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Environmental Management Accounting Assistance at TPST 3R Mulyoagung Bersatu

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Abstract

Purpose: The Community Engagement Program (PKM) aims to address the challenges faced by TPST 3R Mulyoagung Bersatu in managing financial data related to waste management. Enhance their capacity in Environmental Management Accounting through targeted mentoring and accountability.

Method: Activities were conducted under an existing MoU between Politeknik Negeri Malang and TPST 3R Mulyoagung Bersatu. A participatory, hands-on approach was used, involving field observations, informal discussions, and interactive training sessions tailored to the partner's specific needs..

Practical Applications: Participants gained practical knowledge in applying environmental accounting principles in their daily operations. The training improved their ability to systematically record and manage financial data, directly contributing to more transparent and efficient 3R waste management practices.

Conclusion: The program successfully strengthened the understanding and implementation of environmental accounting among TPST managers. It exemplifies productive collaboration academia and the community, where mutual learning leads to sustainable and impactful solutions for environmental challenges.

Introduction

According to the Law of the Republic of Indonesia Number 12 of 2012 on Higher Education, every higher education institution must implement the Tri Dharma Perguruan Tinggi: education, research, and community service. Community service plays a strategic role in connecting academic knowledge with real-world social needs. It provides a platform for academics to apply their expertise to improve social and economic welfare and contribute to national intellectual development. Aligned with the Sustainable Development Goals (SDGs), community service is not just a form of institutional responsibility but also a collaborative effort between academia and society to solve problems scientifically, measurably, and sustainably. Therefore, community service programs should go beyond ceremonial activities and directly address root issues with relevant and applicable solutions.

Politeknik Negeri Malang (Polinema), as a vocational higher education institution, holds both moral and academic responsibility to empower communities. One realization of this commitment is the Community Partnership Program (PKM) conducted in collaboration with TPST 3R Mulyoagung Bersatu, an Integrated Waste Management Site that operates based on the principles of Reduce, Reuse, and Recycle. This long-term partnership was formalized through a Memorandum of Understanding (MoU). Field observations, assessments, and open discussions between the PKM team and TPST management revealed several gaps between the ideal integrated waste management practices and the current on-site conditions. A key challenge identified was the lack of effective implementation of Environmental Management Accounting (EMA) in TPST's operational and reporting systems. A well-functioning EMA system is essential for promoting efficiency, transparency, and accountability, particularly in waste monitoring, environmental cost allocation, and ecological impact reporting.

Previous studies highlight the importance of EMA in supporting environmental sustainability (Putra & Maulana, 2024; Zakhilwal et al., 2024). However, many organizations—including TPST—struggle with limited understanding of EMA principles, which affects their waste management performance (Almasyhari et al., 2024; Tania et al., 2024). The absence of specific financial reports for waste-related activities also hinders transparency and clarity in environmental performance (Kirana et al., 2024). Through this PKM program, the Polinema team is committed to providing practical and tailored assistance to TPST management in understanding and applying a simple yet effective EMA system. The main goals of this community service initiative are to improve environmental accounting literacy among TPST leaders and staff, emphasizing its direct link to sustainability. Design an easy-to-use EMA format suited to their operational capabilities. Transform records and reports into meaningful tools for environmental decision-making. Reveal efficiency potential by properly identifying and managing hidden environmental costs.

Under the broader concept of Green Accounting (GA), one specific form is Environmental Management Accounting (EMA). EMA integrates both environmental and financial data by identifying the use of resources and the costs linked to a company's environmental impact (Wang et al., 2022). It supports various managerial functions, including environmentally informed decision-making, managing environmental risks, and adopting sustainable practices (Mosaoy, 2023). This approach enhances transparency regarding environmental effects, enabling stakeholders to evaluate how effectively a company fulfills its environmental responsibilities. A deeper insight into environmental consequences helps management develop more sustainable strategies, reduce environmental risks, and improve resource efficiency (Hashfi, 2024). Promote transparency as a moral and digital-era obligation. This program aims to help TPST 3R Mulyoagung Bersatu develop accountable and environmentally responsible reports—demonstrating their commitment not only to waste management but also to creating a cleaner, more sustainable future.

Method

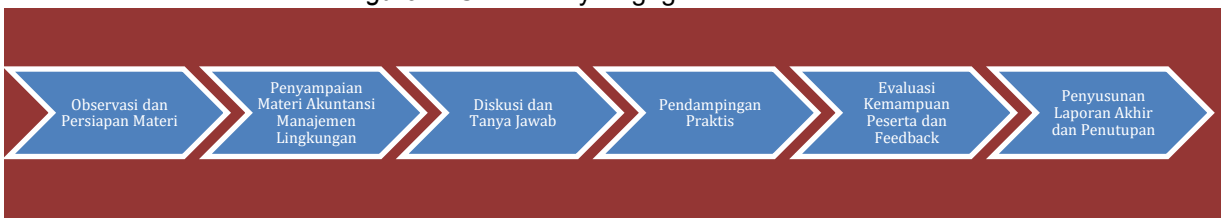
The implementation method of this Community Engagement Program (PKM) was designed using an approach that combines theory and practice to ensure the successful application of Environmental Management Accounting at TPST 3R Mulyoagung Bersatu. The activities began with a preliminary visit to TPST 3R Mulyoagung Bersatu to directly observe the operational processes and the existing waste management system. Interviews with the management team were conducted to gather information on issues, needs, and challenges in applying a relevant accounting system. The team then analyzed the existing workflows and record-keeping systems at the TPST. Based on this analysis, a tailored training module on Environmental Management Accounting was developed to suit the specific conditions of the TPST. In addition, evaluation instruments such as pre-tests and post-tests were prepared, along with sample formats for recording and reporting environmental costs that are practical and easy to apply.

The next phase involved delivering the Environmental Management Accounting material through a workshop. The material was presented using an interactive lecture method, covering the basic concepts of environmental accounting, classifications of environmental costs, and the benefits of recording such costs for sustainable waste management. The explanation was complemented by demonstrations on how to identify, measure, and record relevant environmental costs. Following the presentation, the activity continued with a discussion and Q&A session to deepen participants' understanding. In this forum, participants were encouraged to identify specific environmental costs that arise in their TPST operations. The session also provided an open space for participants to ask questions, express challenges they might face, and collaboratively brainstorm solutions. The discussion further explored how the Environmental Management Accounting system could be integrated with the existing financial system at TPST 3R Mulyoagung Bersatu.

To ensure practical implementation, the PKM activities included a hands-on mentoring phase. The team provided technical guidance in identifying and classifying relevant environmental costs and assisted participants in developing suitable recording formats. An evaluation of participants' capabilities was conducted through a pre-test at the beginning of the training to assess their initial understanding. A post-test was administered after the training to measure the improvement in their comprehension.

As the final stage, a comprehensive report was compiled, and the PKM program was formally concluded. The team analyzed all data obtained throughout the mentoring and training process to assess the program's effectiveness. Changes and developments in the TPST's recording system were thoroughly documented. The final report included evaluation results, participant feedback, and recommendations for program sustainability. A practical guide for implementing Environmental Management Accounting was also created and handed over to TPST management. The activity concluded with an evaluative meeting, where results were presented, and a discussion on the sustainability steps of the implemented system took place.

Figure 1. Community Engagement Workflow



Source: author's work, 2025

The Community Service Activity Plan will be conducted from April to July 2025 at TPST 3R Mulyoagung Bersatu in DAU, Malang, and is structured into three main phases. The first phase, Preparation (1 week), involves coordination among stakeholders, development of

training materials, scheduling of activities, and logistical arrangements. This is followed by the Implementation phase (2 weeks), during which on-site sessions will be held, covering essential topics such as EMA (Environmental Management Accounting) theory, real-world case studies, interactive group discussions, and question-and-answer segments to enhance understanding and engagement. The final phase, Evaluation & Closing (1 week), will focus on assessing the effectiveness of the program through surveys, interviews, and direct field observations. Key steps throughout the activity include initial observation and material preparation, delivery of EMA content, facilitated discussions and Q&A sessions, practical mentoring, participant evaluation and feedback collection, and the compilation of a comprehensive final report to conclude the project. The resulting EMA report will serve as a tangible example, demonstrating that even small, well-intentioned actions—when carried out with integrity—can generate meaningful and far-reaching impacts across academic, industrial, and societal domains.

Result

This Community Engagement Program (PKM) adopts a participatory and inclusive approach, positioning partners as active agents in the empowerment process rather than passive recipients. The program is implemented through a combination of methods, including training sessions, focused group discussions, simulations, and ongoing evaluations to monitor the implementation of the agreed-upon systems. Activities are conducted both on-site and online, designed to accommodate the needs, availability, and comfort of the partners at TPST 3R Mulyoagung Bersatu in DAU, Malang. The initiative not only aims to enhance the partners' capacity in environmental management but also seeks to strengthen the collaborative network between Polinema and the community partner, ultimately fostering the growth of an eco-based creative economy in the surrounding area. Rooted in the principles of Tri Dharma Perguruan Tinggi, this PKM activity serves as a concrete contribution to building a society that is environmentally conscious, socially responsible, and economically empowered.

The program was carried out in six structured stages: beginning with observation and material preparation, which involved preliminary surveys, interviews, and the development of tailored training modules and evaluation instruments. This was followed by the delivery of Environmental Management Accounting (EMA) materials through an interactive workshop that covered core EMA concepts, environmental cost classifications, and relevant case studies. The third stage facilitated discussion and Q&A sessions, enabling participants to identify local environmental and operational challenges and collaboratively explore practical solutions, including the integration of EMA into their current waste management systems.

Theoretically, EMA is an accounting framework that incorporates environmental factors into organizational financial decision-making, supporting both cost efficiency and sustainable practices. It comprises two main components: Physical Environmental Management Accounting (PEMA), which tracks the physical flows of materials, energy, water, and waste, and Monetary Environmental Management Accounting (MEMA), which quantifies the financial aspects—such as costs, savings, and revenues—related to environmental impacts. Through this holistic approach, the program not only transfers knowledge but also empowers communities to make informed, sustainable decisions that benefit both the environment and the local economy.

Figure 2. Observation and Material Preparation Phase

Source: Private Documentation, 2025

Following the theoretical sessions, practical mentoring was conducted to help participants implement the environmental cost recording system directly at the TPST. Another major challenge encountered was transparency. According to Firmansyah & Ginting (2024), many institutions fail to adequately disclose environmental costs and liabilities. To strengthen participants' understanding, case studies and best practices from other waste management facilities that have implemented similar systems were presented. For example, waste management costs can be classified as direct costs because they are directly related to operational or 3R (Reduce, Reuse, Recycle) processing activities (Rimbano, 2019). The delivery process was supported by visual media and teaching aids to enhance participant engagement and comprehension, ensuring that key information—critical to strategic decision-making—was well communicated.

Figure 3. Practical Mentoring of Environmental Management Accounting

Source: Private Documentation, 2025

The program concluded with the compilation of a final report, the submission of practical guidelines, and a presentation of outcomes along with a sustainability plan for future collaboration between the PKM team and TPST 3R Mulyoagung Bersatu. The initial implementation of the environmental accounting system was closely monitored through weekly consultations over the course of a month. During this period, the team assisted in solving any technical issues that arose. Follow-up mentoring was provided to refine the system and ensure consistent and effective recording practices. The evaluation phase included a review of the initial system implementation, particularly regarding the completeness and quality of participants' recordings. Transparency within an organization can prevent fraud that could be detrimental or result in biased environmental accounting reports (Putra, 2022). Feedback was gathered via program evaluation questionnaires to assess the effectiveness of the materials and training methods. Assessments were also conducted to identify areas that required further improvement or support.

Table 1. Qualitative Impact of the Community Service Program (PKM)

Aspect	Before PKM Implementation	After PKM Implementation	Impact
Operational Efficiency	Waste volume recording was done manually, 1–2 times/week.	Daily waste tracking using structured EMA format.	Data processing time reduced from 6 hours/week to 2 hours/week. Organic waste sorting increased by 20% within 2 months.
Financial Transparency	No separate environmental cost classification.	Financial reports include 4 EMA-based cost categories.	35% improvement in environmental cost accuracy. Increased confidence in financial reporting.
Social Impact (Qualitative)	Limited awareness of environmental accounting.	Staff and managers trained in EMA principles.	Managers more confident in presenting reports to stakeholders. New awareness of green accountability emerged.
Social Impact (Quantitative)	Only 25% of staff understood EMA concepts.	80% of staff demonstrated understanding after training.	Staff knowledge of EMA increased by 55%. Community participation in recycling rose from 60 to 95 households.

Source: author's work, 2025

The implementation of the Community Service Program (PKM) based on Environmental Management Accounting (EMA) at TPST 3R Mulyoagung Bersatu has brought significant improvements across operational, financial, and social aspects. Prior to the program, waste volume recording was conducted manually only 1–2 times per week, leading to inefficiencies and delays in data processing. After PKM implementation, daily waste tracking was introduced using a structured EMA format, resulting in a substantial reduction in data processing time—from 6 hours per week to just 2 hours—while also increasing organic waste sorting by 20% within two months. Financially, there was previously no distinction in environmental costs within financial reporting, limiting transparency. Following the intervention, financial reports now incorporate four EMA-based cost categories, improving the accuracy of environmental cost tracking by 35% and enhancing trust in financial disclosures among stakeholders. On the social front, qualitative improvements include increased awareness and understanding of environmental accounting among staff and management. Participants reported greater confidence in preparing and presenting reports, and a new culture of green accountability has begun to emerge within the organization. Quantitatively, staff understanding of EMA concepts rose dramatically from only 25% before training to 80% after training, reflecting a 55% increase in knowledge. Additionally, community involvement in recycling activities grew significantly, with participating households increasing from 60 to 95. These outcomes demonstrate that the PKM initiative has not only improved operational and financial systems but also empowered both individuals and the broader community, fostering a more sustainable and accountable waste management ecosystem.

Figure 4. PKM Closing and Sustainability Commitment

Source: Private Documentation, 2025

Discussion

Table 2. PKM Results Table

No	Activity Phase	Expected Outcome	Evaluation Method	Timeline
1	Observation and Material Preparation	Identify partner needs; develop training content	Evaluation of training materials and media readiness	Week 1
2	EMA Material Delivery	Basic understanding of Environmental Accounting	Assessment of participant understanding	Week 2
3	Discussion and Q&A	Identify issues and practical waste management solutions	Evaluation of participant interaction and proposed solutions	Week 2
4	Practical Mentoring	Direct application of EMA principles	Evaluation of practical implementation skills	Week 3
5	Participant Evaluation and Feedback	Assessment of training implementation and challenges	Participant mastery evaluation and identification of challenges	Week 3
6	Final Report and Program Closure	Final report and follow-up recommendations	Overall program evaluation based on outcomes and implementation	Week 4

Source: author's work, 2025

The community service activity is structured into six sequential phases, each with specific objectives, expected outcomes, evaluation methods, and a clear four-week timeline. The first phase, Observation and Material Preparation (Week 1), focuses on understanding the partners' needs and developing relevant training materials, with success measured by the readiness and quality of the prepared content. In the second week, EMA Material Delivery aims to equip participants with a basic understanding of Environmental Management Accounting (EMA), evaluated through assessments of their comprehension. This is followed

by the Discussion and Q&A phase, also in Week 2, which encourages participants to identify local challenges and collaboratively develop practical waste management solutions, with evaluation based on the quality of interaction and proposed ideas. During Week 3, Practical Mentoring enables participants to apply EMA principles directly in their operations, and their hands-on skills are assessed to gauge effective implementation. Also in Week 3, Participant Evaluation and Feedback is conducted to measure learning mastery and gather insights on challenges encountered throughout the training. Finally, in Week 4, the program concludes with the Final Report and Program Closure, where a comprehensive report is compiled, including follow-up recommendations, and the overall success of the program is evaluated based on achieved outcomes and implementation effectiveness. This structured approach ensures a systematic, measurable, and impactful community engagement process.

The PKM program implemented at TPST 3R Mulyoagung Bersatu successfully addressed critical gaps in environmental cost management and governance by applying Environmental Management Accounting (EMA) principles within a community-based waste management context. The program's objectives and outcomes are strongly supported by recent academic research, highlighting its relevance and effectiveness. One of the key achievements was the improvement in environmental accounting literacy among TPST managers and staff, which underscores the importance of capacity building as a foundational step in EMA implementation. As Zakhilwal et al. (2024) point out, limited understanding of environmental accounting remains a significant barrier to sustainability, particularly in developing economies. By delivering targeted training, the PKM program enabled participants to accurately identify, measure, and classify environmental costs—laying the groundwork for informed decision-making.

Furthermore, the development of a simplified, context-specific EMA reporting format demonstrates a practical adaptation of theoretical models to real-world conditions. This aligns with Hansen and Mowen's (2022) assertion that EMA frameworks must be tailored to organizational and operational realities to be effective. The customized format bridges the gap between academic theory and field application, making EMA accessible and usable for small-scale waste management units. The integration of EMA also led to measurable gains in operational efficiency. By analyzing environmental costs, TPST was able to detect inefficiencies and optimize waste processing workflows. This outcome resonates with Medeckytė and Tamulevičienė (2023), who emphasize that EMA enhances eco-efficiency by uncovering hidden environmental costs and enabling data-driven resource allocation. In addition, the inclusion of environmental costs in financial reporting significantly improved transparency and accountability, fostering greater stakeholder trust. This is consistent with Tania et al. (2024), who highlight that EMA integration promotes environmental responsibility, especially in high-impact sectors like waste management, where public accountability is essential.

Beyond practical improvements, the program made a meaningful scientific contribution by producing a case-based scientific publication. As Nugrahani et al. (2025) stress, there is a growing need for empirical, localized research on EMA in developing countries. This PKM initiative fills that gap by offering a replicable model for other community waste management units. Finally, the formalization of a long-term partnership through a Memorandum of Understanding (MoU) between Polinema and TPST reflects a commitment to sustainability and institutionalization. Supported by ongoing mentoring, this collaboration addresses the common challenge of post-project stagnation. Latifah and Soewarno (2023) emphasize that sustained partnerships are vital for scaling environmental accountability, and this program exemplifies that principle.

Overall, this PKM initiative demonstrates that community-based EMA implementation can yield tangible improvements in operational performance, financial transparency, and environmental stewardship—outcomes that are firmly aligned with contemporary research on sustainable development. By building local capacity, creating practical tools, and fostering

enduring collaboration, the program establishes a scalable model for sustainable waste management governance.

Conclusion

This Community Engagement Program (PKM) was initiated to address the lack of structured Environmental Management Accounting (EMA) practices at TPST 3R Mulyoagung Bersatu, a community-based waste management unit. By introducing a customized EMA framework tailored to local operational conditions, the program successfully strengthened the managerial capacity of TPST personnel in identifying, recording, and reporting environmental costs in a more systematic and transparent manner.

Key findings reveal that EMA training significantly improved environmental accounting literacy among staff and managers, enabling them to better understand and manage the financial implications of environmental activities. The implementation of a simplified, context-specific EMA reporting format led to more organized and reliable financial and environmental documentation, while data-driven monitoring enhanced operational efficiency in waste processing and resource allocation.

Furthermore, the integration of environmental costs into financial reporting significantly improved transparency, thereby increasing stakeholder trust and institutional credibility. These outcomes demonstrate that EMA is not only feasible but also highly effective in grassroots organizations, promoting accountability, sustainability, and informed decision-making. The practical implications of this initiative include the successful integration of EMA into daily operations, setting a replicable model for other community-led waste management units.

Academically, the program contributes valuable case-based insights to the growing discourse on environmental accounting in developing economies, while also supporting national sustainable development goals and community empowerment. Ultimately, the EMA framework developed through this PKM illustrates how vocational higher education institutions can play a transformative role by delivering practical, collaborative, and data-informed solutions to local environmental challenges. With continued support and adaptive follow-up mechanisms, this initiative holds strong potential for scaling and replication across similar waste management programs nationwide, advancing the vision of sustainable, community-driven environmental governance.

Acknowledgement

While the PKM program achieved significant progress in implementing Environmental Management Accounting (EMA) at TPST 3R Mulyoagung Bersitu, the study acknowledges certain limitations. The data collection period was constrained by the short duration of the program, and not all staff could be fully involved due to operational demands, potentially affecting the comprehensiveness of participation and impact assessment. To build on these initial successes, future efforts should include longitudinal evaluations to monitor the sustained adoption and long-term benefits of EMA practices. To ensure the continuity and institutionalization of EMA, several specific and actionable recommendations are proposed. First, TPST should establish an internal EMA Task Force by appointing 2–3 dedicated staff members responsible for maintaining environmental cost records, supported by quarterly refresher training to sustain knowledge and adapt to evolving operations. Second, the EMA system should be digitized by transitioning from paper-based records to digital platforms such as Google Sheets or Excel, incorporating automated templates to streamline data entry, reporting, and analysis. Third, EMA practices should be formally integrated into the organization’s Standard Operating Procedures (SOPs), making environmental cost monitoring a routine responsibility and requiring EMA-based reports in monthly performance reviews. Fourth, semi-annual monitoring and evaluation should be conducted jointly by Polinema and TPST to assess system effectiveness, update indicators, and refine tools for continuous improvement. Fifth, TPST is encouraged to engage external stakeholders—such as local

government, donors, and environmental NGOs—by sharing EMA reports to enhance transparency, build credibility, and unlock funding opportunities, while also collaborating with academic institutions for technical validation and research support. Finally, to promote wider adoption, a knowledge-sharing forum should be developed, such as an annual workshop or webinar, where TPST can share its EMA journey and inspire similar initiatives in other community-based waste management units. These steps collectively support the long-term sustainability, scalability, and impact of EMA within TPST and beyond.

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