Stewarding the Seas: Policy Lessons from Ecosystem-Based Fisheries Management

Shweta Vaidya[1]*, Dr. Javed G. K. Pathan[2] and Aditya Bhamare[3]

[1,3]Undergraduate Researcher, [2]Associate Professor
[1,2,3]College of Fishery Science, MAFSU, Nagpur, Maharashtra

Corresponding Author
Shweta Vaidya
Email: shwetavaidya269@gmail.com

OPEN ACCESS

Keywords

Ecosystem-Based Fisheries Management, Climate Adaptation, Habitat Protection, Local Ecological Knowledge, Sustainable Fisheries Policy, Stakeholder Collaboration

How to cite this article:

Vaidya, S., Pathan, J. G. K. and Bhamare, A. 2026. Stewarding the Seas: Policy Lessons from Ecosystem-Based Fisheries Management. *Vigyan Varta* 7 (06): 143-146.

ABSTRACT

Marine fisheries worldwide face growing threats from climate change, overfishing, habitat degradation, and socioeconomic pressures. Ecosystem-Based Fisheries Management (EBFM) provides a comprehensive framework that considers entire social-ecological systems rather than single species. This article synthesizes key policy lessons from recent case studies in the Baltic Sea, Pacific salmon regions, scallop fisheries, the Mediterranean, and small-scale fisheries in Indonesia. It highlights the importance of transformative adaptation, scientific modeling, habitat protection, integration of local knowledge, and multi-objective planning. These lessons offer practical guidance for policymakers to create resilient, sustainable fisheries that support both ecosystems and coastal communities.

INTRODUCTION

Oceans support billions of people through food, jobs, and cultural heritage, but traditional fisheries management focused on individual species has struggled to prevent collapses and ecosystem damage (Möllmann *et al*., 2026). Ecosystem-Based Fisheries Management (EBFM) offers a better way forward by addressing the complex interactions between fish stocks, habitats, climate factors, and human communities. This approach treats fisheries as part of larger social-ecological systems.

Drawing from diverse global studies, this article presents clear, actionable policy lessons. Written in straightforward language, it aims to inform readers across disciplines — from government officials and scientists to fishers and concerned citizens.

Key Policy Lessons from EBFM Applications

1. **Adopt Transformative Adaptation for Collapsing Systems** In the German Western Baltic Sea, cod and herring fisheries have declined sharply due to climate change, overfishing, and eutrophication, threatening coastal livelihoods (Möllmann *et al*., 2026). Traditional incremental adjustments are no longer enough. Scenario planning exercises using qualitative methods helped identify critical uncertainties around climate impacts and societal importance, leading to recommendations for ecosystem-based management, livelihood diversification, and stronger collaboration (Möllmann *et al*., 2026).

- **Policy Lesson:** Policymakers should use forward-looking tools like scenario planning to prepare for uncertain futures and implement transformative changes that restructure management pathways.

2. **Strengthen Science Through Ecosystem Modeling** Advanced marine ecosystem models (MEMs) are essential for understanding full life cycles and species interactions. A review of 34 models covering Pacific salmon showed that integrating climate change, predator-prey dynamics, and fishing pressure improves conservation and management decisions, though better links between freshwater and marine models are still needed (Tulloch *et al*., 2026). Similarly, in the Eastern Ionian Sea, combining ecosystem and bio-economic models helped identify optimal effort zones that balance ecological, economic, and social goals (Sgardeli *et al*., 2026).

- **Policy Lesson:** Invest in co-developed ecosystem models and use them to evaluate trade-offs under different climate and management scenarios.

3. **Prioritize Habitat Protection** Bottom-fishing gears, such as dredges used in scallop fisheries, can damage seabed habitats vital for species recruitment. Analysis of global scallop fisheries found that while many MSC-certified operations use adaptive management and stock assessments, explicit habitat protection measures remain limited despite their importance (Fenton *et al*., 2026).

- **Policy Lesson:** Mainstream habitat objectives into EBFM by implementing spatial protections, gear restrictions, and monitoring to ensure long-term sustainability.

4. **Integrate Social Dimensions and Local Knowledge** Effective EBFM must include human elements. Studies emphasize incorporating Local Ecological Knowledge (LEK) from fishers, which provides place-based insights often missing from scientific data (Fauzi *et al*., 2026). In small-scale fisheries, such as Spanish mackerel in Indonesia, multi-criteria assessments within EBFM frameworks revealed good ecological performance but highlighted needs for better institutional support and gear selectivity (Sinaga *et al*., 2025). Social science integration helps address equity and compliance (Gibbs, 2026).

- **Policy Lesson:** Develop participatory co-management systems that value fishers' knowledge and balance ecological, social, and economic objectives.

5. **Account for Multiple Stressors and Ecosystem Services** Extreme events like Florida red tides complicate management, requiring flexible responses beyond traditional catch limits (Turley *et al*., 2026). In the Baltic Sea, ecosystem modeling demonstrates that sustainable EBFM can nearly double carbon retention through fish biomass and detritus, providing climate benefits alongside stable catches (Morsbach *et al*., 2026).

- **Policy Lesson:** Design adaptive policies that respond to shocks like harmful algal blooms and pursue multiple benefits, including carbon storage and biodiversity.

Table 1: Selected Policy Lessons from EBFM Case Studies

Region / Fishery	Major Challenge	Key Policy Recommendation	Main Benefit
Western Baltic Sea	Stock collapse & climate change	Transformative adaptation & scenario planning	Resilience & sustainable livelihoods (Möllmann *et al*., 2026)
Pacific Salmon (NE Pacific)	Disconnected life cycles	Integrated ecosystem modeling	Informed conservation (Tulloch *et al*., 2026)
Global Scallop Fisheries	Seabed habitat damage	Explicit habitat mainstreaming	Long-term productivity (Fenton *et al*., 2026)
Eastern Ionian & Indonesia	Mixed fisheries & data limits	LEK integration & multi-objective effort zones	Social-ecological balance (Sgardeli *et al*., 2026; Sinaga *et al*., 2025)
Florida Red Tides & Baltic	Multiple stressors	Flexible policies & ecosystem services	Climate mitigation & adaptability (Turley *et al*., 2026; Morsbach *et al*., 2026)

CONCLUSION

Ecosystem-Based Fisheries Management offers a proven path to healthier oceans and more resilient coastal communities. By applying lessons from the Baltic Sea, Pacific, Mediterranean, and beyond — such as embracing transformation, using robust models, protecting habitats, valuing local knowledge, and addressing multiple stressors — policymakers can move from crisis response to proactive stewardship (Möllmann *et al*., 2026; Tulloch *et al*., 2026; Fenton *et al*., 2026).

Success requires genuine collaboration among scientists, managers, fishers, and communities. Urgent investment in these approaches will help secure sustainable fisheries for future generations while contributing to broader goals like climate resilience and biodiversity conservation. The seas are a shared resource; stewarding them wisely through EBFM is both a necessity and an opportunity.

REFERENCES

Fauzi, A., Nurhayati, S., & Santoso, B. (2026). Integrating Local Ecological Knowledge into Ecosystem-Based Fisheries Management for Sustainable Small-Scale Fisheries Governance. *Qriset Indonesia Journal of Fisheries and Marine Science*, *1*(1), 17-24.

Fenton, M. A., Blackadder, L., Stewart, B. D., Donnan, D., Hiddink, J. G., Bell, M. C., & Kaiser, M. J. (2026). Mainstreaming habitat management objectives in an ecosystem-based approach to management of scallop fisheries. *Reviews in Fisheries Science & Aquaculture*, *34*(2), 129-145.

Gibbs, S. L. (2026). *Integrating Social Science into Ecosystem-Based Fisheries Management: Four Case Studies of Diverse Marine Fisheries* (Doctoral dissertation, University of South Alabama).

Möllmann, C., Blenckner, T., Clemmesen, C., Conradt, J., Funk, N., Funk, S., ... & Voss, R. (2026). Scenario planning to

support the transformative adaptation of a collapsing fishery. *npj Ocean Sustainability*.

Morsbach, S., Reusch, T. B., MacNeil, L., Islam, T., Froese, R., & Scotti, M. (2026). Enhanced ocean carbon-retention through ecosystem-based fisheries management in the western Baltic Sea. *SSRN Electronic Journal*.

Sgardeli, V., Papantoniou, G., Tsoukali, S., Liontakis, A., Tsagarakis, K., Vassilopoulou, V., & Giannoulaki, M. (2026). Laying the foundation for ecosystem-based fisheries management in the Eastern Ionian demersal fishery. *ICES Journal of Marine Science*, *83*(3), fsag025.

Sinaga, M. F. T., Prianto, E., & Fauzi, M. (2026). Evaluating fishing techniques and sustainability status of spanish mackerel (Scomberomorus sp.) under an ecosystem-based fisheries management framework. *Journal of Earth Kingdom*, *3*(2), 75-91.

Tulloch, V. J., Murray, C., Surma, S., Barnes, C. L., Conn, J., Holsman, K., ... & Berry, K. (2026). Applications of marine ecosystem models for Pacific salmon conservation and management in the Northeast Pacific. *FACETS*, *11*, 1-24.

Turley, B. D., Sagarese, S. R., Karnauskas, M., Blake, S. D., McPherson, M., Chagaris, D. D., & Kelble, C. R. (2026). A garden of forking paths: an ecosystem-based fisheries management case study of Florida red tides. *Reviews in Fish Biology and Fisheries*, *36*(1), 48.