



*Leading Practices in the Collection and
Use of E-Data in Fisheries Governance*





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Leading Practices in the Collection and Use of E-Data in Fisheries Governance

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Executive summary

Digital technologies are increasingly central to fisheries governance. From satellite-based vessel tracking to electronic logbooks and onboard monitoring systems, electronic data (“e-data”) has transformed how fisheries are managed, monitored, and enforced. While uptake remains uneven, experience across multiple jurisdictions demonstrates that e-data—when embedded within appropriate legal and institutional frameworks—can significantly enhance compliance, deter illegal fishing, and support effective prosecution of fisheries infringements.

This report distils leading practices in the collection and use of e-data for fisheries governance, drawing on comparative case studies presented by the signing consultants in the September 2025 companion report, *E-data for fisheries compliance: Case Studies and Summary Report*, which gathers and analyses the collection and use of e-data in fisheries management of Australia, New Zealand, Spain, the United States, and the Republic of the Marshall Islands (RMI). It also reflects input gathered through country-specific studies of the legal regimes governing e-data in Chile, Mexico, Panama and Peru, conducted as part of the project *Legal Ocean Watch* coordinated by FIMA in Chile. These practices do not represent aspirational ideals or theoretical best practice. Rather, they identify practical, transferable approaches in governance, data collection and management that can guide policymakers, fisheries authorities, and development partners seeking to strengthen fisheries governance through improved use of e-data.



Key leading practices in the collection and use of e-data for fisheries

E-data collection is already an indispensable tool in fisheries governance, and its role is only growing.

Establishing a framework strategy, policy, or legislation can help to facilitate the development and implementation of e-data systems for fisheries control and enforcement.

VMS is widely used in mature commercial fisheries management and remains the cornerstone of e-data systems, complemented by AIS data.

With the expansion of automated cross-checks and validations, electronic reporting systems strengthen fisheries management and enforcement processes.

Onboard electronic monitoring is demonstrating value and is increasingly seen as a critical e-data collection tool

New image-gathering tools and technology support the value of images as evidence.

Satellite imagery is not widely used, but it can be critical for enforcement actions that require expansive domain awareness with limited capacity.

The use of e-data can be encouraged through technical and financial support measures, including trials and phased approaches.

Even decentralised administrations need to integrate their systems to maximise effectiveness; the integration and connection of a broad range of e-data sources lead to higher data quality and more effective and efficient control and enforcement.



E-data may require a level of protection to ensure its quality and legal certainty, but this must be balanced against transparent practices that protect the public interest.

Real-time e-data monitoring is feasible with current technologies.

Artificial intelligence will be part of any evolving e-data system.

Regional cooperation can be instrumental in achieving ambitious e-data goals.

Administrative enforcement systems provide certain advantages where they supplement more formal and punitive judicial procedures.

E-data systems can be designed at the outset to provide reliable evidence regardless of the technology or process employed.



I. Introduction

Digital technologies are increasingly central to fisheries governance. From satellite-based vessel tracking to electronic logbooks and onboard monitoring systems, electronic data (“e-data”) has transformed how fisheries are managed, monitored, and enforced. While uptake remains uneven, experience across multiple jurisdictions demonstrates that e-data—when embedded within appropriate legal and institutional frameworks—can significantly enhance compliance, deter illegal fishing, and support effective prosecution of fisheries infringements.

This report distils *leading practices* in the collection and use of e-data for fisheries governance, drawing on comparative case studies presented in the September 2025 companion report, *E-data for fisheries compliance: Case Studies and Summary Report* (hereinafter the Case Study Report), which gathers and analyses the collection and use of e-data in fisheries management of Australia, New Zealand, Spain, the United States, and the Republic of the Marshall Islands (RMI). It also reflects input gathered through country-specific studies of the legal regimes governing e-data in Chile, Mexico, Panama and Peru, conducted as part of the project *Legal Ocean Watch* coordinated by FIMA in Chile. These practices do not represent aspirational ideals or theoretical best practice. Rather, they reflect approaches that have already been implemented in at least one jurisdiction, have demonstrated effectiveness in real-world enforcement contexts, and show potential for replication across countries with varying levels of capacity and resources.

The overall purpose of this report is to identify practical, transferable approaches to guide policymakers, fisheries authorities, and development partners in strengthening fisheries governance by improving the use of e-data.

II. Definitions

E-data

For the purposes of this report, “e-data” or “electronic data” refers to information that can be shared or stored as a series of coded instructions that a computer can read. It includes data obtained with digital technologies and also data obtained analogically that can be converted into digital signals.

Leading practices

For the purposes of this report, *leading practices* are defined by four core criteria:

- First, a leading practice may consist of a specific technology, but may equally involve a policy choice, institutional arrangement, or governance approach that enables the effective collection or use of e-data. In many cases, the effectiveness of e-data derives less from the technology itself than from its integration into decision-making, monitoring, and enforcement processes.
- Second, each leading practice identified here has been implemented in at least one of the jurisdictions reviewed as part of the underlying case studies. This ensures that the practices reflect real-world application rather than hypothetical or purely experimental proposals.
- Third, the practice must have demonstrated effectiveness in supporting compliance or deterring and prosecuting fisheries infringements. Evidence of effectiveness is drawn from interviews with fisheries officials, documented enforcement actions, or publicly available administrative and judicial decisions.
- Finally, leading practices must be replicable across jurisdictions with differing capacities. Practices that depend on exceptionally high levels of financial, technological, or human resources are excluded unless they can be scaled or adapted to lower-capacity contexts.

III. Cross-Cutting Governance: Frameworks for E-Data

A foundational leading practice emerging across jurisdictions reviewed in the Case Study Report is the development of multi-year e-data strategies or legal frameworks - ideally prepared through structured dialogue among relevant agencies and stakeholders. Such

framework policies or legislation establish the need to incorporate technological solutions for fisheries control and can articulate a phased approach to the adoption, integration, and use of e-data, aligning technological investments with governance priorities. They provide an “umbrella” under which individual tools—such as vessel monitoring systems or electronic reporting—can be introduced incrementally, tested, and refined. If they are subject to ongoing review and revision, they can also provide an opportunity to identify and expand the use of e-data and its utility. By setting medium-term objectives while allowing flexibility in implementation, roadmap-style planning can help authorities avoid fragmented adoption, reduce industry resistance, and ensure coherence among all fishery governance stakeholders.

A. National-Level E-Data Policies and Roadmaps

Among the jurisdictions reviewed, the **United States** stands out as the only country with an explicit national policy framework addressing the use of e-data in fisheries management and compliance. Through non-binding national policies adopted by NOAA Fisheries, the U.S. has articulated objectives to expand electronic monitoring, electronic reporting, and other digital tools across federally managed fisheries. These policies emphasise flexibility, fishery-specific tailoring, and stakeholder engagement, rather than prescriptive mandates.

Although implementation remains uneven—and the U.S., unlike several other jurisdictions studied, notably lacks systematic real-time monitoring—the national policy framework serves several important functions. It provides a common vocabulary and set of goals for regional fishery managers, signals long-term regulatory intent to industry, and legitimises pilot programmes and experimentation with new technologies. In this sense, the U.S. example demonstrates that even non-binding policies can serve as a strategic umbrella, guiding the incremental adoption of e-data tools over time.

B. Embedded Strategic Planning Through Regulation and Programmes

Unlike the U.S., Australia, New Zealand, Spain, or the RMI do not have specific e-data policies or roadmaps. Instead, these jurisdictions embed their planning within binding regulations, administrative programmes or operational strategies, yielding strong outcomes through distinct institutional pathways.

In **New Zealand**, for example, strategic planning for e-data is reflected in a coordinated suite of regulations adopted in 2017 covering electronic reporting, geospatial position reporting, and electronic monitoring. While New Zealand did not publish a standalone e-data roadmap, its regulations were clearly designed as part of a phased, system-wide transformation of fisheries monitoring and compliance.

In **Spain**, strategic planning for e-data is closely tied to the European Union’s fisheries control framework. Spain’s national systems for electronic reporting, tracking, and automated risk analysis are designed to align with EU control regulations while supporting Spain’s own enforcement priorities. Rather than a formal roadmap, Spain employs a more opportunistic strategy, prioritising comprehensive e-data collection where possible and experimentation with different technologies to support enforcement. This approach demonstrates that strategic planning can be operational rather than declaratory.

For the **RMI**, strategic planning occurs primarily through regional coordination mechanisms rather than national policy documents. RMI’s use of real-time tracking, satellite surveillance, and maritime domain awareness tools reflects a deliberate effort to compensate for limited domestic enforcement capacity by leveraging regional platforms and partnerships. Although not framed as a national e-data plan, this functions as a pragmatic approach tailored to RMI’s specific governance and resource constraints.

Yet the opposite is observed in countries such as **Mexico** and **Peru**, which have not sufficiently or consistently developed legislation and lack comprehensive strategies to strengthen fisheries control and enforcement. Systems rely heavily on VMS and struggle to implement effective measures to combat illegal fishing.

The case studies suggest that explicit national policies, such as those adopted in the United States, are particularly valuable in jurisdictions with fragmented authority or where e-data systems are still in development. In more mature and regionally coordinated systems, strategic planning may be embedded within regional frameworks, regulations, and practice, yet remains no less essential.

IV. Leading Practices in E-Data Collection

This section outlines the core e-data technologies currently used to support fisheries management and compliance, focusing on tools already reflected in regulatory requirements or established operational practice. It examines vessel tracking systems such as VMS and AIS, electronic reporting tools including logbooks, and the growing use of electronic monitoring, noting differences in maturity, coverage, and implementation across jurisdictions. While some technologies, particularly VMS and electronic logbooks, are now widely mandated, others—most notably electronic monitoring—remain subject to phased implementation or pilot programmes in many countries. The section, therefore, focuses on technologies that underpin existing e-data regimes, whereas emerging approaches, such as satellite imagery and advanced AI-enabled analysis, are addressed separately when their role is more exploratory or unevenly integrated.



Based on our review, we can conclude that e-data collection is already an indispensable tool in fisheries governance, and its role is only growing. While different technologies are at various stages of adoption across jurisdictions, they are proving to be cost-effective and effective for real-time decision-making and for addressing infringements, as well as for use as evidence in administrative and jurisdictional procedures.

A. Mandatory Vessel Monitoring Systems for Commercial Fisheries

The mandatory use of vessel monitoring systems (VMS) for commercial fishing vessels is among the most consistently implemented and effective leading practices across all jurisdictions reviewed. VMS is a satellite-based surveillance technology that requires the use of tamper-proof onboard transceivers. It enables fisheries authorities to track the location, speed, and direction of commercial fishing vessels in near-real-time. While the technical specifications and scope of application vary, the case studies demonstrate a broad consensus that mandatory positional tracking is a foundational element of modern fisheries governance and a prerequisite for effective monitoring, control, and surveillance. This is particularly true of regulating industrial and semi-industrial fisheries.

In all five jurisdictions examined in the Case Study Report, VMS is mandatory for vessels above defined size or activity thresholds, reflecting a shared assessment that larger commercial fleets pose the greatest compliance and environmental risks. VMS is also mandatory for large-scale and/or international vessels in **Chile, Mexico, Panama** and **Peru**. Targeted exemptions for artisanal or small-scale fisheries are common where technical feasibility, cost, or operational realities make VMS impracticable. These exemptions are typically framed narrowly and justified explicitly to balance enforcement effectiveness with proportionality and equity.

The **RMI** illustrates this calibrated approach. While RMI mandates VMS for all licensed commercial vessels operating in its EEZ, small-scale domestic fishing activities are excluded. **New Zealand** likewise requires VMS for all commercial vessels, following the expansion of mandatory vessel tracking in 2017, while **Australia** requires VMS for all vessels operating in Australia's EEZ and on Australia's vessels fishing on the high seas. Instead, in **Spain**, VMS is mandatory for all vessels 12 meters or longer operating in its EEZ or for domestic vessels fishing overseas. It feeds into centralised platforms that automatically cross-check vessel positions against fishing authorisations and reported activity. These obligations are embedded in licensing conditions. Data from VMS is collected 24/7 and automatically cross-checked against fishing authorisations, reported activity and other factors; it is used to support spatial management and risk-based compliance rather than continuous real-time enforcement.



In the **United States**, VMS requirements are widespread, but not universal to all fisheries. Instead, financial support mechanisms—such as cost-sharing or reimbursement programmes in certain federally managed fisheries—have been used to encourage early adoption of VMS, particularly where new requirements are introduced or where compliance costs are likely to be burdensome. More information on these types of support systems can be found in Part IV.F below.

The case studies demonstrate that mandatory VMS for commercial fisheries constitutes a highly transferable leading practice. Across jurisdictions, widespread, mandatory use of VMS is valued not only for its deterrent effect but also for its ability to anchor broader compliance systems, enabling spatial management, risk-based enforcement, and the validation of other forms of e-data.

B. AIS for Commercial Fisheries

Automatic Identification Systems (AIS) are widely used in fisheries management as a supplementary vessel tracking tool, providing near-real-time positional data that can enhance transparency, situational awareness, and compliance monitoring. AIS was developed as a maritime safety system and, under International Maritime Organization (IMO) requirements, is mandatory for vessels above 300 gross tonnes engaged in international voyages. As a result, AIS is not a fisheries-specific management instrument, but it is particularly relevant for industrial fishing fleets, where vessels commonly meet the applicable size criteria.

Across the jurisdictions reviewed in the Case Study Report, AIS is most used as a complement to mandatory VMS rather than as a substitute. While AIS provides frequent positional reporting and broad interoperability with commercial and public monitoring platforms, it generally lacks regulatory controls, tamper resistance, and evidentiary assurances associated with fisheries-dedicated tracking systems. AIS data is therefore typically used for screening, cross-checking, and intelligence purposes, rather than as a standalone basis for enforcement action. The case studies also note that AIS data are often publicly accessible, thereby enhancing transparency and enabling third-party monitoring and analysis.

In **Spain**, AIS requirements flow primarily from maritime safety obligations and are increasingly integrated into fisheries control systems. AIS data is used to corroborate VMS positions, identify discrepancies in reported activity, and support risk-based targeting of inspections, while enforcement decisions continue to rely on certified fisheries e-data.

In the **Republic of the Marshall Islands**, AIS plays an important role in regional monitoring and situational awareness, particularly for distant-water fleets operating in and



around its EEZ. AIS data is used alongside VMS within regional surveillance arrangements to support screening and coordination, contributing to a broader picture of vessel activity even where national enforcement capacity is limited. In some jurisdictions, including the **United States**, AIS data has been relied upon in court proceedings as part of the evidentiary record, underscoring its potential legal relevance while reinforcing the importance of corroboration and careful interpretation.

In **Chile, Mexico, Panama** and **Peru**, AIS is required for at least large-scale vessels and widely used for monitoring, control and surveillance. It is used as a complementary data source, and in Panama authorities rely on AIS data analysis by Global Fishing Watch, a third-party, non-profit organisation that, among other things, publishes AIS data for all fishing vessels worldwide.

AIS is most commonly used as a complement to mandatory e-data requirements, rather than a substitute. It is sometimes - though rarely - used as evidence in administrative or court cases but is frequently used for screening, cross-checking, and intelligence purposes. It is publicly accessible, thereby enhancing transparency and enabling third-party monitoring and analysis.

C. Mandatory Electronic Reporting for Commercial Fisheries

The mandatory use of electronic reporting for commercial fisheries improves data accuracy, timeliness, and usability. In all jurisdictions examined, different types of reports must be provided electronically. E-logbooks, which contain information on daily catches and other key fisheries activities, are most frequently requested. Other mandatory electronic reports, required in some of the reviewed countries, relate to transshipment activity, port landings, and traceability schemes. In most countries, e-logbooks and other reports are required for commercial fishing vessels above defined thresholds, typically based on vessel size, gear type, or fishery participation.

As with VMS, leading practice focuses on ensuring comprehensive coverage of fleet segments that generate the highest compliance and management risks. In some countries, such as Panama and Mexico, e-logbooks are not generally required; in others, such as Peru, they are mandatory only for certain fisheries, such as anchoveta. Instead, in other regions, such as the EU, they will soon become mandatory for vessels of any size.

The case studies also underscore that support for adoption is critical to the success of mandatory e-reporting regimes, particularly during the transition from paper-based reporting. In several jurisdictions, authorities provide lists of approved software or certification schemes (see part IV.C below), ensuring that e-reporting systems meet technical and security standards and are compatible with government platforms. This reduces uncertainty for operators and facilitates smoother implementation.

In **New Zealand** and **Australia**, electronic reporting is mandated by regulation and applies broadly across commercial fisheries. The system requires electronic submission of catch, effort, and landing information, replacing paper-based logbooks entirely for most operators. This approach reflects a deliberate policy choice to make electronic reporting the default, rather than an optional alternative and informs analysis of quota compliance, area closures, and reporting obligations.

In the **United States**, requirements for electronic reporting are established through federal regulations and fishery management plans adopted by regional councils. As a result, implementation varies by fishery, but e-logbooks are now widely used in federally managed commercial fisheries, particularly where timely data is essential for quota management or spatial controls. **Spain's** e-logbook requirements are closely aligned with European Union fisheries control regulations, which mandate electronic reporting for commercial vessels. Spain has integrated these requirements into a highly automated national system, enabling near-real-time analysis and enforcement, while enabling authorities to detect inconsistencies and initiate enforcement action efficiently.

In contrast, the **RMI** relies more selectively on electronic reporting, reflecting the structure of its fisheries and its reliance on regional reporting mechanisms. Nonetheless, electronic logbooks play a key role in monitoring the industrial vessels licensed to operate in its EEZ.

E-logbooks increasingly form the backbone of electronic reporting systems, enabling more effective monitoring of catch and effort and supporting a wider ecosystem of electronic reporting tools, including landing declarations, transshipment reports, and sales or disposal records. Taken together, these reporting streams generate structured e-data that can be systematically cross-checked against vessel-tracking systems and, where applicable, electronic monitoring data. This integration supports the validation of reported activity, the identification of inconsistencies, and the documentation of potential infringements, thereby strengthening both fisheries management and enforcement processes.

D. Onboard Electronic Monitoring via Camera Systems

The use of onboard electronic monitoring (EM) systems employing cameras and associated sensors is increasingly common in fisheries governance, particularly where traditional observer programmes are costly, logistically impracticable or insufficiently comprehensive. The Case Study Report demonstrates that EM has moved beyond an experimental status in some jurisdictions, where it now functions as a routine compliance



and verification tool, whereas in others it remains largely pilot-based. This divergence provides useful insight into the conditions under which camera-based monitoring becomes an effective regulatory instrument.

In **Australia** and **New Zealand**, onboard electronic monitoring has progressed furthest toward routine implementation. Following extended trials and observer comparisons, EM is now mandated in selected fisheries, particularly where observer coverage is logistically difficult or where compliance risks warrant independent verification. EM requirements are embedded in licensing conditions, giving them clear legal effect and enabling the use of EM data in compliance assessments. Some Latin American jurisdictions, such as Chile and Panama, have adopted a similar approach and have recently begun requiring electronic monitoring on board certain fishing vessels, although this obligation does not apply to most artisanal fisheries.

Spain, like other EU member states, is preparing for mandatory EM for all vessels 18 meters or longer, effective 2028, across all fleet segments that pose a compliance risk for landing obligations, as determined by the European Commission. For now, it has been used only in pilot programs or on a voluntary basis by some large-scale fleets. In the **United States**, EM also remains largely in the pilot or fishery-specific implementation phase. While several U.S. fisheries use camera systems to supplement or partially replace observers, adoption is uneven and often contingent on regional council decisions and funding availability. As a result, EM in the U.S. has not yet achieved the same degree of regulatory normalisation or evidentiary integration as in jurisdictions where it is mandated. In the **RMI**, EM is not mandatory; however, all purse seiners flagged to the RMI, and most longliners licensed nationally have EM systems on board. This suggests that for large, commercial operations, EM may provide safety and operational control benefits that are independent of compliance obligations.

Some case studies identify data storage, analysis, and associated costs as challenges to broader EM adoption or as sources of concern, as EM remains too unfamiliar. Camera systems generate large volumes of high-resolution video data, which must be securely stored, managed, and reviewed in accordance with data protection and evidentiary requirements.

Taken together, the case studies indicate that onboard electronic monitoring via camera systems constitutes an advancing leading practice, but one that is resource-dependent and capacity-sensitive. EM may be most effective when deployed selectively based on compliance risk, integrated within a broader governance framework, and supported by realistic strategies for managing data volume and analytical demand.

E. Capturing Images for Fisheries Enforcement: Developments in Drone Surveillance

Imagery-based data has long been used in infringement cases and accepted as evidence, particularly when images can be automatically and reliably geo-tagged. Images can be captured directly by fisheries enforcement officials on board aircraft and vessels, as well as from land. In recent years, the use of uncrewed aerial systems (UAS), commonly referred to as drones, has emerged as a limited component of e-data collection in fisheries management. Unlike VMS, electronic logbooks, or onboard electronic monitoring, drone surveillance does not typically generate continuous datasets. Instead, it provides episodic, high-resolution observational data that can corroborate other information sources or support specific compliance and enforcement objectives. Their use is most commonly associated with:

- monitoring compliance in marine protected areas or closed zones;
- observing fishing activity in nearshore or artisanal fisheries;
- supporting port inspections and associated vessel activity; and
- enhancing situational awareness during targeted enforcement operations.

Drone surveillance, and in particular drone-generated imagery, is best understood as one component of imagery-based data collection, which may. Like other forms of imagery, drones can complement and corroborate vessel tracking data, support investigations, and document suspected infringements. Its value is maximised when integrated with established e-data systems and governance frameworks rather than treated as a standalone monitoring tool.

In **Spain**, drone surveillance has been used by enforcement authorities as part of broader inspection and control efforts, particularly in coastal waters. Drone imagery can support verification of fishing activity and assist inspectors in prioritising boarding or inspection actions, but it functions as a supporting tool rather than a primary compliance mechanism. In **Australia**, drones have similarly been used in targeted enforcement and surveillance operations, particularly in nearshore fisheries and protected areas. Their deployment complements satellite-based monitoring and patrol assets, thereby extending surveillance coverage without the costs associated with crewed aircraft.

Compared with vessel patrols or crewed aerial surveillance, drones offer relatively low cost and flexible deployment, particularly for short-duration or targeted missions. This has made them attractive to authorities seeking to augment limited enforcement capacity. However, in several countries participating in this research project, such as **Chile, Mexico and Panama**, the use of drones is not part of control and enforcement activities. In addition, drones do not replace satellite-based monitoring or onboard systems. Their



limited range, endurance, and weather sensitivity constrain their utility, particularly in offshore or high-seas contexts. As a result, drones are best understood as a force multiplier for existing monitoring and enforcement capabilities.

The case studies indicate that drone surveillance is not yet a routine or central monitoring tool, but is increasingly used in targeted, supplementary roles where it can enhance situational awareness or support enforcement in specific contexts. As such, drone surveillance is best understood as a complementary element within a broader, layered e-data strategy.

F. Satellite Imagery-Based Monitoring

Satellite imagery, including optical and synthetic aperture radar (SAR) data, is another tool to support fisheries monitoring by providing independent observations of vessel presence and activity at sea. Unlike vessel-based tracking systems, satellite imagery does not rely on onboard equipment or operator compliance.

At the same time, satellite imagery entails significant cost considerations. High-resolution imagery, frequent revisit rates, and analytical services can be expensive, particularly when sustained coverage is required. These costs may limit the feasibility of imagery-based monitoring as a routine tool for many fisheries authorities, especially in the absence of regional cost-sharing arrangements or external support. The evidentiary status of satellite imagery also remains limited in most jurisdictions. While imagery may prompt investigation, enforcement actions typically require validation through certified vessel-based data or other corroborating evidence.

However, these costs are accompanied by meaningful opportunity. Advances in commercial satellite constellations, the increasing availability of SAR data, and the emergence of subscription-based or pooled-access models are gradually lowering barriers to entry. In **RMI**, for example, and across the Pacific, regional partners are collecting satellite imagery as part of coordinated surveillance operations to detect illegal fishing.

For some States, particularly those managing large EEZs with limited patrol assets, targeted use of satellite imagery may offer a cost-effective means of identifying high-risk activity that would otherwise go undetected. Regional cooperation and shared satellite assets can enhance the accessibility of this technology.



G. Financial and Practical Support to Promote Uptake

The case studies demonstrate that mandating e-data systems alone is often insufficient to ensure effective adoption and sustained compliance. Jurisdictions that have successfully expanded the use of VMS, electronic logbooks, and electronic monitoring have typically complemented regulatory requirements with financial, technical, or operational support mechanisms designed to lower barriers to entry and address capacity constraints.

The case studies illustrate several forms of support used to promote e-data adoption:

- Cost-sharing arrangements, where governments cover or offset the initial costs of hardware installation (such as VMS units or cameras), while operators bear ongoing operational costs.
- Phased implementation timelines, allowing industry to spread costs and adapt gradually to new requirements.
- Provision of approved equipment or service providers, reducing uncertainty and procurement burdens for operators.
- Training and technical assistance, particularly for electronic logbooks and reporting systems, to ensure accurate and consistent data submission.

In **New Zealand**, for example, the expansion of electronic reporting and geospatial position reporting was accompanied by transitional support measures and extended implementation timelines, reflecting recognition of the adjustment required across the commercial fleet. In **Australia** and the **United States**, EM programmes have often incorporated government-funded trials and phased rollouts, reducing initial resistance and generating operational experience before systems were fully mandated.

The experience of the **RMI** highlights the importance of support mechanisms in capacity-constrained settings. Rather than relying solely on domestic resources, RMI leverages regional partnerships, donor support, and external service providers to enable the use of VMS, EM, and other e-data tools. This approach allows RMI to participate in advanced monitoring regimes without incurring the full financial and technical burden. Similarly, access to regional monitoring platforms and shared analytical resources reduces duplication and improves cost-effectiveness, particularly for small island developing States.

As technologies scale and their costs decrease, some segments of the fishing industry are voluntarily adopting them, particularly when e-data collection reduces costs in fisheries management. In **Australia**, for example, private operators are using technologies, like electronic monitoring or e-reporting, on a voluntary basis to achieve immediate operational efficiencies, such as reducing manual data entry, and to prepare for potential future obligations.



Jurisdictions that combine legal requirements with well-designed support measures are better positioned to achieve sustained uptake, reliable data flows, and meaningful compliance outcomes. As e-data systems become increasingly central to fisheries governance, the design of these support mechanisms will help ensure their success. Pilot projects and trials have demonstrated the effectiveness of new technologies and promoted adherence to new programs.

V. Leading Practices in E-Data Management

The Case Study Report makes clear that the value of e-data is realised—or lost—at the management stage. Jurisdictions that have invested heavily in VMS, electronic logbooks, and electronic monitoring have achieved meaningful governance outcomes only where data is effectively managed, integrated, and used.

Leading practice in e-data management is characterised by centralisation, interoperability, clear governance rules, including inter-agency coordination, and risk-based use. Importantly, management practices reflect deliberate choices about how data supports compliance, enforcement, and decision-making, within realistic capacity constraints.

A. Coordination and Centralised Data Systems

A foundational leading practice across the case studies is the use of centralised data systems that integrate multiple e-data streams—most notably VMS, electronic reports, and, where applicable, electronic monitoring footage and other images—into a single operational environment. Centralisation of information systems is accompanied, in well-functioning regimes, by close inter-agency coordination that provides all competent government bodies with access to shared data and maintains open communication channels in both directions. Across these examples, centralisation serves several core functions:

- enabling cross-referencing of different data types,
- reducing duplication and fragmentation,
- supporting consistent compliance analysis, and
- facilitating information sharing within and across agencies.

In **Spain**, centralisation is a defining feature of fisheries control. Electronic logbook submissions, VMS data, and other control information feed into national platforms aligned with European Union fisheries control regulations. As discussed in part V.E below, this

integration enables automated verification, allowing authorities to identify anomalies efficiently and prioritise inspection and enforcement actions.

Australia and **New Zealand** similarly rely on centralised systems. Positional data, electronic reporting, and compliance information are consolidated within national platforms, supporting coordinated oversight and risk-based compliance strategies. Although implementation has faced operational challenges, the regulatory framework reflects a clear commitment to centralised data management as a prerequisite for effective oversight.

For capacity-constrained States such as the **RMI**, centralisation takes a different form. Rather than maintaining fully independent national systems, RMI relies on a combination of domestic databases and regional monitoring platforms operated through Pacific fisheries management arrangements. This approach allows RMI to access integrated data streams and analytical outputs without duplicating infrastructure or analytical capacity. In contrast, in some developing countries, such as **Mexico** and **Peru**, the lack of effective interagency coordination undermines opportunities to monitor and control fisheries effectively. Findings from case studies in **Mexico** and **Panama** underscore the importance of enhancing interagency coordination.

The case studies demonstrate that centralisation of information systems does not imply uniformity and requires high levels of inter-agency coordination. Systems are adapted to national capacities and legal frameworks, but the underlying principle—that e-data must be integrated to be useful—is consistent across jurisdictions.

B. Use of Dedicated and Integrated Data Management and Storage Platforms to Support Scale and Verification

The Case Study Report shows that effective e-data regimes depend not only on centralisation but also on the use of dedicated data management and storage platforms capable of handling large, diverse, and sensitive datasets over time. Jurisdictions that treat e-data as a core regulatory asset have invested in platforms specifically designed to store, organise, secure, and retrieve fisheries data, rather than relying on fragmented or ad hoc solutions. Rather than relying on manual review of individual data sources, advanced systems integrate positional, reporting, and monitoring data to identify inconsistencies, trigger alerts, and prioritise compliance action.

These platforms form the backbone of modern e-data systems, enabling integration, verification, and enforcement while addressing legal and operational requirements related to data security and retention. Databases not only automatically integrate data provided through new technologies and systems but also digitise and integrate information that



was once paper-based, such as fishing licenses, and have transitioned to online systems to facilitate data collection and integration. Dedicated platforms also support data security and integrity, which are critical to both regulatory legitimacy and enforcement credibility. Across the case studies, leading practices include role-based access controls, audit trails of data access and modification, and safeguards against unauthorised use or disclosure, all of which assist in preserving evidentiary integrity.

In **Spain**, for example, national data platforms aligned with European Union fisheries control requirements serve as central repositories for VMS, electronic logbooks, and related control data. These systems are designed to manage long-term data retention and to support cross-referencing and automated checks, rather than functioning as simple data archives. These checks automatically flag fishing activity in closed or restricted areas, inconsistencies between reported catch or effort and vessel position, and discrepancies between authorisations and observed behaviour. This approach allows compliance systems to focus on anomalies and risk indicators, reducing the need for comprehensive manual review. Retention periods are tailored to enforcement needs, reducing long-term storage burdens.

In the **RMI**, storage and management of EM and other e-data often rely on external or regional platforms, reflecting domestic capacity constraints. This allows RMI to meet monitoring and evidentiary needs without maintaining extensive in-country infrastructure. Additionally, automated verification plays a particularly important role in compensating for limited analytical capacity. Cross-checking VMS data against licensing conditions and spatial restrictions—often through regional systems—enables authorities to identify potential violations without continuous manual oversight. This automation is essential to the effectiveness of RMI's participation in regional monitoring arrangements.

In the **United States**, e-data management relies on a combination of federal and regional platforms, reflecting the decentralised structure of fisheries governance. VMS and electronic reporting data are managed through national systems operated by NOAA Fisheries, while electronic monitoring data is often stored and managed through programme- or vendor-specific platforms associated with individual fisheries or regional councils. This approach has enabled EM pilots to proceed, but has also resulted in fragmentation, complicating integration and scalability.

The contrast between highly integrated systems (such as Spain), decentralised arrangements (United States), and shared regional approaches (RMI) underscores that institutional design can vary, but the need for deliberate, well-governed and integrated data platforms is universal. Automated verification, meanwhile, enhances accuracy, reduces administrative burden, and supports both deterrence and fair enforcement, making it a cornerstone of effective e-data governance.



C. Data Access, Retention, and Governance

The case studies make clear that the effectiveness and legitimacy of e-data systems depend not only on how data is collected and stored, but on clear rules governing who may access data, for what purposes, and for how long. Jurisdictions that have advanced e-data regimes have developed explicit governance frameworks addressing data access, retention, and use, recognising that poorly defined rules can undermine trust, create legal vulnerability, and weaken enforcement outcomes.

Access by authorities: Across all jurisdictions reviewed, national authorities have clearly defined mandates to access VMS data, electronic logbooks, and related control information, with such access restricted to inspection, control, and enforcement functions. In **Spain**, for example, centralised systems and role-based permissions ensure that data access is both traceable and limited to authorised users. For the **RMI**, access to e-data often extends beyond national authorities to include regional monitoring partners, reflecting reliance on shared platforms and cooperative enforcement arrangements.

Access by the public: The case studies also demonstrate that public access to e-data is typically limited and highly mediated, reflecting confidentiality and enforcement considerations. However, some public access is provided, particularly for scientific analysis in support of management and decision-making.

In **Spain**, aggregated and anonymised fisheries data—such as compliance statistics or fleet activity summaries—may be made public, while vessel-specific VMS, logbook, and other reports and data remain confidential. Public transparency is achieved through reporting and publication, rather than direct access to raw datasets. In **New Zealand**, certain fisheries data are released publicly in aggregated or processed form for management and scientific purposes, but access to raw e-data is restricted. In the **United States**, public access is governed by federal transparency laws, but confidentiality provisions for fisheries data significantly limit disclosure. Vessel-specific VMS, electronic reporting, and EM footage are generally protected from public release, with access granted only in narrowly defined circumstances. However, some countries such as **Chile**, **Panama** and **Peru** have consented to share VMS data publicly, through the platform provided by Global Fishing Watch. **Mexico** shares vessel positioning data online, but not in real time and in an insufficiently informative format.

Retention: The case studies indicate that leading practices avoid indefinite data retention and instead apply defined retention periods aligned with regulatory and enforcement requirements. Retention policies reflect the type of data collected and its potential evidentiary value. In **Australia**, for example, officials are required to retain EM data for only 6 months, rather than the 20 years typically required under general government record-retention legislation.



Even if current practice limits public access to fisheries information when the data is sensitive, high-volume, or capable of being repurposed beyond its original regulatory intent, governments are making efforts to make fisheries more transparent and engage civil society in fisheries governance - for example, by making VMS data, traditionally highly confidential, publicly available. This effort should continue to enhance transparency and complement government management frameworks by giving scientists and civil society a clearer window into fishing activity and the chance to support the identification of infringements.

D. Use of E-Data for Near-Real-Time Awareness

The case studies demonstrate that, while e-data systems are often described as enabling “real-time” monitoring, leading practice clearly distinguishes between situational awareness and enforcement action. In practice, e-data is used primarily to support near-real-time awareness, prioritisation, and deterrence, as well as post hoc verification and enforcement.

For example, despite limited national enforcement capacity, the **RMI** can support near-real-time and, in some cases, real-time enforcement through its participation in regional monitoring and surveillance arrangements, including access to a regional virtual watchroom. Through this arrangement, VMS data from licensed vessels operating in RMI’s EEZ is monitored continuously, enabling real-time detection of potential incursions into closed or unauthorised areas, rapid identification of suspicious activity and timely coordination with regional partners or patrol assets. This model allows RMI to compensate for limited domestic patrol capacity by leveraging shared regional monitoring infrastructure, demonstrating that real-time enforcement is feasible when supported by cooperative institutional arrangements and dedicated monitoring facilities. In **Spain**, VMS data feeds into centralised control systems that generate automated alerts when vessels enter restricted areas or when reported activity appears inconsistent with authorisations. These alerts support rapid situational awareness and inspection prioritisation.

Contrast these examples with the **United States**, where e-data is used overwhelmingly for post-hoc enforcement, based on subsequent analysis of stored data rather than for immediate response to live alerts. This may reflect an enforcement system that has historically relied on physical patrols, boardings, and interdiction assets. The continued availability of these traditional enforcement tools has reduced institutional pressure to shift toward real-time, data-driven intervention, contributing to potential inefficiencies.

Where effectively engaged—as in RMI’s use of shared regional monitoring infrastructure—real-time e-data monitoring can support timely and efficient operational responses.

E. Use of Machine Learning and AI in Analysis

Outside of the fisheries management context, artificial intelligence (AI) and machine learning tools are increasingly applied to large e-data datasets to support pattern recognition, anomaly detection, and risk profiling. These tools can process vast volumes of positional data, reporting records, imagery, and sensor outputs far more rapidly than manual review. Machine learning tools are increasingly used in fisheries governance to support data-intensive functions, such as risk assessment, anomaly detection, and the prioritisation of monitoring and enforcement activities. These tools are applied to large and diverse datasets—including vessel tracking data, electronic logbooks, observer and EM records, and imagery—to identify patterns or behaviours that may indicate non-compliance or elevated risk. In practice, machine learning is most often used to automate initial screening and flag cases for further human review, rather than to make enforcement decisions directly.

Such tools have been employed for many years in related regulatory domains and are now used across jurisdictions engaged in intensive e-data collection for fisheries management. That said, the Case Study Report did not identify any specific, established practices or standardised approaches for integrating machine learning tools into fisheries governance. Where used, applications appear to be ad hoc or programme-specific, supporting internal risk assessment and analytical functions rather than forming part of formal compliance or enforcement frameworks.

While these approaches remain emerging, there is no inherent legal limitation on the use of advanced analytical tools in fisheries governance, provided that procedures are clearly defined and the underlying technology is reliable. As with other forms of e-data, the legal acceptability of outputs generated through machine learning depends on transparency, auditability, and the ability to explain how information is produced and used.

Machine learning tools may be used to supplement and improve human data review, particularly by assisting with screening large datasets, identifying patterns of interest, and prioritising cases for further investigation. When deployed in this supportive role, such tools can enhance efficiency without displacing human judgment or established procedural safeguards.

F. Regional Cooperation and Data Sharing

The case studies demonstrate that regional cooperation and structured data sharing are critical enablers of effective e-data use, particularly where national enforcement capacity is limited or where fleets operate across multiple jurisdictions. Leading practice treats e-data not solely as a national regulatory asset, but as a resource that can support collective



monitoring, compliance, and enforcement objectives when shared under clear legal and institutional arrangements.

The most developed example in the case studies is provided by the **RMI** and the broader Pacific region, with support from **Australia** and **New Zealand**. Through participation in regional monitoring arrangements and access to a regional virtual watchroom, RMI can monitor vessel activity in near-real-time and coordinate compliance responses despite limited domestic patrol and analytical capacity.

In the European Union, regional cooperation takes a different form. Member States, including **Spain**, operate within a common legal and technical framework for fisheries control. VMS data, electronic logbooks, and related control information are collected and managed nationally but are subject to harmonised standards and data-sharing obligations under EU law. This enables cross-border coordination and the consistent application of control measures across the EU Member States.

The experience of RMI demonstrates the transformative potential of regional cooperation for real-time monitoring and enforcement, while the EU model illustrates how harmonised governance frameworks can support consistent, large-scale data sharing. These examples underscore that the value of e-data increases significantly when it is used cooperatively, rather than in isolation.

VI. Infringement Prosecution

The case studies show that the effectiveness of e-data systems ultimately depends on how well they support the prosecution of infringements. Leading practice recognises that e-data must be usable not only for detection and verification, but also within formal administrative and legal processes. Jurisdictions that have aligned e-data systems with prosecution requirements have been better able to translate monitoring and verification into successful enforcement outcomes.

A. Administrative Proceedings and Specialised Prosecutions

A consistent feature across the case studies is the reliance on administrative proceedings, rather than criminal prosecutions, for most fisheries infringements. Leading practice reflects a deliberate choice to situate most fisheries infringements within specialised administrative enforcement systems, rather than general criminal courts, to improve efficiency, consistency, and the effective use of technical data.

In the **United States**, fisheries infringements are predominantly addressed through procedures managed by specialised administrative authorities. E-data—including VMS records, electronic logbooks, and other control data—increasingly forms an evidentiary foundation of these proceedings. The administrative setting enables decision-makers to develop sector-specific expertise in assessing technical data, interpreting spatial and temporal information, and applying fisheries-specific rules. Over time, this has supported the development of institutional knowledge among administrative officials and reviewing bodies, enabling more predictable and proportionate enforcement outcomes.

Spain relies on a robust administrative system, led by the fisheries authority, as the first tier for sanctioning fisheries infringements. However, judicial procedures often follow as private companies seek to reverse administrative decisions. In the **RMI**, in contrast, the administration has aimed to avoid judicial prosecution of infractions by offering a settlement out of court, saving time to both the public bodies and the infringer.

Current practice reflects a deliberate choice to situate most fisheries infringements within specialised administrative enforcement systems, rather than general criminal courts, as the initial course of action when infringement proceedings are detected. If crimes are committed (often domestically defined as more serious or willful, or identified as sustained violations of fisheries rules), all administrations invariably waive jurisdiction and suspend their sanctioning procedures in favor of the criminal courts. In administrative and civil cases, public administrations tend to avoid litigation, and some encourage out-of-court settlements.

B. Validation

Validation is the critical link between e-data collection and its use in infringement proceedings. Across the case studies, leading practice treats validation not as a technical afterthought, but as a governance function designed to ensure that electronic data is reliable, auditable, and defensible when relied upon for enforcement action. The case studies reveal two distinct but legitimate approaches to validation, reflecting different legal traditions, institutional capacities, and market structures:

- **Certification-Based Validation**

One approach relies on ex ante certification of systems and devices, such that data produced by certified equipment is presumed reliable for enforcement purposes. For example, in **Spain**, validation is anchored in a certification model. VMS devices, electronic logbook systems, and related control technologies are subject to approval against technical and operational standards before deployment. Once certified, data generated by these systems can be relied upon in administrative proceedings without requiring case-by-case technical substantiation. Importantly, validation is front-loaded: responsibility



for system reliability rests primarily with regulators and approved vendors at the point of certification. This approach establishes legal certainty about the evidentiary status of e-data and reduces the need for expert testimony or technical explanation in individual cases, while also supporting consistency across fleets and jurisdictions.

- **Manufacturer-Supported Validation**

A second approach, illustrated most clearly in the **United States**, relies more heavily on manufacturer support and system-specific validation, particularly in the context of electronic monitoring. In the U.S., e-data equipment must be approved for use by fisheries authorities before deployment, ensuring that hardware and software meet baseline technical and operational requirements. However, this approval does not confer a blanket presumption of evidentiary reliability equivalent to certification-based regimes. Instead, enforcement actions involving e-data may require further substantiation by technical experts, including documentation of system configuration and performance during the relevant period; evidence that equipment was functioning correctly at the time of data collection; and, in some cases, testimony or written declarations from manufacturers or technical service providers explaining system design, operation, and data integrity. This testimony may be required as a condition of obtaining the above-referenced approval.

Whether through certification or manufacturer-supported validation, effective approaches clarify the evidentiary status of e-data in advance and reduce uncertainty for both regulators and regulated operators. These systems are most effective if designed into e-data systems from the outset, rather than addressed only at the point of enforcement. This approach facilitates relying on an open category of data sources, which can incorporate new technologies and systems as they come: as long as they are reliable, any kind of e-data can be used as evidence in an infringement case.



VII. Summary of leading practices

General

E-data collection is already an indispensable tool in fisheries governance, and its role is only growing. While different technologies are at various stages of adoption across jurisdictions, they are proving to be cost-efficient and effective for enforcement action, including as evidence in administrative and jurisdictional procedures.

Establishing a framework strategy, policy, or legislation facilitates the development and implementation of e-data systems for fisheries control and enforcement. The case studies suggest that explicit national policies, such as those adopted in the United States, are particularly valuable in jurisdictions where authority is fragmented or where e-data systems are still developing. In more mature and regionally coordinated systems, strategic planning may be embedded within regional frameworks, regulations, and practice, yet remains no less essential.

Technologies

VMS is still the cornerstone of e-data systems, complemented by AIS data. The case studies demonstrate that mandatory VMS for commercial fisheries constitutes a highly transferable leading practice. Across jurisdictions, widespread, mandatory use of VMS is valued not only for its deterrent effect but also for its ability to anchor broader compliance systems, enabling spatial management, risk-based enforcement, and the validation of other forms of e-data. AIS is a publicly accessible technology that is valuable for screening, cross-checking, and intelligence purposes, thereby enhancing transparency and enabling third-party monitoring and analysis.

With the expansion of automated cross-checks and validations, electronic reporting systems strengthen fisheries management and enforcement processes. E-log-books increasingly form the backbone of electronic reporting systems, enabling more effective monitoring of catch and effort and supporting a wider ecosystem of electronic reporting tools, including landing declarations, transshipment reports, and sales or disposal records. Taken together, these reporting streams generate structured e-data that can be systematically cross-checked against vessel-tracking systems and, where applicable, electronic monitoring data. This integration supports the validation of reported activity, the identification of inconsistencies, and the documentation of potential infringements, thereby strengthening both fisheries management and enforcement processes.



Onboard electronic monitoring is an advancing, leading practice. Onboard electronic monitoring via camera systems is becoming a mandatory practice in some countries and is often used in trials and voluntarily in some fisheries. As it is resource-dependent and capacity-sensitive, EM may be most effective when deployed selectively based on compliance risk, integrated within a broader governance framework, and supported by realistic strategies for managing data volume and analytical demand.

New image-gathering tools and technology support the value of images as evidence. Photography and video have typically been used in enforcement cases, and new technologies enhance the reliability of the information as evidence. The case studies indicate that drone surveillance is not yet a routine or central monitoring tool, but is increasingly used in targeted, supplementary roles where it can enhance situational awareness or support enforcement in specific contexts. As such, drone surveillance is best understood as a complementary element within a broader, layered e-data strategy.

Satellite imagery is not widely used, but it can be critical for certain enforcement actions. For some States, particularly those managing large EEZs with limited patrol assets, targeted use of satellite imagery may offer a cost-effective means of identifying high-risk activity that would otherwise go undetected. Regional cooperation and shared satellite assets can enhance the accessibility of this technology.

The use of e-data is encouraged through technical and financial support measures, including trials and phased approaches. Jurisdictions that combine legal requirements with well-designed support measures are better positioned to achieve sustained uptake, reliable data flows, and meaningful compliance outcomes. As e-data systems become more central to fisheries governance, the design of these support mechanisms will help to ensure success. Pilot projects and trials have demonstrated the effectiveness of new technologies and promoted adherence to new programs.

Management

Even de-centralised administrations need to bring together their systems to maximise their effectiveness. The case studies demonstrate that centralisation does not imply uniformity and requires high levels of inter-agency coordination. Systems are adapted to national capacities and legal frameworks, but the underlying principle—that e-data must be integrated to be useful—is consistent across jurisdictions.



The integration and connection of a broad range of e-data sources lead to higher data quality and more effective and efficient control and enforcement. The contrast among highly centralised systems (e.g., Spain), decentralised arrangements (United States), and shared regional approaches (RMI) underscores that institutional design can vary, but the need for deliberate, well-governed, and integrated data platforms is universal. Automated verification, meanwhile, enhances accuracy, reduces administrative burden, and supports both deterrence and fair enforcement, making it a cornerstone of effective e-data governance.

E-data may require protection to ensure its quality and legal certainty, but this imperative should be balanced against the need for transparency that safeguards the public interest. Current practice on data access limits public access to fisheries information, particularly when the data is sensitive, high-volume, or capable of being repurposed beyond its original regulatory intent. However, governments are making efforts to make fisheries more transparent and engage civil society in fisheries governance - for example, by making VMS data, traditionally highly confidential, publicly available. This effort should continue to enhance transparency and complement government management frameworks.

Real-time e-data monitoring is feasible with current technologies. Where effectively engaged—as in RMI’s use of shared regional monitoring infrastructure—real-time e-data monitoring can support timely and efficient operational responses.

Artificial intelligence will be part of any evolving e-data system. Machine learning tools may be used to supplement and improve human data review, particularly by assisting with screening large datasets, identifying patterns of interest, and prioritising cases for further investigation. When deployed in this supportive role, such tools can enhance efficiency without displacing human judgment or established procedural safeguards.

Regional cooperation can be instrumental in undertaking challenging e-data ambitions. The experience of RMI demonstrates the transformative potential of regional cooperation for real-time monitoring and enforcement, while the EU model illustrates how harmonised governance frameworks can support consistent, large-scale data sharing. These examples underscore that the value of e-data increases significantly when it is used cooperatively, rather than in isolation.

Infringement Prosecution

Administrative enforcement systems are often used as an efficient supplement to judicial enforcement of criminal infringements. Leading practice reflects a deliberate choice to situate non-criminal fisheries infringements within specialised administrative enforcement

systems, rather than in general criminal courts, to improve efficiency, consistency, and the effective use of technical data. To avoid going to court, some states encourage out-of-court settlements.

E-data systems can be designed at the outset to provide reliable evidence regardless of the technology or process employed. Whether through certification or manufacturer-supported validation, effective approaches clarify the evidentiary status of e-data in advance and reduce uncertainty for both regulators and regulated operators. These systems are most effective if designed into e-data systems from the outset, rather than addressed only at the point of enforcement. This approach facilitates relying on an open category of data sources, which can incorporate new technologies and systems as they come: as long as they are reliable, any kind of e-data can be used as evidence in an infringement case.



VIII. Strategic considerations for the implementation of e-data systems

The review of case studies points to elements needed to ensure the effectiveness of e-data fisheries management systems. Based on those learnings, this section proposes a decision-making roadmap to assist decision-makers in anticipating key considerations when establishing or upgrading their national systems.

Step 1. BUILD SOLID FOUNDATIONS. Particularly because these systems may be unfamiliar to stakeholders, ensure the roll out and implementation of e-data systems for fisheries management is sound. Learnings from the study advise, in particular, to:

- A. Evaluate existing capacities and assess needs.** As with any other governmental decision, identify the elements and characteristics of existing national fisheries operations and related administrative management systems. Assess the performance of systems already in place and calibrate e-data needs to address gaps, and capacity constraints. Do not just copy others' systems; effective systems are unique and responsive to its specific context.
- B. Establish a strategic framework.** Whether through general policies or framework legislation, provide guidance for the public and private sector to prepare for changes in current systems and allow adaptability to future needs or innovations.
- C. Provide for a phased approach.** Given that collecting and using e-data is based on incorporating technologies that are sometimes unfamiliar, allowing for a transition time can help avoid future problems, obtain buy-in from the private sector and, in so doing, reduce costs and increase the rate of success of newly incorporated e-data systems. A phased approach includes establishing a calendar for implementation, pilot programs, and facilitating voluntary uptake by private actors.

STEP 2. COMPILE A MENU OF OPTIONS. Based on the needs assessment, authorities should identify a range of technological, institutional, and governance options that could address identified gaps. This menu may include different combinations of e-data tools as well as supporting governance measures such as data management systems, validation procedures, and cooperation mechanisms.

- A. Consider complementary technologies rather than single tools.** E-data systems are most effective when different data streams—such as VMS, electronic logbooks, imagery, and monitoring data—can be cross-checked to validate activity and detect inconsistencies.
- B. Assess maturity and feasibility of technologies.** Some tools, such as VMS and electronic reporting, are widely established and transferable, while others—such as electronic monitoring, satellite imagery, or machine-learning analysis—may be adopted selectively or phased in depending on capacity.



- C. Consider cost, scalability, and operational capacity.** Options should account for installation costs, data storage and analysis requirements, training needs, and the ability of authorities to manage increased data flows over time.

STEP 3. PROVIDE TECHNICAL AND FINANCIAL SUPPORT. As part of a phased approach, ensure government supports implementation of e-data systems, in particular through:

- A. Cost-sharing arrangements,** where governments cover or offset the initial costs of hardware installation (such as VMS units or cameras), while operators bear on-going operational costs.
- B. Phased implementation timelines,** allowing industry to spread costs and adapt gradually to new requirements.
- C. Identification of approved equipment** or service providers, reducing uncertainty and procurement burdens for operators.
- D. Training and technical assistance,** particularly for electronic logbooks and reporting systems, to ensure accurate and consistent data submission.

STEP 4. MAXIMIZE EFFICIENCY. E-data systems can reduce the costs of fisheries management, control and enforcement. However, they can require significant investments both from the public and private sectors, particularly in the initial stages of their deployment. Integrating and sharing e-data will maximize their efficiency. Learnings from the study advise, in particular, to:

- A. Explore opportunities for regional cooperation or shared services.** For some States, particularly those with limited resources, regional monitoring systems, shared analytical platforms, or donor-supported programmes can make advanced e-data tools more accessible.
- B. Centralise or integrate systems.** Not all administrations allow for full centralisation, but integration of systems and high levels of coordination maximise the efficiency of collecting and managing e-data. Integration enables cross-referencing of different data types, reduces duplication and facilitates information-sharing within and across agencies.

STEP 5. ESTABLISH CLEAR VALIDATION, CHAIN-OF-CUSTODY, AND ENFORCEMENT PATHWAYS. For e-data systems to support effective fisheries governance, they must be designed from the outset so that collected data can be verified, preserved, and used reliably in compliance and enforcement processes.

- A. Define validation procedures early.** Establish how data from systems such as VMS, electronic reporting, electronic monitoring, and imagery will be validated, whether through certification of approved equipment, regulatory standards, or manufacturer-supported verification.



- B. Maintain a clear chain of custody.** Ensure that data is securely transmitted, stored, and accessed through traceable systems that record when data is created, transferred, reviewed, or modified. This helps preserve evidentiary integrity.
- C. Ensure legal and procedural clarity.** Clear rules regarding the evidentiary status of e-data, the roles of technical experts or manufacturers where required, and the responsibilities of enforcement authorities reduce uncertainty and strengthen prosecution outcomes.
- D. Provide defined pathways for public access where appropriate.** Authorities should consider mechanisms for sharing aggregated or selected datasets with the public, researchers, or civil society. Transparency measures—such as the publication of compliance statistics or limited access to certain monitoring datasets—can strengthen public trust and support independent monitoring of, and public participation in, fisheries governance.

STEP 6: FUTURE PROOF SYSTEMS. When designing or integrating e-data systems, consider fisheries management and enforcement needs comprehensively, anticipating future needs. Allow systems to be adaptable and able to integrate all necessary sources, stakeholders and management agencies, keeping the system as efficient as possible. Learnings from the study advise, in particular, to:

- A. Establish comprehensive systems.** It is important to develop data collection capabilities, but systems should ensure there is the necessary infrastructure to manage and analyse this information, otherwise it is of limited use.
- B. Automate analysis.** From the outset, design systems so they can automatically detect errors, cross reference information and prioritise risks. Practice proves this improves accuracy and reduces management and enforcement costs.