Review of Traceability Systems Applied to the Value Chain of Fisheries and Aquaculture in APEC Economies

APEC Ocean and Fisheries Working Group

April 2024

Asia-Pacific
Economic Cooperation

Asia-Pacific
Economic Cooperation

Review of Traceability Systems Applied to the Value Chain of Fisheries and Aquaculture in APEC Economies

APEC Ocean and Fisheries Working Group

April 2024

APEC Project: OFWG 02 2021A

Produced by
ESTEBAN DONOSO ABARCA
Deputy Director - Fisheries and Aquaculture National Service

Address: Victoria 2832, Valparaiso
Region de Valparaiso
Chile
Telephone: +56322819329
Email: edonoso@sernapesca.cl

ALFREDO ALEJANDRO SFEIR CAMARENA
CEO Shellcatch Inc.
Address: 1000 NW 57th Court
STE 860, Miami, Florida
United States 33126
Telephone: +14158373900

For
Asia-Pacific Economic Cooperation Secretariat
35 Heng Mui Keng Terrace
Singapore 119616
Tel: (65) 68919 600
Fax: (65) 68919 690
Email: info@apec.org
Website: www.apec.org

APEC#224-OF-01.2

TABLE OF CONTENTS

I. Executive Summary

The fisheries and aquaculture sectors are of immense importance to the economic and social well-being of APEC economies, significantly contributing to the global fisheries industry with 65% of the world's fish catches and 80% of aquaculture production. These sectors play a crucial role in ensuring food security, supporting livelihoods, and contributing to economic growth. However, they are currently facing a myriad of challenges that threaten their sustainability and environmental impact. The most pressing of these include illegal, unreported, and unregulated (IUU) fishing and unsustainable production practices. These practices not only undermine the long-term viability of the fisheries and aquaculture industries but also pose significant risks to marine ecosystems, biodiversity, and the global food supply chain.

In response to these challenges, the implementation of traceability systems has emerged as a critical measure. Traceability systems are essential for tracking and verifying the origin, journey, and status of seafood products throughout their supply chain. These systems play a pivotal role in ensuring the integrity, quality, safety, and sustainability of seafood products, which is essential for maintaining consumer trust and stability in global markets. Moreover, traceability systems are crucial in streamlining trade processes, managing the complex dynamics of seafood products within the APEC region, and complying with international standards and regulations. However, the effectiveness of these systems is currently limited by the lack of standardization and interoperability among various traceability platforms, creating significant barriers to their widespread adoption and functional integration.

This project, therefore, focuses on conducting a comprehensive assessment and evaluation of the existing traceability systems utilized in the fisheries and aquaculture value chains of APEC economies. The aim is to identify and analyze existing gaps, share innovative practices, and explore opportunities for the enhancement and standardization of these systems. An additional critical aspect of the project is advocating for the implementation of advanced traceability technologies, which are expected to significantly improve the efficiency, reliability, and functionality of these systems.

The APEC project ‘OFWG 02 2021A’ embarked on a wide-ranging review of the existing traceability systems within its member economies. The objectives of this project were multifaceted: identifying gaps and best practices, recommending improvements and standardization, and encouraging the adoption of advanced traceability technologies.

The project encompassed a comprehensive set of activities:

1. A wide-reaching survey was conducted to collect detailed data on the current status, challenges, and needs of traceability systems in the fisheries and aquaculture sectors across APEC economies. This survey aimed to capture a broad range of perspectives and experiences, providing a rich and nuanced understanding of the current landscape.

2. An informative and engaging webinar was organized to introduce the project’s objectives, scope, and anticipated outcomes. This webinar served as a crucial platform for engaging a diverse range of stakeholders, inviting their valuable feedback and input.

3. An expert workshop brought together a diverse group of specialists, practitioners, and policymakers from APEC economies and other organizations. This workshop facilitated rich discussions and the exchange of best practices, experiences, and recommendations concerning traceability systems and technologies.

4. A detailed final report compiled the project's comprehensive findings, conclusions, and recommendations, offering a strategic and actionable roadmap for the future development and implementation of traceability systems and technologies in the APEC region.

The project's outcomes and contributions were extensive:

- It provided a thorough analysis of the current state of traceability systems in the fisheries and aquaculture sectors of APEC economies, evaluating their strengths, weaknesses, opportunities, and threats in a comprehensive manner.

- It assembled a rich repository of best practices and insights from various successful implementations of traceability systems and technologies across different contexts.

- It offered a set of detailed recommendations and guidelines aimed at enhancing the harmonization, interoperability, and overall effectiveness of traceability systems and technologies across the APEC region. This included tackling existing and emerging challenges and barriers.

- It developed an extensive strategic roadmap, outlining future actions and steps for APEC economies and other stakeholders to further the development and adoption of traceability systems and technologies in these sectors.

The anticipated impacts and benefits of this project are extensive and multifaceted:

- Improvement in the quality, safety, and sustainability of fisheries and aquaculture products within the APEC region, thereby increasing consumer confidence and demand.

- Enhanced trade facilitation and market access for these products, along with a significant reduction in trade barriers and risks.

- Strengthened collaboration and cooperation among APEC economies in the realm of traceability systems and technologies, leading to more impactful capacity building and knowledge sharing.

- Increased awareness and understanding of the critical role and benefits of traceability systems and technologies in the fisheries and aquaculture sectors, alongside increased support and incentives for their widespread adoption and implementation.

Despite these positive outcomes, the project faced several challenges in achieving its goals for event attendance and participant engagement. These challenges can be attributed to a variety of factors:

1. The inherent complexity and technical nature of traceability initiatives within this sector may have been a deterrent to broader attendance. These initiatives, requiring specialized

knowledge and understanding, may have appeared overwhelming to potential participants, especially those less familiar with the technical aspects of traceability.

2. The exclusion of small-scale fishing vessels from these initiatives, despite their compliance with export standards, highlights a significant gap. Addressing this issue calls for an inclusive approach and solutions that are specifically tailored to the needs and limitations of these smaller entities. This gap underscores the need for more nuanced and adaptable traceability systems that can cater to a diverse range of participants in the fisheries and aquaculture sectors.

3. The ambiguity surrounding the choice of technology and implementation strategies might have caused confusion and hesitation among potential attendees. Clear, decisive, and transparent communication about the technological direction and implementation strategies is essential to engage a broader range of stakeholders.

4. The recognition of the need for additional funding and capacity building, a common obstacle for many economies, might have been a sensitive issue. This recognition may affect the willingness of economies to participate openly and actively in such initiatives.

These challenges highlight the multifaceted and intricate nature of traceability initiatives in the fisheries and aquaculture sector. Overcoming these challenges requires a concerted effort, targeted capacity building, and an inclusive approach that caters to the diverse needs of all stakeholders, including those operating on a smaller scale. Furthermore, fostering open discussions about the necessity for additional funding and capacity building is critical for progress in this sector.

In addition, the project's success in reaching its targets for event attendance and participant nominations could be enhanced by strengthening the connections between APEC and local economy representatives. This could be achieved by actively involving local representatives in APEC-related activities, as they bring a deep understanding of the local context, challenges, and needs within the fisheries sector. This involvement is crucial for meaningful contributions to APEC initiatives. Moreover, making summit events mandatory related to fisheries and aquaculture traceability could amplify the importance of these projects within the fisheries leadership, encouraging higher-level participation and engagement.

In conclusion, addressing the project's challenges in meeting target goals for event attendance and participant nominations requires reinforcing ties with local APEC economy representatives and implementing mandatory summit events. These strategies would not only boost participation but also ensure that APEC initiatives in fisheries and aquaculture align closely with the needs and priorities of the economies involved, leading to more meaningful contributions and impactful outcomes. This approach would foster a more inclusive, collaborative, and effective approach to addressing the challenges faced by the fisheries and aquaculture sectors in the APEC region, ultimately leading to more sustainable and resilient fisheries and aquaculture practices.

II. Acknowledgements and Thanks.

We extend our deepest appreciation to the APEC team for their unwavering support and collaboration throughout the duration of this project. Their guidance, expertise, and dedication have been instrumental in driving the success of our endeavors.

We would like to express our sincere gratitude to the leadership in Chile's domestic fisheries organization, Sernapesca, for their invaluable contributions to this project. Their insights, expertise, and willingness to share their knowledge have greatly enriched our understanding of the fisheries and aquaculture sectors within the region.

We are immensely grateful to the domestic officials who generously gave their time and participated in countless meetings, providing invaluable input and assistance in piecing together the information necessary for this report. Their commitment to the advancement of sustainable fisheries practices is truly commendable.

Additionally, we extend our heartfelt thanks to the non-governmental organizations (NGOs) that collaborated with us throughout this project. Their expertise, passion, and tireless efforts have been invaluable in shaping the direction of our research and analysis.

We also want to express our gratitude to the speakers who generously shared their expertise and insights during the workshops. Your contributions were instrumental in facilitating meaningful discussions and advancing our understanding of key issues in the fisheries and aquaculture sectors.

We are deeply appreciative of everyone who contributed to this project, whether through participation in surveys, webinars, workshops, or interviews. Your insights and perspectives have been instrumental in shaping the outcomes of this report.

In closing, we would like to express our profound gratitude to all individuals and organizations involved in this project. Your collective efforts have been essential in advancing knowledge and fostering positive change in the fisheries and aquaculture sectors. Thank you for your unwavering commitment and dedication.

III. Introduction

The project dedicated to enhancing traceability in the fisheries and aquaculture sectors within APEC economies embarked on an ambitious journey, aiming to tackle some of the most pressing challenges in these industries. Its primary objective was to implement and improve traceability systems, a crucial step toward ensuring the sustainability, legality, and ethicality of seafood products. Throughout its course, the project successfully executed several key activities, each contributing significantly toward achieving the intended outcomes. However, like any venture of such scale and complexity, the project encountered a range of challenges that affected the absolute fulfillment of all its goals.

One of the central challenges faced was resource constraints. In any large-scale project, resources such as time, funding, and expert manpower are of paramount importance. These constraints may have limited the project's capacity to conduct an exhaustive survey and in-depth subsequent analyses. The depth and breadth of research are crucial in a project of this nature, where understanding the nuances of various traceability systems and their impacts on different scales of fisheries operations is vital. Limited resources, therefore, might have restricted the project's ability to delve as deeply into these areas as would have been ideal, potentially affecting the robustness of the findings and the comprehensiveness of the recommendations.

The diversity of traceability systems in place across APEC economies also posed a significant challenge. Each economy within the APEC framework has its unique approach to fisheries and aquaculture management, influenced by its geographic, economic, and cultural contexts. This diversity, while a testament to the adaptability and resilience of these systems, also complicates efforts toward standardization. The project aimed to find common ground and harmonize these diverse systems, a task that proved to be complex and challenging. Achieving complete uniformity across such varied systems was not only a technical and logistical challenge but also required navigating through a myriad of regulatory and policy frameworks.

Another constraint was the ambitious timeline set for the project. While timely completion of projects is important, especially in a field as dynamic as fisheries and aquaculture, the complexity and scope of this project called for a more extended period of analysis and discussion. The ambitious timeline may have constrained the depth of the Workshop discussions and the comprehensive analysis necessary for absolute standardization. This time constraint may have led to certain aspects of the project not being explored as thoroughly as necessary to achieve a fully standardized approach.

Moreover, the challenges specific to seafood traceability, compared to other industries like meat, add another layer of complexity. The seafood supply chain is characterized by its length and convolution, involving a wide variety of species and a diverse range of fishing practices. This complexity is significantly different from industries like meat, where tracing the source often involves a shorter and more straightforward supply chain. In seafood, the journey from ocean to plate often involves multiple intermediaries, transshipments, and processing stages, making it challenging to accurately track the journey of seafood products. This complexity

leads to difficulties in ensuring quality, sustainability, and compliance with international regulations and standards.

The penalties imposed by importing markets for inadequately implemented traceability systems add to the dilemma faced by exporting economies. These penalties, often in the form of trade restrictions or 'yellow cards,' impact the exporting abilities of economies that fail to implement effective traceability measures. This situation creates a significant challenge in the global seafood market and serves as a disincentive for full participation in surveys or traceability initiatives. There's a perception among some stakeholders that investing resources in traceability might not yield immediate or visible benefits, especially when the responsibility for meeting minimum traceability standards often falls on larger industrial entities that are better equipped to handle these requirements.

For the seafood industry to thrive sustainably and ethically, traceability efforts need to extend beyond large-scale industrial operations to include small-scale fleets. Achieving comprehensive coverage across the entire spectrum of fishing practices and vessel sizes is essential for creating a fair and effective traceability system. When compliance is limited to large-scale operations, while smaller entities are excluded, it creates an uneven playing field. This partial compliance does not fully address the core issues in the seafood supply chain, such as ensuring sustainability, preventing overfishing, and safeguarding against illegal practices.

Efforts must focus on creating incentives and providing support for all stakeholders, regardless of their scale, to participate in traceability initiatives. This inclusive approach is vital for developing a robust and reliable seafood traceability framework. Such a framework must meet international standards, enhance market access, ensure sustainability, and prevent illegal, unreported, and unregulated (IUU) fishing practices.

IUU fishing, in particular, poses one of the most formidable challenges to standardizing traceability within the seafood industry. APEC economies, like many others globally, grapple with the pervasive issue of IUU fishing. This challenge is critical in establishing comprehensive and standardized traceability measures. IUU fishing operates beneath the radar, often circumventing regulations and lacking proper documentation. This clandestine nature of IUU fishing undermines the integrity of traceability systems. When seafood products from IUU fishing enter the supply chain, they create blind spots, making it extremely difficult to track their origins accurately. This not only compromises the credibility of traceability systems but also jeopardizes efforts aimed at ensuring sustainability, ethical practices, and food safety.

Effective traceability standards require interoperability among various institutions involved in the seafood supply chain. However, if institutions tasked with combating IUU fishing lack interoperability or cohesive collaboration, traceability efforts become fragmented and less effective. To overcome this challenge, concerted efforts are needed to bridge the gap between IUU enforcement institutions and traceability standards. Collaboration, information sharing, and the development of interoperable systems between these entities are paramount.

Addressing IUU fishing in tandem with standardizing traceability measures is crucial for the sustainability of the seafood industry, ensuring legal and ethical practices, and bolstering

consumer confidence. A unified approach, where institutions work in tandem, is fundamental to overcoming the challenges posed by IUU fishing and establishing robust, standardized traceability systems across APEC economies and beyond.

Despite these challenges, the project substantially contributed to advancing the understanding of traceability systems within APEC economies. It laid a solid foundation for future initiatives aimed at harmonizing and enhancing traceability technologies, albeit acknowledging the need for continued efforts to address the aforementioned challenges. This project represents a significant step forward in the quest for a more sustainable, ethical, and transparent seafood industry, and sets the stage for future developments in this crucial area.

IV. Methodology

The survey for the APEC Seafood Traceability project was meticulously designed to gather comprehensive and nuanced data from APEC economies. Hosted on www.apec-seafood.shellcatch.com, the survey aimed to capture essential information crucial for assessing the current state and challenges of seafood traceability within these economies. The survey was methodically divided into several sections, each focusing on a different aspect of traceability, ensuring a holistic understanding of the issue.

APEC Seafood Traceability Government Economy Survey

Section 1: General Information

This initial section was critical for establishing the foundational details of the participating entities. It included the following information requests:

- Economy Name: This was essential to identify which APEC member economy was participating, ensuring that the data collected could be accurately attributed and analyzed on an individual economy basis.

- Government Economy Name: Understanding the official government designation provided clarity and avoided any potential confusion due to colloquial or abbreviated names.

- Contact Information: Gathering contact details such as name, position, email address, phone number, and web page was crucial for establishing clear lines of communication for future correspondence, clarification, and validation of the information provided. Including WhatsApp contact ensured accessibility and ease of communication, considering the widespread use of this platform for professional communication.

Section 2: Seafood Traceability Initiatives

This section sought to delve into the specific traceability initiatives within each economy. Key aspects included:

- Identifying current traceability initiatives and determining whether they are driven by governmental policies or private sector innovation. This distinction was vital in understanding the source of initiative and motivation behind traceability efforts.

- Understanding the extent of traceability technology adoption by assessing the coverage percentage of fisheries. This helped in evaluating how widespread and inclusive the traceability efforts were within each economy.

- Exploring the types of traceability technologies being used gave insights into the technological landscape and sophistication levels within each economy's fisheries sector.

- Assessing adherence to international standards such as GDST and FAO was critical to gauge global alignment and compliance with best practices in traceability.

- Determining the role of government policy or sponsorship in traceability initiatives helped in understanding the level of regulatory support and commitment towards these efforts.

- Evaluating the percentage of large, medium, and artisanal fleets equipped with traceability systems provided a differentiated view of how traceability initiatives were being implemented across various scales of operations within the fisheries sector.

Section 3: Characterization

In this section, the survey aimed to characterize the fisheries sector and traceability approaches of each participating economy. It included:

- Definitions of traceability according to official regulations, shedding light on the legal and formal framework underpinning traceability efforts.

- Categorization of vessel sizes based on the FAO's International Standard Statistical Classification and their contributions to GDP, offering insights into the scale and economic significance of the fisheries sector.

- Analysis of government control and stakeholder demand regarding traceability in the seafood supply chain, revealing the extent of governmental oversight and market-driven needs.

- Examination of traceability coverage at various stages of the supply chain for exported and domestically consumed products, highlighting the depth and reach of traceability practices.

Section 4: Seafood Traceability Coverage Imports

This section focused on the traceability of imported seafood products. It included questions on:

- The motivations behind requiring traceability for imports, such as compliance with international standards, food safety concerns, and protection of local production. Understanding these motivations was key to comprehending the drivers and priorities in traceability for imported seafood.

- Detailed inquiries about the percentage of traceability coverage and the types of technologies used for imported seafood. This information was crucial to assess the effectiveness and thoroughness of traceability systems for imports.

- Challenges in achieving comprehensive traceability for imported seafood, identifying areas where additional support, international cooperation, or technology enhancements might be necessary.

Section 5: Traceability Technologies

Dedicated to exploring the specific technologies employed in seafood traceability, this section asked participants to:

- Identify and specify the usage percentage of various traceability technologies like labeling, electronic reporting, and vessel monitoring systems at different supply chain stages. This would provide a detailed picture of the technological landscape and the extent of technology adoption.

Section 6: Databases and Seafood Traceability

This section focused on the use of Key Data Elements (KDEs) and Critical Tracking Events (CTEs) as per the GDST. Questions here were designed to:

- Determine the level of alignment with GDST standards and the interoperability of data systems. This was crucial for understanding how well the traceability data could be integrated and shared across different platforms and stakeholders.

Section 7: The Purpose Behind Traceability Technologies

The aim here was to understand the primary objectives behind employing traceability systems at different stages of the seafood supply chain. Questions were formulated to:

- Identify the main goals, whether it was ensuring legality, enhancing food safety, supporting sustainability, or facilitating market access. This would help in understanding the primary focus areas and the perceived benefits of traceability systems within each economy.

Section 8: Increasing Use of Traceability Technologies

The final section explored the capabilities, resources, and challenges in adopting traceability technologies. It included:

- Questions on human resource capacities, budgetary allocations, involvement of NGOs, and government initiatives to enhance the adoption and effectiveness of traceability technologies. This section was essential to gauge the readiness, support, and potential barriers to furthering traceability efforts within the fisheries sector of each economy.

The methodology of this survey was comprehensive, covering a wide range of areas pertinent to seafood traceability. Each section and question were carefully crafted to elicit detailed and relevant information that would contribute to a thorough understanding of the current state of traceability, the challenges faced, and areas for potential improvement and harmonization across the seafood industry within APEC economies. The responses were expected to provide valuable insights, helping to inform future strategies and actions to enhance seafood traceability practices.

Methodological Innovation: Integrating NGO Perspectives in the Fisheries Service of Chile's APEC Project

In a significant methodological advancement for the APEC Seafood Traceability project, the Fisheries Service of Chile incorporated a novel approach by actively involving Non-Governmental Organizations (NGOs) in the survey process. This initiative was driven by the understanding that NGOs, with their broad and diverse engagement in fisheries management

and conservation, could provide invaluable insights that complement governmental perspectives.

Development of a Specialized NGO Survey

To harness the unique viewpoints of NGOs, the Fisheries Service of Chile designed a bespoke survey tailored to these organizations. This survey aimed to tap into the extensive knowledge and experience of NGOs in various aspects of fisheries, including sustainability practices, community engagement, and policy advocacy. By doing so, the survey sought to capture a more comprehensive and holistic understanding of seafood traceability issues across APEC economies.

The NGO-specific survey included questions that delved into the effectiveness of existing traceability initiatives, the challenges faced in their implementation, and potential areas for improvement and support. It was designed to gather qualitative insights and anecdotal evidence that could enrich the quantitative data collected from government sources. This dual-survey approach ensured that the project was informed by a diverse range of perspectives, making the findings more robust and representative of the ground realities.

Facilitating Government Engagement through NGOs

NGOs played a pivotal role in bridging the communication gap between the project team and government departments in various APEC economies. Leveraging their established networks and credibility within the fisheries sector, these organizations encouraged and facilitated the participation of government bodies in the survey. This was particularly crucial in economies where direct engagement with government entities was challenging due to bureaucratic hurdles or limited accessibility.

The active involvement of NGOs helped in mitigating potential response biases and ensured a more balanced representation of views. It also helped in highlighting issues and challenges that might not have been readily disclosed or identified in government responses, thereby adding depth to the analysis.

Overcoming Budgetary and Mandate Limitations

Despite their commitment to fisheries sustainability, NGOs faced intrinsic challenges in participating in an initiative that was not directly aligned with their core mandates or funded activities. The lack of dedicated financial resources for such collaborative projects meant that NGOs had to allocate their existing resources judiciously, balancing this project's demands with their ongoing commitments.

The voluntary nature of their participation also meant that the level of involvement and the depth of contributions varied among different NGOs. However, despite these constraints, the NGOs demonstrated a remarkable willingness to support the project, driven by their overarching commitment to sustainable fisheries management.

Significant Contributions from Prominent NGOs

The project received substantial support from renowned organizations such as the World Wildlife Fund (WWF), Oceana, and various local NGOs. These organizations brought with them a wealth of expertise in diverse areas such as policy formulation, environmental advocacy, and community-based conservation. Their engagement in the project provided critical insights into the practical challenges and successes in implementing traceability systems in different contexts.

The involvement of these leading NGOs not only added credibility to the project but also facilitated access to a wealth of knowledge and best practices developed through their extensive work in the field. Their contributions were instrumental in identifying effective strategies for traceability implementation, understanding the nuances of local fisheries practices, and highlighting the socio-economic implications of traceability systems.

Enhanced Methodological Depth and Stakeholder Collaboration

The Fisheries Service of Chile's decision to integrate NGOs into the survey process represented a significant methodological enhancement for the APEC Seafood Traceability project. This collaborative approach yielded a richer and more nuanced understanding of traceability challenges and opportunities across APEC economies. It underscored the importance of multi-stakeholder engagement in addressing complex global issues and demonstrated the value of incorporating diverse viewpoints in research methodologies.

The success of this initiative highlighted the potential for similar collaborative approaches in future projects, advocating for a paradigm where governmental bodies, NGOs, industry stakeholders, and community groups work in concert to achieve common objectives. This inclusive and comprehensive approach is particularly pertinent in addressing global challenges in fisheries management, where collaboration and shared understanding are key to developing effective and sustainable solutions.

Traci Linder from the World Wildlife Fund (WWF) and Farid Maruf from USAID Oceans played pivotal roles in the APEC Seafood Traceability project, leveraging their extensive backgrounds and expertise to significantly contribute to the success of the event and overall attendance.

Secondhand Sources

Due to challenges in obtaining a comprehensive response rate from all APEC economies for the APEC Seafood Traceability project, the consulting team had to adapt their approach to ensure the project's objectives were still met. This adaptation involved a strategic pivot to utilizing secondary sources of information. This shift was crucial in painting a detailed and accurate picture of the state of seafood traceability across APEC member economies, despite the lower-than-expected survey response rates.

Researching Legislation and Policies

The team delved into an in-depth analysis of existing fisheries-related legislation and policies within APEC economies. This research focused on identifying legal frameworks and

regulations that govern traceability in the fisheries sector. By analyzing these legal documents, the team was able to glean insights into the mandatory requirements, guidelines, and standards set by governments for traceability in fisheries and aquaculture. Such an analysis also helped in understanding the level of regulatory support and enforcement mechanisms in place, providing a backdrop against which current traceability practices could be assessed.

Another critical aspect of the secondary research involved compiling and analyzing traceability success stories from various APEC economies. These case studies provided valuable insights into effective traceability systems and practices. They showcased instances where traceability initiatives had led to tangible improvements in fisheries management, sustainability, and economic benefits. These success stories not only served as a source of information on best practices but also as potential models that could be replicated or adapted by other economies facing similar challenges.

The team also focused on researching the coverage of certified catch for exports. This entailed examining the extent to which seafood products destined for export markets were subject to traceability protocols and certifications, such as those from the Marine Stewardship Council (MSC) or other eco-labeling programs. Understanding the coverage of certified catch was crucial as it provided an indication of how traceability systems were being implemented at a larger, often more formalized scale, particularly in economies with significant export-oriented fisheries sectors.

In addition to focusing on export-oriented traceability, the research also delved into small-scale traceability initiatives. These initiatives are crucial in understanding how traceability is implemented at a local or artisanal level, which often faces different challenges compared to large-scale commercial fisheries. The team explored various grassroots and community-led traceability projects, looking at their implementation, effectiveness, and the challenges they faced. This focus helped in gaining a comprehensive view of traceability practices across different scales of operation within the fisheries sector.

Finally, the consulting team conducted extensive research into government systems related to fisheries traceability. This included examining government-led traceability initiatives, the technological infrastructure used by governments for traceability purposes, and the integration of government systems with private-sector traceability efforts. Understanding the role of government systems was vital, as these often form the backbone of domestic traceability frameworks and are key to enforcing and upholding traceability standards.

Resorting to secondary sources in response to the lack of survey responses allowed the consulting team to gather a wealth of information crucial for understanding the various dimensions of seafood traceability in APEC economies. This comprehensive approach ensured that the project outcomes were informed by a diverse range of data sources, offering a holistic view of the successes, challenges, and opportunities in the implementation of traceability systems across the APEC region. Despite the initial challenge of lower survey response rates, the use of secondary sources proved to be a valuable strategy in achieving the project's overarching goals.

Criteria and Analysis Across Economies

The criteria outlined are comprehensive and crucial for establishing reference points for the convergence of standards and technological adoption in fisheries traceability. They cover a broad spectrum of aspects vital for a holistic approach to fisheries management and sustainability. Here's an explanation of why each criterion is useful:

1. Past vs. Present (Yellow Cards for Bad Fishing Processes): Understanding the historical context and improvements made in fisheries management is essential for assessing progress and identifying areas that need further development. It helps in benchmarking against international standards and guides future policy and technological improvements.

2. Supply Chain (Processing, Transport, and Labeling): Evaluating the implementation of traceability in the supply chain reveals how effectively an economy can monitor and control its seafood products. Mandated traceability and labeling across vessel sizes ensure uniformity and compliance, crucial for both market access and resource sustainability.

3. Centralized Database: A centralized database facilitates the effective gathering, storing, and processing of fisheries data. It's essential for managing resources efficiently and for transparency. A user-friendly web interface for data input and sharing enhances stakeholder engagement and public awareness.

4. Satellite Monitoring (VMS Systems): The implementation of VMS systems, especially their coverage across different vessel sizes, indicates an economy's commitment to monitoring and managing its fishing activities. This technology is critical for enforcing fishing regulations and sustainable practices.

5. Electronic Logbook Reporting: The presence of a domestic system for electronic logbook reporting and its coverage reflects the maturity of an economy's traceability system. It ensures accurate and timely recording of fishing activities, which is crucial for sustainable fisheries management.

6. Interoperability and Use of APIs for Third-Party Service Providers: Interoperability and the ability to integrate third-party services demonstrate an adaptive and flexible traceability system. It allows for customization according to specific needs and encourages innovation.

7. Video Monitoring: The extent of video monitoring implementation reflects an economy's advancement in employing technology for fisheries monitoring. It enhances the accuracy and reliability of the data collected, especially in compliance and monitoring efforts.

8. Domestic vs. International Markets: The symmetry in traceability and technology standards between domestic and international markets is essential for consistent quality control and market competitiveness. It ensures that domestic products meet the same high standards expected of exports.

9. Public vs. Private Sector and NGO Involvement: The dynamics between public, private sectors, and NGOs in traceability implementation indicate the collaborative efforts and multi-

stakeholder approach necessary for effective fisheries management. It highlights the roles different entities play in advancing sustainable practices.

10. Small Scale vs. Large Scale Vessels in Sustainability: Addressing the unique challenges faced by small-scale fishers is crucial for inclusive and equitable resource management. This criterion helps understand how economies balance the needs of different scales of operations in their sustainability efforts.

11. Seafood Imports vs. Exports: Comparing the standards for imports and exports provides insight into an economy's commitment to maintaining high-quality standards across the board, essential for ensuring global market access and consumer trust.

12. Legislation: Understanding the state of legislation related to traceability, standardization, and technology use is key to gauging an economy's regulatory framework's effectiveness and its alignment with international norms.

13. Readiness for Adopting GDST Standards: Assessing readiness for adopting GDST standards indicates an economy's commitment to global best practices in traceability. It reflects on the capacity to integrate these standards into domestic systems, crucial for international trade and sustainability efforts.

In summary, these criteria collectively provide a robust framework for evaluating and guiding the implementation of traceability systems in fisheries. They ensure that all critical aspects, from technology to policy and stakeholder engagement, are considered, leading to more effective, sustainable, and internationally compliant fisheries management practices.

IV. Results

The APEC Seafood Traceability project's strategic selection of 15 economies, including Australia; Canada; Chile; Indonesia; Japan; Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; The Republic of the Philippines; Chinese Taipei; Thailand; the United States; and, Viet Nam, represented a deliberate effort to capture a diverse range of approaches and challenges in implementing seafood traceability. Each economy was chosen for its unique position in the global seafood market, either as a net exporter or importer, and its specific incentives for adopting traceability technologies. The varied motivations included compliance with international standards, enhanced food safety assurance, eco-certification and sustainable practices, supply chain optimization, risk mitigation, market competitiveness, consumer trust, and facilitating cross-border trade.

In-Depth Economy Analysis

1. Thailand: As a major seafood exporter, Thailand's focus on compliance with international standards and facilitating cross-border trade is driven by its need to maintain access to key global markets. The economy has faced challenges in the past related to illegal fishing and labor issues, which have made traceability a critical component for proving compliance and regaining market trust.

2. Canada: As a developed economy with a significant seafood sector, Canada's interest in supply chain optimization and fraud prevention reflects its commitment to maintaining a high standard in seafood quality and safety. Advanced technology adoption in traceability aligns with Canada's overall technological and environmental policy framework.

3. United States: The U.S. has a complex seafood supply chain with both significant imports and exports. Its focus on supply chain efficiency and risk mitigation stems from a need to manage this complexity, ensuring safety, legality, and sustainability in its seafood market, which is one of the largest in the world.

4. Chile; Chinese Taipei and Peru: These economies, with robust fishing industries, particularly in the anchovy and salmon markets, focus on eco-certification and sustainable practices. This focus is part of a broader strategy to ensure long-term sustainability of their fisheries and access to environmentally conscious markets.

5. Papua New Guinea and The Republic of the Philippines: As developing economies with rich marine biodiversity, these economies emphasize compliance with international standards. This focus ensures continued access to global markets and aids in attracting foreign investment and partnerships.

6. Indonesia: Indonesia, as one of the largest archipelagic economies, has a significant stake in maintaining sustainable fishing practices. Its focus on international standards and cross-border trade is crucial for its vast seafood sector that feeds both domestic and global markets.

7. Korea: Korea's emphasis on supply chain optimization is reflective of its advanced technological landscape. The economy's focus on fraud prevention aligns with its broader goals of food safety and maintaining a strong international trading position.

8. Australia and New Zealand: These economies exhibit a holistic approach towards traceability, recognizing its multifaceted benefits. Their balanced outlook is influenced by their positions as both importers and exporters, as well as their commitments to sustainable fishing practices and indigenous rights.

9. Japan: With one of the largest seafood markets globally, Japan's interest in traceability technologies aligns with its need for supply chain efficiency and consumer trust. Japan's market is particularly sensitive to issues related to food safety and quality, making traceability a key tool for market assurance.

10. Malaysia and Viet Nam: These economies are increasingly focusing on sustainable practices, driven by the need to protect their fishing industries and ensure access to global markets. Their growing emphasis on eco-certification highlights a shift towards more responsible fishing practices.

Motivations Behind Technology Adoption for Traceability

1. Supply Chain Optimization and Efficiency: economies like Canada; Korea; Japan; the United States and prioritize supply chain optimization to enhance operational efficiency and reduce waste. Advanced traceability technologies enable these economies to manage their complex seafood supply chains more effectively, leading to cost savings and increased competitiveness.

2. Certification for Sustainable Practices: Economies like Chile; Chinese Taipei; Peru; Viet Nam; and are increasingly motivated to adopt traceability to achieve eco-certification. This certification is crucial for accessing markets where consumers demand sustainably sourced products.

3. Compliance with International Standards: economies like Indonesia; Mexico; Papua New Guinea; The Republic of the Philippines, and Thailand focus on meeting international standards to ensure their access to global markets is unhindered. Traceability systems are essential for these economies to prove their compliance with international regulations, particularly in markets with strict import conditions.

4. Balanced Approach: New Zealand and Australia's balanced approach toward traceability technology adoption reflects their comprehensive understanding of its benefits across different aspects, including market access, sustainability, and operational efficiency.

5. Avoiding Yellow Cards: The issuance of yellow cards to economies like Korea; Papua New Guinea; The Republic of the Philippines; Thailand; and Viet Nam and by international regulatory bodies, particularly the European Union, has been a pivotal moment in catalyzing the development of more robust traceability programs, particularly in their larger exporting fleets. These yellow cards, which serve as warnings for potential non-compliance with international fishing regulations, have effectively stimulated significant improvements in the traceability and sustainability of fisheries practices. However, the impact on small-scale fleets has been notably different from that on large-scale, export-oriented fleets.

Impact on Large Exporting Fleets

- Stimulus for Compliance and Improvement: The yellow cards acted as a wake-up call, prompting these economies to enhance their fisheries management and traceability systems. This was largely driven by the need to maintain access to lucrative international markets, especially the EU, which has stringent import regulations.
- Implementation of Export Required Certifications: In response to the yellow cards, these economies have worked diligently to meet the export certification requirements imposed by international markets. This has included the adoption of advanced traceability systems, such as electronic reporting, VMS, and more rigorous monitoring and regulatory compliance measures.
- Demonstration of Commitment: Successfully achieving the necessary export certifications post-yellow card issuance demonstrates these economies' commitment to sustainable fishing practices. It reflects their willingness to align with international standards and practices, thereby improving their reputation in global seafood markets.

Limited Impact on Small-Scale Fleets

- Disparity in Resource Allocation: The focus on enhancing traceability in large, export-oriented fleets often meant that more resources were allocated to these segments. Consequently, small-scale fleets, which typically cater to domestic markets and have less impact on international trade, received less attention and investment in terms of traceability and sustainability initiatives.
- Challenges in Implementation: Small-scale fleets often face unique challenges, including limited access to technology, funding, and training. This makes the implementation of sophisticated traceability systems more complex. Unlike large fleets, small-scale fishers might not have the infrastructure or capacity to comply with stringent traceability requirements.
- Need for Tailored Approaches: Effective traceability in small-scale fleets requires approaches that are specifically tailored to their operational realities. These might include simpler, more cost-effective traceability solutions, community-based management practices, and support for transitioning to sustainable practices.

The yellow cards have undeniably prompted significant advancements in traceability and fisheries management in the larger, export-oriented fleets of these economies. However, to create a fully sustainable and traceable seafood industry, similar efforts need to be extended to small-scale fleets. This requires:

- Balanced Resource Allocation: Equal emphasis and resource allocation for improving traceability in both large and small-scale fleets.
- Customized Traceability Solutions: Development of traceability systems that are feasible and practical for small-scale operators.
- Capacity Building: Providing training and support to small-scale fishers to adopt sustainable and traceable fishing practices.
- Integrated Management Approach: A holistic approach that includes both large and small-scale operations in domestic fisheries management plans.

The diverse motivations and incentives for adopting traceability technology across these 15 economies highlight the multifaceted nature of this issue within the APEC region. Each economy's unique economic, environmental, and social contexts dictate its approach to traceability, underscoring the need for tailored strategies and solutions. Understanding these varied motivations is key to developing collaborative and effective regional policies that advance the broader goals of sustainable fisheries management, food safety, and economic prosperity in the APEC region.

A. Australia

Australia's approach to implementing traceability in its seafood sector shares several similarities with New Zealand, particularly in terms of comprehensive coverage and a commitment to sustainable fisheries management. However, a key difference lies in the interoperability of traceability systems among its territories. Unlike New Zealand's centralized database system, Australia's territories operate more independently, often resulting in a lack of cohesive data integration across the economy.

Decentralized Database and Territorial Silos

In Australia, the absence of a centralized database for fisheries traceability has led to a scenario where different territories manage their data systems independently. This territorial approach results in what can be described as working in silos – each territory has its own set of rules, regulations, and systems for traceability, which may not seamlessly align with those of other territories. This lack of interoperability poses challenges in creating a unified domestic picture of fisheries management and hinders the efficient sharing of information across borders.

Queensland's Leadership in Traceability Technologies

Queensland has emerged as a leader in implementing advanced traceability technologies within Australia. The state has made significant strides in adopting Vessel Monitoring Systems (VMS), electronic reporting, and electronic monitoring. These initiatives place Queensland at the forefront of traceability in Australia, showcasing its commitment to modernizing fisheries management and enhancing sustainability.

Initiatives for Small-Scale Vessels

Recognizing the importance of inclusivity in traceability, Australia has begun focusing on the implementation of these systems in small-scale vessels. This initiative is crucial as small-scale fisheries form a significant part of the economy's seafood sector. By extending traceability technologies to these vessels, Australia is making strides towards a more comprehensive and inclusive approach. This move is expected to enable the economy to catch up with New Zealand in terms of implementing effective and widespread traceability practices.

Challenges and Future Directions

The current structure, with territories operating in silos, presents a significant challenge for Australia in achieving the level of traceability seen in New Zealand. However, the proactive

steps taken by states like Queensland, coupled with the increasing focus on small-scale vessels, signal a positive shift towards more unified and effective traceability systems in the future.

Legislation and Regulatory Framework

Australia's legislative and regulatory framework for fisheries traceability is evolving to support these new initiatives. Policies and regulations are being developed to ensure that traceability systems are robust, reliable, and capable of meeting both domestic and international standards.

Global Standards and Market Access

Like New Zealand, Australia recognizes the importance of aligning with global traceability standards to maintain market access and consumer trust. The economy's efforts in improving traceability systems are partly driven by the need to comply with international requirements and to ensure that Australian seafood products are competitive in the global market.

Public and Private Sector Roles

The development and implementation of traceability systems in Australia involve collaboration between public authorities at the territorial level and private sector stakeholders. This collaborative approach is vital for ensuring that the systems developed are practical, effective, and tailored to the unique needs of each territory.

Australia's journey towards implementing comprehensive traceability in its seafood sector, while distinct from New Zealand's centralized approach, reflects a strong commitment to sustainable fisheries management. The efforts by states like Queensland and the increasing focus on small-scale vessels are steps in the right direction. As Australia continues to evolve its traceability systems, with a focus on improving interoperability and inclusivity, it is poised to achieve a more integrated and effective domestic traceability framework. This progression is essential for ensuring the sustainability of Australia's fisheries and for maintaining its standing in the global seafood market.

B. Canada

Canada's fisheries management history is characterized by a commitment to sustainable practices and compliance with international regulations. While the economy has not typically faced significant challenges like yellow cards for bad fishing practices, it has consistently focused on enhancing its fisheries management and traceability systems. These efforts demonstrate Canada's longstanding dedication to sustainable fishing and adherence to global standards.

Supply Chain Management: Processing, Transport, and Labeling

In Canada, the supply chain management within the seafood industry, including processing, transport, and labeling, is governed by stringent regulations:

- Mandated Traceability: Traceability in seafood processing and transport is a regulatory requirement in Canada, ensuring that seafood products are tracked throughout the supply chain, enhancing transparency and quality control.

- Labeling Requirements: Labeling of seafood products in Canada is comprehensive and mandated, providing consumers with essential information about the products' origin, type, and handling. This requirement is applied across all vessel sizes, promoting uniformity across the industry.

Centralized Database and Data Accessibility

Canada has developed sophisticated systems for fisheries traceability:

- Database Management: Managed by relevant fisheries authorities, these centralized systems integrate data from various sources for effective management of the fisheries sector.

- Web Interface and Data Sharing: A well-established web interface allows fishermen to input data, ensuring transparent data sharing with the public and enhancing awareness and informed decision-making.

Satellite Monitoring: VMS Systems

Canada has implemented Vessel Monitoring Systems (VMS) extensively across its fishing fleet:

- Coverage: VMS coverage includes both large and small-scale vessels, reflecting a comprehensive approach to monitoring and sustainable fisheries management.

Electronic Logbook Reporting

Canada employs an electronic logbook reporting system for fisheries management:

- System and Coverage: This system covers a broad range of vessel sizes, ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Canada actively develops systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality to accommodate diverse industry needs.

Video Monitoring in Fisheries

Canada is progressively implementing video monitoring across various scales of fishing operations, leveraging technology for sustainable fisheries management.

Domestic vs. International Market Traceability

Canada maintains consistent traceability standards for both domestic and export-oriented seafood products, ensuring uniformity across all market segments.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Canada involve collaboration between the public and private sectors. The government sets regulatory frameworks, while the private sector often leads in technological advancements. NGOs also play a significant role, particularly in advocating for sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Canada effectively manages both small-scale and large-scale fisheries, ensuring sustainable practices are maintained across all scales.

Seafood Trade Standards

Canada aligns its standards for seafood imports with its stringent export certification requirements, ensuring consistency and high quality across the seafood industry.

Legislation and GDST Readiness

Canada's legislative framework related to traceability and technology use is well-established, aligning with international standards like the Global Dialogue on Seafood Traceability (GDST) and actively incorporating these standards across its fishing sectors.

Canada's seafood traceability system is a model of efficiency and sustainability, marked by comprehensive implementation and adherence to international standards. The economy has successfully developed a cohesive domestic traceability framework that includes both small-scale and large-scale fisheries, meeting the requirements of both domestic and international markets. Canada’s ongoing commitment to technology adoption, regulatory refinement, and collaborative stakeholder engagement continues to advance its traceability systems and ensure the sustainable management of its seafood resources.

C. Chile

Chile's approach to implementing traceability in its seafood sector presents a unique blend of technological advancement and inclusive fisheries management. As an economy with a significant fishing industry, Chile has taken notable steps in developing a traceability system that caters to both large-scale and small-scale fisheries. However, there are distinct areas where the economy excels and others where further development is needed.

API Development for Third-Party Traceability Vendors

One of Chile's significant advancements in traceability is the development of APIs (Application Programming Interfaces) for third-party traceability vendors. This initiative demonstrates Chile's commitment to creating an open and adaptable traceability ecosystem. By allowing third-party vendors to integrate with their system, Chile is fostering innovation and customization in traceability solutions, which can cater to the diverse needs of its fishing industry.

Comprehensive Monitoring of Large-Scale Fleet

Chile’s large-scale fishing fleet is under comprehensive monitoring, with the implementation of Vessel Monitoring Systems (VMS), electronic logbooks, and electronic monitoring. This extensive coverage ensures transparency and accountability in large-scale fishing operations, aligning with international standards and expectations. Such measures are crucial for maintaining the integrity of Chile's seafood industry and for ensuring sustainable fishing practices.

Export Market Compliance vs. Small-Scale Mandates

While Chile excels in compliance with export markets, ensuring that its seafood products meet international standards, the economy faces challenges in extending similar mandates to its small-scale fisheries. The lack of compulsory traceability measures for small-scale operations creates a gap in the economy’s overall traceability system. This discrepancy highlights the need for a more balanced approach that encompasses all sectors of Chile's diverse fishing industry.

Inclusive Public Sector Traceability System

Chile’s public sector has been instrumental in developing an inclusive traceability system that encompasses both small-scale and large-scale fisheries. This inclusivity is crucial for ensuring that all stakeholders in the fishing industry, regardless of their size or scale, are part of the traceability process. Such an approach is essential for creating a comprehensive and effective domestic traceability framework.

Innovation in Supply Chain Verification

In response to concerns raised by artisanal fishers regarding theft and the need to combat IUU (Illegal, Unreported, and Unregulated) fishing in domestic markets, Chile is innovating in verification across supply chains. By enhancing traceability and verification processes, Chile

aims to protect the rights and livelihoods of artisanal fishers and to ensure the integrity of its seafood products in both domestic and international markets.

Addressing IUU Fishing in Domestic Markets

The need to limit IUU fishing in domestic markets is a key driver behind Chile's traceability initiatives. By implementing effective traceability and verification systems, Chile aims to tackle the challenges posed by IUU fishing, which not only affects the sustainability of fish stocks but also undermines the economic viability of legitimate fishers and processors.

Public vs. Private Sector Implementation

Chile's traceability system reflects a collaborative effort between the public and private sectors. The government's role in dictating traceability standards and fostering an environment conducive to technological innovation has been pivotal. Simultaneously, the private sector's engagement in developing and implementing traceability solutions plays a crucial role in ensuring the system's practicality and effectiveness.

Challenges in Small-Scale Fisheries Management

Managing small-scale fisheries poses specific challenges for Chile, particularly in the context of expanding fishing populations and concerns about sustainability. While large-scale fisheries are well-monitored, extending similar levels of oversight to small-scale fisheries is critical for ensuring the overall sustainability of Chile's fishing industry. Efforts are underway to balance the needs and capabilities of small-scale fishers with the requirements of effective fisheries management.

Chile's seafood traceability system exhibits significant strengths, particularly in its large-scale fleet monitoring and compliance with export markets. However, the need to bring small-scale fisheries under similar traceability mandates remains a key area for further development. The economy's efforts in creating APIs for third-party vendors and its focus on innovation in supply chain verification demonstrate its commitment to evolving and improving its traceability system. As Chile continues to address these challenges, it is well-positioned to establish a more comprehensive and effective domestic traceability framework, enhancing the sustainability and integrity of its seafood sector.

D. Indonesia

Indonesia's fisheries management has evolved significantly over the years. Historically, the economy faced various challenges in its fishing practices, including instances that led to international scrutiny and potential non-compliance with global fishing regulations. In response, Indonesia has undertaken substantial improvements in its fisheries management and traceability systems. These efforts highlight Indonesia's commitment to sustainable fishing practices and adherence to international standards.

Supply Chain Management: Processing, Transport, and Labeling

In Indonesia, the supply chain management within the seafood industry, covering processing, transport, and labeling, is governed by evolving regulations:

- Mandated Traceability: Indonesia has implemented traceability requirements in seafood processing and transport, ensuring that seafood products are monitored throughout the supply chain for enhanced transparency and quality control.

- Labeling Requirements: The economy is progressively mandating labeling of seafood products, providing consumers with essential information about the products' origin, type, and handling. This requirement is being increasingly applied to both large and small vessels, promoting uniformity across the industry.

Centralized Database and Data Accessibility

Indonesia is enhancing its centralized database for fisheries traceability:

- Database Management: Managed by the relevant fisheries authorities, this centralized system aims to streamline data from various sources for better management of the fisheries sector.

- Web Interface and Data Sharing: Efforts are being made to develop a user-friendly web interface for fishermen to input data. The goal is to ensure transparent data sharing with the public, enhancing awareness and informed decision-making.

Satellite Monitoring: VMS Systems

Indonesia has implemented Vessel Monitoring Systems (VMS) within its fishing fleet:

- Coverage: VMS coverage in Indonesia includes both large and small-scale vessels, reflecting a commitment to comprehensive monitoring and sustainable fisheries management.

Electronic Logbook Reporting

Indonesia employs an electronic logbook reporting system for its fisheries management:

- System and Coverage: This system covers a range of vessel sizes, ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Indonesia actively develops systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality to accommodate diverse industry needs.

Video Monitoring in Fisheries

The implementation of video monitoring in Indonesia's fisheries sector is progressively increasing:

- Implementation Scope: Video monitoring is utilized in various scales of fishing operations, reflecting Indonesia's commitment to leveraging technology for sustainable fisheries management.

Domestic vs. International Market Traceability

Indonesia maintains distinct traceability standards for domestic and export-oriented seafood products:

- Differing Standards: While standards for export markets are robust, domestic market traceability is still in a developmental phase, indicating a need for more uniform standards across all market segments.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Indonesia involve collaboration between the public and private sectors, with the government setting regulatory frameworks and the private sector often leading technological advancements. NGOs also contribute significantly, particularly in promoting sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Managing small-scale fisheries alongside large-scale operations presents challenges for Indonesia:

- Sustainability Focus: Efforts are concentrated on ensuring sustainable practices across all scales of fisheries, balancing economic viability with environmental responsibility.

- Resource Management Initiatives: Initiatives like establishing Marine Protected Areas (MPAs) are part of Indonesia's strategy to balance conservation with the socioeconomic realities of fishing communities.

Seafood Trade Standards

Indonesia is working to align its seafood import standards with export certification requirements, ensuring consistency and high quality across the seafood industry.

Legislation and GDST Readiness

Indonesia's legislative framework related to traceability and technology use is evolving:

- GDST Adoption: The economy is increasingly adopting international standards like the Global Dialogue on Seafood Traceability (GDST) and is actively working towards full implementation across all fishing sectors.

Indonesia's seafood traceability system demonstrates significant progress, particularly in complying with international standards and managing its diverse fisheries. However, challenges remain in developing a cohesive domestic traceability framework that includes small-scale fisheries and meets the requirements of both domestic and international markets. Continued efforts in technology adoption, regulatory development, and collaborative stakeholder engagement are essential for advancing Indonesia’s traceability systems and ensuring the sustainable management of its seafood resources.

E. Japan

Japan's history in fisheries management is notable for its dedication to sustainable practices and adherence to international standards. The economy has not typically faced significant challenges like yellow cards for bad fishing processes. Instead, Japan has consistently focused on refining its fisheries management and traceability systems. These efforts demonstrate Japan's long-standing commitment to sustainable fishing and compliance with global regulations.

Supply Chain Management: Processing, Transport, and Labeling

Japan's approach to supply chain management within the seafood industry, encompassing processing, transport, and labeling, is marked by a high level of implementation:

- Mandated Traceability: Traceability in seafood processing and transport is a key regulatory requirement in Japan, ensuring the monitoring of seafood products from catch to consumer for enhanced transparency and quality control.

- Labeling Requirements: Labeling of seafood products in Japan is comprehensive and mandated, providing consumers with essential information about the origin, type, and handling of the products. This requirement applies to both large and small vessels, ensuring consistency across the industry.

Centralized Database and Data Accessibility

Japan has an advanced centralized database system for fisheries traceability:

- Database Management: The centralized system, managed by the fisheries authorities, integrates data from various sources for effective management of the fisheries sector.

- Web Interface and Data Sharing: A sophisticated web interface is available for fishermen to input data, and the system ensures transparent data sharing with the public, enhancing awareness and informed decision-making.

Satellite Monitoring: VMS Systems

In Japan, Vessel Monitoring Systems (VMS) are implemented comprehensively across its fishing fleet:

- Coverage: The coverage of VMS in Japan includes both large and small-scale vessels, reflecting a commitment to comprehensive monitoring and sustainable fisheries management.

Electronic Logbook Reporting

Japan employs a domestic electronic logbook reporting system:

- System and Coverage: This system is integral to Japan's fisheries management, covering a wide range of vessel sizes and ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Japan actively develops systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality to accommodate diverse industry needs.

Video Monitoring in Fisheries

The implementation of video monitoring in Japan's fisheries sector is progressively increasing:

- Implementation Scope: Video monitoring is utilized in various scales of fishing operations, reflecting Japan's commitment to leveraging technology for sustainable fisheries management.

Domestic vs. International Market Traceability

Japan maintains consistent traceability standards for both domestic and export-oriented seafood products:

- Unified Standards: Efforts are made to ensure uniform traceability standards across all market segments, reflecting Japan's commitment to high-quality standards in both domestic consumption and international trade.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Japan involve collaboration between the public and private sectors:

- Sector Collaboration: The government sets regulatory frameworks, while the private sector often leads in technological advancements. NGOs contribute significantly, especially in promoting sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Japan effectively manages both small-scale and large-scale fisheries, ensuring sustainable practices are maintained across all scales.

Seafood Trade Standards

Japan's standards for seafood imports align with its stringent export certification requirements, ensuring consistency and high quality across the seafood industry.

Legislation and GDST Readiness

Japan's legislative framework related to traceability and technology use is well-established:

- GDST Adoption: Japan is aligned with international standards like the Global Dialogue on Seafood Traceability (GDST) and actively incorporates these standards across its fishing sectors.

Japan's seafood traceability system is a model of efficiency and sustainability, marked by its comprehensive implementation and adherence to international standards. The economy has successfully developed a cohesive domestic traceability framework that includes both small-scale and large-scale fisheries, meeting the requirements of both domestic and international markets. Japan’s ongoing commitment to technology adoption, regulatory refinement, and collaborative stakeholder engagement continues to advance its traceability systems and ensure the sustainable management of its seafood resources.

F. Malaysia

Malaysia's fisheries sector has evolved significantly over the years. Historically, the economy faced challenges, including instances where it was criticized for its fishing practices. In response, Malaysia has taken substantial steps to improve its fisheries management and traceability systems, demonstrating a commitment to sustainable practices and adherence to international regulations. These efforts have been crucial in addressing past issues and enhancing the economy's fisheries management reputation.

Supply Chain Management: Processing, Transport, and Labeling

In Malaysia, the supply chain for seafood, encompassing processing, transport, and labeling, has seen considerable development:

- Mandated Traceability: Traceability in processing and transport is mandated, ensuring that seafood products are tracked throughout the supply chain for enhanced transparency and quality control.

- Labeling Requirements: Malaysia also mandates labeling of seafood products, providing consumers with essential information about the products' origin, type, and handling. This labeling requirement applies to both large and small vessels, promoting uniformity in the industry.

Centralized Database and Accessibility

Malaysia is working towards improving its centralized database for fisheries traceability:

- Database Management: The fisheries department is in charge of managing the centralized database, aiming to consolidate data from various sources for better management.

- Web Interface and Data Sharing: Efforts are being made to develop a user-friendly web interface for fishermen to input data. The goal is to ensure that the data is transparently shared with the population, enhancing public awareness and informed decision-making.

Satellite Monitoring: VMS Systems

In Malaysia, Vessel Monitoring Systems (VMS) are implemented across its fishing fleet:

- Coverage: The coverage of VMS is more extensive for large vessels. Efforts to include small-scale vessels in this monitoring system are ongoing, reflecting a commitment to comprehensive monitoring.

Electronic Logbook Reporting

Malaysia has a domestic electronic logbook reporting system:

- System Name and Coverage: The system covers primarily large-scale vessels, with ongoing initiatives to expand its reach to include small-scale operations.

Interoperability and Third-Party Service Integration

Malaysia is developing systems that are interoperable with third-party service providers. This development is aimed at enhancing the traceability systems' flexibility and functionality, allowing for customized solutions to suit the diverse needs of the fishing industry.

Video Monitoring in Fisheries

The implementation of video monitoring in Malaysia's fisheries sector is currently limited:

- Implementation Scope: The use of video monitoring is primarily in larger, more industrial fishing operations. Expanding this technology to smaller vessels and across the nation is a potential area for future development.

Domestic vs. International Market Traceability

Malaysia distinguishes between traceability requirements for domestic and export markets:

- Differing Standards: While the standards for export markets are stringent, traceability requirements for the domestic market are still evolving, indicating a need for more uniform standards across all market segments.

Public and Private Sector Roles in Traceability

In Malaysia, the development and implementation of traceability systems involve collaboration between the public and private sectors:

- Sector Involvement: The government sets the regulatory framework, while the private sector often leads in technological advancements. NGOs also play a significant role, particularly in advocating for sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Managing small-scale fisheries in Malaysia is a challenge:

- Sustainability Concerns: The expanding fishing population and limited alternative livelihood options make small-scale fisheries management complex.

- Resource Management Initiatives: Initiatives like establishing Marine Protected Areas (MPAs) are being considered to balance conservation efforts with the socioeconomic realities of small-scale fishers.

Seafood Trade Standards

Malaysia's standards for seafood imports are gradually being aligned with its export certification requirements. Achieving full parity between these standards is crucial for consistency and sustainability in the seafood industry.

Legislation and GDST Readiness

Malaysia's legislative framework related to traceability and technology use is evolving:

- GDST Adoption: The economy is increasingly adopting international standards like the Global Dialogue on Seafood Traceability (GDST) but is still working towards full implementation across all fishing sectors.

Malaysia's seafood traceability system has shown significant progress, particularly in complying with export market standards and managing large-scale fisheries. However, challenges remain in developing a cohesive domestic traceability framework that includes small-scale fisheries and meets both domestic and international market requirements. Ongoing efforts in technology adoption, regulatory development, and stakeholder collaboration are essential for advancing Malaysia’s traceability systems and ensuring the sustainable management of its diverse seafood resources.

G. Mexico

Mexico's journey in fisheries management reflects a significant evolution. In the past, the economy faced challenges regarding its fishing practices, including instances that could have led to receiving yellow cards for non-compliance with international fishing regulations. Addressing these challenges, Mexico has made substantial strides in improving its fisheries management and traceability systems. These improvements highlight Mexico's commitment to sustainable fishing practices and compliance with international standards.

Supply Chain Management: Processing, Transport, and Labeling

In Mexico, the supply chain within the seafood industry, covering processing, transport, and labeling, has seen considerable improvements:

- Mandated Traceability: Mexico mandates traceability in seafood processing and transport. This requirement ensures that seafood products are monitored throughout the supply chain, enhancing transparency and quality control.

- Labeling Requirements: The economy has also made strides in labeling seafood products, providing consumers with essential information about the products' origin, type, and handling. These labeling requirements are increasingly being applied to both large and small vessels, promoting uniformity across the industry.

Centralized Database and Accessibility

Mexico is enhancing its centralized database for fisheries traceability:

- Database Management: Managed by the relevant fisheries authorities, this centralized system aims to consolidate data from various sources, improving the overall management and oversight of the fisheries sector.

- Web Interface and Data Sharing: Mexico is developing a user-friendly web interface for fishermen to input data. This system aims to ensure that data is transparently shared with the public, enhancing awareness and informed decision-making.

Satellite Monitoring: VMS Systems

Mexico has implemented Vessel Monitoring Systems (VMS) within its fishing fleet:

- Coverage: The coverage of VMS is more extensive for large vessels, with ongoing initiatives to include small-scale vessels in this monitoring system for comprehensive coverage.

Electronic Logbook Reporting

Mexico has an established domestic electronic logbook reporting system:

- System and Coverage: This system is integral to Mexico's fisheries management, covering a wide range of vessel sizes and ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Mexico is actively working on developing systems that are interoperable with third-party service providers:

- Enhanced Flexibility: These efforts aim to make the traceability systems more adaptable and functional, allowing for custom solutions tailored to the diverse needs of the fishing industry.

Video Monitoring in Fisheries

The implementation of video monitoring in Mexico's fisheries sector is gaining momentum:

- Implementation Scope: Currently, video monitoring is primarily used in larger, industrial fishing operations. Efforts to expand this technology to include smaller vessels are ongoing.

Domestic vs. International Market Traceability

Mexico differentiates traceability standards between domestic and export-oriented seafood products:

- Differing Standards: While standards for export markets are robust, domestic market traceability is still developing, indicating a need for more uniform standards across all market segments.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Mexico involve a collaborative effort between the public and private sectors:

- Sector Collaboration: The government establishes regulatory frameworks, while the private sector often leads in technological advancements. NGOs also play a significant role, particularly in advocating for sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Managing small-scale fisheries alongside large-scale operations presents challenges for Mexico:

- Sustainability Focus: Efforts are concentrated on ensuring sustainable practices across all scales of fisheries, balancing economic viability with environmental responsibility.

- Resource Management Initiatives: Initiatives like establishing Marine Protected Areas (MPAs) are part of Mexico's strategy to balance conservation with the socioeconomic realities of fishing communities.

Seafood Trade Standards

Mexico is working to align its seafood import standards with export certification requirements, ensuring consistency and sustainability across its seafood industry.

Legislation and GDST Readiness

Mexico's legislative framework related to traceability and technology use is evolving:

- GDST Adoption: The economy is increasingly adopting international standards like the Global Dialogue on Seafood Traceability (GDST) and is actively working towards full implementation across all fishing sectors.

Mexico's seafood traceability system demonstrates a marked improvement, particularly in complying with international standards and managing its diverse fisheries. However, challenges remain in developing a cohesive domestic traceability framework that includes small-scale fisheries. and meets the requirements of both domestic and international markets. Continued efforts in technology adoption, regulatory development, and collaborative stakeholder engagement are essential for advancing Mexico’s traceability systems and ensuring the sustainable management of its seafood resources.

H. New Zealand

In the realm of fisheries management and sustainability, New Zealand has consistently set high standards, as evidenced in its proactive approach to the APEC Seafood Traceability project. Unlike some economies that have faced challenges such as receiving yellow cards for poor fishing practices, New Zealand has been at the forefront of implementing robust systems for monitoring and sustainability. This ongoing commitment has been instrumental in preserving the health of its marine ecosystems and ensuring the viability of its seafood industry.

Supply Chain Management

In terms of supply chain management, New Zealand's implementation of traceability systems is comprehensive, encompassing processing, transport, and labeling. Mandated traceability in seafood processing and transport ensures that products can be traced back to their source, enhancing quality control and food safety throughout the supply chain. Additionally, comprehensive labeling provides consumers with essential information about seafood products, such as origin and sustainability certifications. These practices apply uniformly to both large and small vessels, ensuring consistency and transparency across the industry.

Centralized Database System

A cornerstone of New Zealand's traceability system is the centralized database managed by the Ministry for Primary Industries (MPI). This system provides a user-friendly web interface for fishermen to input data, facilitating easy access and real-time updates. The emphasis on transparency, with data openly shared with the public, promotes accountability and informed decision-making in seafood consumption.

Satellite Monitoring

The comprehensive implementation of Vessel Monitoring Systems (VMS) in New Zealand covers a wide range of vessel sizes. The system ensures extensive monitoring of both large commercial vessels and smaller fishing operations, playing a crucial role in regulatory compliance and resource protection.

Electronic Logbook Reporting

The domestic electronic logbook system, known as the e-logbook, is a vital component of New Zealand's fisheries management. Adopted across various vessel sizes, this system allows for the accurate and timely reporting of catch data, further enhancing the efficiency and reliability of the economy’s fisheries management.

Interoperability and Third-Party Service Integration

The design of New Zealand’s traceability system is characterized by high interoperability, allowing integration with external platforms and services. This openness to collaboration and integration with third-party service providers enhances the system's flexibility and functionality.

Video Monitoring in Fisheries

Video monitoring is increasingly being implemented across New Zealand's fishing fleet. While more prevalent in large-scale operations, efforts are being made to extend this technology to smaller vessels. The initiatives often involve collaboration between the public and private sectors, reflecting a comprehensive approach to sustainable fisheries management.

Market Traceability: Domestic vs. International

New Zealand maintains a uniform standard of traceability for both domestic and export markets. This uniformity ensures high-quality standards are met, reinforcing New Zealand’s global reputation as a provider of premium, sustainable seafood.

Collaborative Approach in Traceability Implementation

The implementation of traceability systems in New Zealand is a collaborative effort, involving both government and private sectors, with significant contributions from NGOs. This multi-stakeholder approach ensures a balanced and effective implementation of traceability measures, blending regulatory frameworks with technological innovations.

Managing Fisheries Sustainability: Challenges and Strategies

New Zealand faces unique challenges in managing its diverse fishing fleet, particularly in small-scale fisheries. Efforts are focused on balancing livelihoods with sustainability, including the establishment of marine protected areas (MPAs) and sustainable fishing practices. Traceability systems are part of this broader strategy to prevent fishery collapse and ensure long-term sustainability. Various commissions and working groups actively collaborate with both industrial and small-scale fisheries to address these challenges.

Seafood Trade: Import and Export Standards

New Zealand’s standards for seafood imports align closely with its export certification requirements, ensuring that all seafood products, whether imported or exported, meet the high standards expected of New Zealand’s seafood industry.

Legislative Framework for Traceability

The legislative landscape in New Zealand strongly supports the implementation of advanced traceability systems. Laws and regulations are in place to facilitate the use of technology in traceability, ensuring compliance and industry sustainability.

Adoption of Global Traceability Standards

New Zealand is well-positioned to adopt and implement Global Dialogue on Seafood Traceability (GDST) standards. The existing infrastructure and commitment to sustainability make New Zealand highly prepared for integrating these international standards into its existing systems.

New Zealand’s approach to implementing traceability systems in its seafood sector demonstrates an effective model for sustainable fisheries management. Its balanced and collaborative approach, encompassing technological advancements, legislative support, and stakeholder involvement, sets a benchmark for other economies. This report highlights New Zealand's commitment to maintaining high standards in traceability, ensuring the health of its marine ecosystems, and supporting the economic viability of its seafood industry.

I. **Papua New Guinea**

Papua New Guinea (PNG) has experienced a dynamic evolution in its fisheries management. Historically, the economy faced challenges, including potential criticisms over its fishing practices and risks of non-compliance with international fishing regulations. However, PNG has undertaken substantial efforts to enhance its fisheries management and traceability systems, reflecting a commitment to sustainable practices and adherence to international standards.

Supply Chain Management: Processing, Transport, and Labeling

In Papua New Guinea, supply chain management within the seafood industry, particularly in processing, transport, and labeling, has seen key developments:

- Mandated Traceability: PNG has implemented traceability requirements in seafood processing and transport, ensuring monitoring of seafood products from catch to consumer.

- Labeling Requirements: While there are efforts towards labeling of seafood products, the extent and uniformity of implementation, particularly the differences between large and small vessels, are areas that PNG is continuously working to improve.

Centralized Database and Accessibility

Papua New Guinea is in the process of enhancing its centralized database for fisheries traceability:

- Database Management: The centralized system is aimed at consolidating data from various sources for better management of the fisheries sector.

- Web Interface and Data Sharing: Efforts to develop a web interface for fishermen to input data are ongoing, with an emphasis on transparent data sharing to enhance public awareness and informed decision-making.

Satellite Monitoring: VMS Systems

PNG has implemented Vessel Monitoring Systems (VMS) within its fishing fleet:

- Coverage: The coverage of VMS is significant for large vessels, with ongoing initiatives to extend these systems to include small-scale vessels for comprehensive monitoring.

Electronic Logbook Reporting

In Papua New Guinea, electronic logbook reporting is becoming an integral part of fisheries management:

- System and Coverage: The domestic system for electronic reporting primarily covers large-scale vessels. The expansion of coverage to include small-scale operations is a development area.

Interoperability and Third-Party Services

PNG is working on developing systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality.

Video Monitoring in Fisheries

The implementation of video monitoring in PNG's fisheries sector is not yet widespread:

- Implementation Scope: Currently, video monitoring is limited, mostly concentrated in larger, industrial fishing operations. Expansion to smaller vessels is an area for potential development.

Domestic vs. International Market Traceability

In Papua New Guinea, traceability standards for domestic markets differ from those for export-oriented seafood products:

- Traceability Standards: While the standards for export markets are increasingly robust, domestic market traceability is still in a developmental phase.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in PNG involve collaboration between the public and private sectors:

- Sector Involvement: The government sets the regulatory framework, and the private sector plays a significant role in technological advancements. NGOs contribute to promoting sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Papua New Guinea faces challenges in managing its small-scale fisheries, particularly in the context of expanding fishing populations and limited alternative livelihood options:

- Sustainability Concerns: Efforts to include small-scale fishers in the traceability framework are vital for sustainable fishing practices.

Seafood Trade Standards

PNG is working towards aligning its seafood import standards with export certification requirements, ensuring consistency and sustainability across the seafood industry.

Legislation and GDST Readiness

Papua New Guinea's legislative framework related to traceability and technology use is evolving:

- GDST Adoption: PNG is moving towards adopting standards like the Global Dialogue on Seafood Traceability (GDST) and is actively working towards full implementation.

Papua New Guinea’s seafood traceability system has shown significant progress, especially in terms of compliance with export market standards and large-scale fisheries management. However, challenges in developing a cohesive domestic traceability framework, particularly including small-scale fisheries, and ensuring uniform standards across all markets persist. Continued efforts in technology adoption, regulatory development, and stakeholder collaboration are crucial for advancing PNG’s traceability systems and ensuring the sustainable management of its diverse seafood resources.

J. Peru

Peru's history in fisheries management has seen its share of challenges. While there have been instances where Peru faced criticism for its fishing practices, the economy has made considerable strides in improving its fisheries management and traceability systems. Efforts have been concentrated on enhancing regulatory frameworks and adopting advanced monitoring technologies, reflecting a commitment to sustainable fishing practices and international compliance.

Supply Chain Management

In the realm of supply chain management, Peru has implemented significant measures in processing, transport, and labeling.

- Processing and Transport: Peru mandates traceability in seafood processing and transport. This regulation ensures the monitoring of seafood products throughout the supply chain, enhancing transparency and quality control.

- Labeling: Labeling of seafood products is also mandated, providing consumers with crucial information regarding the origin, type, and handling of the products. This requirement applies uniformly to both large and small vessels, ensuring consistency across the industry.

Centralized Database and Data Accessibility

Peru currently lacks a centralized domestic database for fisheries traceability. Each region or territory tends to manage its own traceability data, which can lead to challenges in data sharing and overall coherence in the domestic traceability framework. While there are initiatives to improve this aspect, the current lack of a unified database remains a notable gap in Peru's traceability infrastructure.

Satellite Monitoring: VMS Systems

Peru has implemented Vessel Monitoring Systems (VMS) for its fishing fleet:

- Coverage: The coverage of VMS is more extensive for large vessels compared to small-scale operations. This disparity reflects a focus on monitoring larger commercial fishing activities, although there is a growing awareness of the need to extend these systems to smaller vessels.

Electronic Logbook Reporting

Electronic logbook reporting is an integral part of Peru's fisheries management:

- System and Coverage: The domestic system for electronic reporting is in place, primarily covering large-scale vessels. Efforts are being made to expand this coverage to include small-scale operations, though this remains a work in progress.

Interoperability and Third-Party Services

Peru is in the process of developing interoperable systems that can work with third-party service providers. This development is aimed at enhancing the flexibility and functionality of the traceability systems, allowing for more tailored solutions to meet the diverse needs of the fishing industry.

Video Monitoring in Fisheries

Video monitoring in Peru's fisheries sector is not yet implemented on a economy-wide scale:

- Implementation: Currently, the use of video monitoring is limited and mostly driven by private sector initiatives. Expanding this technology to cover more vessels, including small-scale operations, is a potential area for future development.

Domestic vs. International Market Traceability

Peru's traceability requirements for domestic markets differ from those for export-oriented seafood products:

- Traceability Standards: While compliance with export market standards is robust, domestic market traceability is less stringent. This discrepancy highlights the need for a more unified traceability approach that encompasses both domestic consumption and international trade.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Peru involve both public and private sector efforts:

- Sector Involvement: The government sets the regulatory framework for traceability, while the private sector often leads in technological implementation. NGOs also play a significant role, especially in advocating for sustainable practices and technological innovation.

Managing Small vs. Large Scale Fisheries

Addressing the needs of small-scale fisheries in Peru poses a unique challenge:

- Sustainability Concerns: The pressure from expanding fishing populations and limited alternative livelihood options make managing small-scale fisheries complex. Ensuring sustainable practices while preventing marginalization of small-scale fishers is a critical focus.

- Resource Management Initiatives: Initiatives such as the establishment of Marine Protected Areas (MPAs) are in place, but there is an ongoing need to balance conservation efforts with the socioeconomic realities of small-scale fishers.

Import vs. Export Standards

Peru's standards for seafood imports align with its export certification requirements to some extent. However, there is room for improvement in harmonizing these standards to ensure consistency and sustainability across all seafood products entering and leaving the economy.

Legislation and Readiness for GDST Standards

The state of legislation in Peru related to traceability and the use of technology is evolving. There is a growing emphasis on adopting international standards like the Global Dialogue on Seafood Traceability (GDST). While Peru is moving towards these standards, the full readiness for implementation across all sectors of the fishing industry, including small-scale operations, is an area for further development.

Peru’s seafood traceability system showcases significant achievements, especially in complying with export market standards and large-scale fisheries management. However, challenges remain in creating a cohesive domestic traceability framework that includes small-scale fisheries and meets the demands of both domestic and international markets. Continued efforts in technology adoption, regulatory enhancements, and inclusive stakeholder collaboration will be key to advancing Peru’s traceability systems and ensuring the sustainable management of its rich and diverse seafood resources.

K. The Republic of the Philippines

The Republic of the Philippines has experienced challenges in its fisheries sector, including issues related to illegal, unreported, and unregulated (IUU) fishing. In response, the economy has made significant improvements to its fisheries management and traceability systems. These efforts have been geared towards enhancing compliance with international standards and mitigating the risks associated with IUU fishing, demonstrating the economy's commitment to sustainable fishing practices.

Supply Chain Management

In The Republic of the Philippines, the implementation of traceability in the supply chain, encompassing processing, transport, and labeling, is progressing:

- Processing and Transport: Traceability in these areas is becoming increasingly mandatory, aiming to ensure transparency and accountability from catch to consumption.

- Labeling: There is an emerging trend towards mandating labeling for seafood products, providing essential information about the product’s origin, type, and handling. This requirement is increasingly being applied across all vessel sizes, promoting uniformity in the sector.

Centralized Database and Accessibility

The Republic of the Philippines is developing a more centralized approach to data management in its fisheries sector:

- Database Management: A central database is being established to consolidate data from various sources, enhancing the overall management of fisheries data.

- Data Input and Sharing: There is an effort to create a user-friendly web interface for fishermen to input data, although this is still a work in progress. The aim is for data to be transparently shared, not only within the sector but also with the broader population, to promote informed decision-making and public awareness.

Satellite Monitoring

The implementation of Vessel Monitoring Systems (VMS) is underway in The Republic of the Philippines:

- Coverage: The coverage of these systems is more extensive for large vessels, with ongoing efforts to include small-scale vessels. This inclusion is crucial for a comprehensive monitoring approach.

Electronic Logbook Reporting

The Republic of the Philippines is working towards a domestic electronic logbook reporting system:

- System Development: While a domestic system is in the planning stages, its implementation and coverage across different vessel sizes are still evolving.

Interoperability and Third-Party Integration

Efforts are being made to develop interoperable traceability systems that can accommodate third-party service providers. This move is aimed at enhancing the functionality and adaptability of the traceability systems.

Video Monitoring Implementation

Video monitoring in The Republic of the Philippines' fisheries sector is not yet widespread:

- Limited Use: Currently, the use of video monitoring is limited and mostly concentrated in larger, more industrial fishing operations. The expansion of this technology to smaller vessels and across the economy is an area for future development.

Market Distinction: Domestic vs. International

The Republic of the Philippines distinguishes between traceability requirements for domestic and export markets:

- Differing Standards: While the standards for export markets are stringent, the traceability requirements for the domestic market are still developing, indicating a need for more uniform standards across all market segments.

Sector Collaboration in Traceability

The implementation of traceability systems in The Republic of the Philippines involves collaboration between public and private sectors:

- Role of Government and Private Sector: The government, particularly the fisheries ministry, plays a key role in setting regulations, while the private sector often leads in technological advancements.

Challenges in Small-Scale Fisheries Management

Managing small-scale fisheries is a significant challenge in The Republic of the Philippines, given the pressures of expanding fishing populations and limited alternative livelihood options:

- Sustainability Concerns: Efforts to include small-scale fishers in the traceability framework are crucial for ensuring sustainable fishing practices and preventing fishery collapse.

- Resource Management Initiatives: Initiatives such as establishing Marine Protected Areas (MPAs) are being considered, balancing conservation with socioeconomic realities.

Seafood Trade Standards

The Republic of the Philippines' standards for seafood imports are gradually being aligned with its export certification requirements. However, achieving full parity between import and export standards remains a work in progress.

Legislation and GDST Readiness

Legislative developments related to traceability and technology use in the fisheries sector are ongoing:

- Legislative Framework: There is an increasing emphasis on adopting and implementing international standards, including the Global Dialogue on Seafood Traceability (GDST) standards.

- GDST Implementation Readiness: The readiness for adopting GDST standards is growing, although full implementation across the sector will require further development and integration.

The Republic of the Philippines’ approach to seafood traceability reflects a economy in transition, making strides in enhancing its fisheries management and compliance with international standards. While progress has been made, particularly in large-scale fisheries, extending comprehensive traceability to small-scale fisheries and achieving full system interoperability remain key areas for further development. The collaborative efforts of various stakeholders, coupled with supportive policy frameworks and technological advancements, are crucial for advancing The Republic of the Philippines’ traceability systems and ensuring the sustainable management of its diverse and vital seafood resources.

L. **Chinese Taipei**

Chinese Taipei's journey in fisheries management has been marked by significant progress over the years. Historically, Chinese Taipei faced challenges related to its fishing practices, including instances of receiving yellow cards for non-compliance with international fishing regulations. Responding to these challenges, Chinese Taipei has implemented substantial improvements in its fisheries management and traceability systems. These efforts underscore Chinese Taipei's dedication to sustainable fishing practices and adherence to international standards, reflecting a significant shift from past practices to present-day responsible fisheries management.

Supply Chain Management: Processing, Transport, and Labeling

In Chinese Taipei, supply chain management within the seafood industry, including processing, transport, and labeling, has seen considerable development:

- Mandated Traceability: Chinese Taipei has implemented traceability in seafood processing and transport. This regulation ensures monitoring of seafood products throughout the supply chain, enhancing transparency and quality control.

- Labeling Requirements: The economy mandates labeling of seafood products, providing consumers with essential information about the products' origin, type, and handling. This labeling requirement applies across the board, encompassing both large and small vessels, and promotes industry-wide consistency.

Centralized Database and Accessibility

Chinese Taipei is advancing its centralized database for fisheries traceability:

- Database Management: Managed by the fisheries department, the centralized database aims to streamline data from various sources for better management and oversight of the industry.

- Web Interface and Data Sharing: A user-friendly web interface for fishermen to input data is part of this centralized system. The goal is to ensure transparent data sharing with the population, thereby enhancing public awareness and informed decision-making.

Satellite Monitoring: VMS Systems

Chinese Taipei has robustly implemented Vessel Monitoring Systems (VMS) across its fishing fleet:

- Coverage: The coverage of VMS is extensive, encompassing both large and small-scale operations, reflecting a commitment to comprehensive monitoring and management of its maritime activities.

Electronic Logbook Reporting

Chinese Taipei has established a domestic electronic logbook reporting system:

- System and Coverage: This system is integral to Chinese Taipei's fisheries management, covering a wide range of vessel sizes and ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Chinese Taipei is actively working on developing systems that are interoperable with third-party service providers:

- Enhanced Flexibility: This development is aimed at making the traceability systems more flexible and functional, allowing for custom solutions tailored to the diverse needs of the fishing industry.

Video Monitoring in Fisheries

The implementation of video monitoring in Chinese Taipei's fisheries sector is gaining traction:

- Implementation Scope: Video monitoring is increasingly being used, especially in larger, industrial fishing operations. The expansion of this technology to include smaller vessels is an area of potential future development.

Domestic vs. International Market Traceability

In Chinese Taipei, traceability standards for domestic markets are being brought in line with those for export-oriented seafood products:

- Unified Standards: Efforts are underway to ensure uniform traceability standards across all market segments, reflecting a commitment to consistent quality and sustainability in both domestic consumption and international trade.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Chinese Taipei involve a collaborative effort between the public and private sectors:

- Sector Collaboration: While the government, particularly the fisheries ministry, establishes regulatory frameworks, the private sector leads in technological advancements. NGOs also contribute, particularly in promoting sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Managing small-scale fisheries alongside large-scale operations is a challenge that Chinese Taipei is actively addressing:

- Sustainability Focus: Efforts are concentrated on ensuring sustainable practices across all scales of fisheries, balancing economic viability with environmental responsibility.

- Resource Management Initiatives: Initiatives like establishing Marine Protected Areas (MPAs) and other conservation efforts are part of Chinese Taipei's strategy to balance conservation with the socioeconomic realities of fishing communities.

Seafood Trade Standards

Chinese Taipei's standards for seafood imports are being aligned with its export certification requirements to ensure consistency and sustainability across its seafood industry.

Legislation and GDST Readiness

Chinese Taipei's legislative framework related to traceability and technology use is evolving to meet international standards:

- GDST Adoption: Chinese Taipei is increasingly adopting standards like the Global Dialogue on Seafood Traceability (GDST) and is actively working towards full implementation across all fishing sectors.

Chinese Taipei's seafood traceability system demonstrates a marked improvement, particularly in complying with international standards and managing its diverse fisheries. Challenges remain in ensuring uniform traceability standards across domestic and international markets and fully integrating small-scale fisheries into the traceability framework. Continued efforts in technology adoption, regulatory advancements, and collaborative stakeholder engagement are crucial for advancing Chinese Taipei’s traceability systems and ensuring sustainable management of its seafood resources.

M. Thailand

Thailand's fisheries management has undergone significant changes over the years. Historically, Thailand faced considerable challenges, including receiving yellow cards from international bodies for non-compliance with fishing regulations. This situation prompted a rigorous overhaul of its fisheries management and traceability systems. These improvements reflect Thailand's strong commitment to sustainable fishing practices and adherence to international standards.

Supply Chain Management: Processing, Transport, and Labeling

In Thailand, the approach to supply chain management within the seafood industry, encompassing processing, transport, and labeling, has been marked by substantial advancements:

- Mandated Traceability: Traceability in seafood processing and transport is a regulatory requirement, ensuring that seafood products are effectively monitored throughout the supply chain for transparency and quality control.

- Labeling Requirements: Labeling of seafood products in Thailand is mandated, providing critical information about the products' origin, type, and handling. This requirement is uniformly applied to both large and small vessels, promoting consistency across the industry.

Centralized Database and Data Accessibility

Thailand has been enhancing its centralized database for fisheries traceability:

- Database Management: Managed by the relevant fisheries authorities, this centralized system aims to streamline data from various sources for effective fisheries sector management.

- Web Interface and Data Sharing: Efforts to develop a user-friendly web interface for fishermen to input data are in place, with a focus on ensuring transparent data sharing with the public for enhanced awareness and decision-making.

Satellite Monitoring: VMS Systems

Thailand has implemented Vessel Monitoring Systems (VMS) across its fishing fleet:

- Coverage: The coverage of VMS includes both large and small-scale vessels, reflecting a comprehensive approach to monitoring and sustainable fisheries management.

Electronic Logbook Reporting

Thailand employs an electronic logbook reporting system for its fisheries management:

- System and Coverage: This system covers a broad range of vessel sizes, ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

Thailand actively develops systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality to accommodate diverse industry needs.

Video Monitoring in Fisheries

The implementation of video monitoring in Thailand's fisheries sector is increasingly being adopted:

- Implementation Scope: Video monitoring is utilized across various scales of fishing operations, showcasing Thailand's commitment to leveraging technology for sustainable fisheries management.

Domestic vs. International Market Traceability

Thailand maintains consistent traceability standards for both domestic and export-oriented seafood products:

- Unified Standards: Efforts are made to ensure uniform traceability standards across all market segments, reflecting Thailand's commitment to high-quality standards in both domestic consumption and international trade.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Thailand involve collaboration between the public and private sectors. The government sets regulatory frameworks, while the private sector often leads in technological advancements. NGOs also play a significant role, particularly in advocating for sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

Thailand effectively manages both small-scale and large-scale fisheries, ensuring sustainable practices are maintained across all scales.

Seafood Trade Standards

Thailand aligns its standards for seafood imports with its stringent export certification requirements, ensuring consistency and high quality across the seafood industry.

Legislation and GDST Readiness

Thailand's legislative framework related to traceability and technology use is well-established:

- GDST Adoption: The economy is aligned with international standards like the Global Dialogue on Seafood Traceability (GDST) and actively incorporates these standards across its fishing sectors.

Thailand's seafood traceability system is a model of efficiency and sustainability, marked by comprehensive implementation and adherence to international standards. The economy has successfully developed a cohesive domestic traceability framework that includes both small-scale and large-scale fisheries, meeting the requirements of both domestic and international markets. Thailand’s ongoing commitment to technology adoption, regulatory refinement, and collaborative stakeholder engagement continues to advance its traceability systems and ensure the sustainable management of its seafood resources.

N. United States

The United States has a longstanding commitment to sustainable fisheries management and adherence to international standards. Historically, the U.S. has not faced significant challenges like yellow cards for bad fishing practices. Instead, it has been proactive in enhancing its fisheries management and traceability systems, demonstrating its commitment to sustainable fishing practices and global regulatory compliance.

Supply Chain Management: Processing, Transport, and Labeling

In the U.S., the approach to supply chain management within the seafood industry, covering processing, transport, and labeling, is characterized by stringent regulations and effective implementation:

- Mandated Traceability: Traceability is required in seafood processing and transport to ensure that seafood products are monitored throughout the supply chain, enhancing transparency and quality control.

- Labeling Requirements: The U.S. mandates labeling of seafood products, providing consumers with essential information about the products' origin, type, and handling. This requirement applies to both large and small vessels, promoting uniformity across the industry.

Centralized Database and Data Accessibility

The U.S. has developed sophisticated systems for fisheries traceability:

- Database Management: Managed by relevant fisheries authorities, these systems integrate data from various sources for effective management of the fisheries sector.

- Web Interface and Data Sharing: There is a well-established web interface for fishermen to input data, ensuring transparent data sharing with the public and enhancing awareness and informed decision-making.

The Seafood Import Monitoring Program (SIMP) of the United States is a significant regulatory program aimed at combating illegal, unreported, and unregulated (IUU) fishing and seafood fraud. Implemented by the Domestic Oceanic and Atmospheric Administration (NOAA), SIMP requires traceability for certain seafood products entering the U.S. market. The main features of SIMP include:

- **Species Coverage:** SIMP initially covered a specific list of seafood species considered at higher risk for IUU fishing and seafood fraud. These include popular species like tuna, swordfish, and various types of shrimp.
- **Traceability Requirements**: Importers must trace their products from the point of harvest to the point of entry into the U.S. This includes detailed information about the catch, such as the species, where and when it was harvested, and the supply chain through to the U.S. border.
- **Documentation and Reporting**: Importers are required to maintain detailed records and submit necessary documentation to prove that the seafood they import complies

with the traceability requirements. This data must be provided at the time of entry and is subject to verification by NOAA.

- **Combating IUU Fishing and Seafood Fraud:** The primary goal of SIMP is to prevent IUU-caught and misrepresented seafood from entering the U.S. market, thereby protecting global fish stocks and promoting sustainable fisheries practices.
- **Electronic Reporting:** SIMP emphasizes the use of electronic reporting to streamline data submission and improve the efficiency and accuracy of traceability.
- **Enforcement and Compliance:** The program includes provisions for enforcement and compliance checks to ensure adherence to SIMP requirements. Non-compliance can result in denied entry of seafood products into the U.S. and potential legal consequences.

SIMP represents a significant effort by the U.S. to enhance the sustainability and legality of the seafood supply chain and serves as a model for other economies aiming to implement similar traceability and sustainability measures in their fisheries sectors.

Satellite Monitoring: VMS Systems

In the U.S., Vessel Monitoring Systems (VMS) are widely implemented across the fishing fleet:

- Coverage: VMS coverage is extensive, including both large and small-scale vessels, reflecting a comprehensive approach to monitoring and sustainable fisheries management.

Electronic Logbook Reporting

The U.S. employs an electronic logbook reporting system for its fisheries management:

- System and Coverage: This system covers a broad range of vessel sizes, ensuring accurate and timely reporting of fishing activities.

Interoperability and Third-Party Services

The U.S. has developed systems that are interoperable with third-party service providers, enhancing the traceability systems' flexibility and functionality for diverse industry needs.

Video Monitoring in Fisheries

The U.S. is progressively implementing video monitoring across various scales of fishing operations, leveraging technology for sustainable fisheries management.

Domestic vs. International Market Traceability

The U.S. maintains consistent traceability standards for both domestic and export-oriented seafood products, ensuring uniformity across all market segments.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in the U.S. involve collaboration between the public and private sectors, with the government setting regulatory frameworks and the private sector often leading technological advancements. NGOs also contribute significantly, particularly in promoting sustainable practices and technology adoption.

Challenges in Managing Small vs. Large Scale Fisheries

The U.S. effectively manages both small-scale and large-scale fisheries, ensuring sustainable practices are maintained across all scales.

Seafood Trade Standards

The U.S. aligns its standards for seafood imports with its stringent export certification requirements, ensuring consistency and high quality across the seafood industry.

Legislation and GDST Readiness

The U.S.'s legislative framework related to traceability and technology use is well-established, aligning with international standards like the Global Dialogue on Seafood Traceability (GDST) and actively incorporating these standards across its fishing sectors.

The United States' seafood traceability system is a model of efficiency and sustainability, marked by comprehensive implementation and adherence to international standards. The economy has successfully developed a cohesive domestic traceability framework that includes both small-scale and large-scale fisheries, meeting the requirements of both domestic and international markets. The U.S.’s ongoing commitment to technology adoption, regulatory refinement, and collaborative stakeholder engagement continues to advance its traceability systems and ensure the sustainable management of its seafood resources.

O. Viet Nam

Viet Nam’s history in fisheries management has seen significant evolution. In the past, the economy faced challenges, including criticisms and concerns over fishing practices. However, Viet Nam has made substantial improvements in its fisheries management and traceability systems in recent years. These improvements are a testament to Viet Nam's commitment to sustainable fishing practices and compliance with international regulations.

Supply Chain Management

Viet Nam has implemented considerable measures in the supply chain, which include processing, transport, and labeling:

- Processing and Transport: Viet Nam mandates traceability in seafood processing and transport, ensuring that seafood products are tracked throughout the supply chain. This enhances both transparency and quality control.

- Labeling: The economy also mandates labeling of seafood products, providing vital information about the origin, type, and handling of these products. This requirement is uniformly applied to both large and small vessels, ensuring consistency across the industry.

Centralized Database and Data Accessibility

Viet Nam is currently working on improving its centralized domestic database for fisheries traceability. This centralized approach aims to overcome the challenges of data sharing and coherence in the domestic traceability framework. However, like Peru, Viet Nam still faces challenges in achieving a fully unified database system.

Satellite Monitoring: VMS Systems

Viet Nam has implemented Vessel Monitoring Systems (VMS) across its fishing fleet:

- Coverage: The coverage of VMS is more comprehensive for large vessels compared to small-scale operations. However, efforts are underway to extend these systems to include smaller vessels to ensure a holistic monitoring approach.

Electronic Logbook Reporting

Electronic logbook reporting is an integral part of Viet Nam's fisheries management:

- System and Coverage: Viet Nam has a domestic system for electronic reporting, primarily covering large-scale vessels. The expansion of this coverage to include small-scale operations is still in progress.

Interoperability and Third-Party Services

Viet Nam is in the process of developing systems that are interoperable with third-party service providers. This move aims to enhance the traceability systems' flexibility and functionality, catering to the diverse needs of the fishing industry.

Video Monitoring in Fisheries

Video monitoring in Viet Nam's fisheries sector is not yet implemented on an economy-wide scale:

- Implementation: The use of video monitoring is currently limited and driven primarily by private sector initiatives. The expansion of this technology to more vessels, including small-scale operations, is an area for potential growth.

Domestic vs. International Market Traceability

Viet Nam's traceability standards for domestic markets are different from those for export-oriented seafood products:

- Traceability Standards: While export market standards are robust, domestic market traceability is still developing. This highlights the need for a more unified approach to traceability that covers both domestic consumption and international trade.

Public and Private Sector Roles in Traceability

The development and implementation of traceability systems in Viet Nam involve collaboration between both the public and private sectors:

- Sector Involvement: The government, particularly the fisheries ministry, sets the regulatory framework, while the private sector often leads in technological advancements. NGOs also contribute significantly, especially in advocating for sustainable practices and technology adoption.

Managing Small vs. Large Scale Fisheries

Viet Nam faces challenges in managing small-scale fisheries, given the pressures from expanding fishing populations and limited alternative livelihood options:

- Sustainability Concerns: Balancing the sustainability of small-scale fisheries with broader fisheries management objectives is a critical focus in Viet Nam.

- Resource Management Initiatives: Initiatives like establishing Marine Protected Areas (MPAs) are considered to balance conservation efforts with the socioeconomic realities of small-scale fishers.

Import vs. Export Standards

Viet Nam is working towards aligning its standards for seafood imports with its export certification requirements. Achieving full parity between these standards is essential for consistency and sustainability in the seafood industry.

Legislation and Readiness for GDST Standards

Viet Nam's legislative framework related to traceability and technology use is evolving. The economy is increasingly adopting international standards like the Global Dialogue on Seafood Traceability (GDST) but is still working towards full implementation across all fishing sectors.

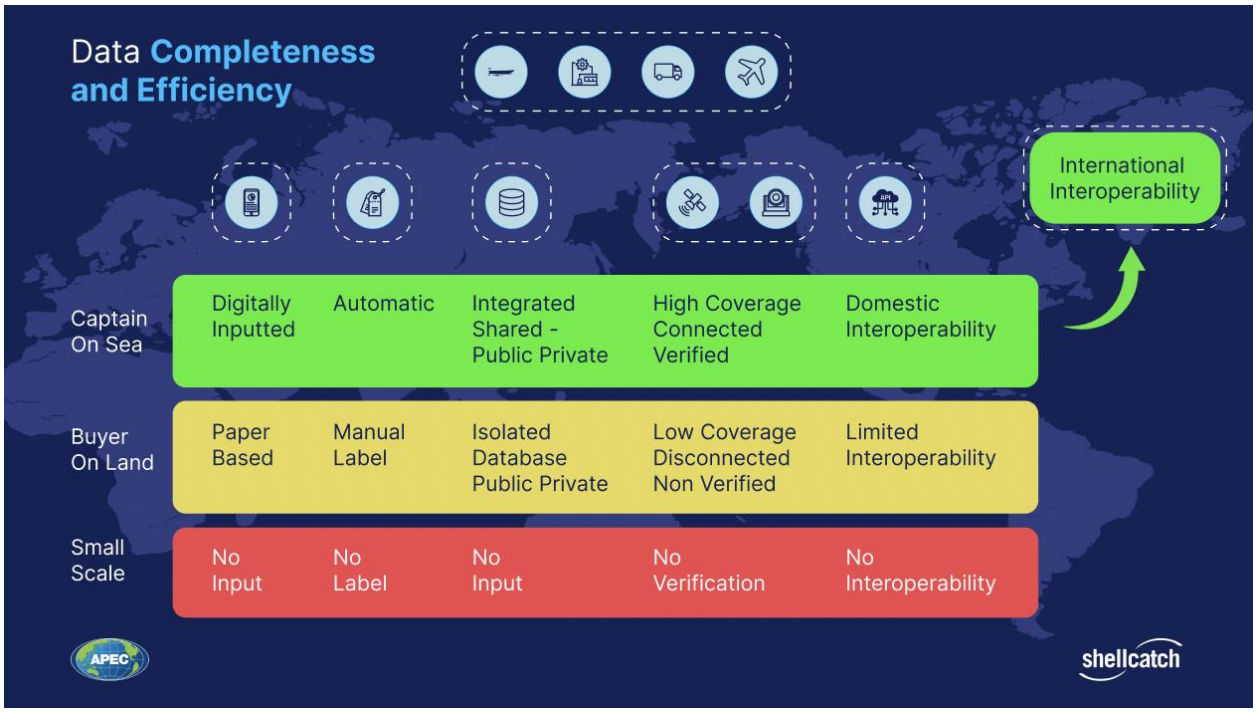
Viet Nam’s seafood traceability system shows significant progress, particularly in complying with export market standards and managing large-scale fisheries. However, challenges remain in developing a cohesive domestic traceability framework that includes small-scale fisheries and meets the requirements of both domestic and international markets. Ongoing efforts in technology adoption, regulatory development, and stakeholder collaboration are essential for advancing Viet Nam’s traceability systems and ensuring the sustainable management of its diverse seafood resources.

VI. Discussion

The comprehensive analysis of traceability implementations across different APEC economies reveals significant insights into best practices, lessons learned, and offers vital recommendations for the standardization and implementation of traceability technologies. These insights are instrumental in guiding future actions to enhance the effectiveness of traceability systems within the APEC region.

Data Completeness and Efficiency

The traceability coverage across APEC economies can be broadly characterized into three distinct scenarios, each reflecting varying degrees of data completeness, integration, and technological adoption. These categories represent a spectrum of traceability in the seafood industry, from minimal participation and verification to highly integrated and interoperable systems.



1. Small-Scale Fishers with Limited Traceability Participation

The first category encompasses small-scale fishers who typically do not engage in advanced traceability practices:

- Absence of Electronic Logbooks and Labels: In this scenario, small-scale fishers often do not participate in electronic logbook systems or use labels that provide traceability information. Their catch documentation may be minimal or non-existent.
- Lack of Verification Tools: There is no usage of satellite monitoring or electronic monitoring systems. Consequently, there is no verifiable means to track and authenticate their fishing activities.
- No Interoperability: Due to the lack of digital traceability tools, there is inherently no interoperability with broader traceability systems. These fishers operate outside the realm of integrated data sharing, making it challenging to include their activities in domestic or international traceability frameworks.

2. Commercial Players with Manual and Isolated Systems

The second category involves commercial entities that buy and resell catches, often relying on paper-based, manual systems:

- Isolated Database Environments: These players may use databases, but these systems are typically isolated with low coverage, lacking integration with other data systems or broader traceability networks.
- Limited Interoperability: The reliance on manual and paper-based systems results in limited interoperability. This lack of integration hinders the efficient exchange of information and verification of data across the supply chain.
- Challenges in Data Completeness and Reliability: The manual nature of these systems and their isolation from larger networks raises concerns about the completeness and reliability of the data collected.

3. Captains with Comprehensive Traceability Control

The final category represents the most advanced level of traceability, typically involving captains of fishing vessels:

- Comprehensive Logbook Responsibilities: Captains in this scenario have full control and responsibility for maintaining electronic logbooks. These logbooks are comprehensive, up-to-date, and accurately reflect the fishing activities.
- Integrated Public-Private Databases: They participate in shared databases that merge public and private data sources, providing high coverage and rich data sets.
- High Coverage of Connected and Verified Technologies: This group employs advanced technologies such as VMS, electronic monitoring, and other verification tools, ensuring high coverage of their fishing activities.
- Domestic and International Interoperability: These systems are characterized by their ability to interoperate both domestically and internationally. This interoperability facilitates compliance with global standards and regulations, enhancing market access and sustainability credentials.

Implications for APEC Economies

Understanding these categories helps in identifying where each APEC economy stands in terms of fisheries traceability and what steps are necessary to advance to more integrated and comprehensive systems. For small-scale fishers, initiatives may focus on introducing basic traceability practices and bridging them to larger systems. For commercial entities, the goal may involve digitizing and integrating their existing systems. For those already at an advanced stage, continuous improvement and adherence to international standards remain key.

In summary, addressing the unique challenges and needs at each level of these traceability scenarios is crucial for APEC economies to achieve effective, comprehensive, and sustainable fisheries management across the board.

Best Practices Identified

1. Comprehensive Monitoring Systems: Economies like Canada; Japan; and the U.S., which have successfully implemented Vessel Monitoring Systems (VMS) and electronic logbooks across various vessel sizes, exemplify the importance of comprehensive monitoring for effective fisheries management.

2. Unified Standards for Domestic and International Markets: The approach of maintaining consistent traceability standards for both domestic consumption and export, as seen in economies like Canada and Thailand, ensures uniform quality and sustainability.

3. Collaborative Approach Between Sectors: The successful collaboration between public and private sectors, along with significant contributions from NGOs, as observed in economies like Indonesia and Mexico, highlights the importance of multi-stakeholder engagement in developing effective traceability systems.

Lessons Learned

1. Importance of Interoperability: Challenges faced by economies like Peru and Viet Nam in achieving system interoperability underscore the need for integrated and adaptable traceability systems that can work seamlessly across different platforms and stakeholders.

2. Balancing Small-Scale and Large-Scale Fisheries Needs: Experiences from economies like Indonesia and Thailand emphasize the necessity of including small-scale fisheries in the traceability framework to ensure comprehensive and sustainable fisheries management.

3. Addressing Historical Challenges: The transformation observed in economies like Thailand demonstrates the effectiveness of rigorous policy reforms and technological enhancements in overcoming historical challenges and improving fisheries management.

Recommendations for Standardization and Implementation

1. Adopting Global Standards: Embracing international standards like the Global Dialogue on Seafood Traceability (GDST) across APEC economies can facilitate uniformity and compliance with global best practices.

2. Enhancing Data Accessibility and Sharing: Developing centralized databases with user-friendly interfaces for data input and sharing, as seen in Canada and Japan, can significantly improve transparency and informed decision-making.

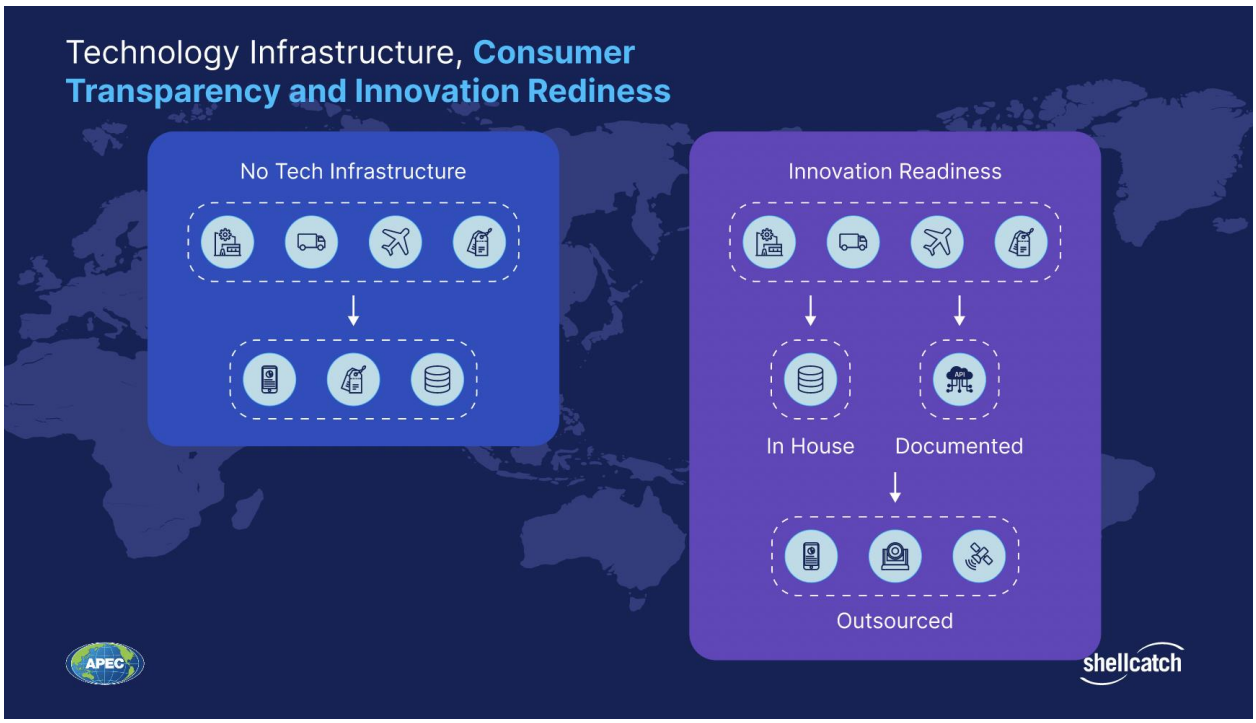
3. Extending Coverage of Monitoring Systems: Broadening the scope of monitoring systems to include all scales of operations, as in the case of Canada and the U.S, ensures a more inclusive and comprehensive traceability system.

4. Leveraging Technology for Sustainability: Incorporating advanced technologies like video monitoring and electronic reporting, as adopted by economies like Japan, can significantly enhance the effectiveness of traceability systems.

5. Addressing the Unique Needs of Small-Scale Fisheries: Tailoring traceability systems to accommodate the specific challenges of small-scale fisheries, as highlighted by the experiences of economies like Indonesia and Mexico, is crucial for equitable and sustainable fisheries management.

6. Continuous Stakeholder Engagement and Capacity Building: Ongoing collaboration and capacity building among governments, the private sector, and NGOs are essential for the successful implementation and sustainability of traceability systems.

7. Creating Innovation Readiness in the Organization



The digital divide in fisheries traceability between agencies with robust IT infrastructure and those without presents a significant challenge in standardizing and implementing effective traceability systems. This divide is not only technological but also encompasses disparities in skills, knowledge, and resources. Addressing this issue is crucial for achieving a harmonized approach to fisheries management across different regions and economies.

1. Lack of IT Infrastructure: Many fishery agencies, especially in developing regions or smaller economies, lack the necessary IT infrastructure to implement advanced traceability systems. This includes both hardware (like servers and computers) and software (such as database systems and analytical tools).

2. Deficit in Technical Know-how: Alongside infrastructure challenges, there is often a significant gap in technical expertise. Agencies may not have personnel with the necessary IT and engineering skills to develop, manage, and maintain traceability systems.

Best Practices for Bridging the Digital Divide

1. Building Minimal Viable IT Capabilities: A practical approach for agencies with low IT capacity is to focus on developing minimal viable IT capabilities. This involves setting up essential infrastructure and software systems that are manageable given their current resources and expertise.

2.In-House Technical Development: Investing in in-house technical and engineering skills is crucial. This might include training existing staff or hiring IT professionals. Developing these competencies internally ensures that the systems are tailored to the specific needs and contexts of the agencies.

3. Mapping Systems with Target Audiences: It is essential that the development of traceability systems is aligned with the needs and capabilities of the intended users, predominantly fishers and related stakeholders. Systems should be user-friendly and appropriate for the technological proficiency of the users.

4. Standardization and Interoperable Tools: For effective standardization, systems need to be interoperable, meaning they can communicate and share data with other systems, both domestically and internationally. Building IT capabilities should therefore include a focus on developing systems that can integrate with broader networks and platforms.

5. Collaboration and Knowledge Sharing: Agencies with limited IT capabilities should engage in partnerships and collaborations with more technologically advanced institutions. This collaboration can facilitate knowledge transfer, shared resources, and joint problem-solving.

6. Leveraging Scalable and Adaptable Solutions: Adopting IT solutions that are scalable and adaptable is crucial. This allows agencies to start with basic functionalities and gradually enhance their systems as their capacity grows.

To effectively address the digital divide in fisheries traceability, there's a need for strategic development of IT infrastructure and expertise within agencies with low IT capabilities. By building minimal viable capabilities and focusing on interoperability, these agencies can better integrate into the larger ecosystem of fisheries management. This approach not only ensures that systems are tailored to the specific needs of different agencies but also facilitates the broader goal of standardized and effective traceability in the fisheries sector.

The collective experiences and practices of APEC economies provide valuable guidance for the standardization and implementation of traceability technologies. By learning from these insights and adopting a collaborative, inclusive, and technology-driven approach, APEC economies can enhance the sustainability, efficiency, and transparency of their fisheries sectors, ultimately contributing to the broader goals of environmental conservation and economic stability.

VII. Illegal, Unreported and Unregulated fishing (IUU)

Addressing IUU Fishing: A Critical Component in Standardizing Traceability

The challenge of Illegal, Unreported, and Unregulated (IUU) fishing is a critical issue that intersects with the broader objectives of standardizing traceability across economies and leveraging technology in fisheries management. Addressing IUU fishing is as crucial as the standardization of traceability systems themselves, as it directly impacts the integrity and effectiveness of these systems.

The Interconnectedness of IUU and Traceability

1. **IUU Undermines Traceability Efforts**: IUU fishing poses a significant threat to the efficacy of traceability systems. When seafood products of illegal origin enter the supply chain, they compromise the reliability of the traceability data. This makes it challenging to guarantee that the seafood being traced and consumed is sustainably and legally sourced.

2. **Need for Comprehensive Monitoring**: Effective traceability must encompass all aspects of the supply chain, from catch to consumption. This includes ensuring that fishing activities are legal and regulated. Without addressing IUU, traceability systems can only provide partial assurance about the sustainability and legality of seafood products.

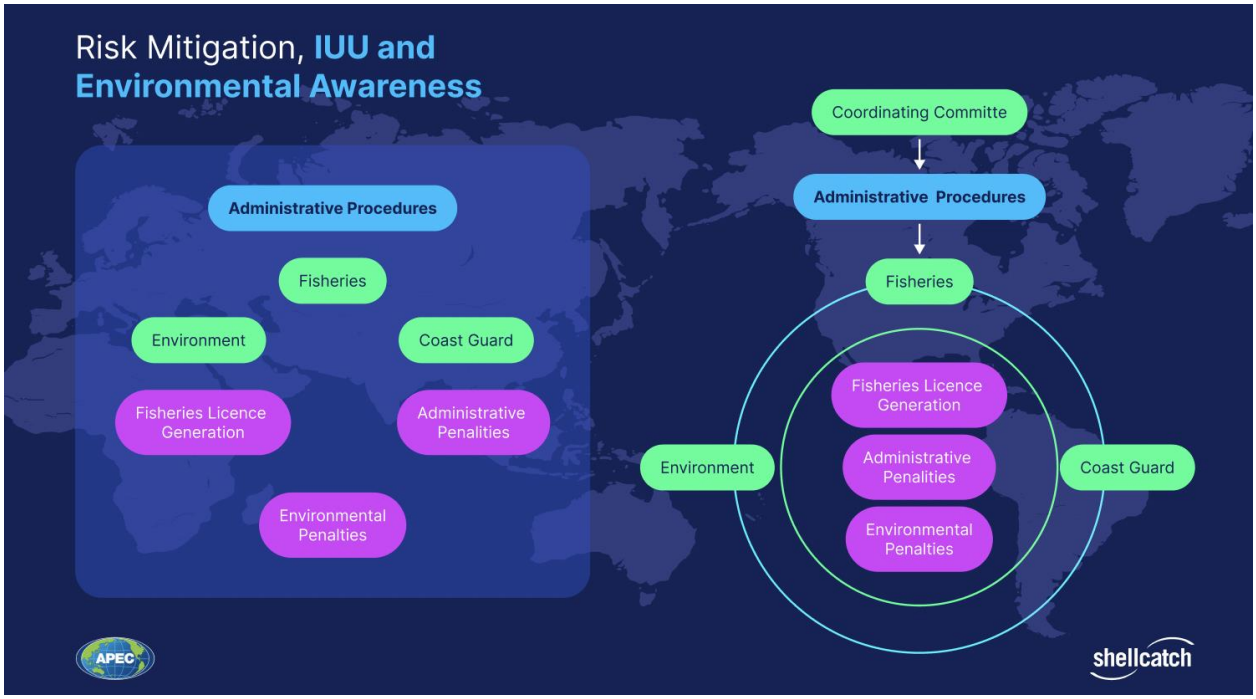
Technology as a Bridge for Standardization and IUU Mitigation

1. **Advanced Monitoring Tools:** The use of technology, such as VMS, electronic logbooks, and satellite monitoring, plays a pivotal role in both traceability and combating IUU. These tools provide real-time data and comprehensive oversight of fishing activities, making it more difficult for illegal operations to go unnoticed.

2. **Data Sharing and Interoperability**: The effectiveness of these technological tools is amplified when there is interoperability among different institutions, including fisheries, environmental bodies, and ocean policing authorities like the navy. Seamless data sharing and communication between these entities are essential for identifying and addressing IUU activities effectively.

The Role of Ministries and International Collaboration

1. **Collaborative Governance:** Ministries of Fisheries, Environment, and related authorities need to work collaboratively to address IUU fishing. This involves not only enforcing regulations and monitoring fishing activities but also sharing information and resources.



2. **International Cooperation**: IUU fishing is a transboundary issue. Therefore, international cooperation is crucial. This includes sharing best practices, intelligence, and technology to ensure that efforts to combat IUU are coordinated and effective across different jurisdictions.

IUU in Context of Small and Large Vessels

1. **Uniform Enforcement:** Addressing IUU requires consistent enforcement across all scales of operations. Both large industrial vessels and small-scale fishers must adhere to the same standards and regulations to ensure a level playing field and to prevent any loopholes that IUU operators could exploit.

2. **Customized Strategies for Different Vessel Sizes**: While the overarching principles of combating IUU remain the same, the strategies may need to be tailored to different types of vessels. For example, small-scale fishers might require different support and resources compared to large commercial operators.

Effectively addressing IUU fishing is integral to the success of standardizing traceability systems in the seafood sector. It requires a multifaceted approach involving advanced technology, collaborative governance, international cooperation, and tailored strategies for different vessel sizes. Combating IUU fishing not only supports the sustainability and legality of the seafood supply chain but also reinforces the integrity and reliability of traceability efforts across economies. The fight against IUU fishing is, therefore, a cornerstone in ensuring the effectiveness of global traceability systems and in maintaining the health of marine ecosystems and fisheries resources.

VIII. Small Scale Fisheries

A critical recommendation for enhancing the effectiveness of fisheries management, particularly for small-scale fisheries, involves a strategic restructuring of fisheries departments and their operational approaches. This restructuring would include the establishment of distinct divisions within fisheries agencies, each focusing on specific facets of fisheries management: an Industrial Division, an IT Division, and crucially, a Small-Scale Division.

The creation of a Small-Scale Division is particularly significant. This division should be dedicated to addressing the unique challenges and needs of small-scale fisheries, which differ substantially from industrial-scale operations. The responsibilities of this division would encompass tailored management and monitoring strategies, as well as the development of appropriate record-keeping systems that align with the capabilities and realities of small-scale fishers.

Key aspects of this recommendation include:

1. Tailored Management Approaches: The Small-Scale Division should focus on developing management strategies that are specifically suited to the nature of small-scale fisheries. This includes simpler, more feasible regulatory and compliance frameworks.

2. Adapted Monitoring and Record-Keeping: Given that small-scale fishers may not have access to advanced technology or may lack the resources for complex record-keeping, the division should explore and implement more accessible and user-friendly methods for monitoring and documentation.

3. Interoperability with Economic Development Agencies: A crucial aspect of this division's role would be to collaborate and interoperate with domestic economic development agencies. This partnership is vital to ensure that the development and support strategies for small-scale fisheries are aligned with broader domestic economic goals and initiatives. Such cooperation could facilitate access to funding, training, and resources that are essential for the sustainable development of small-scale fisheries.

4. Focus on Community and Sustainability: The Small-Scale Division should also prioritize community engagement and sustainability. This involves working closely with fishing communities to understand their needs, challenges, and opportunities for growth, while promoting practices that are environmentally sustainable and economically viable.

5. Inclusive Policy Development: Policy development within this division should be inclusive, considering the voices and perspectives of small-scale fishers to ensure that regulations and initiatives are practical, equitable, and effective.

By establishing a dedicated Small-Scale Division and ensuring its effective cooperation with IT and industrial divisions, as well as with domestic economic development agencies, fisheries departments can more effectively address the diverse needs of their fisheries sectors. This approach not only supports the sustainable development of small-scale fisheries but also contributes to the broader goals of economic development, environmental conservation, and food security.

IX. Conclusion: Summary of Main Findings, Conclusions, and Recommendations of the Project

This comprehensive project on the implementation of traceability systems in the fisheries and aquaculture sectors across various APEC economies has yielded insightful findings, drawn crucial conclusions, and put forth actionable recommendations. The study's depth and breadth offer a panoramic view of the current state and future potential of fisheries traceability in the APEC region.

Main Findings

1. Varied Implementation Levels: The study reveals a spectrum of implementation levels across APEC economies, from advanced systems in economies like Canada and the United States to evolving frameworks in economies like Indonesia and Mexico.

2. Commitment to International Standards: Many APEC economies are actively aligning with international standards, such as the Global Dialogue on Seafood Traceability (GDST), to enhance their traceability practices.

3. Challenges in Interoperability and Inclusivity: Significant challenges exist in achieving system interoperability and inclusivity, particularly in integrating small-scale fisheries into the traceability framework.

4. Effective Use of Technology: The utilization of advanced technologies like VMS, electronic logbooks, and video monitoring has been effective in enhancing traceability and sustainability in fisheries management.

Conclusions

1. Critical Role of Comprehensive Monitoring: The success of traceability systems is largely dependent on comprehensive monitoring that encompasses all scales of fisheries operations.

2. Importance of Collaborative Approaches: The effective implementation of traceability systems requires collaborative efforts among government, private sector, and NGOs.

3. Need for Uniform Standards: Establishing uniform traceability standards across both domestic and international markets is crucial for ensuring sustainability and market competitiveness.

4. Balancing Economic and Environmental Goals: Traceability systems must balance the economic viability of fisheries with environmental sustainability and resource conservation.

Recommendations

1. Adoption of Global Standards: APEC economies should strive to adopt and implement global standards like GDST to ensure uniformity and compliance with international best practices.

2. Enhancing Data Systems: Developing centralized databases with user-friendly interfaces for data input and sharing can significantly improve transparency and decision-making.

3. Expanding Monitoring System Coverage: Broadening the scope of monitoring systems to include small-scale fisheries ensures a more inclusive and comprehensive traceability system.

4. Leveraging Technological Advancements: Continued investment in and adoption of advanced technologies can significantly enhance the effectiveness and efficiency of traceability systems.

5. Continuous Stakeholder Engagement: Ongoing collaboration and capacity building among governments, the private sector, and NGOs are essential for the successful implementation and sustainability of traceability systems.

6. Need for Small Scale Fisheries Capacity Building.

Final Thoughts

The Imperative of Public Awareness and Communication in Traceability and Standardization

One critical aspect that often remains underemphasized in the efforts to create sustainable fisheries is the role of public awareness and communication about traceability and standardization. The substantial efforts that economies are investing in developing sustainable fisheries present a significant opportunity to enhance public engagement and awareness – an opportunity that, so far, has been inadequately tapped.

Existing Initiatives: Evaluation and Improvement

- Review and Assessment: It is essential to review existing initiatives aimed at increasing public awareness of traceability. This involves assessing the scope, reach, and effectiveness of current programs to understand their impact and identify areas for improvement.
- Identifying Gaps in Communication: Evaluating the strategies used to educate the public about traceability is crucial. This includes identifying gaps in clarity, accessibility, and effectiveness of communication, ensuring that the message reaches and resonates with a wide audience.

Enhancing Public Involvement and Engagement

- Assessing Public Participation: Assess the extent to which the public is actively involved in traceability initiatives. This includes examining how well the public is engaged in providing feedback and participating in traceability-related discussions and decisions.
- Strengthening Engagement Mechanisms: Identify and address gaps in public engagement. This could involve creating more interactive platforms, community outreach programs, and feedback mechanisms that allow the public to be more directly involved in traceability efforts.

Identifying Gaps Through Research and Analysis

- Quantitative Analysis: Conducting surveys or analyzing data from public awareness campaigns can quantify the current level of public awareness and participation. This data provides a baseline for measuring improvement and tailoring future initiatives.
- Qualitative Analysis: Qualitative insights are equally important. Conducting interviews or focus groups can offer deeper understanding into public perceptions, concerns, and suggestions regarding traceability and sustainability in fisheries.

Benchmarking Against Best Practices

- Comparative Analysis: It is beneficial to compare existing policies and governance structures against international best practices and standards. This benchmarking can reveal areas where a economy's approach to public awareness and engagement in traceability can be aligned more closely with global leaders in this field.

The project's findings, conclusions, and recommendations underscore the importance and urgency of enhancing traceability systems in the APEC fisheries and aquaculture sectors. By embracing these recommendations, APEC economies can ensure the sustainable management of their fisheries resources, contributing to environmental conservation and economic stability. The commitment to continuous improvement and collaboration will be key to realizing the full potential of fisheries traceability in the APEC region.

Leveraging the Global Data Synchronization Network for Standardization of Traceability Data

In the pursuit of achieving standardized traceability in fisheries, an innovative and effective solution lies in utilizing the Global Data Synchronization Network (GDSN). The GDSN provides a powerful platform for the harmonization and synchronization of data across different stakeholders in the seafood supply chain. Its potential to streamline and standardize traceability data is substantial and can play a pivotal role in enhancing the efficiency and effectiveness of fisheries management globally.

Advantages of GDSN in Traceability Standardization

Uniform Data Standards: GDSN facilitates the adoption of uniform data standards across various jurisdictions and supply chain participants. This uniformity is crucial for ensuring that traceability data is consistent, reliable, and comparable across different systems and regions.

Real-time Data Sharing: The network enables real-time data sharing, which is essential for the timely and accurate tracking of seafood products. This feature aids in quick decision-making and enhances the responsiveness of the supply chain to any traceability issues that may arise.

Improved Data Quality and Accuracy: With GDSN, there is a reduction in data discrepancies and errors, as the information is standardized and synchronized across the network. This leads to improved data quality and accuracy, enhancing the overall integrity of the traceability system.

Enhanced Collaboration and Transparency: The network fosters greater collaboration and transparency among stakeholders, including fisheries, processors, retailers, and consumers. By providing a common platform for data exchange, GDSN encourages a more collaborative approach to traceability and sustainability in fisheries.

Facilitation of Compliance with International Standards: Utilizing GDSN can help fisheries and related businesses comply with international standards and regulations more easily. The network's alignment with global best practices ensures that participants are adhering to the highest standards in traceability.

Scalability and Adaptability: GDSN’s scalable and adaptable nature allows it to cater to the diverse needs of different fisheries, whether large or small scale. This adaptability is crucial for ensuring that the network can be effectively utilized across various contexts and scenarios.

Implementing GDSN in APEC Economies

For APEC economies, integrating GDSN into their traceability frameworks presents a strategic opportunity to elevate their traceability systems. To leverage GDSN effectively, it is essential to:

- Build Capacity and Awareness: Educate stakeholders about the benefits and functionalities of GDSN to encourage widespread adoption.
- Ensure Technological Compatibility: Upgrade existing IT infrastructure to ensure compatibility with GDSN standards and protocols.
- Foster Public-Private Partnerships: Encourage partnerships between governments, private entities, and technology providers to facilitate the integration of GDSN in domestic traceability systems.

The Central Role of APEC in Advancing Traceability and Standardization

As we conclude this comprehensive analysis of fisheries traceability in APEC economies, it becomes unequivocally clear that the Asia-Pacific Economic Cooperation (APEC) plays a critical role in the endeavor to bring these diverse economies together to reach agreements, coordinate actions, and standardize traceability practices. The path towards a more sustainable, efficient, and transparent fisheries sector hinges on APEC's ability to foster collaboration and consensus among its member economies.

APEC's Role in Facilitating Collaboration

Platform for Dialogue: APEC provides a crucial platform where member economies can discuss, negotiate, and align their strategies and policies regarding fisheries management and traceability.

Harmonizing Standards: One of APEC's key roles is to aid in the harmonization of traceability standards across the region. This involves not only encouraging the adoption of international standards like the Global Dialogue on Seafood Traceability (GDST) but also ensuring that these standards are adapted and implemented effectively in different local contexts.

Capacity Building and Knowledge Sharing: APEC can facilitate capacity-building initiatives and the sharing of best practices among its member economies. This approach is particularly vital for economies that are in the early stages of developing their traceability systems or those facing challenges in upgrading existing systems.

Coordinating Actions for Sustainable Fisheries

Policy Coordination: APEC can help coordinate policies that promote sustainable fishing practices and effective traceability systems, ensuring that these policies are not only environmentally sound but also economically viable for all member economies.

Encouraging Technological Integration: APEC can play a significant role in promoting the integration of advanced technologies in fisheries management. This includes supporting initiatives for digital transformation in fisheries traceability, such as the adoption of the Global Data Synchronization Network (GDSN).

Advocating for Inclusive Approaches: Recognizing the diversity of its member economies, APEC should advocate for traceability systems that are inclusive of both large-scale industrial fisheries and small-scale, artisanal fisheries.

Standardization for the Future

Setting the Agenda for Standardization: APEC has the opportunity to set a forward-thinking agenda for standardization in fisheries traceability. This includes not just the technical aspects of traceability but also encompasses regulatory frameworks, data sharing protocols, and public-private partnerships.

Bridging the Digital Divide: APEC can lead initiatives to bridge the digital divide in fisheries traceability, ensuring that all member economies, regardless of their current technological capabilities, can participate fully in the regional traceability system.

Public Awareness and Engagement: APEC can also spearhead campaigns to raise public awareness about the importance of sustainable fisheries and the role of traceability in achieving this goal. Engaging the public is crucial for the success of traceability initiatives.

In summary, APEC's role is indispensable in bringing together the diverse economies of the Asia-Pacific region to develop a unified, effective approach to fisheries traceability. Through its platforms for dialogue, capacity building, and policy coordination, APEC can facilitate the standardization of traceability practices, the adoption of advanced technologies, and the implementation of sustainable fisheries management across the region. The success of APEC's endeavors in this area will not only benefit the fisheries sector but will also contribute significantly to the broader goals of environmental sustainability and economic development in the Asia-Pacific region.