Module 5: Policy and Management Options for Seagrass Ecosystems

Protecting and restoring seagrass ecosystems provides countries with a powerful opportunity to achieve multiple national targets related to the **Sustainable Development Goals** (SDGs), while simultaneously strengthening local economies and meeting global commitments.

As vital marine habitats, seagrass meadows deliver essential goods and services that underpin the well-being of coastal communities worldwide. These ecosystems create direct links to food security, support local economies, and enhance climate change resilience - making them critical components of sustainable coastal management.

by Şevki Danacıoğlu

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Seagrasses Support Multiple Sustainable Development Goals

Seagrass ecosystems directly or indirectly support progress toward most of the United Nations SDGs, proving essential for targets related to climate change and food security. Conservation and restoration of these vital habitats can help countries achieve 26 targets and indicators associated with 10 SDGs, including those addressing poverty, hunger, gender equality, clean water, economic growth, and climate action.

These marine ecosystems contribute to climate change mitigation through carbon sequestration and storage, while buffering impacts of extreme weather events. They enhance economic and food security by providing fish nursery grounds that improve fisheries yields and generating tourism income for local communities.

1 Climate Benefits

Seagrasses sequester carbon and buffer coastal communities against extreme weather, enhancing climate resilience.

2 Economic Security

As fish nursery grounds, seagrasses improve fisheries yields and support tourism, generating vital income for local communities.

3 Gender Sensitivity

Effective management practices recognize the differentiated knowledge, roles and needs of men and women, facilitating gender equality in governance.

HOW SEAGRASSES SUPPORT ACHIEVEMENT OF MULTIPLE INTERNATIONAL COMMITMENTS
Integration of seagrass management in international policy, capacity-building, data sharing and funding is critical to achieve SDG goals
SDGs targets: 17.9, 17.14, 17.16, 17.18
Aichi Targets: 17, 18, 19, 20
RAMSAR targets: 15, 18, 19
At least 1 billion people live within 100km of a seagrass meadow, potentially depending on seagrass ecosystems for their livelihoods (fishing, tourism, etc.)
SDGs targets: 1.5
Aichi Targets: 1, 2, 14
RAMSAR targets: 11
Seagrass supports a wealth of marine biodiversity and is a keystone marine ecosystem
SDGs targets: 14.1, 14.2, 14.3, 14.4, 14.5, 14.7, 14A, 14B, 14C
Aichi Targets: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19
RAMSAR targets: 1, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 18
Hundreds of millions of people are dependent upon seagrass for their daily protein needs
SDGs targets: 2.1, 2.3
Aichi Targets: 3, 4, 7, 8, 18
RAMSAR targets: 3, 10
Seagrass supports climate change mitigation through carbon sequestration and storage, and climate change adaptation through protection against sea-level rise and flooding
SDGs targets: 13.1, 13.2, 13.3
Aichi Targets: 1, 2, 5, 6, 7, 10, 11, 12, 17, 18
RAMSAR targets: 1, 6, 7, 13, 16, 19
Women play a central role in the management and safeguarding of seagrass ecosystems
SDGs targets: 5.5
Aichi Targets: 14, 18
RAMSAR targets: 10
Seagrass management promotes sustainable harvesting of species and natural resources
SDGs targets: 12.8
Aichi Targets: 1, 2, 3, 4, 19
RAMSAR targets: 10
Seagrasses are filters for nutrients, pollutants, disease and provide clean water
SDGs targets: 6.1, 6.3, 6.6
Aichi Targets: 2, 3, 4, 5, 6, 7, 8, 11, 12
RAMSAR targets: 1, 2, 3, 5, 6, 7, 8, 12
Seagrass protects communities from flooding and natural disasters
SDGs targets: 11.5
Aichi Targets: 3, 4, 6, 7, 8
RAMSAR targets: 3
Seagrass supports livelihoods from fisheries and tourism
SDGs targets: 8.9
Aichi Targets: 2, 6, 7
RAMSAR targets: 1, 13
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER & SANITATION
7 AFFORDABLE & CLEAN ENERGY
8 DECENT WORK & ECONOMIC GROWTH
9 INDUSTRY, INNOVATION & INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES & COMMUNITIES
12 RESPONSIBLE CONSUMPTION & PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE & STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
Source: GRID-Arendal (2020)

Seagrasses and Global Biodiversity Frameworks

Many of the CBD's Strategic Plan for Biodiversity 2011-2020 Aichi Biodiversity Targets directly relate to seagrass ecosystems. Several goals specifically map to benefits received from seagrasses, including those addressing habitat loss (Target 5), fish stocks (Target 6), pollution (Target 8), marine protected areas (Target 11), ecosystem services (Target 14), and climate security (Target 15).

The 2015-2020 Gender Plan of Action provides a significant mandate for integrating gender considerations across policy and organizational spheres. Seagrasses and other coastal wetlands are documented in countries' national biodiversity strategies and action plans (NBSAPs), supporting the 2050 Vision for Biodiversity – "Living in harmony with nature."

Habitat Protection

Seagrasses directly support Aichi Target 5 (habitat loss), Target 6 (fish stocks), and Target 11 (marine protected areas).

Ecosystem Services

These marine habitats deliver on Target 14 (ecosystem services for livelihoods) and Target 15 (climate security).

Post-2020 Opportunity

The post-2020 biodiversity framework offers an opportunity to develop SMART targets for effective seagrass management.

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Seagrasses in Climate Change Agreements

Seagrasses provide nature-based solutions for both climate change mitigation and adaptation. Through the UNFCCC, several international agreements have established frameworks relevant to these marine ecosystems, including the Kyoto Protocol which entered into force in 2005 and established mechanisms for international trading in carbon offsets.

The Paris Agreement, adopted in 2015 and signed in 2016, promotes actions on climate change mitigation with the aim to keep global temperature increase well below 2°C above pre-industrial levels, while pursuing efforts to limit the increase to 1.5°C. This agreement recognizes the importance of ecosystem-based approaches to climate action.

Carbon Sequestration

Seagrasses are powerful carbon sinks, supporting climate change mitigation efforts through their ability to capture and store carbon dioxide.

Coastal Protection

These marine ecosystems provide natural barriers against storms and erosion, enhancing adaptation to climate impacts.

Policy Integration

International climate agreements increasingly recognize the value of blue carbon ecosystems like seagrasses in meeting climate goals.

Nationally Determined Contributions and Seagrasses

Nationally Determined Contributions (NDCs) under the Paris Agreement provide a forum for nations to outline self-determined steps for emissions reductions. The IPCC has provided guidelines on accounting for greenhouse gases in wetlands, including seagrasses. As of September 2019, approximately 64 countries have included references to coastal and marine ecosystems for adaptation and mitigation in their NDCs.

However, only 10 countries explicitly reference seagrasses, with 8 referring to adaptation and 5 to mitigation. The Bahamas stands out with a measurable target to protect 20 percent of its nearshore marine environment by 2020, including seagrass meadows, coral reefs, and mangrove nurseries.

1

2016 Assessment

28 countries acknowledged coastal blue carbon habitats for mitigation, with 59 referencing coastal ecosystems for adaptation strategies.

2

2019 Progress

64 countries included coastal and marine ecosystems in their NDCs for adaptation and mitigation purposes.

3

Current Status

Only 10 countries explicitly reference seagrasses, with just one including a measurable target specifically mentioning these ecosystems.

4

Future Potential

Accounting for seagrass climate benefits combined with economic valuation could support sustainable long-term NDC actions.

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Seagrasses and Disaster Risk Reduction

Beyond carbon benefits, seagrasses mitigate risks to coastal communities and infrastructure associated with extreme weather events such as storm surges and flooding. By minimizing these risks, seagrass ecosystems can reduce economic losses, aligning with the targets of the Sendai Framework for Disaster Risk Reduction.

Although nature-based solutions do not feature prominently in the Sendai Framework, it does mention the need to "strengthen the sustainable use and management of ecosystems and implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction." This creates an opportunity to highlight seagrasses' role in coastal protection.

30%

Wave Energy Reduction

Dense seagrass meadows can reduce wave energy reaching shorelines by up to 30%, providing natural coastal defense.

40%

Erosion Prevention

Seagrass root systems stabilize sediments, reducing coastal erosion by approximately 40% compared to unvegetated areas.

$20B

Annual Savings

Global coastal protection value of seagrass ecosystems is estimated at $20 billion annually in prevented damage and reduced insurance costs.

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United Nations Decades Supporting Seagrass Conservation

Two United Nations Decades, both proclaimed by the UN General Assembly in March 2019, provide excellent opportunities to focus attention and attract funding for seagrass ecosystem protection and restoration. These parallel initiatives create a powerful framework for advancing seagrass conservation globally.

The **United Nations Decade on Ecosystem Restoration** (2021-2030) aims to scale up efforts to prevent, halt and reverse ecosystem degradation worldwide, including marine and coastal ecosystems. Stakeholders can include seagrasses in their commitments and actions to achieve decade-related goals, highlighting these vital but often overlooked habitats.

Ecosystem Restoration

Focuses on preventing, halting, and reversing degradation of all ecosystems, including seagrasses.

1

2

Ocean Science

Supports reversing ocean health decline and gathering stakeholders behind a common framework.

Global Awareness

These initiatives raise the profile of seagrasses as critical marine habitats deserving protection.

4

3

Funding Opportunities

Both decades create platforms to attract resources for seagrass research, conservation, and restoration.

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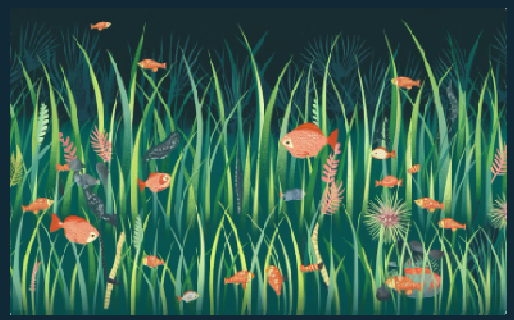
Ramsar Convention and Seagrass Protection

The Ramsar Convention represents a significant international agreement promoting the conservation and wise use of wetlands, which explicitly include seagrass meadows. This convention provides a framework for national action and international cooperation for the conservation and sustainable use of wetlands and their resources.

Resolution XIII.20, created at the 2018 Ramsar Conference of Contracting Parties, specifically promotes the conservation and wise use of intertidal wetlands and ecologically associated habitats, with explicit mention of seagrass ecosystems. This resolution strengthens the policy foundation for protecting these vital marine habitats at national and international levels.

Ramsar Protected Sites

Many seagrass meadows worldwide receive protection under Ramsar designation, recognizing their importance as wetland habitats.



Ecological Importance

The Ramsar Convention recognizes seagrasses as critical components of wetland ecosystems that support biodiversity and provide essential services.

International Cooperation

Resolution XIII.20 specifically promotes conservation of intertidal wetlands including seagrass ecosystems through international collaboration.

United Nations Environment Assembly and Seagrass Policy

While there is no United Nations Environment Assembly (UNEA) resolution specifically adopted for seagrass ecosystem management, several existing resolutions relate to these habitats. These include resolutions on protecting marine environments from land-based activities (4/11), sustainable management of mangroves (4/12), and sustainable coral reef management (2/12 and 4/13).

Many drivers of seagrass degradation are addressed in these resolutions without specifically mentioning seagrass ecosystems. Member States call for actions to address multiple and synergistic stressors affecting coastal habitats. A positive development would be the proposition and adoption of a UNEA resolution specifically focused on sustainable management of seagrass ecosystems.

Current Status

No specific UNEA resolution exists for seagrass ecosystems, though related habitats like mangroves and coral reefs have dedicated resolutions.

Indirect Protection

Existing resolutions address drivers of seagrass degradation without explicitly mentioning these ecosystems.

European Framework

In the European Union, seagrasses are explicitly referenced under Annex I of the Habitats Directive and as biological quality indicators in the Water Framework Directive.

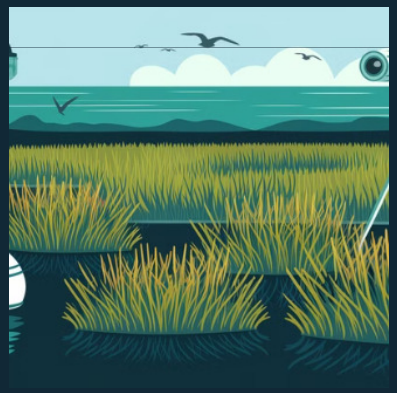
Future Opportunity

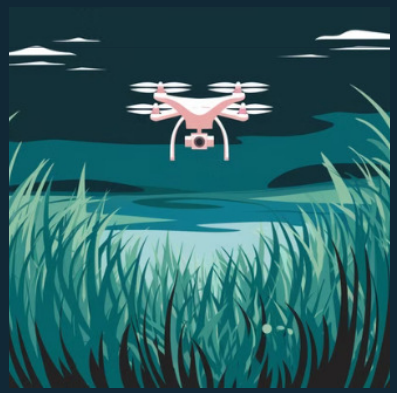
Proposition and adoption of a specific UNEA resolution on sustainable seagrass management would strengthen international policy.

Management Options for Seagrass Conservation

To effectively achieve policy objectives for seagrass conservation, various management measures and tools are available at national, regional, and global levels. These approaches can help ensure a sustainable future for these vital marine ecosystems while delivering on multiple policy goals.

Policy- and decision-makers have several key options to consider when developing strategies for seagrass protection and sustainable management. These options range from developing dedicated national action plans to implementing integrated coastal management approaches that recognize the connectivity between seagrasses and adjacent ecosystems.



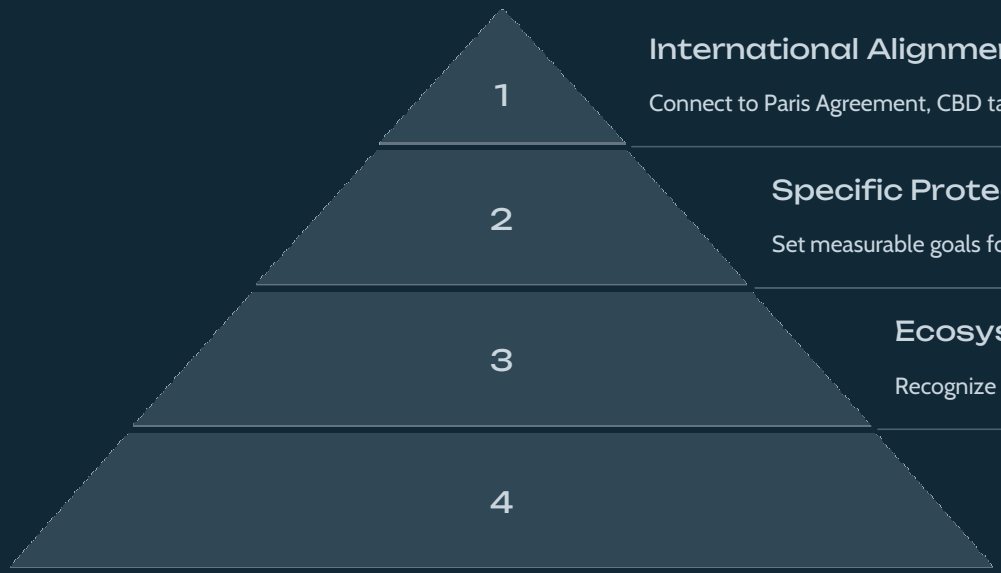


Effective management requires a combination of approaches tailored to local contexts, from protected areas and fishing regulations to restoration initiatives and monitoring programs.

Developing National Action Plans for Seagrass Ecosystems

Currently, very few countries have prepared plans specifically for the protection and management of seagrass ecosystems, especially when compared to the many national plans developed for coral reefs and mangrove ecosystems. Creating dedicated national action plans represents a critical step toward effective seagrass conservation.

These national plans should include specific targets for protection and ecosystem health, while connecting to broader international commitments. Importantly, they should help deliver on Nationally Determined Contributions to the Paris Agreement, Convention on Biological Diversity targets, and the Sustainable Development Goals. Plans must also recognize ecological connectivity with adjacent ecosystems like coral reefs, mangroves, kelp forests, or saltmarshes.



International Alignment

Connect to Paris Agreement, CBD targets, and SDGs

Specific Protection Targets

Set measurable goals for conservation and health

Ecosystem Connectivity

Recognize links with adjacent habitats

Implementation Framework

Define actions, responsibilities, and timelines

Developing comprehensive national action plans provides a foundation for coordinated seagrass conservation efforts across government agencies, research institutions, and local communities.

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Integrated Coastal Management for Seagrass Protection

Spatial planning that integrates stakeholder and cross-ministerial consultation is essential for developing holistic management measures for seagrass ecosystems. This approach ensures effectiveness across the land-sea interface and reduces the cumulative pressures facing seagrasses and associated ecosystems.

Integrated coastal zone management and marine spatial planning provide frameworks for balancing multiple uses of coastal areas while protecting critical habitats. These approaches recognize that threats to seagrasses often originate from both land and sea, requiring coordination across sectors including agriculture, urban development, fisheries, tourism, and transportation.

1

Stakeholder Engagement

Involve all relevant sectors and communities in planning processes to ensure buy-in and comprehensive consideration of needs and impacts.

2

Cross-Ministerial Coordination

Facilitate collaboration between government departments responsible for environment, fisheries, tourism, transportation, and urban development.

3

Spatial Mapping

Develop detailed maps of seagrass distribution and health to inform zoning decisions and identify priority areas for protection.

4

Adaptive Management

Implement flexible approaches that can respond to changing conditions and new information about seagrass ecosystems.

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Ecosystem-Based Fisheries Management for Seagrass Protection

Adoption of the ecosystem approach to fisheries developed by the **Food and Agriculture Organization of the United Nations** (FAO) takes into account protection of habitats that support sustainable fisheries. This approach focuses on reducing pressures on seagrasses and associated species, while also reducing or eradicating the use of destructive fishing gear.

Implementing temporally or spatially defined closures or no-take zones can boost larval production and reduce pressures on degraded areas. These protective measures should be designed through community engagement and co-management structures to enhance support and effectiveness. Explicit protection of seagrass meadows within marine protected areas, locally managed marine areas, or other effective area-based conservation measures leads to better conservation outcomes.

1

Habitat Protection

Recognize seagrasses as essential fish habitat

2

Gear Restrictions

Eliminate destructive fishing practices

3

Spatial Management

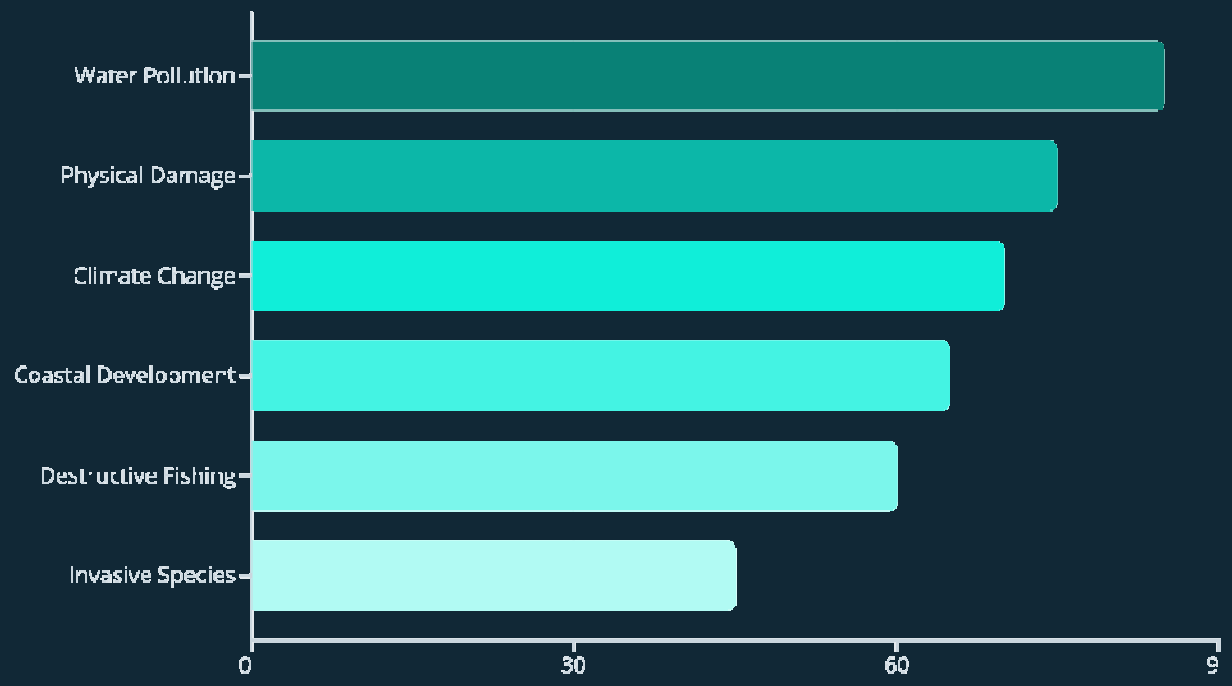
Implement strategic closures and no-take zones

Effective fisheries management recognizes the critical role seagrasses play in supporting fish populations and aims to maintain these ecosystem services while allowing sustainable harvest.

Addressing Drivers of Seagrass Degradation

To halt degradation and promote recovery, management must address the factors necessary to strengthen seagrass ecosystem resilience and avoid "ecosystem regime shifts" that fundamentally alter the potential for these ecosystems to recover. A comprehensive approach targets both direct and indirect drivers of degradation.

Focusing on measures that enhance genetic diversity, species diversity, biological traits, ecosystem connectivity, and continuous, non-fragmented habitat can significantly contribute to the resilience of seagrass ecosystems. This requires addressing multiple pressures including water quality, physical disturbance, climate impacts, and invasive species.



Addressing these key threats requires coordinated action across sectors and jurisdictions, with particular attention to land-based sources of pollution and coastal development that impact water quality and habitat integrity.

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Investing in Seagrass Ecosystem Restoration

Although seagrass restoration trials have been relatively limited in number, a review of 1,786 trials found that restoration success depends on several critical factors. These include the removal of underlying threats, proximity to donor seagrass beds, and the recovery potential of these donor beds.

Planting techniques significantly influence success rates, with large-scale planting often increasing survival. Site selection is equally important, requiring careful assessment of environmental conditions. Seagrass restoration delivers multiple benefits, from local food provision and coastal protection to contributions toward global targets associated with the United Nations Decade on Ecosystem Restoration.

Site Selection

Choose locations with suitable water quality, depth, and substrate

Threat Removal

Address underlying causes of degradation before restoration

Donor Assessment

Ensure healthy source material from nearby meadows

Planting Technique

Implement appropriate methods at sufficient scale

Monitoring

Track progress and adapt approaches as needed

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Monitoring Seagrass Ecosystems

Implementing consistent remote sensing and in situ monitoring of seagrass habitats provides essential data for effective management. These monitoring approaches help track the effectiveness of conservation measures, detect inter-annual trends, and support adaptive management and future planning for seagrass ecosystems.

Monitoring also plays a crucial role in informing sustainable development initiatives by tracking benefits associated with ecosystem services and supporting reporting on national commitments to global targets. A combination of satellite imagery, aerial surveys, and field-based assessments provides the most comprehensive understanding of seagrass distribution and health.

Remote Sensing

Satellite and aerial imagery provide broad-scale mapping of seagrass extent and can detect large changes over time, offering cost-effective monitoring of extensive areas.

Field Surveys

In-water assessments by scientists and trained community members provide detailed data on species composition, density, and health indicators not visible from above.

Data Management

Standardized protocols and centralized databases ensure information is comparable across regions and accessible to researchers, managers, and policy makers.

Trend Analysis

Long-term monitoring enables detection of changes in seagrass ecosystems, helping distinguish between natural fluctuations and concerning declines.

Building Public Awareness of Seagrass Importance

Increasing public awareness campaigns and education programs about seagrass ecosystems is vital for their conservation. Enhanced awareness among local communities and tourists can strengthen compliance with management measures and generate greater appreciation for these often overlooked marine habitats.

Public engagement initiatives help overcome the "charisma gap" that seagrasses face compared to more visible ecosystems like coral reefs. When people understand the ecological and economic value of seagrass meadows, they become more invested in their protection and more likely to support conservation policies.

Educational Outreach

School programs and field trips introduce young people to seagrass ecosystems, building the next generation of marine stewards.

Eco-Tourism

Responsible tourism activities can raise awareness while providing economic incentives for conservation.

Citizen Science

Involving community members in monitoring programs builds understanding and creates personal connections to seagrass conservation.

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Incorporating Traditional and Local Ecological Knowledge

Encouraging the use of traditional and local ecological knowledge in developing management strategies for seagrass ecosystems creates more effective and well-rounded conservation initiatives. Communities that have lived alongside these marine habitats for generations often possess valuable insights about historical conditions, seasonal patterns, and sustainable use practices.

Engaging local communities in co-managing seagrass ecosystems or associated protected areas builds ownership and improves compliance with regulations. This participatory approach recognizes that conservation success depends not just on scientific understanding but also on social acceptance and cultural relevance.

Knowledge Integration

Traditional ecological knowledge provides historical baselines and understanding of long-term changes in seagrass ecosystems that may not be captured in scientific monitoring programs. This information helps set realistic restoration targets and identify sustainable management practices.

Co-Management Approaches

Collaborative governance arrangements that share decision-making authority between government agencies and local communities create more legitimate and effective conservation outcomes. These approaches recognize rights and responsibilities of traditional resource users.

Cultural Values

Understanding the cultural significance of seagrass ecosystems to local communities helps develop conservation strategies that respect and incorporate these values. This creates stronger motivation for protection beyond purely ecological or economic considerations.

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Implementing Effective Seagrass Management

To be effective, seagrass management options must be considered at appropriate scales and levels of governance, with clear understanding of implementation approaches. Step-zero analysis, adaptive management, and meaningful stakeholder participation are essential components of successful conservation initiatives.

Inclusiveness and equitable distribution of impacts, privileges, and opportunities are important considerations, including attention to gender roles and access to resources. Every situation requires careful consideration of a range of socioecological factors, as bioregional, political, cultural, and species-specific elements determine the best methods for influencing policy- and decision-makers.

1 Scale-Appropriate Approaches

Management measures must match the ecological scale of seagrass meadows and the governance structures that influence them, from local to international levels.

2 Adaptive Implementation

Flexibility to adjust strategies based on monitoring results and changing conditions ensures long-term effectiveness of conservation efforts.

3 Equity Considerations

Fair distribution of both conservation responsibilities and benefits builds sustainable support for seagrass protection across diverse stakeholder groups.

4 Context Sensitivity

Tailoring approaches to specific bioregional, political, cultural, and ecological contexts increases the likelihood of successful implementation and lasting impact.

These training materials have been compiled by bringing together existing literature and general practices. While utmost care has been taken to ensure the accuracy and timeliness of the information contained within, it should be noted that relevant legislation, standards, and practices are subject to change. Therefore, the author is not responsible for any consequences arising from the use of the information presented in this material.