

platforms-have already made a noticeable difference to household incomes (Hungevu et al., 2025; Chandravanshi et al., 2025). Experience from coastal areas of China further suggests that, when systems are designed with care, intelligent technologies can support economic returns while remaining broadly compatible with environmental protection goals.

6.3 Beyond environment or economy alone

Whether fisheries supported by intelligent technologies can genuinely be regarded as sustainable is difficult to judge if attention is placed on environmental indicators alone. In practice, economic and social considerations are closely intertwined and rarely easy to separate. From the environmental side, intelligent systems have been linked to more efficient use of resources, lower levels of waste during farming and processing, improved oversight of illegal fishing through continuous monitoring, and conditions that are more favorable for ecosystem recovery (Wang et al., 2025; Li et al., 2025; Lv, 2025). Economic impacts are also becoming increasingly apparent. Digital tools are helping reduce transaction costs along the supply chain and, in some cases, lowering barriers for small-scale fishers to reach markets. Evidence from China's coastal regions suggests that economic growth and environmental improvement do not always stand in opposition, as long as management arrangements take local circumstances into account (Li et al., 2025).

Social effects, however, are often less straightforward. On the positive side, intelligent systems can help ease labor shortages, improve safety during offshore operations, and provide fishers with more opportunities to participate in management processes (Chandravanshi et al., 2025; Briones et al., 2025). At the same time, several studies caution that unequal access to technology and insufficient policy support may widen existing gaps within the sector or lead to an overreliance on automated systems (Jang et al., 2025). Seen from this angle, the key issue is not simply whether intelligent technologies are available, but how they are introduced, shared, and governed in ways that remain fair, inclusive, and balanced over time.

7 Policy and Regulatory Framework for the Development of Intelligent Fisheries

7.1 International governance and institutional support for intelligent fisheries

International laws and governance initiatives provide the overall direction for the development of intelligent fisheries. Key frameworks such as the United Nations Convention on the Law of the Sea and the FAO Code of Conduct for Responsible Fisheries emphasize monitoring, control, and the use of advanced scientific methods, including digital and AI-based technologies. These principles are further operationalized by regional fishery management organizations through standards such as electronic monitoring and satellite vessel tracking. In addition, the proposed Biodiversity Beyond National Jurisdiction agreement highlights electronic monitoring as a core tool for high-seas protection, offering legal support for the wider adoption of intelligent systems.

At the same time, governance challenges emerge early and are difficult to avoid. As intelligent technologies shape fisheries management, debates quickly focus on system transparency, data access, and decision-making authority. Research shows that data accessibility and transparent processes are essential for trust and accountability. The Global Fisheries Watch initiative illustrates this tension: while it enables public, real-time tracking, it has also raised questions about data ownership and enforcement authority. Similar issues appear in broader international discussions, where AI governance remains fragmented and fishers' practical concerns are often underrepresented. Without parallel efforts to ensure fair access and participation, new technologies risk reinforcing existing geopolitical and economic inequalities.

7.2 National-level policies, regulations and governance practices

At the national level, governments operate between international commitments and everyday management needs. In practice, the pace of intelligent aquaculture development depends less on technological readiness than on whether policies allow flexible yet well-defined use. Many countries have revised aquaculture laws to promote monitoring and traceability, increasing regulatory pressure while also improving efficiency and product quality.