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PATTERN

Providing operational economic appraisal methods and practices for decision-making on climate and environmental policies

Policy Brief
Norwegian Case Study

Ensuring Sustainable Aquaculture in Trøndelag, Norway

Introduction

Norway's aquaculture sector plays a crucial role in driving economic growth while supporting biodiversity. The region of Trøndelag benefits from aquaculture exports but faces significant challenges related to climate change, pollution, and biodiversity conservation. The industry predominantly uses open sea cages, requiring a careful balance between growth and sustainability. This policy brief highlights key initiatives aimed at mitigating these challenges, including real-time monitoring, adaptation strategies, and stakeholder collaboration.

Policy Context

Aquaculture policies in Trøndelag operate within both regional and national frameworks. While Norway's national regulations set broad sustainability and environmental requirements, Trøndelag has developed region-specific strategies to align aquaculture growth with local environmental and economic priorities.

Regional Policies Specific to Trøndelag

➡ **Regional Plan for Area Usage**: ensures that spatial planning for aquaculture accounts for environmental and social factors, balancing industry expansion with sustainability.

➡ **Regional Strategy for Climate Change Mitigation and Adaptation**: aligns aquaculture practices with national climate goals while addressing local marine ecosystems challenges.

➡ **Regional Strategies for Value Creation**: promotes economic growth in the aquaculture sector while maintaining sustainability standards.

National Policies Impacting Trøndelag

➡ **Traffic Light System**: classifies coastal regions based on the environmental impact of salmon lice and pollution, using a color-coded scheme to regulate production:

- Green: production can expand
- Yellow: production remains unchanged
- Red: production must be reduced

Trøndelag was classified as yellow in 2024, meaning production levels are stable.

➡ **New Pollution Control Regulations (2024)**: a major policy shift has eliminated individual discharge permits, replacing them with uniform environmental standards under the Aquaculture Operation Regulations. This framework requires all open-sea fish farms to comply with standardized conditions, focusing on:

- Nutrient discharge limits (Nitrogen and Phosphorus)
- Organic waste accumulation beneath farms
- Indicators of benthic health and water quality

Key Findings

- **Short-Term Outcomes**: increased economic growth in aquaculture production driven by current policies, with potential short-term environmental impacts.
- **Intermediate Outcomes**: environmental policies, which regulate nutrient discharge and farm waste, will begin to moderate growth and begin improving seabed conditions.
- **Long-Term Outcomes**: a balance between biodiversity protection and sustainable expansion will be achieved, leading to improved water quality and seabed conditions in alignment with sustainable growth.

Challenges

Several challenges need to be addressed to ensure the long-term sustainability of the aquaculture sector in Trøndelag:

Economic Growth vs Environmental Health

➡ Growth in aquaculture supports job creation in farming, processing, logistics, and related industries, particularly in Trøndelag's coastal communities.

Trade-off: increased production to boost economic growth may lead to environmental degradation, including water pollution and seabed damage, which could undermine the industry's long-term viability.

➡ Growth encourages investments in innovative solutions such as closed containment systems to mitigate environmental impacts.

Trade-off: advanced technologies require significant capital, potentially deterring smaller operators and leading to greater market concentration among larger firms.

Biodiversity Protection vs Industry Expansion

➡ Preserving wild salmon populations is essential for biodiversity and cultural heritage. However, overcrowding in open net farms can lead to sea lice outbreaks and pathogen transmission to wild populations.

Trade-off: reducing sea lice outbreaks often involves chemical treatments or feed additives, which can negatively impact marine life and water quality. Mechanical delousing methods, while reducing chemical use, have raised concerns about fish welfare due to physical injuries, stress and increase mortality rates.

➡ Escaped farmed fish interbreeding with wild stocks can reduce genetic diversity in wild populations.

Trade-off: strict containment measures to prevent farmed fish escapes could increase operational costs for farmers, potentially harming small and medium-sized businesses and leading to market consolidation.

Expansion Pressure vs Regulatory Oversight

➡ Norway's global competitiveness in aquaculture relies on continuous growth.

Trade off: loosening regulations to enable faster growth could damage Norway's reputation for responsible aquaculture practices. Conversely, strict environmental impact assessments ensure long-term sustainability but increase compliance costs, affecting the industry's global competitiveness.

- ➡ Introduction of a Resource Rent Tax (2023) on salmon and trout farming to redistribute profits more equitably across Norwegian society.

Trade-off: stricter sustainability measures, combined with existing taxes, could deter investments and slow innovation in the sector.

Local Community Benefits vs Environmental Costs

- ➡ Industry growth provides jobs and strengthens the economy in rural communities.

Trade-off: environmental degradation, including pollution and loss of recreational areas, can harm community well-being and other local industries such as tourism.

- ➡ Expanding aquaculture farms utilizes valuable coastal space.

Trade-off: expansion may lead to overcrowding, creating conflicts with other stakeholders, including traditional fishers, conservationists, offshore wind operators, and tourism businesses.

Policy Recommendations

To further strengthen the sustainability of the aquaculture sector, the following actions are recommended:

- ➡ **Increasing Public Transparency**: introduce open-access environmental monitoring platforms to build trust between industry players and local communities.
- ➡ **Establish Conflict Resolution Frameworks**: develop clear mediation processes to resolve disputes over marine space allocation.
- ➡ **Strengthen Regional Collaboration**: expand Trøndelag's model of industry-environmental-policy clusters to enhance sustainability dialogue.
- ➡ **Enhance Climate Adaptation**: invest in research and technologies that allow aquaculture to adapt to climate change, including rising temperatures and ocean acidification.
- ➡ **Incentivize Sustainable Practices**: provide additional subsidies for businesses adopting sustainable aquaculture methods that align economic growth with environmental preservation.

Conclusions

Norway's updated aquaculture policy for Trøndelag represents a significant effort to balance economic growth with environmental sustainability. By promoting climate resilience, enhancing pollution control, and encouraging stakeholder cooperation, the policy aims to maintain the aquaculture industry's global competitiveness while safeguarding marine ecosystems. Overcoming challenges related to climate change, pollution, and regulatory resistance will be crucial to ensuring that aquaculture remains sustainable in the region.