

***Innovation, a chance to boost  
freshwater aquaculture in  
Central-Eastern Europe***

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MAGYAR AGRÁR- ÉS  
ÉLETTUDOMÁNYI EGYETEM

Akvakultúra és  
Környezetbiztonsági Intézet

# Major freshwater aquaculture production systems in the EU



Pond aquaculture



Flow-trough system



Recirculation aquaculture system



Cyprinid species



Trout

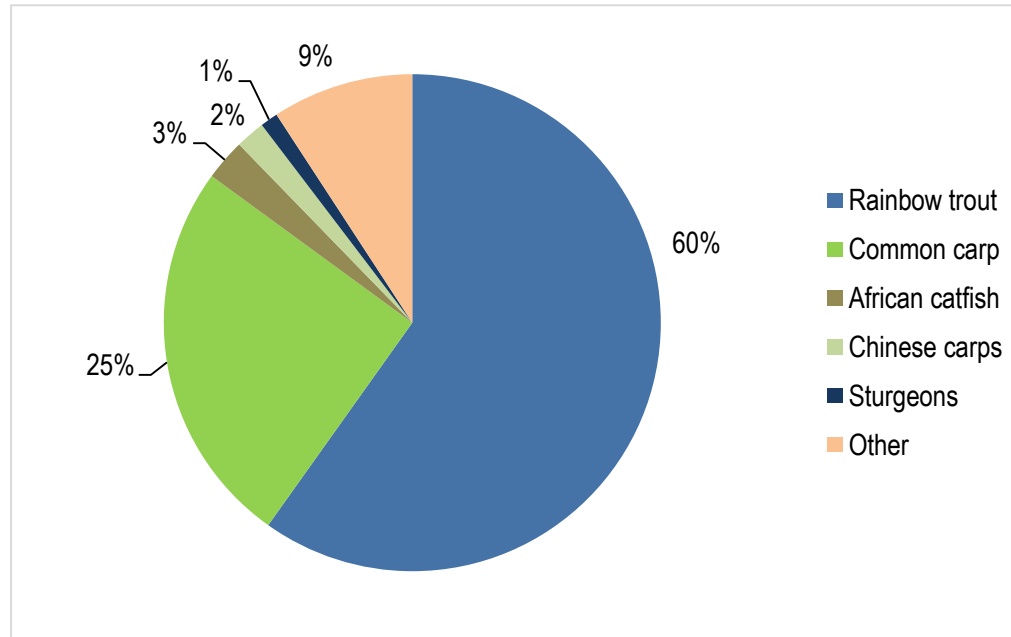


Different „high quality” species

# Freshwater aquaculture production by species in the EU

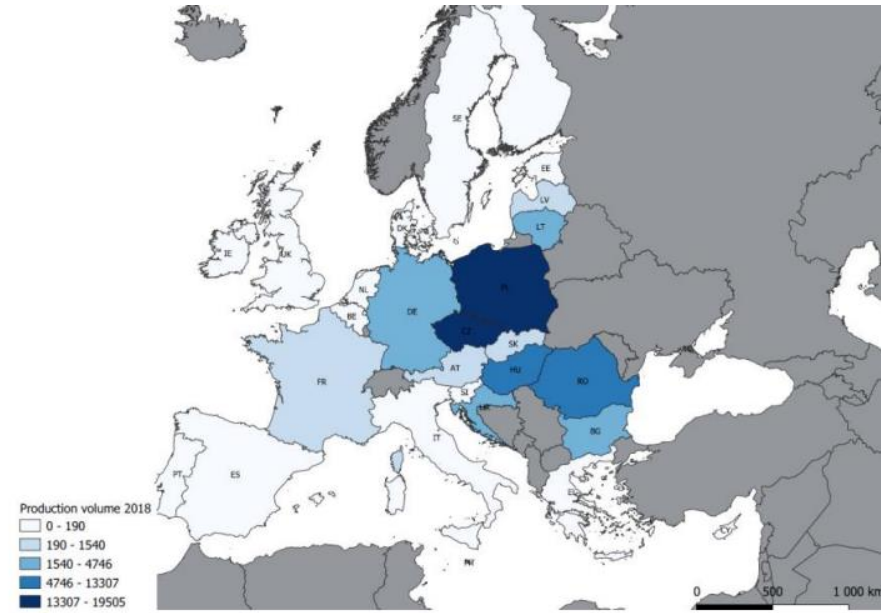
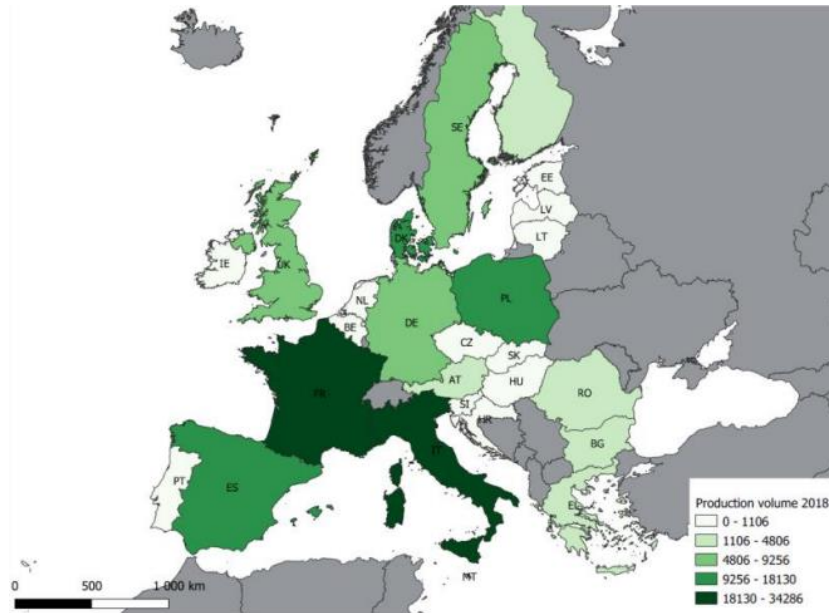


EU Freshwater aquaculture production by species

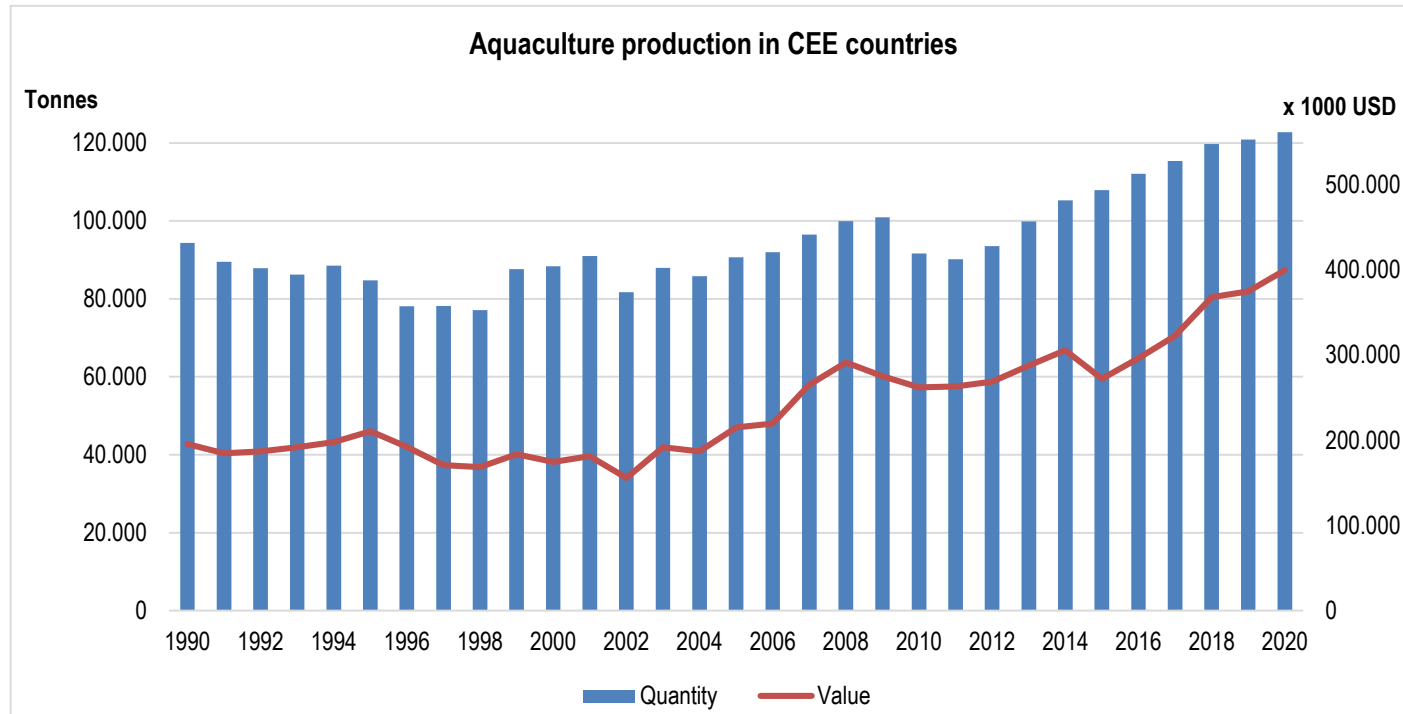


Source: Eurostat 2019

# Regional differences in freshwater aquaculture production by species

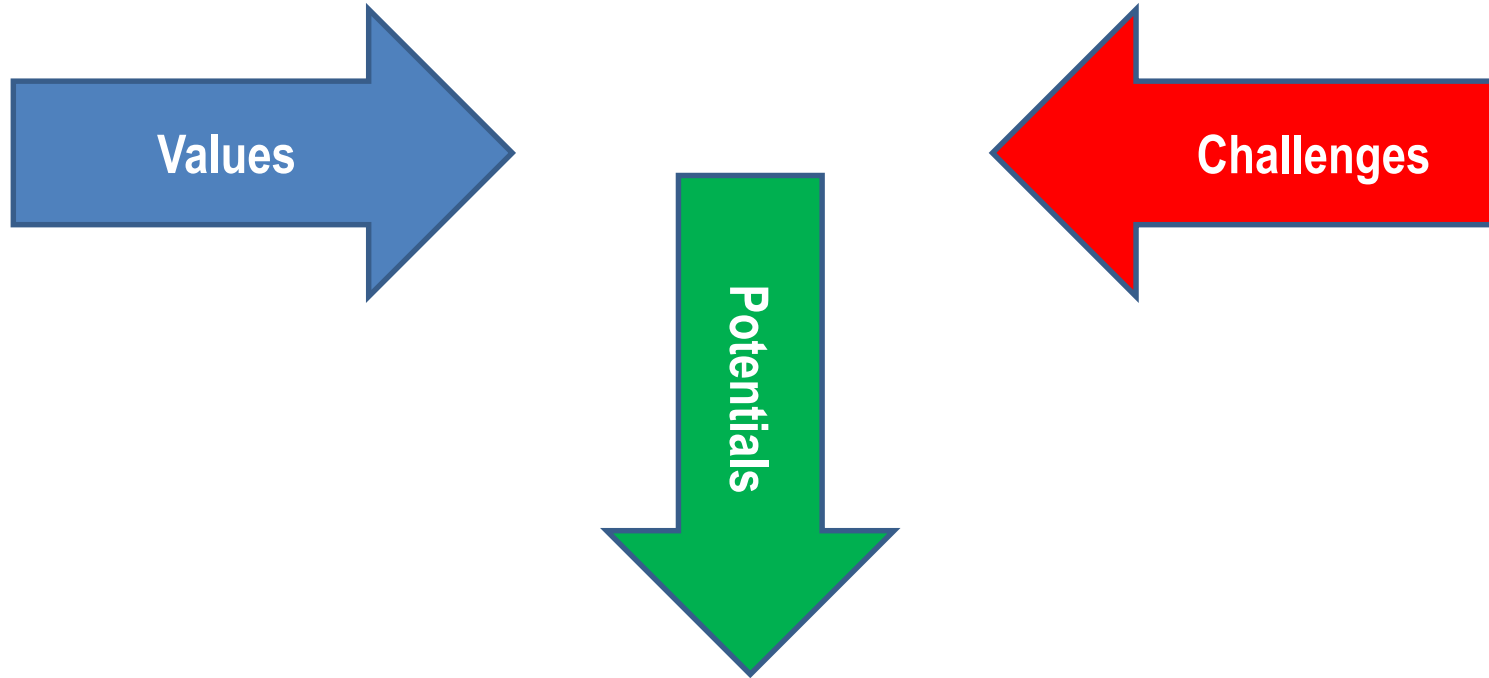


# Increasing freshwater aquaculture production in the CEE regions



Source: Eurostat 2021

# Values – Challenges – Potentials of freshwater aquaculture in CEE



# Socio-economic values of freshwater aquaculture in the CEE Region



- 123 000 tonnes of fish production that is the 45% of the total freshwater aquaculture production of the EU.
- 400 000 000 USD production value.
- Domination of pond aquaculture, with complex environmental benefits and high adaptability.
- Domination of low food chain species, the production independent from marine fisheries based fish meal.
- Increasing intensive production, mostly African catfish but also new species in RAS.
- 13,000 employees in rural areas.



# Environmental values of pond aquaculture in the CEE region



- **Pond aquaculture maintains 250.000 ha man-made wetlands in the EU.**
- **Pond fish farms contribute to preserve biodiversity:**
  - More than 400 bird species, most of them with NATURA 2000 importance
  - Substantial part of the otter population in Europe
  - Numerous wetland related plant and animal species with European significance
- **Pond fish farms contribute to better water management**
  - Retention of water, CO<sub>2</sub>
  - Retention of soluble and floating compartments of supply water





## Regulating and maintaining services of fish ponds:

- CO<sub>2</sub> absorption/Global climate regulation
- Microclimate regulation
- Air quality regulation
- Water quality regulation
- Water storage
- Excess water retention
- Groundwater recharge

## Provisioning and cultural services of fish ponds:

- Reed production
- Livestock and crop production near the ponds (e.g. utilization of dams and other open areas)
- Recreational opportunities/Ecotourism
- Aesthetics
- Environmental education
- Cultural heritage/Source of inspiration
- Opportunity for research

(Palásti et al. 2021)



# Socio-economic challenges of freshwater aquaculture



- Labour intensity of pond aquaculture.
- Low productivity, seasonal and uncertain product supply in pond aquaculture.
- Low processing level and weak supply chain in pond aquaculture.
- Significant land requirements of pond aquaculture.
- High investment costs and low profitability.
- High energy demand in intensive aquaculture.



# Environmental challenges of freshwater aquaculture



- Decreasing renewable water resources.
- Decrease of predictability of water regime.
- Water quality issue.
- Increasing water blooming.
- New pathogens.
- Decrease of non-specific immune status.
- Impact of wildlife.
- Invasive competitor species.
- Invasive competitor species.
- Waste (water, sludge, fish manure, byproducts) treatment issue in intensive aquaculture.

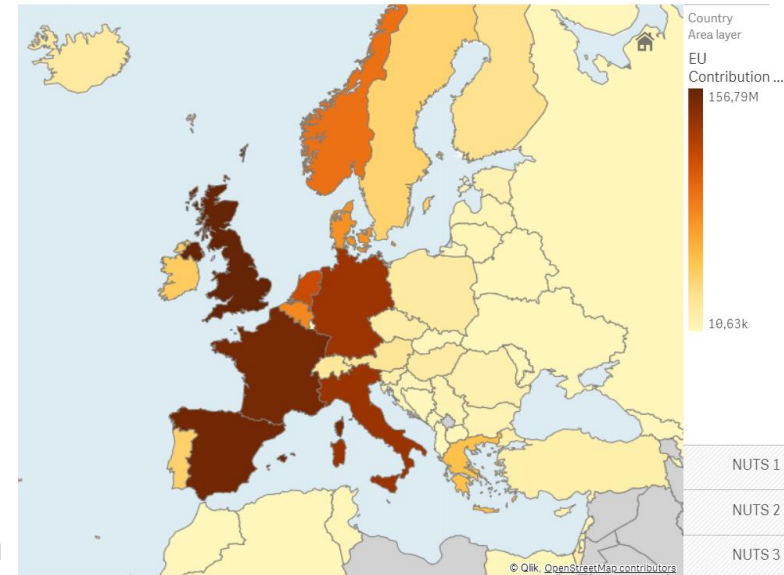


# Policy challenges of freshwater aquaculture

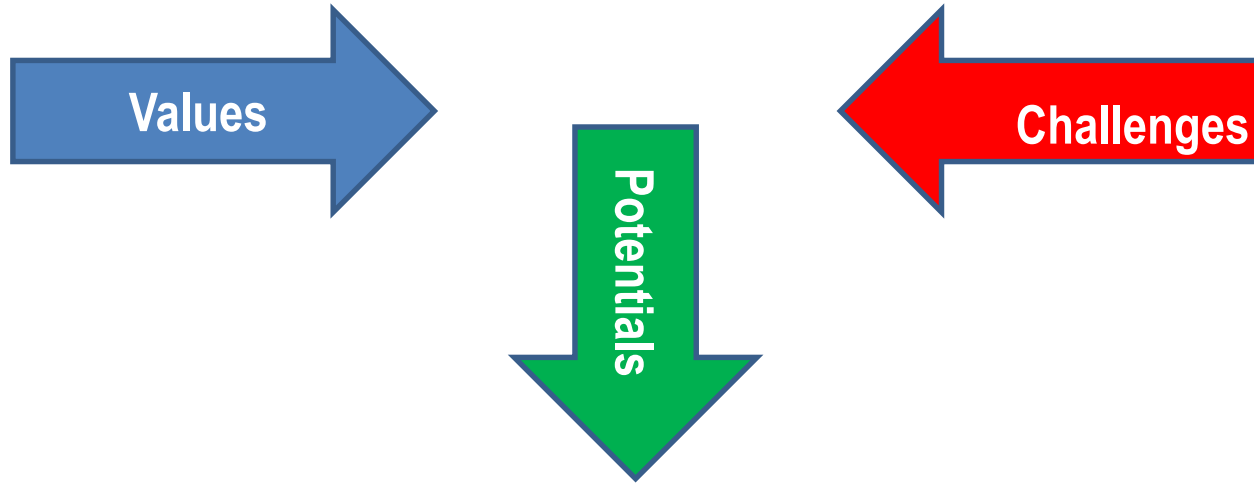


- No accepted support for creation and maintenance of complex natural-environmental values of constructed wetlands (fish ponds (that should be financed by the European Regional Development Fund determined as important rural development goal.)
- Lack of coordinated Great Cormorant management plan on European scale.
- Unnecesssary administrative burden, due to the over regulation.
- Undervalued EU contribution to the innovation of aquaculture development in the CEE region.

Participation in H2020 programs between 2014-2019 based on Blue Growth and Sustainable Food Security Projects



# Values – Challenges – Potentials of freshwater aquaculture in CEE



- Appropriate economic potential.
- Strengths and weakness of pond and intensive aquaculture are largely complementary.
- Turn the weakness to strength!
- Policy challenges are scary, but policies made by man

## **Biodiversity strategy**

- Establishing a network of contiguous protected areas
- Restoring damaged terrestrial and marine ecosystems
- Developing new governance strategies

## **Farm to fork strategy**

- Resilient and sustainable food systems.
- Transition to more innovative, carbon-neutral, and pesticide/antibiotic-free food production methods.
- Blue farming aims to increase seafood production with a low environmental footprint.
- Importance of low trophic species production.

## **Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030**

- Building resilience and competitiveness.
- Participating in the green transition.
- Ensuring social acceptance and consumer information.
- Increasing knowledge and innovation.

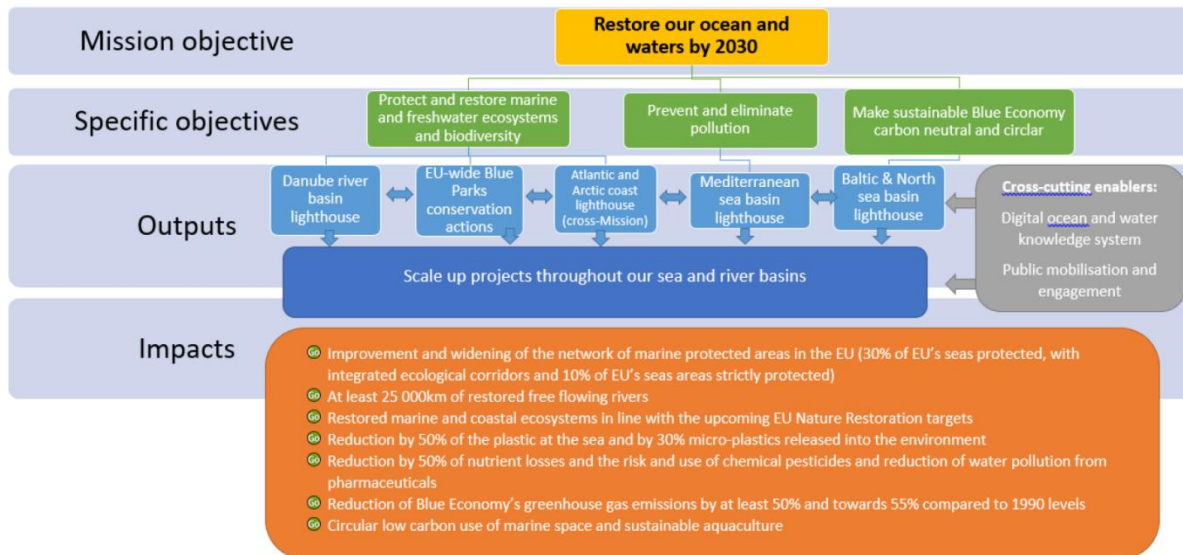
**Focusing on research and innovations for more sustainable, competitive and resilience production systems**

# Mission Restore our Oceans and Waters



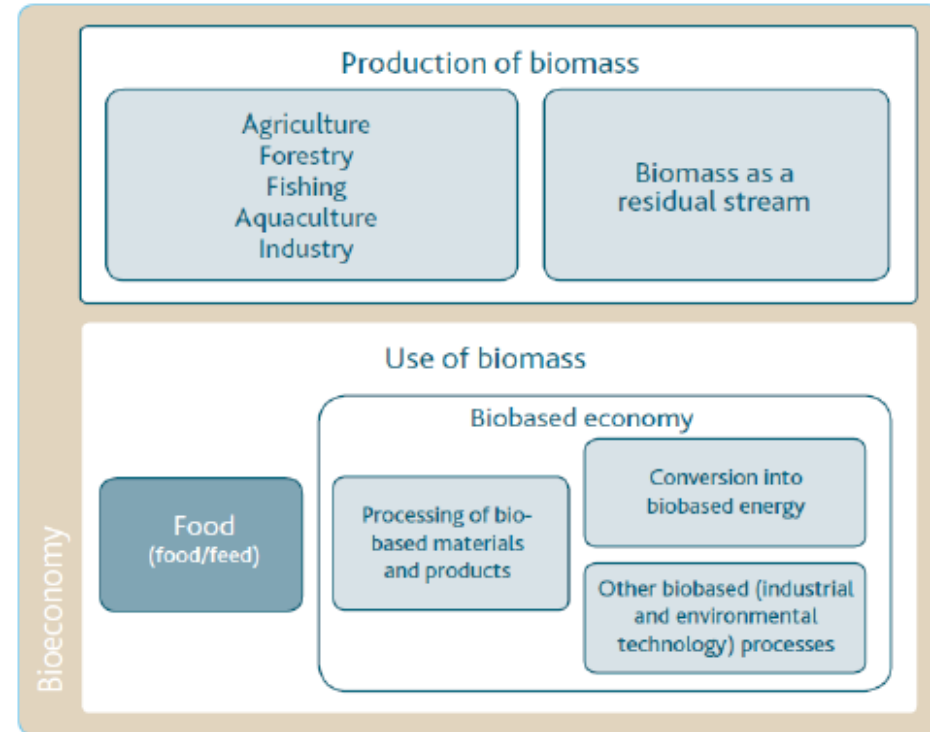
## Mission Restore our Ocean and Waters by 2030

- One of the 5 Missions launched by EC.
- The Mission is a tool to achieve the goals of Green Deal elaboration pilot and test R&I.
- 3 specific objectives: (1) Protect and restore marine and freshwater ecosystems and biodiversity, (2) Prevent and eliminate pollution of our ocean, seas and waters, and (3) Make the sustainable blue economy carbon-neutral and circular.



## European Bioeconomy Strategy (2012)

„The bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. Its sectors have a strong innovation potential due to their use of a wide range of sciences (life sciences, agronomy, ecology, food science and social sciences), enabling and industrial technologies (biotechnology, nanotechnology, information and communication technologies (ICT), and engineering), and local and tacit knowledge.”





# Blue bioeconomy in the EU



„Blue bioeconomy is based on sustainable and intelligent use of biological resources from the sea, lakes, streams and aquaculture.” ([www.aqua.dtu.dk/english/research/topics/blue-bioeconomy](http://www.aqua.dtu.dk/english/research/topics/blue-bioeconomy))

By “blue bioeconomy”, it is intended any economic activity associated with the use of renewable aquatic biological resources to make products. (EUMOFA 2018)

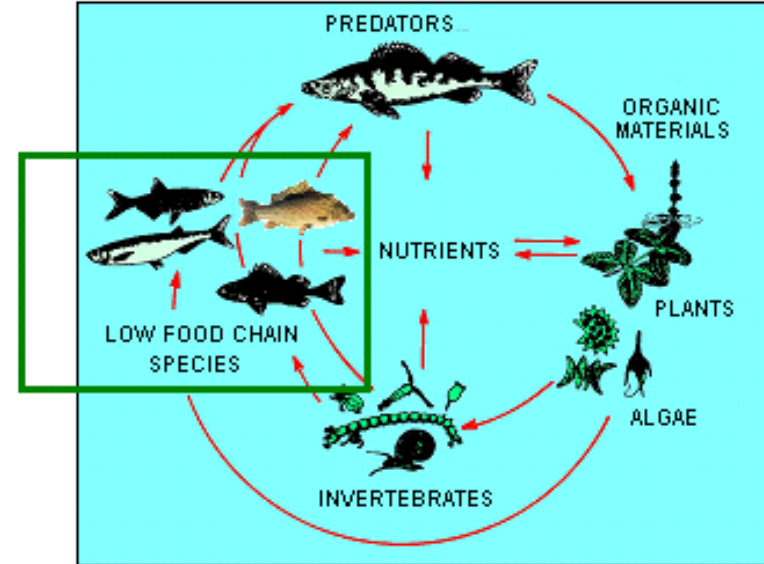
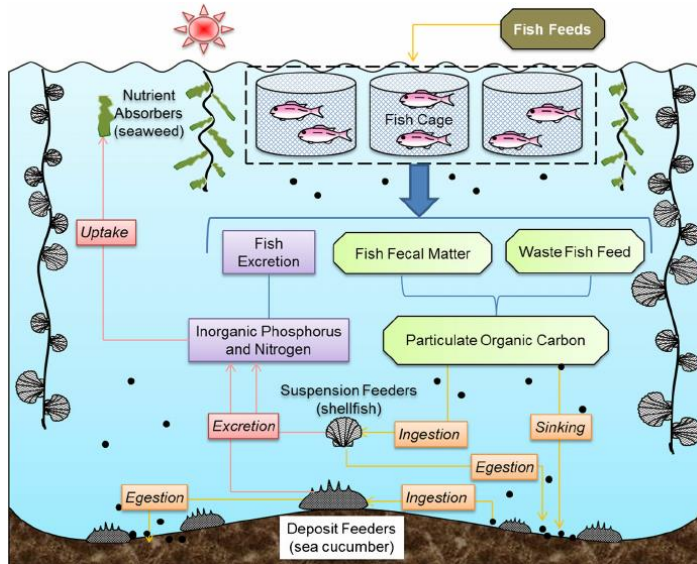
**Freshwater-based bioeconomy is also blue!**  
**Aquaculture is also part of bioeconomy!**



# Directions of innovation in the context of bioeconomy

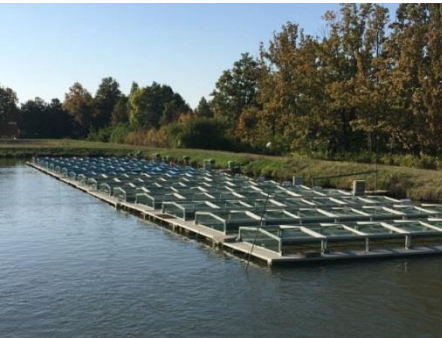
1. Development of new systems, focusing on freshwater low trophic species as microalgae, plants, molluscs, crustaceans, herbivorous and omnivorous fish species.

Development of freshwater integrated multitrophic aquaculture (IMTA) systems.



## 2. Sustainable intensification of pond aquaculture through the introduction of different combined intensive-extensive systems.

- Combined intensive-extensive pond system;
- cage in pond system
- tank-pond system
- inpond raceway system
- RAS-pond system



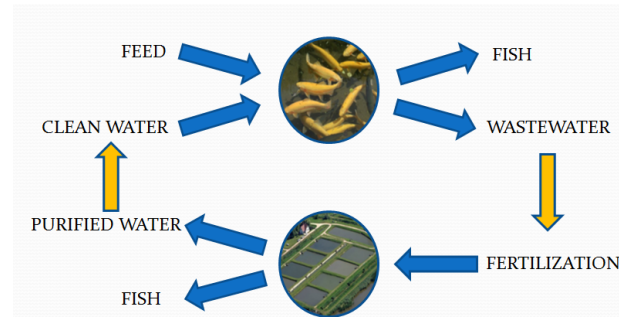
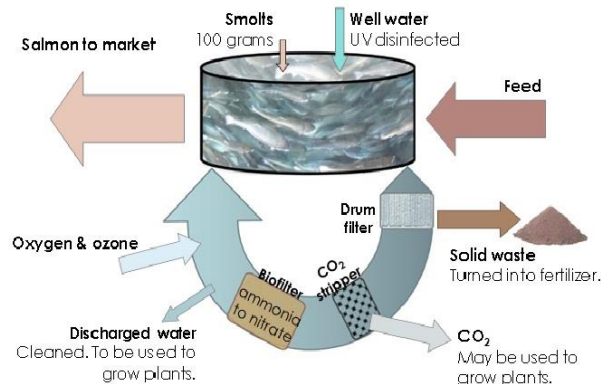
## 3. Lessons learnt from traditional pond aquaculture for the development of circular biobased farming

- Evaluation of interactions between freshwater aquaculture and environment;
- ecosystem service studies;
- climate-resilient production methods;
- social-economic studies: diversified income in multifunctional fisfarms; enhance crisis-resilient and cost-minimising production systems.



## 4. Circular approach in intensive aquaculture

- Reuse of run-off water;
- Utilization of fish manure;
- Reuse of by-products within aquaculture sector and across different agricultural and industrial sectors.
- Utilisation of industrial and agricultural by-products in freshwater aquaculture.



5. Elaboration of the framework for organic aquaculture production in ponds, development of guidelines and policy, taking into account the F2F Strategy recommendation for a significant increase in organic aquaculture production.



# Conclusion



- The potential of freshwater aquaculture is largely underestimated both in the CEE region and the EU compared to the global production, although there are many innovative solutions available for enhance its both in volume and sustainability.
- Freshwater aquaculture can be an important component of blue bioeconomy, not only as an efficient and sustainable biomass-producing sector, but also due to its potential for waste minimization, its complex natural services and as a basis for other bio-based industries.
- Efforts are needed to improve the efficiency of these systems and increase their contribution to food supply, job creation and maintenance or improve biodiversity.

A sunset scene over a large body of water, likely a lake or sea. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water's surface. The sky is filled with soft, wispy clouds in shades of orange, yellow, and grey. In the foreground, the dark silhouettes of reeds or tall grasses are visible, partially obscuring the bottom of the frame. The overall mood is peaceful and serene.

**Thank you for your attention!**

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