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# **KELP CAN HELP**

**A JUST GLOBAL STRATEGY FOR CLIMATE MITIGATION, FOOD SECURITY AND COASTAL RESILIENCE**



**UNIVERSITY OF BERGEN**

Kelp conservation and restoration projects and seaweed cultivation are increasingly promoted as climate solutions, but global expansion must be governed as a just, ecosystem-based transition, not simply as a new blue economy frontier.

## Purpose of this Policy Brief

As the impacts of climate change intensify, policymakers are increasingly seeking nature-based solutions that can simultaneously support climate mitigation, adaptation, food security and sustainable economic development. Kelp forests and seaweed cultivation have emerged as a promising ecosystem service and capacity to support coastal livelihoods. Globally, seaweed cultivation has expanded significantly over the past two decades and is increasingly promoted as a means to address climate change, enhance food and nutrition security, create employment opportunities and support the transition towards a sustainable blue oceans economy (FOA, 2024; Duarte et al., 2022).

The policy brief seeks to examine the opportunities associated with the global expansion of kelp and seaweed cultivation as climate solutions. Kelp and seaweed activities should be governed as a just ecosystem-based transition rather than a solely blue economy frontier. This brief highlights the role of kelp and other seaweeds in climate mitigation, adaptation, resilience building, biodiversity conservation and sustainable livelihoods while identifying policy measures necessary to ensure environmental sustainability and social justice. It provides evidence-based recommendations for policymakers, industry stakeholders and coastal communities to support the responsible and equitable development of the kelp sector. This is aligned with several United Nations Sustainable Development Goals (SDGs):

- **SDG 2 Zero Hunger:** Kelp is a highly nutritious food source.
- **SDG 5 Gender Equality:** Women make up a large portion of the global seaweed aquaculture industry, supporting the industry ensures women empowerment for women in developing coastal regions.
- **SDG 8 Decent Work and Economic Growth:** Seaweed cultivation has the potential to provide stable and

sustainable livelihoods for indigenous and coastal communities.

- **SDG 12 Responsible Consumption and Production:** Kelp can be used to manufacture innovative biodegradable materials i.e bio plastics and green chemicals, reducing reliance on fossil fuels.
- **SDG 13 - Climate Action:** Kelp and other seaweeds are an efficient carbon sink that can absorb large amounts of CO<sub>2</sub>, which help to mitigate the impacts of ocean acidification.
- **SDG 14 Life Below Water:** Healthy kelp forests protect shores from storm surges and provide essential, structured habitats, nurseries and food for a vast diversity of marine life.

Natural kelp ecosystems remain poorly protected; recent studies indicated that less than 2% of the world's kelp is highly protected globally (Talty, 2025). Leaving these ecosystems vulnerable to climate change, over-exploitation, pollution and coastal development pressures (UNEP, 2023). To secure the climate and wider benefits provided by kelp forests, conservation and restoration efforts are necessary.



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## Climate Mitigation Potential

Kelp forests and seaweed cultivation are increasingly recognised as nature-based climate solutions. Through photosynthesis, kelp absorbs carbon dioxide and may contribute to long-term carbon storage through biomass accumulation and export to deep ocean environments. Approximately 56 million tonnes of seaweed carbon are deposited to the deep ocean each year (Filbee-Dexter et al., 2024), highlighting the potential role of kelp and other seaweeds in climate mitigation, although the permanence of this carbon storage remains uncertain.

Beyond carbon sequestration, seaweed cultivation has a relatively low environmental footprint, it requires no arable land, freshwater irrigation or synthetic fertilisers (Sultana et al., 2023). Kelp derived products can also support the transition away from fossil fuel based materials through applications in nutraceuticals, pharmaceuticals, bio-based chemicals, packaging, and bioplastics (Pereira & Cotas, 2024). Realising the climate mitigation potential of kelp and seaweed activities require integrated approaches that combine conservation, research, sustainable aquaculture, and long-term monitoring of both carbon storage and ecosystem co-benefits.



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## Co-benefits of Kelp

Alongside climate mitigation potential, kelp forests offer numerous valuable co-benefits (Eger et al., 2023a; Eger et al., 2023b; MAWEB, 2026):

- **Habitat for Biodiversity and Fisheries:** Kelp cover provides shelter and crucial breeding grounds for a diverse range of species, including fish, invertebrates and marine mammals, supporting many commercial and locally important species (e.g., mackerel, cod, rockfish, lobster, abalone).
- **Aquaculture:** Kelp also provides opportunities for multi-trophic aquaculture, promoting ecosystem recovery and resilience while contributing to local livelihoods.
- **Food Source:** Acting as a base of the food web, much marine life (e.g. urchins and snails) relies on kelp as a source, and in turn acts as a food source for larger species.
- **Coastal Protection:** By absorbing wave energy, kelp forests act as a natural defence and protect coastlines from erosion, storm surges and flooding, reducing their impact on coastal communities and promoting climate resilience.
- **Nutrient cycling:** Kelp forests cycle nutrients in marine ecosystems, absorbing excess nitrogen and phosphorus and rereleasing these nutrients back into the water when consumed by other marine organisms. This process enriches the water and contributes to ecosystem health and productivity.
- **Recreation:** By protecting diverse ecosystems, kelp forests can become eco-tourism and recreational destinations, contributing to local economies. Divers can also play a role in kelp monitoring and citizen science.
- **Traditional Knowledge:** Many traditional and indigenous cultures utilise kelp as a food source, for recreation, as a tool and artistic material.
- **Art and Culture:** Kelp also contributes to artistic practices, such as sculpture, painting, photography, and culturally important crafting.

## Policy Recommendations:

### 1. Strengthen Climate Action, Complementarity & Global Knowledge Systems

Integrate seaweed restoration into national climate plans to support coastal protection and community-led adaptation, and improve global knowledge through long-term monitoring, open data and shared learning across kelp regions. Build and join a global alliance for seaweed stewardship to align standards, coordinate research and uphold Indigenous and small-scale community leadership. See below for relevant initiatives and coalitions.

### 2. Ensure Inclusive Governance and Participation

Ensure self-representation of small-scale and Indigenous coastal communities by embedding community-led and co-design processes in governance, so policies reflect local priorities, knowledge systems, and customary marine tenure.

### 3. Equity in Access, Benefits & Standards

Adopt seaweed cultivation standards that protect labor rights, gender inclusion, Indigenous rights, biosecurity, and sustainable commercialization, ensuring equitable access and safeguarding the livelihoods of small-scale and Indigenous producers and seaweed harvesters.

### 4. Integrate Traditional Knowledge & Co-Management

Integrate traditional ecological knowledge into monitoring, restoration, and management through co-management systems, improving ecological outcomes and data quality while reinforcing culturally grounded stewardship.

### 5. Protect, Restore & Steward Kelp Forests

Restore and conserve kelp forests through passive recovery or funded restoration, and support community-centered protection.

### 6. Use Ecosystem-Based MSP & Safeguard Wild Kelp Before Aquaculture

Use ecosystem-based MSP and Other Effective Area-Based Conservation Measures to guide sustainable development and reduce competition in shared marine spaces, and map, monitor, and protect wild kelp forests before aquaculture expansion to safeguard ecosystem services and natural capital.

#### Existing Initiatives & Coalitions

- Global Seaweed Coalition  
<https://www.safeseaweedcoalition.org/>
- FISH4ACP  
<https://www.fao.org/fish4acp/en>
- High Level Panel for a Sustainable Ocean Economy  
<https://oceanpanel.org/>
- Blue Carbon Initiative  
<https://www.thebluecarboninitiative.org>
- Convention on Biological Diversity, Marine & Coastal Biodiversity  
<https://www.cbd.int/marine>
- IOC–UNESCO, Ocean Science & Marine Spatial Planning  
<https://ioc.unesco.org>
- UN Global Compact, Ocean Stewardship  
<https://www.unglobalcompact.org/take-action/ocean>
- Kelp Forest Alliance: A global home for kelp forests  
<https://kelpforestalliance.com/>

## Highlights

- Kelp and seaweed activities are highly effective, just, nature-based climate solutions, offering a variety of co-benefits that encompass ecological, social, cultural and economic opportunities.
- The policy recommendations for kelp forests and seaweed cultivation explored in this policy brief can only be effective when a system has all the means to execute all the recommendations.

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