share scientific insights, gather regulators and scientific experts, sourcing volunteers	-Review of current regulation on the thematic globally -Offline discussion : • US Regulators criteria, June 26 • Restoration case study, tbc -Presentation at UN Global Seaweed Initiative Annual Meeting, June 29, Geneva	-1st draft of the policy brief - Review by volunteer experts -Participation in WWF US Workshop on kelp breeding, August 27–28, Copenhagen	- Finalization of the brief - Review by UNGSI members - Publication and dissemination (press release by UNU)

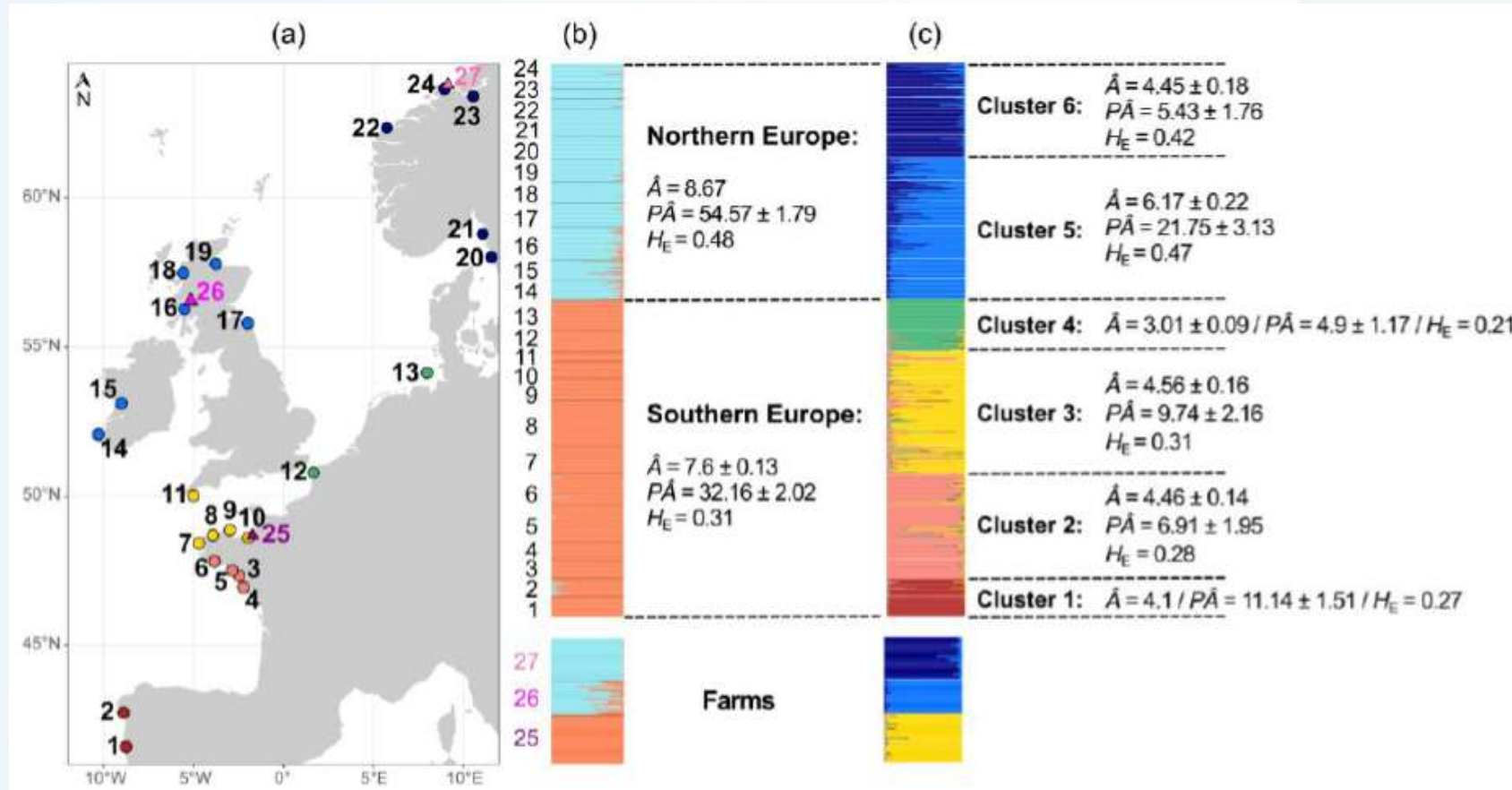
Regulatory analysis highlights global discrepancies

Jurisdiction	Specific Breeding Regulation	Main Regulatory Focus	Broodstock / Genetic Restrictions	Overall Approach
Japan	Yes	Productivity, sustainability, disease prevention	Private breeders can protect cultivars	Proactive : 15 national approved cultivars
Republic of Korea	Yes, dedicated support framework, NFIS center	Productivity and innovation	Controls on mutant species	Proactive : 37 national approved cultivars
China	Yes, approval body NCAOV	Production and food security	Government-led breeding programs	Proactive : 24 national approved cultivars
Chile	No	Protection of native biodiversity	Strong restrictions on alien seaweeds	Biodiversity-focused
Norway	No	Biodiversity and environmental assessment, commercial development	Strains not be moved “too far” from their natural area	Supportive, risk-based
France	No, under discussion	Biodiversity protection	Restricted to local (definition of local strain under discussion)	Risk-based
Scotland	No	Native biodiversity protection	Preference for local sources (<25 km)	Highly precautionary
Northern Ireland	No	Protection from non-native species	Strong restrictions, breeding is “technically” allowed	Highly precautionary
British Columbia (Canada)	No	Biodiversity protection and Indigenous consultation	Preference for local broodstock (<50 km)	Risk-based
Alaska (USA)	No	Genetic diversity conservation	50/50 rule : 50-parent rule and local sourcing requirements (<50 km)	Precautionary
Maine (USA)	No	Indigenous species protection	Parent genetic material originated in Maine (Maine Department of Marine Resources)	Case-by-case
California (USA)	No	Environmental review and public interest	No state aquaculture project approved in over 2 decades	Highly precautionary

- **Regulatory nuances** : regulations / rules vs guidelines / recommendations
- **Definition needed** : local and non-local species need to be defined

Population genetics as a prerequisite for selective breeding

- Characterize strain genetic distribution within and across populations
- Conduct breeding within the same genetic population to preserve genetic consistency and population integrity



The genetic structure of wild and cultivated *Saccharina latissima* populations across European coasts provides guidance for sustainable aquaculture, traceability, and conservation (July 2025)



Key seaweed learnings from Korea: Breeding, biobanking and genetic resource management

■ Productivity increased due to...

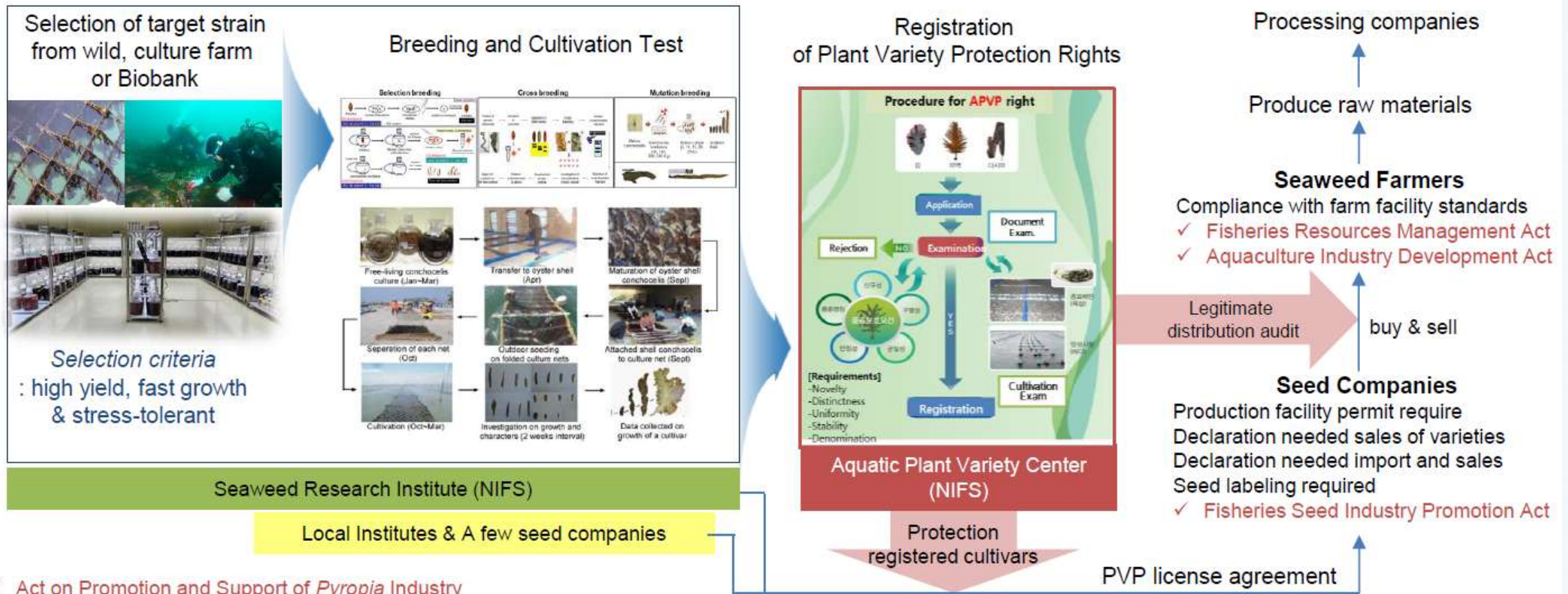
- Increased needs on seaweed biomass (exports increase)
- Developed new seaweed cultivars
- Automation and development of aquaculture materials
- Government efforts (expansion of farms, export support...)

■ Registered Seaweed Cultivars in Korea (2012~2025)

: 37 (30 *Pyropia*, 6 *Undaria*, 1 *Saccharina*)

■ No. Registered Seaweed Cultivars in 2025

: Korea 37 > China 24 > Japan 15



Key seaweed learnings from China: Breeding, R&D and certification process

Driver of the seaweed economy since 1960s

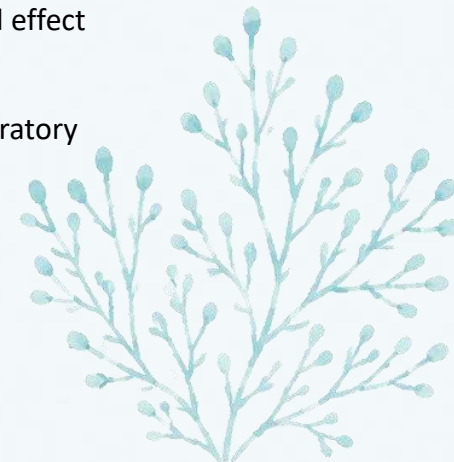
- Improved varieties are a key driver of the sustainable development of China's seaweed aquaculture industry
- China has consistently prioritized seaweed breeding research and development since the 1960s

Breeding Method	Theory and Technology	Breeding Material	Period	Application Effect
Selective breeding	Obtain target genotype through phenotypic selection	Population, family	1960s–	Widely applied, good effect, but relatively low efficiency
Mutation breeding	Artificially induce genetic mutations	Cellular level	1970s–	Widely applied, good effect
Hybrid breeding	Heterosis	Interspecific or intraspecific	1980s–	Widely applied, good effect
Molecular breeding	MAS; genomic selection; gene editing, etc.)	DNA level	2010s–	Experimental / exploratory

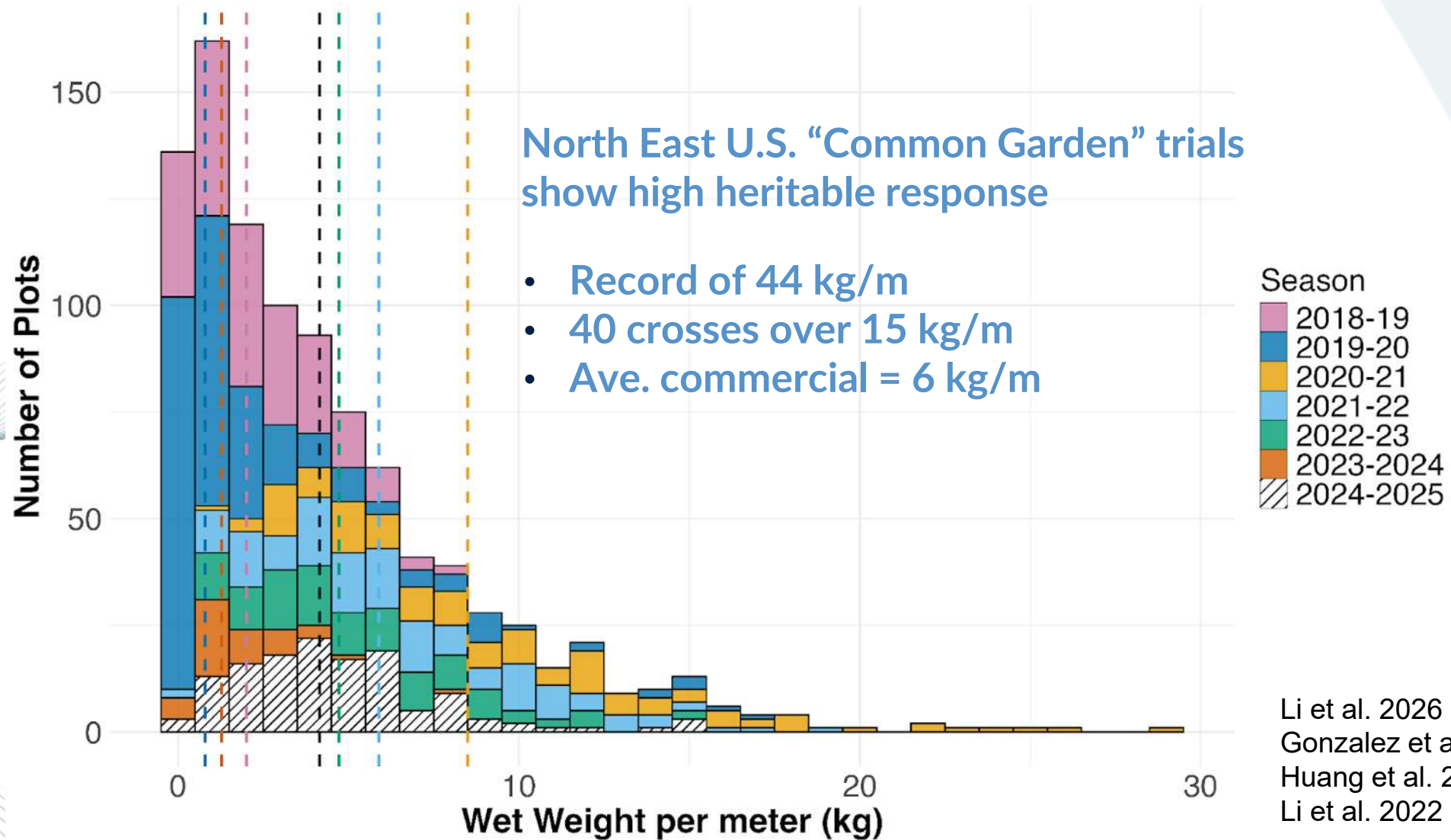
Official Certification Process

Official organization: National Commission for Aquatic Original and Improved Varieties (NCAOV)

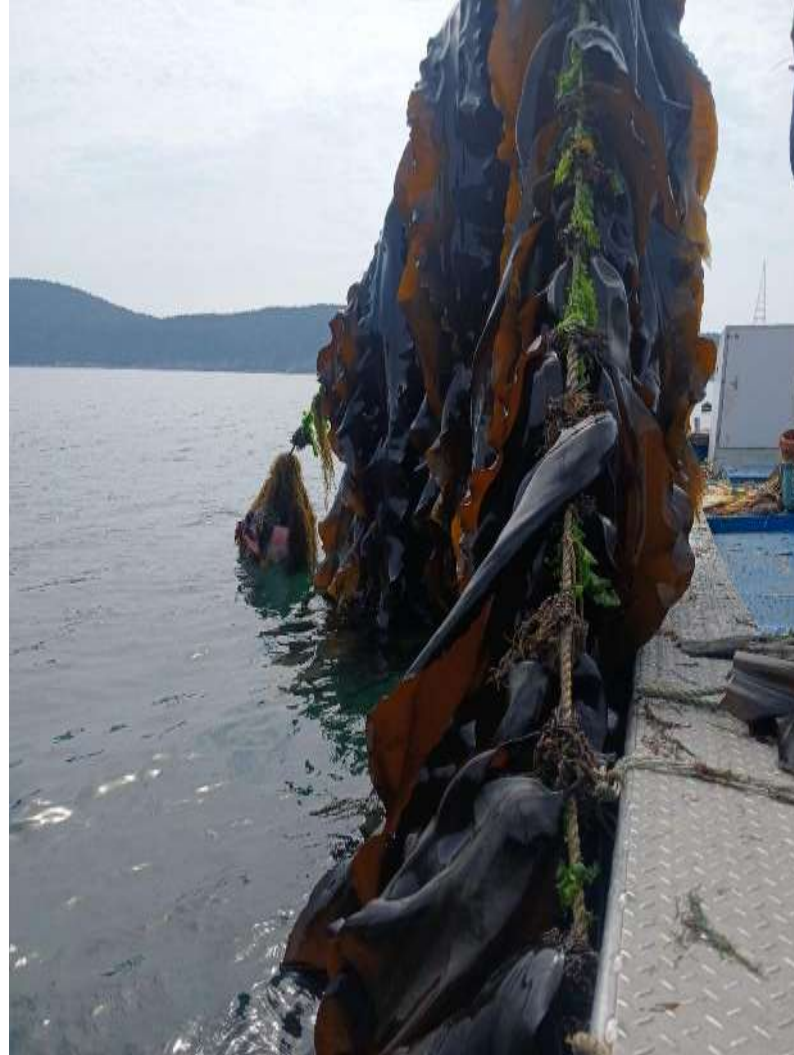
- An official body under the Ministry of Agriculture and Rural Affairs of China; composed of scientists and representatives from government of fishery and the industry of seaweed.
- The Commission holds an evaluation meeting once a year.



Genomic selection improves seaweed yield



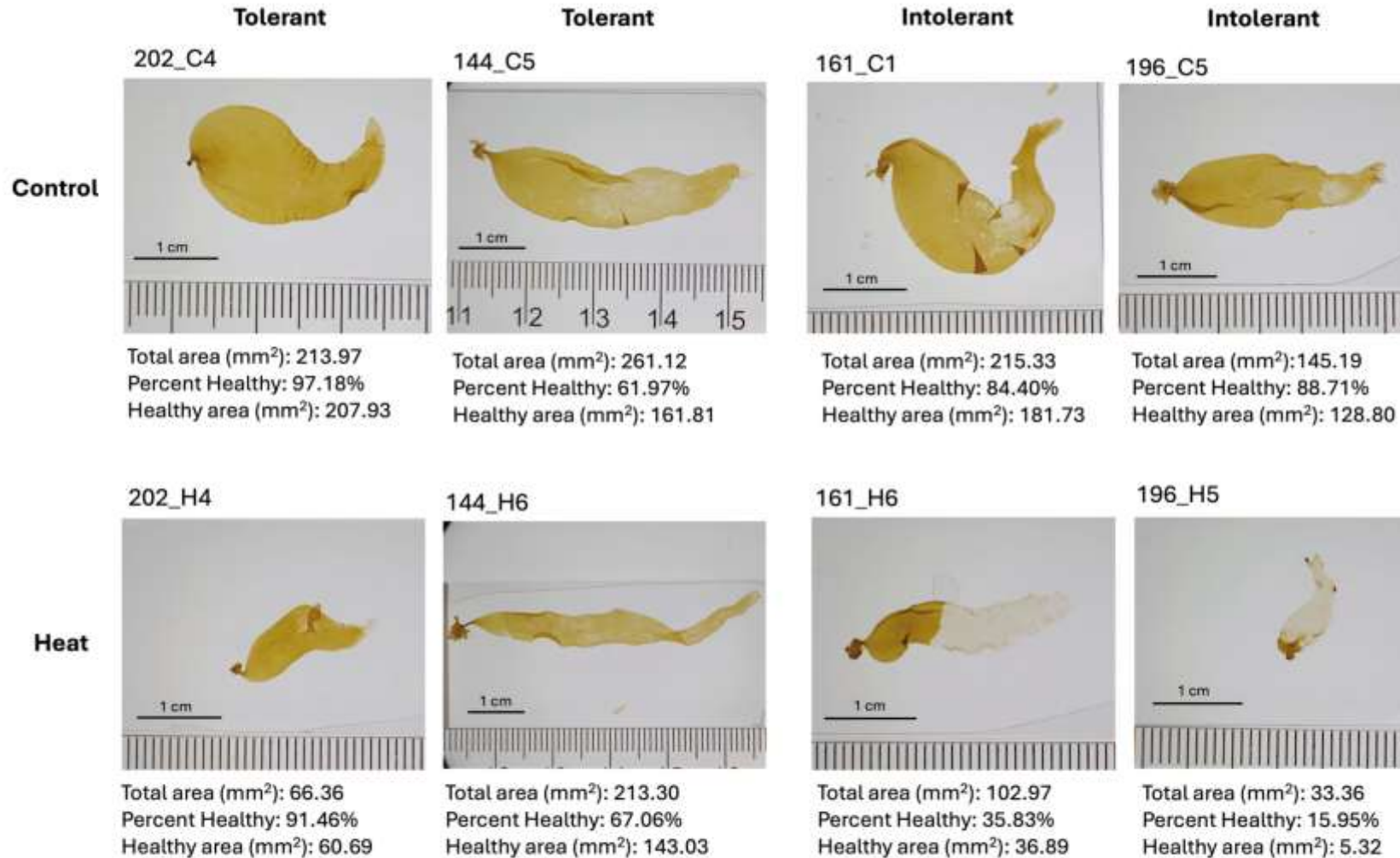
Genomic selection improves seaweed yield



- *Saccharina* sp., France vs Korea after 6 months of growth



Genomic selection improves temperature tolerance



Selected photos of *Saccharina latissima* juvenile sporophytes in the Control (**top row**) and Heat (**bottom row**) experimental treatments, exhibiting different amounts of degraded tissue on blades at timepoint T2, when the Heat treatment was at 22°C. Photos are labeled in the format [Cross#]_[Treatment][Replicate]. The images in the first two columns are samples from the predicted Tolerant group, and images in the last two columns are from the predicted Intolerant group

Scientific recommendations for sustainable breeding



Seaweed Aquaculture

1. Understand the biogeography and population genetics of the target species before cultivation
2. Selective breeding programs on locally adapted genetic material
3. Evaluate opportunities for cultivating non-reproductive or sterile varieties
4. Harvest biomass before reproductive maturity
5. Maintain adequate separation distances from natural populations and wild beds



Scientific recommendations for sustainable breeding



Seaweed Restoration

1. Understand the biogeography and population genetics of the target species
2. Use the closest local population for selective breeding to reduce maladaptation
3. Allow flexibility in genetic sourcing for endangered species, including 'non-local' sourcing where justified

COMMON SAFEGUARDS

- IMPLEMENT MONITORING : IMPACT ASSESSMENT
- REFER TO INTERNATIONAL SCIENTIFIC ORGANIZATION (ISA, GSC, PSA)
- CONDUCT RISK ASSESSMENT WHERE APPROPRIATE



UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

World Bank Group perspective on sustainable seaweed value chains

Harrison Charo-Karisa

Snr Fisheries Specialist World Bank

First United Nations Global Seaweed Initiative (UNGSI)

hkarisa@worldbank.org

www.worldbankgroup.org



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June 29-30, 2026



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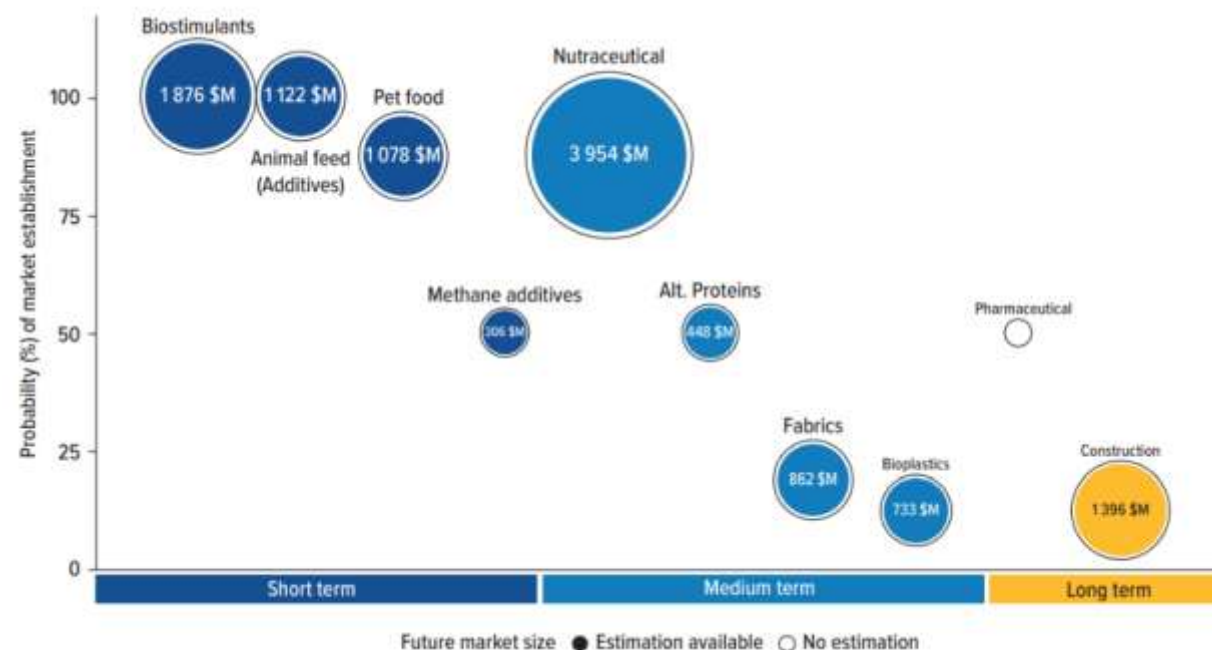


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Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.

The constraint is not only demand. It is the system that turns seaweed into reliable, safe, investable products at scale.



Supply

Volume, consistency and quality of biomass remain limiting factors; established markets compete for the same seaweed supply.

Cost & price

Applications competing with commodity products face greater pressure to reach competitive price levels.

Regulation

Regulations shape each market trajectory and need application-specific analysis.

Technology

Biorefinery approaches can improve economics by deriving multiple products from one biomass input.

Evidence

Ecosystem-services markets need robust measurement, reporting and verification before wide establishment.

Coordination

UNCSI can help align standards, policy integration, research direction, finance and partner efforts.

Ten global seaweed markets with the potential to grow sector by an additional USD 11.8 billion by 2030. Current farmed supply concentrated in a handful of Asian countries 98% of farmed seaweed by volume globally. Emerging products can displace fossil-based inputs in areas such as fabrics and plastics, while supporting ecosystem services.



Global Methane Reduction Platform for Development (CH4D)

CH4D – Kenya Nigeria: Seaweed and Livestock Methane Emissions Reduction Practices





Seaweed Knowledge Exchange campaigns



Operationalizing Korean Technology and Knowledge to Transform the Seaweed Agribusiness in Africa and Southeast Asia



World Bank Group offer: connect evidence to investable value chains

AqualInvest Platform and related WBG work can help UNGSI move from ambition to practical country pathways

Evidence

Global seaweed markets, IFC downstream applications, biostimulants white paper, CH4D methane report

Policy

NDCs, NBSAPs, sustainable ocean planning, trade and standards, feed/fertilizer regulation

Investment

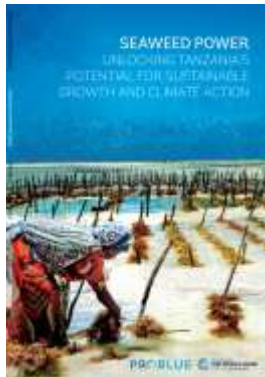
Investment readiness, blended finance, public de-risking, REDA/BEDA style links to operations

Capacity

Knowledge exchange, training, country diagnostics, farmer and SME support

Partnerships

UN agencies, member states, GSC, private sector, investors and research institutions



The WBG can help countries identify which seaweed products are realistic, where public policy can unlock markets, and how early pilots can graduate into bankable pipelines.

Suggested WBG contribution to UNGSI priority pillars

Policy integration

Support countries to integrate seaweed into NDCs, NBSAPs, sustainable ocean planning and sector strategies.

WBG role: analytics + advisory + finance

Production

Identify scalable production systems, species choices, hatcheries, processing and quality assurance needs.

WBG role: analytics + upscaling + finance

Trade & standards

Support regulatory mapping, product definitions, food/feed/biomass standards and market-entry pathways.

WBG role: analytics + advisory + finance

Finance

Develop bankable pilots, blended-finance structures, results-based finance and MRV for ecosystem services.

WBG role: analytics advisory + finance



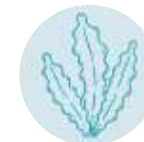
Safe products



Safe working conditions



Environmental protection



Inclusive growth



Sustainable industry



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Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

A collaborative platform that brings together Member States, UN entities, research institutions, industry stakeholders, and civil society to accelerate the safe, and sustainable development of the seaweed sector.



29-30



VENUE

Sébastien JAN

President, Pro Algues

Madagascar (APOFAM)

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Madagascar's seaweed sector

Building a sustainable, inclusive and community-rooted value chain

Session: Production and commercialization constraints of seaweed/algae and their by-products.



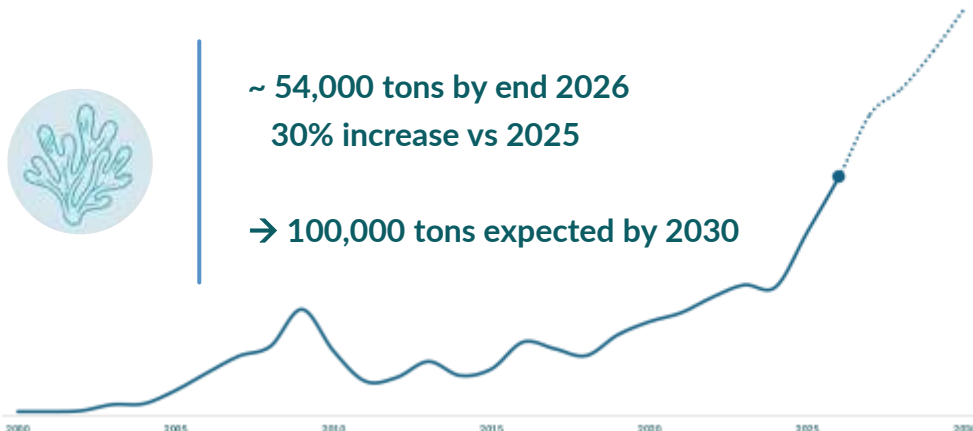
Sébastien JAN — President, Pro Algues Madagascar
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Professional Association of Operators of the Seaweed Value Chain in Madagascar

Madagascar's seaweed production at a glance - 2026

A minor contribution with significant potential supported by a distinctive production model placing people first and risk management as its foundations

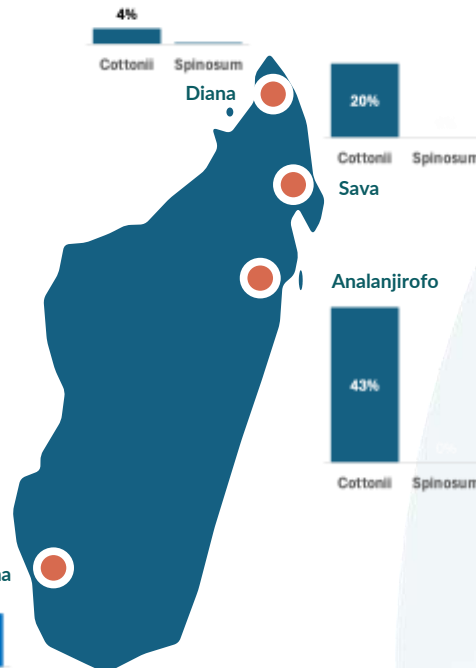
~ 54,000 tons by end 2026
30% increase vs 2025

→ 100,000 tons expected by 2030



34,000 tons – or 75% of total Cottonii production concentrated in 2 regions

8,000 tons – Spinosum production emerging concentrated in Atsimo Andrefana region



4 leading companies producing 90% of national output

12 active companies supporting production growth for coming years



Madagascar's seaweed sector and challenges

A country with significant potential hindered by many obstacles slowing down the emergence of a strong seaweed sector



5,000+ km of coastline — warm, sheltered lagoons perfectly suited to tropical red seaweed

A young, fast-growing workforce — an estimated 50% under 20, half of them women, actively seeking employment and already more than 3,000 seaweed producers nationwide

3M+ hectares of marine protected areas — a world-class natural capital to protect and regenerate, which seaweed farming directly supports

Clear upside in the value chain — favorable conditions, abundant raw material, and a handful of emerging start-ups already proving the model



Climate change is driving more frequent and severe extreme weather events

Remote communities and poor infrastructure inflate logistics costs and leave high-potential areas nearly inaccessible

Political instability and limited sector expertise among regulators and international institutions lead to ill-informed decisions that stall the sector's growth

Lengthy, complex and costly administrative processes deter investment and push operators toward informality

Scarce financing and prohibitive equipment costs — e.g. import taxes — curb investment and slow the sector's emergence

A distinctive Malagasy model

How we differ



→ Contractual village farming – an integrated model unique to Madagascar

- ✓ Direct partnership with coastal communities
- ✓ Aquaculture contracts – clear roles, equipment & high-quality seedlings provided
- ✓ Risk at the core of decision-making
- ✓ Full traceability, certification path and services for producers

→ Free market – the dominant model accounting for 90% of global supply

- Speculative, low-investment, price-driven
- Limited traceability and quality control
- Pressure on environment and communities

Proven impact : evidence from the field

Le Masson study – January 2026 – realized in Sainte-Marie island – Nosy Boraha Seaweed



Accessible job creation

Direct and indirect jobs for fishermen, women and youth — on-time wages, social security and a sharp drop in petty crime around NBS sites.



Stable, predictable income

Average farmer income tripled in 4 years shifting families from daily survival to financial planning.



Food security & nutrition

Diets diversify from rice and leaves to meat, fish, milk and sugar — families move from hand-to-mouth purchases to building food reserves.



Women's empowerment

39% of NBS employees and 54% of daily labourers are women, earning equal pay and gaining autonomy, self-confidence and social respect.



Reduced environmental pressure

Fishermen and charcoal-makers reconvert to seaweed farming, easing pressure on reefs, fish stocks and coastal forests



Local economy & social cohesion

Indirect activity booms — rentals, shops, transport, restaurants — keeping youth in coastal villages and energising the local economy.



Job and dignity

"Before, there was no work, there was no money to earn."

— Seaweed farmer, NBS



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"Growing seaweed allows women autonomy and more freedom. It's important — it brings more respect."

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"Before, a lot of people made coal. 80% of them have taken to seaweed. For the environmental side, the start of seaweed farming was very positive."

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Pro Algues Madagascar

Not for profit organization bringing together private operators of the seaweed sector – from production to transformation
– to accelerate & catalyze the Seaweed Revolution and place Madagascar as a model for the rest of the world

Our mission articulates around 6 key objectives

Unite & represent

private operators in the sector, particularly with the MPEB, technical and financial partners



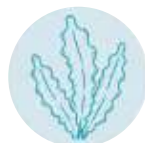
Strengthen Madagascar position

as a reliable source of sustainable & high quality supply with strong social & environmental impact



Share information

knowledge, techniques and innovations to better anticipate risks and climate change impact



Promote sustainable seaweed farming

that is inclusive, traceable and respectful of the environment and relevant international standards



Support sector structuration

Contribute to the development and evolution of regulatory framework, good governance in line with national public policies



Compliance

Support its members with administrative procedures and regulatory compliance



Pro Algues Madagascar

9 companies already members of the association

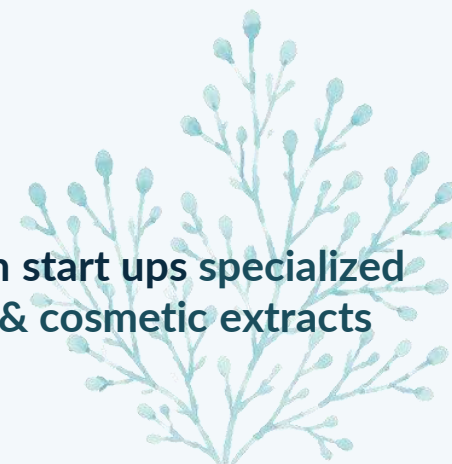
Strong commitment from all founding members



Seaweed producing companies specialized in Cottonii & Spinosum farming



Seaweed transformation start ups specialized in agricultural solutions & cosmetic extracts



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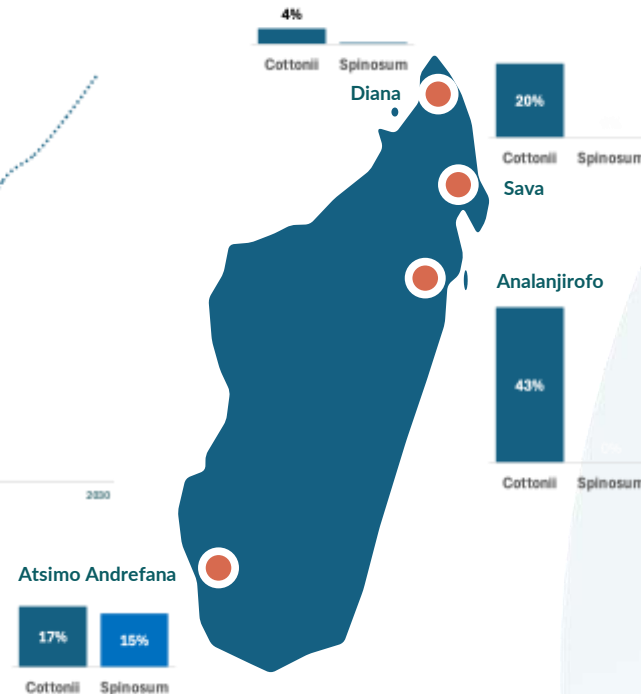
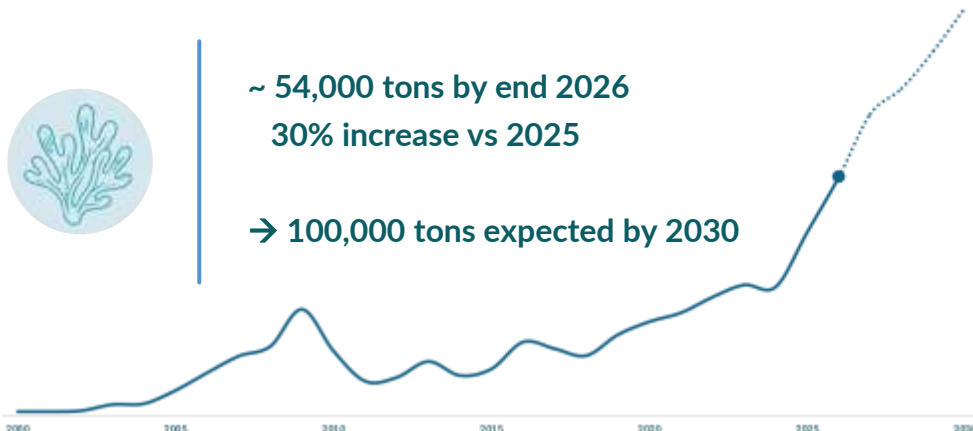
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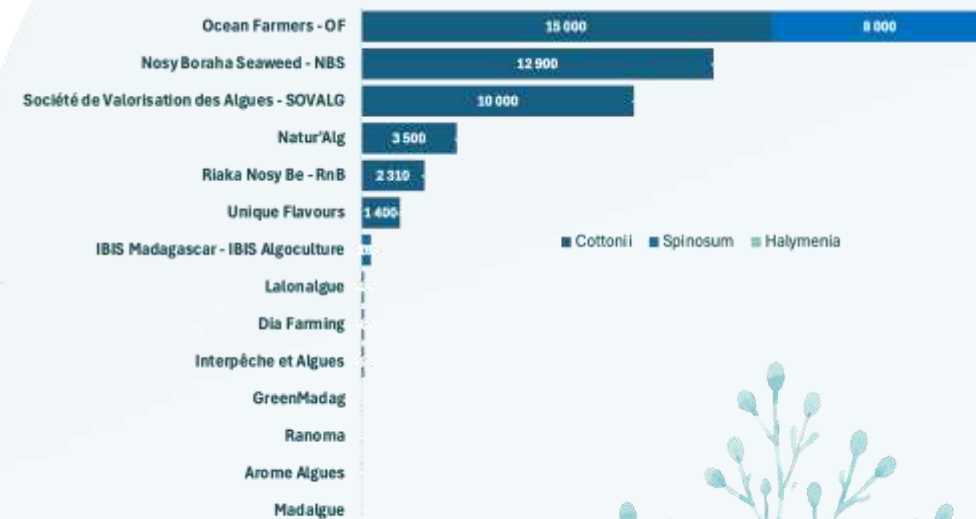


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Political instability and limited sector expertise among regulators and international institutions lead to ill-informed decisions that stall the sector's growth

Lengthy, complex and costly administrative processes deter investment and push operators toward informality

Scarce financing and prohibitive equipment costs — e.g. import taxes — curb investment and slow the sector's emergence

Wild strain harvesting fuels theft, inconsistent quality, reef degradation, and the loss of unique biomass needed to develop Madagascar-specific seaweed strains

Absence of a reference purchase price for seaweed, leading to disparities at country level at the expense of seaweed producers



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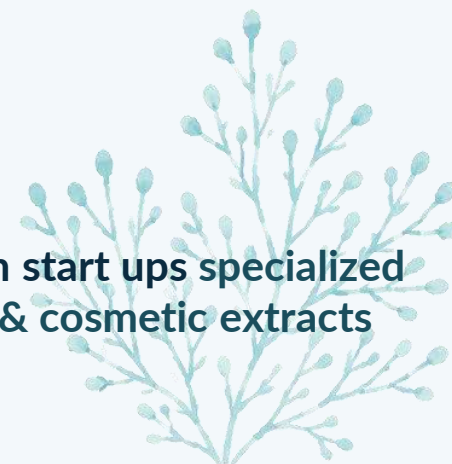
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Seaweed for Development

Trade, Regulations, and Standards for Inclusive Growth

 June 29

 Palais des Nations

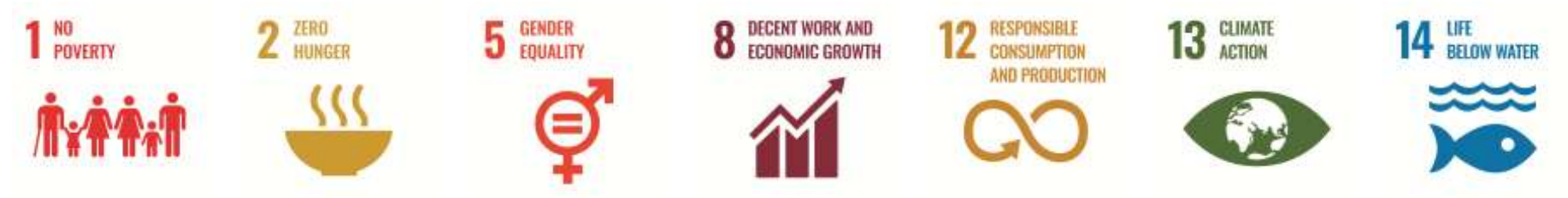
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Why Seaweed Matters?

Sustainable Development:

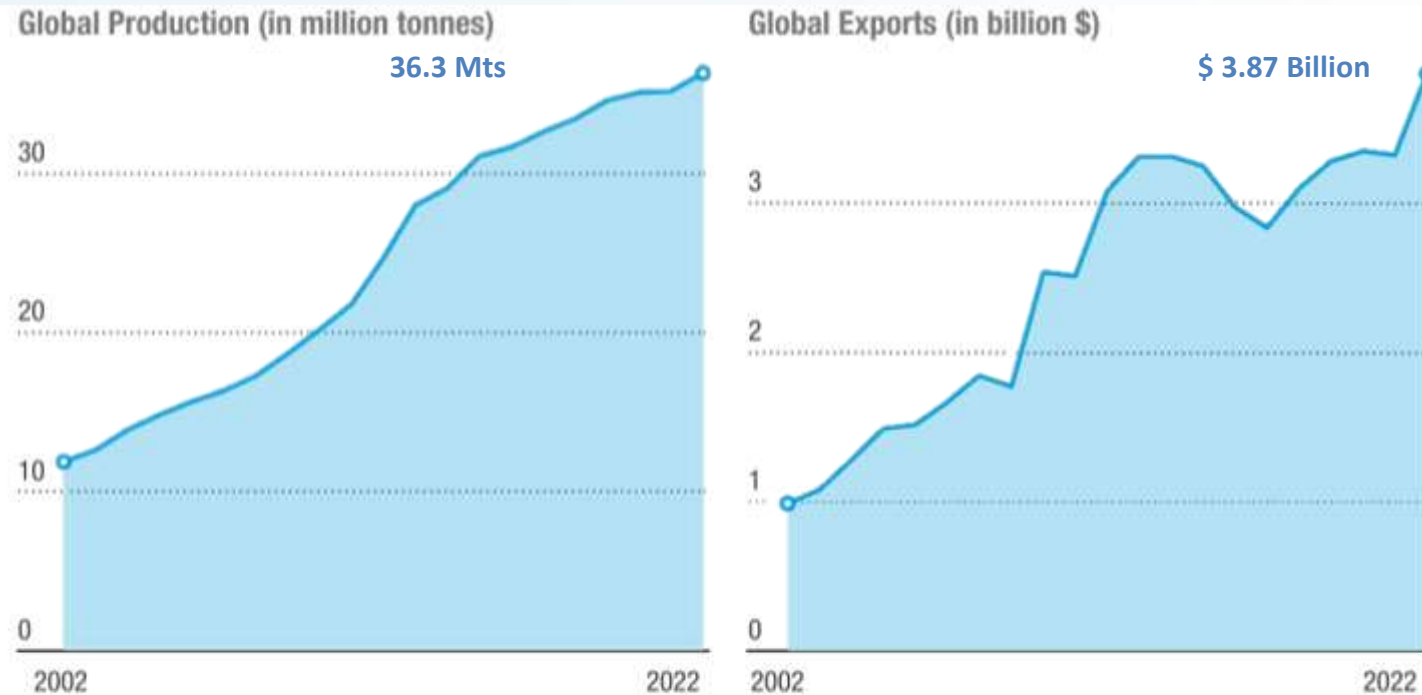


Multiple benefits:

- Food Security
- Carbon absorption & sequestration
- Food security
- Coastal protection
- Marine biodiversity
- Pollution Reduction : Alternatives to fossil fuel-based plastics.
- Economic Diversification: Supports coastal livelihoods, especially for women

Global seaweed production and exports

2002-2022



Source: UNCTAD (2025) analysis based on FAO FishStat for 2002-2022 and UN Comtrade data as of 1 October 2025
Note: Global Exports value is based on the 2022 edition of the Harmonised System (HS), covering selected 6-digit HS codes for primary and processed seaweed and its derivatives: 121221, 121229, 130231, 130239, 391310

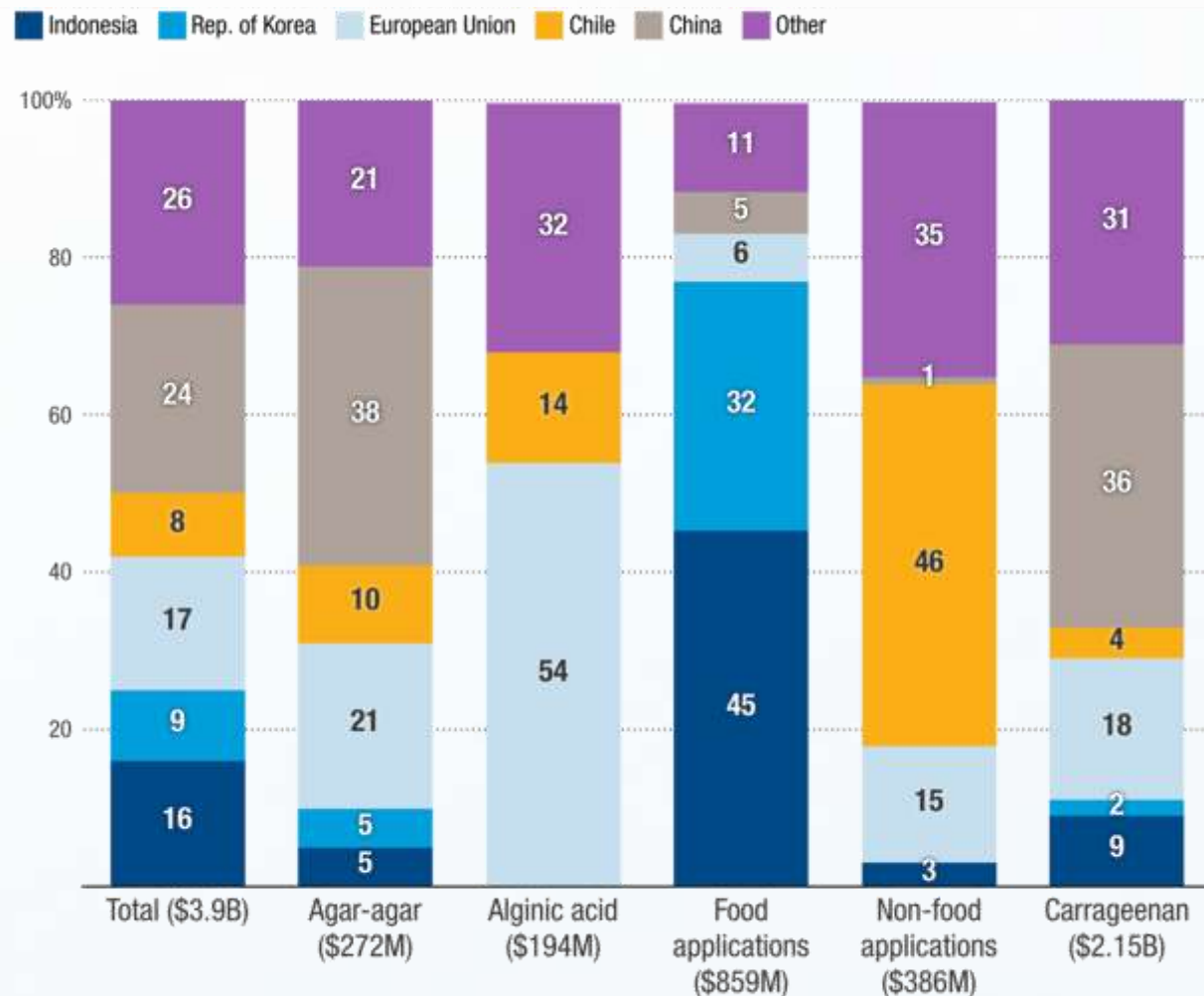


➤ Global production tripled between 2002 and 2022

➤ Global trade nearly quadrupled during the same period

Top exporters of seaweed and seaweed products

Percentage of global exports in value, 2022



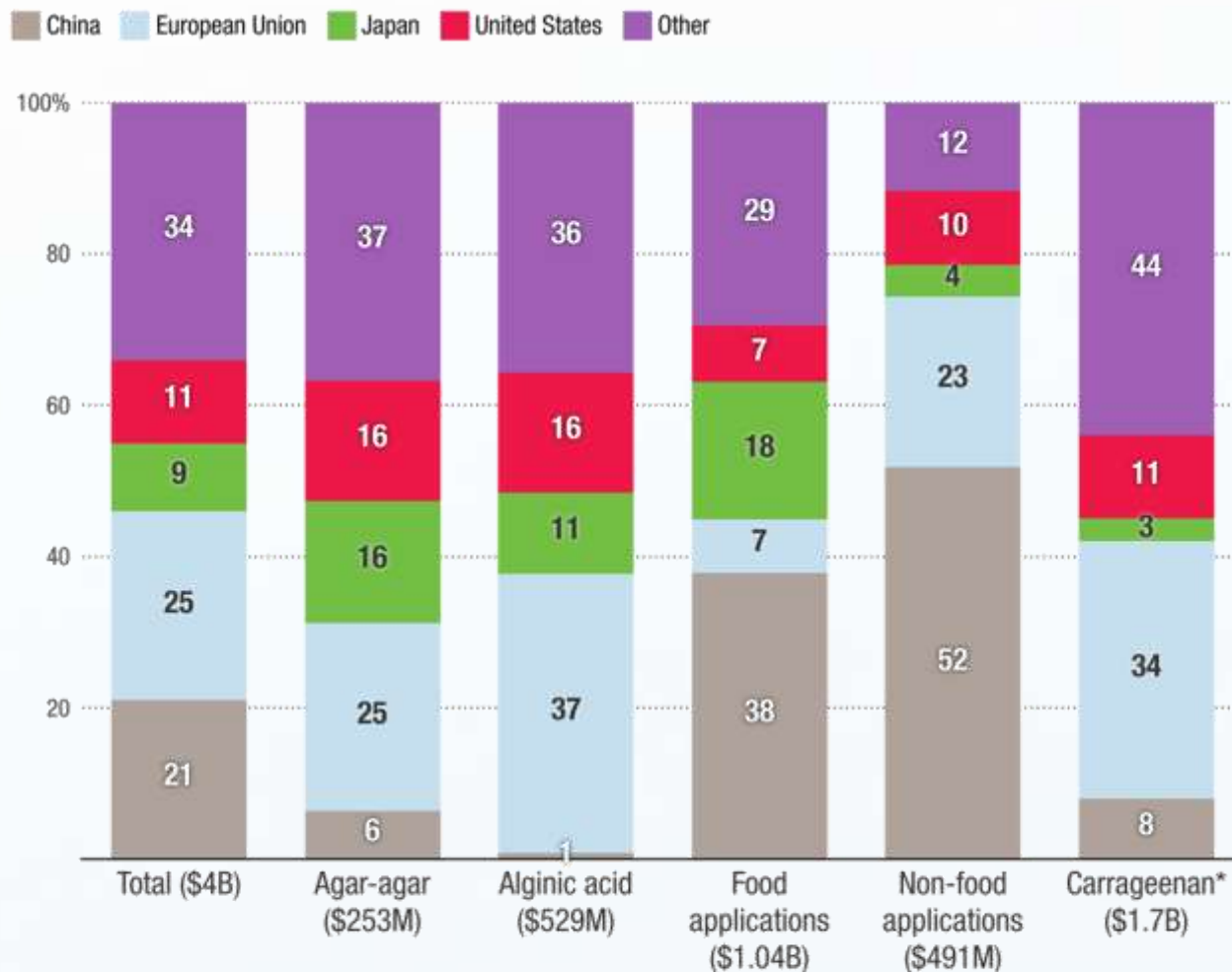
A few economies dominate seaweed exports



South-South trade represents half of total trade in food-grade and non-food grade seaweed

Top importers of seaweed and seaweed products

Percentage of global exports in value, 2022



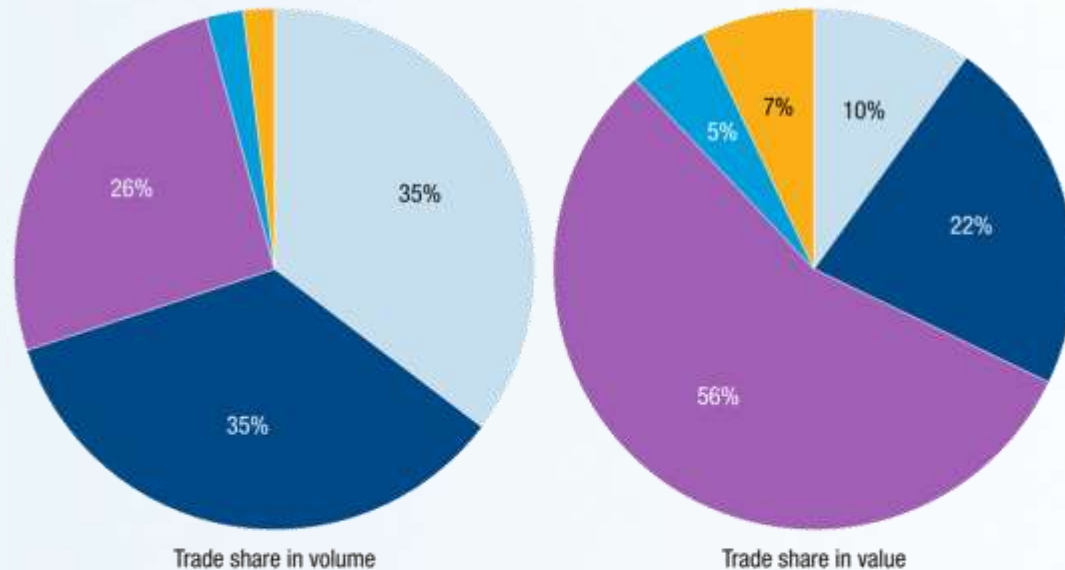
Global seaweed import demand is highly concentrated as well

China, the EU, the US, and Japan are driving 66% of total demand

Trade share in volume and value of seaweed products by HS code

Percentage share, global seaweed exports by volume (net weight) and value (dollars), 2022

Non-food grade seaweed Food-grade seaweed Carrageenan* Alginic acid Agar-agar



Primary seaweed (food & non-food) accounts for 70% of export volume but only 32% of its value



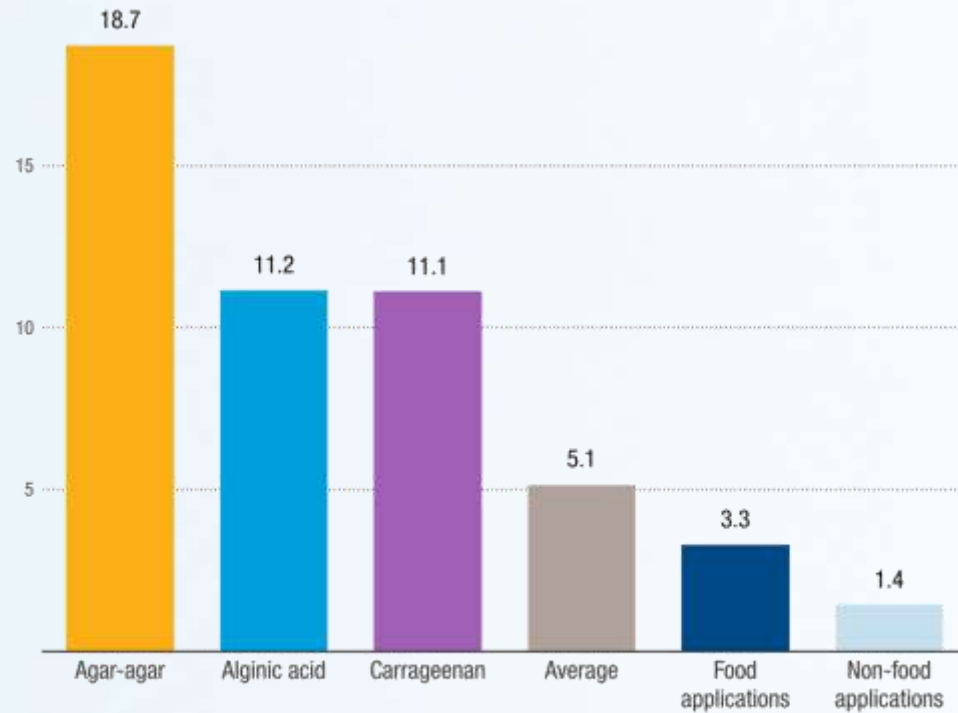
Seaweed derivatives account for 30% of exports by volume but 68% by value

Source: UNCTAD (2025) analysis based on UN Comtrade data for 2022

Note: The figure includes HS121221 (food-grade seaweed), HS121229 (non-food grade seaweed), HS130231 (agar-agar), HS130239 (carrageenan) and HS391310 (alginic acid). *HS130239 includes non-seaweed mucilages and thickeners such as tara gum, xanthan and konjac but was included given the importance of carrageenan exports in total seaweed exports.

Seaweed prices – from food to industrial uses

Average price of seaweed products imported (in USD per kg), 2022



Source: UNCTAD analysis based on UN Comtrade data for 2022

Note: The figure includes HS121221 (food-grade seaweed), HS121229 (non-food grade seaweed), HS130231 (agar-agar), HS130239 (carrageenan) and HS391310 (alginic acid). *HS130239 includes non-seaweed mucilages and thickeners such as tara gum, xanthan and konjac but was included given the importance of carrageenan exports in total seaweed exports.



Investing in processing seaweed derivatives is a key opportunity for developing economies



Agar-agar (US \$18.7/kg) is priced 13 times higher than non-food-grade seaweed

Top seaweed exporters: Raw versus processed products

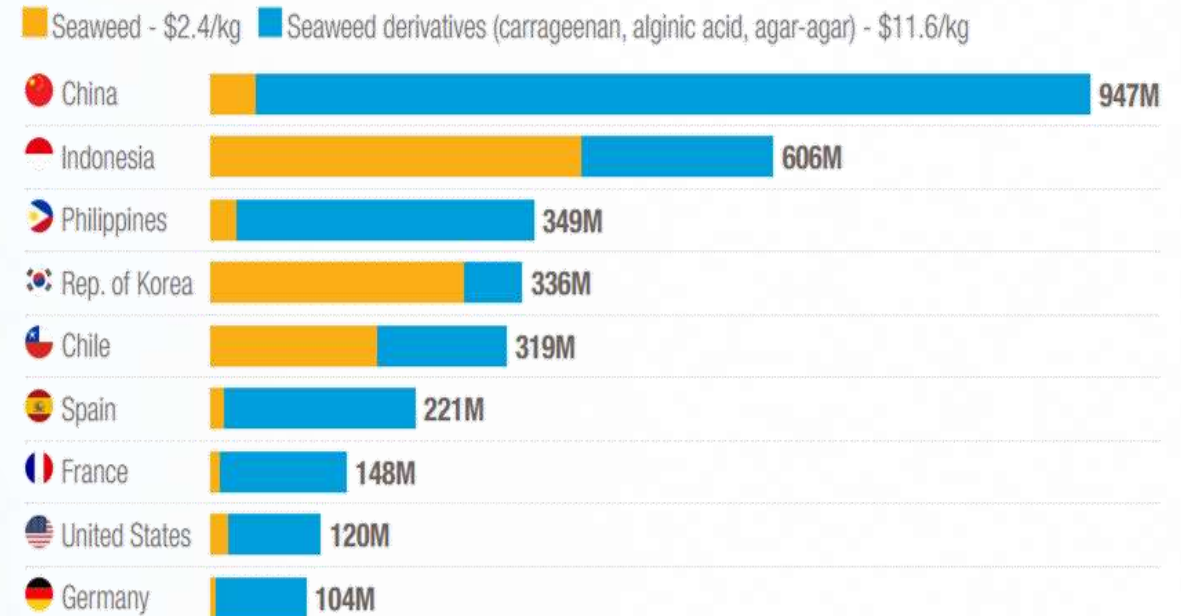
Top exports of seaweed, millions of dollars, 2022



China concentrate value addition on seaweed followed by the Philippines, Indonesia and developed countries



Expanding domestic processing capacity represents a key opportunity for raw materials producer countries to move up the seaweed value chain

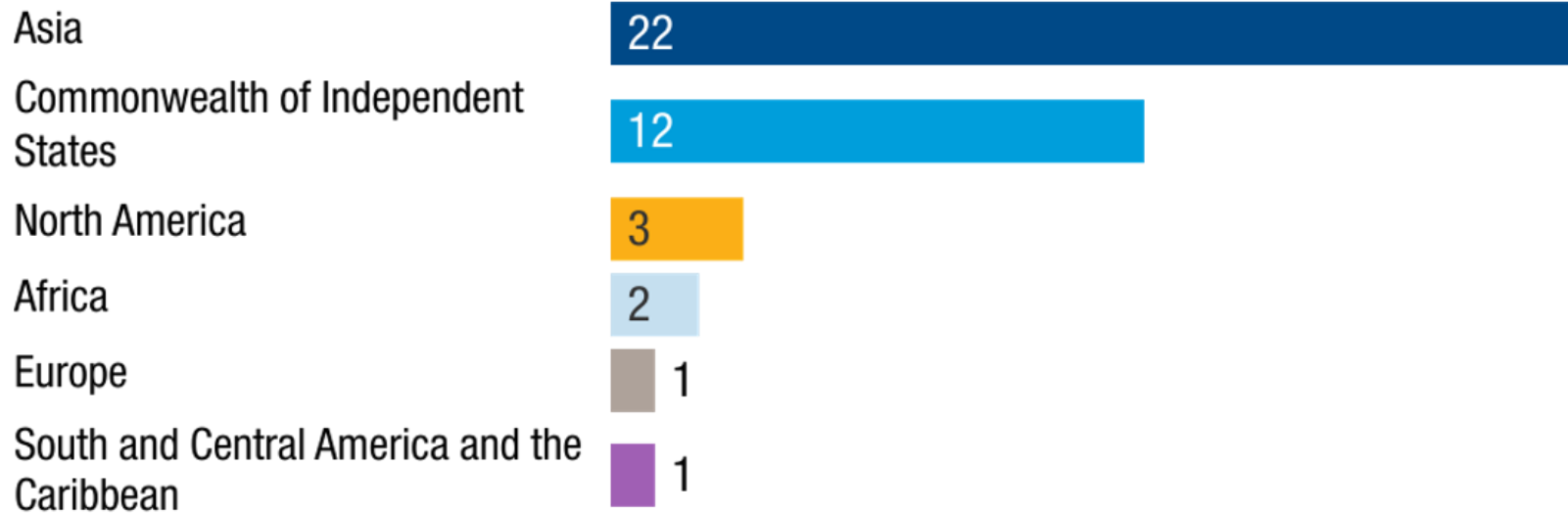


Source: UNCTAD (2025) analysis based on UN Comtrade data for 2022

Note: Seaweed refers to HS121221 (food-grade seaweed) and HS121229 (non-food grade seaweed). Seaweed derivatives refer to HS130231 (agar-agar), HS130239 (carrageenan) and HS391310 (alginic acid). HS130239 also includes non-seaweed mucilages and thickeners such as tara gum, xanthan and konjac but was included given the importance of carrageenan exports in total seaweed exports. Average prices are calculated by dividing total export values by total net weight.

Number of trade-related environmental regulations referencing seaweed, by region

WTO notification by region, as of May 2025



Source: UNCTAD (2025) analysis based on WTO's Environmental Database (2025)



- Most WTO notifications are from Asia
- Other regions often regulate seaweed through broader regulations

Distribution of technical measures (NTMs) affecting seaweed, by HS code

Percentage share, based on review of NTMs as of October 2025

UNCTAD Trains database (109 NTMs):

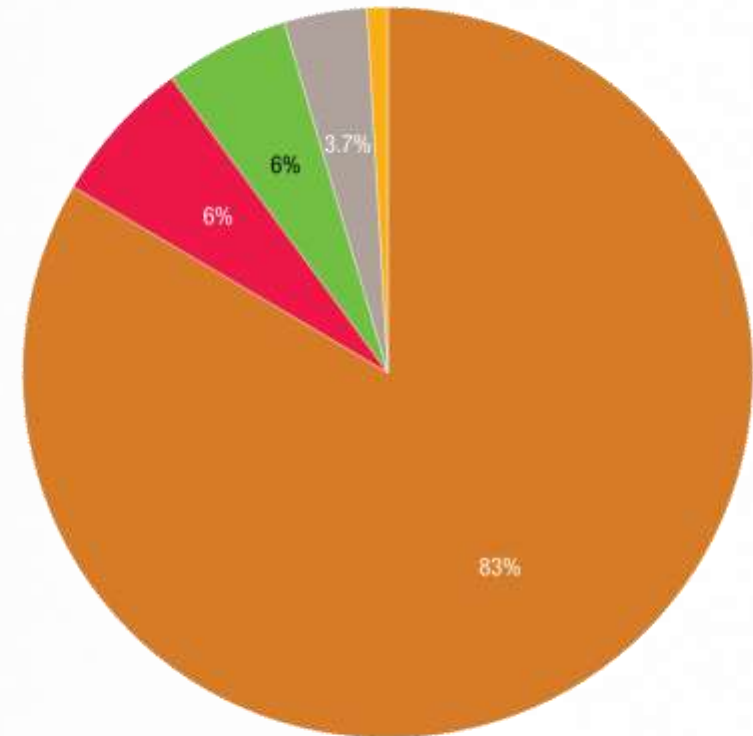


83 per cent of technical measures affecting seaweed are not seaweed-specific



This can create unnecessary regulatory burdens, such as similar exigencies for food-grade and non-food grade seaweed

4 or 2-digit HS codes (alginic acid) HS121221 (seaweeds fit for human consumption) HS121229 (seaweeds unfit for human consumption) HS130231 (agar-agar) HS391310

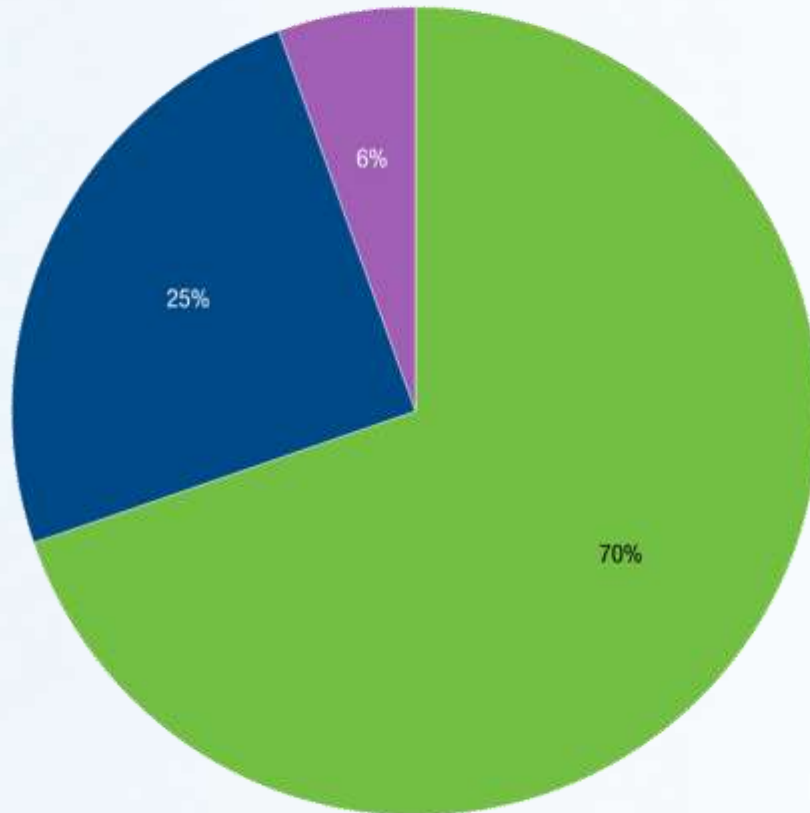


Source: UNCTAD (2025) analysis based on WTO environmental Database (2025) and UNCTAD TRAINS Database (2025)
Note: Technical measures are a subcategory of NTMs consisting of sanitary and phytosanitary measures (SPS), technical barriers to trade (TBT), and pre-shipment inspections and other formalities. Other NTMs are not considered here as they are often applied for horizontally on all products and for non-seaweed specific reasons (for instance, export controls). Only technical measures affecting several economies are considered. NTMs affecting all products are also not included.

Types of technical measures affecting seaweed

Percentage share, based on review of NTMs as of October 2025

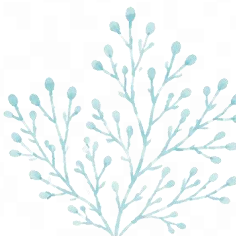
Sanitary and phytosanitary measures (SPS)
Technical barriers to trade (TBT)
Pre-shipment and other formalities



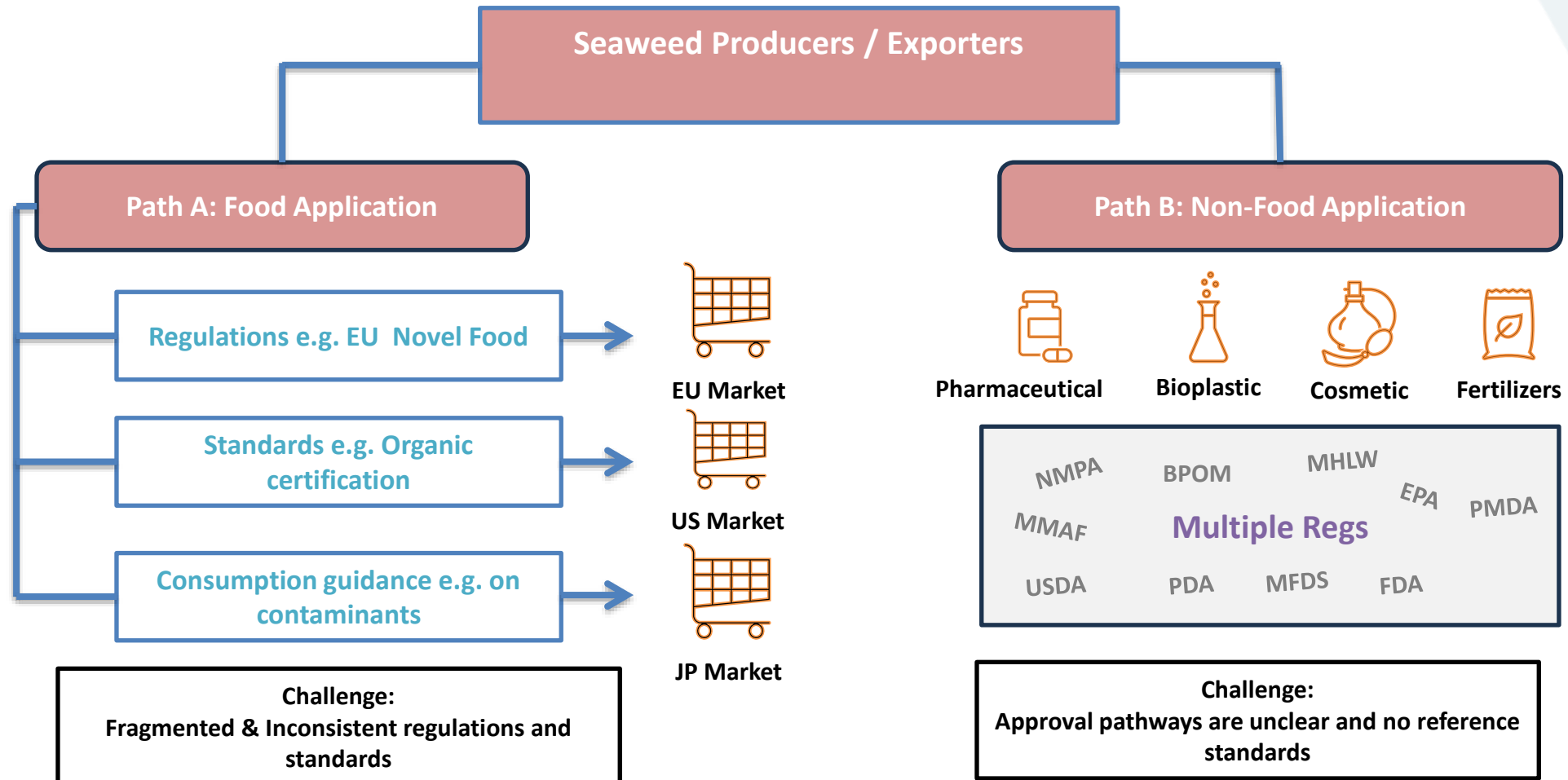
70 per cent of technical measures affecting seaweed are SPS



SPS measures create high assessment and compliance costs for producers, especially in smaller economies



The Challenge of Multiple Standards and Regulations





UNCTAD recommendations : Building a Coherent Framework



Recognize Seaweed as a Distinct Commodity and Value-added Group in Trade.

Action: Systematically monitor production, trade flows, and prices by **establishing specific HS codes** for seaweed and by products. This will enhance policy development and trade negotiations.



Develop Harmonized, Science-Based Food Safety Standards.

Action: Work through global bodies such as **Codex Alimentarius** to create **internationally recognized standards for key food-grade** seaweeds. This process must be inclusive, incorporating scientific input and production realities from developing countries.



Simplify pathways and Align Regulations for Non-Food Application.

Action: **Establish clear approval pathways for innovative products.** Define testing protocols for safety, biodegradability, and lifecycle impacts to encourage investment in green technologies.

UNCTAD recommendations: Enabling Inclusive Trade



Build National and Regional Capacity for Inclusive Trade.

Action: Invest in quality infrastructure in developing countries (accredited labs, storage, processing facilities). Use **South-South platform** (e.g., GSTP, AfCFTA, ASEAN) to **promote mutual recognition of standards** and share knowledge.



Expand the Tracking of Non-Tariff Measures (NTMs)

Action: Support member states in notifying seaweed-specific regulations to **UNCTAD TRAINS** and **WTO environmental databases** to increase transparency and predictability for exporters.



Consolidate Global Leadership via the UN Global Seaweed Initiative (UNGSI)

Action: Empower the **UNGSI** to coordinate the development of aligned global standards, mobilize partnerships, and facilitate the **integration of seaweed into global sustainability, trade, and climate agendas**.





A Call to Action for COP30



1. Integrate sustainable seaweed solutions into climate action plans, including **Nationally Determined Contributions** (NDCs) and adaptation strategies.
2. Support the **UNGSi** to build a coherent global framework that promotes sustainability, equity, and innovation
3. Adopt and implement **Algae Acceleration Plan** at & after COP30 by UNGSi
4. Invest in the infrastructure and capacity that enables developing countries to participate fully in this high-growth sector
5. Build measuring methods for **Carbon absorption** and **sequestration** by seaweed aquaculture.



UNCTAD Algae Acceleration Plan



1. Improve global seaweed data

Strengthen FAO/UNCTAD/UNIDO stats on production & trade

2. Double global seaweed output by 2030

Support pluriculture, climate-resilient production, and promote community-based models

3. Map trade regulations and standards

Develop a harmonized database on seaweed-related rules and norms

4. Mainstream algae in climate policy

Include algae in NDCs, NBSAPs, and national action plans

5. Map industrial seaweed species and establish genebanks

Secure seaweed aquaculture production (biosecurity) and national resources



UNCTAD Algae Acceleration Plan



- 6. Develop Codex Alimentarius guidelines for algae in food safety**
Compile risks, contaminants, and nutrition data
- 7. Assess seaweed value chains and quality infrastructure**
Identify gaps in certification, testing, and compliance
- 8. Launch global innovation & accelerator program**
Support R&D, piloting, upscaling of algae-based solutions
- 9. Build education, training & trade capacity**
Technical support to producers, youth, and institutions
- 10. Unlock blue finance for SMEs and producers**
Develop blended finance models and de-risk investment



Food and Agriculture Organization
of the United Nations

Global Study on Seaweed Aquaculture Legislation

Assessing legal frameworks towards alignment with the FAO Guidelines for Sustainable Aquaculture

Jose Avila-Peltroche Jose.AvilaPeltroche@fao.org

FAO consultant/Carnegie Science, Stanford, USA

Sidar Savci

International Legal Expert, FAO

Julia Nakamura

Legal Officer, FAO



29 June



Palais des Nations,
Geneva

This technical paper is the result of a joint effort of the [FAO Fisheries and Aquaculture Division](#), specifically, its [Aquaculture Technology and Production Team \(NFIAT\)](#), and the [FAO Legal Office](#), specifically, its [Development Law Service \(LEGN\)](#).



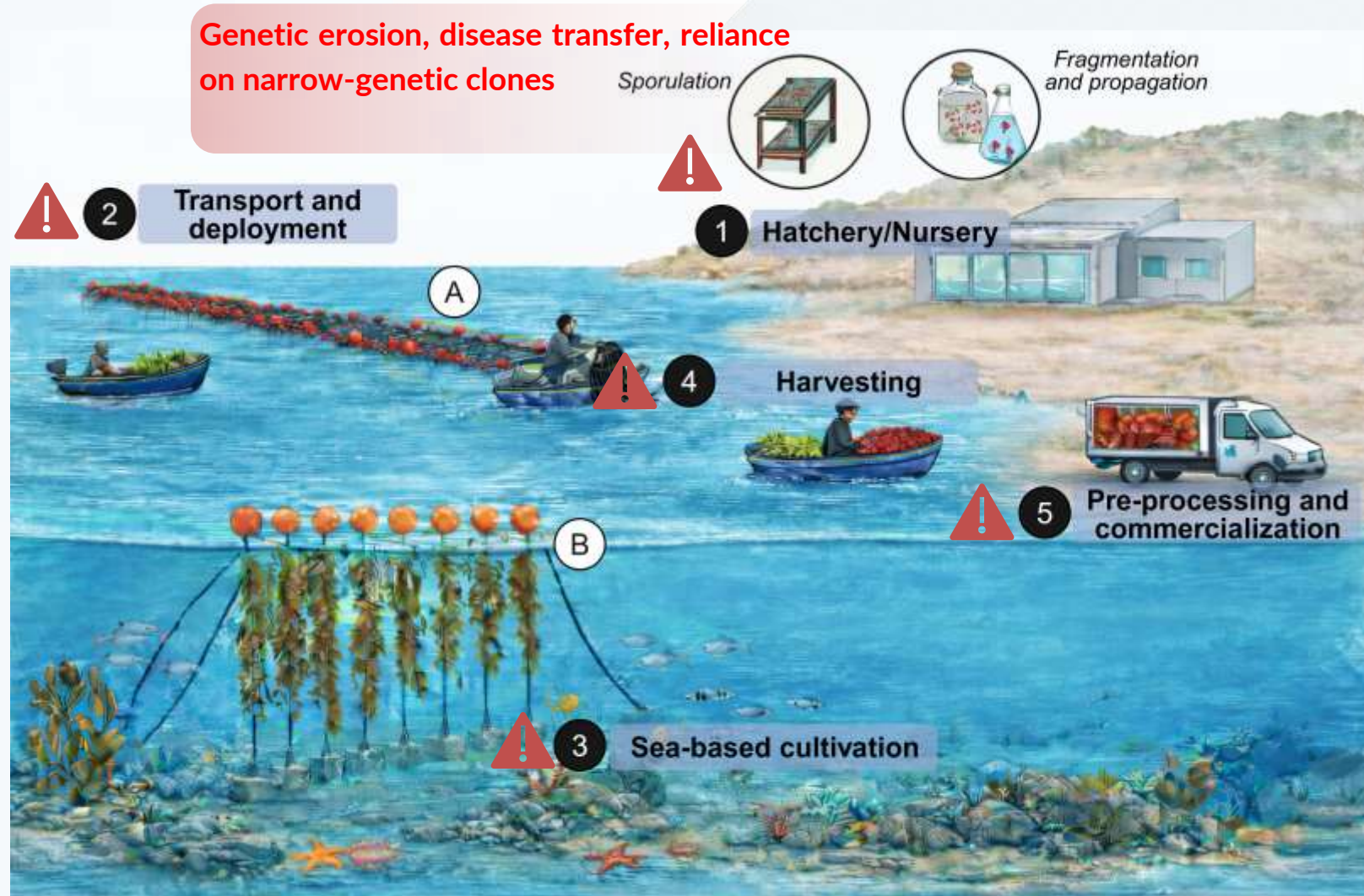
About seaweed aquaculture

Definition

Seaweed aquaculture is the farming of marine macroalgae involving the **intervention in the organisms' life cycle or biology to enhance production**

Risks or benefits?

Despite being considered less harmful than agriculture or fed aquaculture, seaweed farming remains a **human activity that that can disrupt marine ecosystems**



Seaweed aquaculture production and governance trends

The Boom



Most farmed marine organism globally

38 million
t

97%

Of utilized biomass is cultivated (mostly in Asia)



Rapid expansion driven by food, feed, and climate-solution narratives

The Gap

Promoted incorrectly as a “magic solution” for marine biodiversity loss and climate change



Scientific uncertainties and ecosystem risks, particularly in regions with limited experience in seaweed farming



Inadequate regulation might harm environments and coastal livelihoods



Clear regulatory frameworks help to separate “the hype” from a truly sustainable sector

What is the global landscape of seaweed legislation?

Previous reviews



Only at national or regional level:

- Southeast Asia and Northern Europe:
 - *Kambey et al. (2020): Biosecurity in Indonesia*
 - *Camarena-Gómez et al. (2022): Regulation of macroalgae production in Northern Europe*
- Latin America and the Caribbean
 - *Mendez et al. (2024): Biosecurity in LATAM*



FAO Global Study on Seaweed Aquaculture Legislation

Main objectives

- 1 To **compile** the national legislation relevant to seaweed aquaculture of FAO Members that are coastal States
- 2 To **analyze** the extent to which seaweed aquaculture legislation is recognized at the national level by examining laws, regulations, and related binding documents
- 3 To **assess** the extent to which seaweed-specific or related aquaculture legislation in selected countries aligns with the **FAO Guidelines for Sustainable Aquaculture**.

Methodology workflow

Step 1: Literature review



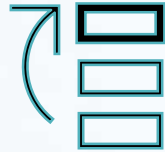
Primary and secondary legal instruments in the FAOLEX database using keywords



Expert consultations

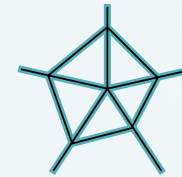
In case of Global Established Leaders (e.g. China, Indonesia)

Step 2: Classification



Categorization of **130 countries** based on the **degree of legal recognition for seaweed aquaculture**, ranging from those with dedicated seaweed-specific legislation to those lacking any legal reference.

Step 3: GSA alignment scoring



Evaluation of **12 representative producer countries** (Established, Regional, and Emerging) against the 4 FAO GSA:

1. **Governance and planning**
2. **Sustainable resource use, ecosystem and farm management**
3. **Social responsibility, decent work, and gender equality**
4. **Value chains, market access and trade**



GUIDELINES for
SUSTAINABLE
AQUACULTURE

Methodology workflow



FAO guidelines	Main regulatory aspects
Governance and planning	Ecosystem approach
	Research and innovation
	Marine Spatial Planning
Sustainable resource use, ecosystem and farm management	Germplasm promotion and management
	Biodiversity conservation
	Precautionary approach
	Biosecurity
	Long-term investment
	IMTA
	Species diversification
Social responsibility, decent work, and gender equality	Work opportunities for women, youth and disadvantaged communities
	Labor and employment equality
Value chains, market access and trade	Food safety and traceability



35
questions
spanning
13
criteria

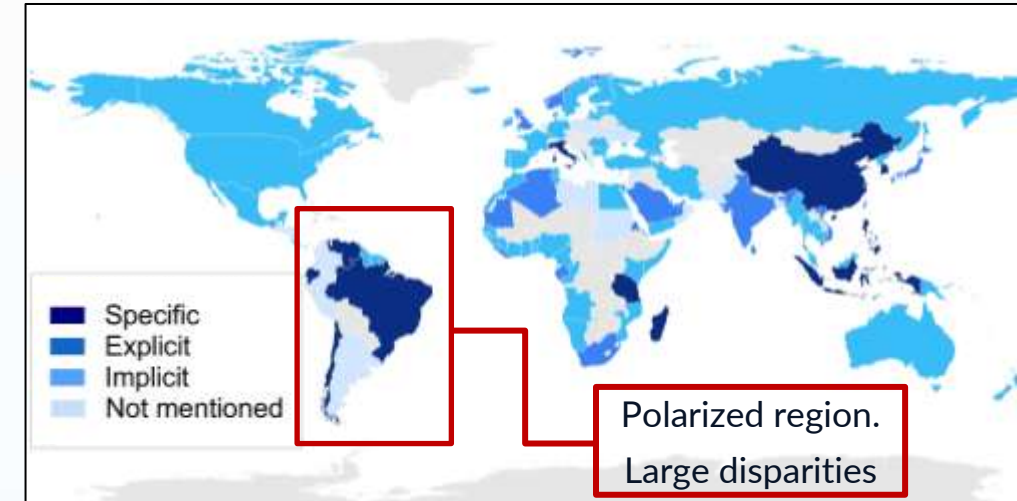
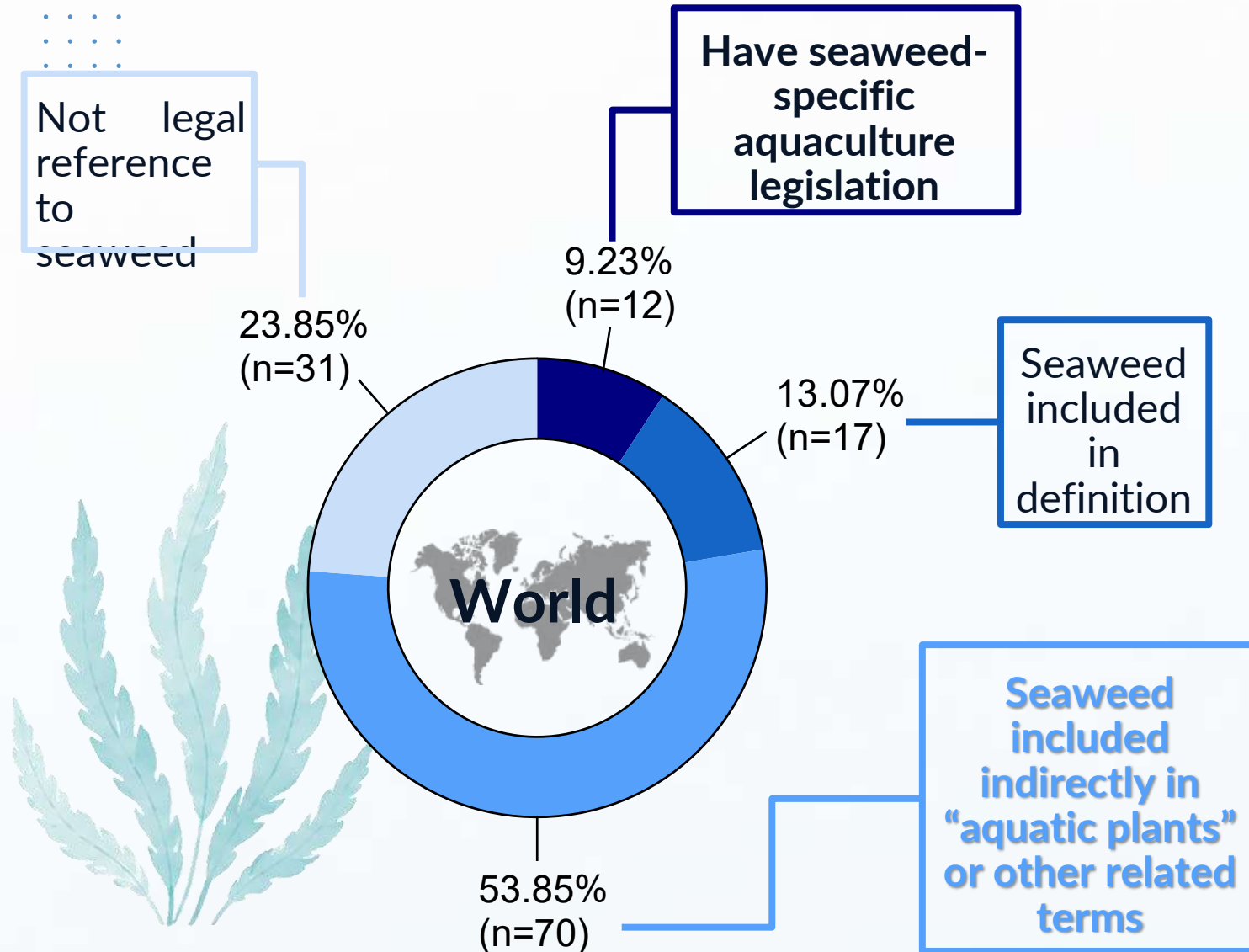
Scores – Main regulatory aspects (GSA components)

4 = Explicitly stated (seaweed legislation)
3 = Implicitly stated (seaweed legislation)
2 = Explicitly stated (general legislation)
1 = Implicitly stated (general legislation)
0 = Not stated

Scores – Alignment with FAO-GSA guidelines

4 = Full alignment
3 = High alignment
2 = Moderate alignment
1 = Low alignment
0 = No alignment

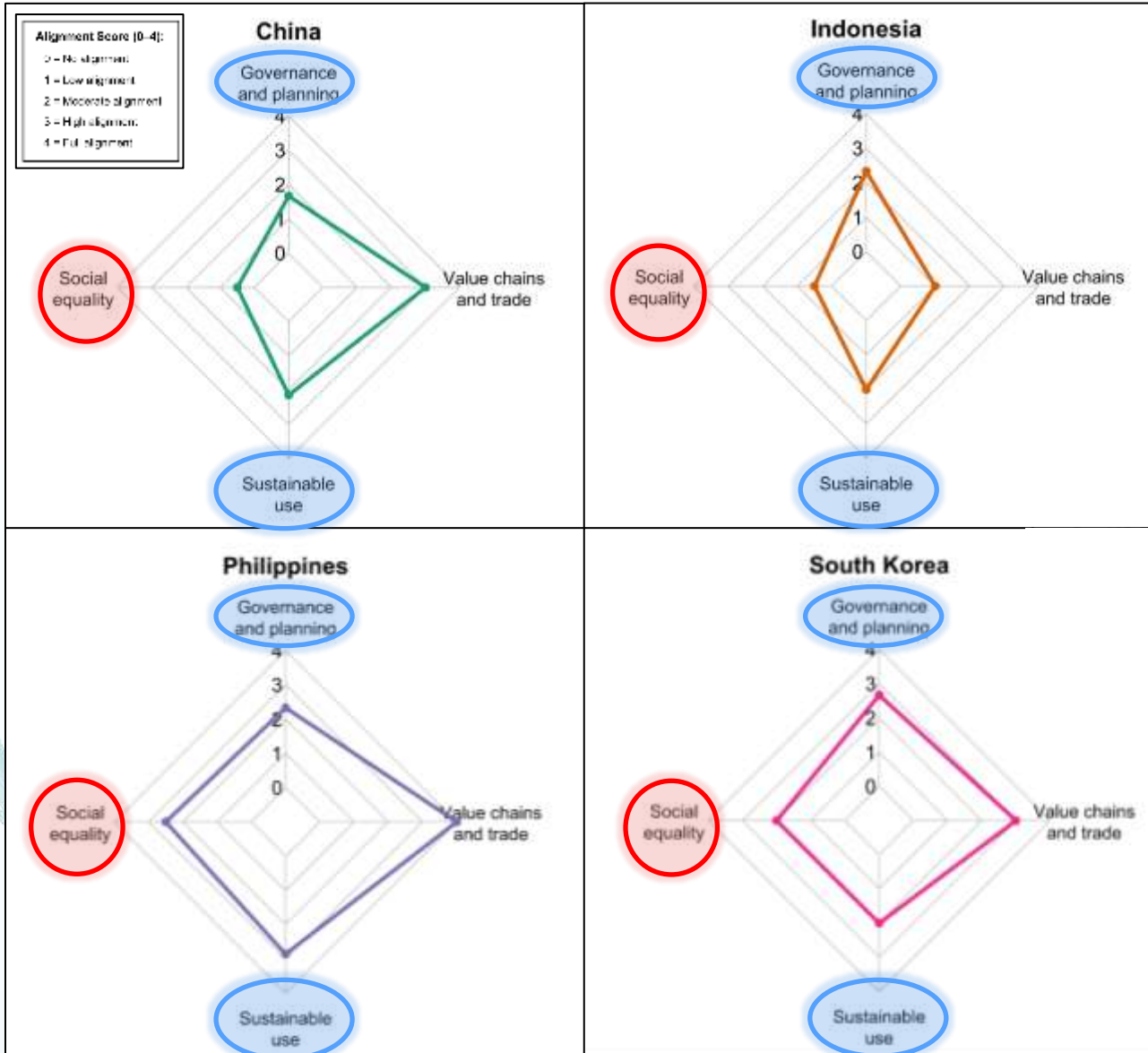
Dedicated legislation is the exception, not the rule



The "Fish-centric" flaw

Seaweed governance is currently a patchwork, largely derivative of fish-centric regulations that ignore the unique ecological and biological characteristics of seaweeds

Established leaders: Mature, yet unbalanced



Profile



High production (> 1 million tonnes). Aquaculture is the dominant mode of production

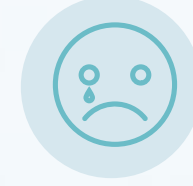
Strengths



Moderate to high alignment in Governance and planning, and Sustainable use (but high contrast in Value chains and trade)

Strong frameworks of Germplasm, Biosecurity and Research & Innovation

Weaknesses



Social aspects consistently emerges as the weakest dimension

Regional producers: governance-centric but uneven

Profile



Significant contributions to their respective regions, particularly through aquaculture's role in total seaweed production, both historically and in recent years

Strengths



Moderate alignment in **Governance and planning**.

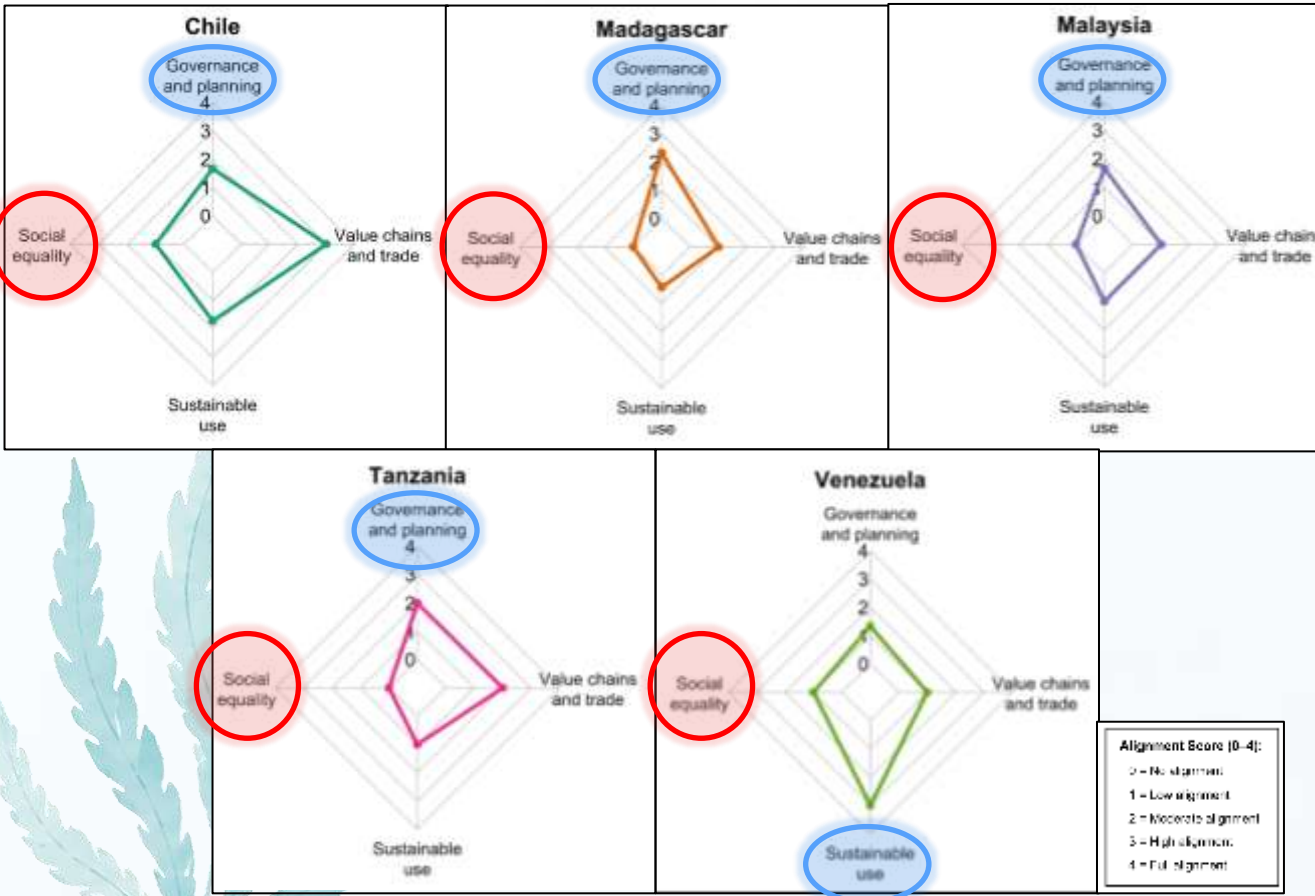
Strong emphasis on the **Ecosystem Approach, Research & Innovation, Marine Spatial Planning and Precautionary Principle**

Weaknesses

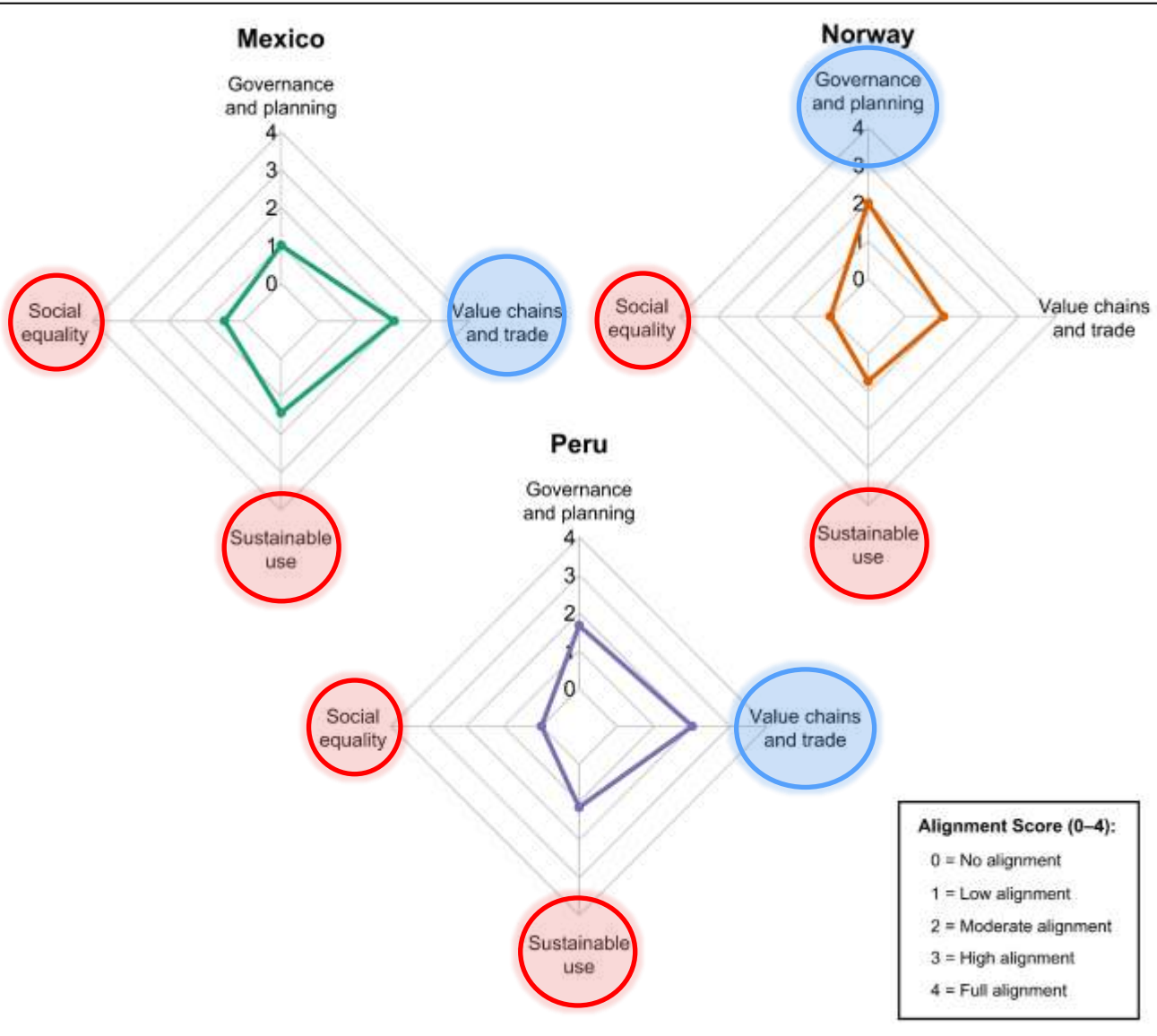


Social aspects consistently emerges as the weakest dimension

Value chains and trade is inconsistently developed.
Sustainable use presents the greatest disparity



Emerging producers: downstream focus, upstream gaps



Profile



Pilot or early commercial stage. Historically reliant on wild harvest

Strengths



Moderate alignment in Value chains and trade.

Food safety and traceability frameworks include seaweeds within general fisheries and aquaculture regulations

Weaknesses



Social aspects consistently emerges as the weakest dimension. Lack of seaweed-specific biosecurity and upstream cultivation governance.

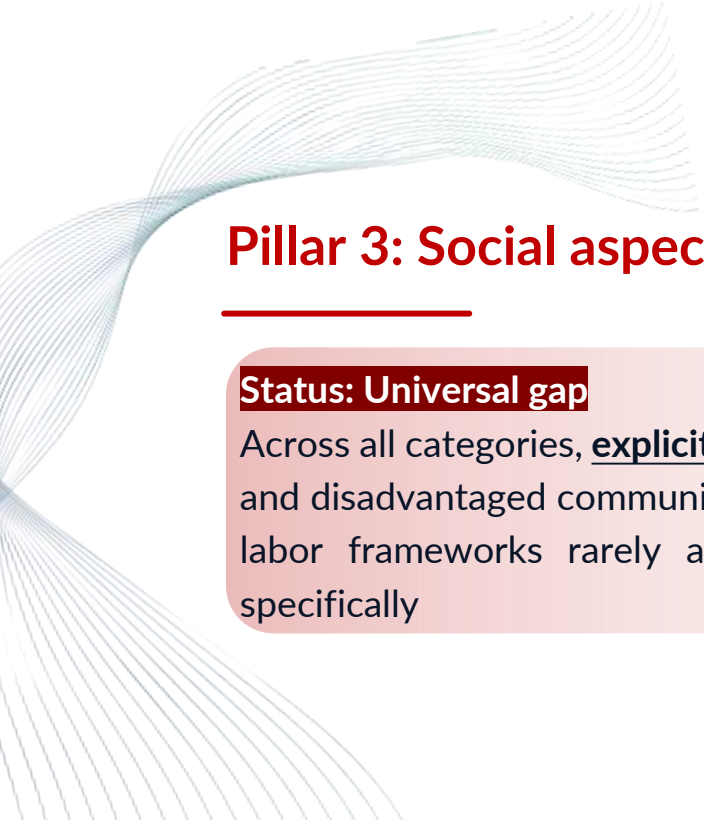


Overall alignment with FAO GSA

Pillar 1: Governance and planning

Status: Derivative

Generally strong in established and regional producers, but fundamentally flawed by relying heavily on adapted fish-centric legal frameworks



Pillar 3: Social aspects

Status: Universal gap

Across all categories, explicit provisions for women, youth, and disadvantaged communities were generally limited, and labor frameworks rarely addressed the seaweed sector specifically

Pillar 2: Sustainable resource use

Status: Uneven

Alignment varied widely and was often addressed only implicitly in legislation. Vital biological controls like Germplasm management and biosecurity are mostly ignored outside top-tier producers

Pillar 4: Value chains and trade

Status: Variable

Generally strong among global leaders and some emerging countries. In these emerging countries, downstream regulation appears more advanced than upstream cultivation governance



United Nations Industrial Development Organization (UNIDO)

SESSION 3: Trade (TBT+SPS), regulations and standards for seaweed/algae

Production and processing standards for seaweed products

Mr. Raymond Tavares
Unit Chief, TCS/SME/MDJ
MSME Development and Job Creation Unit (TCS/SME/MDJ)

R.TAVARES@unido.org

<https://www.unido.org>



29 June 2026



Geneva

Members and partners:

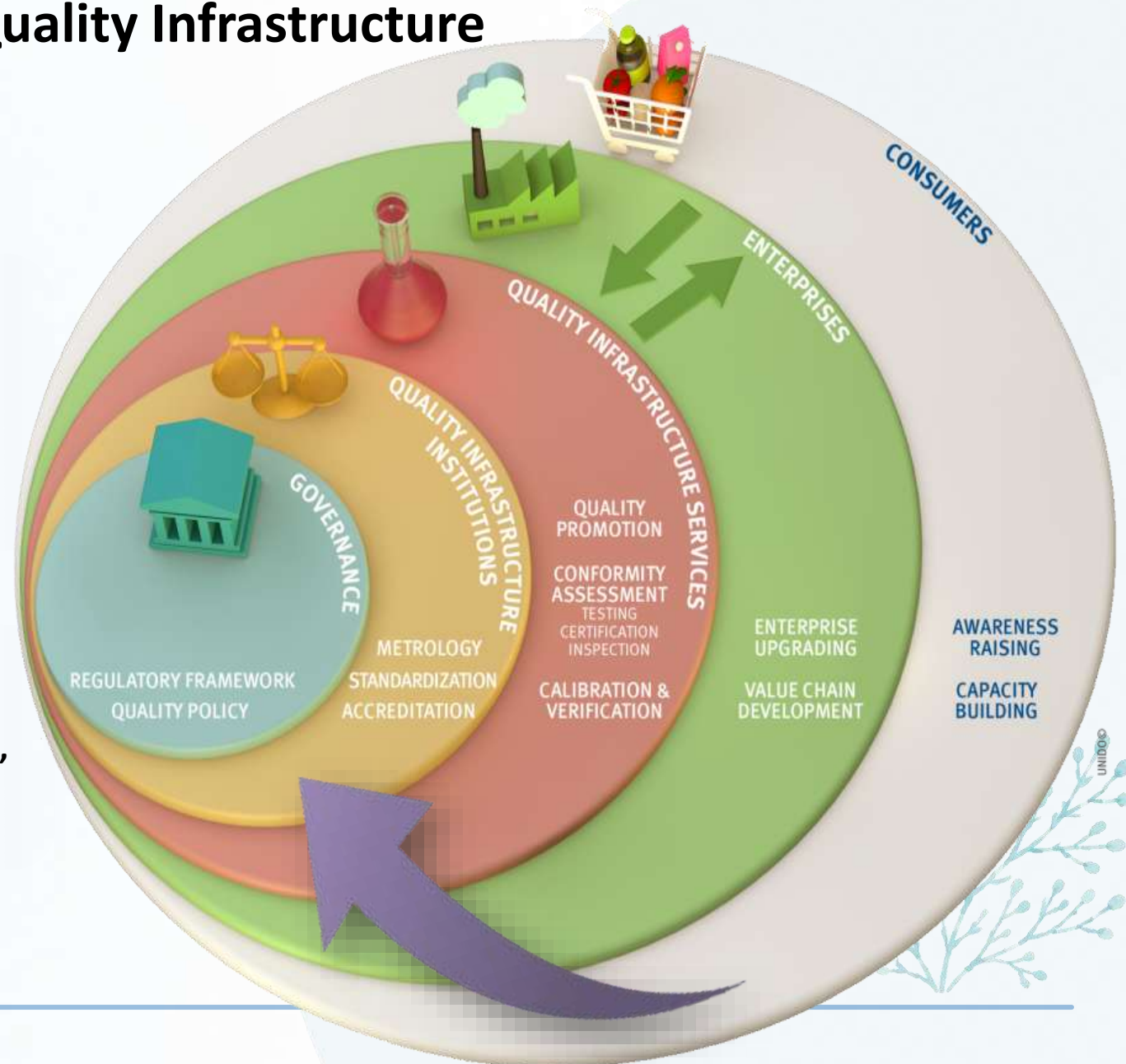
Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.



UNIDO's systemic approach to Quality Infrastructure

A Quality Infrastructure System (QIS) is a combination of initiatives, institutions, organizations, activities and people. It includes a national quality policy and institutions to implement it, a regulatory framework, quality service providers, enterprises, customers and consumers.

Quality Infrastructure enables producers to demonstrate product quality, safety and compliance, building confidence and improving market access.



Different Applications Require Different Standards and Quality Infrastructure



Key message: Different applications require different standards and conformity assessment services. A strong QI system enables the seaweed industry to demonstrate product quality and safety, comply with regulations, strengthen traceability, and access higher-value domestic and international markets.



The same seaweed can serve different markets, but each market requires different quality requirements.

 FOOD			
Examples of Standards	Quality Infrastructure Services	Examples of Standards	Quality Infrastructure Services
• National product standards (fresh, dried, powder, flakes) • Food safety management (ISO 22000 / FSSC 22000) • Traceability (ISO 22005) • Processing standards	 Testing laboratories  Inspection  Certification  Traceability  Accreditation	• Product quality • Safety • Labelling	 Testing laboratories  Inspection  Certification  Traceability  Accreditation

 BIOSTIMULANTS & BIOFERTILIZERS			
Examples of Standards	Quality Infrastructure Services	Examples of Standards	Quality Infrastructure Services
• Product quality • Safety • Labelling	 Testing laboratories  Inspection  Certification  Traceability  Accreditation	• Product quality • Safety • Labelling • ISO 22716 (GMP) • ISO 16128-1 & ISO 16128-2	 Testing laboratories  Inspection  Certification  Traceability  Accreditation

 COSMETICS & BIOPHARMACEUTICALS			
Examples of Standards	Quality Infrastructure Services	Examples of Standards	Quality Infrastructure Services
• Product quality • Safety • Labelling • ISO 22716 (GMP) • ISO 16128-1 & ISO 16128-2	 Testing laboratories  Inspection  Certification  Traceability  Accreditation		



Different Applications



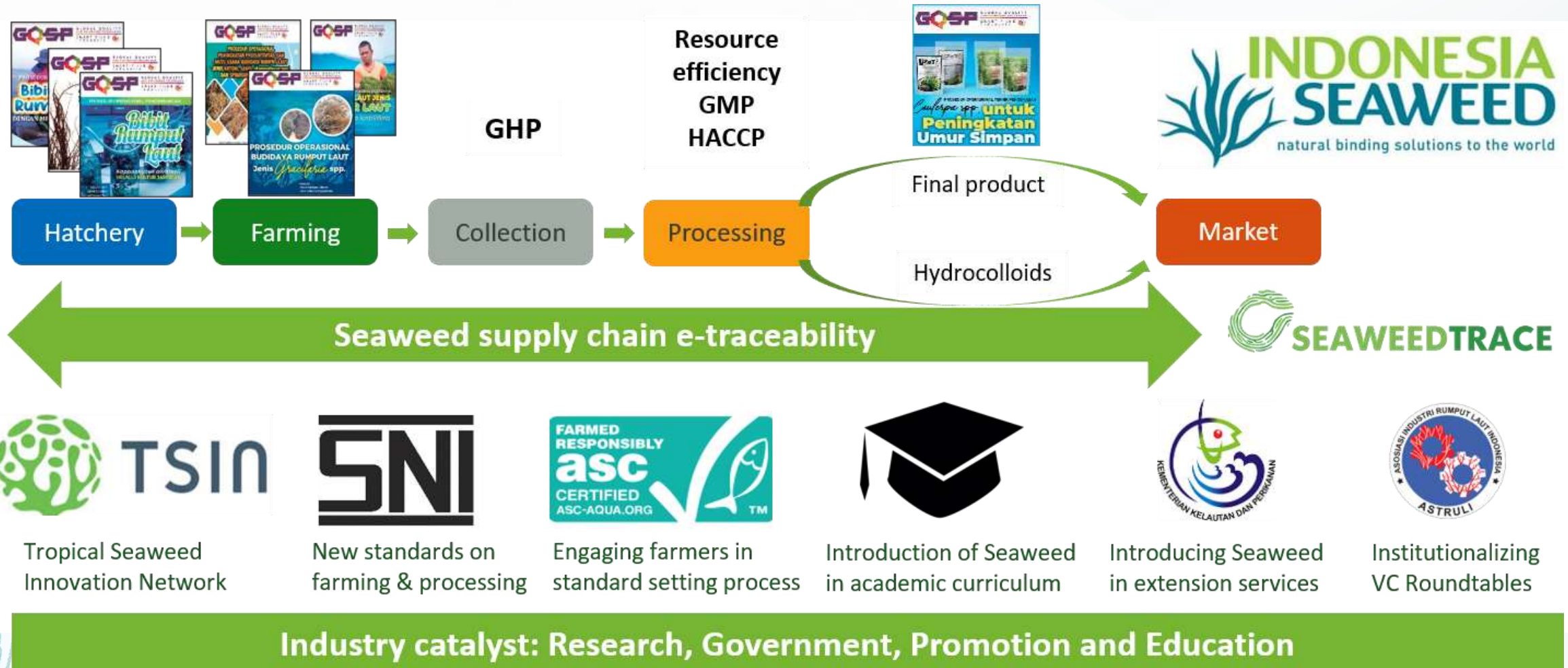
Different Standards



Different Quality Infrastructure Services



Building a Quality Infrastructure System for Seaweed Indonesia Example (2014-2026)



UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

André Bispo Oliveira, Coordinator for Analytics and International Cooperation, Ministry of Fisheries and Aquaculture, Brazil

internacional@mpa.gov.br <https://www.gov.br/mpa/pt-br>

 29.06.2026

 Palais des Nations, Geneva

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.



SESSION 3: Trade (TBT+SPS), regulations and standards.

Outcomes of Session 37 of Codex Committee on Fish and Fishery Products

From a species-specific proposal to a broader international framework.

Brazil is developing seaweed aquaculture, particularly through the cultivation of *Kappaphycus*, and the call for new work proposals at CCFFP37 provided an opportunity to address the absence of international standards for this emerging sector.

As discussion progressed, it became evident that a broader and more inclusive approach could provide greater benefits. CCFFP37 therefore supported the development of a flexible and scalable framework capable of accommodating different seaweed species, product categories and production systems over time, while supporting food safety, fair practices in trade and future sector development.



Source: <http://algicultura.com/>



Seaweed is becoming a global commodity

Example sub title



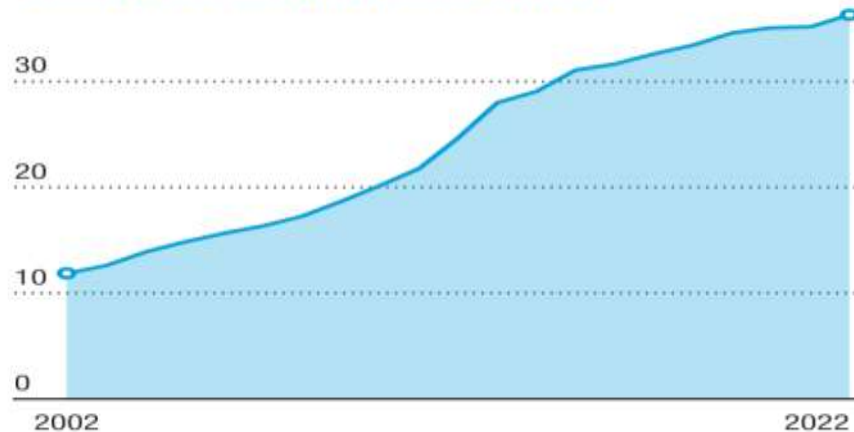
Global production and trade of seaweed continue to expand, supporting food systems, hydrocolloid industries, aquaculture, agriculture, cosmetics and bio-based products.



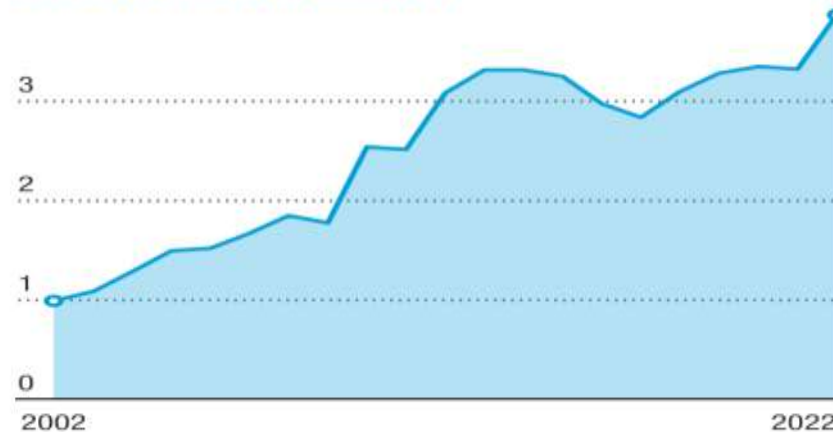
Figure 1. Global seaweed production and trade tripled and quadrupled, respectively, between 2002 and 2022

Global seaweed production and exports, 2002-2022

Global Production (in million tonnes)



Global Exports (in billion \$)



Source: UNCTAD (2025) analysis based on FAO FishStat for 2002-2022 and UN Comtrade data as of 1 October 2025



As markets grow, regulatory convergence becomes increasingly important.

Seaweed aquaculture deserves attention

Growing Industry



Seaweed aquaculture is one of the fastest-growing aquatic food sectors.

It can contribute to livelihoods, coastal development, women's participation, climate strategies and blue economy initiatives



Source: <http://algicultura.com/>



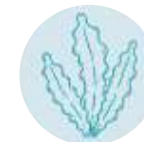
Safe products



Safe working conditions



Environmental protection



Inclusive growth



Sustainable industry

WHY CODEX MATTERS?

International trade and standards are closely linked.



Codex standards support food safety objectives.

Codex standards contribute to fair practices in food trade and help avoid unnecessary barriers to trade.

Codex Standards often combine quality specifications (TBT) and food safety requirements (SPS).

Regulatory choices can create either enabling conditions or unnecessary barriers for sustainable aquaculture, innovation and international trade.

Source: <https://www.fao.org/fao-who-codexalimentarius/home/en/>

KEY OUTCOMES FROM CCFFP37 (REP26/FFP)

Key messages emerging from the discussions:



- Codex standards should protect consumer health while supporting fair practices in food trade (Para. 98).

- For emerging sectors such as seaweed, proportionate and risk-based approaches are essential to support innovation, sustainable aquaculture and market access (Paras. 100 and 107).

KEY OUTCOMES FROM CCFFP37 (REP26/FFP)

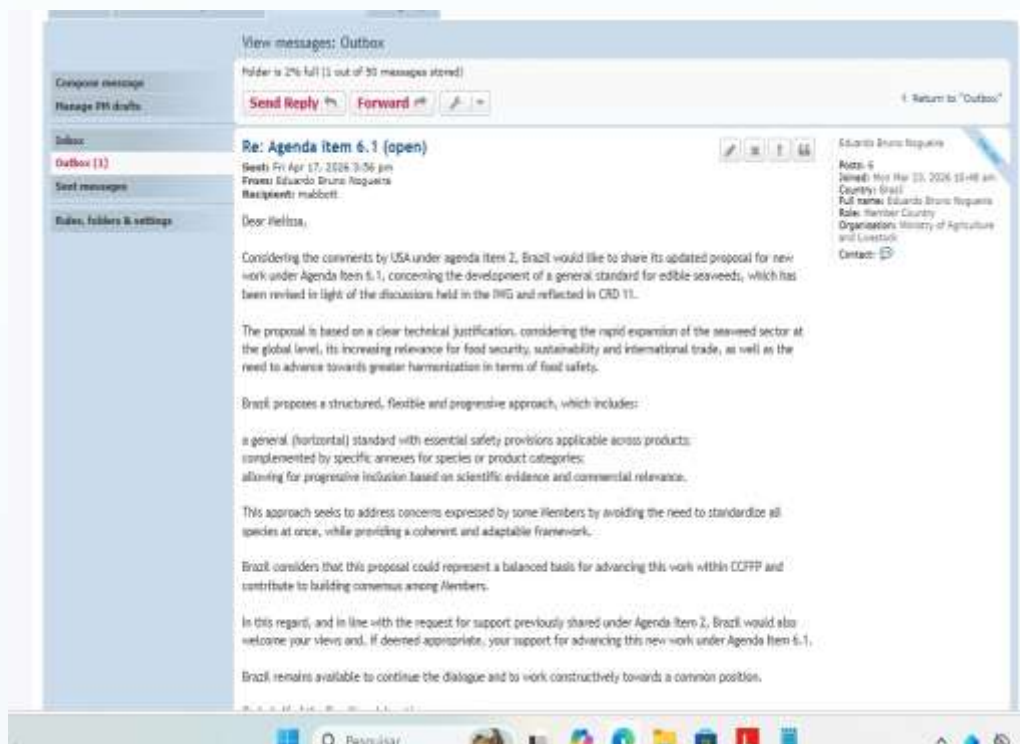
Outcome 1: Conversion of the Regional standard for laver products (Asia) (CXS 323R2017) into a worldwide standard (Step 4).



- Laver standard advanced to Step 5 (Para. 47).
 - Inclusion of the genus *Porphyra* to the Scope (Para. 47).
 - Hygiene: Reference to CXC 75-2015 and not to CXC 52-2003, reflecting a risk-based and proportionate approach for dried seaweed products (Paras. 31, 32).
-
- Contaminants: CCFC to evaluate provisions for seaweed for heavy metals such as inorganic arsenic, cadmium, lead, and mercury; iodine; and marine biotoxins (Para. 48).

KEY OUTCOMES FROM CCFFP37 (REP26/FFP)

Outcome 2: New work Proposals - CCFFP37 has agreed on a complementary dual-track approach.



- A horizontal group standard for seaweed (Para. 115ii).

Decision and ToR: an EWG to revise the discussion paper and project document taking into account the discussion held during CCFFP37, including a need for a gap analysis and scoping exercise.

- A code of practice for production of seaweeds (Para. 115iii).

Decision and ToR: the Philippines and interested Members to revise the discussion paper and project document taking into account the discussion held during CCFFP37, including a need for a gap analysis and scoping exercise.

KEY OUTCOMES FROM CCFFP37 (REP26/FFP)

Outcome 3: FAO Proposal for change of the terms of reference for and the name of CCFFP*.

Commodity committees (active)	Acronym	Codex Committee on	Id	Document reference	Host country
	CCFFP	Fish and Fishery Products	CX-722	CX/FFP	Norway (working by correspondence only since 2021)
Terms of reference To elaborate worldwide standards for fresh, frozen (including quick-frozen) or otherwise processed fish, crustaceans and mollusc.					

- CCFFP37 agreed to inform CCEXEC90 and CAC49 of:
- The need for revising the ToR for the committee to better reflect the growing role of aquaculture products in the global aquatic food supply and consequently also the name of the committee (Para. 122i).
- The proposal for a slightly revised ToR for the committee: “To elaborate worldwide standards for live, fresh, frozen (incl. quick frozen) or otherwise processed aquatic food products.” (Para. 122ii).*

* [COFI/2024/REPORT](#) – Para 20 (g) The Committee: urged FAO to continue supporting and promoting the importance of aquatic food systems in relevant regional and international fora.

THE MESSAGE FOR UNGSI.

The United Nations Global Seaweed Initiative is well positioned to support CCFFP work on seaweed.

CODEx ALIMENTARIUS COMMISSION



Food and Agriculture
Organization of the
United Nations



World Health
Organization

Viale delle Terme di Caracalla, 00153 Rome, Italy - Tel: (+39) 06 57051 - E-mail: codex@fao.org - www.codexalimentarius.org

Agenda item 6

FFP37/CRD08

Original language only

JOINT FAO/WHO FOOD STANDARDS PROGRAMME
CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS
Thirty-seventh Session

INFORMATION NOTE ON THE UNITED NATIONS GLOBAL SEAWEED INITIATIVE ON THE GLOBAL PLATFORM FOR SEAWEED AND SUSTAINABLE LIVELIHOODS

(Submitted by Brazil and France with the assistance of the UNGSI Secretariat)

Agenda item 6: Consideration of new work proposals on other seaweed species and/or other aquatic species

INTRODUCTION

Seaweeds and algae have been part of the human diet for centuries, with documented consumption dating back to ancient civilizations in regions of China, Japan and Republic of Korea, as well as traditional uses in parts of Ireland and the United Kingdom. These products are widely consumed around the world in various forms, including dried, roasted and seasoned preparations, and are valued for their nutritional properties and culinary versatility.

Seaweed and algae are increasingly having national, regional and international market relevance, therefore requiring the development of specific food safety standards. Global seaweed production tripled from 11.9 to 36.3 million tonnes between 2002 and 2022, while exports quadrupled to \$3.9 billion (UNCTAD and FAO,

- Information note on the United Nations Global Seaweed Initiative on the global platform for seaweed and sustainable livelihoods (CRD08): Highlighted the role of UNGSI in supporting cooperation, sustainable development, trade facilitation and inclusive growth across the seaweed sector.

- CCFFP's work on seaweeds and algae will require broad participation from producing and consuming countries.
- Initiatives such as UNGSI can play a valuable role in supporting data collection, gap analysis, trade and value-chain information and a broader understanding of the sector.



UNITED NATIONS

Global Seaweed Initiative

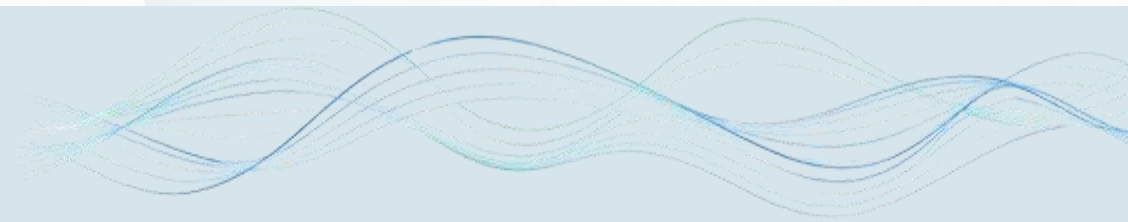
Seaweed for the Codex Alimentarius Commission (CAC49) and FAO's work



DATE: 29.06.2026

Panellist:

Dr. Esther Garrido Gamarro, Fishery Officer, Food Safety and Quality – Aquatic Products, FAO,



FAO's work

Seaweed related matters



2021



2003



1987





CCFFP37

Seaweed related matters



CCFFP37 agreed to advance the conversion of the Regional Standard for Laver Products (Asia) into a worldwide Codex standard. The scope was slightly expanded to include the genus *Porphyra*.

CCFFP37 identified the need to improve the safety framework for seaweed products. The Committee agreed to inform CCCF of the need to consider safety evaluations by JECFA for key hazards relevant to seaweed, including heavy metals (inorganic arsenic, cadmium, lead and mercury), iodine, and marine biotoxins.

CCFFP37 supported the development of two new work areas related to seaweed: CoP for the production of seaweeds, and a group standard for seaweed. A gap analysis will be carried out to define scope and priorities.

CAC49

Seaweed related matters

Codex Alimentarius Commission 49th Session (CAC49)

Languages
Arabic, Chinese, English,
French, Russian and Spanish

6-10 July 2026
10.00 - 13.00 and 15.00 - 18.00 (CEST)
CICG, Geneva, Switzerland

Tentative programme

Monday
06 July

- 10.00-10.30 Opening and housekeeping
- 1 Adoption of the agenda and methods of work for the session
 - 2 Election of Chairperson - Nomination period opens
 - 3 Report by the Chairperson on the 90th Session of the Executive Committee
 - 4 Amendments to the Codex Procedural Manual
 - 5 Standard setting work of Codex committees (adoption, revocation and discontinuation)
- 4.1 Codex Committee on Spices and Culinary Herbs (CCSCH)
- 4.2 Codex Committee on Food Hygiene (CCFH)
- 11.00-13.00 Lunch break
- 15.00-16.00
- 6 Election of Chairperson - Nomination period closes and election by clear general consent in case there is no more than one candidate
 - 7 Standard setting work of Codex committees (cont.)
- 4.3 Codex Committee on Fats and Oils (CCFO)
- 4.4 Codex Committee on Methods of Analysis and Sampling (CCMAS)
- 4.5 Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF)
- 4.6 Codex Committee on Food Additives (CCFA)
- 4.7 Codex Committee on Food Labelling (CCFL)
- 4.8 Codex Committee on Fish and Fishery Products (CCFFP)

CODEX ALIMENTARIUS COMMISSION



Food and Agriculture
Organization of the
United Nations



World Health
Organization

Viale delle Terme di Caracalla, 00153 Rome, Italy - Tel: (+39) 06 57051 - E-mail: codex@fao.org - www.codexalimentarius.org

Agenda item 4.8

CX/CAC 26/49/10
May 2026

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX ALIMENTARIUS COMMISSION

Forty-ninth session

CICG, Geneva, Switzerland

6-10 July 2026

WORK OF THE CODEX COMMITTEE ON FISH AND FISHERY PRODUCTS (CCFFP)

1. The 49th Session of the Codex Alimentarius Commission (CAC49) is invited to adopt the standards and related texts submitted by CCFFP37 as listed in **Part 1** of this document.
2. CAC49 is also invited to adopt the standard submitted for adoption at Step 5 as listed in **Part 2** of this document.
3. The comments received regarding standards and related texts submitted for adoption by CAC49 are contained in CX/CAC 26/49/10 Add.1.
4. The critical review of these standards and related texts will be conducted by the 90th session of the Executive Committee of the Codex Alimentarius Commission (CX/EXEC 26/90/3 Add.3).¹

Part 1 – Standards and related texts submitted for final adoption

Standards and related texts	Reference	Job No.	Step
Taxonomic updates in the <i>Standard for canned tuna and bonito</i> (CXS 70-1981), <i>Standard for canned sardines and sardine-type products</i> (CXS 94-1981), and <i>Standard for quick-frozen lobsters</i> (CXS 95-1981)	REP26/FFP paragraph 72i and Appendix III	-	Adoption

Part 2 – Standard for adoption at Step 5

Standards and related texts	Reference	Job No.
Standard for adoption at Step 5	REP26/FFP paragraph 47ii and	N/A

UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

A collaborative platform that brings together Member States, UN entities, research institutions, industry stakeholders, and civil society to accelerate the safe, and sustainable development of the seaweed sector.



29-30

NOTPLA

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.



PIONEERING SEAWEED PACKAGING

Notpla at a
glance



55 employees

10 years of R&D

6 patents

80 trade secrets

45 million units of plastic replaced



A PORTFOLIO OF SOLUTIONS

Powered by Seaweed



Notpla has replaced over 45m single use plastic packaging items over the last ten years, harnessing the power of seaweed to create a diverse portfolio of products from different seaweed extracts and species:



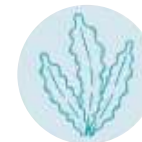
Safe
products



Safe working
conditions



Environmental
protection



Inclusive
growth



Sustainable
industry

TRUSTED BY HERO BRANDS

Over 45m units sold to date across 10 countries



Mandated by **Compass Group** in all EU stadiums

2x growth in the UK foodservice market YoY

1st QSR Kwalitaria (150 sites) rollout

HEMA and IKEA mandating Notpla



APPROACH TO CERTIFICATION

NATURAL POLYMERS GROUP

Taking lessons from previous Notpla initiatives



A coalition advocating for the development and adoption of safe, environmentally sound, and sustainable plastic-free materials



Notpla

LOLIWARE



zerocircle



PlantSea



MarinaTex

Xampla

traceless

Set the **gold standard** for safe and natural materials

Advocacy for recognition of natural polymers in policy

Build **public awareness** of natural polymers



This first phase of work is currently supported by:



BUILDERS VISION

NATURAL POLYMERS GROUP

Our established policy call for the EU

- **Inclusion of 'unmodified natural polymers'** as a distinct category of sustainable packaging materials.
- **Evaluate alternative materials** to facilitate evidence-based criteria for the delegated acts on recyclability of materials.
- **Align Article 6 exemption for all unmodified natural polymers** and align the regulation with the SUPD, which has already exempted unmodified natural polymers.



Confidential (do not share without permission)

16 August 2024

Feedback on the EU Packaging and Packaging Waste Regulation (PPWR) Revision

1. Executive Summary

Notpla, a pioneer in sustainable packaging solutions, strongly supports the European Commission's ambitious goal to reduce the environmental impact of packaging through the PPWR. This document outlines our perspective on the regulation, highlights the environmental benefits of **unmodified natural polymers**, and proposes recommendations to **include unmodified natural polymers in the PPWR framework and subsequent delegated acts**.

2. Background

Notpla is pioneering the use of natural materials such as seaweed and plants to create sustainable packaging solutions and eliminate plastic waste. Our achievements include:

- Winner of The Earthshot Prize 2022 in the "Build a Waste-Free World" category
- Recipient of the Tom Ford Plastic Innovation Prize 2023
- [Recognition by the Dutch government](#) as a provider of plastic-free materials in accordance with the EU Single-Use Plastics Directive

3. Notpla's Perspective On The PPWR

Notpla strongly supports the European Commission's ambitious goal to reduce the environmental impact of packaging through the PPWR. We believe this regulation represents a critical step towards addressing the urgent environmental challenges associated with packaging waste.

A LANDMARK MOMENT FOR NATURAL POLYMERS

The EESC has officially called for natural polymers to be recognised as a distinct, non-plastic material category.



NAT/970
Nature-based biodegradable materials

Brussels, 29/4/2026

RECORD OF THE PROCEEDINGS

European Economic and Social Committee

A comprehensive strategy for nature-based biodegradable materials to foster circularity and resource efficiency, strengthen the agri-food sector and scale-up the EU bioeconomy
(own-initiative opinion)



211

Votes in favour



PUSHING FOR BEST PRACTICE IN SEAWEED

Notpla's Buying Principles

Why?

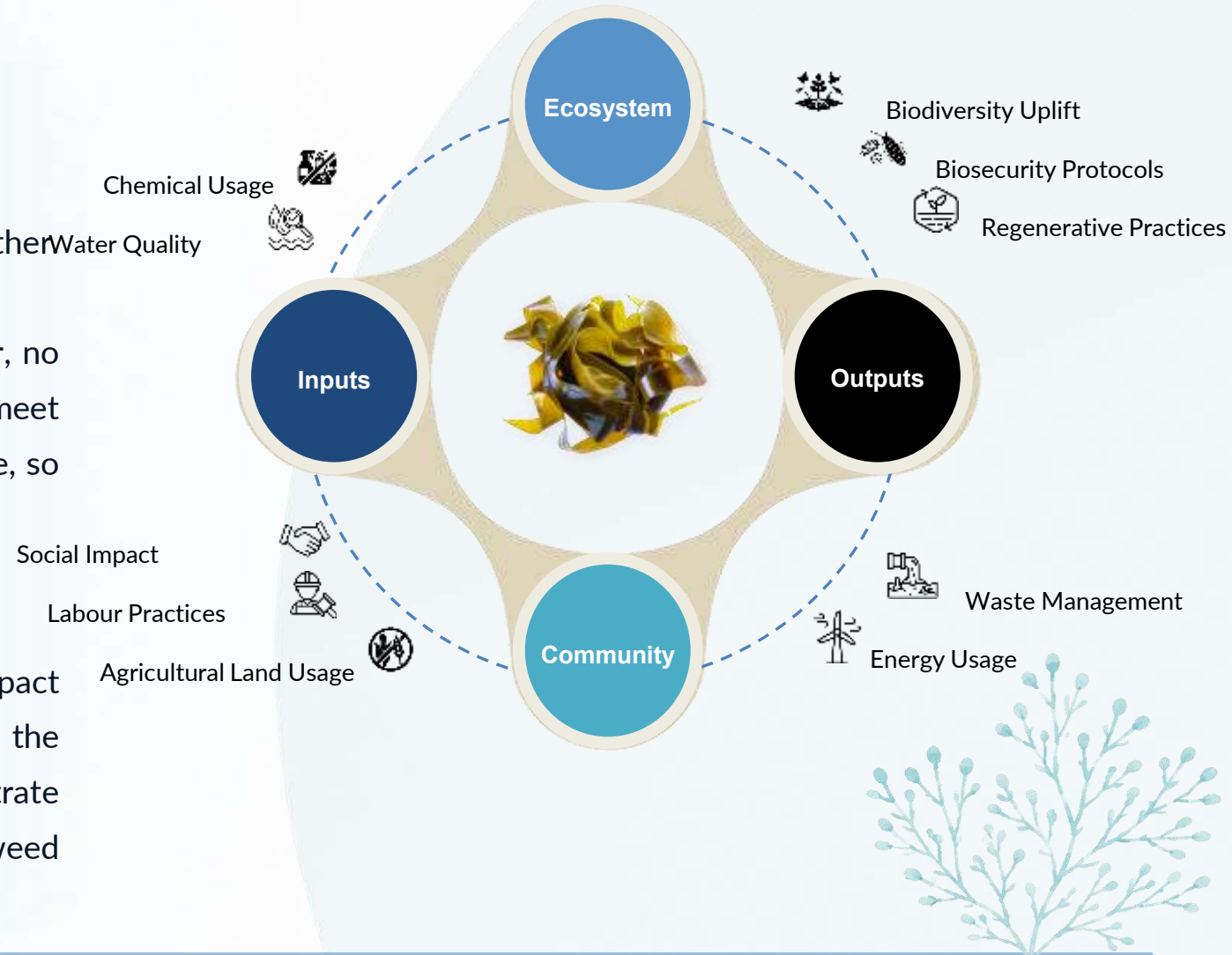
1. No Regrettable Substitutions [Internal]:

Most bio-based materials swap one problem for another. Seaweed does not.

It grows in the ocean, needs no fertiliser, no freshwater, no arable land. We feel it is the only feedstock that can meet the scale of the plastic issue without creating a new one, so we need to ensure we scale the industry appropriately.

2. Commercial Bottlenecks [External]:

Large scale partners have stringent procurement / impact requirements, but the seaweed industry currently lacks the robust, recognised standards needed to demonstrate compliance, creating a barrier to adoption of seaweed materials at significant scale.



ASC/MSC SEAWEED STANDARD

“The most comprehensive private, international standard”

Food vs Other Applications

Seaweed hydrocolloids and whole seaweed food products are produced in **very different processes**

- Seaweed hydrocolloids constitute a **small fraction** of the final blended ingredient
- Whole seaweed food ingredients make up the majority of the product

Limited Uptake Since 2017

- Due mainly to cost, complexity and market demand
- **33 seaweed production units** are certified as of H2 2025
- Audit costs, royalty fees & subscription **costs** have meant the standard is cost prohibitive for most producers.

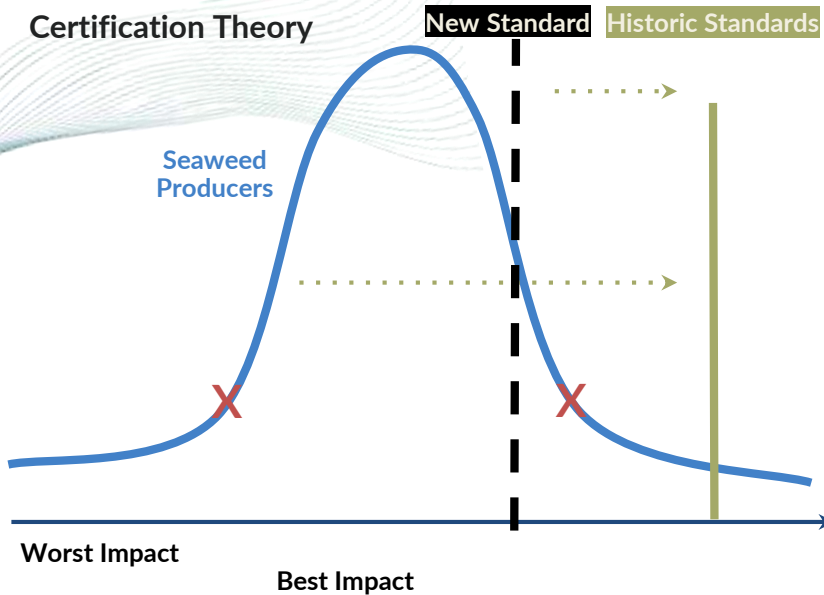


BALANCING COSTS WITH RIGOUR?

Driving wider adoption of Standards in Seaweed

Can we feasibly create a new standard that **moves the curve to the right** and improves the baseline impact of producers?

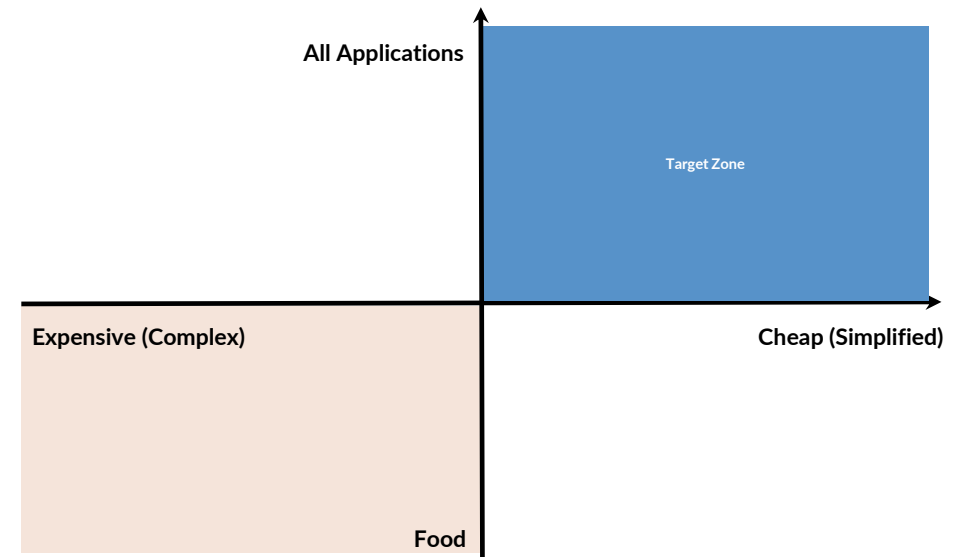
Are historic standards setting requirements too high?



Can we produce a non-food, lower cost Standard or are we **over-simplifying a complex/costly challenge**?

There are other considerations to bear in mind, such as:

Market Dynamics, Brand, Audit Quality, Enforcement, Funding, Certification Fatigue etc.



LET'S MAKE STANDARDS A PRIORITY TOGETHER

“Reducing the **cost and complexity** of application, verification and certification, and ensuring that standards remain **adaptable to different species, context-sensitive** and **flexible** to different production systems and national capacities”

*“Seaweed for development
Trade, regulations and standards for inclusive growth” (UNCTAD, 2026)*

humphrey@notpla.com

- 1.
- 2.
- 3.
- 4.
- 5.

Seaweed as a Distinct Commodity
Non-Food Application Frameworks
Light-Touch, Contextual Standards
Cross Border Collaboration
Finance for Scaling

www.notpla.com

Global Seaweed Initiative

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO (IOC) and GSC.

UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

Building Sustainable Seaweed Value Chains: Why National Strategies Matter for Effective Public Financing

June 2026

Palais des Nations – Geneva

General Directorate of Maritime Affairs, Fisheries and Aquaculture (DGAMPA)

[Yas Farjad](#)

yas.farjad@mer.gouv.fr

+33 7 52 72 51 74



Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.

Setting the scene

- Seaweed is increasingly recognised as a strategic sector for food systems, the blue economy, climate resilience and the bioeconomy
- However, developing a sustainable seaweed sector is not only about increasing public funding
- Public investment is most effective when it is guided by a clear long-term national strategy

Financing should not drive the strategy, the strategy should guide the financing.



The French approach

France has chosen to establish a National Seaweed Roadmap

- Adopted by the French Government in 2025.
- Developed through extensive consultation with public authorities, scientists, producers, processors and other stakeholders.
- Provides the national strategic framework for the sustainable development of the seaweed sector.
- Creates a common vision shared by all actors.

A national roadmap provides visibility, policy coherence and long-term confidence for both public authorities and investors.



A strategy creates the conditions for effective investment

Without a strategic framework:

- ✓ financing risks becoming fragmented;
- ✓ priorities may differ between funding bodies;
- ✓ public investment may not fully address sector needs.

A national strategy helps to:

- ✓ align public policies;
- ✓ identify priorities across the value chain;
- ✓ coordinate existing funding instruments;
- ✓ anticipate future investment needs;
- ✓ create confidence for private investment.

One of the five strategic pillars focuses on competitiveness and financing:

- strengthen the competitiveness of French seaweed companies;
- improve access to existing public funding mechanisms;
- better align national funding programmes with the needs of the sector;
- identify financing gaps across the different seaweed value chains;
- facilitate innovation and industrial development.

This demonstrates that financing is not considered as a stand-alone policy but as an integral component of sector development.



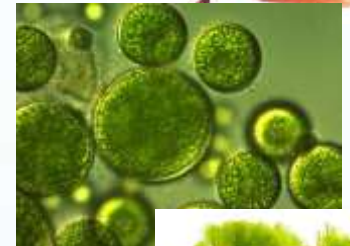
Financing must reflect the diversity of the sector

Investment needs differ considerably across the sector.

- Microalgae often require significant investment in innovation, biotechnologies, production systems and industrial scale-up.
- Spirulina farms generally have different investment profiles, often involving smaller-scale production and local business models.
- Macroalgae production may require support for cultivation systems, harvesting technologies or sustainable production methods.

Different stages require different policy responses.

- Primary production: improving scientific knowledge, monitoring wild resources, strengthening resilience to climate change and securing sustainable biomass availability.
- Processing: investment in innovative processing technologies, energy efficiency, circular economy solutions and co-product valorisation.
- Market development: supporting product diversification, market uptake and industrial deployment.



Beyond funding: building investor confidence

An enabling financial ecosystem is equally important.

- funding programmes adapted to the size and capacity of companies;
- administrative procedures proportionate to project scale;
- realistic implementation timelines;
- technical support for SMEs when preparing applications;
- better awareness among investors and funding agencies of the long-term potential of the seaweed sector.

Seaweed should increasingly be recognised not simply as an emerging niche, but as a strategic investment contributing to food security, environmental sustainability and the blue economy.



Looking ahead!

France is committed to contributing to this international effort by sharing its national experience and working with partners to identify financing approaches that are better adapted to the diversity of seaweed value chains.

Through its engagement in the UN Global Seaweed Initiative, France is contributing to ongoing international reflections on financing mechanisms that can support the sustainable development of the sector.

Ultimately, sustainable financing is not only about mobilising more resources, it is about ensuring that investment is guided by a shared vision, aligned with sector needs and capable of delivering long-term impact.



**UNITED NATIONS
GLOBAL SEAWEED
INITIATIVE**

UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

Annual meeting - Session 4: Financing the seaweed transition: public, private and blended solutions

Antoine Rougier – Agence Française de Développement (AFD)
Bilateral Financing

 29/06/2026

rougiera@afd.fr

www.afd.fr

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Senegal, and Republic of Korea), UNCTAD, UNGC, FAO, UNIDO, UNECO-IOC and GSC.





Example of bilateral financing

MARISE Project – Indonesia



MARISE (Enhancing Mariculture Facilities and Integrated Seaweed Development):

- Project led by the **Indonesian Ministry of Marine Affairs and Fisheries (KKP)**
- Included in the **“Blue Book” 2025-2029**: listing the medium-term planned external loan for the Republic of Indonesia, and produced by the **Ministry of National Development Planning/ National Development Planning Agency (Bappenas)**



Key attributes of the MARISE project:

- **USD 150m sovereign loan**, to be financed by development partners
- Dual focus on
 - **Mariculture** (marine finfish, crustacean (except shrimp), bivalves)
 - **Tropical seaweed**
- Combining **infrastructures**, and **capacity building**

Example of bilateral financing

MARISE Project – Indonesia

Current stage: pre-feasibility phase

- Agence Française de Développement (AFD) alongside the Islamic Development Bank (IsDB) have expressed their interest in co-financing this project
- Ongoing collaborative work with KKP on a pre-feasibility study with support from consultants



Project structure 1/2

A combination of infrastructures and soft components



Component 1: modernization/ revitalization of 7 KKP Technical Implementation Units (UPTs)

- Infrastructure rehabilitation and expansion, including finfish hatchery, seaweed tissue culture labs and post-harvest.
- Species/seaweed targeted aligned with provincial specificities
- Focus on UPTs distributed across Indonesia, to act as centre of excellence/ innovation and capacity building hubs



Project structure 2/2

A combination of infrastructures and soft components



Component 2: Extension, Training and Community Development

- Capacity building of KKP staff, including regional/ international training/ exchanges
- Farmers field training (production, post harvest) alongside inputs provided by UPTs, cooperative strengthening.
- Market access programmes



Component 3: Environmental Monitoring and Climate Adaptation

- Establish environmental monitoring infrastructure require to protect/ adapt production against climate, disease and environmental risks



Component 4: Project Management

- Support the KKP project management unit, including technical assistance



Seaweed-specific planned activities



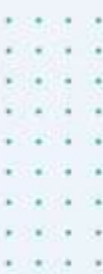
- Rehabilitation and upgrade of **UPTs' seaweed research and seed production facilities** into regional Centres of Excellence, with specific attention to **South Sulawesi, West Nusa Tenggara and Maluku**.
- Production and dissemination of **high-quality, disease-free and climate-resilient** seaweed planting material.
- Support to **community nurseries, cooperatives and extension services** to improve farmer productivity and adoption of best practices: 12,000 households targeted
- **Investment in post-harvest infrastructure** and value addition to strengthen domestic processing and market competitiveness.
- Environmental monitoring, sustainable spatial planning and climate adaptation for **resilient seaweed farming systems**.
- Capacity building and technology transfer to **strengthen Indonesia's seaweed innovation and support ecosystem**.

Only the beginning of the process...

Some key steps remain before the project to be implemented

- **Presentation of the pre-feasibility** by the KKP to the Bappenas for review/ feedback.
- Official request for support to AFD/IsDB and inclusion in the **Annual Planning** ("**Green Book**").
- **Full-feasibility study:**
 - Confirming scope/ locations, detailing requirements and costing of civil works capacity building, assessing E&S risks.
 - Integrating project in current market dynamics and existing initiatives
- Internal **project instructions** for development banks.
- **Securisation of grants** complementary to the sovereign loan, to support the programme.





**United Nations Industrial
Development Organization (UNIDO)**

Financing the Seaweed Transition

Session 4 • Investment, Finance & Blended Solutions

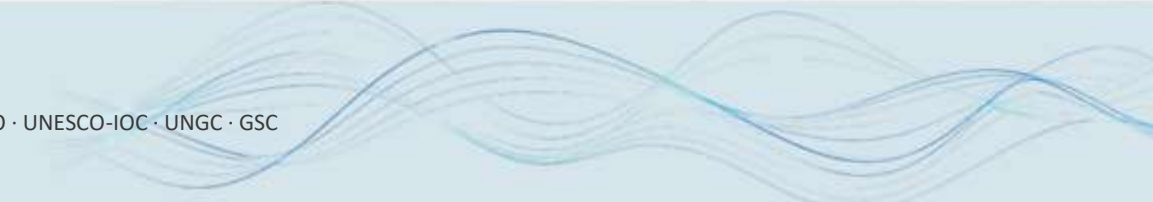
Nima Bahramalian Industrial Development Expert • UNIDO
June 29, 2026

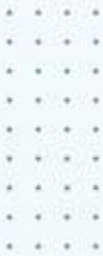
N.BAHRAMALIAN@UNIDO.ORG

<https://www.unido.org>

United Nations Industrial Development Organization (UNIDO)

Members & partners: Belize • Brazil • Chile • France • Indonesia • Madagascar • Republic of Korea • Senegal • UNCTAD • FAO • UNIDO • UNESCO-IOC • UNGC • GSC





THE STRATEGIC FRAME

Frame seaweed as an adaptation, mitigation and bio-diversity asset

WHY THE FRAMING MATTERS

While blue-carbon credits are more developed; adaptation and bio-diversity finance windows reward exactly what seaweed delivers — resilience for coastal economies and improvement of biodiversity— and they are larger, more patient, and a better fit for the de-risking work this sector needs.



Transformation of seaweed sector globally should be seen as a major investment opportunity across public and private sector.



Coastal livelihood diversification

Income resilience for vulnerable coastal communities.



Reduced pressure on wild fisheries

Easing strain on over-exploited marine stocks.



Ecosystem services

Habitat, water quality and biodiversity co-benefits.



Mitigating emissions

Bio-alternative to chemical farming inputs



Plastic pollution

Bio-alternative to replace plastic

WHERE THE SECTOR IS STUCK

The access-to-finance gap — the barriers stack



Sub-scale & fragmented

Ticket sizes fall far below anything a bank or fund will underwrite — an aggregation problem before a financing one.



The “missing middle”

Too large for microfinance, too small and risky for commercial banks — the classic SME gap in a young sector.



No collateral, informal

Often women-led and informal: no land title, no audited accounts, no credit history, sea-use rights unrecognized.



Risk without data

Biological, climate and thin-market risks — with too little performance history to price them, so capital stays away.



Currency & tenor mismatch

Local-currency revenue against hard-currency finance; long-gestation assets against short-tenor instruments.



Weak enabling environment

Unclear tenure, scarce insurance and weak quality infrastructure keep producers out of premium markets; missing MRVs.

RELEVANCE FOR GEF 9

The global seaweed challenge



A sector under pressure

Climate change is destabilizing the coastal oceans the sector depends on — warming, acidification, sea-level rise, storms and disease — while structural gaps hold seaweed back as a nature-based solution.



Genetic & climate risk

Only 10–12 of thousands of species are farmed — mostly *Kappaphycus* and *Eucheuma*, with weakened genes exposed to warming, disease and stress; mal-adaptation risk.



Value-chain limits

Exports stuck in low-value agar and carrageenan, with thin farmer margins. Higher-value markets — *Ulva*, *Sargassum* biostimulants — stay largely untapped.



Service gaps

Producer countries still lack the basics — policies, standards, biosecurity, gene banks and infrastructure — under fragmented governance.



Vulnerable communities

Climate-sensitive livelihoods with weak adaptive capacity — and women, youth and MSMEs face the steepest barriers and exclusion.

FOUR TRANSFORMATIONS WE DELIVER

From resilient farms to high-value products, standards and national policy



One integrated value chain

The programme works across the whole value chain, so gains compound rather than stall — each transformation helps make the next one bankable.



Climate-resilient farming systems

Improved seedstock, resilient strains, genetic-resource conservation, disease management, and IMTA and restorative ocean farming.



Market diversification

Intermediates — agar, carrageenan, alginates — and by-products, at 3–10× the margin of raw seaweed.



Enabling environment

Standards, quality infrastructure, food-safety labs, traceability and certification.



Integration in policies

Seaweed embedded in NDCs, NAPs, NBSAPs, blue-economy strategies and marine spatial planning.

Together these turn a low-value raw commodity into resilient, high-value, investable value chains.

GEF FOCAL AREAS

A multi-focal-area programme delivering global environmental benefits



Multi-focal-area by design

The programme delivers benefits across several GEF focal areas, letting countries align child projects to national priorities and financing windows



Climate Change Adaptation

Resilient coastal livelihoods and nature-based protection against sea-level rise, storm surge and climate shocks.



Biodiversity

Regenerative cultivation improves marine habitat quality in and around farm areas, measured via harmonized validated protocols.



International Waters

Seaweed takes up excess nitrogen and phosphorus, cutting nutrient loads in shared coastal ecosystems and reliance on synthetic fertilizers.



Chemicals & Waste

Downstream applications replace chemical inputs and fossil-based plastics, supporting wastewater treatment and nutrient recovery.

Each country picks the windows that match its priorities — adaptation, biodiversity, international waters or chemicals and waste.

PROGRAM ARCHITECTURE

One global framework, many country pathways



Global Component

- 1) Coordination
- 2) Strategic and Scientific Advisory
- 3) Normative Functions
- 4) M&E and knowledge management
- 5) Communication and outreach

Four modular components — national child projects select only what they need (4–6 countries, demand-driven).



1 • Resilient production

Species and strain diversification, temperature-resilient strains, gene banks, biosecure nurseries, and IMTA under marine spatial planning.



2 • Value addition

Climate-adaptive processing, higher-value products, SME incubation, market access, blended finance and women-led enterprises.



3 • Standards & markets

Food-safety labs, farm-to-fork traceability, certification, national regulation and regional standards convergence.



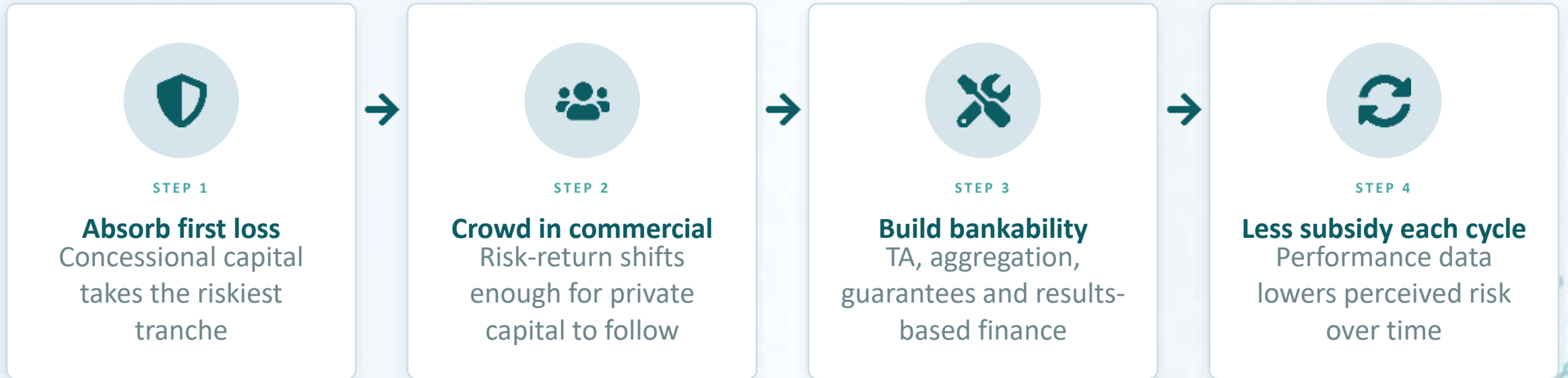
4 • Policy mainstreaming

Embedding seaweed in NDCs, NAPs, NBSAPs and blue-economy strategies, marine spatial planning, and national coordination via UNGSI.

Each national child project is a 2-page concept aligned to the PFD, choosing components and GEF window by national priority.

BLENDED FINANCE IS THE ARCHITECTURE

Concessional and grant capital — from the GEF and donors — absorbs first loss and changes the risk-return maths enough to crowd in commercial capital that would never enter alone.



A successful blend mobilized more capital and catalyzes wider impact.

WHAT WE ARE SEEKING FROM COUNTRIES

Expressions of interest & endorsement letters



Expressions of interest

Letters of support to explore participation in the programme and in UNGSI activities.



National focal points

Designated lead institutions to facilitate technical discussions and project design.



Priorities & alignment

Where seaweed advances climate, biodiversity, livelihoods, food security or blue-economy goals — and how it fits national strategies.



Partners & co-financing

Existing and prospective partners, financing initiatives and investment programmes that could align or co-finance.



Preferred areas of engagement

Each country's pathway differs by priorities and capacities — tell us where to focus.



Technical consultations

Join consultations to shape country-specific priorities and potential child projects.

Voluntary and country-driven: tell us where seaweed fits your national agenda, and we will help build the child project around it.

THE NEAR-TERM WINDOW

COP31 Antalya is where this case lands

COP31 — Antalya, Türkiye, 9–20 November 2026, hosted by Türkiye with Australia leading negotiations and a Pacific-led pre-COP — turns the global spotlight onto adaptation, finance and coastal vulnerability: exactly the case S4A makes.



Adaptation takes the stage

Loss & damage · SIDS finance

Antalya elevates adaptation funding and a dedicated SIDS climate-finance session — vindicating our frame: seaweed is an adaptation asset.



Delivery, not just pledges

Investment mobilization & facilitation

The proposed global programme mobilizes concessional and private capital and facilitates the deals — the real-world finance delivery the Presidency wants to showcase.



A coastal-South story to tell

Pacific pre-COP · frontline economies

The Pacific-led pre-COP and SIDS focus spotlight frontline coastal nations. Our members and the South–South model are a ready-made COP31 showcase.

The proposed global program is fundamentally an investment mobilization and facilitation platform, and COP31 in Antalya offers a unique opportunity to align that pipeline with emerging climate-finance priorities and capital flows.

Seaweed in non-food / materials applications: GEF-9 Concept note

Sustainable Materials Trade Programme (SMTP)



29.06.2026

Members and partners:

Members of the UNGSI (Belize, Brazil, Chile, France, Indonesia, Madagascar, Republic of Korea, and Senegal), UNCTAD, FAO, UNIDO, UNESCO-IOC, UNGC and GSC.

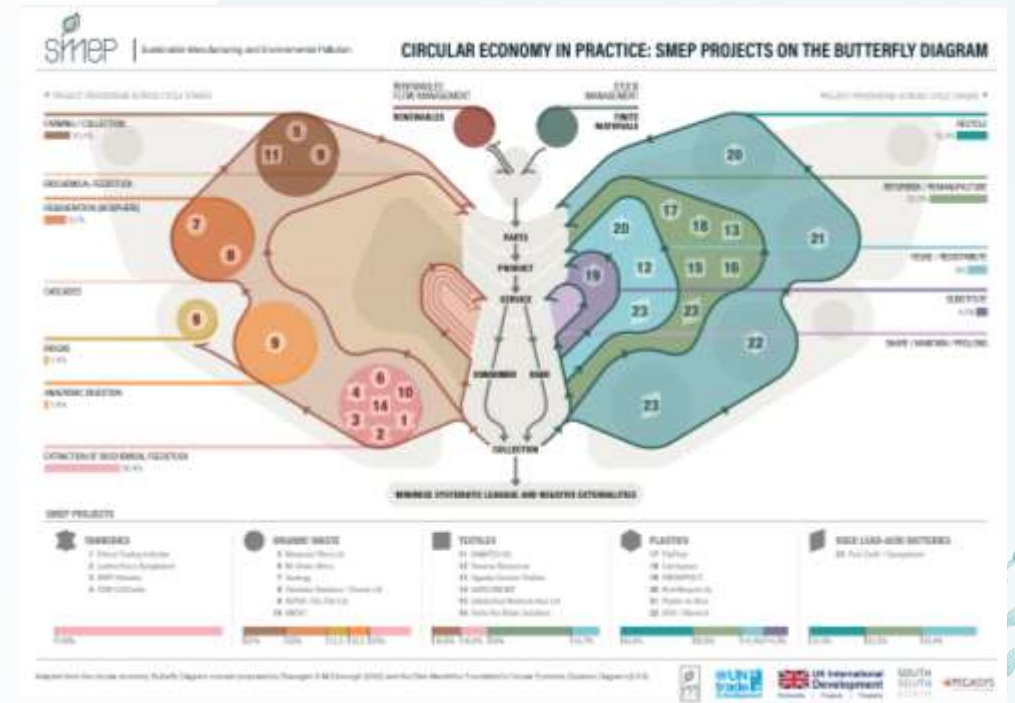


Origins – Sustainable Material Trade Programme SMTP

Evidence from UK-UNCTAD Sustainable Manufacturing and Environmental Pollution (SMEP) Programme

USD 32m, 27 field projects, including on plastics, natural fibers and improving process and production methods (industrial wastewater treatment and recovery)

Evidence from UN Oceans Forum / Conference; INC (plastics treaty) negotiations; UNCTAD statistical databases; UNCTAD Legacy work on biofuels and organic agriculture; Circular Economy / Biodiversity / Regenerative production



Origins - SMTP

Land use change

Food, Feed, Fuel: Land systems cant provide it all.

Biofuels, conventional / organic agriculture: All face limits based on land availability

Land-use change drives biodiversity loss, land conflict, food price inflation.

Petrochemicals / plastics: Operate at a scale that cannot be substituted for materials derived from land-based agriculture.

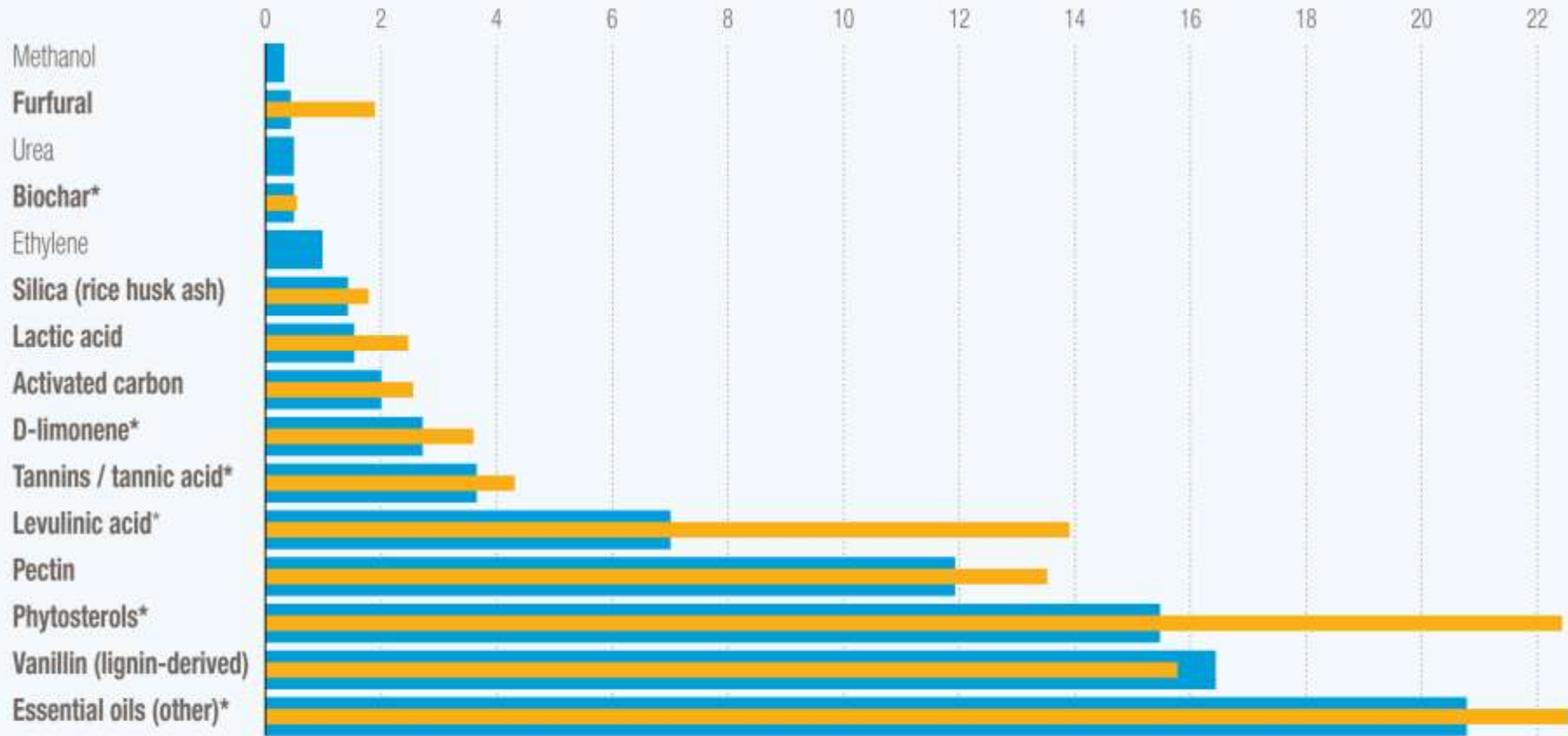




The Value Premium of Specialty Bio-Chemicals

Global unit price of Bio-chemical, Exports, USD/kg, (Avg & Median : 2017-2023)

■ Comtrade data 2017-2023 avg ■ Comtrade data 2017-2023 median



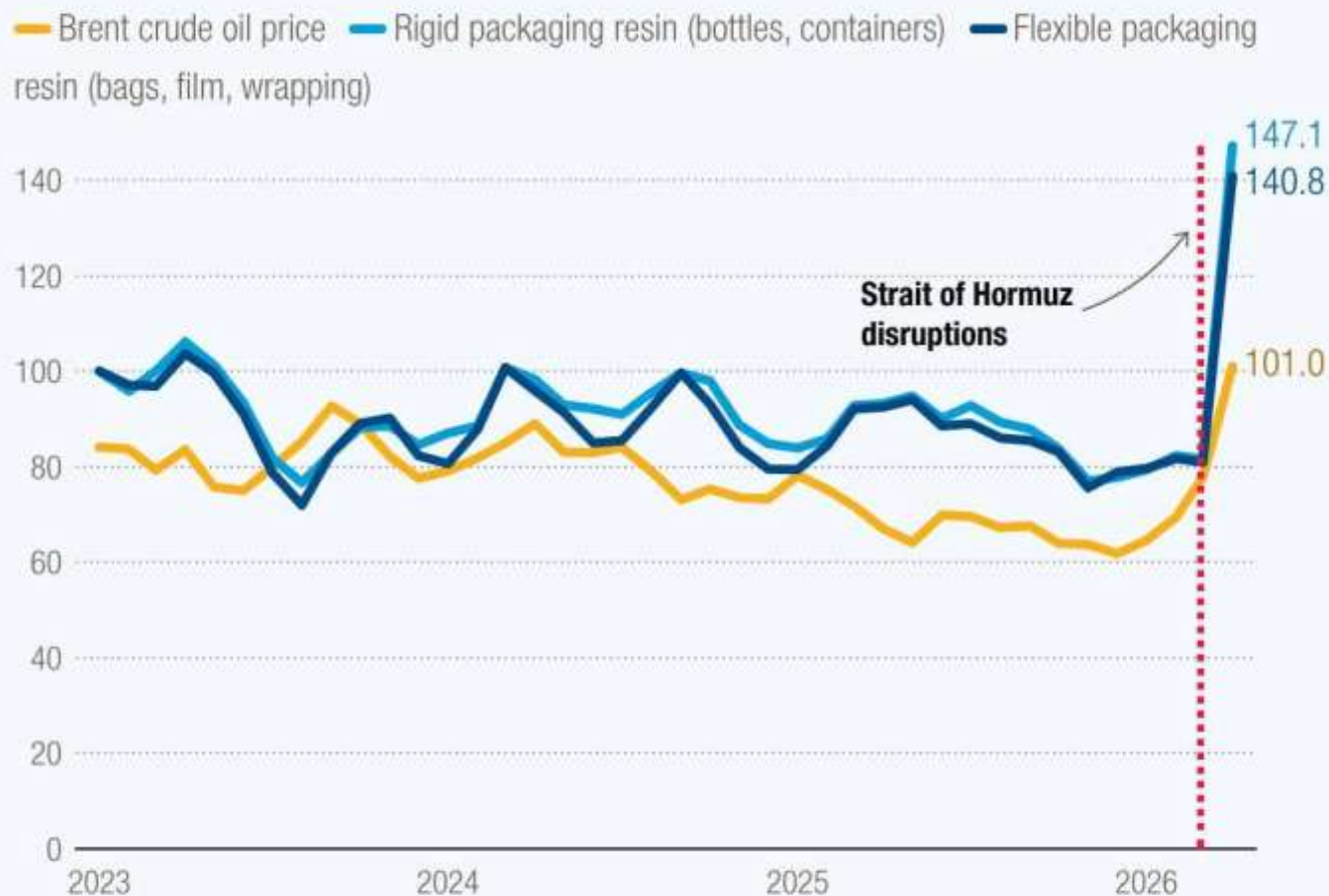
Source: UNCTAD 2026, data based on comtrade

Note: *Named subheading shared with similar products Unit price is approximate. Global weighted average unit price (USD/kg) reflecting transaction volumes, calculated after excluding statistical outliers (using the IQR method)



Hormuz Strait closure sends oil and plastics prices soaring

Plastic resin indexes, index 2023=100 and Brent crude oil price, dollars, January 2023 – April 2026



Source: UN Trade and Development (UNCTAD), based on LSEG data and analytics
Note: Rigid packaging resin refers to HDPE; flexible packaging resin refers to LLDPE



Avoiding regrettable substitution in materials systems (Plastics-> Substitutes)

Life Cycle Analysis evidence shows conventional process and production methods behind usual plastic substitutes (Paper, glass, natural fibers...) also pollute. Seaweed no exception.



SMTP

Core safeguard

– *avoiding regrettable substitution*

Trade policies can accelerate the shift from plastic to non-plastic substitutes. However, if these policies do not address **the pollution profile of substitute-material production**, they may only displace, rather than eliminate, environmental harm.

SMTP's dual approach uses **HS codes** for goods and **CPC codes** for services, addressing both substitution supply chains and the environmental services required for cleaner production.

As a result, value chains can transition more cleanly, fairly and at scale.

1	2	3	4
supply facilitation	demand creation	enabling cleaner production capacities	trade policy & services access
SMTP reduces tariff and non-tariff barriers on non-plastic substitute goods and safer additives. It supports HS reclassification to improve their market competitiveness, supports pilot production to generate evidence, and builds South-South trade corridors for bio-based and natural fibre materials. Supply is facilitated through trade, not aid.	SMTP aligns trade rules, product standards, and public procurement policies to generate predictable demand for safer substitutes. Inter-ministerial and intergovernmental cooperation links trade, environment, and industry ministries to build local support. Working with the WTO, WCO, and regional blocs (AFCFTA, ASEAN, and MERCOSUR), SMTP helps create demand signals that guide private investment.	SMTP supports access to cleaner process and production methods, safer additives, non-toxic coatings, and improved wastewater and VOC management through trade in environmental services. This helps prevent regrettable substitution by ensuring non-plastic production is not only commercially viable but also cleaner and more efficient, enabled by tradeable expertise and technology.	SMTP addresses regulatory barriers that impede trade in environmental services. Many developing economies that lack the capacity to manage pollution from substitute materials also maintain restrictive regimes on services imports. SMTP bridges this gap through GATS commitments, RTA scheduling, customs capacity-building and product composition services to verify additives at borders.
HS 1518 · 1521 · 4819.40 · 6305 · 7010	CPC 81122 · 83310 · 83931	CPC 83322 · 94110 · 94321 · 94413	CPC 83441 · 83449 · 83931 · 94229



Durable systemic shifts: Global Environmental Benefits arise from reformed rules, materials and markets, not temporary downstream interventions, and represent SMTP's core GEF-9 contribution.

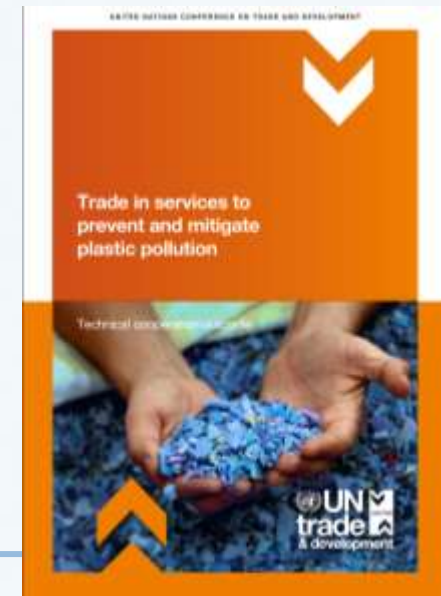
Cross-border accountability: Pollution-free supply chains and customs data transparency enable measurable and verifiable reductions in chemicals and plastics embedded in traded materials and products.

SMTP - Enabling regulatory infrastructure for seaweed as a key non-plastic substitute

Builds upon the USD 32 million UK-UNCTAD SMEP Programme learnings, Oceans Forum / Oceans Conference, and significant analytical work on the trade dimensions of non-plastic substitutes.

SMTP work is anchored in **DATA**

- **Harmonized system (HS) – Trade in Goods**
- **UN Common Product Classification (CPC) – Trade in Services**
- **UNCTAD Plastics trade database**
- **UNCTAD Non-plastic substitutes trade database**



UNITED NATIONS

Global Seaweed Initiative

Advancing safe, sustainable and inclusive growth for the global seaweed sector

SESSION 4: Financing the seaweed transition: public, private and blended solutions

Michael White

Partner - Planet Ocean Capital,

Chairman - Seaforester Group Limited

Founder – Collab Global

29 June 2026

michael.white@planetoocean.fund

mwhite@collab-global.com

www.planetoocean.fund

www.seaforster.org

www.seaweedsolutions.com

www.collab-global.com

Members and partners:

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Financing the seaweed transition

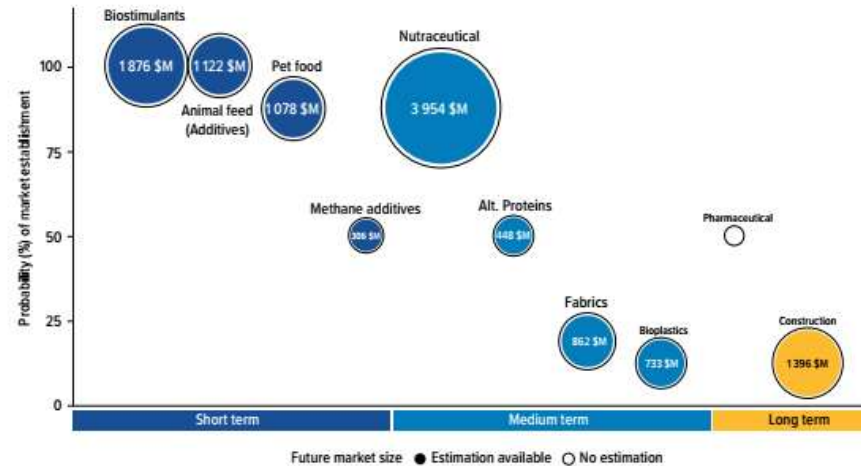
Background

Over the last 5 years there have been a number of publications on the opportunities in seaweed in both developed and emerging markets

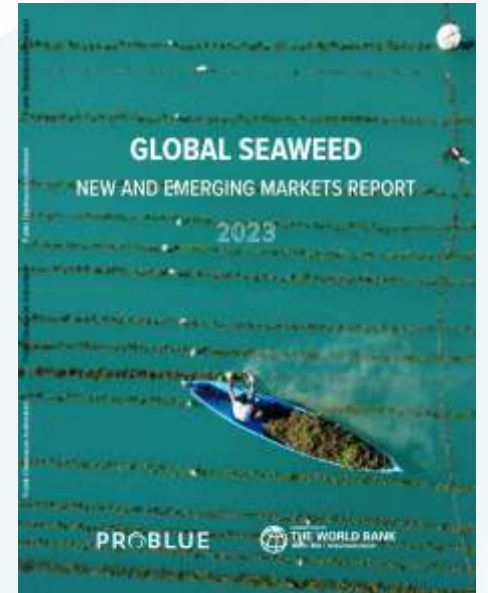
But few addressed how to fund investments. Some had guidance.

Until now, most new investments were from own sources, corporate players, development agencies, VC and private equity. There were no sector focused funding vehicles

FIGURE 32: Predicted seaweed market size by 2030 (\$M) with chance of market establishment indicated by color on a high-level market horizon timeline



One of the biggest obstacles is a lack of funding for seaweed companies. We see a need for increased global collaboration to establish investment support programmes for the seaweed industry so that smallholder farmers can get easier access to funding. These programmes should also be designed to facilitate the establishment of larger commercial enterprises that can operate in a more automated way and scale up seaweed production more rapidly. We believe that a guaranteed, pooled investment approach would work well to attract sufficient capital to unlock the industry's potential and help to achieve sustainability targets.



Financing the seaweed transition

Lessons from Asia

Countries outside of Asia produced less than 2% of the total farmed seaweed volumes in 2020. But each country outside of Asia will develop in a different way

As an example of Asian models- South Korea has long established relationships with Government with centralized strategies, technical institutions, well developed ecosystems and good financial support. Use of cooperatives with farmers supplying processors. These are high volume businesses selling to large markets. We can learn some key lessons but we need to develop differently.

We should concentrate on **ecosystems, innovation, value chains (drawing in corporates at an early stage), and scalable finance**. Opportunity for more international cooperation.

Innovation in Finance - Scalable finance can take the lead from terrestrial agriculture for SME funding (debt), green banks, generation 2 of micro-finance (larger loans), cooperative facilities. We can develop hybrid models – equity for operations funding and debt for capex. Need for expert investment teams. Need for investible cases

Additive instruments – blue carbon, biodiversity credits will require more science, data and engagement of corporates and other institutions willing to pay for such credits.

	Asia	Europe
Main production method	Farming	Wild harvesting
Seaweed production 2020 (wet tonnes)	~35 million	~300,000
2000 – 2020 y-o-y growth	~7% p.a.	~0% p.a.
Share of aquaculture	99%	4%



Financing the seaweed transition

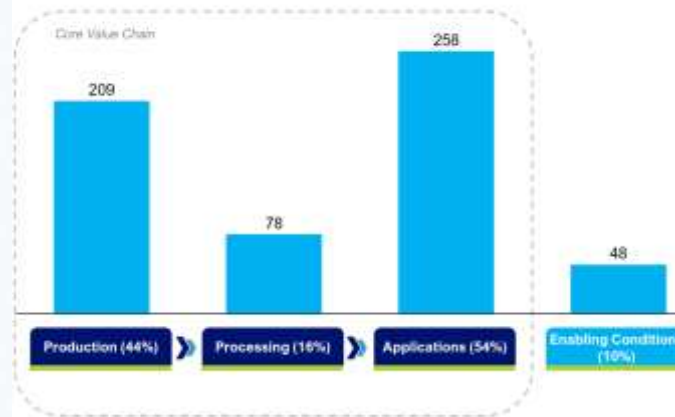
Market research to quantify market needs

In 2025 two landmark reports were published focused on the EU that sought to define the sectors that needed funding for seaweed and bivalves in EU

On the back of the EIB report, Collab Global published a guide to blended finance vehicles for SDG 14 based on experience in terrestrial funds in emerging markets. The first building block is to have a detailed market research on an investible case and that the expertise is already with the DFIs and some commercial institutions

Seaweed		
Debt financing archetype	Est. % of pipeline with financing need to 2030	Ticket size
Revolving loan	~15%	€200k - €1.5 m
Farming infrastructure & Green transition	~5%	€500k - €2 m
Mechanisation		
Processing and logistics	~3%	€500k - €5 m
Biorefinery	1%	€20m - €50 m
M&A	4%	€1m - €10 m

Europe seaweed pipeline breakdown by value chain
of organisations



Financing the seaweed transition

Dedicated debt fund for Seaweed (and Bi-valves)

Debt is the optimal instrument to fund growth at the SME levels. Debt can be sized and with terms to match the client and use of funds. Can be used to build out value chains with innovative processing solutions

Proposal is a €100m private debt fund for EEA/UK to fund working capital, capex, automation, climate resilience, M&A, succession, value chain investments. Sized from €500k to €5m. 30 investments.

Dedicated team with a track record in fund management, debt structuring, risk management and credit management and sector presence and expertise. Sector team led by Adrien Vincent and Ocean Factory. We are building this for EEA but it can be replicated in other markets. The team will work with country associations, banks, and potentially VC/ funds to source investments.

A €3-5m technical assistance facility (TAF) will provide training and ecosystem development in conjunction with partners.

Our solution: SBDF – a € 100m debt fund for a sustainable and resilient low trophic aquaculture in Europe, with a dedicated TAF

We aim to sustainably develop and strengthen the resilience of European low-trophic aquaculture to unlock ecological and climate benefits, diversify livelihoods and create jobs, and support a stronger food system and better nutrition

Investment Strategy

- Tailored debt with flexible models e.g. grace periods, revenue-based repayment
- 50% seaweed / 50% bivalves – Seaweed hatchery and farming, processing, and applications • Bivalve aquaculture (mussels, oysters, clams)
- Mostly SMEs and opportunistically start ups
- Ticket: €200k - €10M

Geographic Focus

- 70% EU allocation
- 30% non-EU Europe (UK, Norway)
- Primary focus: France, Spain, Norway, UK, Ireland, Portugal

Team

- Managed by Planet Ocean Capital, a specialist team combining marine sectors impact investing expertise
- Partnership with Ocean Factory, a seaweed and bivalve, and ocean impact expert advisory firm

Risk-adjusted Structure

- ESM Technical Assistance Facility (TAF) to support the use of tools, analysis for potential borrowers
- SFDR Article 9 – including screening and monitoring for Principle Adverse Impacts and Do No Significant Harm, EU Taxonomy Alignment – sustainable use and protection of water and marine resources
- Option to add first loss commitments if available



SEE ALL NEWS

18/05/2024

Origin by Ocean

EU Backing for First-of-a-kind Industrial-Scale Seaweed Biorefinery

European Investment Bank (EIB) appraises a proposed EUR 30 million participation as part of a EUR 65 million blended finance round to build the company's first industrial-scale biorefinery.



Blended Finance Investments in the Seaweed Sector

June 2026



Enhance the resilience of coastal reef ecosystems, communities and economies by unlocking new public and private resources that accelerate sustainable businesses and financial solutions



GLOBAL COALITION

GLOBAL FUND FOR
CORAL REEFS



PATHWAYS TO SCALE



GLOBAL TARGETS

GLOBAL FUND FOR
CORAL REEFS



30K+
*Directly
Supported
Reef-
Positive
Jobs*



400+
*Reef-Positive
Businesses
& Financial
Mechanisms*



20M+
*Community
Members with
Increased
Resilience*



3M HA
*Area of
Coral Reefs
Under
Improved
Management*



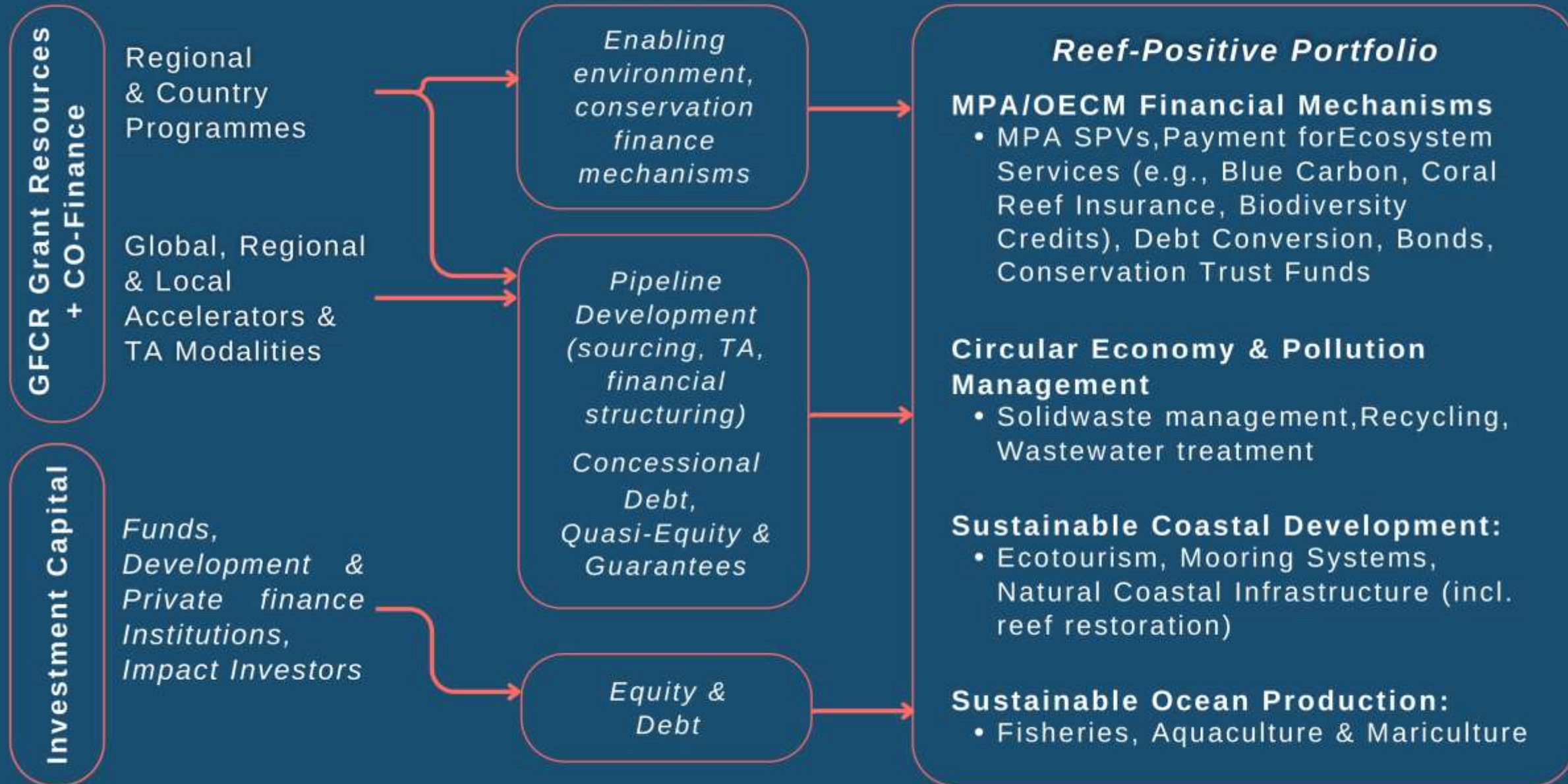
7.5M HA
*with
MPA area
Sustainable
Financing
Support*



\$2-3B
*Private
& Public
Finance
Leverage*



BLENDING FINANCE STRATEGY



GFCR IMPLEMENTATION - GLOBAL STATUS

As of November 2025



■ Programme Implementation
■ Technical Assistance

18

Country/Regional Programmes

22

Coral Nations Supported

11

SIDS & LDCs

72

Priority Sites Supported

317

Implementing & Government Partners Supported

151

Supported Business Solutions

24

Facilities



MEXICO: Carbonwave



Through its convening agent in the Mesoamerican Reef region, the MAR Fund, and the Mesoamerican Reef Technical Assistance Facility (MARTAF), GFCR supports the scaling of a sargassum upcycling model that converts invasive algae into bio-based polymers, displacing fossil-fuel plastics and other synthetic inputs. The initiative collects over 25,000 tons of sargassum annually, helping reduce pressure on coral reefs while building circular blue economy value chains across the region.

Estimated additional capital needs: \$45 million USD

Already Generating : \$1.3 million USD annually

GFCR Approved TA Coverage: \$475,000 USD



**Seaweed based fertilizer for
crop and soil resilience**



**Plant-based fabric
(plastic-alternative)**



**Emulsifiers for cosmetics &
skin-care products**



MEXICO: BioPlaster Research



Converts sargassum into biodegradable thermoplastics, biofertilizers, and compostable alternatives to single-use plastics. Positioned for blended-finance readiness, with GFCR identifying support needs for pilot-to-scale expansion, regulatory testing, and equipment upgrades for biopolymer refinement. Further investigation is needed to assess the biodegradability of the bio-based plastics in the natural environment.

Completed 2023 Acceleration Program. Active pipeline in Transactional Services area, successful fundraising for a total of 655,000 USD.





INDONESIA: Seadling



A seaweed biotech company supporting farmers through integrated contract farming and processing raw seaweed into functional ingredients for animal, plant, and human nutrition. Proprietary fermentation-based processing to convert seaweed into higher-value ingredients, paired with local sourcing and community partnerships in Borneo.

GFCR through CI Ventures deployed a US\$ 500,000 equity investment into Seadling as part of funds committed to GFCR.

CI Ventures support helps investees during fundraising to secure additional private and impact capital, with leverage close to 1:10





INDONESIA: Birufinery



Birufinery is an Indonesian blue economy startup that develops innovative marine-based products by upcycling seaweed and other ocean biomass. With a strong focus on circular economy principles, Birufinery transforms raw marine materials into sustainable goods such as biodegradable packaging and natural skincare products. The company works closely with coastal communities, empowering them through fair trade and capacity building, while simultaneously reducing marine waste and promoting regenerative ocean practices.

Supported at incubation stage through grant-based support (GFCR grant utilised: US\$150,000), aligned with the Biru Fund Reef+ Window approach, pairing catalytic finance with technical assistance to help community enterprises reach production readiness.





INDONESIA: Living Seas Aquafeed



Living Seas Aquafeeds, based in Indonesia, specializes in manufacturing nature-based functional aquafeeds for crustaceans. By upcycling locally available seaweeds and marine plants, they produce regenerative aquafeeds that enhance shrimp vigor, survival, and growth while reducing the need for conventional feed. Their products are developed through extensive trials at their experimental shrimp farm, Living Seas Lab, in Northern Lombok.

Supported by GFCR in Incubation stage with US\$350,000 investment secured through CIV and an R&D partnership with Mataram University; next 12 months focus on making the product fully market-ready.



