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Impact of Energy-Efficient Electricity Usage Counseling on Community Behavior in Cibenda Village Pangandaran Regency

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ABSTRACT

In Indonesia, the household sector is one of the largest consumers of electricity, so it is necessary to optimize energy use to reduce costs and environmental impacts. This study aims to provide counseling on energy-efficient electricity usage techniques. Methods Activities carried out include lectures, discussions, demonstrations, and simulations. Counseling focused on the selection of efficient electrical equipment, the application of environmentally friendly technology, and strategies for effective and efficient electricity use. The results of the study showed that the counseling program on environmentally friendly technology and energy saving was well received by various community groups. Most respondents, including Karang Taruna youth 90%, village government officials 95%, PKK mothers 85%, and fishing communities 88%, considered this counseling useful. In addition, the majority felt more confident in choosing energy-efficient equipment 83-90% and understood more environmentally friendly technology 75-85%. Most also planned to implement 80-90% and had started implementing more energy saving techniques 70-80%. These results confirm the positive impact of counseling in increasing awareness and energy saving practices in the community.

Keywords: *energy saving, electricity consumption, counseling, environmentally friendly technology, Cibenda Village*

1. INTRODUCTION

In the modern era, characterized by technological advances and rising living standards, electricity consumption has significantly increased. According to data from the International Energy Agency (IEA), global electricity consumption continues to rise in tandem with rapid economic growth and urbanization **(International Energy Agency, 2021)**. In Indonesia, electricity usage also shows a consistent upward trend, with the household sector being one of the largest consumers **(Kementerian Energi dan Sumber Daya Mineral, 2021).** This situation necessitates efforts to optimize electricity use efficiently to reduce cost burdens and mitigate negative environmental impacts.

In efforts to address climate change and achieve ambitious national goals to reduce carbon dioxide (CO_2) emissions, direct and indirect energy consumption is highly relevant.

(Matthies & Wallis, 2015). In this context, the housing, transport and food sectors were identified as top priorities in reducing household CO_2 emissions. **(EEA, 2012)**. Key areas suggested to focus on emission reduction measures include the type and use of heating systems and electrically consuming devices, as well as the choice of transport mode. **(Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009)**.

Several studies demonstrate the outcomes of energy-saving electricity outreach using various approaches. These studies include outreach on techniques for energy-efficient electricity use and how to calculate electricity bills from kWh meters. Through such outreach methods, communities can simulate their monthly electricity bill calculations, adopt lifestyle changes in their power consumption patterns, and select electronic devices capable of saving energy **(Purnawan, Musafa, Sujono, Laksana, & Fath, 2019)**. In densely populated residential environments, electricity-saving outreach impacts air circulation and suboptimal natural lighting in homes. To address these issues, people use electric lights during the day for optimal lighting and air conditioning (AC) or fans for cool and fresh air, resulting in increased electricity usage in these areas. With energy-saving outreach that introduces energy-efficient electrical devices and builds awareness of energy conservation, communities can reduce their monthly costs and become more conscious of energy savings **(Patabang, Leda, Sampebatu, Ramadhan, & More, 2023)**.

Sociodemographic factors, residence, and environment have a strong influence on daily energy-saving behavior, the adoption of energy-efficient equipment, and energy-saving retrofit investments undertaken by households in the UK. This research uses household data from the UK's "Survey of Public Attitudes and Behaviors toward the Environment" collected in 2009, employing nonlinear principal component analysis (NLPCA), ordinary least squares regression (OLS), and probit models. Findings indicate that age, marital status, gender, and income levels affect the likelihood of households adopting energy-saving behaviors and making energy-efficient retrofit investments **(Trotta, 2018)**. Energy saving and management highlight the importance of gender roles. This review found that women use less energy compared to men in household activities, which supports household energy-saving behavior. Additionally, gender, income, family composition, ownership, and education are significant factors influencing energy-saving behavior **(Shrestha, Tiwari, Bajracharya, Keitsch, & Rijal, 2021)**.

Outreach on energy-efficient electricity usage techniques has emerged as an effective approach to address these challenges. This outreach aims to educate the public on practical and efficient methods of using electricity. The material covered includes selecting energy-efficient electrical appliances, applying environmentally friendly technologies, and developing wise electricity usage strategies. With increased public awareness and knowledge about energy-saving techniques, it is hoped that more efficient and responsible electricity consumption behaviors will be fostered.

Energy-efficient electricity usage techniques provide not only economic benefits through reduced electricity costs but also have positive environmental impacts. Efficient electricity use can lower greenhouse gas emissions that contribute to global climate change **(United Nations Framework Convention on Climate Change, 2007)**. Additionally, with decreased energy demand, pressure on natural resources can also be minimized.

This study aims for the outreach on energy-efficient electricity usage techniques in Desa Cibenda, Kabupaten Pangandaran, to provide local residents with insights so they can utilize electricity efficiently. This outreach is also expected to provide practical knowledge about energy-saving electricity usage techniques.

2. METHODS

2.1 Implementation Method

The method of implementing this Community Service activity includes several approaches by replicating similar types of service by making several comparisons, so that the implementation of the service can run optimally. The stages of the implementation method are carried out with the stages shown in Figure 1.

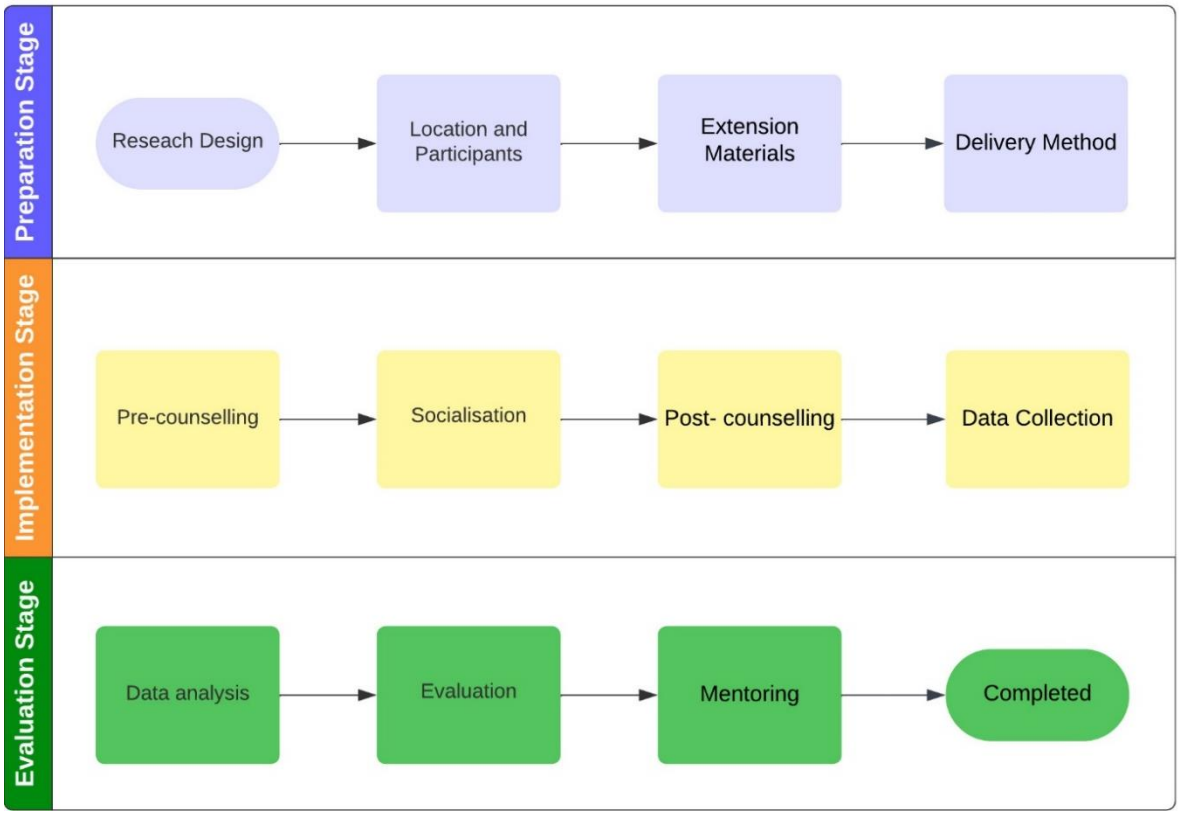

Figure 1. Method of Community Service Implementation for the Use of Energy Efficient Electricity

Research Design, This study uses an interactive counselling method that aims to increase community understanding and awareness of energy-efficient electricity use techniques. The counselling was conducted through a series of activities that included presentations, group discussions, and practical demonstrations.

Location and Participants, The counselling was conducted in strategic locations that included fishing communities, communities, schools, and Cibenda Village government offices in Pangandaran district. Participants in this outreach were local residents, consisting of various groups, including youth Karangtaruna, village government bodies, and mothers of PKK (Family Welfare Empowerment). The target number of participants was 40 people.

Counselling Materials, Counselling materials were prepared by referring to the standards for the use of efficient energy that have been set by related institutions. The materials include: 1. Introduction to the importance of energy saving; 2. How to choose efficient electrical appliances. 3. Techniques to use electrical appliances wisely; 4. Application of environmentally friendly technology in households; 5. Tips and tricks to reduce daily electricity consumption.

Delivery Method, The delivery of materials is done through various methods:

Lecture Method: The lecture method was used to educate the public on simple electrical installation techniques, the use of simple electrical appliances, as well as energy saving strategies and efficient budgets.

Discussion and Q&A Method: Engaging the community in active discussions and Q&A sessions to deepen their understanding of various issues related to electricity use in households, public buildings, schools, and others.

Demonstration Method: Presenting concrete examples of the use of simple electrical appliances and explanations of how to perform calculations to use electrical power in an energy-efficient manner.

Simulation Method: Simulation Method: Using simulation methods to teach the community about calculating power capacity and energy use economically, as well as strategies to reduce the cost of household needs.

Data Collection, collected through: 1. Observation, Direct observation during counselling to assess participants' participation and interaction. 2. In-depth Interviews, Interviews were conducted with selected participants to gain deeper insights into their understanding and application of energy saving techniques.

Data Analysis, Data that has been collected is analysed using descriptive statistical methods to measure the level of change in participants' knowledge and attitudes. The results of the analysis will be used to evaluate the effectiveness of the counselling and provide recommendations for future counselling.

The Duration of Extension Activities, as for the activities scheduled in this Community service extension are shown in Table 1.

Table 1. Community Service Activity Agenda

Time	Event
08:00 - 08:30	Registration and arrival of participants
08:30 - 09:00	Introduction and official opening of the training.
09:00 - 09:15	Coffee Break
09:15 - 10:00	Introduction on the importance of energy saving
10:00 – 11:00	How to choose efficient electrical appliances;
11:00 - 12:00	Techniques to use electrical appliances wisely
12:00 - 13:00	Lunch Break
13:00 - 14:00	Application of environmentally friendly technology in households;
14:00 - 15:00	Tips and tricks to reduce daily electricity consumption
15:00 - 15:15	Closing and evaluation of the training.

Evaluation, Evaluation was conducted by providing extension questionnaires to participants, as well as through direct feedback from participants. The success of the outreach was measured based on participants' increased knowledge of energy-saving techniques and behavioural changes in the use of electricity in their homes.

3. RESULT AND DISCUSSION

The implementation of Community service activities on energy-efficient electricity usage techniques was held in Cibenda Village, Pangandaran Regency, on Monday, 5 February 2024. The opening of the activity was attended by the Village Head and village officials of Cibenda Village, as well as participants consisting of Youth Youth Organisations, Village Government Bodies, PKK mothers, and fishing communities. At the opening stage, participants were provided with introductory material that introduced the importance of energy saving. The opening of this activity is shown in Figure 2.

Figure 2. Opening Ceremony

The next stage was the core activities of the counselling, which used lecture, discussion, and question and answer methods. Figure 3 shows the presentation of counselling materials related to "How to Choose Efficient Electrical Equipment" and "Techniques for Using Electrical Equipment Wisely." It is hoped that with this material, participants can gain insight into choosing tools and using electricity wisely. With the methodological approach, participants actively provided responses and rebuttals regarding their daily electrical energy usage habits. Observations in the field show that the understanding and application of energy-saving techniques in the surrounding community is still lacking. This stage is very important to ensure that the material is conveyed correctly and participants are able to apply daily electricity use effectively and efficiently.

Figure 3. Presentation of Counselling Material

In the next material, participants were given an explanation of "Application of Environmentally Friendly Technology in Households" and "Tips and Tricks to Reduce Daily Electricity Consumption." At this stage, direct demonstration and simulation methods were used so that the community could directly practice energy saving, by measuring the energy power used and calculating the energy costs that must be paid to PLN. With direct demonstration and simulation, participants are expected to have strategies in using electricity to reduce the cost of household needs.

At the closing stage, participants were asked to provide feedback on the counselling process that had been carried out. At the end of the event, the Community service team from the Electrical Engineering Study Programme contributed in the form of solar-powered public street lighting. This aims to provide experience in the use of environmentally friendly energy in Cibenda Village. The closing of the activity is shown in Figure 4.

Figure 4. Closing Ceremony

The socialization methods used, namely lectures, discussions and Q&A, demonstrations, and simulations, are very suitable to be applied in Cibenda Village because they combine informative and interactive approaches. The lecture method is effective in providing easy-to-understand basic explanations about simple electrical installation techniques and energy saving, while discussions and Q&A allow the community to be actively involved, ask questions, and get clarification according to the local context. The demonstration method provides real examples that make it easier for the community to understand the practical application of energy saving, and simulations allow participants to directly practice calculating power capacity and using energy economically. This approach helps the Cibenda Village community understand and apply the concept of energy saving in everyday life.

Figure 5. Electronic Media Publication

Source: https://www.kompasiana.com/neris83855/657ab8a3c57afb4f63770fa2/pelatihan-penggunaan-listrik-hemat-energi-di-pangandaran

The results of Community Service from the Electrical Engineering Study Programme have been published in the form of electronic media publications, with the aim that energy saving

programmes can reach a wider community and become general knowledge that should be known for the benefit of sustainable energy. The publication results are shown in Figure 5.

Table 2. Satisfaction and Opinion Questionnaire Results

Respondent Category	Benefits of Counselling	Confidence in Choosing Energy-Saving Equipment	Understanding of Environmentally Friendly Technology	Plan to Implement Energy-Saving Techniques	Energy Saving Techniques Applied
Youth Karang Taruna	90% found it useful or very useful	85% are more confident in choosing energy efficient equipment	80% understand more about environmentally friendly technology	85% plan to implement energy-saving techniques	75% more apply energy saving techniques
Village Government Agency	95% found it useful or very useful	90% are more confident in choosing energy efficient equipment	85% understand more about environmentally friendly technology	90% plan to implement energy-saving techniques	80% more energy saving techniques
PKK mothers	85% found it useful or very useful	80% are more confident in choosing energy efficient equipment	75% understand more about environmentally friendly technology	80% plan to implement energy-saving techniques	70% more energy saving techniques
Fishermen's Community	88% found it useful or very useful	83% are more confident in choosing energy efficient appliances	78% understand more about environmentally friendly technology	82% plan to implement energy-saving techniques	73% are adopting more energy-saving techniques

Table 2 shows the results of the satisfaction matrix show that education on saving electrical energy has had a positive impact on all categories of respondents, including the Fisherman Community. Village Government Bodies recorded the highest satisfaction, indicating the effectiveness of extension in increasing knowledge and application of energy saving techniques among them. Karang Taruna Youth and PKK Women also showed significant increases, although slightly lower. The fishing community, which has unique characteristics and needs regarding energy use, showed a positive response with 88% benefiting from education and 83% becoming more confident in choosing energy-efficient equipment. The relatively high ratings in all groups indicate that extension has succeeded in increasing awareness, knowledge and application of energy saving techniques in various communities.

4. CONCLUSIONS

From the results and discussion, it can be concluded that education on techniques for using energy-saving electricity is effective in increasing public awareness, understanding and intention to apply energy-saving techniques in all groups. The outreach methods used have a significant influence on the community's ability to understand and apply techniques for using energy-saving electricity. The relatively high assessment of all participant groups shows that this extension has succeeded in increasing awareness, knowledge and application of energy saving techniques in various levels of society. These findings emphasize the importance of ongoing and targeted education to promote efficient and responsible energy saving practices. The recommendations for future community service are Counseling and Making Simple Prototypes of Renewable Energy in the Community to provide understanding and skills to the community.

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