

## Enhancing Community Self-Sufficiency: A Case Study of Motorcycle Maintenance Training in North Balikpapan

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### KEYWORDS

*Training  
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**ABSTRACT** – Motorcycle maintenance and service training represents a strategic initiative to enhance technical skills and empower individuals to independently maintain the condition of their vehicles. This training program was implemented in North Balikpapan with the primary objective of imparting both practical and theoretical knowledge on motorcycle maintenance and repair to local residents. The training methodologies employed encompassed classroom-based theoretical sessions, live demonstrations, and hands-on practical work under the guidance of experienced instructors. The outcomes of this training program indicated a substantial improvement in participants' comprehension and technical proficiency. Prior to the training, most participants possessed minimal knowledge regarding the fundamental aspects of motorcycle maintenance. However, post-training assessments revealed that participants were capable of performing various routine maintenance tasks such as oil changes, brake inspections, and chain adjustments. Furthermore, participants demonstrated the ability to diagnose and repair common issues, including carburetor contamination and ignition system malfunctions. The success of the program was evaluated not only by the enhancement of technical skills but also by the increased confidence and self-reliance of the participants in maintaining their motorcycles. The broader implications of this training include cost savings on vehicle maintenance for residents, improved driving safety, and potential economic uplift through the establishment of independent motorcycle service ventures. In conclusion, the motorcycle maintenance and service training program conducted in north Balikpapan had a marked positive impact, enhancing the technical capabilities of the community and fostering community empowerment through the development of practical skills.

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## INTRODUCTION

With the growth in population and societal mobility, motorcycles have become a primary means of transportation in many areas due to their high efficiency and flexibility [1], including in north Balikpapan. For the community, especially students, motorcycles are an efficient and affordable mode of transport. However, challenges in maintenance and repair often arise due to a lack of knowledge and skills [2]. This issue creates a need for technical training to enhance the community's ability to maintain and repair their motorcycles. Technically, well-maintained motorcycles that undergo regular servicing and oil changes can ensure long engine life, sustained performance, and improved fuel efficiency [3]–[6]. From an economic perspective, this situation also presents significant business opportunities. Data shows that over 5,000 motorcycles pass through this area daily, considering the number of students and residents [7]. Therefore, a comprehensive and sustainable approach is required to address these issues.

The proposed motorcycle maintenance training program in north Balikpapan aligns with similar endeavors conducted globally, reflecting a shared recognition of the importance of equipping communities with practical skills. Initiatives akin to this include competency enhancement projects like those implemented at SMK Bina Industri [8] and SMK Bina Utama Kendal [9], as well as training programs tailored for school dropouts in locales such as Ogan Ilir [10] and Karang Tanjung Sidoarjo [11]. Such efforts are not confined to specific regions; they are mirrored in diverse corners of the world, evidenced by similar undertakings in Hungary [12] and the Philippines [13], [14]. The primary aim of the proposed program is to furnish residents of north Balikpapan with both theoretical knowledge and practical skills pertaining to motorcycle maintenance and repair. The delineated objectives encompass augmenting participants' comprehension of fundamental motorcycle components and functionalities, imparting proficiency in routine upkeep tasks like oil changes, brake inspections, and chain adjustments, honing their ability to diagnose and rectify common mechanical issues, and nurturing their self-assurance and self-reliance in motorcycle care. While acknowledging the efficacy of prior technical training initiatives within the automotive domain in bolstering community empowerment and reducing dependence on external servicing, it's observed that such programs predominantly gravitate towards

urban settings endowed with ample resources and seasoned instructors. Consequently, the proposed program aspires to bridge this gap by extending analogous opportunities to communities like north Balikpapan, where access to such resources may be comparatively constrained.

The novelty of this program lies in its implementation within north Balikpapan, an area that may have been previously untouched by similar initiatives. The approach emphasizes knowledge transfer and the enhancement of participants' confidence and self-reliance. A combined learning methodology, encompassing classroom theory, direct demonstrations, and hands-on practice, ensures a comprehensive learning experience. Moreover, the program introduces new economic opportunities by enabling participants to establish their own motorcycle servicing businesses independently, thereby enhancing the economic well-being of the local community. Thus, the motorcycle maintenance and service training program aims to enhance the technical skills of the residents of north Balikpapan and empower them economically and socially. Additionally, it has the potential to serve as an effective and sustainable training model for other communities.

## METHOD

### A. Method of Implementation at the Training Site

The training methods implemented in the motorcycle maintenance and service activities in north Balikpapan comprise several approaches designed to provide participants with a comprehensive learning experience. Firstly, classroom theory sessions are utilized to deliver fundamental knowledge about motorcycle components, operating principles, and routine maintenance procedures [15]. This includes discussions on ignition systems, fuel systems, as well as techniques for identifying and addressing common motorcycle problems. Subsequently, direct demonstrations conducted by instructors showcase step-by-step maintenance procedures such as engine oil replacement, brake system inspection, and chain adjustment [16]. Participants then engage in hands-on practice where they have the opportunity to apply the acquired knowledge by performing maintenance and repairs on motorcycles under the guidance of instructors [17]. Discussions and question-and-answer sessions are also held to facilitate the exchange of information and experiences among participants and to provide updates on relevant technology and recent developments in the automotive industry. Final evaluations and feedback sessions are conducted to assess participants' progress and the overall effectiveness of the training program. With these methods, it is expected that participants will acquire sufficient knowledge and skills to confidently maintain and repair their motorcycles.

### B. Types of Damage and Solutions

Routine motorcycle maintenance involves several key tasks to ensure the optimal performance and longevity of the vehicle. These tasks include:

#### 1. Engine Oil Replacement:

- **Importance:** Engine oil is vital for lubricating the internal components of the engine, reducing friction, and preventing overheating. Over time, engine oil degrades and becomes contaminated with particles, reducing its effectiveness.
- **Procedure:** To replace the engine oil, start by warming up the engine to ensure the oil flows more easily. Then, place a drain pan under the engine and remove the drain plug to let the old oil drain out completely. Replace the drain plug and refill the engine with new oil of the recommended type and grade. It's also advisable to replace the oil filter at the same time to ensure optimal oil flow and filtration.

#### 2. Brake System Inspection:

- **Importance:** The brake system is critical for safety. Worn-out brake pads can reduce stopping power and increase stopping distances, potentially leading to accidents.
- **Procedure:** Inspect the brake pads for wear and replace them if they are thin. Check the brake fluid level and top it up if necessary, ensuring it is of the correct type. Inspect the brake lines for any signs of leaks or damage and ensure the calipers are functioning properly. Additionally, test the brake lever and pedal for proper pressure and responsiveness.

#### 3. Chain Adjustment:

- **Importance:** The chain transfers power from the engine to the wheels. A poorly adjusted chain can cause loss of power and premature wear of the sprockets and chain.
- **Procedure:** To adjust the chain, use the adjustment bolts located at the rear of the swingarm. Ensure the chain has the proper amount of slack as specified in the owner's manual. After adjusting, make sure to lubricate the chain with appropriate chain lube to prevent rust and reduce friction.

#### 4. Ignition System Inspection:

- **Importance:** The ignition system is responsible for starting the engine and maintaining its smooth operation. Faulty components can lead to misfires, reduced performance, and higher fuel consumption.
- **Procedure:** Inspect spark plugs for wear and deposits, and replace them if necessary. Check the spark plug gap to ensure it is within the manufacturer’s specifications. Inspect the ignition wires for cracks or wear and replace them if needed. Additionally, ensure the ignition coil and other related components are in good condition.

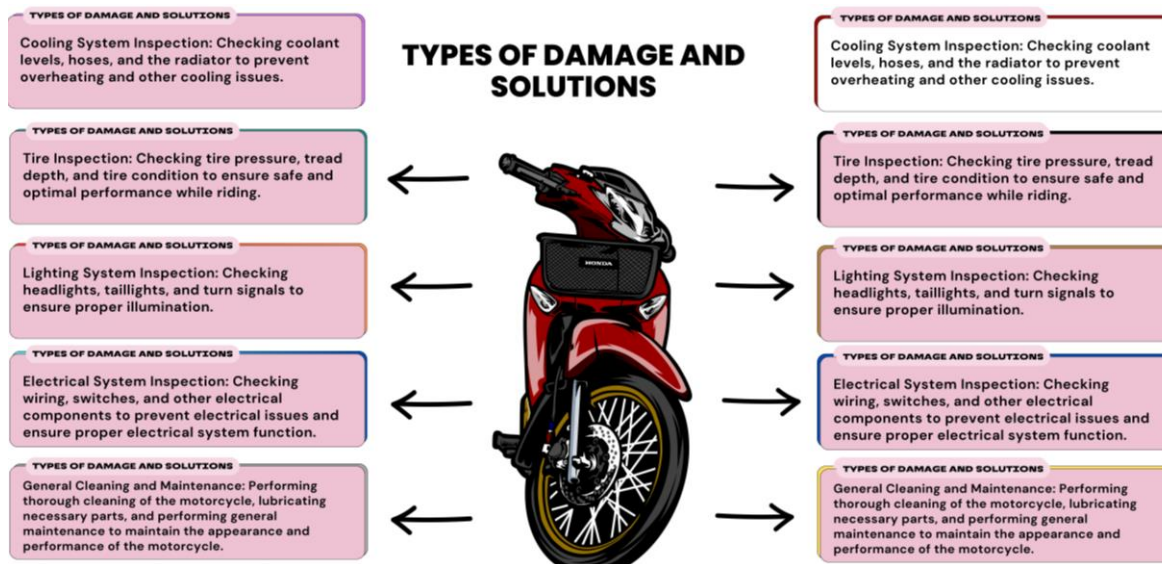


Figure 1. Photos of Motorbike Repair and Service Items

#### 5. Fuel System Inspection:

- **Importance:** The fuel system ensures the proper mixture of air and fuel for combustion. Issues in the fuel system can lead to poor engine performance and reduced fuel efficiency.
- **Procedure:** Clean or replace the air filter to ensure a proper air supply. Inspect the fuel lines for cracks or leaks and replace them if necessary. If the motorcycle has a carburetor, clean it to ensure it is free of deposits. For fuel-injected bikes, ensure the injectors are clean and functioning correctly.

#### 6. Cooling System Inspection:

- **Importance:** The cooling system prevents the engine from overheating, which can cause severe damage. Regular checks ensure the system functions correctly.
- **Procedure:** Check the coolant level in the reservoir and top it up if necessary with the appropriate coolant. Inspect hoses for leaks, cracks, or bulges, and replace any damaged ones. Ensure the radiator is clean and free of debris, and check the radiator cap for a proper seal.

#### 7. Tire Inspection:

- **Importance:** Tires are the only contact points between the motorcycle and the road. Proper tire maintenance ensures safety, handling, and fuel efficiency.
- **Procedure:** Check tire pressure using a reliable gauge and inflate to the manufacturer’s recommended pressure. Inspect the tread depth and ensure it meets the legal minimum requirement. Look for any signs of damage, such as cuts, punctures, or bulges. Rotate the tires if necessary to promote even wear.

#### 8. Lighting System Inspection:

- **Importance:** The lighting system is essential for visibility and signaling to other road users, especially at night or in poor weather conditions.
- **Procedure:** Ensure all lights, including headlights, taillights, brake lights, and turn signals, are functioning properly. Replace any burnt-out bulbs and check the wiring for any signs of wear or damage. Adjust the headlight aim if necessary to ensure proper illumination of the road ahead.

**9. Electrical System Inspection:**

- Importance: The electrical system powers essential components like the ignition, lights, and battery. Issues can lead to starting problems or electrical failures.
- Procedure: Check the battery terminals for corrosion and clean them if necessary. Ensure the battery is holding a charge and replace it if it's old or not holding a charge well. Inspect all wiring and connectors for signs of wear, damage, or loose connections. Test the functionality of switches and relays to ensure proper operation.

**10. General Cleaning and Maintenance:**

- Importance: Regular cleaning prevents the buildup of dirt and grime, which can cause corrosion and wear. It also helps in identifying potential issues early.
- Procedure: Wash the motorcycle using a mild detergent and water, avoiding direct water spray on sensitive areas like the engine and electrical components. Dry the motorcycle thoroughly to prevent rust. Apply appropriate lubricants to moving parts such as cables, levers, and pivot points. Additionally, wax the painted surfaces to protect them from the elements.

By diligently performing these maintenance tasks, motorcycle owners can ensure their vehicles remain in optimal condition, providing reliable, safe, and efficient transportation. Regular maintenance not only extends the life of the motorcycle but also enhances the riding experience and safety for the rider.

**RESULTS AND DISCUSSION**

The motorcycle maintenance and service training program conducted in north Balikpapan yielded significant and positive outcomes. The primary objective of this program was to enhance the technical knowledge and skills of the participants, thereby increasing their independence and economic well-being. Prior to the training, most participants had limited understanding of basic motorcycle maintenance. Post-training evaluations showed a substantial improvement in their knowledge. Participants were able to identify essential components such as the engine, brake system, chain, ignition system, fuel system, and cooling system, and understand their functions and maintenance requirements. During the practical sessions, participants had the opportunity to apply their newly acquired knowledge. They successfully performed tasks such as engine oil replacement, brake system inspection, chain adjustment, and general motorcycle cleaning and maintenance. Evaluations conducted through practical tests revealed that participants could perform these tasks independently and with a high success rate. This hands-on experience was crucial in strengthening their skills and ensuring they could maintain their motorcycles effectively. Table 1 below shows the number of people's vehicles who reported that their motorbikes were experiencing problems and the maintenance solutions from the team to overcome these problems

Table 1. Number of Motorbikes Being Repaired and Maintenance Measures

| N<br>O | Motorcycle<br>Vehicle Plate<br>Number | Identify problems   | Treatment Solutions |   |   |   |   |   |   |   |   | Total of<br>Repairs |
|--------|---------------------------------------|---|---------------------|---|---|---|---|---|---|---|---|---------------------|
|        |                                       |   | A                   | B | C | D | E | F | G | H | I |                     |
| 1      | KT 2806 AJ                            | Didn't change the oil for 6 months                              | 1                   | - | - | - | - | 1 | - | - | - | 2                   |
| 2      | KT 2410 KR                            | The gas is low so if you don't gas the motorbike it stops       | -                   | 1 | - | - | 1 | 1 | - | 1 | - | 4                   |
| 3      | KT 5401 CZ                            | The valve on the motorbike is leaking                           | 1                   | - | - | - | - | 1 | - | - | - | 2                   |
| 4      | KT 6479 LO                            | The CVT makes a harsh sound                                     | -                   | - | - | - | - | 1 | - | - | - | 1                   |
| 5      | KT 6273 KG                            | Didn't change the oil for 4 months                              | 1                   | - | - | - | 1 | 1 | 1 | - | - | 4                   |
| 6      | KT 6059 KN                            | Didn't change the oil for 5 months                              | 1                   | - | - | - | - | 1 | - | - | - | 2                   |
| 7      | KT 2381 YZ                            | The drag (performance) on the engine is reduced                 | 1                   | - | - | - | - | 1 | - | - | 1 | 3                   |
| 8      | KT 5034 ZK                            | Overhaul on the engine because the lubricant ran out completely | 1                   | - | - | 1 | - | 1 | - | - | - | 3                   |
| 9      | KT 3438 YB                            | The oil pan bolt won't open                                     | -                   | - | - | - | - | 1 | - | - | - | 1                   |
| 10     | KT 6771 LN                            | The brakes are squeaky  | 1                   | 1 | - | - | 1 | 1 | - | - | - | 4                   |
| 11     | KT 3697 JK                            | Dirty spark plugs   | 1                   | - | 1 | - | - | 1 | - | - | - | 3                   |

|                   |            |                  |    |   |   |   |   |    |   |   |   |    |
|-------------------|------------|------------------|----|---|---|---|---|----|---|---|---|----|
| 12                | KT 3736 QE | Dirty carburetor | -  | - | - | 1 | - | 1  | 1 | - | - | 3  |
| 13                | KT 4099 QE | Dirty air filter | 1  | - | - | 1 | - | 1  | - | 1 | - | 4  |
| 14                | KT 6028 ZN | Dirty injector   | 1  | - | - | - | - | 1  | - | - | 1 | 3  |
| 15                | KT 2388 BC | Oil leak         | 1  | - | - | - | 1 | 1  | - | - | 1 | 4  |
| Total work amount |            |                  | 11 | 2 | 1 | 3 | 4 | 15 | 2 | 2 | 3 | 43 |

Figure 2 depicts that 15 motorcycles from residents of north Balikpapan were reported for inspection. From the initial diagnosis of damage, it was found that 5 motorcycles required extensive handling, involving 4 types of maintenance actions. Conversely, 2 motorcycles only needed one type of maintenance action. The level of repair and maintenance actions for motorcycles is based on the number of damages or the diagnosis of vehicle problems. The more issues identified in the vehicle, the greater the number of repair items provided.

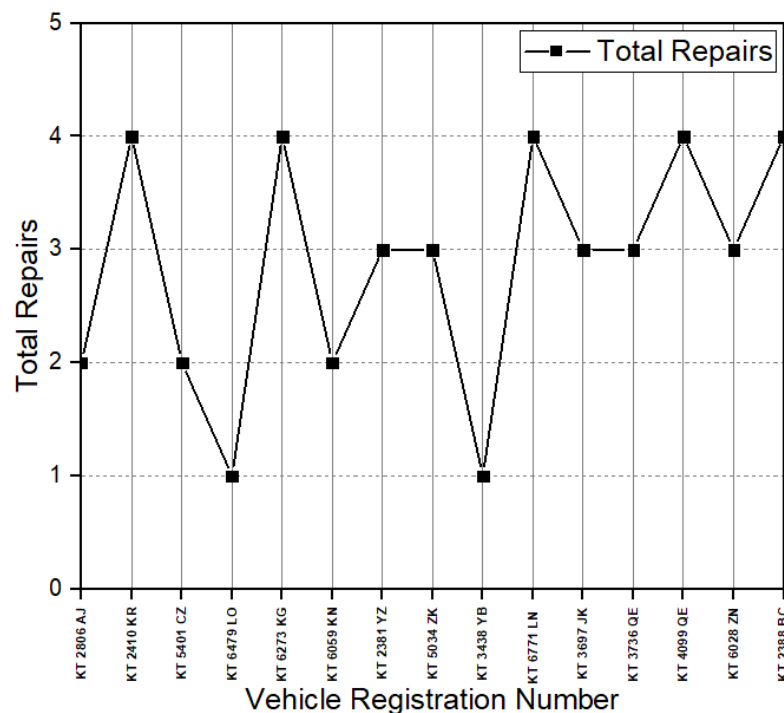


Figure 2. Graph of the Number of Motorcycle Repair Items

This observation highlights the varying maintenance needs among the inspected motorcycles. Those requiring multiple maintenance actions likely had several underlying issues necessitating comprehensive attention. It emphasizes the importance of thorough diagnostics to identify all potential problems for effective maintenance and the prolonged lifespan of motorcycles. The training program effectively equipped participants with the skills needed to perform a broad range of maintenance tasks, enabling them to address various issues identified during diagnostics.



Figure 3. Vehicle Checking by the Work Team

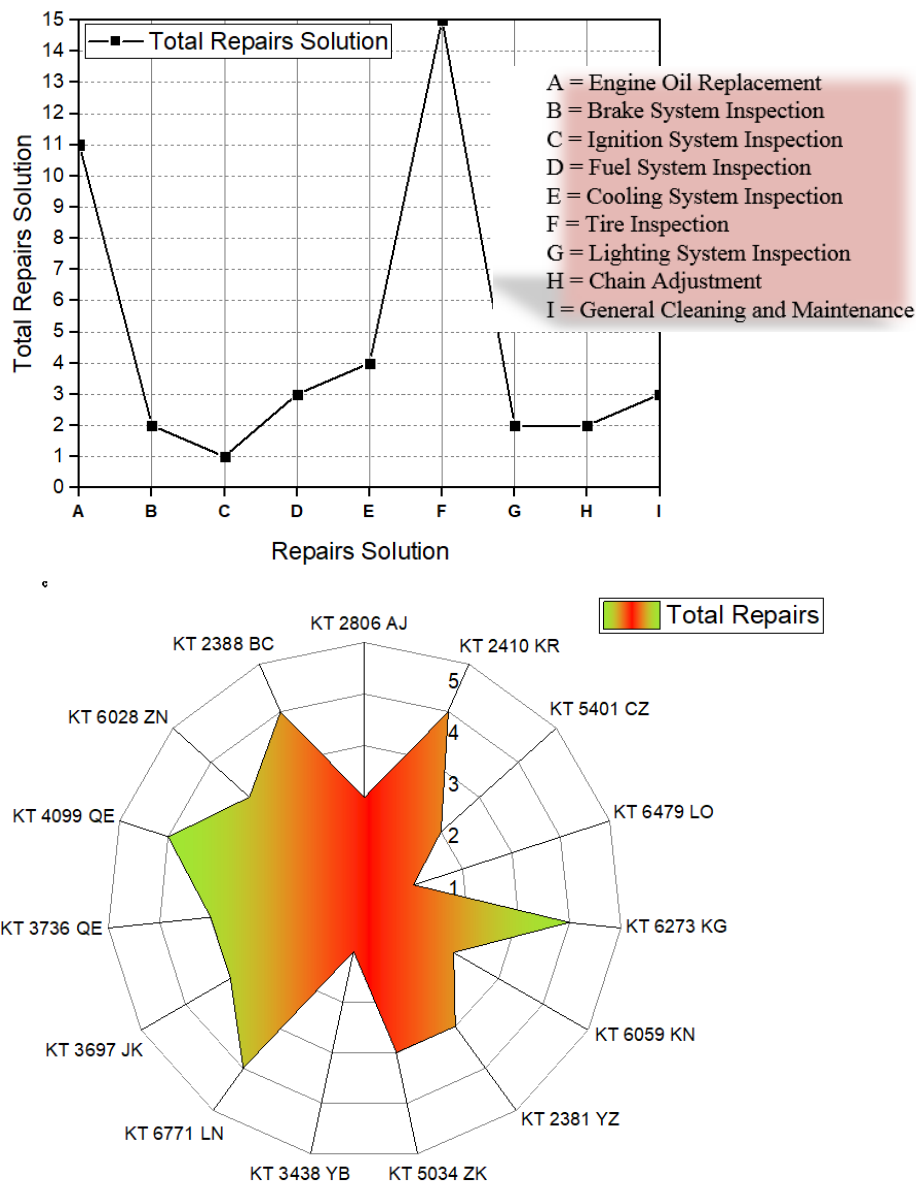


Figure 4. Graph of The Number of Motorbike Maintenance Solutions

The graph in Fig 3 above provides insight into the distribution of maintenance solutions among the vehicles of residents (15 motorcycles) in north Balikpapan. It reveals that tire inspection is the most prevalent maintenance solution, indicating the importance of ensuring tire safety and functionality. Engine oil replacement follows closely behind, demonstrating the significance of regular oil changes for optimal engine performance and longevity. Conversely, ignition system inspection appears to be the least required maintenance solution, suggesting that issues related to ignition systems are less common among the vehicles inspected. This data underscores the diverse maintenance needs of the vehicles and emphasizes the critical role of regular maintenance in ensuring their safe and efficient operation.

This direct experience is essential for bolstering their skills and ensuring they can maintain motorcycles effectively. Furthermore, the program significantly enhanced participants' confidence and independence. Many participants, who previously had doubts about performing routine maintenance, now felt more self-reliant and capable of handling basic motorcycle repairs and maintenance. This shift not only reduced their reliance on external service providers but also resulted in cost savings.

Overall, the program's success can be attributed to its comprehensive training approach, which included theoretical classroom sessions, live demonstrations, and practical work. This multi-faceted approach ensured that participants received a well-rounded education. The program's ability to improve technical skills, foster independence,

and create new economic opportunities demonstrates its potential as a model for similar initiatives in other communities.

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## CONCLUSION

the motorcycle maintenance and service training program conducted for the residents of north Balikpapan has yielded significant benefits and positive outcomes. The program successfully achieved its primary objective of enhancing participants' technical knowledge and skills in motorcycle maintenance, thereby empowering them to independently address routine maintenance tasks and minor repairs. Through a comprehensive approach encompassing theoretical sessions, practical demonstrations, and hands-on exercises, participants gained a deeper understanding of various components and systems of motorcycles, such as the engine, brakes, and fuel system. Furthermore, the program's impact extends beyond technical proficiency, as it has also contributed to the participants' confidence and self-reliance in maintaining their motorcycles. By providing them with the necessary knowledge and skills, the program has reduced their dependency on external service providers, leading to potential cost savings and increased driving safety. Additionally, the economic empowerment aspect of the program is noteworthy, as it opens up opportunities for participants to establish their own motorcycle service businesses, thereby contributing to local economic development. Overall, the success of the motorcycle maintenance and service training program in north Balikpapan underscores the importance of community-based initiatives in promoting practical skills and fostering self-sufficiency among residents. The positive outcomes observed highlight the potential for similar programs to be implemented in other communities, with the aim of enhancing technical competencies, empowering individuals, and promoting economic resilience at the grassroots level.

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