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Improving Fishermen's Capacity and Skills Through a Pilot Boat Workshop in Karangharjo Village, Rembang Regency

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Abstract
The community service programme in Karangharjo Village, Rembang Regency, was implemented through a pilot workshop on ship repair as an effort to improve the capacity and technical skills of coastal fishermen. The main problems faced by local fishermen were a lack of understanding of ship diesel engine maintenance, limited access to repair workshops, and the use of manual techniques that risked engine damage. This community service activity was designed with a group-based approach, local potential, and comprehensive intervention, including training in engine maintenance and repair, practical use of workshop equipment, tool management inventory, and the construction of a community-based shipyard workshop. The results of the activity showed an increase in fishermen's skills in performing routine maintenance, managing workshop equipment, and readiness to manage workshops independently. This programme supports the achievement of the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), and SDG 14 (Life Below Water). With the establishment of synergy between universities, village governments, and fishermen's groups, this workshop initiative is expected to increase the independence, business sustainability, and economic resilience of coastal communities.

Keywords: coastal fishermen, workshops, shipyards, appropriate technology, community empowerment

INTRODUCTION

Coastal communities are categorized as groups of people inhabiting coastal areas whose economic livelihoods depend on the utilization of marine and coastal resources. Most coastal communities, both directly and indirectly, depend for their survival on managing the potential of fisheries resources, which are a key component of Indonesia's maritime community structure (Abidin As, 2019) **.**

One example is the coastal community in Rembang, which relies heavily on fishing for its livelihood. Specifically, Karangharjo Village, Kragan District, Rembang Regency, is home to 20 fishing communities, comprising 2,120 people and 687 vessels. Seventy-five percent of vessels with a capacity of under 5 GT use 20 HP, single-cylinder diesel engines. Each vessel has four diesel engines: two for propulsion, one for pulling nets, and one for backup. Fuel consumption per trip ranges from 20 to 30 liters.

Currently, most fishermen still do not perform routine maintenance on their diesel engines, even though they have basic knowledge of disassembling and assembling engine components. For fishermen, the condition of the engine is considered sufficient as long as it still functions properly. Meanwhile, routine maintenance such as changing the oil, diesel filter, oil filter, and air filter is often neglected. Engine oil is never changed, but only topped up when the volume is low. In fact, in the vast majority of cases (99.9%), the addition of oil is done using used oil. S

One of the important systems to support the performance of the main engine is the lubrication system. This system needs to be maintained so that the main engine can function smoothly. If the

lubrication system is not good or not maintained, the performance of the main engine can be disrupted, causing the engine to overheat quickly and damage engine components (Mochamad, 2020) . Meanwhile, the impact of never carrying out regular engine maintenance includes fishermen complaining of frequent wear on engine components (*camshaft, bearing,* crankshaft, piston, cylinder and *piston ring*) due to never changing the engine oil and there are incidents of fishermen often experiencing *diesel runaway* - the condition of the engine running out of control using an external fuel source and the operator cannot turn off the engine conventionally (Mariyanna & Chakravarthy, 2013) .

According to other research, if this problem is not addressed promptly, the turbocharger and main propulsion engine can be damaged, the diesel engine performance is compromised, piston rings often break, and vessel operations are hampered (Endrodi, 2010) . Lack of attention to engine maintenance often results in sudden breakdowns while fishermen are on the move. This condition causes departure delays, and in some cases, fishermen fail to reach their planned fishing locations. Engine damage can be reduced with routine and planned maintenance. Timely and structured maintenance will increase engine *availability* and reliability *(* Alwi et al., 2022) .

Furthermore, fishermen tend to be unfamiliar with the use of measuring instruments for valve clearance adjustment and injector calibration. Valve adjustment is performed manually, relying on intuition (*feeling*) without the aid of measuring instruments, only by observing the sound and the looseness of the trigger (*rocker arm*). Injector calibration is also performed manually, namely by installing the injector in the fuel line and then turning the engine to observe the fogging process visually without measuring the fogging pressure. This should be given careful attention because the function of calibrating each injector is to obtain the fuel injection pressure setting that comes out through each injector so that the pressure on each injector has the same magnitude (Anugrah, 2021) .

Based on the background of the conditions in the field, it reflects a lack of technical knowledge and access to appropriate equipment, thus hampering the operational effectiveness of fishermen in carrying out fishing activities. This is because fishing vessels have a certain service life, on the other hand, cases of equipment used by fishermen are still found missing. In the capture fisheries business, the largest investment is invested in the procurement of fishing vessels so that fishing vessels can be used or have a long life. Therefore, generally all fishing vessels will require maintenance or repairs at certain periods (Subawa et al., 2016) . The lack of understanding of fishermen regarding ship maintenance and repair affects the condition of the ship's engine and fishing activities, so fishermen need further training and the implementation of the construction of a ship workshop that will later be used as a business development for fishermen in Karangharjo Village. Another goal is to serve the fishing community due to the lack of adequate workshops (Pratiwi, 2023) .

This facility is highly relevant for fishermen, especially in small-scale fisheries centers dominated by fishermen using outboard motorboats and fishing gear such as nets, rods, and lift nets (Feriadi et al., 2022) . Each member of the fishing community can utilize the workshop to repair boat engine damage and other fishing equipment frequently encountered by fishermen (Chalid, 2017) . The existence of a fishing workshop not only increases income but also reduces fishermen's expenses on fuel (Hadiyana et al., 2021) . The operational processes of a fishing boat engine workshop include frequent engine repairs, spare part replacement, dismantling and reassembly (*overhaul*), and service. The development of boat motorization, which is part of the fishing or production subsystem, will be hampered if it is not balanced by the development of a boat engine workshop, which is part of the production facilities subsystem (Ahmad, 2013) .

This program is also related to Appropriate Technology (TTG) which has been regulated in the Minister of Home Affairs Regulation Number 20 of 2010 concerning Community Empowerment through Management of Appropriate Technology (Teknologi et al., 2013) . Appropriate technology is technology that is appropriate to the needs of the community and can be utilized optimally (Oleh, n.d.) . The goal is to minimize damage to engine components. Engine maintenance is not only based on working hours, but is also influenced by the condition of the components. If there is a problem with the diesel engine, maintenance must be carried out early to maintain optimal performance (Hermawati et al., 2020) .

This program helps fishermen improve their engine maintenance skills, reduce repair costs, and minimize the risk of income loss (SDG 1). Furthermore, the program promotes the productivity and sustainability of the fisheries sector (SDG 8), utilizes more efficient technology (SDG 9), and reduces marine environmental impacts through proper engine maintenance (SDG 14). This program improves the independence, well-being, and sustainability of fishing communities.

METHOD

The methods and approaches applied in community service activities in Karangharjo Village are designed to provide maximum and sustainable impact for the community. 1) The group-based approach aims to facilitate a more effective learning and mentoring process, by using fishermen's groups as a medium for planning, implementing, and evaluating activities. 2) The comprehensive approach includes interventions in various aspects, including the provision of facilities and infrastructure, increasing knowledge and awareness, establishing institutions, and training in institutional management, with the aim of improving the overall capacity of the community. 3) The local potential-based approach emphasizes the utilization of local values and culture in every stage of the activity, thereby increasing the relevance and acceptance of the program in the community. Through the implementation of these three approaches, it is hoped that the program can make a significant contribution to community empowerment and produce sustainable change.

RESULTS AND DISCUSSION

Coordination of Joint Activity Programs with Partners

Before implementation of the Improvement Program Fishermen's Capacity and Skills through Pioneering Ship Workshop in Karangharjo Village, has done a series coordination strategic with various party related to May 15, 2025. Coordination This is step crucial start For ensure harmony purpose, effectiveness program implementation, as well as optimization impact devotion to community. Activities coordination focused on two groups main, namely Karangharjo Village Government, in particular Village Head and Karya Samudra Fishermen Group as recipient benefit directly. The equalization process perception done in a way intensive, good through meeting face advance and online communication, with discuss various aspect technical and substantive activity.

Coordination results the produce a number of agreement main, including: the existence of approval and support active from Karangharjo Village Government and Karya Samudra Fishermen's Group, the determination module applicable training, as well as commitment together For conducting learning reviews and mentoring further to ensure the material provided can implemented in a way sustainable. After the coordination and preparation process agreement together finished done, stage furthermore is implementation of the program directly in the field. Implementation This done with still referring to the results coordination that has been agreed upon, to ensure all over stages walk in accordance program plans and objectives can achieved optimally.

Figure 1. Coordination with the Karya Samudra Fishermen's Group

Ship Engine Repair and Maintenance Training

Advanced workshop training activities were carried out directly and practically with fishermen in Karangharjo Village. The material was presented with a focus on increasing fishermen's capacity in routine maintenance and repair of boat engines, particularly diesel engines commonly used by local fishermen. The training was not only conducted theoretically, but also followed by field practice sessions that actively involved participants. The implementation team, together with groups of fishermen, directly observed, dismantled, and repaired boat engine components using the equipment provided during the training. Participants were given the opportunity to try workshop equipment, such as hand grinders, magnetic welding holders, and other supporting tools, to improve their technical skills directly.

This situation created a space for participatory learning, where fishermen could discuss the real-world challenges they face in the field. Some of the issues that frequently arise include a lack of understanding about regular maintenance, how to recognize minor damage, and simple but vital parts replacement techniques for maintaining optimal engine performance. The results of this activity revealed that most fishermen face challenges due to limited access to local boat repair shops, as well as a lack of equipment and prior training. Therefore, this training is the first step in establishing a community-based boat repair shop that can help fishermen independently repair their engines and prevent more serious damage in the future.

Figure 2. Documentation of Ship Engine Repair and Maintenance Training Activities

Training on Equipment Inventory and Construction of Ship Workshops

As a follow-up to the technical training, the activity continued with assistance with equipment inventory management. This activity aimed to introduce the fishermen group to the importance of recording, managing, and regularly maintaining workshop equipment. Equipment inventory serves as the foundation for workshop management, ensuring the ongoing, orderly and professional operation of the workshop.

In this session, fishermen were given an understanding regarding the classification of work tools, the function of each tool, and how to store and maintain equipment to keep it in optimal condition. Based on the inventory results, it was found that some of the tools currently owned by the fishermen group are still limited and the conditions are quite diverse, ranging from tools with basic functions to tools that have begun to wear out due to use without adequate maintenance. Therefore, through this service, UNNES is present to collaborate with each other by facilitating the tools needed by fishermen and can be used sustainably until the availability of a ship repair shop. The following are the tools used to support this service program: liner removal machine, spring valve puller, hand socket set, digital caliper, bearing puller, 12 13 ring fitting, inner-outer snap ring, 28 ring wrench, Y wrench, 30mm shock wrench, plastic gauge, 6314 bearing, bearing puller, liner cylinder + ring, gasket head, rtv silicone, torch, wd, container box.

The implementation team, along with the fishermen's group, also began building a Boat Workshop as a facility to support the program's sustainability. This process involved direct discussions with representatives from the Karya Samudra Fishermen's Group to determine a strategic location that was easily accessible to the fishing community. Several aspects were developed, including: 1) Determining the location of the workshop construction near the fishermen's residential area to facilitate access to repairs and further training, 2) Building a simple, functional workshop, taking into account coastal environmental conditions and land availability, 3) Preparing an operational scheme for the workshop that involves fishermen as managers, with support from fisheries extension workers and periodic university mentoring.

This progress marks a milestone in establishing a community-based technical service center focused on empowering fishermen to perform boat repairs and maintenance. It is hoped that through this workshop, fishermen's groups in Karangharjo Village will be better equipped to address technical engineering issues independently without having to rely on workshops from outside the area.

Figure 3. Training on Equipment Inventory and Construction of a Ship Workshop

CONCLUSION

The Fishermen's Capacity and Skills Improvement Program through the Pilot Boat Workshop in Karangharjo Village, Rembang Regency, has had a positive impact on improving technical skills, understanding equipment management, and fishermen's awareness of the importance of community-based workshop management. Training covering boat engine maintenance and repair, the use of simple workshop tools, and equipment inventory has successfully equipped fishermen with practical competencies relevant to field needs. Although equipment availability is still limited and requires updating, the workshop development planning process with fishermen's groups has become the initial step towards establishing an independent technical service center. The involvement of universities, village governments, and fisheries extension workers forms a strategic synergy for the program's sustainability, while also opening up opportunities to strengthen the local economy through boat workshop businesses managed independently by local fishermen.

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REFERENCES

Abidin As Z. Empowerment of Fishing Communities on the Blanakan Coast, Subang Regency. J Caraka Prabu. 2019;1(2):84–122.

Mochamad RE. Analysis of Main Engine Lubricating Oil Maintenance on MV Ships. Jurnal Cakrawala Bahari. 2020;3(2):13–28.

Mariyanna N, Chakravarthy R. Method of identifying and stopping an electronically controlled diesel engine in runaway mode. SAE Tech Pap. 2013;12.

Endrodi M. Strategy to Overcome the Causes of Surging in Diesel Engines as Prime Propulsion Devices in MT. ONTARI. 2010;29–51.

Alwi MR, Yusuf ZA, Klara S, Haryanto S, Husni A, Rivai H, et al. Empowerment of Fishermen Community Through Regular Boat Engine Maintenance Training in Galesong Village, Takalar Regency. 2022;5:81–9.

Anugrah RA. Analysis of the Effect of Inline Type Injection Pump Calibration and Diesel Engine Injector on Injection Volume and Pressure. J Mechanical Tech. 2021;10(1):9.

Subawa IN, Sitanggang EP, Polii JF. Study on damage and repair time of fishing vessels undergoing repairs at the Fisheries Vessel Training Workshop of the Bitung Marine and Fisheries Polytechnic. J Science and Technology of Capture Fisheries. 2016;2(2):101–4.

Pratiwi M. Efforts to Improve the Welfare of Coastal Fishing Communities in Lopo Village Through the Development of a Ketinting Engine Repair Service Workshop. 2023;2(1):64–71.

Feriadi I, Ariyanto A, Aswin F, Rivai M. Machine Repair to Improve Workshop Services at the Nusantara Fisheries Port, Sungailiat District, Bangka Regency. J Community Service

Polmanbabel. 2022;2(02):51–7.
Chalid A. Patronage Politics in Bontoa District, Maros Regency. Ekp. 2017;13(3):1576–80.
Hadiyana S, Yuli A, Luhur R. Implementation of Corporate Social Responsibility Practices at PT Pertamina Hulu Mahakam through the Fishermen's Empowerment Program. J Community Empowerment Univ Al Azhar Indonesia. 2021;3(2):74.
Ahmad M. Fishing Boat Engine Workshop in Dumai City. Department of Agriculture. 2013;XXVIII(2):141–52.
Regulation of the Regent of West Bandung Number 26 of 2013. Guidelines for Community Empowerment Through Appropriate Technology Management. Regent of West Bandung. 2013;1–13.
Imran, Mohammad. Environmentally Friendly Construction Materials with the Application of Appropriate Technology.:146–57.
Hermawati L, Mujiarto I, Hariyadi S, Kemaritiman F, Maritim U, Semarang A, et al. Analysis of Cylinder Liner and Piston Measurements in Diesel Engine Overhaul. 2020;1(2):6–12.