MIRO Board transcript

Meeting of WG5 at 20. October 2022

MIRO board: [LINK](https://miro.com/welcomeonboard/cndVa2tsRGNiZ3JXTjRqaGRtd040cllZYlhhSVdDelluT0dXQ2JHNEw4THJSMmNKVndvS0ZEUk9PZWlDWWtFbnwzNDU4NzY0NTE4OTc5ODM2OTM0fDI=?share_link_id=743783277340)

# Studies on Multi-trophic aquaculture systems (land/sea)

1. IMPAQT project:

Promovideo: <https://www.youtube.com/watch?v=8AVUG_KWuis&t=21s>

**Project handbook:** To facilitate agile and engaging learning beyond the project about the most relevant actions and results, we have created this easy-to-skim handbook, documenting this journey. The IMPAQT Handbook is guiding you through the project lifespan, providing quick access to expand information and to contact partners for future collaborations.

<https://impaqtproject.eu/wp-content/uploads/2021/09/IMPAQT_handbook_web.pdf>

1. Contact Ola Oberg.

# Carbon/ nutrient uptake studies

1. Frédérique Ferey: Experience of culture of microalgae plugged to industrial chimney
2. Samantha: Kelp Forest Foundation is creating a kelp CDR model with Cambridge University to help quantify the carbon sequestration potential of kelp cultivation
3. Grogenics: Sargassum Carbon Insetting to Promote Tourism and Increase Food Security: <https://uplink.weforum.org/uplink/s/uplink-contribution/a012o00001pUC4LAAW/sargassum-carbon-insetting-to-promote-tourism-and-increase-food-security>

Blue Resilience initiative

1. Sequestration of macroalgal carbon: The elephant in the Blue Carbon room June 2018 Biology Letters 14(6):20180236 <https://royalsocietypublishing.org/doi/10.1098/rsbl.2018.0236>

Abstract: Macroalgae form the most extensive and productive benthic marine vegetated habitats globally but their inclusion in Blue Carbon (BC) strategies remains controversial. We review the arguments offered to reject or include macroalgae in the BC framework, and identify the challenges that have precluded macroalgae from being incorporated so far. Evidence that macroalgae support significant carbon burial is compelling. The carbon they supply to sediment stocks in angiosperm BC habitats is already included in current assessments, so that macroalgae are de facto recognized as important donors of BC. The key challenges are (i) documenting macroalgal carbon sequestered beyond BC habitat, (ii) tracing it back to source habitats, and (iii) showing that management actions at the habitat lead to increased sequestration at the sink site. These challenges apply equally to carbon exported from BC coastal habitats. Because of the large carbon sink they support, incorporation of macroalgae into BC accounting and actions is an imperative. This requires a paradigm shift in accounting procedures as well as developing methods to enable the capacity to trace carbon from donor to sink habitats in the ocean.

1. New green farm plan will use foul-smelling seaweed to capture carbon

Sargassum is a blight on beaches across the Caribbean – but British entrepreneurs believe it can become a carbon hero.

[Seafields](https://seafields.eco/) is a British start-up that plans to construct vast farms in the Atlantic ocean, where sargassum seaweed will be grown, harvested, and sunk to the bottom of the ocean floor.

<https://inews.co.uk/news/green-farm-plan-new-uk-seaweed-capture-carbon-1372233>

<https://www.seafields.eco>

1. Kim, J. K., Yarish, C., Hwang, E. K., Park, M., and Kim, Y. (2017). Seaweed aquaculture: Cultivation technologies, challenges and its ecosystem services. Algae 32, 1–13. doi:10.4490/algae.2017.32.3.3.

<https://www.e-algae.org/upload/pdf/algae-2017-32-3-3.pdf>

Abstract: Seaweed aquaculture technologies have developed dramatically over the past 70 years mostly in Asia and more recent- ly in Americas and Europe. However, there are still many challenges to overcome with respect to the science and to social acceptability. The challenges include the development of strains with thermo-tolerance, disease resistance, fast growth, high concentration of desired molecules, the reduction of fouling organisms and the development of more robust and cost efficient farm systems that can withstand storm events in offshore environments. It is also important to note that seaweed aquaculture provides ecosystem services, which improve conditions of the coastal waters for the benefit of other living organisms and the environment. The ecosystem services role of seaweed aquaculture and its economic value will also be quantitatively estimated in this review. **Key Words:** ecosystem services; *Eucheuma*; *Gracilaria* / *Gracilariopsis*; *Kappaphycus*; kelp; *Pyropia* / *Porphyra*; *Sargas- sum*; seaweed aquaculture

# Other studies on ecosystem services: biodiversity, MPAs etc.

1. Kelp Forest Foundation (KFF) is undertaking biodiversity studies of cultivated kelp funded by the Safe Seaweed Coalition.
2. KFF is about to start a 3-year study with Wageningen University on the impact of biostiumlants on plant physiology, soil health and biodiversity
3. Ola Öberg: There are also other values than ecosystem to society, e.g. tourism, live close to nature etc.
4. A seaweed aquaculture imperative to meet global sustainability targets

Carlos M. Duarte, Annette Bruhn & Dorte Krause-Jensen

<https://www.nature.com/articles/s41893-021-00773-9>

## Abstract: Seaweed aquaculture accounts for 51.3% of global mariculture production and grows at 6.2% yr−1 (2000–2018). It delivers a broad range of ecosystem services, providing a source of food and natural products across a range of industries. It also offers a versatile, nature-based solution for climate change mitigation and adaptation and for counteracting eutrophication and biodiversity crisis. Here we offer the perspective that scaling up seaweed aquaculture as an emission capture and utilization technology, one supporting a circular bioeconomy, is an imperative to accommodate more than 9 billion people in 2050 while advancing across many of the United Nations Sustainable Development Goals

# **Exploring mechanisms to pay for ecosystem services provided by mussels, oysters and seaweeds** [S.W.K.van den Burg](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[a](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[E.E.W.Termeer](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[a](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[M.Skirtun](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[a](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[M.Poelman](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[b](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[J.A.Veraart](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[c](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[T.Selnes](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)[a](https://www.sciencedirect.com/science/article/pii/S2212041622000031" \l "!)

<https://www.sciencedirect.com/science/article/pii/S2212041622000031>

**Abstract**

This explorative study identifies and evaluates mechanisms for payment for ecosystem services provided by mussel, oyster and seaweed aquaculture. Concerns about the economic profitability of farming mussels, oysters and seaweeds hamper upscaling of production. It is argued that valuing and capitalizing the ecosystem services provided by the production of these lower trophic species can benefit the business case. The Delphi method is used to consult experts across the world in various sectors, including industry, NGO, science and government. Six payment mechanisms for ecosystem services were considered feasible; tax-payer funded payments, tradeable credits, encouraging subsidies, social licenses to produce, production cost-sharing schemes and increased utility for consumers. The latter was deemed most feasible, with little differences in feasibility found in the other five. There are however barriers to implementation in a lack of solid quantification, inadequate regulatory framework and lack of independent validation. Future payment mechanisms for ecosystem services provided by mussels, oysters and seaweeds need solid, science-based measurements based on sound monitoring indicators to quantify effects on the ecosystem services, liaised with relevant existing carbon and nitrogen credit trading schemes and an independent checks-and-balances for long-term trust in such payment schemes. The need for better mechanisms for capitalization justify further development of better data and knowledge of these mechanisms, inclusion of ecosystem services in new regulations and more political and societal support to implement them.

6) Eger, A., Marzinelli, E., Baes, R., Blain, C., Blamey, L., Carnell, P., et al. (2021). The economic value of fisheries, blue carbon, and nutrient cycling in global marine forests. EcoEvoRxiv. doi:10.32942/osf.io/n7kjs."

<https://ecoevorxiv.org/repository/view/4081/>

Abstract: Underwater kelp forests have provided valuable ecosystem services for millennia. However, the global economic value of those services is largely unresolved. Kelp forests are also diminishing globally and efforts to manage these valuable resources are hindered without accurate estimates of the services kelp forests provide to society. We present the first global economic estimation of services - fisheries production, nutrient cycling, and carbon removal - provided by four major forest forming kelp genera (Macrocystis, Nereocystis, Ecklonia, and Laminaria). Each of these genera provides between $135,200 and $177,100/ ha/ year. Collectively, they contribute $684 billion/year worldwide. These values are primarily driven by fisheries and nitrogen removal, but kelp forests also have the potential to sequester 2.7 megatons of carbon from the atmosphere/year and may be considered blue carbon systems valuable for climate change mitigation. These findings highlight the value of kelp forests to society and will enable informed marine management decisions.

# Other EU/national/Regional projects relevant to algae bioremediation and ecosystem services

1. Alexander Jueterbock: Sustainability focus group of the Norwegian Seaweed Association (I am involved)
2. Giorgos Paximadis: GFCM/FAO is promoting algae farming in the Mediterranean and Black Sea as part of its 2030 Strategy, activities include regional mapping, collaborating with member countries such as Morocco, Tunisia and Catalonia, Spain on developing  macro algae pilot projects.
3. Samantha: Jo Kelly in Australia runs Australian Sustainable Seaweed Alliance using seaweed as biofilters for reef resilience and emission reduction
4. Giorgos Paximadis: “International workshop on microalgae and macroalgae culture and applications” in Jeddah, Saudi Arabia, on 5-6 December 2022 (hybrid format), organized by the GFCM/FAO, in collaboration with the Ministry of Environment Water and Agriculture (MEWA) of Saudi Arabia, and the King Abdullah University of Science and Technology (KAUST).
5. Thierry Chopin in Canada does multitrophic seaweed/mussels cultivaiton

# Business models / Good practices, using bioremediation and ecosystem services

1. Frédérique Ferey: Production of microalgae from industrial streams might not allow valorization in high-value products --> distinguish the targeted market from the intrants
2. Seaweed is certifiable under the joint ASC/MSC Seaweed Standard. ASC will be looking at IMTA in the future (no timeline yet)
3. Kelp Blue grows giant kelp forests in Namibia to sequester COs/boost biodiversity and make kelp products that help avoid emissions eg biostimulants
4. Nutri-trade platform.org. Crowd-funding platform for the Baltic Sea
5. [Seafields](https://seafields.eco/) is a British start-up that plans to construct vast farms in the Atlantic ocean, where sargassum seaweed will be grown, harvested, and sunk to the bottom of the ocean floor.

<https://www.seafields.eco>

# Science to policy studies

1. Ecosystem services 2014. Nordic Council of Ministers

**Abstract:** Human wellbeing is dependent upon and benefit from ecosystem services which are delivered by well-functioning ecosystems. Ecosystem services can be mapped and assessed consistently within an ecosystem service framework. This project aims to explore the use and usefulness of the ecosystem service framework in freshwater management, particularly water management according to the Water Framework Directive (WFD). There are several examples of how ecosystem services have been used in WFD related studies in all the Nordic countries. Most of them involve listing, describing and categorizing freshwater ecosystem services, while there are few comprehensive Cost Benefit Analyses and analyses of disproportionate costs that apply this framework. More knowledge about ecosystem services and the value of ecosystem services for freshwater systems is needed.

<https://www.norden.org/en/publication/ecosystem-services>

1. What is the state of knowledge regarding the potential of macroalgae culture in providing climate-related and other ecosystem services, focusing on knowledge gaps? – ECLIPSE Report 2022 <https://eklipse.eu/request-macroalgae/>

This request aims to explore and map existing knowledge and identify knowledge gaps and trade-offs, to inform future development of macroalgae culture strategies and policies. Furthermore, more knowledge is needed to evaluate impacts in terms of water, energy and land use, changes in sedimentation rates and structure of local communities, and potential pollution and risk of releasing invasive species into the environment and can contribute to the development, promotion and implementation of adequate and timely policy frameworks.

End\_