



Sustainable and Development Energy Resilience in Multidisciplinary Perspective

Ony Anwar Harsono¹

¹ Universitas Airlangga, Indonesia

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Abstract

Energy is one of the things that greatly affects human life, many operational processes and energy development planning that need to be updated because there have been many problems in the form of delays in energy access to several billion people around the world. In order to achieve succession in SDG's seventh point, namely affordable and clean energy and the thirteenth point, namely climate action, in sustainable energy development, these two points become the main reference for further energy developments to be implemented. Therefore, researchers through this study try to discuss Sustainable and Development Energy Resilience In Multidisciplinary Perspective, with the aim of deepening views related to the importance of studying sustainable energy development and security in a multidisciplinary perspective, namely social perspective, economic perspective, and environmental perspective (climate change mitigation). By presenting a literature review of previous studies related to the elements discussed in this study, it is hoped that the objectives and results of this research can provide a fairly good theoretical contribution in sustainable and development energy resilience. The results of this study state that if stakeholders consider energy and refer to Chester (2010) related to the components that need to be considered in energy development, namely availability, accessibility, affordability and community acceptance. So if the four components are maintained and considered properly, then the energy needs of the global community can be met sustainably.

Keywords *Sustainable Development Goal's, energy resilience, social, economic, environment*

INTRODUCTION

The dynamics of global life have an impact in the form of massive changes that occur in the lives of the world community. The changes that occur are the basic reasons for sustainable development, one of which is in the energy aspect which aims to maintain the welfare of human life from time to time and is not eroded by global dynamics that have an impact on all aspects, both physical and non-physical aspects and material and immaterial aspects. Many issues related to the need for sustainable energy development and development, reported from sdgs.un.org that first, progress in energy efficiency needs to be accelerated, because to achieve the Global Climate Goals only 1.9% energy efficiency has been achieved and requires another 3.2% to achieve the Global Climate Goals 2030.

Second, there are still 2.4 billion people around the world who still use inefficient cooking systems and produce pollution that has a negative impact on the environment for a long time. Third, there are still delays in the development of modern energy caused by difficult challenges and may take a

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Corresponding author's email: ony.anwar.harsono-2022@pasca.unair.ac.id

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long time to overcome them. According to developments every ten years, in 2010 there were 1.2 billion people who did not get electricity. In 2020 the number dropped to 733 billion people, and if energy development is properly carried out, it is predicted that by 2030 the number of limited access to electricity will decrease to 679 billion people. With this amount, the handling of this energy problem is felt to be delayed and needs to be accelerated, supporting the second point.

Apart from that, there are some forms of renewable resources available everywhere in the world, e.g. solar radiation, wind, tidal waves, heat from biomass. Some forms are infinite and almost infinite, like the sun. Solar radiation that reaches the Earth's surface in one year provides more than 10,000 times the world's annual energy needs. Moreover, harnessing only a quarter of the solar energy that falls in paved areas of the world can comfortably meet all current global energy needs. The technology that converts these resources into electricity and energy is available and improving rapidly. There are seemingly great opportunities and However, there are obstacles and problems related to the development of energy, including the processing process that causes a reduction in the rate of development of Energy Building Transformation (EBT) and its introduction in the structure of the modern economy.

Therefore, it can be seen that energy is one of the things that greatly affects human life, many operational processes and energy development planning that need to be updated because there have been many problems in the form of delays in energy access to several billion people around the world. In order to achieve succession in SDG's seventh point, namely affordable and clean energy and the thirteenth point, namely climate action, in sustainable energy development, these two points become the main reference for further energy developments to be implemented. Therefore, researchers through this study try to discuss Sustainable and Development Energy Resilience In Multidicpinary Prespective, with the aim of deepening views related to the importance of assessing sustainable energy development and security in a multidisciplinary perspective, namely social perspective, economic perspective, and environmental perspective (climate change mitigation). By presenting a literature review of previous studies related to the elements discussed in this study, it is hoped that the objectives and results of this research can provide a fairly good theoretical contribution in sustainable and development energy resilience.

LITERATURE REVIEW

Previous Studies

Study about sustainable and development energy resilience in social context

Is society willing to pay for the environmental benefits of bamboo buildings? A case study of china. This study by Xu, P. et al (2023) resulted in a discovery that Chinese people are willing to use bamboo as an environmentally friendly building material. This is also motivated by several factors, namely the existence of environmental tax rates, environmental pollution status and the supply of bamboo materials.

Public perceptions of wave energy development on the west coast of North America: Risks, benefits, and coastal attachment. The study by Stelmach, G. et al (2023) found that there are some respondents who have a positive attitude and are open to new technologies that use wind and solar energy, they support the use of this energy for environmental and social benefits.

Quantifying future water and energy security in the source area of the western route of China's South-to-North water diversion project within the context of climatic and societal changes. A study by Liang, H. et al (2023) resulted in the discovery that climate change causes mitigation of water

stress in water receiving areas and loss of hydroelectric power plants in water diversion areas, resulting in disrupted electricity distribution to communities.

Greenhouse Gas Emission Reduction Based on Social Recycling: A Case Study with Waste Picker Cooperatives in Brasília, Brazil. Studies by Mesquita, J. L. C. et al (2023) resulted in the discovery that waste picker organizations are able to contribute to reducing greenhouse gas emissions and energy savings. Work as a waste picker brings positive environmental and climate impacts.

Not just income: The enabling role of institutional confidence and social capital in household energy transitions in India. A study by Soni, A., & Chatterjee, A. (2023) resulted in the finding that a positive relationship in the form of participation in local community organizations and trust in local governments can facilitate the adoption of stove technology and spending on liquefied petroleum gas.

Study about sustainable and development energy resilience in economic context

Evaluation on the impact of digital transformation on the economic resilience of the energy industry in the context of artificial intelligence. The study by Lei, Y. et al (2023) provides results that the economic model made in this paper is able to provide a good predictive effect on economic resilience in the energy industry. So that it can be used to accurately predict the economic cycle in the future.

Optimal planning of an economic and resilient district integrated energy system considering renewable energy uncertainty and demand response under natural disasters. This study by Ren, H. et al (2023) states that natural disaster considerations can increase total system costs by 6.78% in the planning period.

E-fuels, technical and economic analysis of the production of synthetic kerosene precursor as sustainable aviation fuel. A study by Colelli, L. et al (2023) provides results that an energy management cost is influenced by the following values, namely; the price of power, energy, and hydrogen used in operations.

Green finance and energy natural resources nexus with economic performance: A novel evidence from China. The study by Gong, Q. et al (2023) recommends increasing green financing with environmental innovation and renewable energy. The study has had a major impact on policymakers.

Nitrogen management in farming systems under the use of agricultural wastes and circular economy. Studies by Rodríguez-Espinosa, T. et al (2023) recommend the existence of a combination of organic and inorganic fertilization to increase crop yields as a realistic and practical method for dealing with large amounts of organic residues in the context of a circular economy.

Study about sustainable and development energy resilience in environment context

Life-cycle environmental burdens of ethylene production in the context of China's chemical feedstock transition from naphtha to coal and shale gas by-product of ethane. The study by Qian, H. et al (2023) provides recommendations to policymakers to promote the environmental sustainability of the chemical manufacturing sector, due to the continuous expansion of the industry.

Multidimensional evaluation for environment impacts of plastic straws and alternatives based on life cycle assessment. A study by Guo, X. et al (2023) provides results that the use of plastic straw alternatives does not have a positive impact in most aspects, but this solution is able to reduce environmental problems.

Environmental sustainability via green transportation: A case of the top 10 energy transition nations. A study by Rehman, F. U. et al (2023) provides results that green transportation is able to reduce environmental degradation. However, the high urbanization is a focus that must be paid more attention to because it has the potential to hinder the implementation of green transportation.

A roadmap for required technological advancements to further reduce onshore wind turbine noise impact on the environment. The study by Bertagnolio, F. et al (2023) provides results that it is necessary to increase technological advances in environmental research, in order to provide accurate research results to reduce the acoustic environmental impact of wind energy. Advanced computational methods are recommended in this regard.

Environmental innovations, energy innovations, governance, and environmental sustainability: Evidence from South and Southeast Asian countries. The study by Lei, L. et al (2023) provides the result that the prospects for achieving environmental sustainability are relatively higher across Southeast Asia compared to South Asia, in this case given some suggestions for the policy level.

METHODOLOGY

Research Method

This research uses qualitative descriptive research method with literature review approach. Through this approach and method, in collecting data, researchers select data in the form of previous studies that have a similar discussion context to the researcher's topic. From the results of these data, researchers categorize the results and findings of the study into the following categories; Sustainable and Development Energy Resilience from a Social Perspective, Sustainable and Development Energy Resilience from an Economic Perspective and Sustainable and Development Energy Resilience from an Environmental Perspective. The results of the categorization are then described in order to be able to provide an in-depth picture to readers regarding the purpose of this study, which is to increase the development of concepts related to sustainable and development energy resilience in multidisciplinary prespective.

FINDING AND DISCUSSION

Sustainable and Development Energy Resilience In Social Context

Previously it has been explained that in sustainable and development energy resilience has elements of energy development. From these elements, various components or factors that affect energy security are developed, namely availability, affordability, accessibility and community acceptance.

This is also supported by research results from several previous studies in table 1 about sustainable and development energy resilience in social context. From the results of previous studies, a conclusion can be drawn that sustainable energy development has a positive impact on community life or social life, and vice versa, the community and the wider community are the main actors in the success of sustainable energy development, these two components influence each other significantly. In accordance with the opinion of Chester (2010) that community acceptance is one of the factors that can encourage increased energy resilience, the policy of energy development must also consider the condition of a community both globally and regionally. The energy development policy itself is formed with the aim of improving the welfare of the community through efforts, one of which is by developing energy innovations that are efficient and modern and based on common needs. Through this, it creates resilience of an energy development and can be used sustainably. As an example of the implementation of this can be seen from the results of a study by Soni, A., & Chatterjee, A. (2023) which states that the participation of local communities in organizations and the existence of community trust in local governments are positively related to the adoption of stove technology and spending on liquefied petroleum gas. In addition, the role of women's education and membership in women-led networks also plays an important role in

driving adoption of such technologies. Therefore, policies aimed at promoting the transition to cleaner cooking fuels should leverage community and social networks to promote the use of sustainable fuels. Every national program must be anchored in the local context and involve local actors (adjusting to the needs of local communities) so that technology development runs well and on target.

Sustainable and Development Energy Resilience In Economic Context

Furthermore, namely sustainable and development energy resilience in economic context, Back to the factors and components by Chester (2010), that the economic context has one component that affects the development of energy resilience, namely affordability. Affordability can be interpreted as affordability, which is about how people or energy users can or can produce and use their energy efficiently so that they can implement economic principles, namely obtaining the maximum results by using the minimum possible capital.

This is also supported by research results from several previous studies in table 2 about sustainable and development energy resilience in economic context. Referring to the results of studies related to the economic context in sustainable and development energy resilience, it can be concluded that the cost of power, energy and resources used in the operation of production, distribution and consumption activities must be calculated in detail, because the amount of costs needed greatly affects the process of planning economic activities involving energy (Ren, H. et al, 2023). In addition, the availability of natural resources also affects the need for human resources in the economic operations of a country/region. In this case, financial development and human capital are able to increase economic growth. As a result, if the flow of financial management is higher, it will be followed by the output of energy sources such as renewable electrical energy and the ability of environmental innovation Gong, Q., Ying, L., & Dai, J., 2023). In addition, to optimize energy resilience in a country/region, it is necessary to create a strategy that uses a recycle system, with the aim of saving budget while still providing income for energy operations, for example the combination of organic and inorganic fertilization to increase crop yields is recommended in this context, this is a realistic and practical method of dealing with large amounts of organic residues in an economic context circular (Rodríguez-Espinosa, T. et al, 2023).

Sustainable and Development Energy Resilience In Environmental Context

The last part is sustainable and development energy resilience in environmental context, referring to the factors and components of energy resilience by Chester (2010), Availability and Accessibility are components contained in the environmental context. Accessibility or the ability to provide energy is highlighted by the government's ability to increase public access to energy, which includes; Processing capacity, additional capacity, Refineries show how to ensure people's oil needs are met, Expansion of electricity transmission and distribution networks shows that people have better access to electricity, Successful savings describe an increase in energy supply capacity with a simultaneous decrease in demand, The electricity index, which indicates the ability to generate electricity, and the increase in strategic reserves are aimed at improving the quality of energy supply and ensuring the continuity of energy supply. All these efforts can be done if the availability of energy sources in an environment is sufficient.

This is also supported by research results from several previous studies in table 3 about sustainable and development energy resilience in environmental context. In energy resilience, the environmental context when viewed through the results of previous studies is strongly influenced by availability and accessibility. In this case, availability is the availability of energy sources that can be used and processed by the wider community / society and can be obtained in the long term / sustainable. Therefore, in order to achieve these conditions, control is needed in energy consumption and import activities, so that the existence of energy sources can be maintained. This is supported by a study by Qian, H. et al (2023) which states that the large need for ethylene as the main energy source, the government provides references to policymakers to promote environmental sustainability of the chemical manufacturing sector. Then control over urbanization or population movement is also needed to avoid excessive consumption of energy sources

(Rehman, F. U. et al, 2023).

Then the advent of optional by creating and using alternative energy to minimize the occurrence of scarcity is also recommended in this context, the study by Guo, X. et al (2023) also states that Plastic straw alternatives will not be superior in all indicators, but will lead to a shift in environmental problems, which will provide a basis for decision making and avoid biases caused by subjective choices. The point is that there is a strategy by creating an alternative to the use of plastic straws to avoid environmental damage caused by subjective interests, the alternative offered is to create straws made from paper that are recycle able and anti-reuse, so that it also indirectly has a positive impact on consumer health and environmental health (protected from plastic waste that is difficult to decompose)

Technological advances and the availability of technology in processing the environment and resources are also one of the most important aspects, according to the results of a study by Bertagnolio, F. et al (2023) technological aspects and the need for further research as evaluation and protection materials are needed to reduce the negative impact of energy use on the environment.

CONCLUSIONS AND FURTHER RESEARCH

Energy security and sustainable energy development are the main elements that are the focus of attention in the dynamic global era. Human life does not escape the use of energy, so it can be said that energy is a basic need that is sustainable, continuous and will not be lost. The development of a time, the need for energy will also increase, therefore attention is needed in the form of development and special protection of the availability of energy sources, because energy has an impact on human life from social, economic and environmental aspects. Referring to Chester (2010) the components that need to be considered in energy development are availability, accessibility, affordability and community acceptance. If these four components are maintained and cared for properly, then the energy needs of the global community can be met sustainably.

This research contributes theoretically in aspects of sustainable and development energy resilience in multidisciplinary prespective, by presenting a deep urgency related to the importance of maintaining energy resilience from various multidisciplines, namely from a social perspective, economic perspective and environmental perspective. This research can also be used as a basic guideline for the government, energy development companies and the community to be wise in using the availability of energy in the surrounding environment, both for daily consumption and production and distribution.

The limitation in this study is that this study was conducted only to discuss theoretically and conceptually the sustainable development of energy resilience from a multidisciplinary perspective. This research will be better if it is carried out by involving field data obtained through surveys and questionnaires so as to obtain more accurate data. This can be used as a reference for further research to develop this research.

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