Opportunities for aquaculture in circular (bio)economy




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EU MISSIONS
RESTORE OUR OCEAN & WATERS

EU Missions in Horizon Europe

EU Missions are a new way to bring concrete solutions to some of our greatest challenges. They have ambitious goals and will deliver concrete results by 2030.

The 5 EU Missions are:

Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030
Cancer: working with Europe's Beating Cancer Plan to improve the lives of more than 3 million people by 2030 through prevention, cure and solutions to live longer and better
Restore our Ocean and Waters by 2030
100 Climate-Neutral and Smart Cities by 2030
A Soil Deal for Europe: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030

Restore our Ocean and Waters by 2030

EU Mission: Restore our Ocean and Waters

What this mission is, how it will work, how it was chosen, meetings, news, events.

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- What is the Mission?
- Mission Charter
- Funding opportunities
- Mission Portal
- Portfolio Analysis
- What are EU Missions?
- More information
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- Documents
- Latest
- Events

What is the Mission?

With a 2030 target, the EU Mission "Restore our Ocean and Waters" aims to protect and restore the health of our ocean and waters through research and innovation, citizen engagement and blue investments. The Mission's new approach will address the ocean and waters as one and play a key role in achieving climate neutrality and restoring nature.

Cross-cutting enabling actions will support this objective, in particular broad public mobilisation and engagement and a digital ocean and water knowledge system, known as Digital Twin Ocean.

The Mission supports regional engagement and cooperation through area-based "lighthouses" in major sea/river basins: Atlantic-Arctic, Mediterranean Sea, Baltic-North Sea, and Danube-Black Sea. Mission lighthouses are sites to pilot, demonstrate, develop and deploy the Mission activities across EU seas and river basins

Mission Charter

We are calling on Member States, regions and a wide range of stakeholders to endorse the Charter and pledge actions that will contribute to the successful implementation of the Mission and its lighthouses.

Please click below to endorse the Charter and pledge actions

Endorse the Charter

Action pledges submitted so far, interactive map

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Restore our Ocean and Waters by 2030

The Mission supports regional engagement and cooperation through area-based “lighthouses” in major sea/river basins: Atlantic-Arctic, Mediterranean Sea, Baltic-North Sea, and Danube-Black Sea.

Mission’s lighthouses are sites to pilot, demonstrate, develop and deploy the Mission activities across EU seas and river basins.
In line with the Mission Implementation Plan,

- the lighthouses in the Danube River basin and the Atlantic & Arctic Sea basin both focus on Mission objective – protect and restore marine and freshwater ecosystems and biodiversity,
- the lighthouse in the Mediterranean Sea basin focuses on the implementation of the Mission’s objective - prevent and eliminate pollution,
- the Baltic-North Lighthouse focuses on Carbon neutral and circular blue economy.

- There are also cross-basen projects/actions

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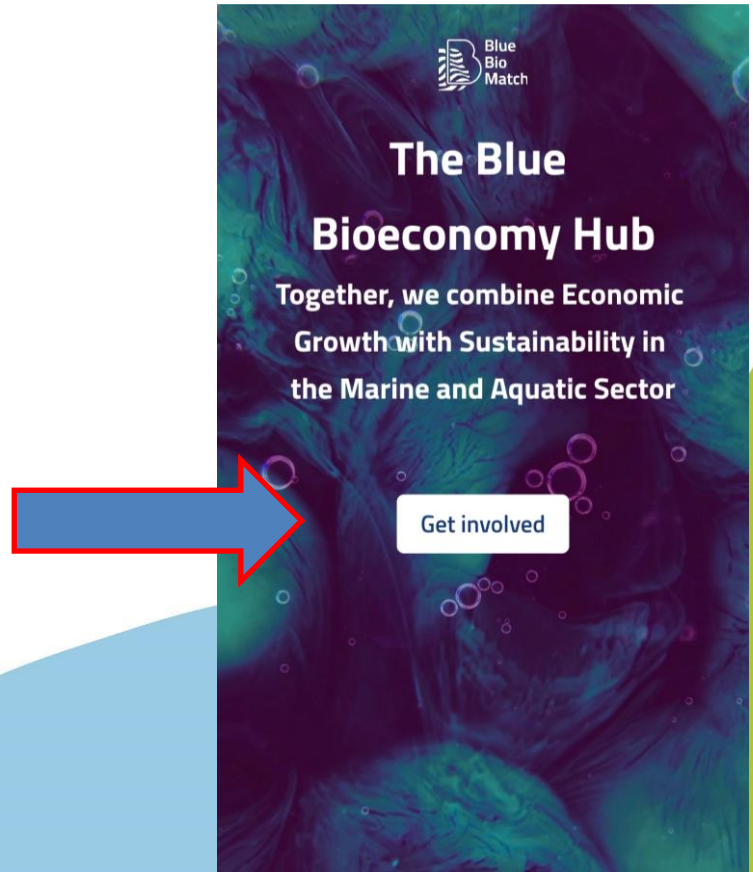
Restore our Ocean and Waters by 2030

Funding opportunities
(tenders and opportunities)

Framework Programme	Number of projects	EU contribution (M€)[3]
H2020	388	2249,6
HORIZON	181	1174,8
Interreg (ERDF)	119	199,9
LIFE2027	74	226,4
EMFF	28	37,9
ERASMUS2027	11	38,0
CEF	10	40,5
EMFAF	9	9,3
LIFE	7	32,3
COSME	6	3,8
CEF2027	2	27,7
DIGITAL	2	2,8
I3	1	5,1
EPLUS2020	1	5,0
SMP	1	1,4
ESTAT	1	0,2
Total	841	4055



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Restore our Ocean and Waters by 2030

HORIZON CLUSTER 6 (read full document on the link)

Work Programme 2023-2024
9. Food, Bioeconomy, Natural Resources, Agriculture and Environment

- Fair, healthy and environment-friendly food systems from primary production to consumption (Sustainable fisheries and aquaculture; Sustainable, healthy and inclusive food systems, etc.)

- Call - Circular economy and bioeconomy sectors
- HORIZON-CL6-2023-CircBio-01-1: Enhancing collaboration between Circular Cities and Regions Initiative's (CCRI) supporting organisations
- HORIZON-CL6-2023-CircBio-01-2: One hundred circular model households: making European households sustainable through inclusive circular practices

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Where and how does aquaculture fit here?

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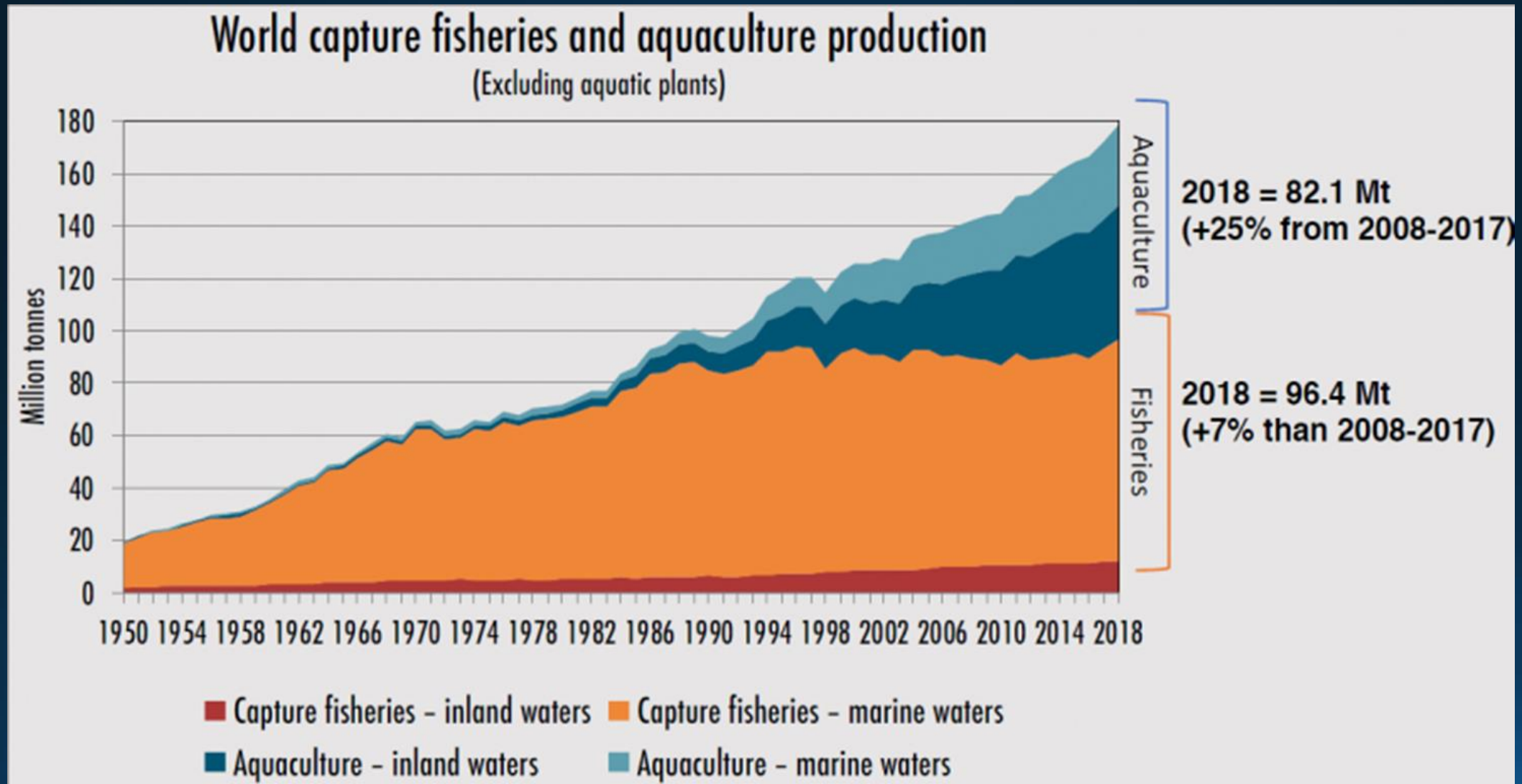
Restore our Ocean and Waters by 2030

EMFAF WP 2024-2025 (read full doc and be prepared)

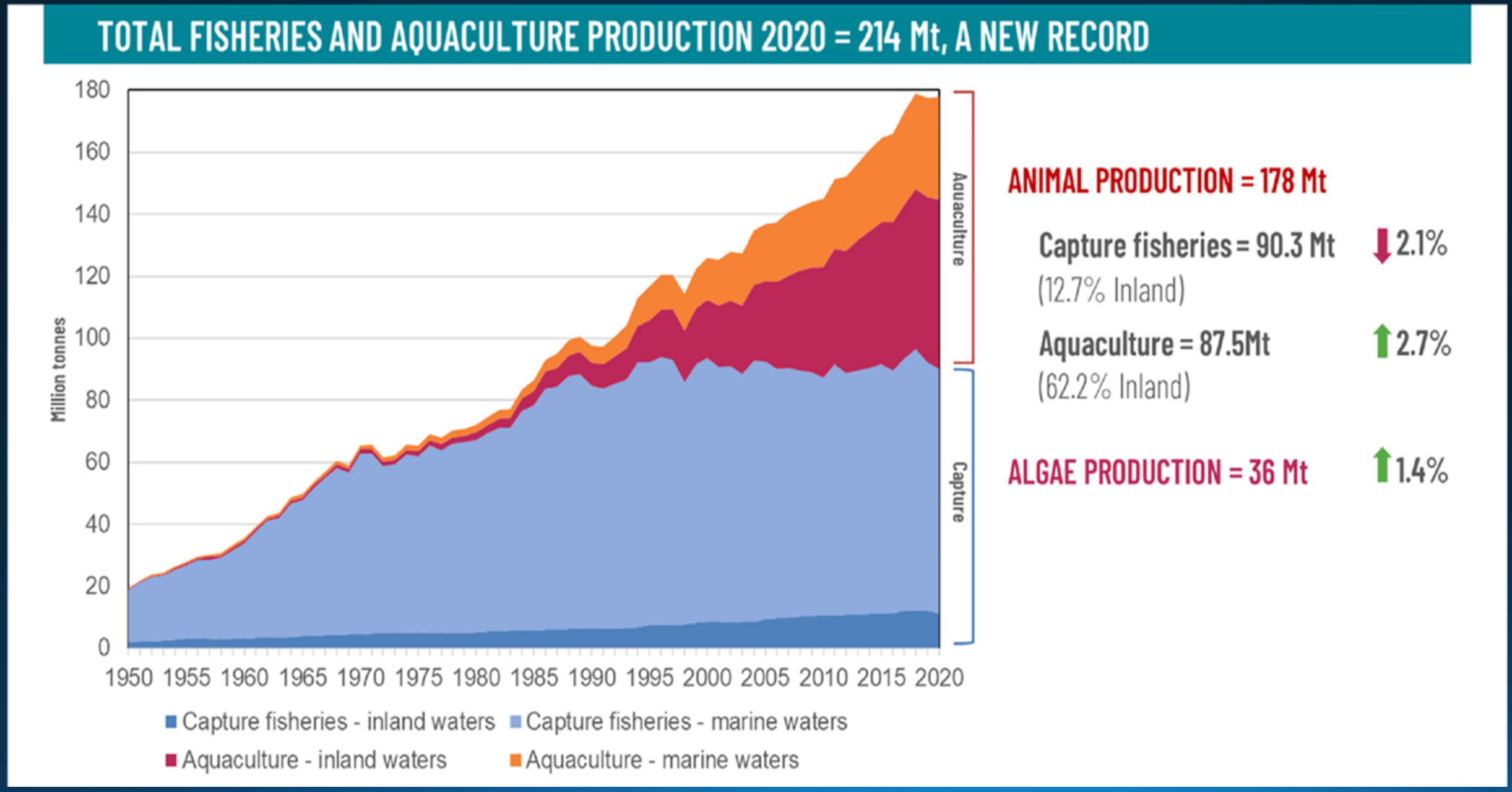
Follow open calls at: https://cinea.ec.europa.eu/funding-opportunities/calls-proposals_en

LIFE Program Calls for proposals

FAO – State of world aquaculture and fisheries (2020)



FAO – State of world aquaculture and fisheries (2022)



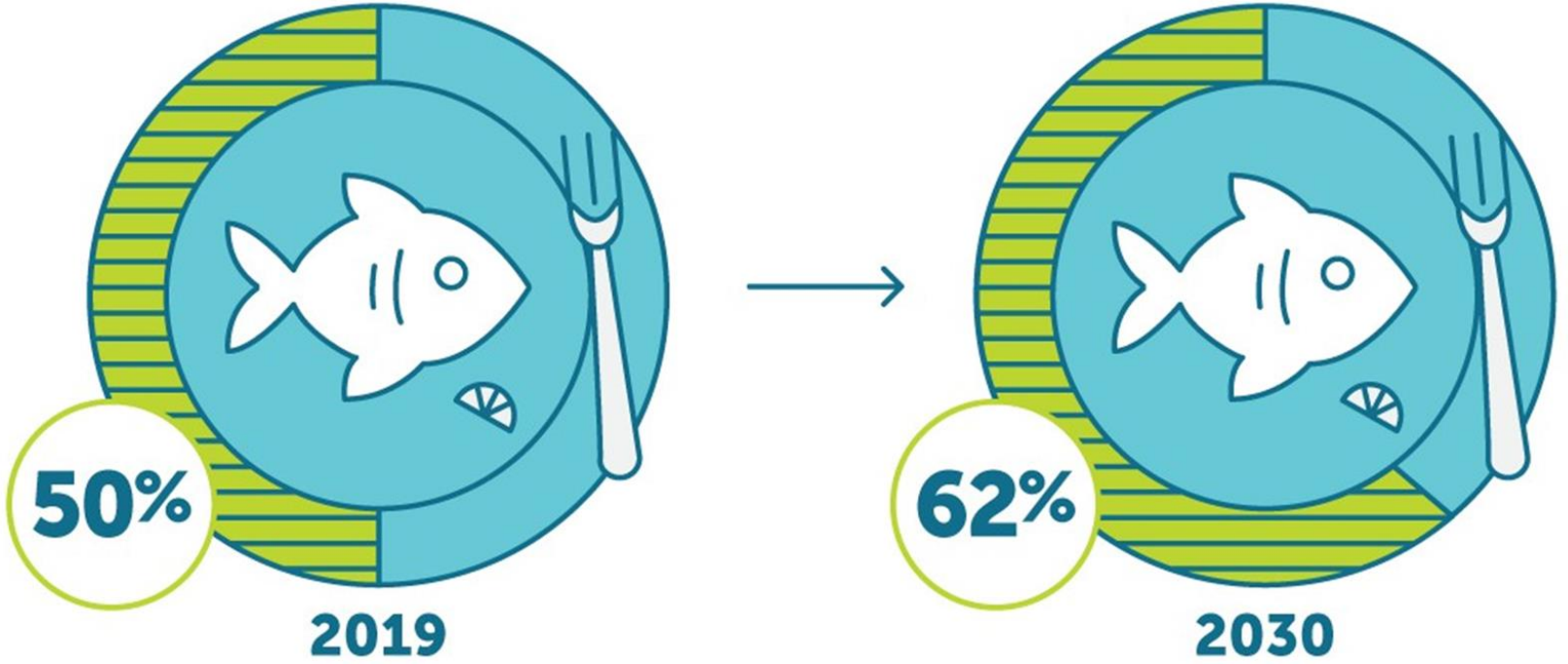
Challenges of Traditional Aquaculture

- Limited quantities of water, land prices, negative impact on the environment, water quality, climate changes, increased number of diseases
- Long and unpredictable, semi intensive and intensive farming under uncontrolled conditions, are exposed to numerous risks (weather, predators, pollution, diseases and ever-tighter legal regulations)
- The production process continually creates solid and liquid waste as well as CO_2. Methods of disposal depend on the production system (flow though, cages, ponds, RAS), and a volume and concentration of waste water.

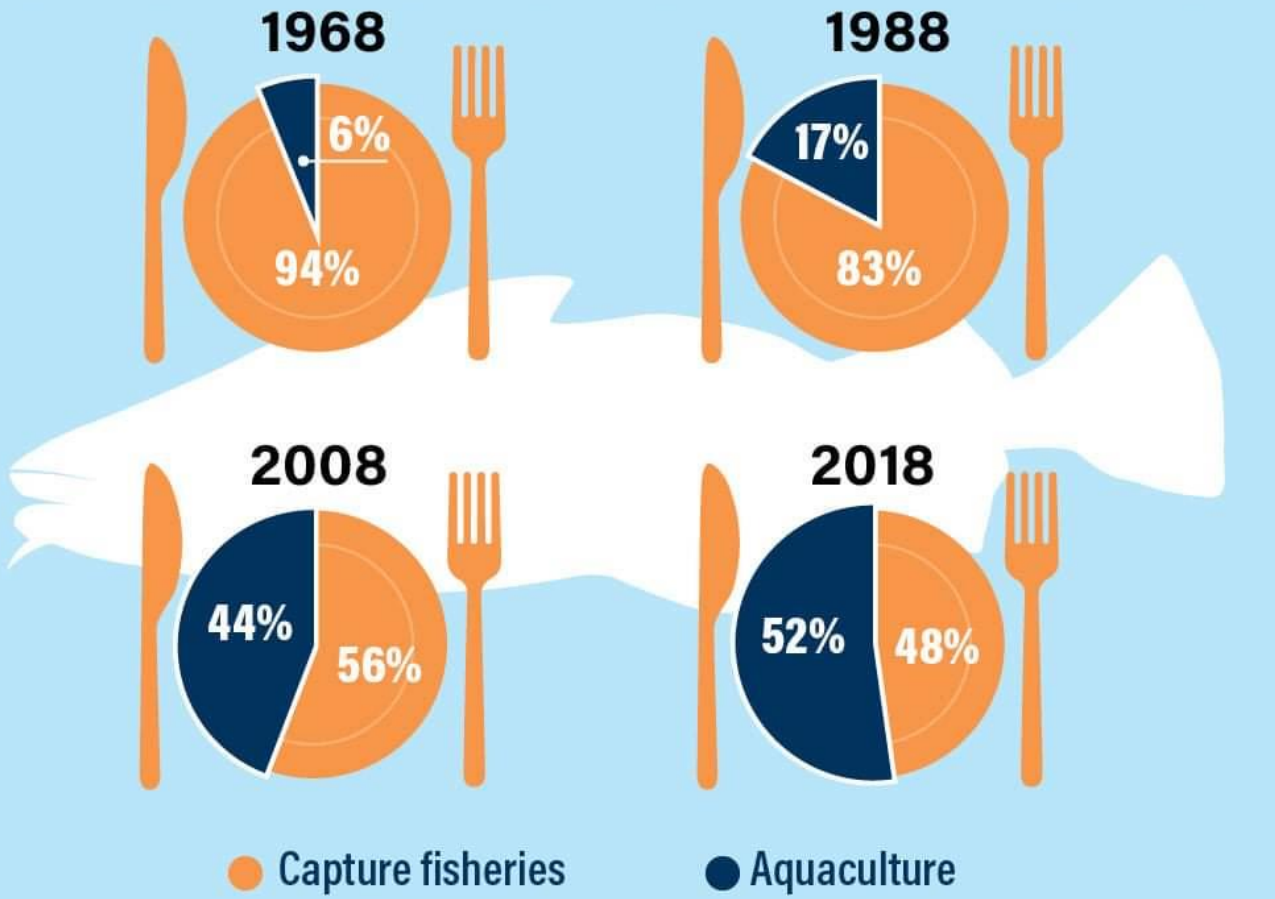
SEAFOOD PRODUCED BY

AQUACULTURE

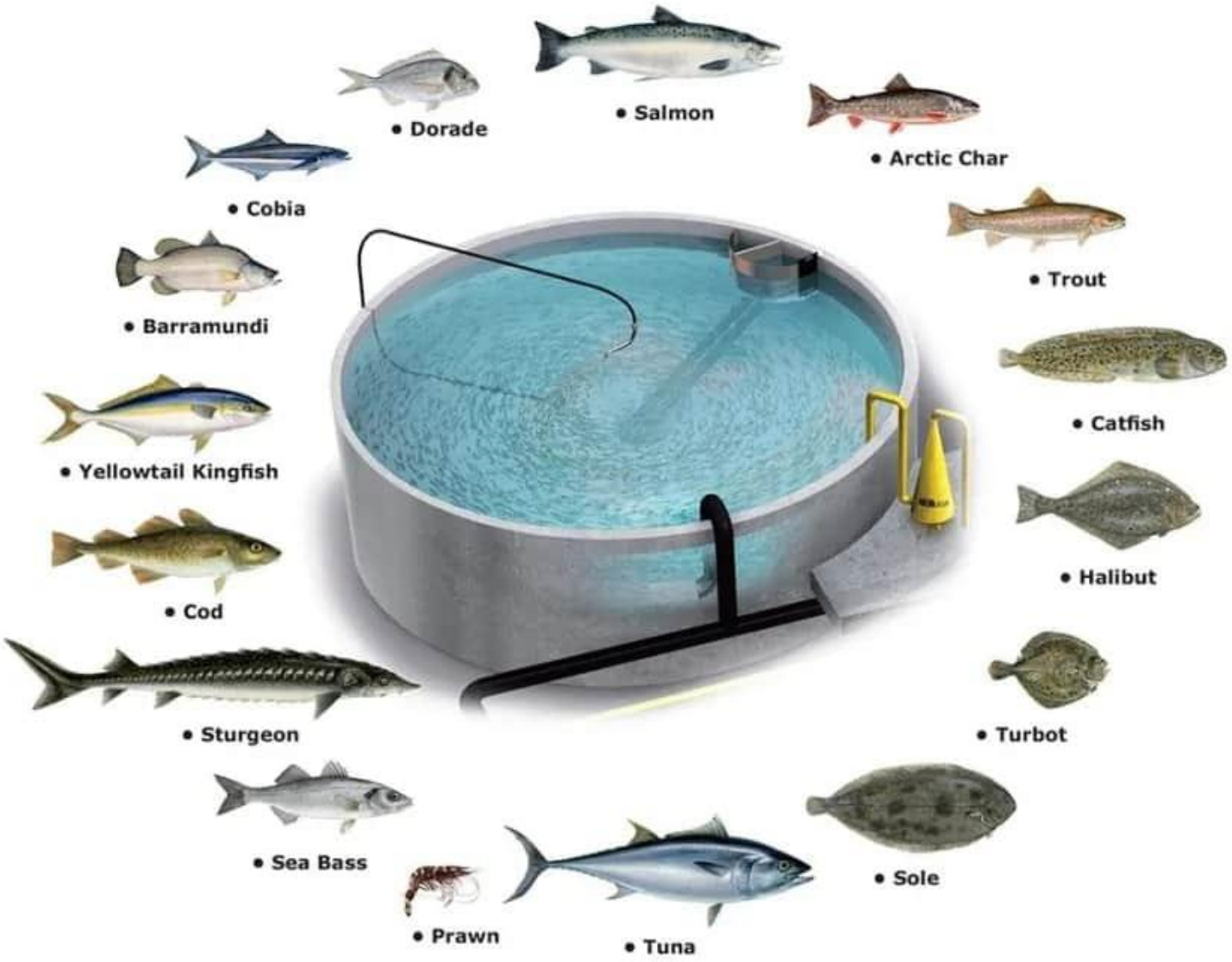
SOURCE: WORLD BANK



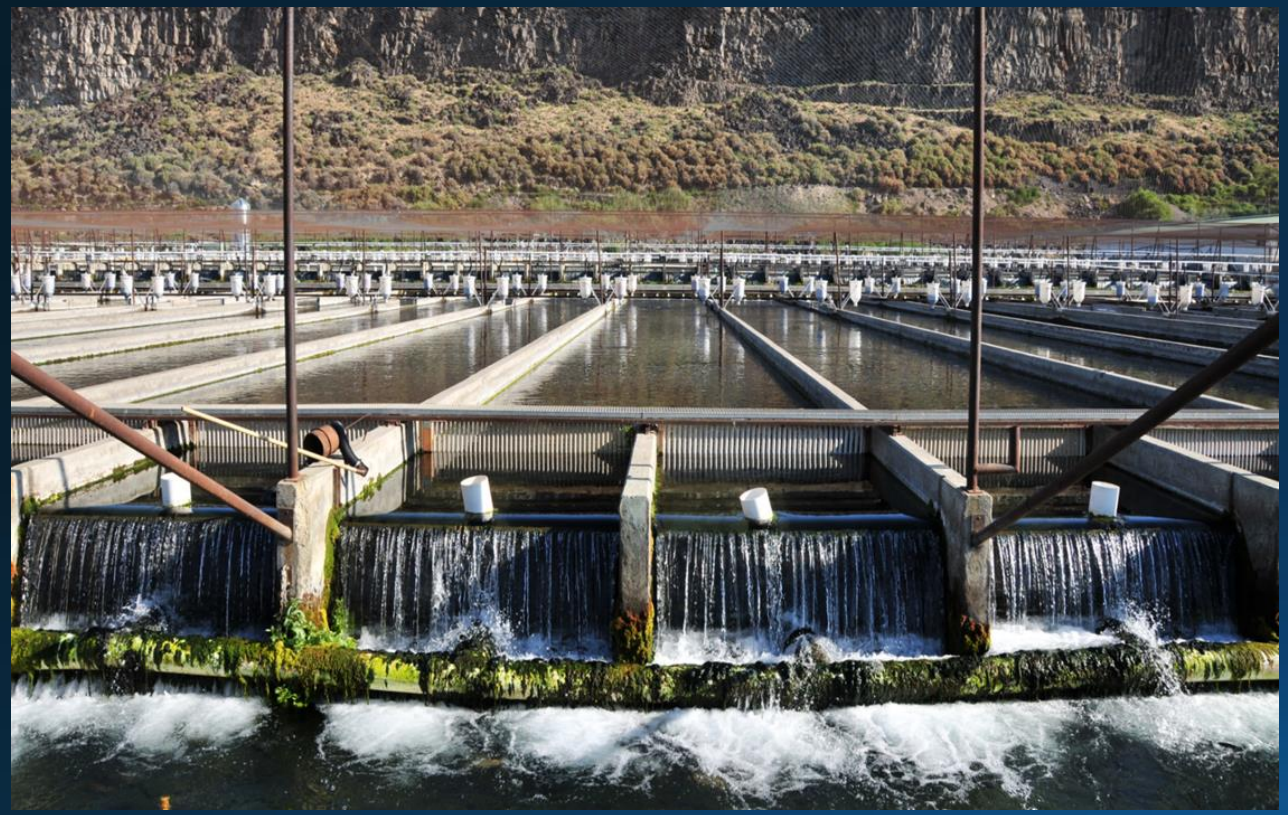
Contribution of capture fisheries vs aquaculture to human consumption



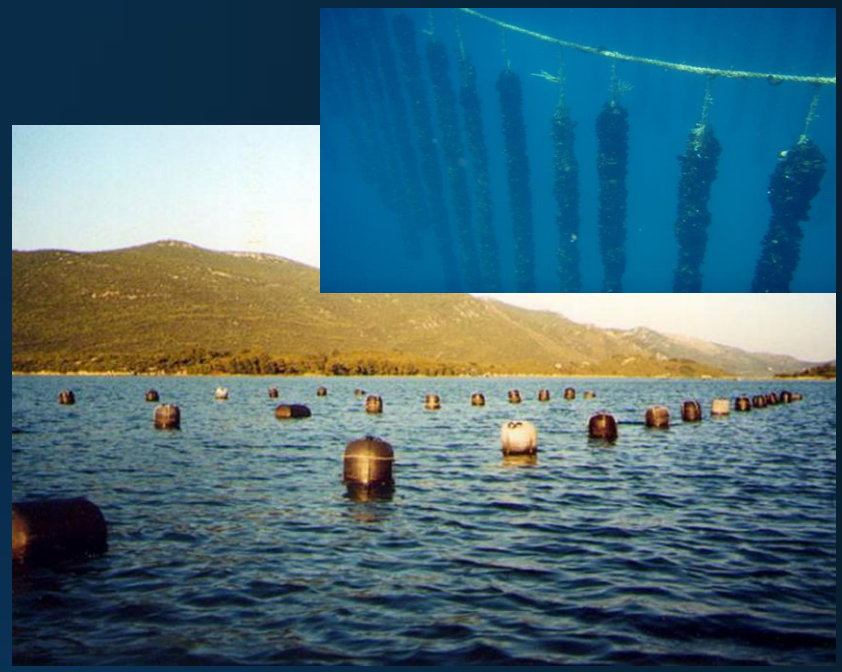
Food and Agriculture Organization of the United Nations


• Dorade
• Salmon
• Arctic Char
• Cobia
• Trout
• Barramundi
• Catfish
• Yellowtail Kingfish
• Halibut
• Cod
• Turbot
• Sturgeon
• Sea Bass
• Sole
• Prawn
• Tuna

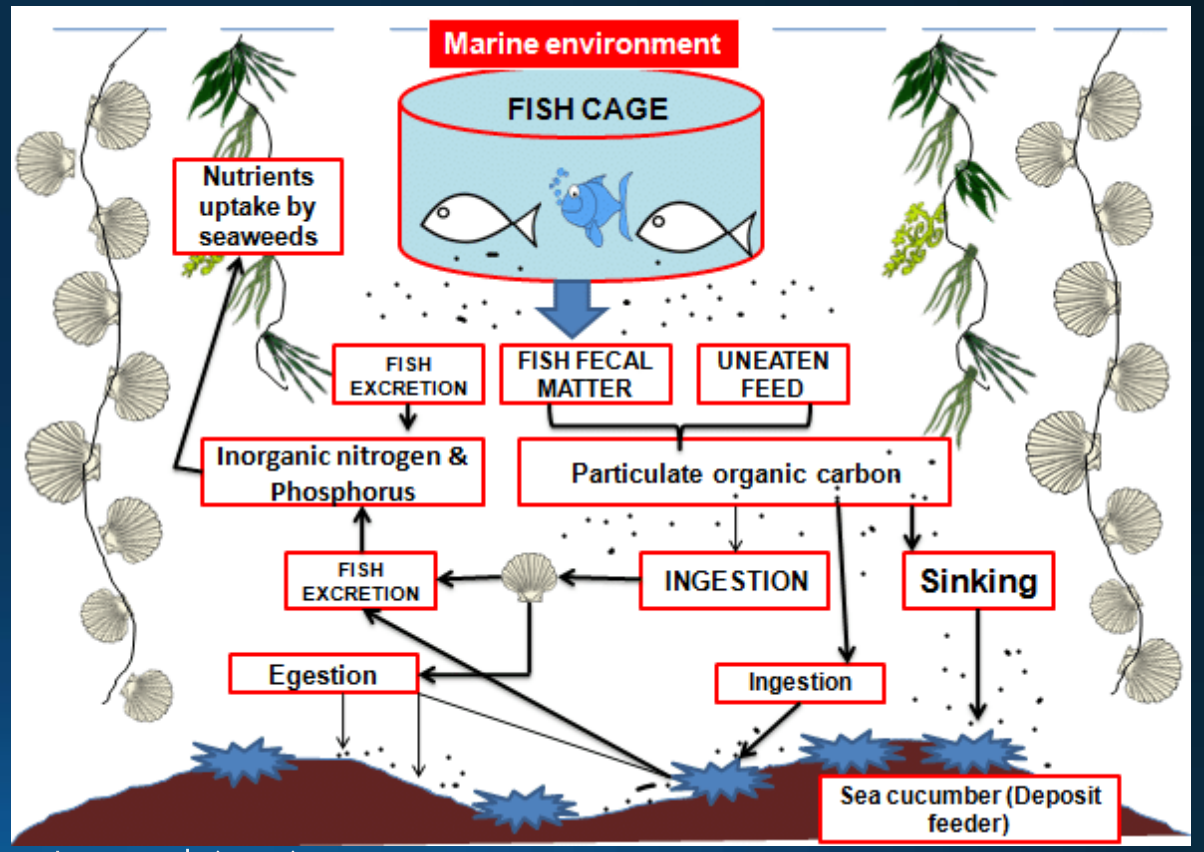
Traditional technologies



Traditional technologies



„Newer" technologies – RAS and IMTA



- Jena et al. (2017)

Sustainable Aquaculture

- Sustainable aquaculture is a dynamic concept and the sustainability of an aquaculture system varies with species, location, social norms and the state of knowledge and technology.

- The application of new aquaculture technologies and the introduction of technologies known in other industries are one of the ways for developing ecologically, socially, financially and energetically sustainable aquaculture production.

Recirculation Systems

- The growing need for food and the preservation of the environment dictates an increasing exigency for changing designs of cultivation systems
- Recirculating Aquaculture Systems minimize water usage and land requirements
- Limited volume of wastewater can be economically treated for the removal of both solid and dissolved waste

Aquaponics System

Definition of Aquaponics:

- Aquaculture + Hydroponics = Aquaponics

What are the main components of the aquaponics system?

- Recirculating Aquaculture System (RAS)
- Hydroponic Greenhouse

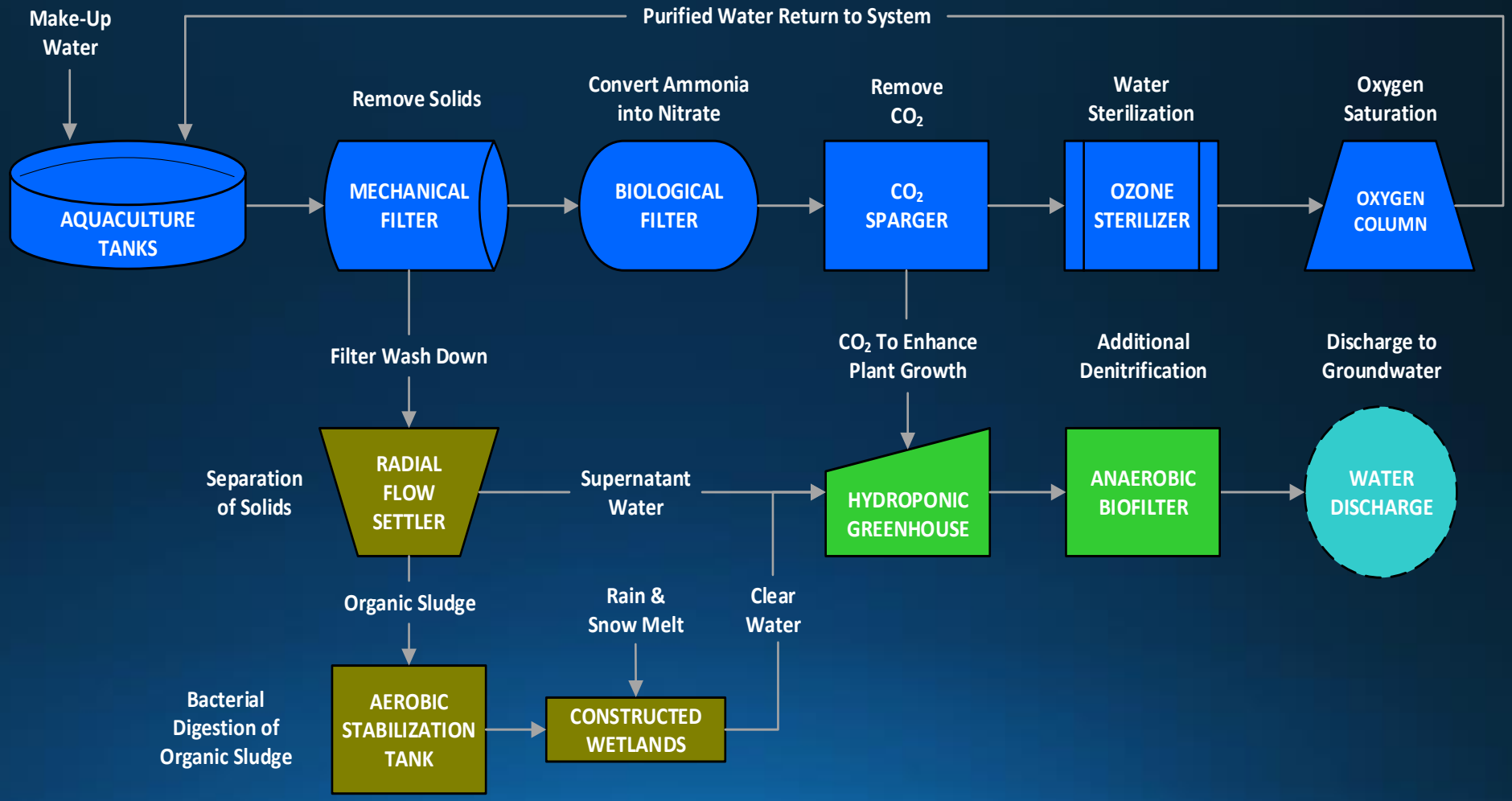
What makes the aquaponics process sustainable?

- Water recirculation, waste utilization
- Byproducts of one process enhances the next

Aquaponics System

Aquaculture waste water aerobically stabilized, filtered by reed beds, and then sent to the hydroponic greenhouse.

Clear liquid waste contains nitrates, phosphates, and other dissolved nutrients from the fish tank water

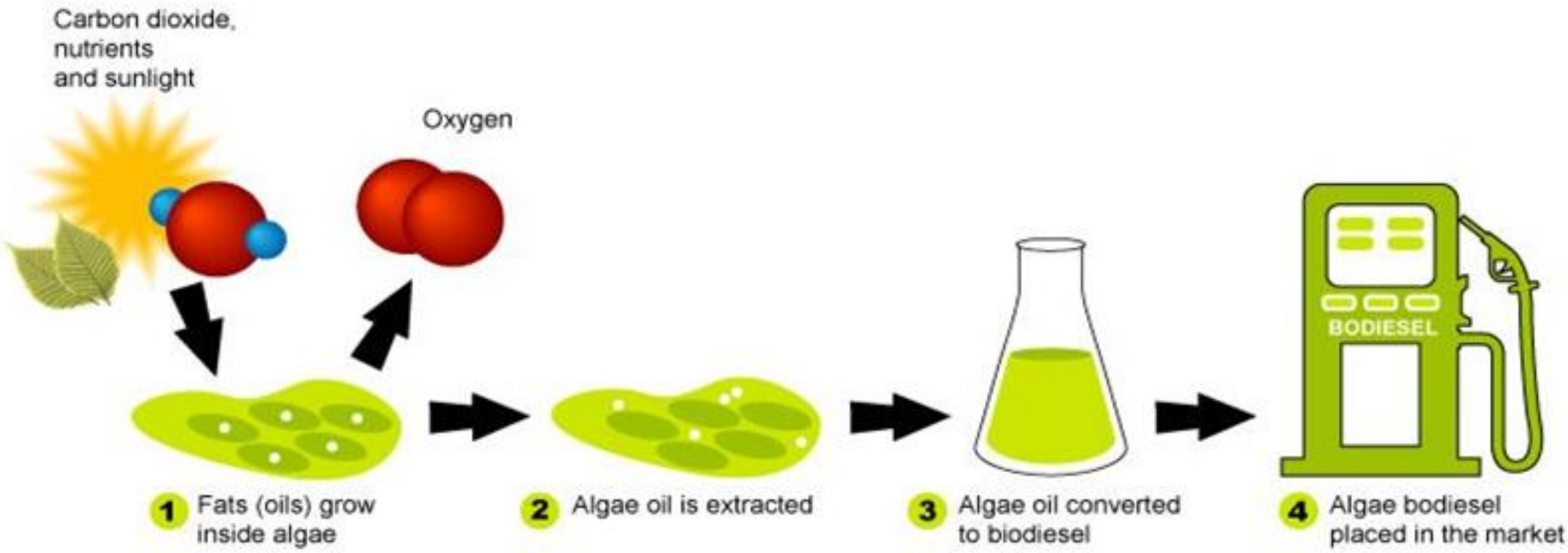


Hydroponic Greenhouse

- Clear nutrient reach water is transferred to the hydroponic greenhouse
- Greenhouse area is scaled to efficiently extract nutrients from water discharged from the recirculating aquaculture system.
- A variety of terrestrial plants and algae can be produced that way

Algae Cultivation – In aquaculture

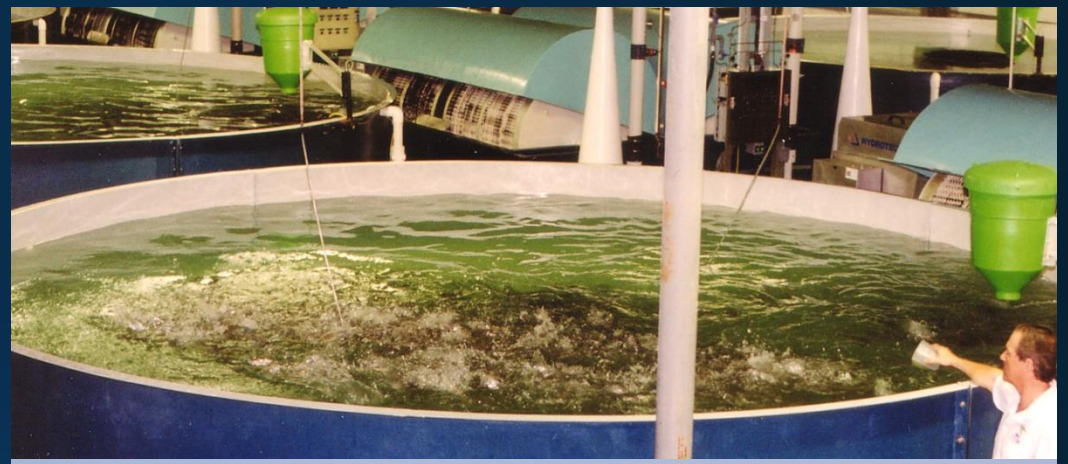
Algae Cultivation - Biodiesel Production



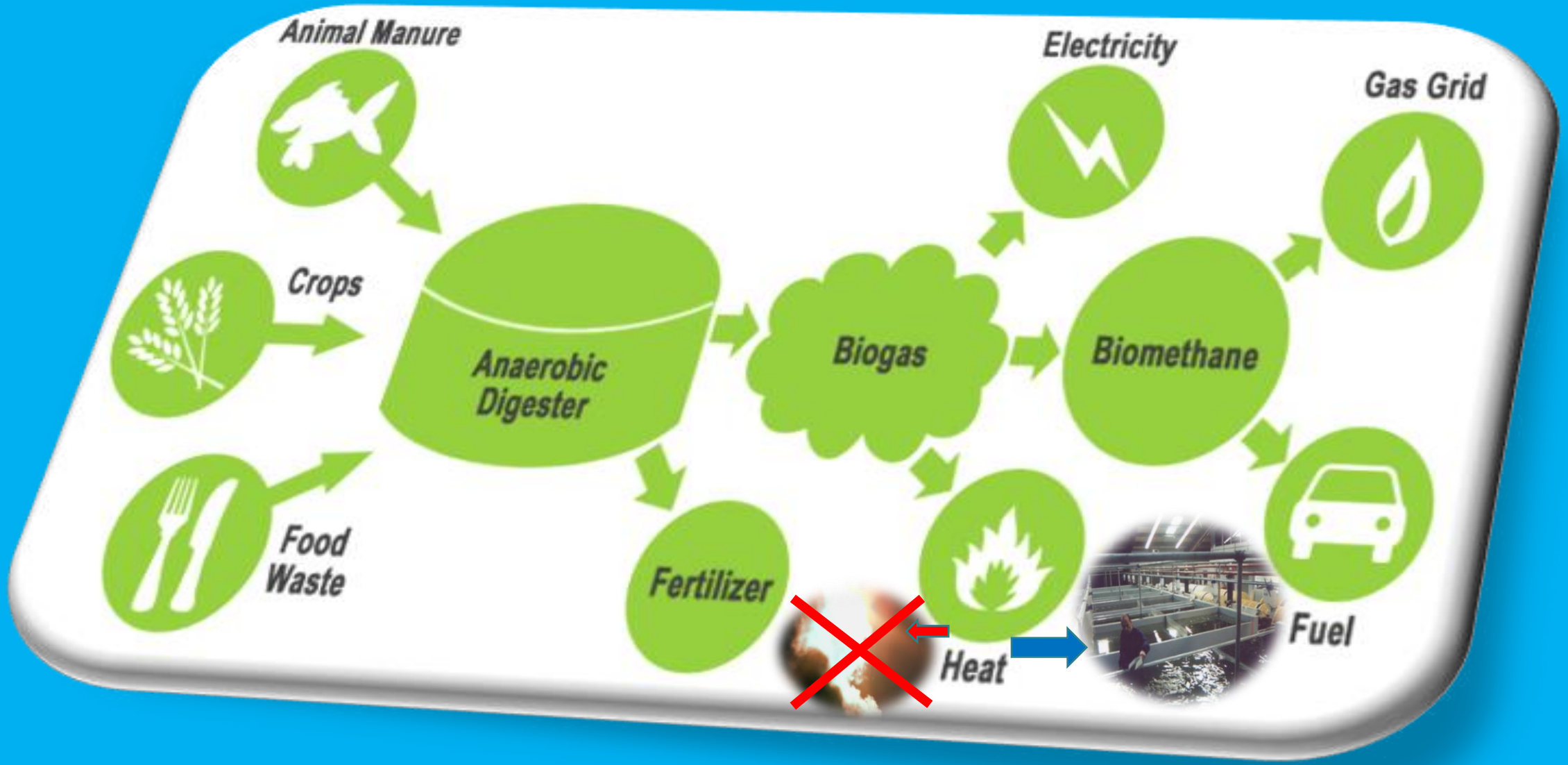
Algae Cultivation – now

Introduction of a Biogas Facility in the Aquaculture System

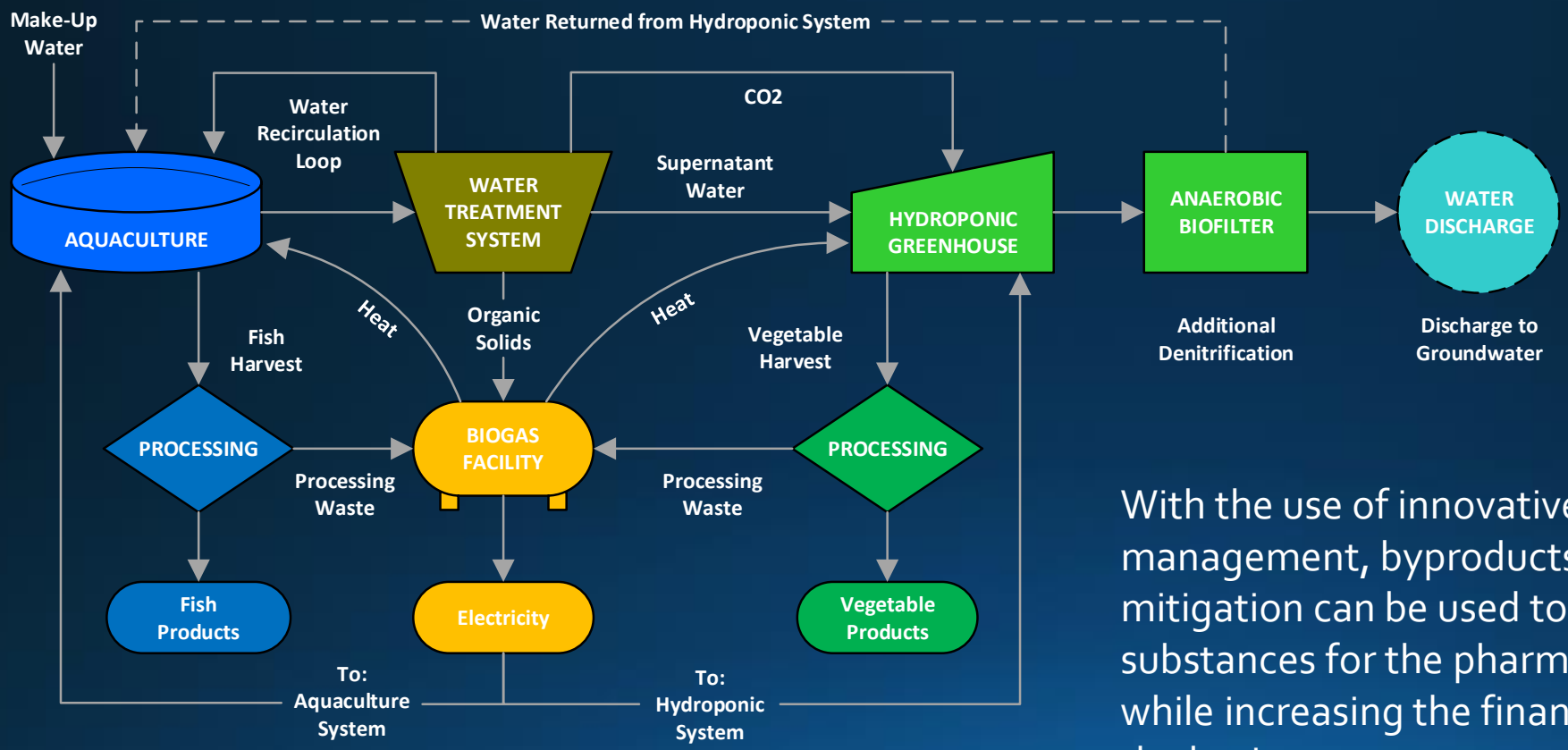
- Biogas Facility digests organic waste to create methane gas, which generates electricity
- Heat is a byproduct of that process, which is considered thermal pollution if improperly discharged
- Heat can be mitigated by the Recirculating Aquaculture System
- Closed Recirculation Aquaculture System and a Biogas Facility are a perfect synergy



Biogas Production and Use Template



Aquaponics Production System with Biogas Facility



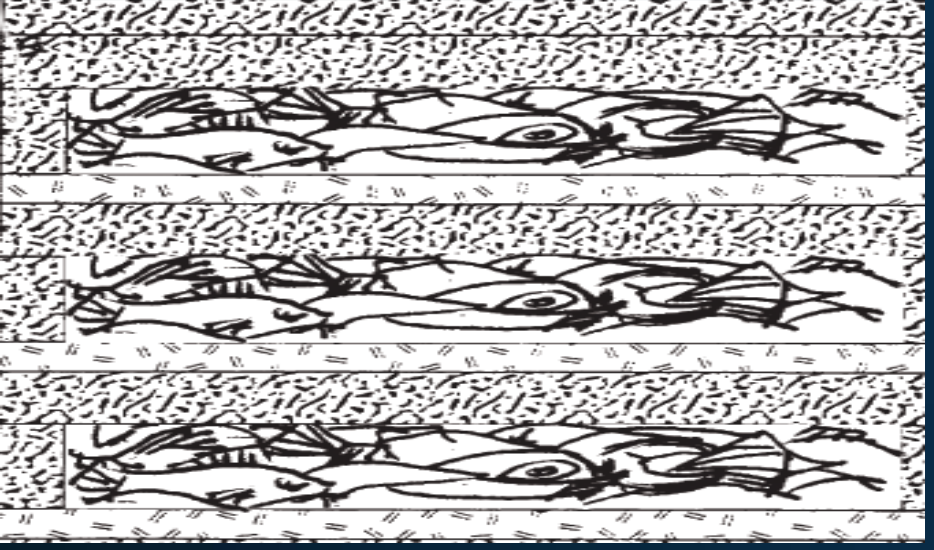
With the use of innovative technologies and proper management, byproducts of fish production and waste mitigation can be used to produce biogas, biodiesel, substances for the pharmaceutical and cosmetic industries, while increasing the financial stability and profitability of the business.

Dead Fish and Processing Waste Disposal

One of the basic ecological problems on fish farms and fish processing plants is the disposal of dead fish, fish waste and utilization of processing by-products

Treated fish wastes and Processing By-products

have found many applications among which the most important are animal feed, dietetic products, natural pigments, food-packaging applications, cosmetics, enzyme isolation, Cr immobilization, soil fertilizer and moisture maintenance in foods



Composting

- Efficient method for ecologically clean and economically feasible resolution of solid waste and dead fish from fish farms and processing plants. Waste is mixed with a certain percentage of plant material and occasionally shuffled (tumbled).
- Bacterial decomposition of waste material at an elevated temperature creates a mixture of organic materials and microorganisms that represents organic fertilizer for the production of plants.
- Composting is a "living process" because the final product handles contain living organisms that account for about 50% of the total compost volume.

CONCLUSSIONS

- The introduction of new technologies in aquaculture production and the use of methods applied in other industries led to the development of more sustainable, more efficient and more environmentally friendly production systems and processes.

- Such a trend allows the integration of aquaculture with other branches of agriculture into circular economy models.

- In this way the use of by-products that have so far been proclaimed as wastes, in the creation of commercially interesting products and the production of energy from renewable sources.

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Thank you!

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