# WMO Capacity Development Framework (WCDF)

**Purpose of collecting Case Studies:** Demonstrate good practices when applying the strategic approach of the WMO Capacity Development Framework (WCDF) to design and implement interventions that support capacity development.

#### **Case Title**

# Enhancing Fishermen's Safety and Catchment through Weather Field School for Fishermen

#### Country(ies) involved in the Capacity Development Intervention

The Republic of Indonesia, through its Agency for Meteorology, Climatology, and Geophysics (BMKG), conducts the Weather Field School for Fishermen as a national initiative to enhance services in marine-related sectors. Modeled after the successful Climate Field School for Farmers, this empowerment program is tailored to meet the specific needs of fishermen and coastal communities, providing essential weather information services to aid their daily decision-making processes.

The national success of the Fishermen's Weather Field School has motivated BMKG to expand its impact by promoting regional engagement. As a Regional Training Centre for the World Meteorological Organization (WMO) in Regional Association V (RA V) and a Specialised Training Centre (STC) for the Ocean Teacher Global Academy (OTGA) of the Intergovernmental Oceanographic Commission of UNESCO (IOC/UNESCO), BMKG has been working closely with OTGA to take this initiative to a global platform. In collaboration with OTGA IOC UNESCO, BMKG has conducted the online Weather Field School session, which was attended by participants from RA V member countries such as Indonesia, Fiji, Papua New Guinea, the Philippines, as well as from other regions such as Guatemala, Kenya, Madagascar, Mozambique, Sao Tome, and Tunisia.

#### Capacity Development Dimension(s) addressed

Institutional ⊠; Technological ⊠; Information and Services ⊠; Human resources ⊠

### Purpose of the Capacity Development Intervention

Located in the maritime continent and characterized by its unique natural features, Indonesia faces significant challenges due to extreme marine weather and climate conditions. These conditions require specialized meteorological services to ensure the safety and sustainability of its extensive coastal and marine activities. Consequently, robust and adaptive strategies are

essential for mitigating the impacts of these severe weather phenomena on the nation's vast archipelago.

The similar challenges also faced by the Small Island Developing States (SIDS) of the South West Pacific and other developing and least developed countries, extreme weather events such as tropical cyclones, heavy rainfall, and storm surges, pose significant challenges to the safety of people's lives. These events, intensified by climate change, are affecting the lives and livelihoods of coastal communities. For fishermen and others dependent on the sea, navigating these hazards is a continuous struggle. The Weather Field School for Fishermen addresses this urgency by aiming to improve fishermen's safety and optimize fishing outcomes through tailored training programmes.

The purpose of the Weather Field School for fishermen both at national and regional level is to improve fishermen safety and optimize catchment outcomes. This initiative aims to enhance the knowledge and skills of fishermen in understanding weather patterns, interpreting weather forecasts, and applying appropriate safety measures while at sea. By equipping fishermen with the necessary tools and information, the program seeks to reduce the risks associated with adverse weather conditions, mitigate potential hazards, and ultimately improve the overall safety and productivity of fishing operations.

In addition to leveraging modern meteorological tools, the program integrates traditional knowledge and practices used by fishermen to interpret weather and marine conditions. For example, local fishermen often rely on natural indicators such as changes in wind patterns, cloud formations, or the behavior of marine animals to predict weather conditions. These traditional methods have been harmonized with modern forecasting techniques to ensure that fishermen can utilize a holistic approach in decision-making. This integration not only enhances the relevance of the program but also fosters trust and engagement among coastal communities who value their cultural heritage.

In short, this program aims to enhance fishermen's ability to adapt to rapidly changing weather and climate conditions, which are crucial for their daily activities and long-term sustainability. This intervention specifically addresses the identified capacity development gaps in understanding and utilizing meteorological and oceanographic information effectively.

#### **Case description**

#### Step 1: Assess

The need for the Capacity development program was identified based on the gaps between current technology usage and the insufficient understanding level of meteorological and oceanographic information among coastal communities. This was determined through a systematic analysis, including regional hazard mapping and socio-economic assessments of fishing communities most affected by extreme weather events. Priority was given to regions with high dependency on fisheries, limited access to meteorological information, and frequent exposure to hazards such as tropical cyclones and storm surges. The rapid technological and informational changes, coupled with the occurrence of extreme weather events highlighted the

importance of weather information by fishermen. This assessment underscores the need to enhance ocean literacy and the use of weather information in the fisheries-related sectors.

# Step 2: Engage

In general, engagement involves collaboration with multiple stakeholders including relevant Ministries, Local Governments, NGOs, Universities, Private Sectors, and international organizations, such as WMO and IOC UNESCO. In Indonesia, the program mainly involved the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia (KKP) among others to broaden its reach and impact. All these engagements are essential not only for gathering resources and sharing knowledge but also to ensure the programs are effective and align with the needs of fishing, aquaculture, and coastal communities.

# Step 3: Design

The program is meticulously designed to enable direct interaction between the National Meteorological and Hydrological Services (NMHSs) and fishermen. It offers a comprehensive blend of theoretical knowledge and practical lessons, ensuring that participants can immediately apply what they learn to improve their daily operations, particularly in terms of dealing with weather and climate challenges.

Central to the program's design is the integration of modern meteorological tools with traditional knowledge and practices commonly used by fishing communities to interpret weather and marine conditions. Coastal communities, particularly fishermen, often rely on *local wisdom* in their daily operations, such as interpreting changes in wind patterns, observing marine animal behavior, or identifying specific cloud formations to predict weather changes. This wisdom, passed down through generations, reflects a deep understanding of their environment. By harmonizing these traditional methods with scientific weather forecasts and modern technologies, the program enhances the relevance and acceptance of the training. This combination strengthens the fishermen's ability to make informed decisions, improving their safety and productivity while respecting their cultural heritage and fostering greater trust and engagement with the program.

The design and development of the Weather Field School for Fishermen activities involves collaboration with relevant stakeholders to comprehensively understand the requirements of marine weather services essential for supporting the activities of fishermen, taking into account the local culture of the community. Stakeholders include fishermen, regional government partners involved in fisheries, fishing port authorities, and other relevant parties. This collaborative approach not only ensures that the Weather Field School effectively addresses the specific needs and challenges faced by fishermen but also reinforces the program's capacity to integrate diverse expertise and perspectives in its implementation.

### Step 4: Implement

The Weather Field School for Fishermen was initially launched in 2016 with the aim of providing training to communities in 11 locations in Indonesia. Since then, the program has expanded significantly and is now implemented in numerous locations across Indonesia, totaling up to 203 locations by 2023. This inclusive program targets both sea-capture fishermen and aquaculture fishermen, recognizing the diverse needs of different segments of the fishing community. In some areas, it also includes a thematic Weather Field School for Fishermen for the salt farmers

community. Recognizing the value of this initiative, the program has been adapted for sharing with other National Meteorological and Hydrological Services (NMHSs) in different countries, contributing to broader capacity-building efforts in marine weather services worldwide.

#### Step 5: Evaluate

The evaluation of the Fishermen Weather Field School program focused on assessing the effectiveness of the training sessions and the participants' ability to adapt to and prepare for weather variations. Feedback was gathered from both participants and stakeholders, with a particular emphasis on measuring increased awareness and preparedness for extreme weather risks. Success stories, such as villages successfully avoiding hazards through heightened awareness and improved preparedness, were highlighted as key indicators of the program's impact.

### Application of WCDF Principles

#### P1: Holistic approach;

The Weather Field School for Fishermen employs a holistic approach by involving various stakeholders including coastal communities, local governments, NGOs, Universities, and International Organizations to ensure a broad spectrum of expertise and support. By integrating information from regional governments and participants, the program address the specific needs and conditions of the local fishing communities. This inclusive approach fosters better and practical application of the knowledge.

Central to the program's effectiveness is its ability to harmonize traditional knowledge systems with modern technological solutions. Fishermen from various regions have long relied on natural indicators, such as changes in wind direction, the behavior of marine animals, and specific cloud formations, to predict weather conditions and locate fish. For instance, fishermen in Kupang observe the movement of seabirds like frigate birds to locate schools of fish, a practice now complemented by meteorological tools such as the Ina-WIS platform. This platform provides real-time weather updates and fish location predictions, blending traditional and modern methods. Similarly, fishermen in eastern Indonesia use seasonal wind patterns, locally known as "Angin Barat" ("Westerly Wind") and "Angin Timur" ("Easterly Wind"), to plan their fishing trips, which are now supported by satellite-based weather forecasting. This integration enhances both safety and operational efficiency.

Preserving and integrating local wisdom is crucial, as it represents generations of lived experience and a profound understanding of local environmental conditions. By blending these time-honored practices with technological advancements, the program bridges the gap between community knowledge and modern scientific tools. This ensures that fishermen can adapt to new technologies without losing their cultural heritage, fostering harmony between traditional and modern approaches. Such an approach empowers fishermen to make informed decisions, optimize their operations, and address the challenges posed by changing weather and climate conditions. Furthermore, advanced meteorological tools and technologies enhance fishermen's ability to monitor weather conditions, predict fish locations, and identify potential hazards. These practical applications improve their productivity and safety at sea. By incorporating sessions on reading and accessing meteorological data into its curriculum, the program equips fishermen with the skills to adapt to evolving weather and climate patterns, solidifying its holistic and inclusive approach

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# P2: Sustainability;

This program has been incorporated into national strategic plans and has secured government support and recognition to ensure its continuity and consistency. The endorsement of the Weather Field School for Fishermen by the UN Decade of Ocean Science for Sustainable Development highlights international significance. This recognition underscore the program's contribution to achieving sustainable development goals, particularly in the context of climate action, ocean conservation, and coastal community resilience. Furthermore, the endorsement elevates the program's visibility elevates the program's visibility, aligns it with global standards and priorities, and enhances its credibility and potentially attracting further support and collaboration.

Sustainability is a key pillar of the program's design and implementation. Currently, the Fishermen Weather Field School program in Indonesia is fully funded by the Government of Indonesia, reflecting its commitment to national priority programs. This funding ensures equitable implementation across the archipelago, reaching diverse fishing communities. To further enhance the program's impact, BMKG is actively exploring international funding opportunities for collaborative activities. As the program has been endorsed by the UN Ocean Decade, this opens pathways to propose funding from international organizations. Such support would enable the adaptation and expansion of the Fishermen Weather Field School to other countries, particularly those facing similar challenges in marine weather resilience.

Community engagement in this program has been accelerated actively through the formation of alumni groups WhatsApp Group platform, as a support for the ongoing learning and application of the skills acquired. This network also serves as a community of practice (CoP) and a support system to enhance the resilience of the local coastal community. The BMKG Regional Offices and the involved parties need to build the specific design of the Weather Field School for Fishermen to ensure the ongoing communication between the parties is sustained.

The emerging online training method and facilities, along with the collaboration with WMO and IOC UNESCO have become modalities for ensuring the sustainability of the program to be shared with even wider communities worldwide.

To strengthen its result-based approach, the program is developing a comprehensive results framework to measure its long-term impacts. Key metrics include:

• **Safety**: A reduction in weather-related fishing accidents, reflecting the effectiveness of training on preparedness.

- **Economy**: An increase in participants' income through improved operational efficiency and reduced fuel consumption.
- **Resilience**: Enhanced community adaptation to weather variability and climate challenges, as seen in the adoption of better safety practices.

A longitudinal study is recommended to monitor the sustained impact of the training on fishermen and their communities. Periodic surveys and data collection over several years will be conducted to assess the program's contributions to improved safety, economic outcomes, and overall community well-being. These studies will also identify areas for further enhancement, ensuring the program remains adaptive to the evolving needs of fishing communities while consistently delivering measurable results.

#### P3: Prioritization;

The program prioritizes the delivery of weather information provided by the NMHSs in a manner that is easily accessible and understandable to the fishermen community. This prioritization addresses both immediate local needs and broader international goals aimed at mitigating the impacts of climate change and promoting sustainable fisheries. To ensure the program effectively targets the most vulnerable communities, a systematic analysis was conducted, including regional hazard mapping and socioeconomic assessments. This analysis identified regions most affected by extreme weather events, such as tropical cyclones and storm surges, and areas with high dependency on marine livelihoods. These findings guided the program's focus on regions critical for both local subsistence and global food security.

This approach ensures that the fishermen are not just passive recipients of information but are equipped and empowered to actively utilize this data in enhancing their daily operations and long-term planning. Furthermore, the involvement of fishermen and local communities in reporting current weather conditions in the form of crowdsourcing is valuable for NMHSs to improve the services as the direct validation of the weather information in the field. The integration of community feedback and localized assessments ensures that the program remains responsive to the dynamic needs of fishing communities.

#### P4: Efficiency and Innovation;

Expanding the target audience of this program includes a wider range of roles in marine services to enhance its impact and relevance. This inclusive approach ensures that a broader range of individuals can benefit from the training, thereby promoting resilience and safety across the entire community. An innovative feature is also added to the system that allows users to choose specific fish types for targeted location information. In this regard, the technology becomes not only a tool for general weather forecasting but also a resource to help fishing efficiency.

The program is also exploring additional innovative tools to further enhance efficiency and scalability. For instance, integrating Ina-WIS website for predictive fish locations and dynamic weather updates could provide real-time support to fishermen, reducing uncertainties during operations. Mobile applications tailored for fishermen with limited technical literacy are under development to ensure accessibility and usability.

In this context, technology serves not only as a tool for general weather forecasting but also as a resource to optimize fishing efficiency. This targeted approach guarantees that fishermen spend

less time searching for productive fishing spots, thereby enhancing their overall efficiency. Therefore, the participation of fishermen and fisheries authorities will be crucial in supplying information about fishing zones, complementing the fishing ground data provided by BMKG on the Ina-WIS platform.

# P5: Cooperation, equity, and inclusion;

The cooperation and close collaboration were built from the beginning with the Indonesian local and national partners and stakeholders. In the wider scope, this collaboration expanded to international organizations like WMO and OTGA IOC UNESCO. The inclusion of participants from various countries demonstrates the program's commitment to global learning and knowledge exchange. The program also places a strong emphasis on reaching vulnerable groups within fishing communities, including women and small-scale fishers, who are often underrepresented in capacity development initiatives. Specific efforts have been made to tailor training content to their needs, such as simplifying weather information delivery and ensuring accessibility to training sessions. This international perspective enriches the learning experience to implement best practices. By involving fishing communities directly in program design and addressing the needs of marginalized groups, the initiative ensures equity, relevance, and broader impact.

Equity and inclusion are key principles that can further enhance the program's design, with opportunities to ensure that marginalized groups within fishing communities, including women, are better represented. While the current implementation of the Weather Field School has not explicitly targeted women as participants, future iterations of the program could integrate this focus. For instance, many women in fishing communities play crucial roles in fish processing and logistics but often have limited access to meteorological information. Addressing this gap through targeted training sessions and outreach could significantly expand the program's impact. Additionally, localized training broad accessibility and inclusivity. By progressively involving underrepresented groups, the program can further strengthen its equity, relevance, and societal impact.

### P6: Result-based CD

Regular assessments of participants' understanding and the effectiveness of the training sessions provide critical feedback that guides the improvement of the ongoing program development. Pre and post-training tests, along with evaluation survey, have been conducted to measure the program's impact on participants' knowledge and preparedness. This approach not only allows organizers to measure the participant's understanding before and after the training but also provides essential insights to refine the program and address specific needs. Feedback from participants highlights how weather-related data and information have influenced their fishing practices, with many reporting improved decision-making and operational safety.

Notable examples of the program's success include the evacuation in Oesapa village during Tropical Cyclone Seroja, where weather knowledge gained through the training enabled the community to avoid significant damage and safeguard their livelihoods. Another example is the rescue of a buoy off the west coast of Sumatra, where fishermen applied their understanding of ocean observation equipment acquired from the program. In North Sulawesi, fishermen participating in the SILUCA program have actively reported real-time weather conditions, which are now being utilized for the verification and validation of weather predictions, demonstrating the practical value of community engagement in the program. While these outcomes illustrate the tangible benefits of SLCN, BMKG has yet to empirically track changes in fishermen's behavior or document increases in fishing yields. Moving forward, integrating post-activity evaluations into a structured framework is essential to systematically measure the program's long-term impacts. This framework should build upon existing sustainability metrics, focusing on behavioral and operational changes among participants.

By periodically collecting and analyzing data through longitudinal studies, BMKG can evaluate how the program contributes to reduced weather-related risks, improved operational efficiency, and enhanced community resilience. These insights will enable the program to remain relevant and adaptive, ensuring its continued impact on fishing communities.

#### Lessons learned and recommendations for wider application

Weather Field School for Fisherman is a key initiative within our capacity development efforts. Adopting a last-mile approach with a people-centred design philosophy, this programme is strategically designed to ensure that National Meteorological and Hydrological Services (NMHSs) are responsive to the specific needs of our end users: the fishing community. By prioritising fishermen's perspectives and requirements, we aim to improve the effectiveness and relevance of meteorological services in supporting their livelihoods and ensuring their safety at sea. Through this approach, we are committed to fostering a stronger bond between weather services and the people who rely on them every day, ultimately promoting resilience and sustainable practices within the fishing industry.

The program demonstrates the value of hands-on training and community engagement in enhancing fishermen's safety and catchment. By tailoring training to local contexts, fostering multi-stakeholder collaboration, and incorporating traditional knowledge and wisdom, the program empowers fishermen to improve their marine weather-related decision-making at sea. Investing in local capacity building, monitoring, and evaluation ensures program sustainability and scalability. This people-centric approach, rooted in community participation and traditional wisdom, exemplifies the last-mile delivery of impactful interventions, enhancing safety and livelihoods for coastal communities.

Several lessons learned from the program highlight the importance of community participation and localized approaches. For example, in Kupang, fishermen successfully avoided significant damage during Tropical Cyclone Seroja by applying weather knowledge gained from the program. In North Sulawesi, fishermen actively participate in the SILUCA program, reporting real-time weather conditions that are used for weather validation. Similarly, fishermen in Sumatra have adopted ocean observation tools, reflecting the program's influence on fostering technological adoption and capacity-building.

To amplify the program's impact, BMKG should develop a structured evaluation framework to systematically track long-term outcomes. Key metrics include reductions in weather-related fishing accidents, operational cost efficiency, and community resilience. Longitudinal studies are also recommended to monitor sustained behavioral and operational changes, providing insights

for program refinement and adaptation to evolving needs. Additionally, to further expand the impact of the Weather Field School for Fishermen program, it is recommended to conduct incountry-specific technical assistance for Weather Field School for Fishermen programs in collaboration with local partners and stakeholders. This approach would involve tailoring the program to the unique needs and challenges of each country's fishing communities, ensuring relevance and effectiveness. However, to implement such country-specific programs, support from donors is essential to enable the necessary resources and expertise to be mobilized. By securing funding support, we can enhance our capacity to deliver targeted technical assistance programs that address the specific needs of fishing communities in different countries, thereby maximizing the program's reach and impact.

BMKG's Weather Field School for Fisherman has been endorsed as one of the contributing activities to the UN Decade of Ocean Science for Sustainable Development 2021-2030 initiatives. It underlines our commitment to sustainable practices and enhancing marine and coastal operation safety. We are now looking forward to the donor collaboration with BMKG to initiate the implementation of these important activities in member countries, particularly Members in the Southwest Pacific region which could also be expanded to other regions.