Blue Citizen Community Indicators Research Report

APEC Ocean and Fisheries Working Group

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Asia-Pacific
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Together, we hope that this report will serve as a starting point for ongoing dialogue, application, and refinement within the blue citizen community. The blue citizen community indicator framework is intended to act as a catalyst for empowering communities, informing evidence-based policymaking, and fostering an ocean-literate society across the APEC region.

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1.1 Research Background

1.1.1 Ocean Challenges

The ocean is a key component of the Earth's ecosystem, playing a fundamental role in maintaining global climate stability, promoting socio-economic development, and ensuring human well-being. Currently, the global ocean faces complex challenges from multiple stressors. Marine plastic pollution is an increasingly prominent issue, with vast amounts of plastic waste entering the ocean annually, posing a persistent ecological threat. Concurrently, land-based pollutants, including industrial wastewater, agricultural runoff, and untreated sewage, contribute to eutrophication and the expansion of hypoxic zones in coastal waters.

Rising global temperatures have led to increased sea surface temperatures, triggering widespread coral bleaching events that threaten coral reefs, a critical biodiversity hotspot. Ocean acidification also endangers the survival of calcifying organisms such as mollusks and crustaceans. Furthermore, unsustainable fishing practices, especially overfishing and illegal, unreported, and unregulated (IUU) fishing, have caused the decline of major global fish stocks. Coastal development activities also continue to cause the degradation and loss of key coastal ecosystems like mangroves and seagrass beds. These interconnected pressures are eroding the health, productivity, and resilience of marine ecosystems.

In response to these challenges, some economies have established a series of multilateral governance frameworks. High-level platforms such as the United Nations Ocean Conference serve as one mechanism for mobilizing political commitment, strengthening partnerships, and advancing coordinated action. On specific issues, the United Nations Environment Programme (UNEP) is leading the development of a legally binding international instrument on plastic pollution. The Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ Agreement) was adopted in 2023. Simultaneously, the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) is working to bridge the gap between science and policy. The effective implementation of these international frameworks depends on broad and sustained stakeholder engagement, particularly enhanced public awareness and participation.

1.1.2 Ocean Literacy

The "Ocean Literacy" concept is a direct response to the aforementioned challenges. The origins of this movement can be traced to a collective reflection within some marine science and education communities in the late 20th century. Following the release of the U.S. National Science Education Standards in 1996, some marine scientists noted the absence of ocean-

related topics, which could lead to a lack of structured and coherent ocean education in primary and secondary schools. They recognized the need to develop a clear knowledge framework to help the public, especially younger generations, understand the importance of the ocean.

A 2002 conference titled “Oceans for Life” is considered by some as the formal beginning of the ocean literacy movement, paving the way for the development of its core principles. In 2004, an online workshop, sponsored by NOAA, involving over one hundred scientists, educators, and policymakers defined ocean literacy — “an understanding of the ocean’s influence on you and your influence on the ocean”—along with “Seven Essential Principles” and “Forty-five Fundamental Concepts.” In 2005, “Ocean Literacy: The Essential Principles of Ocean Sciences for Learners of All Ages” was officially published.

The introduction of the ocean literacy concept was discussed more widely. Internationally, collaborative networks for ocean education were established, such as the International Pacific Marine Educators Network (IPMEN, 2007), the European Marine Science Educators Association (EMSEA, 2012), and the Asia Marine Educators Association (AMEA, 2016), forming a global promotion network. The European Commission also funded large-scale innovation projects like “Sea Change” through its Horizon 2020 program to enhance ocean literacy among European citizens.

In the second decade of the 21st century, ocean literacy was discussed in some multilateral organizations. The United Nations Educational, Scientific and Cultural Organization (UNESCO) and its Intergovernmental Oceanographic Commission (IOC) released “Ocean Literacy for All: A Toolkit” in 2017, providing practical guidance for educators worldwide. Within the framework of the “UN Decade of Ocean Science for Sustainable Development (2021-2030),” ocean literacy serves as a means to address its Challenge 10: “Restoring society’s relationship with the ocean.” Ocean literacy education and public engagement therefore constitute one driver for reshaping societal behavior to support marine science and sustainable management.

1.1.3 APEC Regional Responses and the Gaps in Blue Citizen Community Practice

The Asia-Pacific Economic Cooperation (APEC), as a key platform for regional cooperation, has actively discussed ocean literacy. Most APEC economies have extensive coastlines and significant marine economies, while also facing severe challenges such as marine debris.

APEC has long attached great importance to ocean-related issues and continuously promoted regional marine cooperation. Notably, in 2014, the 4th APEC Ministerial Meeting on Oceans and Fisheries, held in Xiamen, China, adopted the Xiamen Declaration, which called for cooperation to reduce marine debris and recommended that members raise public awareness through community outreach. In 2018, the APEC Ministerial Chair’s Statement emphasized the importance of sustainability.

In this context, the APEC Marine Sustainable Development Center (AMSDC) officially proposed the “blue citizen” concept in 2019. This initiative aims to translate the principles of ocean literacy into concrete public action. As proposed by AMSDC, a “blue citizen”, who has

learned about blue services from the ocean and is willing to explore the ocean and take actions for the beautiful ocean, means that an individual understands and values the services provided by the ocean ("blue services") and is willing to connect with and explore the ocean, and acts responsibly to protect its health, thereby sustainably sharing in its benefits.

APEC has provided project funding to further explore this concept. The "Capacity Building for Blue Citizen in the APEC Region" project (OFWG 06 2022A) was launched in 2022. In 2024, the APEC Blue Citizen Guidebook was published, alongside the APEC Marine Sustainable Development Report, which emphasized the need to "scale up blue citizen initiatives to engage with private sectors, civil society, and local communities in ocean conservation and the blue economy." In early 2025, APEC further approved the current project, "APEC Workshop on Blue Citizen Community for Ocean Literate Society," which proposed the cultivation of "blue citizens" to build an "ocean-literate society."

However, as the initiative and projects have progressed, it is noted that at the community level, economies could benefit from a voluntary framework to guide the direction and pathways for building blue citizen community. Currently, there is a lack of a guiding framework and development blueprint to bridge the gap between regional initiatives and local community practices. This may result in communities lacking clear objectives and comprehensive considerations when planning and implementing related projects, and it hinders the sharing of best practices among different economies and communities. Therefore, the proposed development of a blue citizen community indicator framework is intended not as a mandatory assessment tool but as a voluntary, forward-looking guidance mechanism. The project aims to offer a voluntary framework and action guide for future community-building efforts in Asia-Pacific region, thereby more effectively promoting the grassroots implementation of the "blue citizen" concept.

1.2 Research Purpose

To address the aforementioned gap and provide scientific support for the sustainable marine development of APEC economies, this report aims to:

1.2.1 Developing a Scientific Assessment Tool

The core objective of this report is to develop a blue citizen community indicator framework that covers four key dimensions: Infrastructure and Environment, Ocean Literacy and Actions, Policy and Management, and Economy and Culture. This framework could provide a quantifiable, comparable, and policy-relevant model for coastal cities and communities in interested APEC economies as they work to build blue citizen communities in the future.

1.2.2 Guiding and Supporting Policy Implementation

Through the development and application of the indicator framework, this report could provide a basis for interested local governments to make informed decisions, guiding them to voluntarily integrate ocean literacy into urban planning, environmental management, and public

education systems in a coherent and coordinated manner. For example, the indicators can be used to assess the effectiveness of policies related to ecotourism, ocean cultural education, and coastal protection, thereby promoting the concrete implementation of blue citizen community development and regional initiatives such as the APEC Roadmap on Marine Debris at both the local and community levels.

1.2.3 Empowering and Motivating Community Action

By identifying and quantifying key behavioral indicators of residents' ocean literacy and participation in marine conservation, this report aims to translate the blue citizen community concept into concrete and actionable guidance for residents' daily lives. The indicator framework is designed to stimulate bottom-up community vitality, providing clear pathways and goals for the public, social organizations, and businesses to engage in marine conservation, effectively bridging the gap between awareness and action.

1.3 Research Significance

This report, which aims to develop a blue citizen community indicator framework, provides a voluntary framework for sustainable marine development in the APEC region.

The primary value of this indicator framework lies in providing clear and actionable development guidance for concrete practices at the coastal community and city levels. By translating the comprehensive concept of "ocean literacy" into an operational and measurable set of community-level indicators, this report offers local managers and stakeholders a self-assessment tool and a development pathway reference. This will help communities identify their current status in ocean literacy development, determine priority areas for future work, and break down macro-level marine conservation goals into specific, feasible, and context-appropriate actions at the community level. This, in turn, could effectively guide the public, social organizations, and local enterprises to participate in sustainable practices, fostering a bottom-up conservation synergy. Guided by indicators that focus on cultivating blue citizens, enhancing ocean literacy, strengthening the human-ocean connection, and improving ocean well-being, this framework can promote community development in areas such as ecotourism, ocean cultural education, and sustainable aquaculture while improving livelihoods, thereby enhancing the ecological, social, and economic resilience of coastal communities in interested economies across the APEC region.

At the regional policy level, the findings of this report are intended to provide a reference for decision-making and a basis for cooperation among the relevant authorities of interested APEC economies. The indicator framework offers a data-driven reference for governments to assess the implementation progress of related policies (such as marine debris management and ocean education promotion), thereby supporting optimized resource allocation and future policy formulation. More importantly, by providing a shared technical language for communication, this report will facilitate the exchange of best practices and experiences in building blue citizen community among interested APEC economies.

The development of this indicator framework explicitly serves as a local-level implementation and monitoring tool for Challenge 10 of the "UN Decade of Ocean Science for Sustainable Development"— "Restoring society's relationship with the ocean." The voluntary framework and methodology developed in this report can serve as a valuable reference for other coastal as well as inland communities worldwide, thereby contributing to APEC's practical and scalable solutions.

2. Principles and Framework of the Blue Citizen Community Indicators

The development of a scientific, comprehensive, and instructive blue citizen community indicator framework could follow a series of core principles. These principles ensure the rigor and practicality of the framework and enable it to serve as an effective driver for guiding coastal communities toward a sustainable, resilient, and well-being future.

2.1 Principle of Multidimensional Integration

Multidimensional integration is the foremost principle in constructing the blue citizen community indicator framework. It calls for coverage of dimensions relevant to marine-related community development, avoiding the limitations of a single-perspective assessment. Therefore, the indicator framework could go beyond traditional environmental assessments and organically integrate Infrastructure and Environment, Ocean Literacy and Actions, Policy and Management, and Economy and Culture to form a multi-level evaluation and voluntary guidance framework. Such a comprehensive perspective helps governments and planners better understand community-wide development trends, identify linkages and interactions across domains, particularly the reciprocal influence of the human–ocean relationship, leading to more coordinated and balanced development strategies.

2.1.1 Integrating the Four Core Dimensions

This framework uses twelve existing directional and qualitative indicators to link the four threads of culture, ecology, economy and society into a coherent structure that could guide both short-term actions and long-term sustainable blue development for communities. The comprehensiveness of the indicator framework is first reflected in its use of twelve indicators, which collectively integrate these four dimensions within a single framework. The cultural dimension, centered on the “Number of ocean-themed facilities” and the “Frequency of ocean cultural activities, could guide communities a holistic development process that includes both physical infrastructure and cultural engagement. It emphasizes the establishment of “Blue Citizen Service Centers” and “Blue Citizen Volunteer Teams,” and it promotes the cultivation of an “Ocean literacy atmosphere” and a “Local traditional maritime culture atmosphere.” The ecological dimension applies three indicators (“Community eco-environmental quality,” “Coastal marine environmental quality (special indicator),” and “Ocean accessibility”), which help advance integrated land-sea environmental management. The economic dimension relies on the “Proportion of ocean-related employment,” which focuses on blue industries that directly benefit residents. The social dimension highlights participatory governance and community identity through “Public participation coverage” and “Community Ocean brand development.” Taken together, these twelve indicators form a clear pathway for communities to pursue both actionable short-term measures and long-term blue industry development.

2.1.2 Providing Directional Guidance

In the initial phase of developing the blue citizen community indicator framework, the focus is on defining the development direction, building consensus, and establishing a foundational framework rather than pursuing precise quantitative assessment. The indicators at this stage are primarily directional and are intended to offer communities clear goal orientation, policy guidance, and voluntary actionable pathways. These indicators are not intended to provide precise quantitative measurement at this stage, but instead highlight conceptual institutional development and behavioral guidance, which helps lay the groundwork for introducing quantitative indicators in later stages. Their core value lies in providing a sense of direction and an action-oriented structure that helps interested governments and communities identify priority areas, determine policy focuses, and foster shared understanding, helping to ensure that all practices remain aligned with the overarching objectives. As community practices advance and data availability improves, quantitative indicators can be progressively incorporated, leading to a smooth transition from directional guidance to a more data-supported scientific assessment.

2.1.3 Balancing Development and Conservation

The core of the multidimensional integration principle is to identify a balanced pathway between protecting the ocean and enhancing community well-being within the existing twelve indicators. The indicators “Community eco-environmental quality” and “Coastal marine environmental quality (special indicator)” place water quality and ecosystem health at the forefront of coastal community development, helping to ensure that environmental protection is integrated into development planning from the very beginning. Meanwhile, the indicator “Share of ocean-related employment” focuses directly on human benefits. It prioritizes nature-positive and climate-resilient livelihoods, including sustainable ecotourism, regulated small-scale fisheries, blue biotechnology, and recreational fishing—all of which have relatively low environmental impact. By encouraging the growth of these sectors, communities can expand local employment while simultaneously improving environmental conditions, thereby transforming ecological gains into residents’ income. Over time, the interaction between the two creates a self-sustaining cycle of “conservation → employment → renewed conservation,” in which environmental improvements generate livelihood gains that, in turn, strengthen incentives for further conservation, supporting a development pathway that is both sustainable and resilient.

2.2 Principle of Development Orientation

The principle of development orientation serves as a core pillar of the blue citizen community indicator framework. It requires that indicators not only assess a community’s current conditions but also possess the capacity to guide future development and anticipate emerging trends. Coastal communities face both unprecedented challenges and new opportunities. An indicator framework grounded in development orientation enables communities to plan ahead and proactively adapt to future shifts, rather than respond passively to emerging crises. This

principle also encourages communities to look beyond immediate interests and cultivate a long-term development vision. By setting forward-looking and ambitious goals, it stimulates community creativity and generates momentum for transformation. It helps communities build the foundations needed to navigate uncertainties and strengthen their long-term resilience. Ultimately, the principle of development orientation ensures that the construction of a blue citizen community is not a static exercise in meeting predefined benchmarks but a dynamic and continuously evolving process. It guides communities toward a more sustainable, resilient, and vibrant future, while enhancing ocean literacy. and fostering a cultural environment conducive to the growth of more blue citizens.

2.2.1 Encouraging Innovation and Adaptive Management

The principle of development orientation requires that the indicator framework be able to identify and encourage innovative practices in communities such as ocean governance, economic development, and social development. Overly rigid indicators may constrain a community's creativity and adaptability. Therefore, the framework should incorporate indicators that reflect innovation capacity and learning ability. These indicators assess whether a community can continuously learn and improve, and whether it can adjust its strategies in a timely manner in response to internal and external changes. Moreover, the framework itself should function as an open and dynamic framework that is regularly reviewed and updated to integrate new scientific findings, technological advances, and emerging best practices. This concept of adaptive management helps ensure that the framework remains current, scientifically sound, and directive in practice, thereby encourages communities to explore new development pathways and strengthen their resilience in the face of future uncertainties.

2.2.2 Addressing Future Ocean Challenges and Opportunities

The principle of development orientation also means that the indicator framework could be able to help communities anticipate and respond to future ocean challenges while seizing potential opportunities. These challenges include sea-level rise, ocean acidification, an increase in extreme weather events, and new types of marine pollutants. At the same time, the future ocean also holds enormous development opportunities, such as marine renewable energy, blue biotechnology, and smart oceans. This orientation also encompasses the stewardship of marine ecosystems alongside the safeguarding of local traditions, intangible cultural heritage, and dual natural-cultural legacies. It reflects a commitment to preserving unique local identities while fostering harmonious coexistence. The indicator framework should establish relevant indicators to assess a community's ability to seize these opportunities and uphold these values. By simultaneously focusing on challenges and opportunities, the indicator framework can help communities to conduct comprehensive risk assessments and strategic planning, thereby achieving higher quality and more sustainable development.

2.3 Principle of a Unified Framework

The principle of a unified framework is a key practical value of the blue citizen community indicator framework. It requires that the framework be designed to enable vertical comparison within economies and communities, as well as exchange and mutual learning across different economies and communities, thereby facilitating the identification, diffusion, and scaling of best practices. An indicator framework that lacks comparability significantly undermines its usefulness. This principle underscores the need for standardized definitions, calculation methods, and data sources to ensure the fairness and comparability of assessment results. By establishing a voluntary unified framework, communities in different geographic settings and at varying stages of development can conduct self-assessment and cross-community comparison within the same structure, fostering healthy competition and driving overall improvement in performance and standards.

2.3.1 Enabling Comparability Across Communities

To achieve effective exchange and mutual learning, the indicator framework must strive for a high degree of uniformity and standardization. This requires that every third-level indicator have a clear and unambiguous definition, as well as a unified measurement method and data collection protocol. In addition, the framework should account for differences among communities in scale, population, and other structural factors by introducing relative indicators or applying standardization methods, such as “per capita” or “per unit area,” to reduce biases arising from scale effects. With such refinement, the indicator framework can serve as an effective tool that helps communities identify their strengths and weaknesses and clarify their priorities for improvement.

2.3.2 Promoting the Sharing of Best Practices and Experiences

The ultimate purpose of the principle of a voluntary unified framework is to promote the identification, consolidation, and dissemination of best practices. When different communities are assessed under a unified indicator framework, those performing strongly on specific indicators naturally emerge as potential best-practice cases. Through experience-sharing workshops, the publication of best-practice reports, and the establishment of online knowledge-sharing platforms, these successful approaches can be shared more widely, accelerating collective progress. Such data- and evidence-based knowledge sharing is far more persuasive and actionable than abstract slogans or general theories, and can effectively advance the development of blue citizen communities from isolated pilots to broader, scaled-up implementation.

2.3.3 Aligning with International and Regional Standards

To enhance the credibility and international relevance of the indicator framework, its design should, as far as possible, align with relevant international and regional standards and frameworks. Such alignment enables the use of established methodologies and data resources,

reducing the cost of framework development while helping evaluation results gain broader recognition and application. It also creates favorable conditions for communities to participate in international cooperation and seek economy-level support. In addition, aligning with international standards allows the achievements of blue citizen community development to be more effectively integrated into global and economy development narratives, thereby enhancing their strategic significance.

2.4 Principle of Practical Feasibility

Practical feasibility is essential for translating the blue citizen community indicator framework from conceptual design into effective implementation. It requires that every indicator be clear, explicit, and operational, capable of being quantified or qualitatively assessed through reliable data sources. An indicator framework filled with vague concepts or unmeasurable indicators cannot meaningfully support decision-making or community management. The principle of practical feasibility therefore emphasizes the usability of indicators, ensuring that assessment processes are workable in practice and that the resulting evaluations are credible. This principle forms the foundation for ensuring that the indicator framework can be implemented effectively and deliver tangible outcomes.

2.4.1 Ensuring Clear Indicator Definitions and Data Sources

The first requirement for practical feasibility is the clarity and precision of indicator definitions. Each indicator must include an accurate description that specifies its measurement content and assessment method. At the same time, reliable data sources must be identified. These may include government statistical reports, environmental monitoring data, or information obtained through surveys, field observations, and other specialized methods. Clear definitions and explicit data sources are fundamental to ensuring data quality and maintaining the comparability of assessment results.

2.4.2 Ensuring Operability and Assessability

The indicator framework must be not only theoretically measurable but also operationally feasible in real-world settings. This requires that assessment methods remain practical, straightforward, and cost-effective, avoiding excessive technical complexity or resource demands. In designing indicators, priority should be given to those that rely on existing data sources or are easy to collect, so as not to place undue burdens on communities. Evaluation readiness also requires that indicators be sensitive to change over time. They should possess sufficient temporal responsiveness to track progress, identify emerging issues, and detect evolving challenges throughout the implementation process. Through regular and structured assessments, communities can monitor development trajectories, identify problems in a timely manner, and adjust strategies accordingly. Such a dynamic assessment mechanism is essential for ensuring that the indicator framework remains relevant and effective as a tool for continuous guidance.

2.4.3 Ensuring Data Reliability and Currency

The ultimate objective of the Principle of Practical Feasibility is to help ensure data reliability and currency. Data reliability refers to the extent to which information accurately reflects the actual conditions of a community, which must be secured through standardized data collection procedures, strict quality control, and cross-validation across multiple sources. Data currency requires that information reflect the most up-to-date situation. Accordingly, the indicator framework should establish a regular data-update mechanism that specifies the update frequency for each data item. By developing a dynamic data platform, decision-makers can access current information at any time, enabling them to make quick and accurate assessments of a community's development status.

2.5 Principle of Resident-Centered Community Participation

Resident-centered participation is a core value guiding the construction of the blue citizen community indicator framework. This principle underscores that community development should not remain solely at the macro level but must focus deeply on the growth and empowerment of every individual blue citizen. The driving force of development comes from the people, and its ultimate purpose is to serve the people. Accordingly, the indicator framework must position residents as central actors. Residents should not be passive subjects of assessment but active participants throughout the entire process of indicator design, data collection, assessment feedback, and continuous improvement. This principle seeks to ensure that the indicator framework genuinely reflects public concerns, harnesses community wisdom, and mobilizes collective strength, turning the development of blue citizen communities into a dynamic process of co-creation, co-governance, and shared benefits.

2.5.1 Strengthening the Role of Residents in Indicator Development and Evaluation

A resident-centered approach first requires meaningful participation at every stage of the indicator framework. During the formulation phase, residents' views should be widely solicited through community hearings, focus group discussions, and other participatory methods to ensure that selected indicators truly reflect issues of greatest concern to the community. In the data collection phase, the concept of "citizen science" may be promoted by training residents as data-collection volunteers, thereby strengthening their sense of ownership and responsibility. During assessment and feedback, results should be communicated to residents in clear and accessible formats, and community discussions should be organized to jointly interpret findings, analyze underlying causes, and explore improvement measures. Such full-process participation transforms residents from passive bystanders into active contributors and co-owners of the community's development.

2.5.2 Assessing Residents' Identification with Ocean Culture

The Principle of Community-based Participation emphasizes that the indicator framework should be able to capture and measure residents' intrinsic identification with, and emotional connection to, ocean culture, particularly their local knowledge and traditional customs. Ocean culture is not only expressed through external festive activities but can constitute a deeply rooted value system. Therefore, carefully designed qualitative indicators are required to assess this cultural "soft power." For example, questionnaire surveys can be used to understand residents' familiarity with local ocean history and customs and to measure their pride in this shared heritage; interviews can be conducted to explore how ocean culture is manifested in residents' daily lives; and observational methods can document the frequency and participation rates of community-initiated ocean-related cultural activities, including efforts to actively promote and share these traditions more broadly. These indicators aim to determine whether ocean culture genuinely "lives" within the community, whether it has become a core force that unites community spirit, and whether it inspires broader participation and engagement.

2.5.3 Measuring the Convenience and Safety of Resident Participation in Marine Conservation

The Principle of Community-based Participation also requires the indicator framework to examine both the objective conditions and the subjective experiences that shape residents' involvement in marine conservation. The two key aspects are convenience and safety. Residents' willingness to protect the marine environment can be transformed into concrete action only when participation pathways are easy to access and perceived as safe. Therefore, the indicator framework should include measures that evaluate the level of community support provided to ensure convenient and secure participation. In addition, questionnaire surveys should be used to understand residents' satisfaction with the convenience and safety of taking part in marine conservation activities. These indicators encourage community managers to respond to residents' actual needs, improve management and service delivery, remove barriers that hinder participation, and create an environment that is safe, welcoming, and supportive of sustained community engagement in marine conservation.

3. Indicator Framework for the Blue Citizen Community

This chapter presents a comprehensive elaboration of the conceptual architecture and indicator framework underpinning the blue citizen community (BCC). The development of this framework draws upon established sociological frameworks, normative principles of ocean literacy, and the practical governance needs identified within the APEC region. To help ensure conceptual robustness and empirical grounding, the framework underwent structured validation through an expert questionnaire survey conducted across APEC member economies and responded by some APEC member economies (see Appendix 1). The survey was disseminated via the Wenjuanxing platform (https://www.wjx.cn/), circulated proactively by the research team, and further distributed through the APEC Secretariat's formal mailing lists and working group communication channels. Data collection occurred between July and September 2025. All responses were subsequently subjected to standardized processing, interpretive analysis, and synthesis, with descriptive statistical techniques employed to generate the corresponding analytical report (see Appendix 2). A total of 58 valid responses were obtained from 10 APEC economies—Chile; China; Indonesia; Japan; Malaysia; Peru; the Philippines; Chinese Taipei; Thailand; and Viet Nam. The respondent pool encompassed a diverse array of stakeholder groups, including researchers and academics, government officials, educators, local residents, enterprises, and non-governmental organizations. This broad participation provides an empirical basis for evaluating the conceptual validity and operational relevance of the proposed indicator framework. Looking ahead, further validation phases may incorporate targeted strategies to broaden participation across economies with varied socio-cultural and ecological contexts, thereby strengthening the framework's cross-cultural applicability and regional representativeness. Nonetheless, the present survey already furnishes validation results with substantial empirical adequacy and conceptual credibility, affirming the indicator framework's relevance across the diverse settings of the APEC region.

3.1 Concepts of Blue Citizen

The importance of ocean literacy has become increasingly recognized, and efforts to translate this understanding into concrete public action led to the joint launch of the "Blue Citizen Initiative" in November 2023 by the Ministry of Natural Resources of China, the Ministry of Environment of Cambodia, the National Research and Innovation Agency of Indonesia, the Ministry of Natural Resources and Environment of Thailand, the Ministry of Environment, Climate Change, Disaster Management and Meteorology of Solomon Islands, and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC/UNESCO) Sub-Commission for the Western Pacific (WESTPAC). The initiative seeks to articulate a clear identity and orientation for individual

action within the APEC region, thereby fostering collective engagement in addressing ocean challenges and promoting a more harmonious relationship between humanity and the ocean.

According to the *APEC Blue Citizen Guidebook*, a blue citizen is grounded in ocean literacy and refers to an individual who has learned about blue services from the ocean and are willing to explore the ocean, and take actions for the beautiful ocean. This means that an individual who both understands and values the ecosystem services provided by the ocean ("blue services"). A blue citizen is willing to engage with and explore the marine environment and takes responsible actions to safeguard its health, thereby ensuring the sustainable enjoyment of ocean benefits. An ocean-literate blue citizen recognizes the deep interconnections between human societies and marine ecosystems and is committed to strengthening these links at the individual, community, and societal levels. Such individuals cultivate their relationship with the ocean through practical experience and are motivated to translate knowledge and awareness into action.

The conceptual essence of a blue citizen is captured in four defining attributes. The first is scientific rigor, reflected in knowledge of ocean literacy and the ability to engage in evidence-based reasoning. The second is humanistic values, demonstrated through deep emotional connection to and empathy for the ocean. The third is an open and inclusive mindset, signifying the willingness and ability to engage in and lead diverse partnerships. The fourth is action orientation, manifested in proactive, responsible behaviors that contribute to the protection, health, and long-term sustainability of marine ecosystems while benefiting from them.

Understanding these individual attributes underscores the importance of cultivating a community context capable of reinforcing such qualities. Establishing a "blue citizen community" thus becomes a key pathway for operationalizing the blue citizen concept and embedding it into everyday social practice.

3.2 Concepts of Blue Citizen Community

To effectively cultivate blue citizens, enhance ocean literacy, advance ocean well-being, deepen human–ocean connections, and strengthen community-based conservation and blue industry development efforts, this report adopts the "community" as the fundamental unit and core vehicle for achieving these objectives. From a sociological perspective, a community refers to a population situated within a defined geographic space that shares social relations and common activities. Accordingly, this report recommends defining a blue citizen community at a sub-city scale, with the precise delineation determined flexibly by each economy in accordance with its administrative structures, community size, geographic characteristics, and governance practices.

Drawing on the defining attributes of blue citizens, who actively learn about the ocean, engage with it, and participate in conservation efforts, a blue citizen community refers as a community oriented toward cultivating blue citizens, centered on improving residents' ocean literacy, and committed to improving the benefits of the ocean for the human well-being while promoting marine ecological protection and community development.

To assess the acceptance and applicability of this concept within the APEC region, the questionnaire survey included a dedicated validation item. Results indicate strong support: among the 58 respondents, 55 individuals (94.83%) expressed agreement with the proposed definition, while the remaining 3 (5.17%) selected “Neutral,” and none selected “Disagree.”

Open-ended responses further reinforced and elaborated this consensus. Many respondents regarded the definition as clear, logically structured, and operationally meaningful, noting that it effectively integrates the core objectives of advancing ocean literacy and enhancing community well-being, and promoting community development. One expert observed that the definition “fully reflects the interdependence between human well-being and the health of marine ecosystems” and commended its ability to “appropriately link individual knowledge and action with community-level commitments.” Another expert emphasized its value in highlighting the “dual importance of individual responsibility and community participation” and noted the significance of linking ocean literacy with sustainable livelihoods, which is essential for long-term conservation outcomes.

Advancing blue citizen communities serves as one measure for extending awareness of ocean challenges to the grassroots level. This process requires translating macro-level policy frameworks into public participation and everyday practices, thereby embedding the principle of “harmony between humanity and the ocean” into community life. The development of blue citizen communities also provides a concrete pathway toward fostering greater cohesion across the Asia-Pacific region. It functions as an important mechanism for decentralizing ocean governance, stimulating local initiative, and mobilizing community-level innovation. As these communities take shape, new development scenarios centered on ocean culture, ecotourism, and sustainable aquaculture are expected to emerge. The indicator framework proposed in this report offers clear guidance for the development of blue citizen communities. It aims to support the cultivation of blue citizens and strengthen ocean literacy, and enhance community-level human well-being.

3.3 Application Principles and Evaluation Methodology of the Indicator Framework

Before detailing the specific composition of the blue citizen community indicator framework, it is essential to clarify its core application principles and evaluation methodology. The indicator framework is not intended to function as a tool for cross-economy or cross-community ranking. Communities differ widely in natural endowments, economic foundations, cultural backgrounds, and stages of social development. Direct horizontal comparison would therefore lack fairness and practical relevance. The core purpose of the framework is to act as a guiding tool that encourages vertical self-comparison and continuous improvement, while also supporting exchange and mutual learning among different communities.

The framework emphasizes guidance rather than mandatory evaluation. It provides a voluntary framework that enables communities to understand their current status, strengths, and weaknesses in building ocean literacy, and to identify priority areas for future development.

The framework also allows for flexible adaptation. Each economy and community may adjust its application of the twelve secondary indicators based on its characteristics and development priorities, selecting indicators that best correspond to local needs and realities.

In terms of evaluation methodology, a semi-quantitative approach is recommended for the initial phase. This approach does not prioritize precise numerical scoring. Instead, it focuses on assessing progress relative to a community's own historical baseline, alongside the actions and improvements aligned with the directions suggested by the indicators. The emphasis is on the extent of progress, including efforts to cultivate a blue citizen cultural environment, create sustainable consumption scenarios, strengthen marine conservation, and support community livelihoods and the blue economy.

To facilitate a semi-quantitative evaluation, this report recommends exploring the development of a grade-based assessment method for future application. This method could include three performance levels for each secondary indicator: "Foundational," "Good," and "Excellent." Each level would correspond to a clear and verifiable set of qualitative or quantitative descriptions. For example, for the indicator "Frequency of ocean cultural activities," the "Foundational" level may require at least one relevant event per year, the "Good" level may require diverse event types reaching different demographic groups, and the "Excellent" level may involve a regular annual event plan supported by a continuous community feedback mechanism.

Based on this approach, the report proposes a preliminary recommended standard for a Certified blue citizen community. A community should achieve a performance level of "Good" or "Excellent" on more than half of all applicable indicators, for example seven or more, and no indicator should fall below the "Foundational" level. This combination-based assessment method reflects overall performance while avoiding the limitations of single-score ranking. It provides communities with a clear and tiered pathway for improvement and offers stronger incentives for continuous progress on the journey toward becoming a blue citizen community.

3.4 Composition and Validation of the Primary Indicator Framework

Based on the five core elements of a community, namely population, territory, facilities, culture, and organization, and following the principle of multidimensional integration, this indicator framework translates the four conceptual dimensions of culture, ecology, economy, and society into four primary indicator dimensions. Together, they form a comprehensive assessment framework. The four primary indicators are:

Infrastructure and Environment, corresponding to the Ecology dimension and reflecting the community's spatial and ecological foundation.

Ocean Literacy and Actions, representing the individual-level expression of the Society and Culture dimensions and focusing on residents' ocean awareness and practical competence.

Policy and Management, representing the governance-level expression of the Society dimension and reflecting institutional support and management capacity.

Economy and Culture, integrating the Economy and Culture dimensions and reflecting the vitality of the blue economy and the community's cultural identity.

A questionnaire survey evaluated the relevance of these four primary indicators to the concept of a blue citizen community, using a scoring system in which Highly Relevant equals 3, Relevant equals 2, and Irrelevant equals 1. The mean scores for all four indicators exceeded 2.5, placing them within the high-relevance range and confirming the validity of the framework.

Among the indicators, Ocean Literacy and Actions received the highest score at 2.81, indicating strong expert consensus that enhancing ocean knowledge and practical engagement is the central priority for building blue citizen communities. Policy and Management followed at 2.69, underscoring the importance of institutional support. Infrastructure and Environment scored 2.55 and Economy and Culture scored 2.50, both viewed as essential material and developmental foundations. Together, these four primary indicators form the core architecture for blue citizen community development, and their relative priorities are affirmed by expert assessment.

Expert comments further substantiate the logical coherence of these findings. Respondents generally agreed that the four primary indicators are closely connected and mutually reinforcing. One expert summarized their internal relationship as follows: ocean literacy provides the central axis through which communities understand ocean value and participate in conservation, infrastructure and environment supply the material basis for action, policy and governance ensure continuity and long-term support, and economy and culture reinforce identity and strengthen the sustainability of community initiatives. Another expert emphasized that infrastructure and environment create the foundation for participation, ocean literacy and actions motivate individual responsibility, policy and management provide governance backing, and economy and culture link ocean health with livelihoods and traditions. These views demonstrate that the four primary indicators function as an integrated and coherent system, jointly forming a solid core structure for building blue citizen communities.

3.5 Design and Effectiveness Assessment of Secondary Indicators

Within the primary indicator framework, the framework is further developed into twelve secondary indicators, comprising eleven basic indicators and one special indicator for coastal communities.

3.5.1 Specific Composition of Secondary Indicators

The complete composition of the blue citizen community indicator framework is presented in Table 1.

Table1: Blue Citizen Community Indicators

Primary Indicators	Secondary Indicators
Infrastructure and Environment	Number of ocean-themed facilities
	Community eco-environmental quality
	Coastal marine environmental quality*
	Ocean accessibility
Ocean Literacy and Actions	Frequency of ocean cultural activities
	Frequency of other ocean-related activities
	Participation rate in ocean activities
Policy and Management	Number of ocean-related policies
	Share of ocean-related expenditure
	Public participation coverage
Economy and Culture	Share of ocean-related employment
	Community ocean brand development

The 12 secondary indicators and their specific measurement contents are as follows:

Primary Indicator 1: Infrastructure and Environment

(1) Number of ocean-themed facilities: The number of ocean-themed public facilities within the community, such as ocean science museums, ocean cultural plazas, and ocean ecological parks. The establishment of "Blue Citizen Community Service Centers" is encouraged to serve as core carriers for coordinating community marine affairs and facilitating resident participation.

(2) Community eco-environmental quality: An assessment of the community's implementation of separate drainage systems for rainwater and sewage, the effectiveness

of domestic wastewater collection and treatment, the provision of marine debris collection facilities, and the overall quality of the community's ecological environment.

(3) Coastal marine environmental quality: For coastal communities, this indicator assesses the quality of the surrounding marine environment, covering metrics such as seawater quality and marine ecosystem health that are directly relevant to community resilience and livelihood well-being. In archipelagic contexts, it is recommended to include key ecosystem metrics, such as trends in local mangrove or seagrass coverage, coral reef health status (e.g., bleaching index), and the marine debris density index for beaches and nearshore waters.

(4) Ocean accessibility: Measures the convenience of public access to high-quality waterfront areas (such as beaches and promenades), mangrove forests, wetland parks, and marine education bases in the community's vicinity.

Primary Indicator 2: Ocean Literacy and Actions

(5) Frequency of ocean cultural activities: This indicator records the annual number of ocean-related cultural and educational activities organized within the community. These include training sessions on the ocean literacy framework, capacity-building activities on marine conservation skills, and commemorative events for World Oceans Day or National Oceans Day. Regular implementation of such activities is intended to cultivate a robust marine cultural atmosphere and to strengthen residents' understanding, appreciation, and stewardship of the ocean.

(6) Frequency of other ocean-related activities: This indicator captures the number of practical, action-oriented activities conducted annually in the community. These activities may include beach clean-ups, coral conservation initiatives, water quality monitoring, marine biodiversity surveys, and community drills related to marine hazards such as tsunamis and storm surges. The indicator reflects the extent to which communities promote hands-on engagement and preparedness for marine environmental challenges.

(7) Participation rate in ocean activities: This indicator measures the proportion of community residents who join the Blue Citizen Service Volunteer Team and participate in marine environmental protection activities or ocean cultural education programs. The proportion is calculated relative to the total community population and reflects the breadth of public involvement in building a culture of ocean stewardship.

Primary Indicator 3: Policy and Management

(8) Number of ocean-related policies: This indicator refers to the number of marine conservation and development policies and plans formulated by the community or by the relevant local government that apply to the community.

(9) Share of ocean-related expenditure: This indicator measures the proportion of the community's total expenditure allocated to blue or ocean-related projects, including marine conservation, ocean literacy education, blue infrastructure maintenance, and the promotion of blue cultural initiatives.

(10) Public participation coverage: This indicator captures the proportion of residents participating in ocean governance and policy-related activities. Participation may include involvement in public hearings, online engagement platforms, volunteer services, and citizen science projects.

Primary Indicator 4: Economy and Culture

(11) Share of ocean-related employment: This indicator measures the proportion of community residents employed in blue industries, including marine fisheries, marine tourism, and marine technology, relative to the total community population.

(12) Community ocean brand development: This indicator assesses the community's efforts in identifying and promoting elements of traditional local marine culture and in developing distinctive marine product brands, ocean cultural brands, and a recognizable public brand image for the blue citizen community.

3.5.2 Effectiveness of Secondary Indicators

The questionnaire survey assessed the relevance of the twelve secondary indicators. The results show that all twelve indicators achieved mean scores above 2.30 on a three-point scale, placing them within the medium-high to high relevance range and indicating broad acceptance of the indicator set.

"Coastal marine environmental quality" (mean=2.76) and "Community eco-environmental quality" (mean = 2.64) received the highest ratings, reflecting the fundamental importance of environmental conditions in building blue citizen community. They were followed by "Participation rate in ocean activities" (mean = 2.57) and "Number of ocean-related policies" (mean=2.53), representing two key drivers of individual engagement and institutional support. "Ocean accessibility" (mean=2.53) also received consistent recognition, with no respondent rating it as Irrelevant, indicating its broad applicability across diverse community contexts.

Expert comments further supported the completeness and internal coherence of the secondary indicators. One expert observed that "the proposed secondary indicators provide a comprehensive assessment of a blue citizen community. Environmental quality and citizen participation are the two core pillars, while economic and cultural indicators ensure sustainability and a sense of belonging." This observation aligns with the survey results in which ecological conditions and public participation emerged as central components. Experts also emphasized the importance of maintaining balance among all indicators and avoiding the elevation of economic considerations at the expense of conservation and ocean literacy. Another expert noted that "the government plays an important role in providing budgets for coastal infrastructure," pointing directly to the feasibility of indicators such as "Share of ocean-related expenditure" and underscoring the role of government support in implementation.

3.5.3 Data Accessibility of Secondary Indicators

The practical feasibility of the indicator framework is closely tied to the availability of relevant data. The survey specifically evaluated this aspect using a three-point scale in which Easy

equals 3, Medium equals 2, and Hard equals 1. The results indicate an overall positive trend and show that the indicator framework has a solid data foundation.

The survey findings reveal that “Number of ocean-themed facilities” (mean = 2.41) and “Number of ocean-related policies” (mean = 2.26) received the highest scores for data accessibility. More than 44 percent of respondents rated the data required for these two indicators as Easy to obtain, reflecting the relatively mature statistical systems for public facilities and the transparency of policy dissemination. These results provide a strong basis for subsequent baseline assessments.

Most indicators were rated in the medium accessibility category. Eight indicators received more than 50 percent of responses in this category, ranging from “Community eco-environmental quality” to “Community Ocean brand development.” This suggests that although data collection requires coordination and effort, it remains feasible. Existing datasets, data management practices, and the willingness of stakeholders to share information contribute to this feasibility. For example, indicators such as “Coastal marine environmental quality” (mean=2.26), “Ocean accessibility” (mean=2.21), and “Frequency of ocean cultural activities” (mean=2.17), while presenting certain challenges, can still be assessed using currently available tools and resources.

Expert comments further identified factors influencing data accessibility. One expert noted that “the establishment of a coastal infrastructure database depends on the government's ability to introduce relevant budget policies,” highlighting the close link between data infrastructure development and government policy and financial support. This observation relates directly to the practicality of indicators such as “Share of ocean-related expenditure.”

Overall, the evaluation suggests the operational feasibility of the indicator framework. Most indicators have at least moderate data availability, providing a foundation for monitoring and evaluating blue citizen community. For indicators with relatively lower accessibility, future improvements may be achieved through expanding shared data platforms, aligning data collection standards, and refining data management procedures to support the long-term development of blue citizen community.

3.5.4 Prospects for Promoting Blue Citizen Community Development

To further assess the overall rationality of the indicator framework and the significance of building blue citizen community, the final part of the questionnaire addressed the necessity, benefits, feasibility, and support needs. The survey results clearly indicate broad prospects and specific pathways for promoting blue citizen community within the APEC region.

On the necessity of promotion, 65.52% of respondents believe it is “very necessary” to promote blue citizen community in their economies, with another 27.59% considering it “necessary.” In total, over 93% of respondents hold a positive attitude. This demonstrates a broad consensus among the public and experts in the APEC region for advancing the construction of blue citizen community.

As for the expected benefits, “Promote marine ecological protection” (89.66%) and “Improve residents' ocean literacy” (77.59%) received the highest recognition. Expert comments further

elaborated on the comprehensive benefits, with one expert stating: “The construction of blue citizen community will integrate the social, environmental, and economic dimensions of coastal development. Such communities will enhance public environmental awareness, encourage citizen participation in sustainable ocean management, and inspire innovation in responsible economic activities.” Concurrently, “Support the development and implementation of blue economy policies” (74.14%) and “Boost community economic vitality” (72.41%) were also widely endorsed. An expert specifically mentioned that “marine tourism is the most convenient way to promote community investment,” which corroborates feedback from Indonesia that “the development of tourism is closely linked to all community actions,” highlighting the potential of blue citizen community in driving local sustainable economic development. Furthermore, experts emphasized their demonstration effect, believing that blue citizen community “will provide valuable experiences that can be replicated in other APEC economies, helping to achieve more inclusive and effective ocean governance.”

Regarding the implementation feasibility, over 74% of respondents view implementation as “somewhat feasible (additional support is needed),” with another 7.27% considering it “very feasible.” This indicates that while the construction of blue citizen community is feasible in many APEC economies, external support is generally required. Expert comments provided specific context for “somewhat feasible,” with one expert stressing that “implementing this concept requires political support.” The case from Peru was more detailed: “With abundant marine resources and accumulated experience in community fisheries management and coastal protection, building blue citizen community is entirely feasible. However, additional support is still needed in terms of funding, local community capacity building, and the generation of accessible data and information.” This clearly points out that feasibility is based on local resources and experience, while the conditions depend on the availability of external support.

In terms of required support, “Funding support” (93.10%) and “Policy support” (82.76%) were identified as the two most critical pillars. Experts provided a summary, suggesting that the construction of blue citizen community “requires a comprehensive approach”: first, “it is essential to strengthen the regulatory framework to secure sustainable funding for education and conservation projects”; second, “facilitate community participation and project implementation through capacity building and the provision of technical resources”; and finally, “building partnerships among government, academia, the private sector, and civil society will be key to consolidating these initiatives in the long term.” This comprehensive support framework provides a clear direction for future APEC and member economy policies.

In summary, this survey demonstrates a degree of consensus, relevance, and feasibility of the blue citizen community concept and its indicator framework within some economies of the APEC region. The indicator framework is not only structurally sound and comprehensive in content but also has good data accessibility, making it a tool that can effectively guide future community practices.

4. Case Studies and Insights from Coastal Cities and Communities

While the concept of the "blue citizen community" and its indicator framework are still in the development phase, many coastal cities and communities within the APEC region, have already implemented numerous innovative and effective practices to enhance ocean literacy and promote marine conservation. Although these initiatives may not have been carried out under the label of "blue citizen community," their core principles align closely with the goals outlined in this report, collectively aiming towards the harmonious coexistence of humanity and the ocean.

This chapter seeks to review and present a selection of representative international best practices. These cases primarily stem from the best practices recommended and submitted by experts and stakeholders from various economies during the questionnaire survey for this report. The goal in selecting these cases is to provide experiences for APEC economies as they plan build their own blue citizen communities. By analyzing successful approaches in areas such as policy formulation, community mobilization, public-private partnerships, technology application, and cultural heritage, this chapter highlights the diverse pathways for realizing the blue citizen community concept across different geographical, cultural, and economic contexts.

These cases serve as an empirical complement to the indicator framework developed in this report. Their primary role is to create a practical knowledge base for reference. By studying these pioneering experiences, economies can gain insights into how to localize their own practices, thereby more effectively translating the vision of a blue citizen community into sustainable development actions suited to their unique conditions.

4.1 Chile: "Centinelas del Mar" Program

4.1.1 Case Overview

"Sentinels of the Sea" (Centinelas del Mar) is an economy-wide initiative launched and led by Chile's National Fisheries and Aquaculture Service (SERNAPESCA). The program has been implemented in several coastal regions, including Aysén and Los Ríos. Its core objective is to establish a volunteer-based coastal monitoring network by training and certifying community members. This network aims to strengthen early warning systems and information reporting capabilities for marine ecosystems, aquaculture activities, and marine animal stranding events. The program addresses challenges such as illegal fishing, environmental pollution, and climate change affecting coastal areas. In addition to SERNAPESCA, the program involves a broad coalition of local universities (e.g., the Catholic University of the Most Holy Conception, UCSC), aquaculture enterprises, fisher associations, tourism operators, and community residents passionate about marine conservation, forming a multi-stakeholder governance model.

Fig 1: SERNAPESCA Certifies 10 Individuals as “Sentinels of the Sea”

4.1.2 Key Initiatives and Practices

The core of the “Sentinels of the Sea” program is a standardized training and empowerment process. SERNAPESCA provides professional citizen science training courses that cover the identification of common local marine species, standard response procedures for marine animal stranding events, methods for observing and recording abnormal environmental conditions in coastal zones, and basic legal regulations related to fisheries and marine conservation. Volunteers who complete the training and pass the assessment are officially certified as “Sentinels of the Sea.” This certification grants them the status of official community liaisons for SERNAPESCA, enabling the faster initiation of official responses and investigation procedures based on the reports they submit. The program goes beyond individual training; it aims to establish a long-term collaborative network between government agencies and community members. Through regular communication and information exchange, it strengthens mutual trust and cooperation in marine governance.

4.1.3 Outcomes and Impacts

While the program is still in its rollout phase, it has already achieved significant initial results in several regions. To date, dozens of “Sentinels of the Sea” have been successfully certified in areas such as Aysén and Los Ríos, establishing a preliminary community monitoring network covering extensive coastlines. Timely reports from sentinels have allowed SERNAPESCA to detect and respond more quickly to marine animal strandings and signs of illegal fishing, significantly enhancing regulatory efficiency and emergency response capabilities. More importantly, community members participating in the program—including students, fishers, and tourism operators—have gained increased marine science knowledge and environmental protection awareness through training. Official certification has also fostered a greater sense of community responsibility and enthusiasm for participating in marine governance.

4.1.4 Inspirations for Blue Citizen Community Building

The key inspiration drawn from Chile’s “Sentinels of the Sea” program lies in its government-

empowered community participation model. This model provides a vivid illustration of how several key indicators within the proposed framework can be effectively implemented in practice.

In particular, the program excels in the primary indicator of Ocean Literacy and Actions. The training it provides to volunteers directly aligns with Indicator 5, “Frequency of ocean cultural activities,” specifically marine conservation skills training. The ongoing coastal monitoring conducted by these volunteers forms the core content of Indicator 6, “Frequency of other ocean-related activities.” These initiatives contribute to the improvement of Indicator 7, “Participation rate in ocean activities.” In the primary indicator of Policy and Management , the program, as an economy’s initiative led by SERNAPESCA, directly corresponds to Indicator 8, “Number of ocean-related policies.” Furthermore, by establishing official certification and formal communication channels, the program significantly enhances Indicator 10, “Public participation coverage,” integrating community members into the official marine governance network. The model combines top-down empowerment with bottom-up participation, emphasizing the importance of strong policy support and management mechanisms. By granting participants the status of certified sentinels, the program assigns them clear responsibilities and channels for action, effectively creating a closed loop from knowledge to practice. This integrated approach, linking individual literacy, collective action, and official governance, offers a valuable reference framework for the future development of blue citizen communities.

4.2 China: Xiamen Haicang Bay Community as a New Marine Urban Area

4.2.1 Case Overview

This section presents the case of the Haicang Bay Community in Xiamen, China, located along the scenic Haicang Avenue on Dongyu Island. The community oversees six modern residential complexes and three business parks. It benefits from convenient transportation and comprehensive public facilities, including cultural venues such as Haicang Bay Park, a children’s park, Jinsha Academy, fitness trails, and strip parks, as well as educational resources spanning kindergartens, primary schools, and secondary schools. The community is rich in pro-ocean resources, including Haicang Lake, mangrove forests, a wooden boardwalk, Haicang Bay Park, and Tidal Park. It also carries a deep cultural heritage that encompasses Min-Tai culture, Maritime Silk Road culture, and ocean culture. Guided by a people-centered approach, the community organizes a wide range of ocean-themed cultural activities, including neighborhood festivals, artistic performances, family events, and public lectures, continuously enhancing residents’ sense of well-being and fulfillment through their connection with the ocean.

Fig 2: Ship Model Making Summer Camp Activity

Fig 3: Drowning Prevention Safety Education Lecture

Fig 4: Inauguration of the Community Blue Citizen Service Station

Fig 5: China-Thailand Blue Citizen Public Activity

4.2.2 Key Initiatives and Practices

The Haicang Bay Community has established a Blue Citizen Service Platform as a foundation for enhancing residents' ocean literacy. Key initiatives include the creation of a blue citizen community Service Centre to coordinate marine-related affairs and meet diverse resident needs; the development of a one-stop integrated service platform; the formation of a stable and diverse Blue Citizen Volunteer Team composed of experienced community workers, enthusiastic residents, and professionals with specialized knowledge, who conduct regular marine environmental protection and science education activities; and the promotion of a collaborative mechanism involving families, schools, the community, and enterprises to advance marine conservation.

Since the launch of the blue citizen community pilot project, the Haicang Bay Community, in cooperation with Jinsha Academy, has hosted marine science and technology exhibitions that provide residents with engaging demonstrations of China's latest marine technological achievements. The community has drawn on the expertise of universities and research institutes to offer ocean knowledge education for local students and children, nurturing their curiosity and aspiration for ocean exploration. It has participated in joint China-Thailand Blue Citizen Public Activities and marathon blue ribbon mangrove planting events to promote mangrove conservation. Ship model making summer camps and practical workshops have enriched residents' ocean cultural experiences. Regular "Clean Beach, We Act Together" campaigns have mobilized more than 300 volunteers to clean five kilometers of coastline, contributing to significant environmental improvements and increased public awareness of marine protection. A series of "Prevent Drowning, Stay Safe" safety education lectures and practical drills have also strengthened residents' awareness of maritime safety and self-rescue capabilities.

4.2.3 Outcomes and Impacts

Through sustained implementation of the above initiatives and collaborative measures, the Haicang Bay blue citizen pilot community has achieved notable initial results. The one-stop Blue Citizen Community Service Centre has significantly improved the efficiency of managing marine-related affairs. The continuous operation of the volunteer team has expanded the reach and influence of activities. The collaborative mechanism among families, schools, the community, and enterprises has strengthened social synergy for marine conservation. A variety of themed activities, including marine science exhibitions, mangrove planting, and ship model summer camps, have enriched residents' ocean cultural experiences and enhanced ocean literacy and environmental awareness across age groups. The beach clean-up campaigns have cumulatively cleaned five kilometers of coastline, improving the coastal environment. Safety education lectures and drills have strengthened residents' capacities for self-rescue and maritime risk prevention. These activities have contributed to the establishment of a community-based practice for enhancing ocean literacy.

4.2.4 Inspirations for Blue Citizen Community Building

The key insight from the Xiamen Haicang Bay Community case is its integrated work model

combining marine literacy education, cultural experience, environmental protection, and safety management. The establishment of the Blue Citizen Community Service Center and Blue Citizen Volunteer Teams, along with efforts to cultivate an ocean literacy atmosphere, offers a comprehensive practical example for multiple dimensions of the indicator framework presented in this report.

In the primary indicator of Infrastructure and Environment, the community has enhanced Indicator 1, "Number of ocean-themed facilities," by developing mangrove boardwalks and opening science venues such as the marine technology exhibition at Jinsha Academy. It has transformed a previously simple coastline into a high-quality public space, improving Indicator 4, "Ocean accessibility." Regular beach clean-ups and mangrove conservation activities contribute to the improvement of Indicator 2, "Community eco-environmental quality."

In the primary indicator of Ocean Literacy and Actions, initiatives such as marine science exhibitions, ship model summer camps, China-Thailand public activities, and safety education lectures directly contribute to Indicator 5, "Frequency of ocean cultural activities." Beach clean-ups and mangrove planting efforts align with Indicator 6, "Frequency of other ocean-related activities." Together, these initiatives encourage greater resident participation, thereby strengthening Indicator 7, "Participation rate in ocean activities."

The value of this case lies in its establishment of a sustainable development loop led by the community, driven by multi-stakeholder collaboration, and benefiting both the ecosystem and residents. The community serves as a central hub that connects government departments, research institutions, enterprises, and social organizations, integrating dispersed public resources into a coherent governance force. This supports the enhancement of Indicator 10, "Public participation coverage." By integrating ecological conservation, civic education, and quality of life, the Xiamen experience offers an important model for how coastal cities can cultivate knowledgeable, responsible, and engaged blue citizens.

4.3 Indonesia: Mangrove Conservation Area at SMA Negeri 8 Balikpapan

4.3.1 Case Overview

This case is located in Balikpapan, East Kalimantan, Indonesia, centered around a mangrove conservation area established in collaboration with SMA Negeri 8 Balikpapan (State Senior High School 8 of Balikpapan). The conservation area was officially established by a decree from the Indonesian Ministry of Environment in 2008, with the goal of protecting a vital urban mangrove ecosystem to support biodiversity and mitigate coastal erosion. The key stakeholders in the project form a typical tripartite collaborative alliance, including SMA Negeri 8 as the educational institution, the Balikpapan Environmental Agency (BLH) as the government regulatory body, and local community residents, who jointly share responsibility for the conservation and sustainable management of the area.

Fig 6: Mangrove Education in SMA 8 Balikpapan

Fig 7: Type of Vegetation within the Mangrove of SMA 8 Balikpapan

4.3.2 Key Initiatives and Practices

The successful operation of this conservation area can be attributed to the integration of several key initiatives. Firstly, at the ecological conservation level, the area provides an essential habitat for the proboscis monkey (Nasalis larvatus), endemic to Kalimantan, as well as various bird species, including the Blue-collared Kingfisher, Common Iora, and Little Heron. Records show that eight species of mangroves grow within the site, playing a crucial role in maintaining regional ecological stability. Secondly, at the environmental education level, SMA Negeri 8 has fully integrated the mangrove area into its campus environment and teaching activities, with

the towering mangrove trees becoming a prominent feature of the school. The conservation area serves as an “outdoor learning facility,” providing both students and the public with direct environmental education resources. Lastly, in terms of community accessibility and management, the area has been developed into a conservation-based tourism site, open to the public free of charge, through the construction of infrastructure such as wooden walkways. Management has established clear visitor rules, such as maintaining cleanliness and prohibiting the removal of natural objects, ensuring the integrity and long-term sustainability of the ecosystem.

4.3.3 Outcomes and Impacts

After years of collaborative management, the mangrove conservation area has achieved positive results across multiple aspects. It has successfully protected a valuable urban wetland ecosystem in Balikpapan, preserving its rich biodiversity, and notably providing a sanctuary for the endangered proboscis monkey. At the same time, the project has become a popular environmental education hub and community ecotourism site, increasing environmental awareness among students and the public. More importantly, it offers a practical example of youth engagement in mangrove conservation and restoration initiatives. The management model promotes biodiversity protection, raises environmental awareness, and fosters sustainable community livelihoods through ecotourism and mangrove-related products.

4.3.4 Inspirations for Blue Citizen Community Building

The core inspiration from the SMA Negeri 8 Balikpapan mangrove conservation area case lies in its innovative “education-government-community” tripartite collaborative co-management model, demonstrating that educational institutions can serve as both physical spaces and practical centers for community-driven ecological conservation. This model presents a unique pathway for implementing several key indicators within the proposed framework.

In the primary indicator of Infrastructure and Environment, the mangrove conservation area itself serves as a high-quality example of Indicator 1, “Number of ocean-themed facilities.” By constructing wooden walkways and offering free public access, the area significantly enhances Indicator 4, “Ocean accessibility.” Additionally, the effective conservation of the mangrove ecosystem directly contributes to improving Indicator 3, “Coastal marine environmental quality.”

In the primary indicator of Ocean Literacy and Actions, the school uses the conservation area as an "outdoor learning facility" to conduct environmental education, representing an innovative approach to Indicator 5, “Frequency of ocean cultural activities.” This model seamlessly integrates environmental education, ecological protection, and community development, offering an innovative framework for other economies to explore how existing public resources, such as schools, can be leveraged to promote community ocean literacy.

Furthermore, by transforming the conservation area into a public space that enhances residents' sense of well-being and environmental identity, this case successfully balances ecological conservation with community development. This integrated method of converting ecological

assets into educational and community assets provides a replicable example for building a blue citizen community where humans and nature coexist in harmony. It also holds the potential to indirectly support Indicator 11, “Share of ocean-related employment,” and Indicator 12, “Community ocean brand development,” through activities like ecotourism.

4.4 Japan: Ocean Education Pioneer School in an Inland City

4.4.1 Case Overview

This case originates from Japan's “Ocean Education Pioneer School Program” (PSP), a grant initiative launched in 2016 by The Nippon Foundation, the Ocean Policy Research Institute of the Sasakawa Peace Foundation, and the Center for Ocean Literacy and Education at the University of Tokyo. The program supports kindergartens and schools across Japan by funding the development of teaching materials and covering expenses for hands-on activities related to ocean education. By fiscal year 2025, 1,695 schools had participated, with 628 actively involved. While nearly half of the participating schools are located near the coast, a unique aspect of the program is the inclusion of schools in mountainous towns far from the ocean. These inland schools successfully conduct ocean education by focusing on their community's connection to the sea, through activities such as cleaning local rivers to prevent plastic debris from entering the ocean and studying historical and cultural routes from the mountains to the sea.

4.4.2 Key Initiatives and Practices

This case study focuses on one such inland school, Gifu Municipal Nagara Nishi Elementary School. Participating in the PSP since 2022, the school is located in a region that is a significant source of marine debris for Ise Bay. The school's key initiative is to build a cross-regional collaborative learning model centered on the global challenge of "marine debris." Students learn about cooperative responses and sustainability perspectives by engaging with the “22nd Century Nasa Beach Project Committee,” which operates at Nasa Beach on Toshijima Island, Mie Prefecture. They collaborate with students from Yokkaichi Municipal Kusunoki Elementary School, located on the coast of Ise Bay, to conduct on-site beach clean-ups and investigations, jointly exploring practical solutions to the marine debris problem. This approach transcends a singular focus on either “preventing discharge” or “cleaning beaches.” By having inland students travel to the coast to investigate the types and origins of debris, it enables them to fully understand the entire impact chain of human activities through rivers and the sea, thereby internalizing the ocean issue as “their own problem.”

4.4.3 Outcomes and Impacts

Through a series of practical activities, students at Nagara Nishi Elementary School have achieved significant learning outcomes and enhanced awareness. Using the geographical location of Toshijima Island and the currents of Ise Bay as clues, the students deeply investigated the reasons why marine debris drifts ashore and understood the close connection

of their own community to the ocean through the river system. In their own discussions, they treated the community's waste discharge process as a personal issue and collaboratively proposed solutions. These learning outcomes were extended during summer vacation through activities such as researching marine debris issues in other regions and creating marine debris art. Subsequently, students participated in a lecture by a university professor on the coastline of Yokkaichi City and conducted a beach clean-up with local elementary school students, sharing the solutions they had previously devised. These real-world social participation and problem-solving experiences greatly enhanced their awareness of marine debris issues and gave them a sense of connection and involvement with society.

4.4.4 Inspirations for Blue Citizen Community Building

The practice of Nagara Nishi Elementary School offers profound inspiration on how to cultivate ocean literacy in inland areas for the construction of a blue citizen community. The core experience of this case is that by focusing on tangible evidence (like debris) that connects the local environment (rivers) with the distant ocean, it is possible to effectively establish a personal connection between children and ocean issues, even without direct access to the sea. This suggests that identifying and utilizing "tangible objects" that concretely demonstrate the human-ocean relationship is crucial for building a blue citizen community in inland areas.

This case provides an innovative practical pathway for the primary indicator of Ocean Literacy and Actions. The students' cleanup actions in local rivers directly improve Indicator 2, "Community eco-environmental quality," and make a cross-regional contribution to Indicator 3, "Coastal marine environmental quality," by reducing the source of marine debris. The cross-regional collaborative learning and beach clean-ups organized by the school are an extended application of Indicator 6, "Frequency of other ocean-related activities," proving that a community's boundaries can transcend geographical limits. The students' transformation of learning outcomes into solutions for sharing demonstrates a deepening of Indicator 7, "Participation rate in ocean activities," from passive participation to active creation. Furthermore, the case underscores the critical role of experts in guiding public understanding of ocean issues, emphasizing the need for dialogue to jointly explore the ocean's importance. This method of combining local action, cross-regional cooperation, and expert guidance provides valuable experience for promoting the blue citizen community concept across a wider geographical scope.

4.5 Peru: Sustainable Fisheries and Environmental Governance Projects in Coastal Communities

4.5.1 Case Overview

This case provides a comprehensive overview of several initiatives promoted in the southern coastal regions of Peru aimed at enhancing community marine governance capacity. These initiatives are led or supported by institutions such as the Ministry of Production of Peru

(PRODUCE) and the CAF—Development Bank of Latin America, in close collaboration with local artisanal fisher organizations (OSPAs) and community members. The projects are set against the backdrop of numerous challenges faced by local communities, including overfishing, marine debris pollution, limited ocean literacy, and the vulnerability of traditional fishing livelihoods. The core objective is to facilitate the transition of artisanal fisheries towards a sustainable model, improve the livelihoods of fishers, and promote the conservation and restoration of marine ecosystems through scientific research, technology transfer, community capacity building, and public awareness initiatives.

4.5.2 Key Initiatives and Practices

Peru's practices have implemented a comprehensive set of interventions, integrating ecological restoration, environmental governance, and community empowerment.

To address the decline of key species such as sea urchins and seaweed, relevant projects have introduced species restoration and sustainable aquaculture techniques. By establishing community-managed hatcheries and promoting “long-line” aquaculture models, these projects not only aid communities in restoring depleted fishery resources but also provide new, sustainable sources of income.

To combat the growing issue of marine debris, the Ministry of Production of Peru launched a economy wide underwater clean-up campaign called “My Sea, My Home” (Mi mar, mi hogar). In areas such as Morro Sama in the Tacna region, this campaign mobilized local artisanal fishers and diver associations, utilizing their boats and professional skills to conduct large-scale clean-ups of solid waste from the seabed. For instance, in one event, community members used 15 boats to successfully remove over 6 tons of underwater debris.

The projects have also provided technical training to over 600 artisanal fishers, covering topics such as species aquaculture, resource management, environmental impact assessment, and solid waste management. Additionally, fisher representatives were organized to visit economies like Chile for exchange programs, drawing on advanced practices to significantly enhance the community's scientific knowledge and management capacities.

All initiatives have successfully established effective dialogue and collaboration mechanisms among government agencies, research institutions, local governments, and community organizations. During the “My Sea, My Home” campaign, the Vice Minister of Production personally participated, emphasizing that it is “an initiative that allows us to align efforts with guilds, fishers, divers, civil society, and regional governments,” highlighting a multi-stakeholder governance model.

4.5.3 Outcomes and Impacts

These projects have achieved significant social, economic, and ecological outcomes. At the ecological level, species restoration efforts have effectively facilitated the recovery of local marine ecosystems, while marine clean-up campaigns have directly reduced solid waste in the marine environment, thereby improving the ecological health of nearshore waters. At the social

level, the capacity of over 53 fisher organizations has been strengthened, significantly enhancing the community's organization and autonomy in participating in marine governance. At the economic level, the introduction of sustainable aquaculture and improvements in product quality have expanded and stabilized the income sources of fishers. Most importantly, these projects have fundamentally changed the mindset of the fishers. As one participant stated, "We are no longer predators. Now, we are cultivators; we are the protectors of our ecosystem." Simultaneously, the clean-up campaigns have greatly enhanced the sense of responsibility and pride among fishers as guardians of the ocean.

4.5.4 Inspirations for Blue Citizen Community Building

The core insight from Peru's comprehensive project lies in its livelihood-focused community transition and governance model. It demonstrates that linking marine conservation directly to the economic interests of the community is crucial for driving long-term conservation efforts. This case offers valuable practical support for the indicator framework, particularly the primary indicator of Economy and Culture.

By introducing sustainable aquaculture practices, the project directly impacts Indicator 11, "Share of ocean-related employment," creating new and sustainable income sources for fishers and improving their livelihoods. Additionally, by enhancing product quality and connecting with high-end markets, the project has established a new value chain for the community, laying the foundation for Indicator 12, "Community Ocean brand development." This approach of combining economic transition with ecological restoration demonstrates that improving community economic well-being is key to sustaining long-term environmental protection efforts.

The case also highlights the importance of other indicators. The community-led underwater clean-up campaigns provide a strong example of Indicator 6, "Frequency of other ocean-related activities," while the technical training and knowledge dissemination align with Indicator 5, "Frequency of ocean cultural activities." By establishing a robust multi-stakeholder collaboration platform, the project ensures that community efforts are supported by government policies (Indicator 8), scientific research, and market resources, creating a virtuous governance ecosystem. This integrated approach combining economic transition, community empowerment, and multi-stakeholder collaboration offers a valuable model for building a blue citizen community that is both economically sustainable and ecologically resilient.

4.6 The Philippines: "Resilient Coasts" Initiative

4.6.1 Case Overview

RESILIENT COASTS: Strengthening Climate Resilience and Disaster Risk Management in Coastal Communities of Catanduanes Island is a community extension project initiated by the College of Science at Catanduanes State University in the Philippines. The project focuses on addressing the high vulnerability of coastal communities on Catanduanes Island to the impacts of climate change, such as sea-level rise and extreme weather events, due to their geographical

location. Through a comprehensive assessment of community needs, the project aims to bridge gaps in adaptive capacity and climate change awareness, with the ultimate goal of fostering climate-resilient, adaptive, and sustainable coastal communities. Key participants in this initiative include the university's project team, local communities (Barangays), residents (including fisherfolk, women's groups, and youth), and local government officials.

Fig 8: Community Awareness and Education Campaign in Coastal Communities of Catanduanes Island

4.6.2 Key Initiatives and Practices

The project follows a phased approach, establishing a strong foundation for long-term resilience through community engagement and capacity-building initiatives. Key actions include:

Community Needs and Vulnerability Assessment: During the pre-implementation phase, a comprehensive assessment was conducted to evaluate the community's perception of climate change, its vulnerabilities, available resources, and knowledge levels. This process employed participatory methods, including community-level coastal risk assessments (e.g., Multi-Criteria Analysis, MCA), household carbon footprint calculations, and communication resource mapping. These assessments provided a data-driven foundation for the development of subsequent interventions.

Enhancing Climate Change Awareness: To address the community's limited understanding of climate change impacts, the project team implemented a three-day pilot capacity-building and awareness campaign. Through a series of lectures and interactive learning sessions, the initiative enhanced residents' knowledge of climate change, its causes, and its specific impacts on coastal regions.

Community-Driven Solution Formulation: This project emphasizes not only one-way knowledge transfer but also collaborative solution development. In workshops, community members identified the primary local disaster risks—such as typhoons, storm surges, and coastal erosion—and collectively proposed tailored solutions aimed at reducing the community's carbon footprint. These solutions covered various sectors, including energy efficiency, transportation, and waste management.

Establishing Formal Partnerships: The project team formalized a partnership with the target communities (including Barangays Batag, Balite, and Magnesia) by signing a Memorandum of Agreement (MOA). This three-year partnership establishes an institutional framework to ensure the sustained implementation of the project and continuous community participation over the long term.

4.6.3 Outcomes and Impacts

Although the project is still in its early stages (having started in the third quarter of 2024), it has already achieved significant quantitative results in raising community awareness. In the pilot information campaign conducted in Barangay Balite, a pre-test and post-test analysis showed that participants' overall knowledge of climate change increased by 87.8%, and a paired T-test confirmed that this difference was statistically significant. This strongly demonstrates the effectiveness of the participatory education methods used in the project. Furthermore, through risk assessment and resource mapping, the project has successfully helped the community identify key local disaster risks and communication channels, laying a solid foundation for establishing a community-level disaster risk management system.

4.6.4 Inspirations for Blue Citizen Community Building

The primary inspiration drawn from the Philippines' "Resilient Coasts" initiative lies in its data-driven, community-centered approach to resilience. The initiative underscores the importance of rigorous scientific assessment at the outset to ensure that community projects effectively address real-world challenges. The project began with a thorough scientific evaluation of the community's vulnerabilities and needs, ensuring that subsequent interventions were precisely targeted and highly relevant.

This project offers practical insights across several indicators of the indicator framework. The capacity-building and information campaigns conducted by the project directly contribute to enhancing community climate literacy, aligning with Indicator 5, "Frequency of ocean cultural activities". By linking climate change directly to residents' daily lives (e.g., reduced fish catch) and safety (e.g., disaster risks), the project effectively stimulated the community's willingness to engage and take action, thus advancing Indicator 7, "Participation rate in ocean activities".

Moreover, the project encourages the community to independently identify disaster risks and propose solutions through workshops, a practice that exemplifies Indicator 10, "Public participation coverage." This reflects the community's autonomy and creativity. The community disaster drills organized by the project also correspond to Indicator 6, "Frequency of other ocean-related activities." This integrated approach, which empowers the community

and fosters co-creation of solutions, provides valuable lessons for building a blue citizen community that is both adaptable and capable of self-directed development.

4.7 Chinese Taipei: “Building a Model for Ocean Literacy and Upgrading Marine Industry Talent” Initiative

4.7.1 Case Overview

This case represents a government-led, economy-wide, medium- to long-term ocean literacy education initiative in Chinese Taipei. The program, titled “Building a Model for Ocean Literacy and Upgrading Marine Industry Talent,” will be officially launched by the Ocean Affairs Council in 2025. Spanning four years, the initiative has a total investment of approximately USD 12.7 million. The primary goal of this program is to deepen and expand ocean literacy education throughout society, fostering a new generation of citizens who can coexist harmoniously with the ocean and take proactive measures to protect it. The key participants in this initiative include the leading government agency, education departments at all levels, schools, as well as teachers and students.

Fig 9: Seed Teachers Gaining Practical Experience in Ocean Literacy Experimental Teaching

4.7.2 Key Initiatives and Practices

The implementation of this initiative focuses on the formal education, promoting ocean literacy through teacher training and curriculum reform. Key initiatives include:

Seed Teacher Training: At the core of the initiative is the training of a cohort of "seed teachers" who are well-versed in the key concepts of ocean literacy and capable of effectively applying relevant teaching materials. Through the empowerment of teachers, the initiative aims to ensure that ocean literacy education is delivered to a high standard and consistently applied across schools.

Introduction of an Inquiry-Based Curriculum: The initiative adopts the inquiry-based "Ocean Science Sequence" (OSS) curriculum, which was developed in the United States. This curriculum encourages students to learn through experimentation, hands-on activities, exploration, and verification. The objective is not only to deepen students' understanding of ocean knowledge but also to foster an attitude of humility and gratitude towards the ocean.

Rooting in Basic Education: The initiative emphasizes embedding ocean literacy education from the basic education stage and gradually expanding it. By incorporating ocean knowledge into the compulsory education curriculum, it ensures that every student receives ocean-related content throughout their educational journey.

4.7.3 Outcomes and Impacts

As the initiative is set to officially launch in 2025, it is currently in the preparatory phase, and specific quantitative outcomes will require long-term monitoring. However, its expected impacts are both far-reaching and systemic. The initiative is anticipated to significantly improve the younger generation's understanding of and care for the marine environment, thereby establishing a solid social foundation for achieving sustainable marine development goals. Through the cultivation of talent for the marine industry, the initiative will also provide human resource support to enhance the competitiveness and sustainability of related sectors. As a large-scale, long-term government investment project, it has already conveyed a clear policy-level commitment to integrating ocean literacy into the core educational agenda.

4.7.4 Inspirations for Blue Citizen Community Building

The core inspiration drawn from the Chinese Taipei initiative lies in its top-down, educational empowerment model, which underscores the crucial role of government-led macro-level planning in ensuring the breadth and depth of ocean literacy education. This model provides a compelling practical example for the primary indicator of Policy and Management.

Through substantial financial investment and long-term strategic planning, the initiative directly reflects the strategic application of Indicator 9, "Share of ocean-related expenditure," and the planning of Indicator 8, "Number of ocean-related policies." By integrating educational resources, the government ensures a level of ocean literacy education that is difficult for fragmented community projects to replicate. Additionally, the case highlights the central role of "teacher empowerment" in ocean literacy education. By training "seed teachers," the initiative establishes a professional teaching force, which is critical to the effective implementation of Indicator 5, "Frequency of ocean cultural activities" (specifically, knowledge lectures and skills training) at the school level. Finally, by adapting a well-established international curriculum system to local contexts, the initiative provides a replicable

model for other economies to develop their own localized ocean literacy curricula efficiently. This strategic approach, focused on the formal education system and cultivating future blue citizens from the outset, establishes a solid foundation of talent and culture for the long-term, sustainable development of a blue citizen community.

4.8 Thailand: Seagrass Restoration Project through Multi-Sectoral Collaboration

4.8.1 Case Overview

This case represents a government-led, economy-wide project in Thailand aimed at restoring degraded seagrass ecosystems. The initiative is being led by the Marine and Coastal Resources Research and Development Institute and is being implemented across eight coastal provinces, including Chanthaburi, Rayong, and Trang. The core objective of the project is to restore seagrass beds that have been degraded due to human activities and environmental changes. Seagrass ecosystems are vital for providing food and habitat for endangered species such as dugongs and sea turtles, stabilizing sediments, and sequestering carbon. The project aligns with Thailand's 20-Year National Strategic Plan, enhancing the resilience and biodiversity of marine ecosystems through multi-sectoral collaboration.

Fig 10: Volunteer Seagrass Transplanting Activity at Ban Hat Hua Laem

4.8.2 Key Initiatives and Practices

The project adopts a comprehensive approach that combines ecological restoration with community participation. At the technical level, the project team uses a range of restoration techniques, including the direct transplanting of seagrass shoots and the cultivation of seedlings

from collected seeds in nurseries prior to transplanting. Between 2018 and 2025, the project aims to restore approximately 53 hectares of seagrass beds across eight provinces, covering seven different seagrass species.

At the community participation level, the project strongly encourages and organizes volunteers and local community members to actively engage in restoration activities. For instance, in 2024, an event in Ban Hat Hua Laem, Chanthaburi Province, saw 250 volunteers transplant 8,000 clumps of Halodule uninervis. Through such hands-on involvement, volunteers not only acquire practical experience in seagrass restoration techniques but also develop skills in assessing and monitoring seagrass conditions.

4.8.3 Outcomes and Impacts

The project has yielded positive outcomes in both ecological restoration and community empowerment. Monitoring data indicates a significant increase in marine biodiversity and species abundance in the restored areas, signaling the ecosystem's recovery. Community satisfaction is also high, reflecting the success of the initiative. By organizing large-scale volunteer activities, the project has greatly enhanced public understanding of the importance of marine and coastal resources, fostering an awareness of the need for sustainable conservation of seagrass ecosystems.

However, the project faces challenges, such as low transplant survival rates due to factors like tidal exposure, seasonal fluctuations, predation by marine fauna, and storm surges. Despite these challenges, the project has shown that deep community involvement is essential for its success, as it fosters long-term stewardship and a sense of responsibility for the restored areas.

4.8.4 Inspirations for Blue Citizen Community Building

The core inspiration derived from Thailand's seagrass restoration project lies in its community mobilization model, centered on ecological restoration. This model clearly demonstrates how a specific ecological conservation action can evolve into an integrated platform for scientific practice, public education, and community participation. It serves as an exemplary case for primary indicators of Ocean Literacy and Actions.

By restoring seagrass beds, the project directly improves the health of the surrounding marine ecosystem, contributing significantly to Indicator 3, "Coastal marine environmental quality." Moreover, by organizing volunteers to actively engage in restoration tasks such as seagrass transplanting, the project successfully translates abstract environmental concepts into tangible, personal experiences. These activities align with Indicator 6, "Frequency of other ocean-related activities," and the large-scale volunteer involvement directly supports Indicator 7, "Participation rate in ocean activities." This hands-on experience is a powerful tool for enhancing public ocean literacy and motivating action.

Furthermore, the case highlights the importance of multi-sectoral collaboration in addressing complex ecological issues, particularly through aligning project goals with economy's long-term development strategies. This provides strong policy support for the project's sustainability

and exemplifies Indicator 8, “Number of ocean-related policies.” Lastly, the project reflects on the challenges of ecological restoration and proposes adaptive management strategies, such as strengthening community coordination and adopting innovative methods. This practice-based, reflective approach offers valuable lessons for other communities engaged in similar ecological conservation efforts.

5.Policy Recommendations and Conclusions

5.1 Conclusions

The core output of this report is the development of an indicator framework for the development of a "blue citizen community" (BCC). Through a literature review, framework design, and an empirical survey of diverse stakeholders across 10 APEC economies, this report has provided a BCC indicator framework comprising four primary indicators and twelve secondary indicators for further piloting and validation. The key conclusions are as follows:

The concept of the "blue citizen community" has received widespread acknowledgement within the APEC region. Survey results (with 94.83% of respondents in agreement) and expert feedback suggest that the concept effectively integrates three major goals: advancing ocean literacy, ecological protection, and community development.

The introduction of this indicator framework offers a voluntary standardized, forward-looking guiding tool for interested APEC economies to promote marine development. While not intended for mandatory evaluation, it provides communities with a voluntary framework to assess their current development status, identify priority areas, and share best practices within the region. In conclusion, this report not only addresses the gap in evaluation and guidance between macro-level initiatives and community-level practices, but also offers a reliable solution for the development of "blue citizen communities" within APEC.

5.2 Policy Recommendations

Based on the findings of this report and expert feedback, the following policy recommendations are proposed to effectively promote and develop a blue citizen community in the APEC region. These recommendations are progressively, aiming to build a comprehensive, multi-level support system from macro-level vision to micro-level implementation.

5.2.1 Propose a Common APEC Framework to Guide Regional Coordinated Development

APEC could leverage its key role as a platform for regional cooperation by discussing the "blue citizen community" indicator framework proposed in this report at the OFWG. Following discussion with OFWG member economies, APEC could then release guidelines for the promotion of blue citizen communities, providing a voluntary framework for related efforts across interested economies. Furthermore, APEC could lead the creation of a regional "blue citizen community" demonstration network and knowledge-sharing platform if agreed upon by all OFWG economies. This network could promote voluntary membership, facilitating the exchange of best practices and responding to the value of cross-regional learning, as demonstrated by cases from Chile; Peru and other economies.

5.2.2 Integrate Ocean Literacy into Core Agendas and Strengthen Policy Support

Member economy governments could integrate ocean literacy into economy's policies related to education, the environment, tourism, and fisheries. The example of Chinese Taipei demonstrates that government-led, long-term planning focused on the formal education system is an effective method for ensuring the breadth and depth of ocean literacy education. At the same time, governments could introduce specific domestic policy incentives, for enterprises and communities that adopt sustainable marine practices, to provide robust institutional support for BCC development.

5.2.3 Build a Technical and Knowledge Support Network to Empower Scientific Community Practices

Research institutes, universities, and relevant government technical departments could build a technical and knowledge support network aimed at assisting communities. As shown in relevant cases, scientific assessments and technical training are vital for project success. This network could provide support in areas such as marine monitoring, ecological restoration, and data analysis, using user-friendly tools. Additionally, it could incorporate ecological knowledge from coastal communities, combining it with modern scientific technology to ensure culturally appropriate and locally effective solutions.

5.2.4 Promote Participatory to Ensure Community Ownership

Local governments and project implementers could ensure that community members play a central role in project planning, implementation, and evaluation. Efforts should be made to incorporate all perspectives into community policy frameworks, educational curricula, and citizen science programs, fostering co-creation of knowledge between local communities and scientific institutions. Bridging ecological wisdom with modern science ensures solutions are not only scientifically robust but also culturally appropriate, thus improving the human-ocean relationship and promoting long-term community participation.

5.2.5 Encourage Localized Innovation and Launch Pilot Demonstration Projects

It is recommended to launch pilot demonstration projects in selected communities, exploring BCC development pathways that are tailored to diverse geographical, cultural, and economic contexts. During the piloting process, a robust feedback mechanism could be established to capture on-the-ground insights and, based on these, make necessary adjustments to the localized application of indicators, ensuring their relevance and maximizing their impact.

Exemplary blue citizen communities can inspire other communities through experience-sharing. Non-governmental organizations (NGOs) and foundations could utilize their inherent flexibility to serve as catalysts and connectors, actively exploring innovative community mobilization strategies. If requested, they could also assist communities in documenting and

disseminating their successful experiences, thereby providing a foundation for the broader replication and scaling of these effective models.

Appendix 1: Survey on Blue Citizen Community Indicator Framework

Part 1: Background

The APEC Project "APEC Workshop on Blue Citizen Communities for Ocean Literate Society (OFWG_103_2024A)" will promote public ocean literacy across the APEC region by organizing a workshop on APEC Blue Citizen Communities and providing the Blue Citizen Communities Indicator Research Report. The initiative aims to enhance capacity building for the transition towards an ocean-literate society. The blue citizen initiative calls on global stakeholders to collaborate in safeguarding the ocean's health and vitality and to create a more prosperous and sustainable blue future for future generations. In line with this vision, the initiative seeks to develop "blue citizen communities" at the local level, which are centered around cultivating blue citizens, enhancing ocean literacy, improving livelihoods and human well-being through ocean benefits, and promoting sustainable community development while preserving the health of the ocean ecosystem.

Objective: This questionnaire aims to gather expert feedback from representatives of APEC economies on the concept and indicators of blue citizen communities, evaluate the rationale of the proposed indicators, and scientifically develop an internationally applicable community construction standard. It seeks to provide practical guidance for building blue citizen communities globally.

Respondent Profile: This survey is intended for individuals with experience in marine governance and community development, including professionals from government, public agencies, academia, and NGOs. All personal information collected will remain strictly confidential.

Contact Information: Any questions or queries on the questionnaire, please contact:

Ms. WENG Danfeng

Thank you very much for your participation!

Part 2: Respondent Information

Please fill out the relevant details:

a. Economy:_____

b. Name:_____

c. E-mail:_____

d. Organization:_____

e. Please indicate which group you belong to (use √):

Policy maker	□
Government official	□
Program/Project manager	□
Educator	□
Researcher/Academia	□
Non Governmental Organizations	□
Local residents	□
Private sector	□
Enterprisice	□
Foundation Organization	□

Others:_____

Part 3: Questions

According to the APEC Blue Citizen Guidebook, blue citizens are **"individuals who have learned about the services provided by the ocean and are willing to explore the ocean and take actions for a healthy and productive ocean**."

The blue citizen community is defined as: **"Communities that are guided by the cultivation of blue citizens, centered on improving ocean literacy, and committed to enhancing livelihoods and human well-being from the benefits of ocean and promoting sustainable community development while preserving the health of ocean ecosystem."**

1. Please rate your agreement with this concept:

☐ Agree ☐ Neutral ☐ Disagree

Comments/Suggestions:

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2. Based on the above definition, please evaluate the **relevance** of the following primary indicator categories to the development of blue citizen communities:

Primary Indicator	Irrelevant	Relevant	Highly Relevant	Comments/Suggestions
Infrastructure and Environment	○	○	○	_____
Ocean Literacy and Actions	○	○	○	_____
Policy and Management	○	○	○	_____
Economy and Culture	○	○	○	_____

3. Please assess the **relevance** of each secondary indicator based on the concept of blue citizen communities:

Primary Indicator	Secondary Indicator	Relevance			Comments
		Irrelevant	Relevant	Highly	
Infrastructure and Environment	Number of ocean-themed facilities	○	○	○	_____
	Community eco-environmental quality	○	○	○	_____
	Coastal marine environmental quality*	○	○	○	_____
Ocean Literacy and Actions	Ocean accessibility	○	○	○	_____
	Frequency of ocean cultural activities	○	○	○	_____
	Frequency of other ocean-related activities	○	○	○	_____
	Participation rate in ocean activities	○	○	○	_____
Policy and Management	Number of ocean-related policies	○	○	○	_____
	Share of ocean-related expenditure	○	○	○	_____
	Public participation coverage	○	○	○	_____
Economy and Culture	Share of ocean-related employment	○	○	○	_____

Primary Indicator	Secondary Indicator	Relevance			Comments
		Irrelevant	Relevant	Highly	
	Community ocean brand development	○	○	○	_____

Applicable only to coastal communities.

4. Please assess the **data accessibility** of each secondary indicator based on the concept of blue citizen communities:

Primary Indicator	Secondary Indicator	Data Availability			Comments
		Hard	Medium	Easy	
Infrastructure and Environment	Number of ocean-themed facilities	○	○	○	_____
	Community eco-environmental quality	○	○	○	_____
	Coastal marine environmental quality*	○	○	○	_____
Ocean Literacy and Actions	Ocean accessibility	○	○	○	_____
	Frequency of ocean cultural activities	○	○	○	_____
	Frequency of other ocean-related activities	○	○	○	_____
	Participation rate in ocean activities	○	○	○	_____
Policy and Management	Number of ocean-related policies	○	○	○	_____
	Share of ocean-related expenditure	○	○	○	_____

Primary Indicator	Secondary Indicator	Data Availability			Comments
		Hard	Medium	Easy	
Economy and Culture	Public participation coverage	○	○	○	_____
	Share of ocean-related employment	○	○	○	_____
	Community ocean brand development	○	○	○	_____

Applicable only to coastal communities.

5. How necessary is it to promote blue citizen communities in your economy?

☐ Very necessary; crucial for marine conservation and community development
☐ Necessary; not an urgent priority
☐ Not very necessary; there are more pressing matters
☐ Not necessary at all; no practical significance

Comment: _____

6. What benefits do you think will be brought by promoting the construction of blue citizen communities? (Multiple choices allowed)

☐ Improve residents' ocean literacy
☐ Promote marine ecological protection
☐ Strengthen community cohesion and sense of belonging
☐ Boost community economic vitality (e.g., marine tourism, fisheries)
☐ Promote sustainable community development
☐ Support the development and implementation of blue economy policies
☐ Provide models for global ocean governance
☐ Other: _____

Comment: _____

7. How feasible is it to implement blue citizen communities in your economy?

☐ Very feasible; all resources and conditions are in place
☐ Somewhat feasible; additional support is needed
☐ Low feasibility; significant challenges exist
☐ Very difficult; nearly impossible to implement
Comment: _____

8. What support is most needed to develop blue citizen communities? (Multiple choices allowed)

☐ Policy support: Relevant laws and policies to ensure legality and sustainability
☐ Funding support: Financial resources for marine education, environmental protection, and community programs
☐ Educational resources: Professional educators, science materials, and training
☐ Public participation: Raise awareness and encourage local involvement
☐ Technical support: Ocean monitoring, ecological restoration, sustainable technology
☐ Community partnerships: Cooperation with NGOs, enterprises, and governments
☐ Infrastructure: Marine parks, science centers, and cultural plazas
☐ Other: _____
Comment: _____

Part 4: Open Comments

Any suggestions on promoting blue citizen communities within APEC? (You may comment on policy coordination, funding mechanisms, technical standards, cultural adaptation, etc.)

Part 5: Best Practices Sharing

Please share the best practices or local cases in your economy regarding improving ocean literacy, cultivating blue citizens, and building blue citizen communities. Photos, charts, or tables can be attached.

Title of the case:	
Contents of the Case *including the background overview, location, main issues, best practices, benefits, and lessons, etc.*	

We greatly appreciate your time and efforts in completing this questionnaire.

Appendix 2: Survey Report of Blue Citizen Community Indicator Framework in the APEC Region

1. Research Objectives

The APEC Project "APEC Workshop on Blue Citizen Community for Ocean Literate Society (OFWG_103_2024A)" will advance public ocean literacy across the APEC region by convening the APEC Blue Citizen Community Workshop and delivering the Blue Citizen Community Indicator Research Report, with the overarching objective of strengthening capacity building to support the transition toward an ocean-literate society. The blue citizen initiative calls upon the international community to work collectively to safeguard the health and vitality of the ocean and to secure a more prosperous and sustainable blue future for present and future generations. Guided by this vision, the initiative seeks to promote the development of "blue citizen communities" at the local and community levels, focusing on cultivating blue citizens, strengthening ocean literacy among residents, and enhancing livelihoods and human well-being through the sustainable use of ocean-related resources, while contributing to community development and the long-term protection of marine ecosystems.

This study aims to collect expert insights from stakeholders across APEC economies on the concept of "blue citizen community" and its associated indicator framework, assess the validity and relevance of the proposed metrics, and formulate a scientifically grounded and internationally applicable guideline for community building that can inform practical implementation across diverse contexts. Specifically, the research intends to:

- Evaluate awareness, acceptance and applicability of the blue citizen community concept across APEC economies, thereby establishing an accepted foundation for the forthcoming guiding framework.
- Evaluate the relevance and data availability of the four proposed first-level indicators, namely Infrastructure and Environment, Ocean Literacy and Action, Policy and Management, and Economy and Culture, together with their corresponding second-level indicators, identify the core metrics, and generate evidence to support the refinement of their assigned weights.
- Determine the necessity and feasibility of promoting blue citizen community development in each economy, quantify priorities and articulate differentiated needs.
- Catalogue best practices, success stories and lessons learned in enhancing residents' ocean literacy, nurturing blue citizens and building blue citizen community, producing replicable and scalable implementation templates.

- Raise public attention to blue citizen community throughout APEC economies.

2. Research Methodology

The study is anchored by a seven-question survey organized around three thematic blocks:

- **Conceptual validation:** one question assessing respondents' acceptance of the definition of blue citizen community.
- **Indicator assessment:** three questions evaluating the relevance of the four first-level indicators, namely Infrastructure and Environment, Ocean Literacy and Action, Policy and Management, and Economy and Culture, in relation to the blue citizen community concept, as well as examining the relevance and data availability of all second-level indicators.
- **Implementation of appraisal:** four questions addressing the necessity, expected benefits, feasibility, and required support for advancing blue citizen community development in each economy.

The broader research cycle comprises four components: literature review, primary data collection, questionnaire analysis, and best-practice case documentation. The survey instrument was proactively distributed by the research team and further disseminated through the APEC Secretariat mailing list and working group newsletters, with responses collected from July to September 2025. The returned data were processed, interpreted, and summarized using descriptive statistics, and cross-tabulations were conducted to identify regional and stakeholder variations. In parallel with the survey, best-practice cases from government, academia, business, NGOs, and grassroots communities were compiled and triangulated with the questionnaire findings to support the formulation of final policy recommendations for the blue citizen community development guidelines.

3. Survey Findings on Blue Citizen Community Development in the APEC Region

The questionnaire was distributed to professionals across APEC economies with demonstrable experience in ocean governance and community development, including representatives from government agencies, public institutions, academia and non-governmental organizations. Dissemination followed a two-track approach: the APEC official channel and working-group newsletters. A total of 58 valid responses were received from 10 APEC economies: 2 from Chile; 32 from China; 3 from Indonesia; 1 from Japan; 1 from Malaysia; 10 from Peru; 1 from the Philippines; 2 from Chinese Taipei; 4 from Thailand; and 1 from Viet Nam.

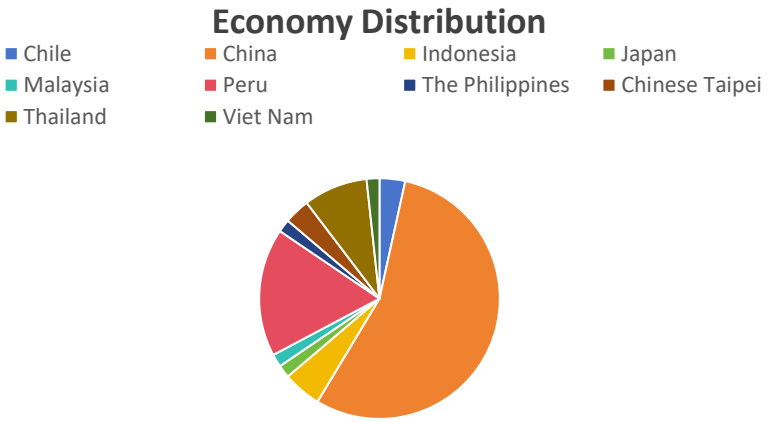

Fig A1: Economy Distribution

Respondents self-identified as Researchers/Academia (21), Government officials (13), Educators (7), Local residents (4), Enterprises (4), Non Governmental Organizations (3) and others (6). This composition ensures comprehensive coverage of key stakeholder groups—government, public institutions, academia, business and civil society—providing a robust and diverse evidence base for analyzing acceptance of the blue citizen community concept, indicator weighting and promotion feasibility, indicator weighting and promotion feasibility.

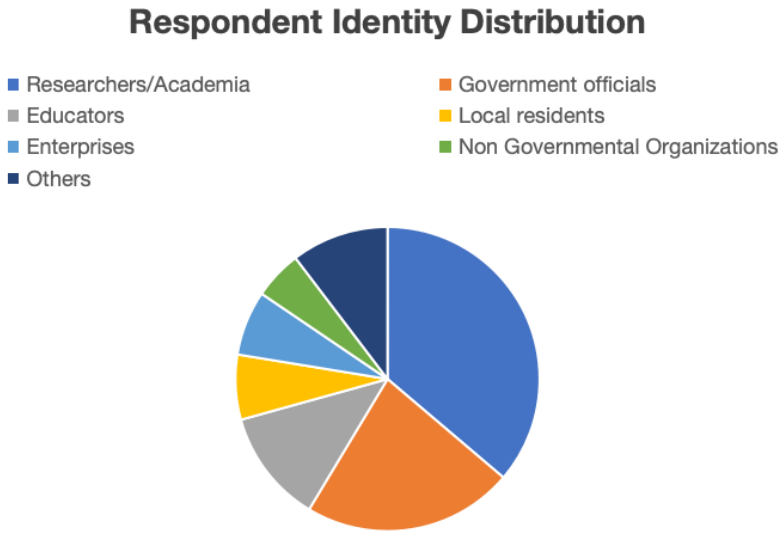

Fig A2: Respondent Identity Distribution

3.1 Acceptance of the Blue Citizen Community Concept in the APEC Region

Among the 58 valid questionnaires returned, the item on conceptual acceptance showed that 55 respondents—94.83 %—explicitly selected “Agree”, three (5.17 %) chose “Neutral”, and none ticked “Disagree”. Over nine in ten participants thus affirmed the proposed blue citizen community definition, regarding it as a clear, logical and actionable synthesis of ocean-literacy advancement, community well-being and sustainable development.

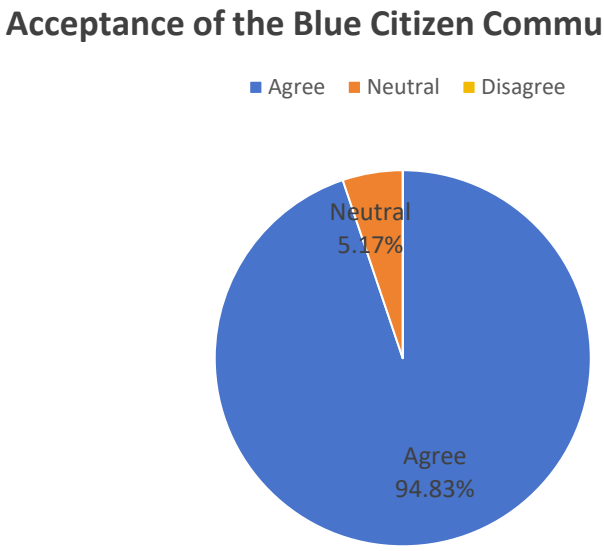

Fig A3: Acceptance of the Blue Citizen Community Concept

3.2 Assessment of Indicator Relevance and Data Availability in the APEC Region

In the survey, expert respondents evaluated the relevance of the four first-level indicators—Infrastructure and Environment, Ocean Literacy and Actions, Policy and Management, and Economy and Culture—to the development of blue citizen community. To enable quantitative comparison, the three response options were scored as follows: Highly Relevant = 3, Relevant = 2, Irrelevant = 1. Mean scores were then calculated to reflect the overall importance assigned by the respondent group. All four indicators received high acceptance, with Ocean Literacy and Actions achieving the highest mean score, underscoring its central role in building blue citizen community, specifically:

Infrastructure and Environment: 35 respondents selected "Highly Relevant", 21 selected "Relevant", and 1 selected "Irrelevant", yielding a mean score of 2.55. This indicates broad recognition of the importance of infrastructure and environmental conditions in advancing blue citizen community, a minority of respondents from certain economies expressed reservations about their salience.

Ocean Literacy and Actions: 48 respondents chose "Highly Relevant", 9 chose "Relevant", and only 1 chose "Irrelevant", producing the highest mean score of 2.81 among all first-level indicators. The result confirms that enhancing public ocean knowledge and practical engagement is viewed by experts as the foremost priority.

Policy and Management: 40 respondents rated it 'Highly Relevant", 18 "Relevant", and none "Irrelevant", generating a mean of 2.69. The near-universal acceptance highlights policy frameworks and governance mechanisms as critical enablers for institutionalizing and sustaining blue citizen community.

Economy and Culture: 37 respondents indicated "Highly Relevant", 20 "Relevant", and 1 "Irrelevant", giving a mean of 2.50. While economic vitality and cultural identity are still regarded as integral components, their relative priority is modestly lower compared with ocean literacy and policy management.

Averaged across all responses, every first-level indicator exceeds 2.5 on a 3-point scale, confirming a "high-relevance" band and validating the rationality of the indicator framework. Ocean Literacy and Actions ranks first at 2.81, signaling the strongest cross-economy acceptance; Policy and Management (2.69) and Infrastructure and Environment (2.55) follow in close succession, while Economy and Culture, though lowest at 2.50, still registers pronounced relevance.

Collectively, the four indicators constitute the core architecture for building blue citizen community. Ocean Literacy and Actions is universally regarded as the foremost priority, whereas policy support, cultural-economic vitality and infrastructure-environment furnish the indispensable institutional and material underpinnings.

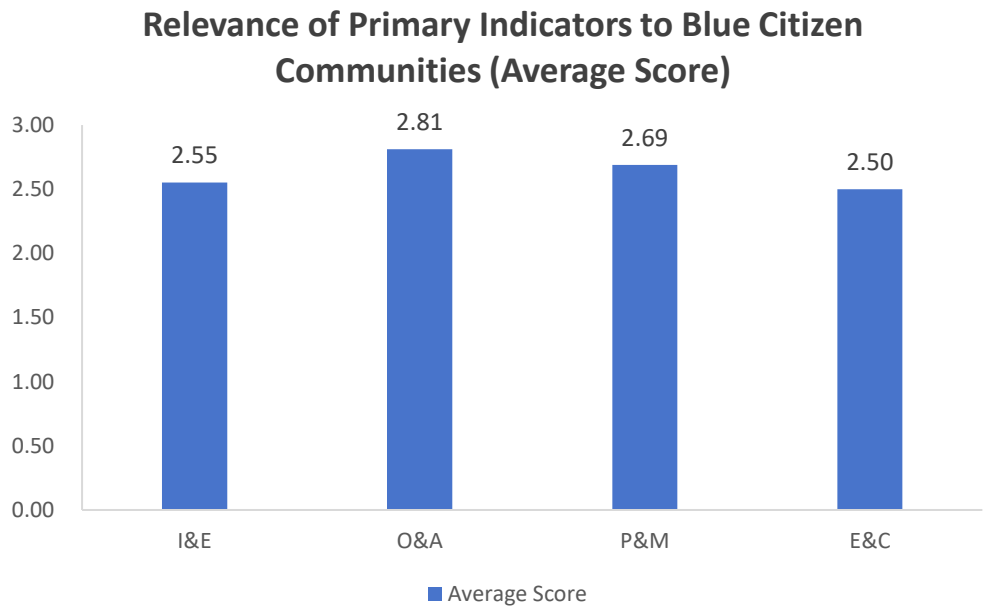

Fig A4: Relevance of Primary Indicators to Blue Citizen Community (Average Score)

Note: Maximum score = 3 points. I&E = Infrastructure and Environment, O&A = Ocean Literacy and Actions, P&M = Policy and Management, E&C = Economy and Culture.

Experts assessed each of the 12 second indicators for its relevance to the blue citizen community concept. To permit quantitative comparison, the three response options were scored as follows: Highly Relevant = 3, Relevant = 2, Irrelevant = 1, and mean values were calculated to reflect overall importance within the expert sample.

All twelve indicators received mean scores above 2.30 (maximum = 3), placing them in the "high-to-medium-high" range and confirming broad acceptance of the proposed sub-indicator set. Coastal marine environmental quality (mean = 2.76) and community eco-environmental

quality (mean = 2.64) ranked first and second, highlighting the foundational role of environmental health in the development of blue citizen communities.

Table A1: Relevance Ratings for Secondary Indicators

Secondary Indicator	Highly Relevant	Relevant	Irrelevant
1. Number of ocean-themed facilities	21 (36.21%)	35 (60.34%)	2 (3.45%)
2. Community eco-environmental quality	38 (65.52%)	19 (32.76%)	1 (1.72%)
3. Coastal marine environmental quality*	45 (77.59%)	12 (20.69%)	1 (1.72%)
4. Ocean accessibility	31 (53.45%)	27 (46.55%)	0 (0.00%)
5. Frequency of ocean cultural activities	28 (48.28%)	27 (46.55%)	3 (5.17%)
6. Frequency of other ocean-related activities	18 (31.03%)	37 (63.79%)	3 (5.17%)
7. Participation rate in ocean activities	35 (60.34%)	21 (36.21%)	2 (3.45%)
8. Number of ocean-related policies	33 (56.90%)	23 (39.66%)	2 (3.45%)
9. Share of ocean-related expenditure	28 (48.28%)	27 (46.55%)	3 (5.17%)
10. Public participation coverage	30 (51.72%)	24 (41.38%)	4 (6.90%)
11. Share of ocean-related employment	25 (43.10%)	31 (53.45%)	2 (3.45%)
12. Community ocean brand development	20 (34.48%)	36 (62.07%)	2 (3.45%)

Collectively, the 12 secondary indicators reveal a clear hierarchy of expert acceptance. Coastal marine environmental quality and Community eco-environmental quality occupy the top tier, anchoring shared agreement on the primacy of ecological health. Immediately following are Participation rate in ocean activities (mean = 2.57) and Number of ocean-related policies (mean = 2.53), representing the two critical levers of individual action and institutional provision.

Ocean accessibility, with a mean of 2.53 and zero "irrelevant" ratings, demonstrates applicability across diverse economic contexts.

In short, experts widely accept the importance of these secondary indicators for developing blue citizen community, providing evidence base for their use in guiding high-quality implementation going forward.

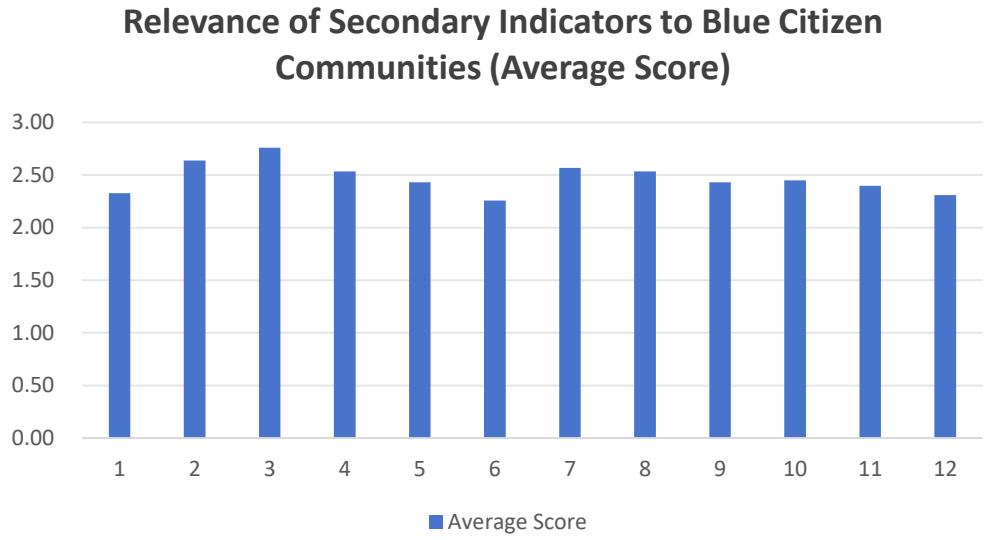

Fig A5 : Relevance of Secondary Indicators to Blue Citizen Community (Average Score)

Note: Maximum score = 3 points; numbers on the horizontal axis correspond to indicators listed in Table 1.

The assessment of data availability for the twelve second-level indicators reveals a favorable pattern: data for some indicators are readily available, while the majority fall into the medium-difficulty category.

For indicators such as "Number of ocean-themed facilities" and "Number of ocean-related policies," over 40% of respondents (44.83% each) rated data collection as "Easy," providing a solid foundation for future surveys.

The "Medium" category predominates for most indicators, with shares ranging from 60.34% for both "Community eco-environmental quality" and "Community Ocean brand development." Eight of the twelve indicators exceeded 50%, suggesting that, while minor challenges exist, the required data is generally attainable due to existing datasets, improving data-management systems, and an increasing willingness to share information.

Overall, the evaluation indicates a good aggregate level of data availability for monitoring the development of blue citizen communities. Continued investment in data infrastructure, transparency, and open-sharing mechanisms will further strengthen evidence-based decision-making and elevate blue citizen community initiatives to a higher standard.

Table A2: Data Accessibility Ratings for Secondary Indicators

Secondary Indicator	Easy	Medium	Hard
1. Number of ocean-themed facilities	26 (44.83%)	30 (51.72%)	2 (3.45%)
2. Community eco-environmental quality	11 (18.97%)	35 (60.34%)	12 (20.69%)
3. Coastal marine environmental quality*	23 (39.66%)	27 (46.55%)	8 (13.79%)
4. Ocean accessibility	16 (27.59%)	38 (65.52%)	4 (6.90%)
5. Frequency of ocean cultural activities	18 (31.03%)	32 (55.17%)	8 (13.79%)
6. Frequency of other ocean-related activities	16 (27.59%)	32 (55.17%)	10 (17.24%)
7. Participation rate in ocean activities	15 (25.86%)	28 (48.28%)	15 (25.86%)
8. Number of ocean-related policies	26 (44.83%)	21 (36.21%)	11 (18.97%)
9. Share of ocean-related expenditure	14 (24.14%)	30 (51.72%)	14 (24.14%)
10. Public participation coverage	13 (22.41%)	33 (56.90%)	12 (20.69%)
11. Share of ocean-related employment	13 (22.41%)	33 (56.90%)	12 (20.69%)
12. Community ocean brand development	6 (10.34%)	35 (60.34%)	17 (29.31%)

To provide a fuller picture of data availability for the twelve sub-indicators, we converted expert ratings into numerical scores: Easy = 3, Medium = 2, Hard = 1. Mean availability scores range from 1.81 to 2.41, revealing noticeable variation across indicators. High-scoring metrics such as “Number of ocean-themed facilities” (2.41) and “Number of ocean-related policies” (2.26)

are relatively easy to obtain, benefiting from established statistical systems, greater policy transparency, and robust data-management protocols. Indicators with scores around 2.0, such as "Coastal marine environmental quality" (2.26), "Ocean accessibility" (2.21), and "Frequency of ocean cultural activities" (2.17), present moderate challenges but remain accessible with existing tools and resources. Overall, the results confirm that a solid data-collection foundation is already in place. Streamlining procedures and deepening collaboration will further enhance efficiency.

The majority of indicators enjoy at least moderate data availability, providing a reliable evidence base for blue citizen community initiatives. For lower-scoring metrics, potential improvements, such as expanding shared data platforms, harmonizing collection standards, and refining protocols, can be pursued to improve attainability and better support the long-term development of blue citizen communities.

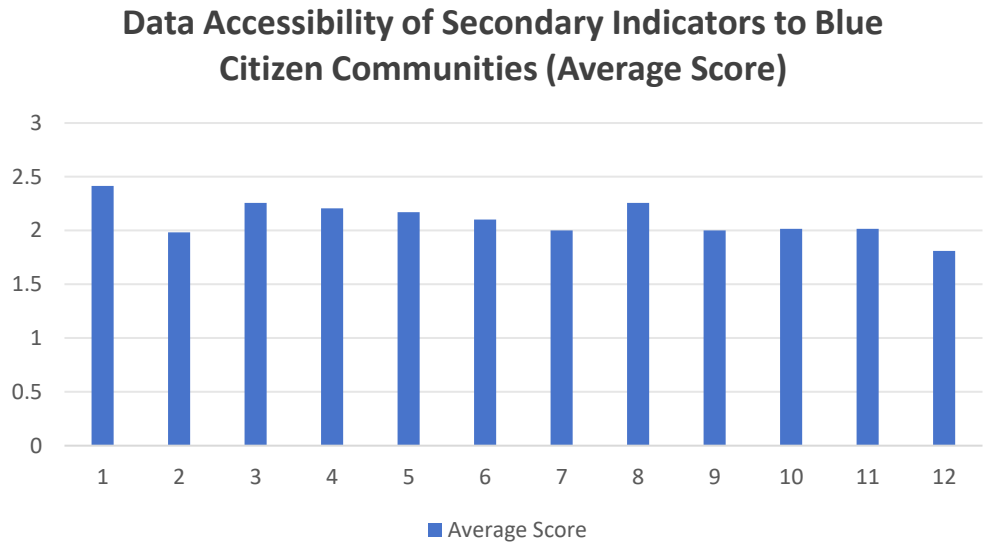

Fig A6: Data Accessibility of Secondary Indicators to Blue Citizen Community

(Average Score)

3.3 Promotion Prospects and Support Needs for Blue Citizen Community Development in the APEC Region

When asked, "How necessary is it to promote blue citizen community in your economy?" 65.52% of respondents selected "Very necessary; crucial for marine conservation and community development," highlighting broad agreement that the concept is essential for both ocean protection and community well-being. A further 27.59% rated it as "Necessary; not an urgent priority," acknowledging its value but noting that other pressing issues may delay action. Only 6.90% considered promotion "Not very necessary; there are more pressing matters," and no respondents chose "Not necessary at all; no practical significance." Collectively, these results demonstrate high acceptance and support for blue citizen communities across APEC economies. While some respondents expressed concerns about prioritization, the concept is widely seen as

a promising and worthwhile development model, offering a positive signal for its broader dissemination.

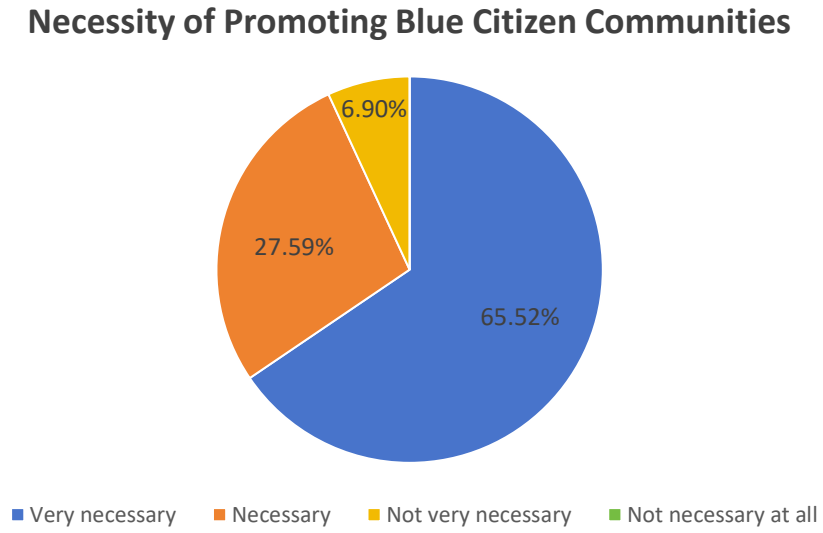

Fig A7: Necessity of Promoting Blue Citizen Community

Respondents were asked about the potential benefits of promoting blue citizen community development. The results indicate that respondents generally believe such promotion will lead to multiple positive impacts. Among these, “Promote marine ecological protection” received the highest recognition, with 89.66% of respondents agreeing. This underscores the widespread view that the construction of blue citizen communities plays a critical role in advancing marine ecological protection, reflecting the high level of attention and urgency the global community places on marine conservation. “Improve residents’ ocean literacy” also received substantial recognition, with 77.59% of respondents agreeing. This suggests that the construction of blue citizen communities is widely regarded as an effective means of enhancing residents' awareness and understanding of the ocean, thereby fostering greater public participation in marine protection and development initiatives. “Support the development and implementation of blue economy policies” and “Boost community economic vitality (e.g., marine tourism, fisheries)” were recognized by 74.14% and 70.69% of respondents, respectively. This highlights the belief that blue citizen communities are not only significant for ecological protection but also offer new opportunities and momentum for economic development. “Promote sustainable community development” received a recognition rate of 68.97%, indicating that the construction of blue citizen communities is viewed as an important pathway for advancing sustainable community development.

In summary, the data show that respondents generally believe promoting blue citizen community development will bring multifaceted benefits, covering ecological protection, economic vitality, policy support, and sustainable community development. These results provide support and recognition for the development of blue citizen communities, offering clear direction and momentum for future community development and marine conservation efforts.

Table A3: Benefits of Promoting Blue Citizen Community Development

Option	Responses	Percentage
Promote marine ecological protection	52	89.66%
Improve residents' ocean literacy	45	77.59%
Support the development and implementation of blue economy policies	43	74.14%
Boost community economic vitality (e.g., marine tourism, fisheries)	42	72.41%
Promote sustainable community development	40	68.97%
Provide models for global ocean governance	33	56.90%
Strengthen community cohesion and sense of belonging	30	51.72%
Total	58	100%

When respondents assessed the feasibility of implementing blue citizen communities in their respective economies, a clear pattern emerged: most consider implementation realistic, though it is contingent on additional support.

- **74.14%** judged the initiative as "Somewhat feasible; additional support is needed." This suggests that while most economies already possess the basic conditions necessary to develop blue citizen communities, adequate resource allocation and policy support are still essential.
- **7.27%** considered it "Very feasible; all resources and conditions are in place." Although this share is modest, it highlights economies that are well-positioned to serve as pilot showcases.
- **17.24%** rated it as "Low feasibility; significant challenges exist," indicating that in these economies, resource shortages, policy barriers, or limited public awareness may hinder progress. Tailored remedies and further groundwork are required in these cases.
- Importantly, no respondents selected "Very difficult; nearly impossible to implement," suggesting that even in more challenging settings, the possibility remains, provided that greater effort and innovation are applied.

Overall, the findings suggest that the blue citizen community is based on a viable foundation across many APEC economies. However, they also highlight the need for differentiated support tailored to local contexts. These data provide an evidence base for designing implementation strategies and allocating resources in the next phase.

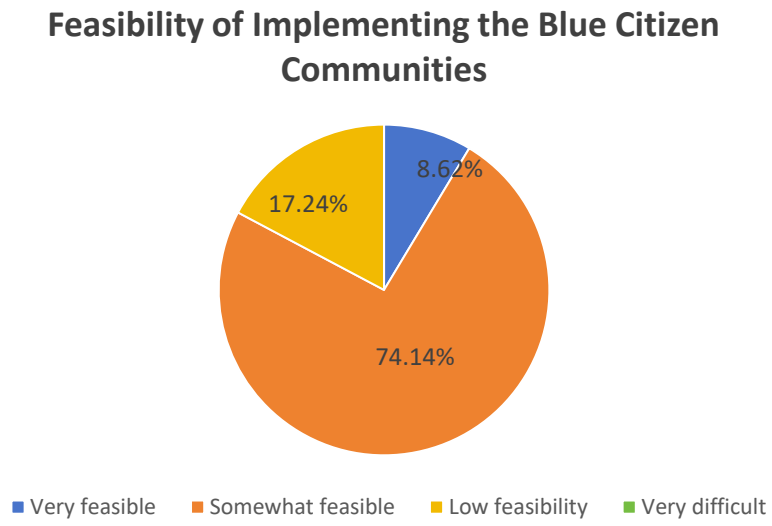

Fig A8: Feasibility of Implementing the Blue Citizen Community Initiative

When asked to identify the most critical types of support for developing blue citizen community, respondents overwhelmingly regarded a broad package as essential. Funding support topped the list at 93.10 %, underscoring that reliable finance is the bedrock of any operational rollout. Policy support followed at 82.76 %, highlighting that clear, enabling frameworks are indispensable for long-term viability. Technical support and educational resources also garnered strong acceptance, at 74.14 % and 70.69 % respectively, reflecting urgent demand for assistance in ocean monitoring, ecological restoration and professional training—elements that collectively raise community ocean literacy and underwrite sustainable development. Taken together, the findings reveal that multi-dimensional backing is required: finance and policy provide the foundation, while technology and education act as the key drivers of progress.

Table A4: Required Supports for Blue Citizen Community Development

Option	Responses	Percentage
Funding support	54	93.10%
Policy support	48	82.76%
Technical support	43	74.14%
Educational resources	41	70.69%

Public participation	39	67.24%
Community partnerships	34	58.62%
Infrastructure	25	43.10%
Total	58	100%

4. Summary

This study provides an assessment of the blue citizen community concept and its indicator framework across some APEC economies, based on a survey of recognized experts. Fifty-eight valid responses were received from ten economies, encompassing government, academia, NGOs, and the private sector.

Key findings indicate broad acknowledgement of the blue citizen community concept: 94.83% of respondents agree that it effectively integrates ocean literacy advancement, ecological protection, and community development. At the first level, all four indicators were rated as highly relevant (mean > 2.5/3), with “Ocean Literacy and Actions” leading at 2.81. Among the 12 second-level indicators, every item scored above 2.30, placing the entire set in the “high-to-medium-high” relevance range. “Coastal marine environmental quality” (2.76) and “Community eco-environmental quality” (2.64) showed the strongest alignment, underscoring the crucial role of environmental health.

Data availability is equally encouraging. Two indicators, “Number of ocean-themed facilities” and “Number of ocean-related policies,” were classified as “Easy” to obtain by 44.83% of respondents, while more than half of all metrics received “Medium” difficulty ratings. This suggests that the requisite data are largely accessible. and that the framework is operationally viable.

Regarding necessity, 65.52% of respondents consider promotion “very necessary,” with the leading expected benefits being enhanced marine ecosystem protection (89.66%) and improved resident ocean literacy (77.59%). Support for blue-economy policy uptake (74.14%) and increased community economic vitality (72.41%) also received strong endorsement. On feasibility, over 80% view implementation as either “somewhat feasible with additional support” (74.14%) or “fully feasible” (8.62%), and no respondents considered the initiative “nearly impossible.” Financial support (93.10%) and policy support (82.76%) emerged as the primary enablers, complemented by technical assistance (74.14%) and educational resources (70.69%).

In conclusion, the study clearly demonstrates broad acceptance of the blue citizen community concept by some APEC economies and suggests the relevance and data accessibility of the proposed indicator framework. It suggests targeted policy and funding support, pilot assessments in representative communities, and the establishment of a regional demonstration

network to accelerate the creation of a sustainable, replicable pathway for blue citizen communities, all of which will play a role in advancing efforts towards an ocean-literate society.