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Competitiveness and Sustainable Development Analysis of Alternative Energy Exploitation Using MOORA Method

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Abstract. *Alternative energy exploitation, also known as renewable energy, refers to energy sources that can be replenished and renewed naturally, such as solar, wind, hydro, geothermal, and biomass energy. Unlike fossil fuels, which are finite resources that release harmful emissions when burned, alternative energy sources are cleaner, more sustainable, and have a lower impact on the environment. Alternative energy exploitation involves harnessing these renewable energy sources to generate electricity, heat, and fuel. This process typically involves using technologies such as solar panels, wind turbines, hydropower systems, geothermal heat pumps, and biomass generators. There are several reasons why alternative energy exploitation is becoming increasingly important. First, as the world's population grows, so does the demand for energy. The use of fossil fuels for heating and cooking has increased due to the rise in population, standard of living, urbanization over time, and the higher cost of other energy sources like kerosene, gas, and electricity. Fuel wood harvesters earn income from harvesting trees, but this practice needs careful evaluation. Estimating fuel wood exploitation requires considering factors such as age, the number of harvested bundles, price, and the educational level of respondents.*

Keywords*: Determining the thermal power. Determining the potential of thermal power*

1. INTRODUCTION

"In planning and evaluating a project, the exploitation of local energy resources need not be considered merely an economic evaluation. Other factors like regional development and the environmental impact of risk are important in decision-making. Energy is one of the daily necessities promoting human growth, productivity, and economic growth. Energy is essential for heating, lighting, cooking, space comfort, movement, communication, and health service delivery. So far, Indonesia is still facing an energy shortage, which is due to the availability of energy in Indonesia. Indonesia’s energy demand is disproportionate to its population. Hence, applied research on alternative energy sources is absolutely necessary. In fact, this research has already been done, as mentioned by parties, but due to the lack of coordination between the developments of one energy source among others, energy sources and less optimal development for a large energy source, national independent oil and gas has not been achieved, and we are still in a state of energy scarcity. One alternative energy source with significant potential in Indonesia is shale gas. There are seven ponds and Pong Shale, Delis Shale, Kumai, classified with significant potential for shale gas. Shale, Kunai Basin, Tantung Basin, North-East Java Basin, East Java Basin. Alternative energy exploitation is a topic of great importance in today's world due to its potential to help address some of the most pressing challenges facing our planet, including climate change and environmental degradation. The traditional sources of energy, such as oil, coal, and natural gas, have been the mainstay of the global energy system for many years. However, the burning of these fossil fuels releases greenhouse gases such as carbon dioxide into the atmosphere, which contributes to the ongoing problem of global warming. The negative impacts of climate change, including rising sea levels, more frequent and severe natural disasters, and loss of biodiversity, are already being felt around the world. Alternative energy sources, on the other hand, are typically much cleaner and more sustainable than fossil fuels. For example, solar power relies on the energy from the sun to generate electricity, while wind power harnesses the kinetic energy of wind to turn turbines and produce electricity. Hydroelectric power, geothermal power, and biomass power are other examples of alternative energy sources that do not rely on fossil fuels. One of the biggest advantages of alternative energy sources is their potential to be renewable, meaning they can be replenished naturally over time and are not finite resources that will eventually run out. By contrast, fossil fuels are non-renewable, and their reserves are limited. As such, alternative energy sources have the potential to provide a more sustainable energy system in the long term. However, there are also challenges associated with the use of alternative energy sources. For example, many renewable energy sources are intermittent, meaning they are only available at certain times and may not always be able to meet demand. Solar power, for example, is only available during the daytime, while wind power is only available when there is sufficient wind. As such, alternative energy systems often require the use of energy storage technologies, such as batteries, to ensure a steady supply of electricity. Another challenge associated with alternative energy exploitation is the need for new infrastructure and technologies to support their widespread use. For example, the development of new transmission lines and storage facilities may be required to transport and store the energy generated by alternative sources. Additionally, there may be a need for new technologies to make alternative energy sources more efficient and cost-effective. Despite these challenges, there is growing interest and investment in alternative energy sources around the world. Many countries and companies are working to develop and deploy new renewable energy technologies, and there is growing recognition of the importance of transitioning to a more sustainable energy system in the face of climate change. Ultimately, the success of alternative energy exploitation.

2. MATERIALS & METHODS

MOORA Method: A MOORA is a multi-objective optimization method MOORA method refers to the technique of multiple types of attributes simultaneously and MOORA is a functional approach that takes approaches. Constraints [9Mura technique may forget all attributes with their relative importance, leading to overestimation of alternatives. The proposed technique is a general technique and provides a more targeted and simpler selection approach for any quantity and quality while considering the properties. Moreover, this approach can be extended to any type of selection problem [13]. Multi-goal optimization primarily based on ratio analysis (MOORA) is a situational optimization system for positive constraints with two or more conflicting attributes (references) simultaneously, in addition to multi-criteria or multi-attribute optimization. There is a wide variety of projects to choose from to be part of the conflicting and complex supply chain environment at the moment. Where more effective tests are needed, MOORA can be used [15]. Each of the recognized failures can be seen in MOORA, ranked in awesome priorities according to the priority of the failure that ended the application of the extension. In other words, failure uncertainty of methods and reliability concepts by using the threshold concept, the proposed technique tries to set aside several major drawbacks of RPN scoring, and provides reliability in addition to the selection method in conventional MOORA. Finally providing sensible outputs to the decision maker. The Moore method, also known as the Moore System of Instruction, is a pedagogical approach to teaching mathematics developed by Robert Lee Moore in the early 20th century. The method is based on the idea that students learn best by actively engaging with the material and discovering mathematical concepts on their own. In the Moore method, students are given a list of carefully chosen problems to work on independently, without any direct instruction or guidance from the teacher. The problems are designed to gradually build on one another, leading the student to discover important mathematical ideas and concepts through their own efforts. The teacher's role is primarily to provide feedback on the student's work and to help guide their thinking in the right direction when they get stuck. The Moore method is often associated with the teaching of advanced undergraduate and graduate level mathematics courses, where it has been shown to be highly effective in developing students' mathematical reasoning and problem-solving skills. However, the method has also been adapted to other subjects and levels of education, and its underlying principles have influenced many other pedagogical approaches to teaching and learning. The Moore method is sometimes also referred to as the "inquiry-based" or "discovery-based" method of teaching. It is based on the belief that students learn best when they are actively engaged in the process of discovery and inquiry, rather than simply being passive recipients of information. One of the key features of the Moore method is that it encourages students to develop their own approach to problem-solving and to think creatively and independently. By working through a series of carefully chosen problems, students learn to develop their own intuition and to apply mathematical concepts in novel and creative ways. Another important aspect of the Moore method is its emphasis on collaboration and community. Students are encouraged to work together and to share their ideas and insights with one another, creating a supportive and collaborative learning environment. One potential criticism of the Moore method is that it can be difficult to implement in large classes or with students who are not highly motivated or self-directed. It also requires a high degree of skill and experience on the part of the teacher, who must be able to guide students without providing direct instruction or answers to the problems they are working on. Overall, the Moore method remains an important and influential pedagogical approach to teaching mathematics and other subjects, and its principles have been adapted and incorporated into many other teaching methods and approaches.

3. RESULT AND DISCUSSION

TABLE 1. Alternative energy exploitation

	Determining the thermal power	Determining the potential of thermal power	Estimation of heat energy	Estimated consumption of thermal energy	Techno-economic analysis
Space heating	0.1090	0.0960	0.1400	1.0200	15.0500
Bathing and swimming	0.0840	0.1100	0.0390	4.5000	11.0500
Agricultural drying	0.0690	0.0836	0.1530	0.2500	7.0500
Greenhouses	0.1170	0.0954	0.1210	13.0500	4.0500
Fish and other animal farming	0.0790	0.1040	0.0250	15.0300	15.2000
Industrial process heat	0.1930	0.1320	0.1760	4.0500	25.0500

Table 1 shows the rate analysis and multi-objective optimization based on it Alternative energy exploitation. Determining the thermal power, determining the potential of thermal power, Estimation of heat energy, estimated consumption of thermal energy, Techno-economic analysis and Space heating, bathing and swimming, agricultural drying, greenhouses, fish and other animal husbandry, industrial process heating.

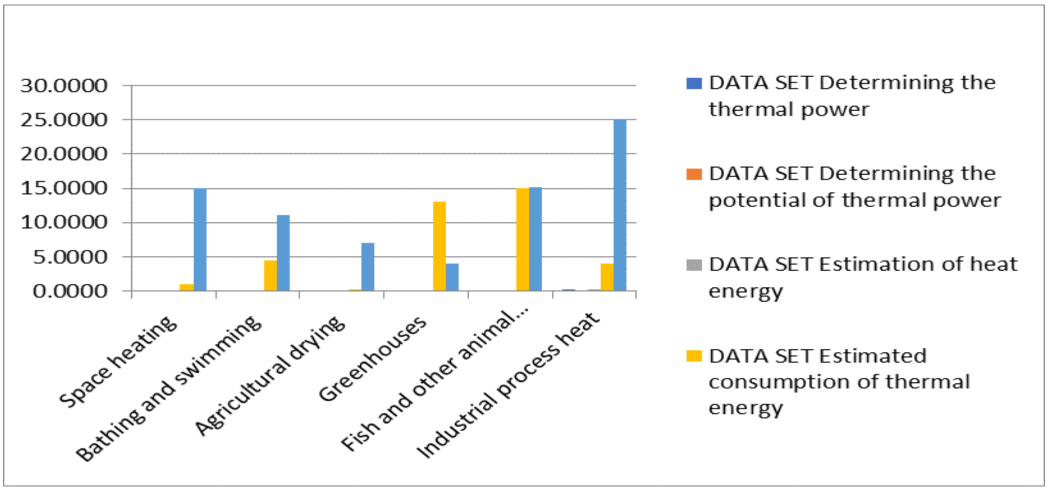

FIGURE 1. Alternative energy exploitation

Figure 1 shows multi-objective optimization based on ratio analysis and alternative energy exploitation. Determination of thermal energy, determination of thermal energy capacity, evaluation of thermal energy, estimated consumption of thermal energy, techno-economic analysis and space heating, bathing and swimming, agricultural drying, greenhouses, fish and other animal husbandry, industrial process heat.

TABLE 2. Normalized Data

Normalized Data				
Determining the thermal power	Determining the potential of thermal power	Estimation of heat energy	Estimated consumption of thermal energy	Techno-economic analysis
0.3833	0.3747	0.4647	0.0490	0.4218
0.2954	0.4293	0.1294	0.2160	0.3097
0.2426	0.3263	0.5078	0.0120	0.1976
0.4114	0.3723	0.4016	0.6264	0.1135
0.2778	0.4059	0.0830	0.7215	0.4260
0.6786	0.5152	0.5842	0.1944	0.7020

Table 2 shows the various Normalized Data High values of determining the thermal power, determining the potential of thermal power, Estimation of heat energy, estimated consumption of thermal energy, Techno-economic analysis. The normalized value is obtained using the formula. Table 3 shows the weights used for the analysis. We took the same weight for all parameters for analysis

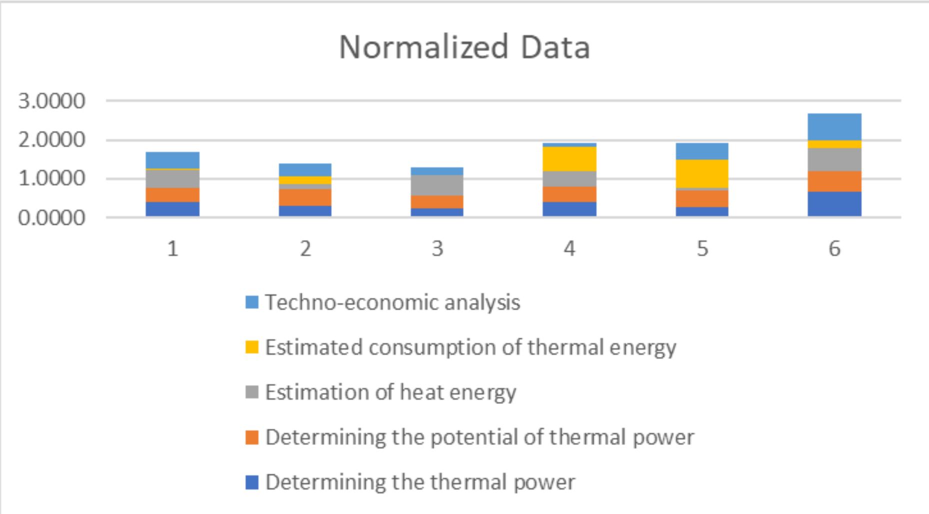

FIGURE 2. Normalized data

Figure 2 shows various normalized data high values of determination of heat energy, determination of potential of heat energy, estimation of heat energy, estimated consumption of heat energy, techno-economic analysis. The normalized value is obtained using formula (1). Table 3 shows the weights used for the analysis. We took equal weights for all parameters for analysis.

TABLE 3. Weightages

Weight				
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix				
0.0958	0.0937	0.1162	0.0122	0.1054
0.0738	0.1073	0.0324	0.0540	0.0774
0.0607	0.0816	0.1270	0.0030	0.0494
0.1029	0.0931	0.1004	0.1566	0.0284
0.0694	0.1015	0.0207	0.1804	0.1065
0.1697	0.1288	0.1460	0.0486	0.1755

Table 4 shows the final result of multi-objective optimization based on ratio analysis of alternative energy exploitation. Calculated using a weighted default matrix.

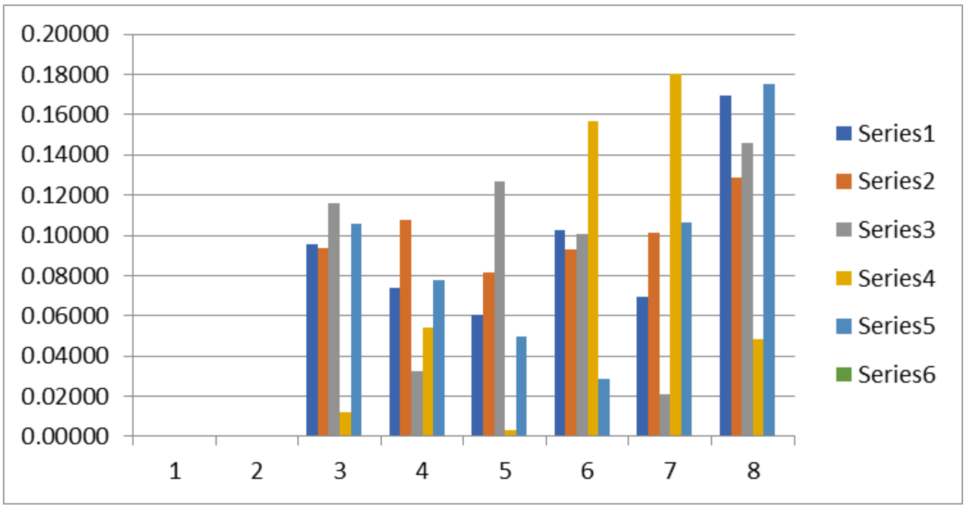

FIGURE 3. Weighted Normalized Decision Matrix formula.

Figure 3 Multi-objective optimization based on ratio analysis shows the final result Alternative energy exploitation. The weighted default is calculated using the matrix formula.

TABLE 5: Assessment value

	Assessment value	Rank
Space heating	0.2125	5
Bathing and swimming	0.1901	6
Agricultural drying	0.2228	4
Greenhouses	0.4246	1
Fish and other animal farming	0.2655	3
Industrial process heat	0.3176	2

Table 5. In Assessment value, Greenhouses is having is Higher Value and Bathing and swimming is having Lower value formula.

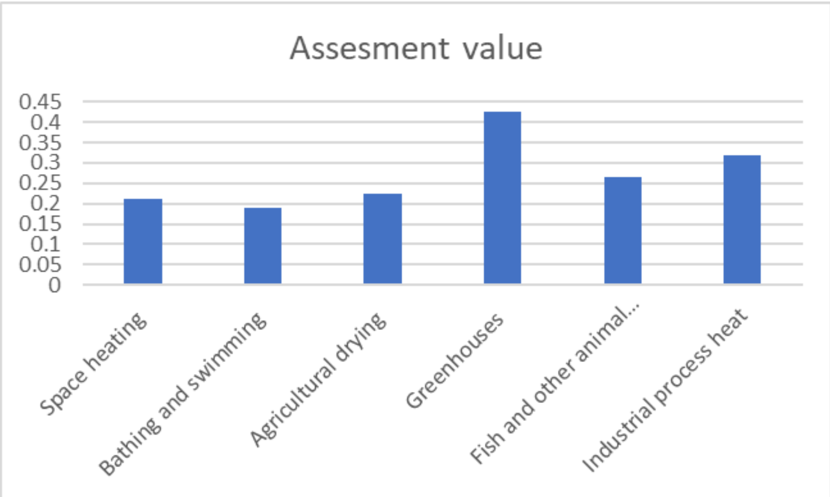

FIGURE 4. Assessment value

Figure 4. In Assessment value, Greenhouses is having is Higher Value and Bathing and swimming is having Lower value formula.

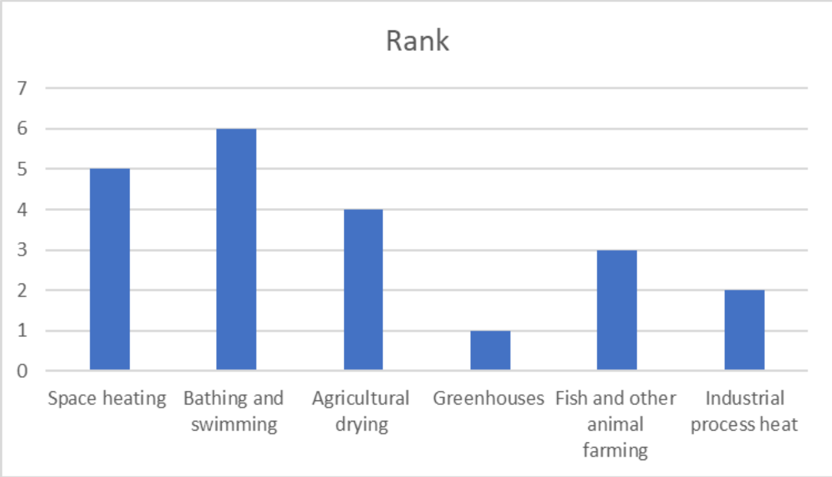

FIGURE 5. Rank

Figure 5 shows the ranking of alternative energy exploitation. Greenhouse ranked first, while bathing and swimming ranked lowest.

4. CONCLUSION

Fuel is the primary energy source used for heating and cooking. Fuel consumption has increased due to population growth, improved standards of living, urbanization, and rising costs of other energy sources such as kerosene, gas, and electricity. Fuelwood harvesters earn income from tree harvesting, but often without proper planning. It is essential to estimate fuelwood exploitation by considering factors such as age, number of harvested bundles, price, and the educational level of respondents. Waste-to-energy plants have experienced significant technological advancements, leading to improved recovery and enhancement of the dust fraction. Years of economic crisis have further driven investments in research, plant recovery, and efficiency improvements. A dynamic assessment of the dust area can offer numerous assurance benefits. This approach facilitates the reduction of large waste areas while increasing the number of marketable products. Additionally, it helps meet the targets set by the European Union and serves as a superior alternative to fossil fuels.

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