



Sustainable Aquaculture Development: policy and future

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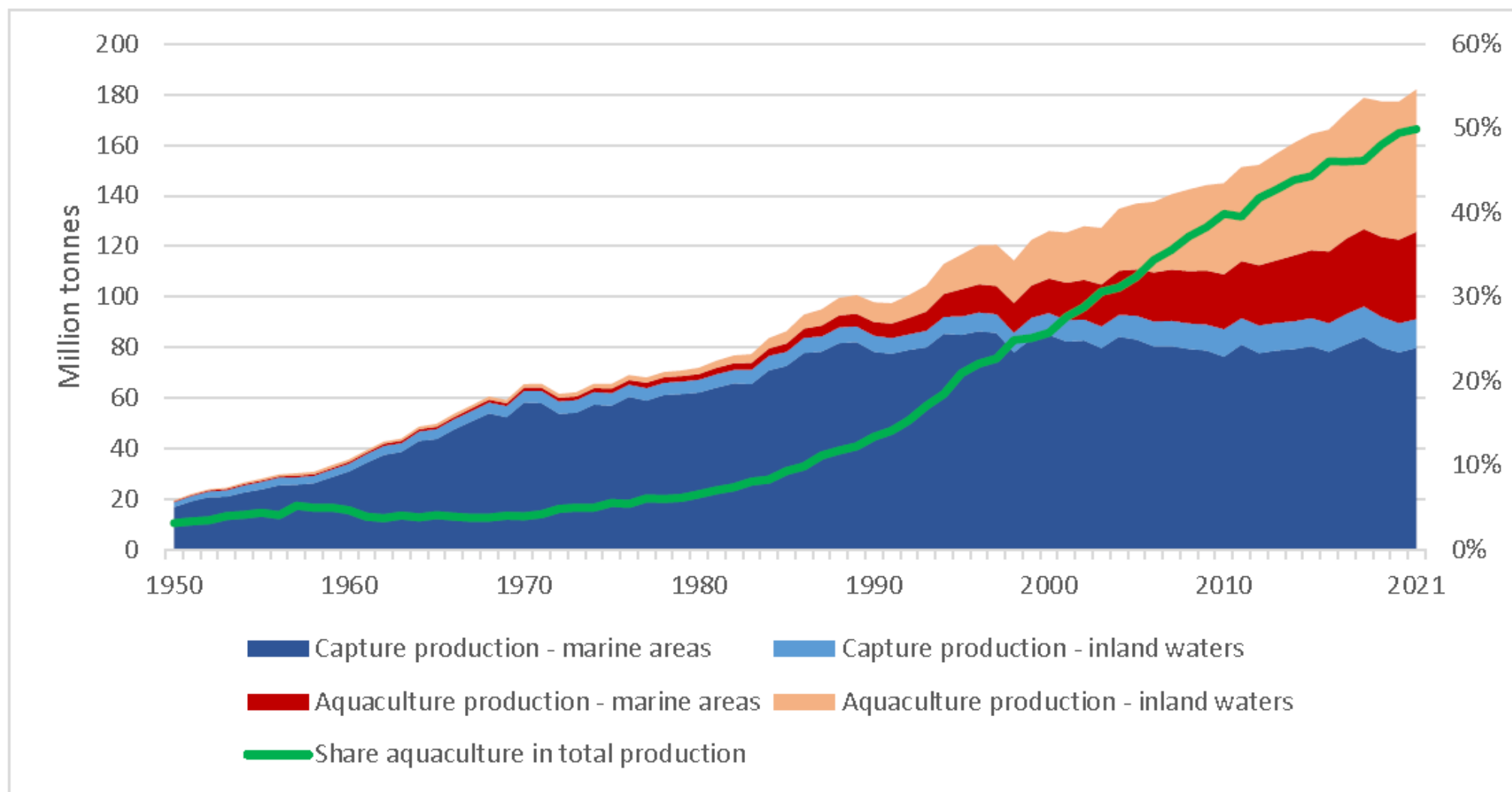
Rome, Italy



Contents

- World aquaculture status quo
- Blue transformation roadmap
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TOTAL FISHERIES AND AQUACULTURE PRODUCTION OF AQUATIC ANIMALS



Source: FAO 2023.



World Aquaculture Production Quantity and Value

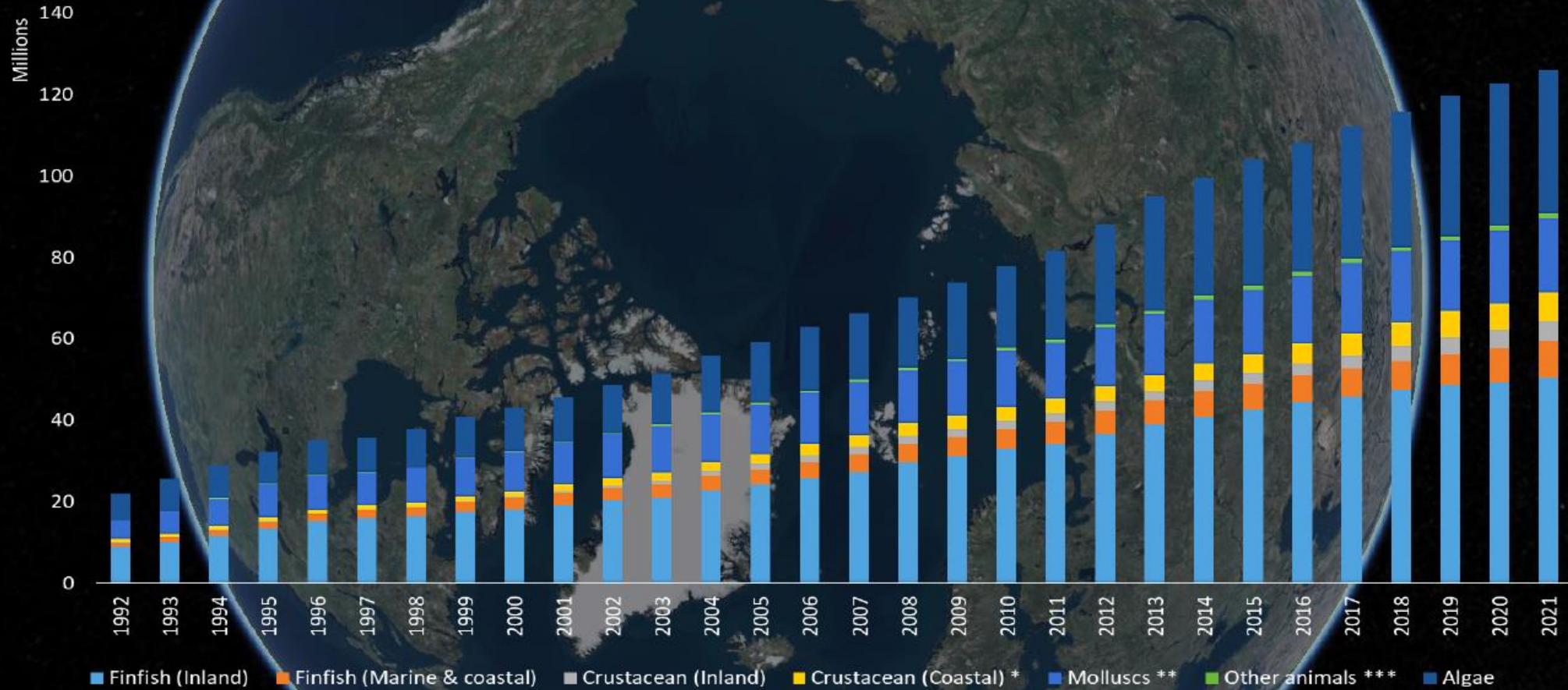
thousand tonnes

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Quantity (thousand tonnes) | | | | | | | | | | | | |
| Finfish, crustaceans and molluscs, etc. | 57 759.1 | 59 809.1 | 63 502.1 | 66 935.8 | 70 519.3 | 72 893.5 | 76 521.6 | 79 566.5 | 82 463.9 | 85 219.2 | 87 630.5 | 90 861.8 |
| Seaweeds and microalgae | 20 174.3 | 21 768.4 | 24 667.7 | 27 993.6 | 29 067.5 | 31 073.5 | 31 645.6 | 32 608.4 | 33 433.3 | 34 587.3 | 35 079.6 | 35 171.6 |
| Ornamental shells and pearls | 63.3 | 53.5 | 22.2 | 33.5 | 48.2 | 41.0 | 54.2 | 65.7 | 27.3 | 2.4 | 1.8 | 1.9 |
| Total aquaculture | 77 997 | 81 631 | 88 192 | 94 963 | 99 635 | 104 008 | 108 221 | 112 241 | 115 925 | 119 809 | 122 712 | 126 035 |
| Value (USD billion) | | | | | | | | | | | | |
| Finfish, crustaceans and molluscs, etc. | 1 311.9 | 1 548.5 | 1 699.1 | 1 920.6 | 2 109.2 | 2 069.1 | 2 239.0 | 2 389.3 | 2 492.9 | 2 591.7 | 2 632.7 | 2 808.9 |
| Seaweeds and microalgae | 88.6 | 90.6 | 107.8 | 114.4 | 112.7 | 104.7 | 114.4 | 123.0 | 134.5 | 147.3 | 151.6 | 154.5 |
| Ornamental shells and pearls | 2.4 | 2.5 | 2.3 | 2.4 | 2.7 | 2.4 | 2.6 | 2.9 | 2.6 | 1.9 | 1.4 | 1.4 |
| Total aquaculture | 140 | 164 | 181 | 204 | 222 | 218 | 236 | 252 | 263 | 274 | 279 | 296 |

Note: Quantities are in live weight, except ornamental shells and pearls that are in product weight.

World aquaculture production in three decades

live weight in million tonnes



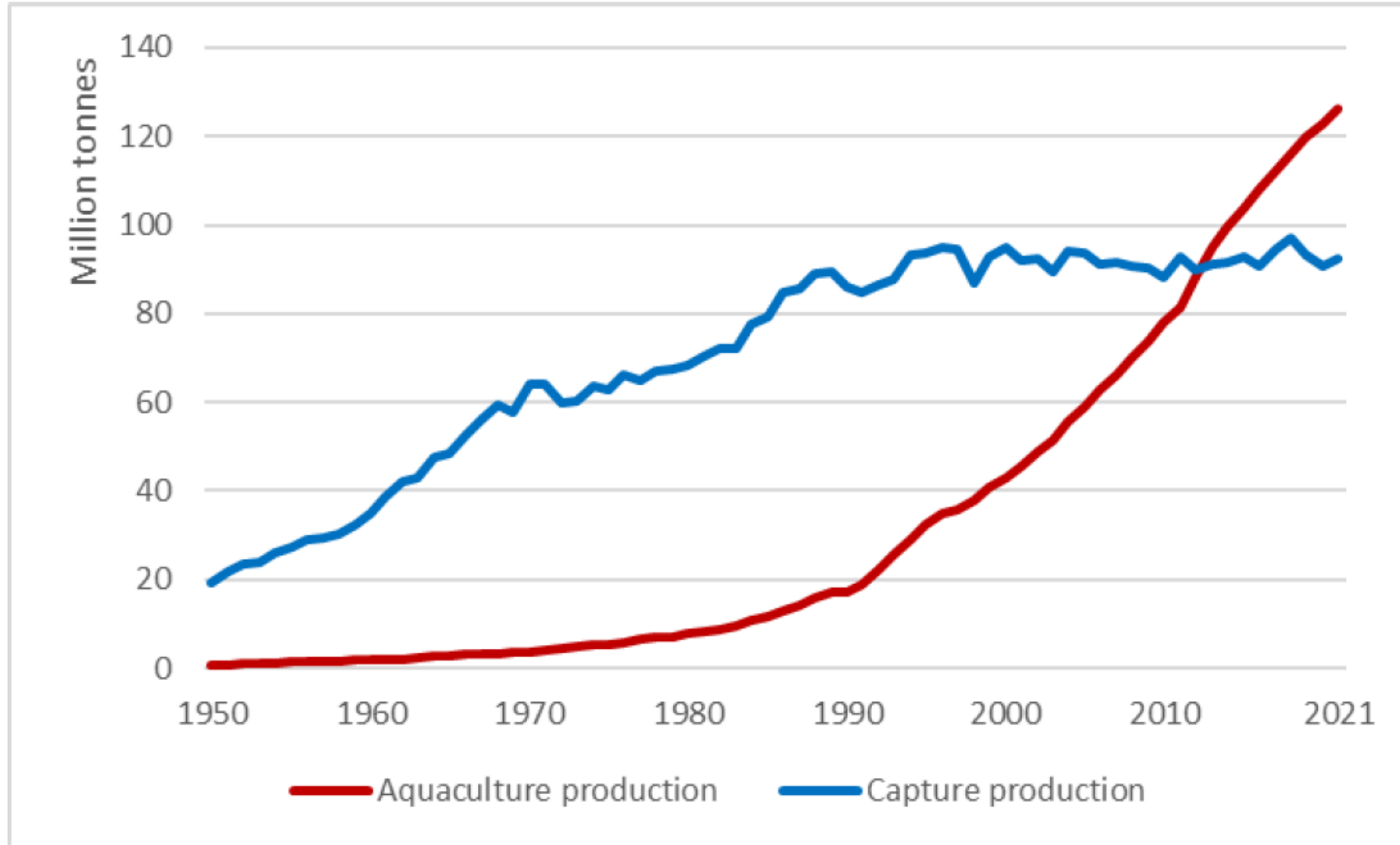
Note: * Includes small quantity of crustaceans grown in the sea (tropical lobsters, etc.)
 ** Dominated overwhelmingly by marine molluscs
 *** Includes aquatic turtles, frogs, sea cucumber, sea squirts, sea urchins, edible jellyfish, etc.



Share of aquaculture in total fishery production

| | Total production of aquatic animals | Total production of aquatic animals and algae |
|------|-------------------------------------|---|
| 2021 | 49.9 | 57.7 |
| 2010 | 39.8 | 46.9 |
| 2000 | 25.7 | 31.2 |
| 1980 | 6.5 | 10.3 |
| 1950 | 3.1 | 3.2 |

TOTAL FISHERIES AND AQUACULTURE PRODUCTION OF AQUATIC ANIMALS AND ALGAE



Source: FAO 2023.



WORLD CAPTURE FISHERIES AND AQUACULTURE PRODUCTION OF AQUATIC ANIMALS IN MILLION TONNES AND PERCENTAGE

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Capture fisheries | | | | | | | | | | | |
| Inland | 10.5 | 10.9 | 10.9 | 11.0 | 11.1 | 11.3 | 11.9 | 12.1 | 12.2 | 11.5 | 11.4 |
| Marine | 81.0 | 77.7 | 78.8 | 79.3 | 80.4 | 78.2 | 81.3 | 84.1 | 79.9 | 78.0 | 79.8 |
| Total capture fisheries | 91.6 | 88.7 | 89.7 | 90.3 | 91.6 | 89.5 | 93.2 | 96.2 | 92.1 | 89.6 | 91.2 |
| Aquaculture: | | | | | | | | | | | |
| Inland | 37.2 | 39.7 | 42.2 | 44.4 | 46.0 | 48.1 | 49.7 | 51.8 | 53.5 | 54.5 | 56.2 |
| Marine | 22.6 | 23.8 | 24.8 | 26.1 | 26.9 | 28.5 | 29.9 | 30.7 | 31.7 | 33.2 | 34.6 |
| Total aquaculture | 59.8 | 63.5 | 66.9 | 70.5 | 72.9 | 76.5 | 79.6 | 82.5 | 85.2 | 87.6 | 90.9 |
| Total inland | 47.7 | 50.6 | 53.1 | 55.4 | 57.1 | 59.4 | 61.6 | 63.9 | 65.7 | 66.0 | 67.6 |
| Total marine | 103.7 | 101.6 | 103.6 | 105.4 | 107.4 | 106.7 | 111.2 | 114.8 | 111.6 | 111.2 | 114.5 |
| Total world capture fisheries and aquaculture | 151.4 | 152.2 | 156.6 | 160.8 | 164.5 | 166.1 | 172.8 | 178.7 | 177.3 | 177.2 | 182.1 |

World aquaculture production of aquatic animals by region

live weight in thousand tonnes

| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-----------------|-------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Africa | Inland aquaculture | 1437.7 | 1567.0 | 1656.1 | 1719.5 | 1885.4 | 1895.3 | 2118.5 | 2144.8 | 2085.2 | 2142.8 |
| | Marine or coastal aquaculture | 61.4 | 63.7 | 73.1 | 69.5 | 104.8 | 142.5 | 130.7 | 146.4 | 177.9 | 179.2 |
| Americas | Inland aquaculture | 960.0 | 987.3 | 1144.2 | 1082.2 | 1111.6 | 1160.2 | 1205.2 | 1224.4 | 1252.3 | 1231.7 |
| | Marine or coastal aquaculture | 2030.6 | 1999.1 | 2204.6 | 2197.0 | 2205.4 | 2426.6 | 2646.1 | 2966.4 | 3109.3 | 3233.7 |
| Asia | Inland aquaculture | 36796.2 | 39129.5 | 41106.2 | 42691.0 | 44536.7 | 46107.0 | 47943.6 | 49612.9 | 50566.8 | 52262.1 |
| | Marine or coastal aquaculture | 19192.3 | 20244.3 | 21214.5 | 21989.0 | 23485.5 | 24583.6 | 25119.1 | 25661.7 | 26946.5 | 27997.7 |
| Europe | Inland aquaculture | 468.4 | 464.5 | 475.7 | 468.8 | 514.0 | 521.7 | 512.6 | 544.8 | 556.0 | 560.5 |
| | Marine or coastal aquaculture | 2369.6 | 2299.4 | 2458.2 | 2498.7 | 2473.7 | 2524.2 | 2583.5 | 2708.7 | 2711.3 | 3007.3 |
| Oceania | Inland aquaculture | 4.2 | 3.7 | 3.5 | 4.2 | 4.1 | 4.3 | 4.9 | 4.5 | 4.7 | 5.3 |
| | Marine or coastal aquaculture | 181.6 | 177.3 | 183.2 | 173.5 | 200.3 | 201.2 | 199.7 | 204.8 | 220.4 | 241.5 |
| Total | | 63502.1 | 66935.8 | 70519.3 | 72893.5 | 76521.6 | 79566.5 | 82463.9 | 85219.2 | 87630.5 | 90861.8 |

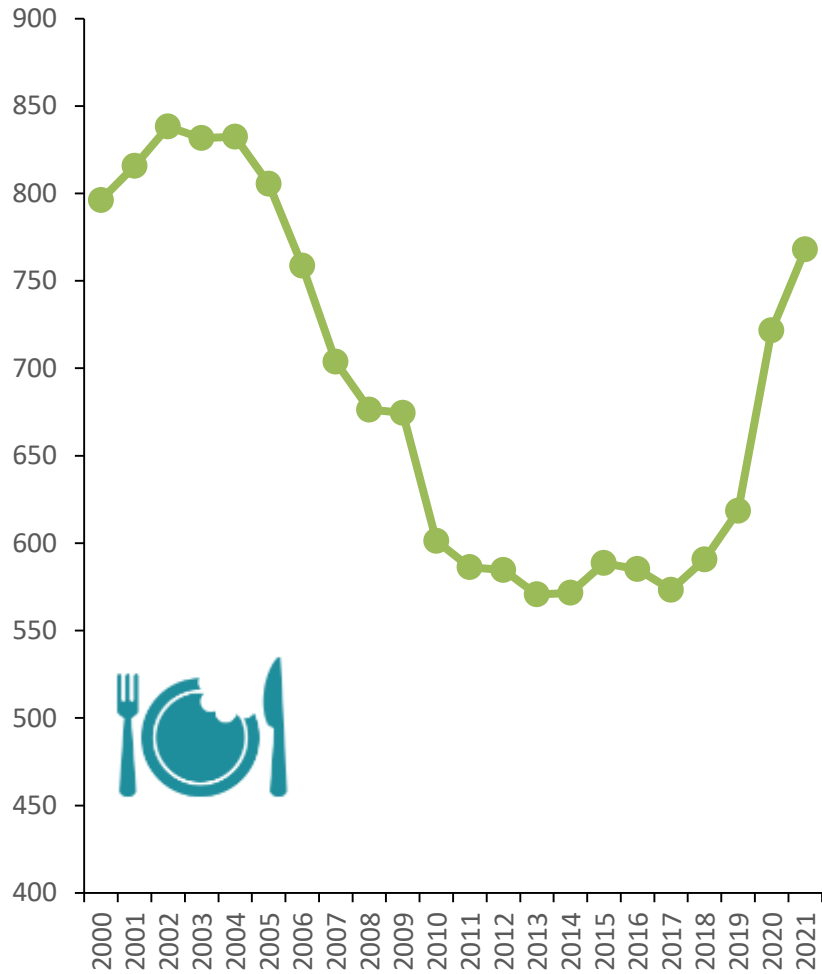
- Aquaculture production of animals and animals

| Total aquaculture | | | Aquaculture in marine waters | | | Aquaculture in inland waters | | |
|-------------------|-------------|---------------|------------------------------|-------------|---------------|------------------------------|-------------|---------------|
| | 2021 | Share | | 2021 | Share | | 2021 | Share |
| China | 51.2 | 56.4% | China | 19.4 | 56.0% | China | 31.8 | 56.6% |
| India | 9.4 | 10.3% | Viet Nam | 2.1 | 6.0% | India | 8.2 | 14.6% |
| Indonesia | 5.5 | 6.1% | Indonesia | 1.9 | 5.4% | Indonesia | 3.6 | 6.5% |
| Viet Nam | 4.7 | 5.2% | Norway | 1.7 | 4.8% | Viet Nam | 2.7 | 4.7% |
| Bangladesh | 2.6 | 2.9% | Chile | 1.4 | 4.1% | Bangladesh | 2.4 | 4.3% |
| Others | 17.3 | 19.1% | Others | 8.2 | 23.8% | Others | 7.5 | 13.3% |
| Total | 90.9 | 100.0% | Total | 34.7 | 100.0% | Total | 56.2 | 100.0% |

- Aquaculture production of animals and animals + algae

| Total aquaculture | | | Aquaculture in marine waters | | | Aquaculture in inland waters | | |
|-------------------|--------------|---------------|------------------------------|-------------|---------------|------------------------------|-------------|---------------|
| | 2021 | Share | | 2021 | Share | | 2021 | Share |
| China | 72.8 | 57.8% | China | 40.9 | 58.6% | China | 31.9 | 56.7% |
| Indonesia | 14.6 | 11.6% | Indonesia | 11.0 | 15.7% | India | 8.2 | 14.6% |
| India | 9.4 | 7.5% | Korea, Republic of | 2.4 | 3.4% | Indonesia | 3.6 | 6.5% |
| Viet Nam | 4.7 | 3.8% | Viet Nam | 2.1 | 3.0% | Viet Nam | 2.7 | 4.7% |
| Bangladesh | 2.6 | 2.1% | Philippines | 2.0 | 2.8% | Bangladesh | 2.4 | 4.3% |
| Others | 21.8 | 17.3% | Others | 11.4 | 16.4% | Others | 7.5 | 13.2% |
| Total | 126.0 | 100.0% | Total | 69.7 | 100.0% | Total | 56.3 | 100.0% |

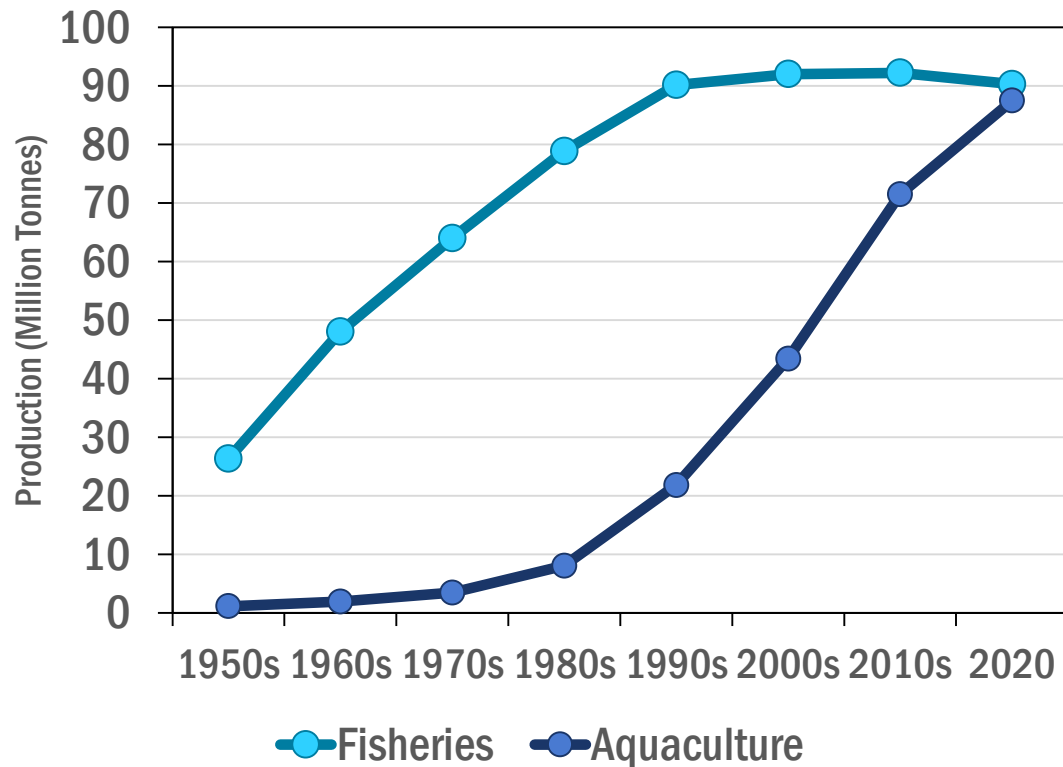
Undernourished (millions)



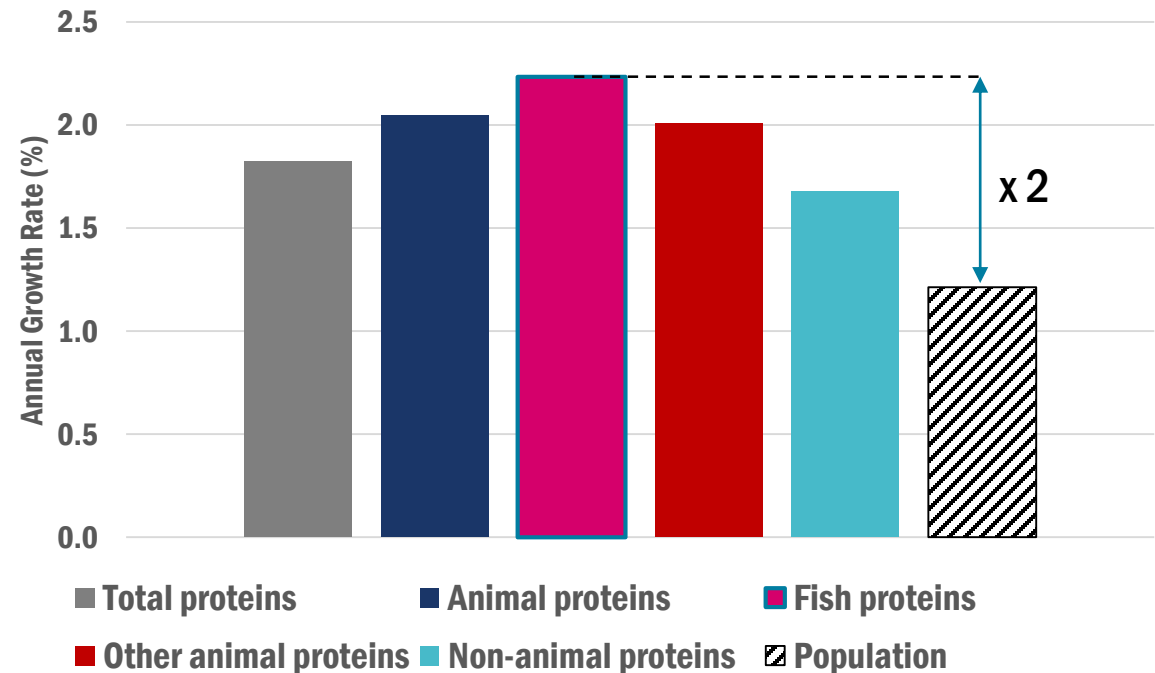
© FAO data



AQUATIC FOODS: TRANSFORMING AND IMPACTFUL

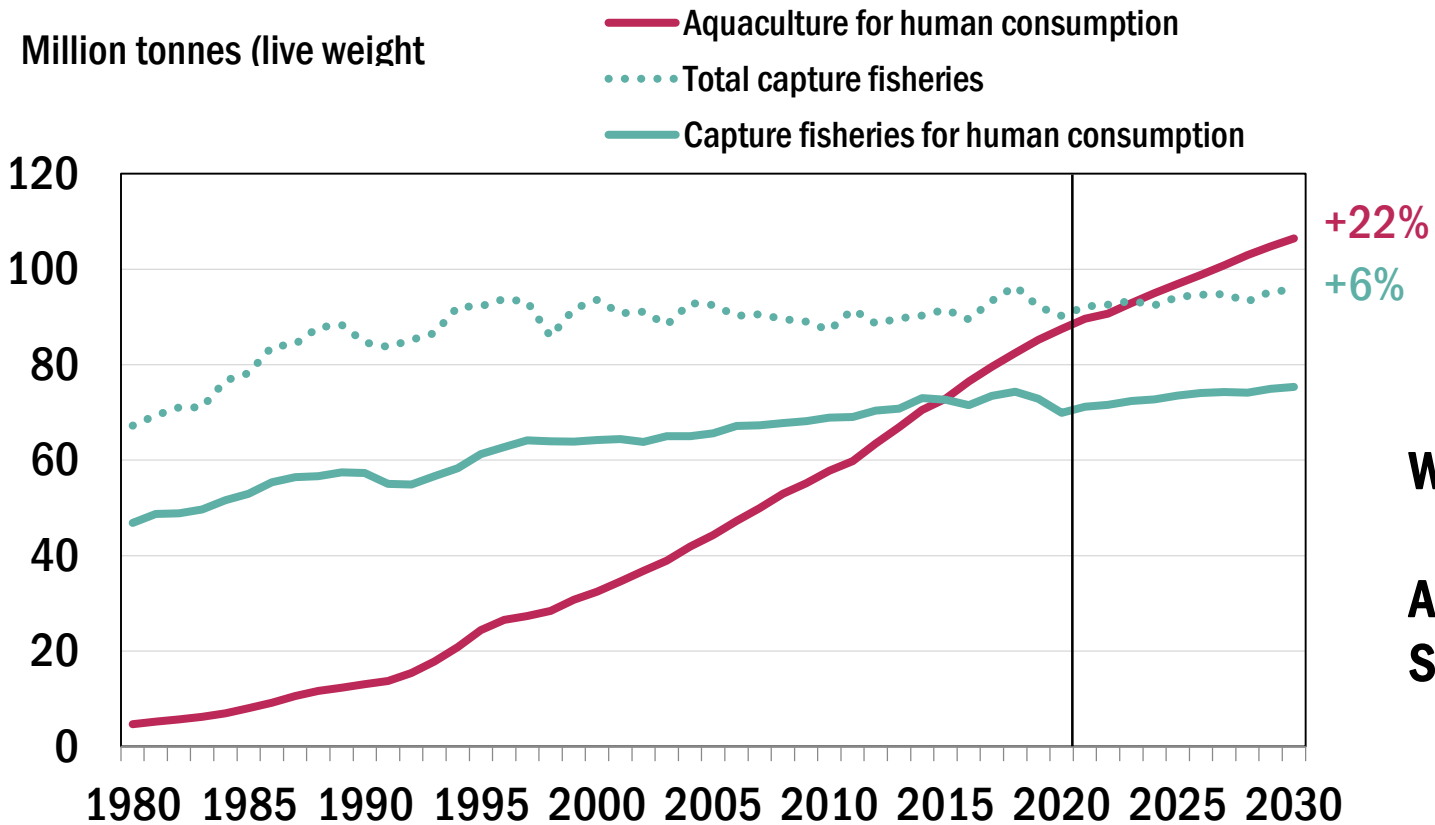


**Consumption Aquatic Animal Foods
(Global, 2010-2020)**



PRODUCTION OF AQUATIC ANIMALS EXPECTED TO GROW BY 14% BY 2030

Global capture fisheries and aquaculture production, 1990–2030, under *Business as Usual*



Present and Future FAO expectations of per capita consumption of fish

| | 2020 | → | 2030 |
|-------------------|--------|---|----------------|
| World | 20.2kg | | 21.4kg |
| Africa | 9.9kg | | 9.8 kg |
| S-S Africa | 8.6kg | | 8.4. kg |



FAO strategic framework





BETTER NUTRITION

End hunger, achieve food security and improved nutrition in all its forms (including promoting nutritious food and increasing access to healthy diets)

| | |
|---|--|
| BN1: Healthy Diets for All | 1 NO HUNGER 2 ZERO HUNGER 3 GOOD HEALTH AND WELL-BEING 12 RESPONSIBLE CONSUMPTION AND PRODUCTION 14 LIFE BELOW WATER |
| BN2: Nutrition for the Most Vulnerable | 1 NO HUNGER 2 ZERO HUNGER 3 GOOD HEALTH AND WELL-BEING |
| BN3: Safe Food for Everyone | 2 ZERO HUNGER 3 GOOD HEALTH AND WELL-BEING |
| BN4: Reducing Food Loss and Waste | 2 ZERO HUNGER 12 RESPONSIBLE CONSUMPTION AND PRODUCTION |
| BN5: Transparent Markets and Trade | 2 ZERO HUNGER 10 AFFORDABLE AND CLEAN ENERGY 17 PARTNERSHIPS FOR RENEWAL |



BETTER PRODUCTION

Ensure sustainable consumption and production patterns, through inclusive food and agriculture supply chains at local, regional and global level, ensuring resilient and sustainable and agri-food systems in a changing climate and environment

| | |
|--|---|
| BP1: Green Innovation | 2 ZERO HUNGER 6 CLEAN WATER AND SANITATION 15 LIFE ON LAND |
| BP2: Blue Transformation | 2 ZERO HUNGER 14 LIFE BELOW WATER |
| BP3: One Health | 1 NO HUNGER 3 GOOD HEALTH AND WELL-BEING 15 LIFE ON LAND |
| BP4: Small-Scale Producers' Equitable Access to Resources | 1 NO HUNGER 2 ZERO HUNGER 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE |
| BP5: Digital Agriculture | 1 NO HUNGER 2 ZERO HUNGER 5 GENDER EQUALITY 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 17 PARTNERSHIPS FOR RENEWAL |



BETTER ENVIRONMENT

Protect, restore and promote sustainable use of terrestrial and marine ecosystems and combat climate change (reduce, reuse, recycle, residual management) through more efficient, inclusive, resilient and sustainable agri-food systems

| | |
|--|---|
| BE1: Climate Change Mitigating and Adapted Agri-Food Systems | 2 ZERO HUNGER 13 CLIMATE ACTION 14 LIFE BELOW WATER |
| BE2: Bioeconomy for Sustainable Food and Agriculture | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION |
| BE3: Biodiversity and Ecosystem Services for Food and Agriculture | 2 ZERO HUNGER 14 LIFE BELOW WATER 15 LIFE ON LAND |



BETTER LIFE

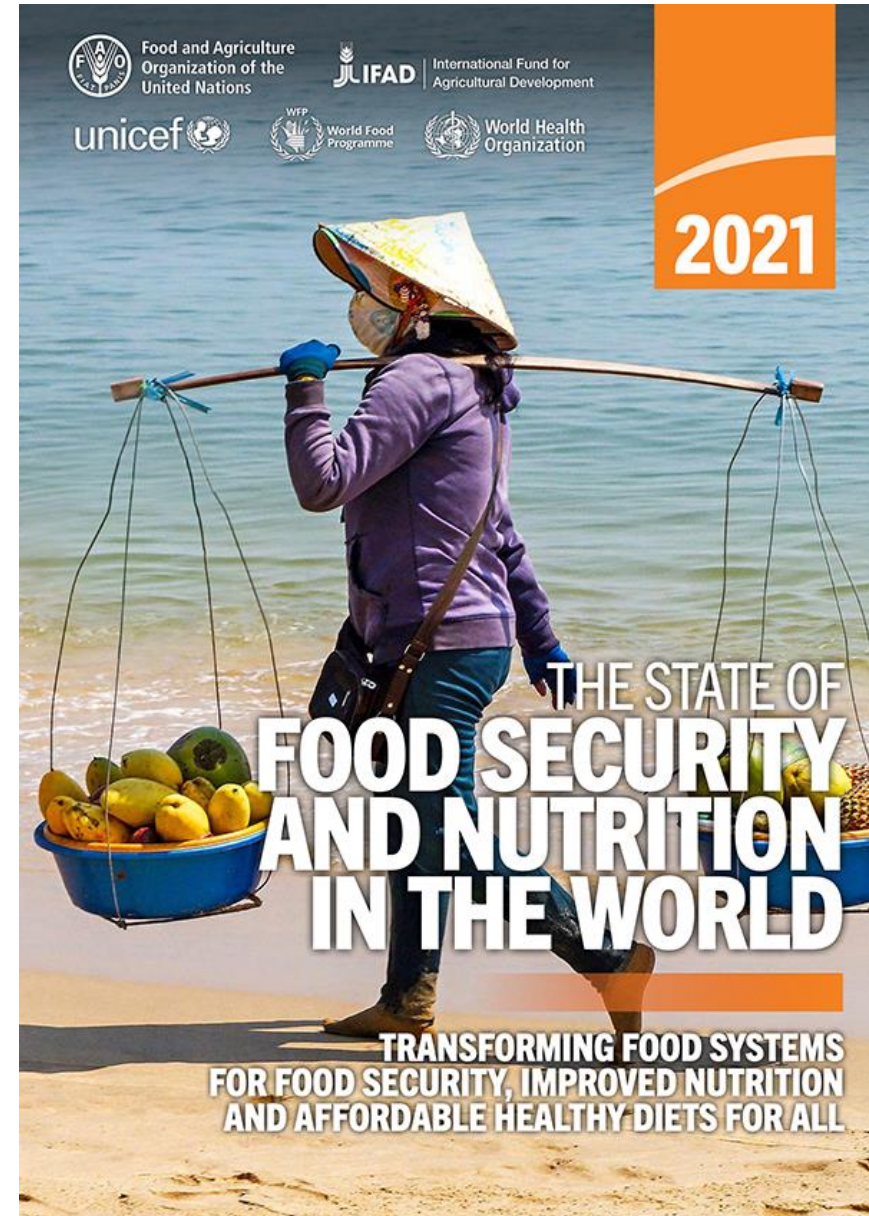
Promote inclusive economic growth by reducing inequalities (urban/rural areas, rich/poor countries, men/women)

| | |
|---|--|
| BL1: Gender Equality and Rural Women's Empowerment | 2 ZERO HUNGER 5 GENDER EQUALITY |
| BL2: Inclusive Rural Transformation | 1 NO HUNGER 8 ECONOMIC GROWTH AND JOBS 10 AFFORDABLE AND CLEAN ENERGY 14 LIFE BELOW WATER |
| BL3: Achieving Sustainable Urban Food Systems | 1 NO HUNGER 2 ZERO HUNGER 11 SUSTAINABLE CITIES AND COMMUNITIES 12 RESPONSIBLE CONSUMPTION AND PRODUCTION |
| BL4: Agriculture and Food Emergencies | 1 NO HUNGER 2 ZERO HUNGER 16 PEACE, JUSTICE AND STRONG INSTITUTIONS |
| BL5: Resilient Agri-Food Systems | 1 NO HUNGER 2 ZERO HUNGER |
| BL6: Hand-in-Hand (HIH) Initiative | 1 NO HUNGER 2 ZERO HUNGER 10 AFFORDABLE AND CLEAN ENERGY |
| BL7: Scaling up Investment | 1 NO HUNGER 2 ZERO HUNGER 10 AFFORDABLE AND CLEAN ENERGY 17 PARTNERSHIPS FOR RENEWAL |



The State of Food Security and Nutrition in the World 2021

- In 2020, between 720 and 811 million people faced hunger
- Around **660 million people may still face hunger in 2030**, in part due to lasting effects of the COVID-19 pandemic on global food security – 30 million more people than in a scenario in which the pandemic had not occurred.
- Beyond hunger, nearly one in three people did not have access to adequate food in 2020
- Healthy diets are out of reach for 3 billion people
- The way forward: Food system transformation



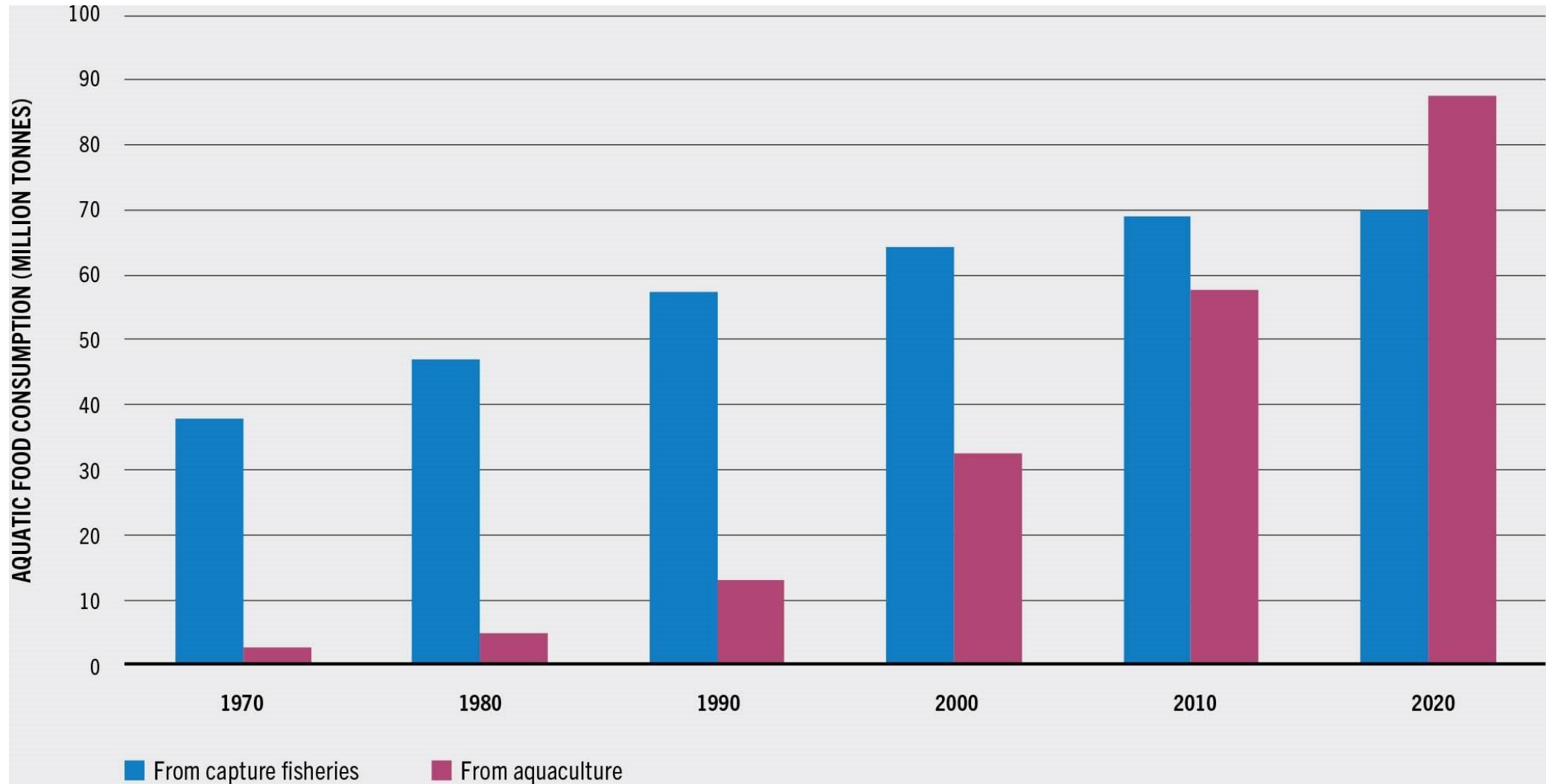


TOTAL AND PER CAPITA APPARENT CONSUMPTION OF AQUATIC FOODS BY REGION AND ECONOMIC CLASS, 2019

| Region/economic class | Total aquatic food consumption (million tonnes, live weight equivalent) | Per capita aquatic food consumption (kg/capita/year) |
|---------------------------------|--|---|
| World | 157.7 | 20.5 |
| World, excluding China | 100.3 | 16.0 |
| Africa | 13.1 | 10.0 |
| Americas | 14.8 | 14.6 |
| North America | 8.3 | 22.7 |
| Latin America and the Caribbean | 6.4 | 9.9 |
| Asia | 113.1 | 24.6 |
| Europe | 15.8 | 21.1 |
| Oceania | 1.0 | 23.2 |
| High-income countries | 32.0 | 26.5 |
| Upper-middle-income countries | 72.2 | 28.1 |
| Lower-middle-income countries | 50.0 | 15.2 |
| Low-income countries | 3.5 | 5.4 |



RELATIVE CONTRIBUTIONS OF AQUACULTURE AND CAPTURE FISHERIES TO AQUATIC FOODS AVAILABLE FOR HUMAN CONSUMPTION





Food and Agriculture Organization
of the United Nations

BLUE TRANSFORMATION

A roadmap for FAO's work
on aquatic food systems

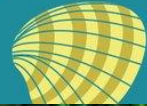
Blue Transformation

[blu: ˌtrænsfəˈmeɪʃən] - *adjective + noun*

A vision for sustainable,
productive, resilient
and equitable aquatic
food systems.



Food and Agriculture
Organization of the
United Nations





AQUATIC SYSTEMS ARE A POWERFUL SOLUTION: THE NEED FOR A BLUE TRANSFORMATION



OBJECTIVE 1

Sustainable aquaculture intensification and expansion satisfies global demand for aquatic foods and distributes benefits equitably.



OBJECTIVE 2

Effective management of all fisheries delivers healthy stocks and secures equitable livelihoods.



OBJECTIVE 3

Upgraded value chains ensure the social, economic and environmental viability of aquatic food systems.

Supply and production

Accessibility

Feeding the world through aquaculture intensification and expansion.

Aquaculture expansion



Analyzing key problems and opportunities

-  Expanded area
-  Diversified species
-  Diversified systems
-  Environmental restoration
-  Eco-tourism

Aquaculture intensification



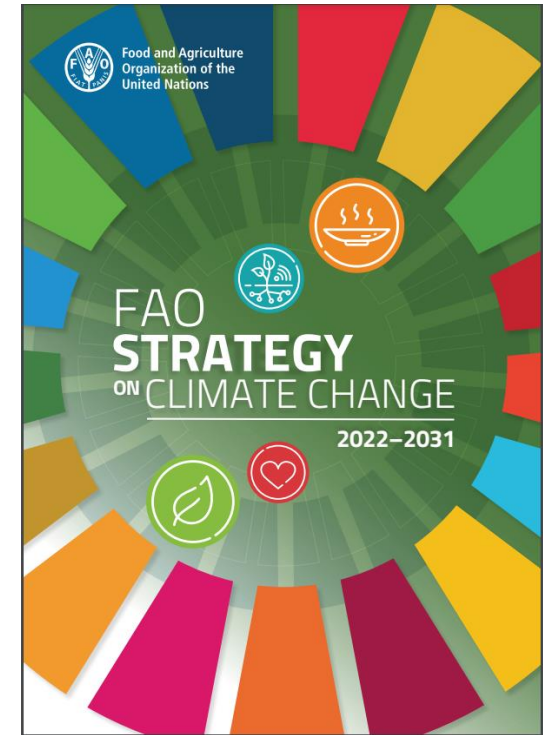
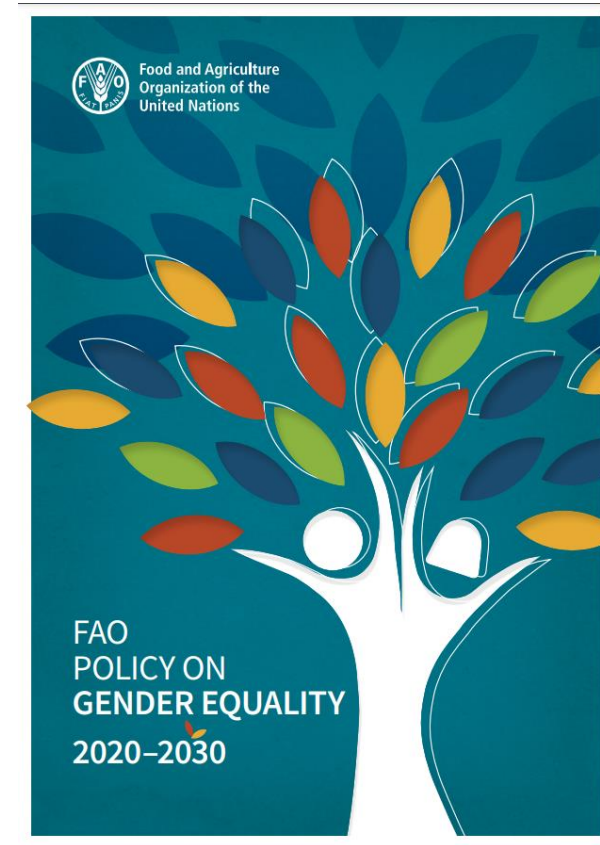
Analyzing key problems and opportunities

-  Aquafeed supply and management
-  Modern technology and digitalization
-  Quality seed supply and genetic resources
-  Farm management
-  Effluent management
-  Energy management



Cross-cutting and approaches

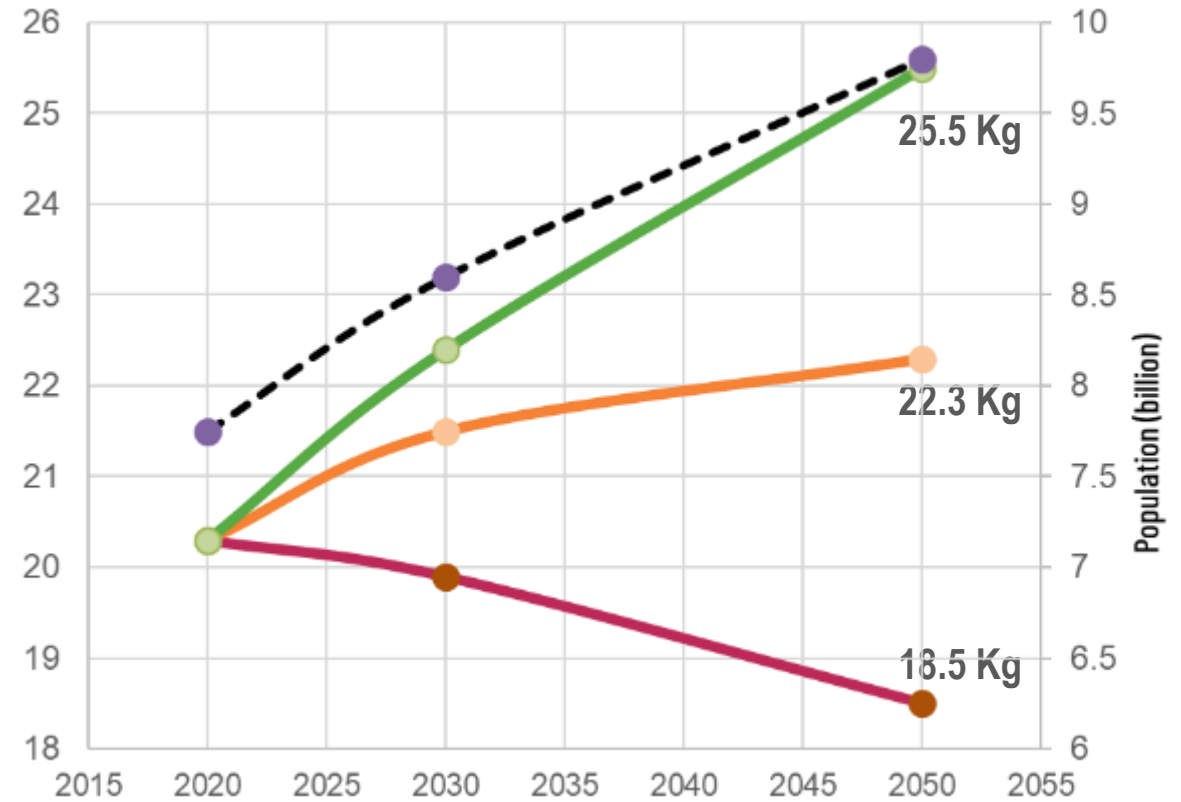
- Cross-cutting issues:
 - Mainstreaming nutrition
 - Empowering women
 - Attracting youth
 - Climate changes and biodiversity
- Approaches:
 - Participatory and partnering
 - Building capacity
 - Knowledge sharing
 - Policy support
 - Monitoring and data collection



BLUE TRANSFORMATION: MEETING EXPECTATIONS



Per capita consumption (kg/yr)
(Scenarios to 2050)



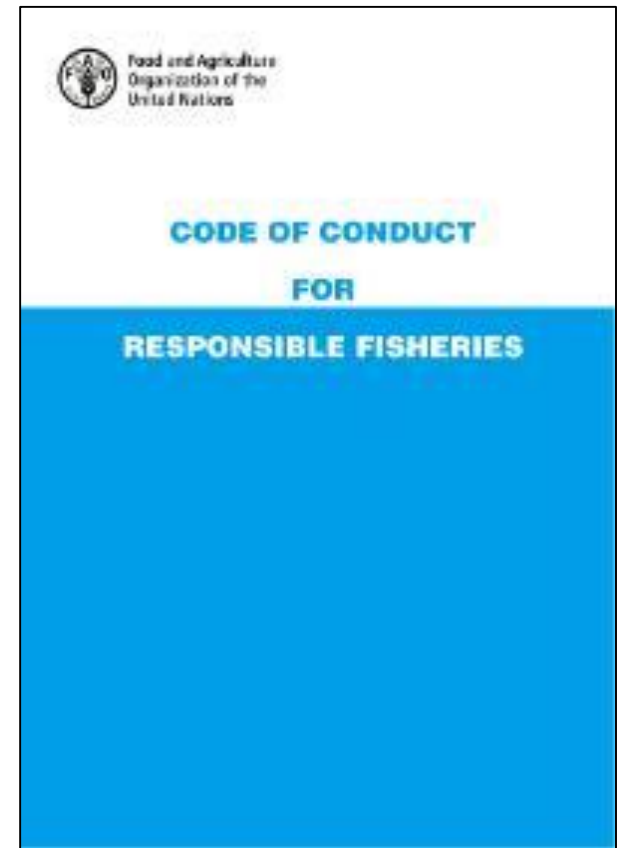


Guideline for Sustainable Aquaculture GSA

The Guidelines for Sustainable Aquaculture (GSA) will provide practical guidance to government authorities and policymakers in their efforts of:

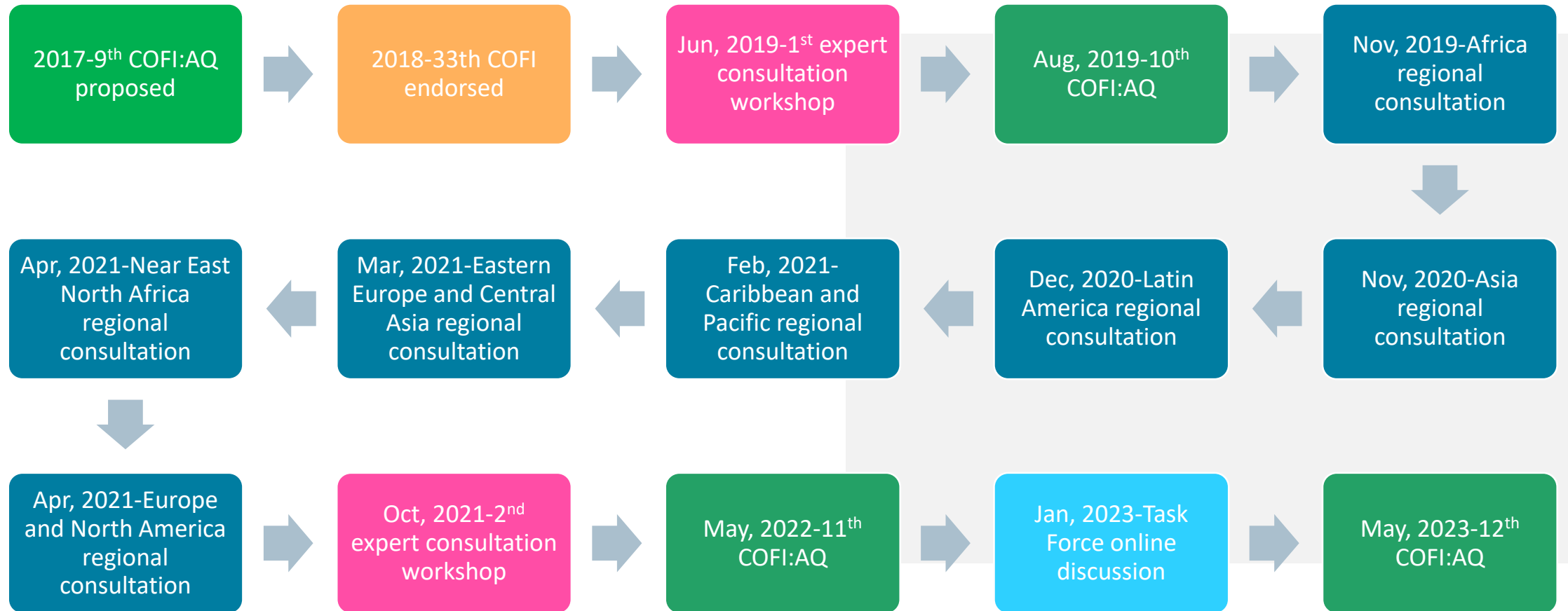
- promoting the implementation of CCRF, and
- engaging and enabling aquaculture to effectively participate in the implementation of the 2030 Agenda for Sustainable Development.

More specifically, it will help FAO Members use the existing and upcoming FAO guidelines to develop their sustainable aquaculture by advancing their capacity development in this area. For this, the GSA will build on the lessons learned from a series of successful and unsuccessful aquaculture case studies.





Guideline for Sustainable Aquaculture GSA





Guideline for Sustainable Aquaculture GSA

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The way forward

- Review and update the challenges in aquatic food trade
- Enhance the national capacity building for fisheries and aquaculture
- Encourage Research, Education and Development support
- Promote global partnership
 - Global Sustainable Aquaculture Advancement Partnership (GSAAP)
 - <https://www.fao.org/in-action/sustainable-aquaculture-partnership/en>



Global Sustainable Aquaculture Advancement Partnership (GSAAP)

Background [Partners](#) [News](#) [Publications](#)



Global Sustainable Aquaculture Advancement Partnership

The Global Sustainable Aquaculture Advancement Partnership (GSAAP) is a voluntary partnership mechanism of aquaculture stakeholders including universities, scientific research agencies, and other academic institutions established to enhance scientific understanding of aquaculture, promote continuous innovation of sustainable technologies, and fully harness the potential of aquaculture for achieving the Sustainable Development Goals. Private sector enterprises, civil and professional societies, non-governmental organizations, intergovernmental organizations, and government representatives provide complimentary support and linkages among wider stakeholders as advisory observers.

Thank you very much!

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