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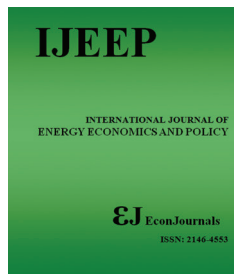
Dear Editor,  
Prof. Dr. Ilhan OZTURK

We send answers to questions in the article.

Best regards,  
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## Energy Conservation and Energy Management for Industry in Indonesia in Islamic Economic Perspective

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### ABSTRACT

This article will explore energy conservation as part of the national energy policy in Indonesia. Although the government has implemented a strategy for implementing energy conservation by applying energy management to the industrial sector, energy conservation still has challenges and obstacles in making it happen. By analyzing energy conservation policies and understanding the Maqasid Al-shariah framework which is the operational foundation of Islamic economics on the themes of economic energy, this paper concludes that energy conservation as part of religious obligations implemented in energy consumption behavior, because energy is the main source for sustainability human life. Therefore, moral values become the main foundation in energy conservation behavior as a reflection of the achievement of the objectives of Islamic law and energy management as a systematic effort to utilize energy in industry, not only to increase productivity through energy efficiency and conservation but also to maintain sustainability towards the energy needs themselves.

**Keywords:** Energy Conservation, Energy Management, Maqashid Al-shariah, Sustainable Development Goals, Islamic Economics

**JEL Classifications:** O13, P48, Q43, Q48, Q57

### 1. INTRODUCTION

One of the most severe challenges for humans today is energy engineering that leads to resource depletion and environmental damage, so this encourages developing energy engineering that is in harmony with nature (Wall, 2002). In the same context, **AOI** **Marechal et al. (2005)** assert that energy plays a central role in world development which represents a major challenge for sustainable development. More than 80% of primary energy consumption is based on fossil fuels and its share is likely to remain high in the future. Even if technological development would reduce specific consumption, world energy demand is likely to increase in line with its population.

In sustainable development, energy and material efficiency and the integration of renewable resources play a major role. The challenge concerns not only technology at the level of conversion and uses energy, but also energy management and infrastructure.

Therefore, major technological breakthroughs are very important to reduce the use of primary energy, such as the presence of new energy materials, new technology and product intensification, and the use of capital. On the other hand, political responsibility for developing community infrastructure is needed for the distribution of energy (electricity, gas, or heating networks) and information technology.

Katsounaros et al. (2014) provide an important note that electrochemistry will play an important role in creating sustainable energy solutions in the future, especially for the conversion and storage of electricity into chemical energy in electrolysis cells, and reverse conversion and utilization of energy stored in galvanic cells. A common challenge in both processes is the development of nanostructured materials that can catalyze attractive electrochemical reactions at high speeds over long periods of time. An overall understanding of the processes and related mechanisms that occur under operating

conditions is the need for rational material design that meets these requirements.

Meanwhile, Alanne and Saari (2006) asserted that power plants are large and centralized units. A new trend is developing towards distributed energy generation, which means that energy conversion units are located close to energy consumers, and large units are replaced with smaller ones. Distributed energy systems are an efficient, reliable, and environmentally friendly alternative to traditional energy systems. This distributed energy system is a good choice with respect to sustainable development.

Chu and Majumdar (2012) emphasized the importance of access to clean, affordable and reliable energy that has been the foundation for increasing the prosperity and growth of the world economy since the beginning of the industrial revolution. The use of energy in the twenty-first century must also be sustainable. Some examples of alternatives include solar and water-based energy generation, and microbial engineering to produce biofuels. This Perspective puts these opportunities into a larger context by linking them with a number of aspects in the transportation and power generation sector, while also providing an overview of the current energy landscape with a development that leads to a prosperous, sustainable and safe future for energy for the world.

Research conducted by Steg (2008) found that households must change their behavior to reduce problems caused by increasing levels of fossil energy use. Strategies for behavior change will be more effective if they target the most important causes of the intended behavior. There are factors that influence household energy use with three barriers to fossil fuel energy conservation, namely inadequate knowledge of effective ways to reduce household energy use, low priority and high cost of energy savings, and lack of alternatives worthy. The effectiveness and acceptance of information strategies on promoting household energy savings are very important to create household energy conservation.

Delmas et al. (2013) also conducted a study of strategies that provide information about the environmental impacts of effective activities to encourage energy conservation behavior. With the most comprehensive meta-analysis approach from information-based energy conservation experiments conducted to date, the average individual in the experiment reduced electricity consumption by 7.4%. This research also shows that strategies that provide individual audits and comparative consultations are more effective for energy conservation behavior than strategies that provide feedback. In this case, feedback in the form of money and incentives leads to a relative increase in energy use rather than encouraging energy conservation.

Other research from Carrico and Riemer (2011) found that limiting consumer demand for energy through behavioral interventions is an important component of efforts to reduce greenhouse gas emissions, especially in the short term. Behavior in an organizational environment can pose special challenges for people who want to promote energy conservation because employees usually do not have direct financial incentives to reduce energy use and rarely have access to information about their level of

consumption. These behavioral interventions have the overall potential to reduce energy use and their eligibility which is implemented in future organizational settings.

The study conducted by Ozturk (2015) focuses on the exploration of ecological indicators that are relevant to long-term sustainability in the food-energy-water nexus among Brazil, the Russian Federation, India, China, and South Africa (BRICS). The problem of sustainability arises with the environmental kuznets curve (EKC) hypothesis and biodiversity that requires the appropriate allocation of resources to provide food security among BRICS countries. this is able to reveal that the lack of energy and inadequate water resources can damage food security in BRICS, economic growth can strengthen energy demand and environmental degradation, depletion of forests and natural resources will burden economic prosperity, driven by rapid industrialization, high growth, domestic investment, better water sources, and labor force participation.

In energy conservation in Indonesia, the government has a firm commitment to implement energy conservation as an effort to improve the economy and competitiveness, achieve energy security, and overcome global climate change through reducing CO<sub>2</sub> emissions (Laksmi et al., 2018). In the Law of the Republic of Indonesia No. 30/2007 concerning energy, energy conservation is a systematic, planned and integrated effort to conserve domestic energy resources and increase the efficiency of energy resource utilization.

The Government of Indonesia has targeted energy conservation until 2025 which refers to the National Energy Policy, which is to reduce energy intensity by 1% per year until 2025 and achieve a final energy savings of 17% in 2025. In this case, the government is implementing an energy conservation implementation strategy to achieving this target by implementing an energy management mandate for energy users >6000 ton oil equivalent (TOE) per year, applying energy efficiency standards and labels for equipment, implementing energy conservation within ministries and government agencies as a pilot, encouraging private investment in the field of energy conservation, increasing the awareness of energy users towards energy conservation, increasing the capacity of human resources and mastering technology, and implementing an evaluation monitoring system, and supervision in the field of energy conservation.

In Indonesia, primary energy intensity up to 2017 has reached 400 SBM/billion rupiah from the target of 429 SBM/billion rupiah, and final energy savings of 231 SBM/billion rupiah. Meanwhile, the reduction in CO<sub>2</sub> emissions reached 43.802 million tons of CO<sub>2</sub> or 123% of the reduction target. Energy conservation investment of 0.00623 billion USD from the target of 0.005 billion USD. In addition, the application of energy management systems and SKEM and Labels provide support for achieving energy conservation targets that have been set.

This article will explore about energy conservation in Indonesia which includes the discussion of: first, a model of sustainable energy conservation in the Islamic economy that is linked to sustainable energy development policies in Indonesia;

second, moral values in the energy conservation behavior as an implementation of the religious obligations of each person accompanied by a comparison between the 5 basic principles in the maqasid al-shariah (the objectives of Islamic law) and the 5 principles of sustainable development goals (SDGs) that are operationalized in energy conservation and values the morals of the Qur'an concerning energy conservation; and third, energy management in the industry for energy conservation in Indonesia.

## 2. LITERATURE REVIEW

The study of Maqasid Al-Shariah (the objectives of Islamic law), energy conservation, and sustainable energy development will be discussed in three parts, namely the perspective of maqasid al-shariah on the environment, specifically energy conservation, Maqasid Al-Shariah and development which includes energy goals, and the development of energy conservation in Indonesia with an Islamic economic perspective. This energy conservation becomes an important part of the life of the world's emergency community because it is related to the sustainability of human life itself. The following are some studies on energy conservation that focus on the above problems.

Dariah et al. (2016) conducted a study with a new approach in discussing SDGs from an Islamic perspective, especially the application of SDG in Muslim countries. The seven SDGs consist of the ultimate goal of development that is focused on community welfare, and the other objectives are the means to achieve that goal. Using an Islamic perspective, this study provides guidance for SDGs that are implemented from the trilogy of human relations, namely humans and God, humans, and humans, and humans and the environment. Islam not only promotes three relationships as an embodiment of spiritual power, but also provides a mechanism of reciprocal relations for human development and system development in the economic, social, educational, and governance fields.

Sarkawi et al. (2017) examine the philosophy of maqasid al-shariah and its explanation in environmental development in Malaysia. Conceptually, there is a relationship between environmental development and maqasid al-shariah that encourages the implementation of policies in realizing a sustainable environment. Jabar et al. (2015) examine green energy and sustainable development from an Islamic perspective. Islam has outlined a number of concepts such as wisdom, justice, public interest, and innovation (ijtihad) to ensure that the environment is managed responsibly and sustainably. These concepts as a framework of higher goals than the maqasid al-shariah in providing guidance on religion, soul, reason, ancestry, and property that must be protected or sustainable. Specifically, environmental issues including green energy production should not be ignored just for the achievement of material benefits, but to realize the sustainability of good life, including the importance of energy efficiency and conservation.

Aström (2011) confirms that sustainable development is a general concept in the 21<sup>st</sup> century that targets changes that are quite slow. Expected changes in development must start from understanding SDG material. If sustainable development is the goal, then this

will require a change in understanding, namely a paradigm shift needed for sustainable development in terms of Islamic economics, both in terms of content and analysis.

Fritz and Koch (2014) provide a critical view of ecological economics and a social science which shows that the problem of climate change, resource depletion, and environmental degradation cannot be effectively addressed under conditions of sustainable economic growth. Structural potential and policy challenges for welfare scale with economic development remain within the ecological carrying capacity. There is a three-dimensional concept to operationalize prosperity in terms of ecological sustainability, social inclusion, and quality of life which is measured using data from sources such as the World Bank, Global Footprint Network and OECD. All aspects of prosperity, including ecological performance related to unsatisfactory economic development, can even cause greater environmental damage.

Everett et al. (2012) conducted research on how people in providing a clean, safe and sustainable energy supply to the world, despite increasing population levels and rapid economic development. With an interdisciplinary approach and global perspective, this study explores contemporary aspects of the economic, social, environmental and policy issues raised by current energy use systems, and illustrates the physical features and techniques that they use. The historical evolution of the world energy system, the principles underlying its use, as well as the current situation and future prospects are linked to important issues of sustainability. The increasing pattern of human energy needs at various levels requires consideration in the issue of energy sustainability, especially the use of fossil fuels and nuclear, and ways that require improvement along with technological and social developments, especially an increase in the use of renewable energy.

Nasreen et al. (2017) provide notes on the relationship between financial instability, energy consumption, environmental quality, carbon dioxide (CO<sub>2</sub>) emissions in South Asian countries during the 1980-2012 period and the multivariate framework. In this case, financial stability can improve the quality of the environment, while increasing economic growth, energy consumption, and population density can damage the quality of the environment in the long run. This study provides a new perspective for policymakers to design comprehensive financial, economic and energy supply policies to minimize the adverse effects of environmental pollution.

Delmas et al. (2013) conducted a study of strategies for providing information about the environmental impacts of effective activities to encourage conservation behavior. Using a meta-analysis approach from information-based energy conservation experiments, this study found that strategies in providing individual audits and comparative consultations would be more effective for conservation behavior than strategies that provide energy comparison feedback to fellow individuals, namely financial feedback and incentives leading to a relative increase in energy use rather than encouraging conservation itself.

Al-Mulali et al. (2016) investigated the renewable energy consumption that affects pollution and the relationship between

income and pollution to form a U-shaped inverse relationship that indicates the existence of EKC. This research shows that renewable energy consumption has a significant negative effect on pollution in Central and Eastern Europe, Western Europe, East Asia and the Pacific, South Asia, and the Americas, while renewable energy consumption has no significant effect on pollution in the Middle East and Africa North and Sub-Saharan Africa. In this research, the EKC hypothesis is only found in areas where renewable energy has a significant correlation with pollution in the short and long term.

Based on some of the studies above show that maqasid al-shariah as a basic concept in realizing the sustainability of human life in various aspects, including the sustainability of energy through conservation in providing human needs. Therefore, this study is very important to be carried out to provide a new perspective based on religious principles in the Islamic economy by focusing on energy conservation laws, so that it can be applied by policyholders, especially in energy conservation programs in Indonesia.

### 3. METHODOLOGY

This article has been prepared in the following steps: first, identification of problems regarding the Maqasid Al-shariah relationship, energy conservation, energy management, and sustainable development in Indonesia; secondly, data collection related to energy conservation and energy management policies in Indonesia obtained from official government documents in 2018 and 2019, as well as sustainable energy development policies at the Ministry of Energy, Resources and Minerals of the Republic of Indonesia; third, the collection, study, and analysis of traditional sources in the field of Islamic economics and Islamic law, especially the concept of maqasid al-shariah and masalahah (goodness/benefit); fourth, analysis of energy conservation and energy management policies for industry and sustainable energy conservation in Indonesia from an Islamic economic perspective; and fifth, draw conclusions from discussions on this study.

### 4. THE SUSTAINABLE ENERGY CONSERVATION MODEL IN ISLAMIC ECONOMY

Science provides a framework for the existence of a sustainable and stable human life, especially the way humans develop their species by realizing ecological sustainability as a top priority. In this case, Salonen and Konkka (2015) state that without a functioning biosphere, there would be no community, and without a functioning society, certainly there would be no stable economy. This framework explains that in a sustainable world, the economy is a subsidiary of ecological and social sustainability itself.

Despite the alarming trends in the lives of the world's people today stemming from global warming and ecosystem degradation, economic growth must continue to achieve stability as the first priority for national and global development. As released by the United Nations since 2015, the SDGs of the UN Agenda until 2030 are based on the idea of green and fair growth which can

provide basic concepts to meet basic needs for all people on earth (United Nations, 2015). Likewise the 2015 UN Climate Change Conference in Paris, also sought to find solutions to the green growth paradigm. However, a development model that does not have economic growth as the basis for such a solution seems to be politically incorrect.

Sustainable energy development, as formulated by the Commitment on Sustainable Development (2020) states that energy for sustainable development can be achieved by providing universal access to a mix of cost-effective energy resources that are compatible with the different needs and requirements of different countries and regions. This should include providing a greater share of the energy mix to renewable energy, increasing energy efficiency and greater reliance on advanced energy technologies, including fossil fuel technology. Energy-related policies for sustainable development that are intended to promote these goals will address many economic and social development problems and facilitate responsible management of environmental resources.

To realize sustainable energy development in Indonesia, conducive policies are needed that are supported by financial, technological and human resource independence. Financial independence can be achieved if it is able to independently finance the national energy supply and use operations. Technology independence must be carried out through long stages. The initial stage is to increase the ability of national technology in the supply of goods and services in the energy sector so that the local content of national technology in these goods or services is even greater. While the independence of human resources can be achieved by continuing to improve the ability of domestic human resources in the energy sector that actively involve the community.

Sustainable development is an agenda or action plan for people, the earth and prosperity that can strengthen universal peace in greater freedom. Eradication of poverty in all its forms and dimensions, including extreme poverty is the biggest global challenge and an indispensable requirement for sustainable development. All countries and stakeholders must act through collaborative partnerships in realizing this action plan.

The SDGs have 17 SDGs and 169 targets as the scale and ambition of this universal agenda. SDGs also as a continuation in building the millennium development goals (MDGs) and resolving what was not achieved. Some important goals of the SDGs are to strive to free humanity from the tyranny of poverty, heal and secure planet earth, and to realize human rights, achieve gender equality, and empower all women and girls. This agenda is integrated and inseparable and balances three dimensions of sustainable development, namely economic, social and environmental (United Nations, 2015). The SDGs targets and targets cover five main areas for humanity and the earth, namely people, planet, prosperity, peace, and partnership.

Thus, SDGs are: (a) a new development agreement to replace the MDGs. Term of 2015-2030; (b) a 35-page document agreed upon by more than 190 countries; and (c) contains 17 goals and 169 development goals. Seventeen goals with 169 goals are

expected to be able to answer the underdeveloped development of countries around the world, both in developed countries (excessive consumption and production, as well as inequality) and developing countries (poverty, health, education, protection of marine and forest ecosystems, urban areas, sanitation and availability of drinking water) (Hoelman et al., 2015).

In the Islamic economy, SDGs or sustainable development goals have the goal of saving lives on this earth, upholding human rights, alleviating poverty, securing energy sustainability, and others to be part of the objectives of the shariah which reduce the goals objectives of Islamic law itself. In the view of Auda (2007), maqasid al-shariah reflects a broad and comprehensive understanding of the objectives of the Islamic law that are operationalized and implemented for the benefit of all humans. Maqasid Al-shariah is the ultimate goal set by God so that all people reach salvation in this world and the hereafter. According to Ashur (2013), the basic concept of Maqasid Al-shariah is in the form of maslahah which means benefits. In this case, Ashur gave an opinion that the Maqasid Al-shariah was intended to realize safety, goodness, usefulness, and welfare for humans, and also to avoid or prevent all forms of crime, destruction, backwardness, and damage to humans, including this planet. The main concepts of “realizing good” and “preventing damage” are the concepts of the sustainability of human life itself.

Meanwhile, Al-Shatibi (2006) divides the general objectives of sharia into three types, namely daruriyat (basic needs), hajiyat (comfort, complementary benefits), and tahsiniyat (additional needs, luxury). According to Dusuki and Bouheraoua (2011), basic needs become the main element of each individual in life. Human life will not be complete and prosper if these five aspects (al-kulliyat al-khamsah) are not fulfilled, as confirmed by Al-Ghazali (2000) and Auda (2007), namely protection of religion, protection of life or life, protection of reason or intelligence, lineage protection and property or property protection.

In the view of Naim (2003), the implementation of an action in a way that is contrary to Islamic law with the reason to fulfill the objectives of sharia must be rejected. Its main purpose is to carry out this action in a way that is guided by Islamic law. Therefore, it is important to achieve sharia goals in a way that is in accordance with Islamic law. Technically, energy conservation as an action

taken for the continuation of human life in meeting energy needs is commendable in accordance with sharia objectives, so that energy conservation is in accordance with Islamic law. In other words, energy conservation is a must for everyone and part of religious obligation, because this energy is needed by all people.

The five indicators of developing the objectives of Islamic law for sustainable energy conservation in a review of Islamic economics can be seen in Figure 1:

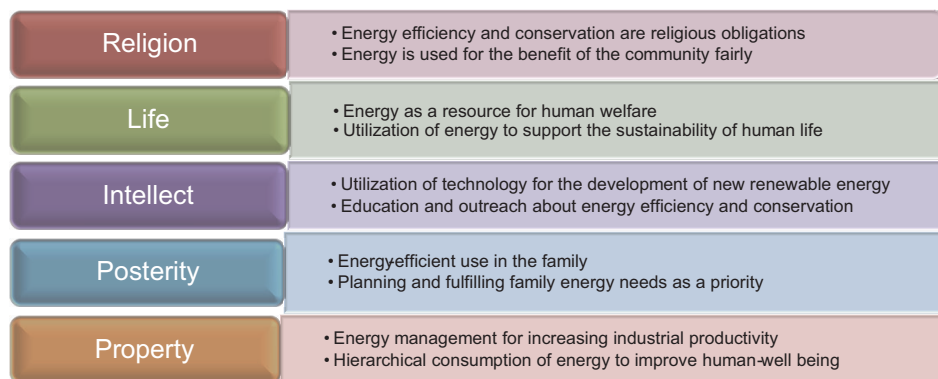
In the goal of sustainable development, energy is one of the goals scheduled for all countries, because these goals are related to the environment, clean energy, and efforts to deal with climate change. In Indonesia, the 7<sup>th</sup> goal of SDGs is energy for all, which is clean and affordable energy as an effort to improve the economy and competitiveness, achieve energy security and overcome global climate change through reducing CO<sub>2</sub> emissions. Therefore, the Indonesian government is firmly committed to implementing energy conservation.

### 5. MORAL VALUES IN ENERGY CONSERVATION BEHAVIOR

Blumstein et al. (1980) provide an analysis that although economically there are many rational responses to energy crises, energy conservation measures can be hampered by social and institutional barriers. It is important to consider not only the efficiency of the strategy in achieving energy conservation goals but also their impact on others competitively in emphasizing social and economic goals. Other research from Finlay and Palmer (2003) explores the ecological worldview of eleven major world religions and considers how this can help shape effective environmental policies. The authors discuss that religion can work with organizations that focus on the environment and development, both to provide alternative models of conservation approaches, and to develop programs for humanity themselves. World religions can, through storytelling, celebrations, training, spiritual guidance, community activism, and advocacy throughout the world become strong and effective partners in various conservation initiatives.

An important study by Islam (2017) that connects sustainable development with the concept of Islam and international law.

**Figure 1:** Maqashid Al-shariah development model for sustainable energy conservation



By focusing on sustainable development in a world that places a balance between economic, social and environmental development along with increasing population and prosperity in the world, the challenges of sustainable development have created increasing concerns. Various environmental challenges have resulted in many studies that seek to find religious teachings in creating attitudes for environmental protection. In this case, Islam can play an important role in the conflicts that arise between development and the environment. By emphasizing the importance of environmental ethics, Islam provides an important reflection on the development of a sustainable environment for the future of human life.

Sarkawi et al. (2017) examine the relations of Maqasid Al-shariah and the environment which find an application of its philosophy to environmental development. If seen as a result of human thoughts and actions on the environment to meet the needs, desires, and human values, the built environment is closely related to Islam's view of humans as caliphs on earth. In this case, Maqasid Al-shariah plays the same role by establishing a way of life for humans with the principles of the Qur'an and Sunnah. Basically, the human reaction in daily life affects these elements, because human welfare for humanity is the ultimate goal of shariah. This goal is achieved by actualizing the role of humans in producing the best quality of environmental development.

In developing alternative futures, including sustainable energy development, the use of scientific knowledge to understand the relationship between economics, welfare, and ecological sustainability is very important to find possible solutions (Laininen, 2019). According to Max-Neef (2010), there are five postulates for a new sustainable economy, namely (1) the economy is to serve the people, and not the people to serve the economy; (2) development is about humans and not about objects; (3) growth is not the same as development, and development does not always require growth; (4) no economy is possible without ecosystem services; and (5) economics is a sub-system of a larger and more limited system, namely the biosphere, so permanent growth is not possible.

Max-Neef (2010) view shows that the most important contribution of the human-scale economy is to make a transition from a paradigm based on greed, competition, and accumulation, to a paradigm based on solidarity, cooperation, and compassion. Furthermore, a new economic model must accept the limits of the earth's carrying capacity, move from efficiency to sufficiency and qualitative well-being, and resolve current economic imbalances and inequalities. Transition must lead to societies that can adapt to reduced levels of production and consumption, and support local economic organization systems.

The implementation of energy conservation in Indonesia is carried out at all stages of energy management which includes energy supply, energy exploitation, energy utilization and energy resource conservation. Because of this, energy conservation is not just to save fossil energy that can not be renewed, but also to use renewable energy to be more environmentally friendly. Policies relating to energy for sustainable development aim to solve economic and social development problems and facilitate responsible management of environmental resources.

A model of developing the five basic principles of the Maqasid Al-shariah and the five pillars of sustainable development can be seen in Table 1.

Based on Table 1, the five basic principles of the Maqasid Al-shariah and the five pillars of sustainable development have material and substance similarities, namely realizing the welfare of individuals and society by developing the five principles in sustainable energy development. Even in religion, sustainable energy development is the duty of every religious adherent in carrying out energy conservation and energy efficiency, as well as the prohibition of everyone from exploiting and damaging the environment. In this context, the five basic principles can be developed harmoniously through the description of SDGs in the energy sector. Thus it can be understood that Islam teaches its adherents to do environmental conservation. Environmental conservation as a duty and responsibility of humans to reflect the relationship between living organisms and their environment and to maintain the ecological balance created by God.

In Islamic economics, some ethical values found in the texts of the Qur'an relating to energy conservation include justice, goodness, self-sacrifice, generosity, gratefulness, consideration for others, and saving energy. These universal environmental values can overcome challenges in future energy sustainability and overcome shared environmental challenges. These ethical principles can be incorporated into economic models to develop policies that can better protect these values and at the same time become a major part of managing energy.

There is a need for further reflection on the biocentric and ecocentric viewpoints that place critical environmental destruction actions that need to be resolved quickly. These Islamic economic values will help in conceptualizing the values of energy conservation that are used by the human community and allow for broader global action in resolving together on the issue of energy sustainability.

Energy conservation can be traced from 3 interrelated aspects in the energy economy, namely the task of man as the caliph of God who is in charge of the welfare of mankind and the earth, the environment as a place of human life that contains natural resources, and human needs for energy. These three aspects are important in building a shared awareness and energy conservation policy for the sustainability of all mankind, which can be seen in Table 2.

In sustainable energy development, the Indonesian government has formulated policies to meet the energy needs of the community, one of them is by using new and renewable energy as a substitute for fossil fuels. However, Citraningrum (2019) asserts that some of the challenges of developing renewable energy in Indonesia are: (1) relatively low demand in meeting the energy needs for electricity, transportation, and the subsidized industry for fossil energy; (2) subsidies for fossil energy cause prices to be relatively low resulting in the price of renewable energy not being able to compete; (3) a centralized electricity system, even though the diversification of renewable energy types depends on location and is more suitable for use with a decentralized approach;

**Table 1: Five basic principles of Maqasid al-Shariah and the five pillars of sustainable development**

S. No.	5 basic principles of Maqasid Al-shariah	Objectives and goals	5 pillars of SDGs	Objectives and goals
1.	Religion	a. Humans have the responsibility of managing the universe properly as part of religious obligations b. Humans do not make damage on earth, such as exploitation which is detrimental to humans and the environment as a religious order c. Humans must act efficiently in the use of energy resources d. To create a peaceful, just and inclusive society that is free from fear and violence	People	a. To end poverty and hunger b. Guaranteeing the fulfillment of human potential, dignity, equality in a healthy environment
2.	Life	a. Humans as potential creatures who have the main task to manage and prosper the earth b. Man's obligation is to create goodness in realizing the lives of all beings on the planet.	Planet	a. Protect the planet from degradation through consumption and production and manage natural resources sustainably b. Take quick action on climate change that supports the needs of present and future generations
3.	Intellect	a. Humans have the potential for reason in creating technology to manage the earth and natural resources b. Humans think of the entire universe in glorifying the greatness of God and enjoy all His gifts to meet the needs of life and carry on with his life	Prosperity	a. To create a prosperous and satisfying life for all humans b. Aligning economic, social and technological progress with nature
4.	Posterity	a. Realizing human survival with efficiency measures in meeting energy consumption needs and avoiding energy crises for future generations b. Develop new renewable energy and energy conservation for energy savings that have an impact on human life in the future	Peace	Fostering a peaceful, just and inclusive society that is free from fear and violence
5.	Property	a. Carry out environmental and energy conservation as a religious obligation b. Commit exploitation and damage to the environment, as well as mistakes in the management of natural resources as an evil deed	Partnership	Mobilize global partnerships to achieve sustainable development focused on the needs of the poorest and most vulnerable

**Table 2: Moral values for energy conservation in the Qur'an**

S. No	Moral values	Surah and verses of the Qur'an	Issues of energy conservation
1.	Justice	Al-Nisa', 4: 135 Al-An'am, 6: 152	Energy management that is fair and equitable Fair energy policy
2.	Benefit	Al-Baqarah, 2: 195 Al-Qashash, 22: 76-77	Utilization of energy for the welfare of the community as worship; keep the environment from pollution, and make energy savings Prohibition of doing damage on earth, such as exploitation of energy sources, environmental pollution, and energy waste
3.	Self sacrifice	Al-Hashr, 59: 9 Hud, 11: 61	Promote energy saving, energy subsidies, energy conservation The role of everyone in the welfare of the earth, the use of geothermal energy, the development of renewable energy sources
4.	Generosity	Al-Mu'minun, 23: 18-22	Encouragement of research and technology creation to find renewable energy sources (rainwater, plants and fruit, oil-producing timber trees, livestock, marine), and energy conservation
5.	Gratefulness	Ibrahim, 14: 7 Al-Isra', 17: 29-30	Give thanks for Allah's blessings through environmental preservation and energy utilization, energy conservation, and energy efficiency Prohibition of exploitation and waste of energy, conduct energy efficiency, and plan for sustainable energy
6.	Consideration for others	Al-Hadid, 57: 23-24	Preventing energy crisis by making energy savings in daily life, and sustainable energy
7.	Energy saving	Al-An'am, 6: 141	Energy management, the use of plants and fruits as energy, supporting and fulfilling energy needs, and prohibiting energy waste

Source: Hasanuzzaman (1999)



(4) government policies are not conducive for investors to invest in the renewable energy sector; (5) human resource capacity needs to be increased, especially for the process of maintaining and maintaining renewable energy power plants; and (6) renewable energy research and development is inadequate and not integrated with industry.

The development of renewable energy for electricity and various other sectors should get high priority and clear support. With the development of existing technology and information, small scattered power plants such as roof solar electricity installations will be the choice of many electricity customers and can, therefore, encourage disruption of the use of large scale plants such as Steam Power Builders (PLTU). In addition, the use of renewable energy for electricity generation can reduce the risk of rising costs due to fluctuations in fossil energy prices. By increasing the share of renewable energy, electricity prices will not be affected by fuel prices. In the next few years, renewable energy technology will also continue to develop so that it is expected that the price of electricity generation will be even lower.

## 6. ENERGY MANAGEMENT IN THE INDUSTRY FOR ENERGY CONSERVATION IN INDONESIA

Energy management as an integrated activity to control energy consumption in order to achieve effective and efficient energy utilization to produce maximum output through structured and economic technical measures to minimize consumption of raw materials and supporting materials. The goals of energy management are saving resources, climate protection and cost savings. For consumers, energy management makes it easy to get access to energy according to what and when they need. Energy management is concerned with environmental management, production management, logistics and other business-related functions.

As for the scope of energy conservation in Indonesia, it can be carried out at all stages of energy management which includes the supply of energy, energy utilization, and energy utilization. This energy conservation is carried out by taking into account the provisions of the Government of the Republic of Indonesia's policy on national energy policies (KEN) (Jaelani et al., 2017) which can be seen in Figure 2:

The Directorate of Energy Conservation of the Ministry of Energy and Mineral Resources of the Republic of Indonesia, as stated by Laksmi et al. (2018), that various energy conservation implementation strategies implemented to achieve these targets

include implementing an energy management mandate for energy users  $\geq 6000$  TOE per year, applying energy efficiency standards and labels for equipment, Implementing energy conservation in ministries/institutions for example, encouraging private investment in the field of energy conservation, raising the awareness of energy users towards energy conservation, increasing the capacity of human resources and mastering technology, implementing a system of monitoring, evaluation, and supervision in the field of energy conservation.

To realize the goal of energy conservation in Indonesia, the Government Regulation of Republic of Indonesia No. 70/2009 concerning energy conservation has been established which regulates the responsibilities of entrepreneurs in implementing energy conservation at all stages of energy management and using energy-efficient technologies. In article 11 paragraph 1 it is stressed that individuals, business entities, in the form of permanent businesses in undertaking energy exploitation are required to carry out energy conservation. Therefore, organizations or companies that are users of energy sources and energy users can implement an Energy Management System based on ISO 50001: 2011.

The ISO 50001 concept uses a management system model with a Plan, Do Check, Action (PDCA) cycle approach for continuous improvement. In Indonesia, the standard becomes SNI ISO 50001 Energy Management System which can be seen in Table 3.

Silva et al. (2019) explain that energy management is a relatively new and less explored field of interdisciplinary knowledge that focuses on organizational aspects rather than on more popular studies of system improvement and technological aspects related to energy efficiency. Difficulties explained in the scientific literature for successful energy management in industry are in the form of obstacles and their origins: (1) external, such as markets, government or politics, suppliers, technology or services, designers, producers, suppliers, energy suppliers, and financiers; and (2) intra-organization: from an economic-behavioral and organizational perspective. Regarding intra-organizational barriers, different aspects stand out: (1) lack of effective internal management in the company; (2) complex decision making

Figure 2: National Energy Policies (KEN) in Indonesia

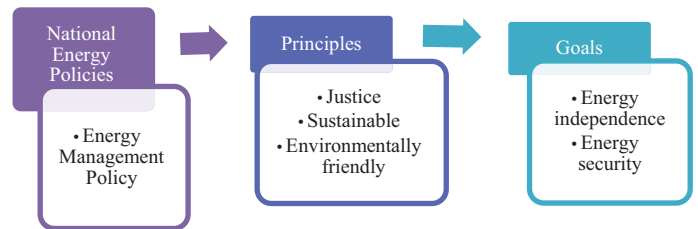


Table 3: Plan, do, check, action cycles in energy management

Plan	Do	Check	Action
Conduct energy reviews and establish baselines, energy performance indicators, objectives, targets and action plans needed to provide results that will improve energy performance in accordance with the organization's energy policy	Implement energy management action plans	Monitor and measure the processes and key characteristics of operations that determine energy performance against energy policies and objectives and report results	Take action to continuously improve energy performance and the energy management system

chains; (3) lack of strength and influence of an energy manager; (4) organizational culture that leads to neglect of energy and environmental aspects; and (5) low importance is given to energy efficiency programs (not the company's main business).

In Indonesia, energy management as an integrated activity to control energy consumption in order to achieve effective and efficient energy utilization to produce maximum output through structured and economic technical measures to optimize energy utilization including energy for production processes and to optimize the consumption of raw materials and supporting materials, and energy users  $\geq 6000$  TOE per year must implement energy management. Energy management obligations include activities to appoint energy managers to develop energy conservation programs, conduct energy audits regularly, carry out energy audit results recommendations, and report on energy management implementation. This energy management is important because industrial growth contributes to Indonesia's economic growth, but on the other hand, the industry uses energy as well as being a significant greenhouse gas-producing sector.

In 2019, Indonesia's energy needs could reach 1316 million SBM (equivalent to a barrel of oil). In this case, the government has tried to encourage the public to save energy by controlling the distribution system of fuel oil (BBM) at every public fueling station, government vehicles are prohibited from using subsidized BBM, prohibiting subsidized BBM for plantation and mining vehicles, conversion of BBM to gas fuel for transportation, saving

electricity and water use in central and regional government offices, BUMN, BUMD, as well as saving on street lighting.

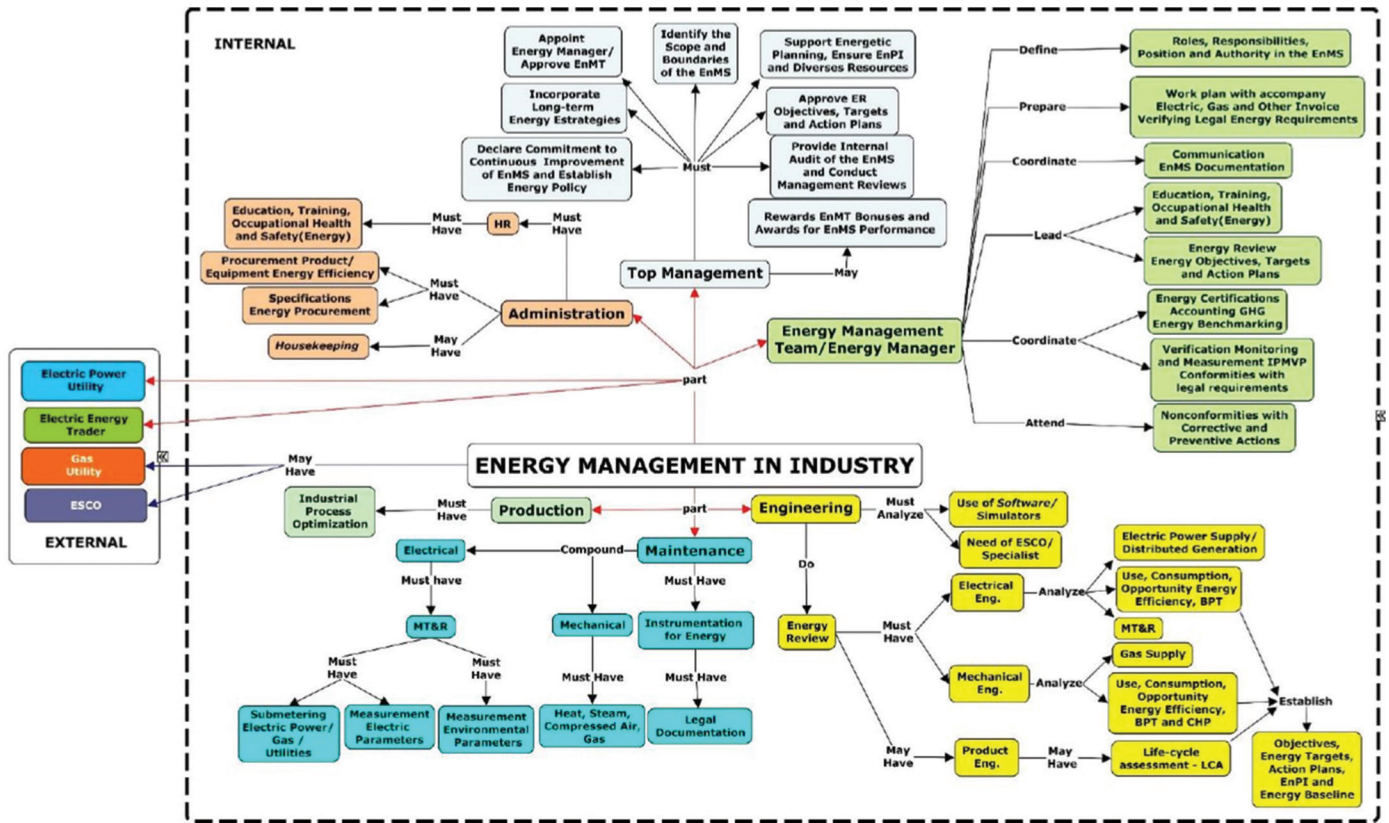
Silva et al. (2019) with a complete conceptual map approach can also explain energy management for industry, specifically by combining and making explicit relationships between the functional areas of intra-organization and external organizations involved in the energy management process for energy-intensive industries which can be seen in Figure 3 below:

National energy is still dominated by fossil energy so it must be reduced by energy conservation efforts. This condition needs to be responded to for energy security because energy demand continues to rise along with economic growth. In addition, energy efficiency and conservation are very important to be implemented in order to improve the competitiveness of national industries. Energy conservation efforts need to be increased for savings. The success of the industry in energy conservation will be applied by other industries because it will produce efficiency and savings so that it will benefit the industry concerned.

There are several drivers of energy conservation policies in Indonesia (Laksmi et al., 2018) which can be seen in the following Table 4.

A study conducted by Ibtissem (2010) found that various economic, social and ecological crises experienced by humanity were caused by human behavior, especially the behavior of production and consumption (Jongen and Meerdink, 1998). In this case, modes of

Figure 3: Conceptual map for an energy management system in an industrial company



**Table 4: Drivers of energy conservation policies in Indonesia**

S. No.	Boosters	General purposes
1.	Economic Growth and Competitiveness	a. Reducing energy intensity b. Increase industrial competitiveness c. Reducing production costs d. Energy costs are more affordable
2.	Enerby resistance	a. Reducing energy imports b. Maximizing for domestic needs and reducing exports c. Increase reliability d. Control the growth of energy demand e. Encourage energy diversification by maximizing new and renewable energy (EBT)
3.	Climate Change	a. Global mitigation and adaptation efforts b. Fulfill international obligations under the United Nations Framework Convention on Climate Change UNFCCC

production and consumption can be considered as the cause of this crisis. To ensure a balance at the economic, social and ecological levels both now and in the future, sustainable development trends suggest a number of actions for different actors. Kaiser (1998) and Kaiser and Willson (2004) propose the importance of awareness of the dangers of using certain consumable resources, especially water, and the side effects of excessive consumption of other resources, such as fossil energy, are at the beginning of the call for conservation behavior. Therefore, energy conservation is considered as a dimension of conservation behavior.

Thus, energy conservation is the behavior of everyone who consumes less energy. Energy conservation is focused on human behavior of energy users so that the reduction in energy consumption is done in rational ways without reducing the use of energy needed, or without reducing safety, comfort, and productivity. In industry, energy conservation behavior includes reducing the use of plastic, paper, metal funds, recycling materials such as soda cans and steel, and utilizing waste heat recovery power generation.

The view of the Qur'an states that everything on earth was created for all humans as a pleasure, so that the earth and existing resources including energy, need to be protected from exploitation and damage for the sustainability of human life. The main thing that humans need to do is to maintain environmental harmony (Khalid, 2002), one of which is by balancing energy needs through energy efficiency and conservation. As for the perspective of maqasid al-shariah that mainstreams aspects of benefit for humans, then everyone's energy needs need to consider the hierarchy of objectives selectively, starting in terms of basic energy needs, supporting or complementary energy requirements, or only to improve conditions that do not affect anything for energy users.

## 7. CONCLUSION

Energy conservation in Indonesia is done by improving energy management as a form of energy savings in the industry and

promoting energy conservation behavior in everyone. In the perspective of Maqasid Al-shariah, energy conservation is part of religious obligation, because energy is the source of human life and has valuable benefits for survival on this planet. To consume energy, people and industries have a hierarchy of needs in fulfilling them, ranging from priority to complementary scales. This is because everyone is obliged to take energy conservation measures, not only to meet basic needs but to prevent the energy crisis that can destroy humans and other life on this earth.

## REFERENCES

- Alanne, K., Saari, A. (2006), Distributed energy generation and sustainable development. *Renewable and Sustainable Energy Reviews*, 10(6), 539-558.
- Al-Ghazali, A.H.M. (2000), Muhammad. Al-Mustashfa. Beirut: Dâr al-Kutub al-'Ilmiyah.
- Al-Mulali, U., Ozturk, I., Solarin, S.A. (2016), Investigating the environmental Kuznets curve hypothesis in seven regions: The role of renewable energy. *Ecological Indicators*, 67, 267-282.
- Al-Shatibi, A.I. (2006), Al-Muwafaqât fi Ushul al-Syari'ah. Qahirah: Kairo, Dar al-Hadith.
- Ashur, M.T.I. (2013), Treatise on Maqasid Al-Shari'ah. London: International Institute of Islamic Thought.
- Aström, Z.H.O. (2011), Paradigm shift for sustainable development: The contribution of Islamic economics. *Journal of Economic and Social Studies*, 1(1), 73-79.
- Auda, J. (2007), The Goals and Objectives of the Shariah as Philosophy of Islamic Law: A System Approach. United States of America: International Institute of Islamic Thought.
- Blumstein, C., Krieg, B., Schipper, L., York, C. (1980), Overcoming social and institutional barriers to energy conservation. *Energy*, 5(4), 355-371.
- Carrico, A.R., Riemer, M. (2011), Motivating energy conservation in the workplace: An evaluation of the use of group-level feedback and peer education. *Journal of Environmental Psychology*, 31(1), 1-13.
- Chu, S., Majumdar, A. (2012), Opportunities and challenges for a sustainable energy future. *Nature*, 488(7411), 294.
- Citraningrum, M. (2019), Sudahkah Indonesia Menggunakan Energi Terbarukan? Energi Kita: Buletin Strategic Partnership Green and Inclusive Energy. Jakarta Selatan: Institute for Essential Services Reform.
- CSD. (2002), Report of the Ninth Session. United Nation: Commitment on Sustainable Development.
- Dariah, A.R., Salleh, M.S., Shafiai, H.M. (2016), A new approach for sustainable development goals in Islamic perspective. *Procedia Social and Behavioral Sciences*, 219, 159-166.
- Delmas, M.A., Fischlein, M., Asensio, O.I. (2013), Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012. *Energy Policy*, 61, 729-739.
- Dusuki, A.W., Bouheraoua, S. (2011), The framework of Al-Shariah and its implication for Islamic finance. In *Islam and Civilisation Renewal*, 2(2), 316-336.
- Everett, R., Boyle, G., Peake, S., Ramage, J. (2012), *Energy systems and sustainability: Power for a sustainable future*. Oxford: Oxford University Press.
- Finlay, V., Palmer, M. (2003), *Faith in Conservation: New Approaches to Religions and the Environment*. The World Bank. Available from: <http://www.hdl.handle.net/10986/15083>.
- Fritz, M., Koch, M. (2014), Potentials for prosperity without growth: Ecological sustainability, social inclusion and the quality of life in 38 countries. *Ecological Economics*, 108, 191-199.

1 Hasanuzzaman, S.M. (1999), *Economic Guidelines in the Quran*.  
 2 Islamabad Pakistan: International Institute of Islamic Thought.  
 3 Hoelman, M.B., Parhusip, B.T.P., Eko, S., Bahagijo, S., Santono, H.  
 4 (2015), *Panduan SDGs Untuk Pemerintah Daerah (Kota Dan*  
 5 *Kabupaten) Dan Pemangku Kepentingan Daerah*. Jakarta:  
 6 International NGO Forum on Indonesian Development.  
 7 Ibtissem, M.H. (2010), Application of value beliefs norms theory to the  
 8 energy conservation behaviour. *Journal of Sustainable Development*,  
 9 3(2), 129-138.  
 10 Islam, S.S. (2017), Sustainable development in Islam and international  
 11 law: An investigation. In: *Qur'anic Guidance for Good Governance*.  
 12 U.K: Palgrave Macmillan, Cham. p169-192.  
 13 Jabar, A., Ilham, S., Saifuddeen, S., Rahman, A. (2015), Green energy  
 14 towards sustainability from the Islamic perspective. *International*  
 15 *Journal of Sustainable Future for Human Security*, 3(2), 31-34.  
 16 Jaelani, A., Firdaus, S., Jumena, J. (2017), Renewable energy policy  
 17 in Indonesia: The qur'anic scientific signals in Islamic economics  
 18 perspective. *International Journal of Energy Economics and Policy*,  
 19 7(4), 193-204.  
 20 Jongen, W., Meerdink, G. (1998), *Food Product Innovation: How to*  
 21 *Link Sustainability and the Market*. Wageningen: Agricultural  
 22 University. Available from: [http://www.agris.fao.org/agris-search/](http://www.agris.fao.org/agris-search/search.do?recordID=NL2012063641)  
 23 [search.do?recordID=NL2012063641](http://www.agris.fao.org/agris-search/search.do?recordID=NL2012063641).  
 24 Kaiser, F.G. (1998), A general measure of ecological behavior. *Journal*  
 25 *of Applied Social Psychology*, 28(5), 395-422.  
 26 Kaiser, F.G., Wilson, M. (2004), Goal-directed conservation behavior:  
 27 The specific composition of a general performance. *Personality and*  
 28 *Individual Differences*, 36(7), 1531-1544.  
 29 **AQ2** Kamali, M.H. (2002), *Principles of Islamic Jurispence*.  
 30 *United Kingdom: The Islamic Texts Society*.  
 31 Katsounaros, I., Cherevko, S., Zeradjanin, A.R., Mayrhofer, K.J. (2014),  
 32 Oxygen electrochemistry as a cornerstone for sustainable energy  
 33 conversion. *Angewandte Chemie International Edition*, 53(1), 102-121.  
 34 Khalid, F.M. (2002), Islam and the environment. In: Timmerman, P.,  
 35 editor. *Encyclopedia of Global Environmental Change*. Chichester:  
 36 Wiley. p332-339.  
 37 Laininen, E. (2019), Transforming our worldview towards a sustainable  
 38 future. In: *Sustainability, Human Well-being, and the Future of*  
 39 *Education*. Switzerland: Palgrave Macmillan, Cham. p161-200.  
 40 Laksmi, D., et al. (2018), *Data dan Informasi Program Konservasi Energi*  
 41 *di Indonesia Edisi II*. Jakarta: Direktorat Konservasi Energi.  
 42 Max-Neef, M. (2010), The world on a collision course and the need for  
 43 a new economy. *Ambio*, 39(3), 200-210.  
 44 Naim, A.M. (2003), *Maqasid Syariah dan Pemikiran Pengurusan Islam*.  
 45 Kuala Lumpur: Penerbit Universiti Utara Malaysia.  
 46 Nasreen, S., Anwar, S., Ozturk, I. (2017), Financial stability, energy  
 47 consumption and environmental quality: Evidence from South  
 48 Asian economies. *Renewable and Sustainable Energy Reviews*,  
 49 67, 1105-1122.  
 50 Ozturk, I. (2015), Sustainability in the food-energy-water nexus: Evidence  
 51 from BRICS (Brazil, the Russian Federation, India, China, and South  
 52 Africa) countries. *Energy*, 93, 999-1010.  
 53 Salonen, A.O., Konkka, J. (2015), An ecosocial approach to well-being: A  
 54 solution to the wicked problems in the era of anthropocene. *Foro de*  
 55 *Educación*, 13(19), 19-34.  
 56 Sarkawi, A.A., Abdullah, A., Dali, N.M., Khazani, N.A.M. (2017),  
 57 The philosophy of Maqasid Al-Shari'ah and its application in the  
 58 built environment. *Journal of Built Environment, Technology and*  
 59 *Engineering*, 2(3), 215-222.  
 60 Silva, V.R.G., Loures, E.D.F., Lima, E.P.D., Costa, S.E.G. (2019), Energy  
 61 management in energy-intensive industries: Developing a conceptual  
 62 map. *Brazilian Archives of Biology and Technology*, 62(SPE), 1-17.  
 63 Steg, L. (2008), Promoting household energy conservation. *Energy Policy*,  
 64 36(12), 4449-4453.  
 65 United Nations. (2015), General Assembly Resolution A/RES/70/1.  
 66 *Transforming Our World, the 2030 Agenda for Sustainable*  
 67 *Development*. Available from: [http://www.un.org/ga/search/](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)  
 68 [view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E). [Last accessed on  
 69 2016 Feb 10].  
 70 United Nations. (2015), *Transforming Our World: The 2030 Agenda*  
 71 *for Sustainable Development, Resolution*. Adopted by the General  
 72 Assembly on 25 September 2015. Available from: [https://www.](https://www.sustainabledevelopment.un.org/post2015/transformingourworld)  
 73 [sustainabledevelopment.un.org/post2015/transformingourworld](https://www.sustainabledevelopment.un.org/post2015/transformingourworld).  
 74 Wall, G. (2002), Conditions and tools in the design of energy conversion  
 75 and management systems of a sustainable society. *Energy Conversion*  
 76 *and Management*, 43(9-12), 1235-1248.

Author Queries???

-  AQ1: Kindly provide these author details in the reference list
- AQ2: Kindly cite reference in the text part
- AQ3: Kindly provide six authors before et al

## PEER REVIEW

### Energy Conservation and Energy Management for Industry in Indonesia in Islamic Economic Perspective

Aan Jaelani\*, Layaman, Dewi Fatmasari, Adang Djumhur Salikin, Abdussalam Dz

#### AQ1: Kindly provide these author details in the reference list

- Marechal, F., Favrat, D., & Jochem, E. (2005). Energy in the perspective of the sustainable development: The 2000 W society challenge. *Resources, Conservation and recycling*, 44(3), 245-262. <https://doi.org/10.1016/j.resconrec.2005.01.008>.

Page 1:

..... In the same context, Marechal et al. (2005) assert that energy plays a central role in world development which represents a major challenge for sustainable development. More than 80% of primary energy consumption is based on fossil fuels and its share is likely to remain high in the future. Even if technological development would reduce specific consumption, world energy demand is likely to increase in line with its population.

#### AQ2: Kindly cite reference in the text part

- Kamali, M.H. (2002). *Principles of Islamic Jurispendence*. United Kingdom: The Islamic Texts Society.

Page 5:

In the view of Naim (2003), the implementation of an action in a way that is contrary to Islamic law with the reason to fulfill the objectives of sharia must be rejected. Its main purpose is to carry out this action in a way that is guided by Islamic law. Therefore, it is important to achieve sharia goals in a way that is in accordance with Islamic law (Kamali, 2002). Technically, energy conservation as an action taken for the continuation of human life in meeting energy needs is commendable in accordance with sharia objectives, so that energy conservation is in accordance with Islamic law.

#### AQ3: Kindly provide six authors before et al

- Laksmi, D., Prasetyaningsih, F.R., Murdiyati, S., Supriyadi, Hakiman, F.A.B., Mustika, H.S., Sembodo, B.A.A., Utama, P.A., Fahmi, M.T., & Kurnianingsih, A. (2018), *Data dan Informasi Program Konservasi Energi di Indonesia Edisi II*. Jakarta: Direktorat Konservasi Energi.

Page 3:

..... In energy conservation in Indonesia, the government has a firm commitment to implement energy conservation as an effort to improve the economy and competitiveness, achieve energy security, and overcome global climate change through reducing CO2 emissions (Laksmi et al., 2018).

Page 12:

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Indonesia, 28 January 2020  
Author/Correspondence,

Aan Jaelani

## ENERGY CONSERVATION AND ENERGY MANAGEMENT FOR INDUSTRY IN INDONESIA IN ISLAMIC ECONOMIC PERSPECTIVE

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### ABSTRACT

This article will explore energy conservation as part of the national energy policy in Indonesia. Although the government has implemented a strategy for implementing energy conservation by applying energy management to the industrial sector, energy conservation still has challenges and obstacles in making it happen. By analyzing energy conservation policies and understanding the maqasid al-shariah framework which is the operational foundation of Islamic economics on the themes of economic energy, this paper concludes that energy conservation as part of religious obligations implemented in energy consumption behavior, because energy is the main source for sustainability human life. Therefore, moral values become the main foundation in energy conservation behavior as a reflection of the achievement of the objectives of Islamic law and energy management as a systematic effort to utilize energy in industry, not only to increase productivity through energy efficiency and conservation but also to maintain sustainability towards the energy needs themselves.

**Keywords:** *energy conservation, energy management, maqashid al-shariah, SDGs, Islamic economics*

**JEL Classification:** O13, P48, Q43, Q48, Q57

### 1. INTRODUCTION

One of the most severe challenges for humans today is energy engineering that leads to resource depletion and environmental damage, so this encourages developing energy engineering that is in harmony with nature (Wall, 2002). In the same context, **Marechal et al. (2005)** assert that energy plays a central role in world development which represents a major challenge for sustainable development. More than 80% of primary energy consumption is based on fossil fuels and its share is likely to remain high in the future. Even if technological development would reduce specific consumption, world energy demand is likely to increase in line with its population.

In sustainable development, energy and material efficiency and the integration of renewable resources play a major role. The challenge concerns not only technology at the level of

conversion and uses energy, but also energy management and infrastructure. Therefore, major technological breakthroughs are very important to reduce the use of primary energy, such as the presence of new energy materials, new technology and product intensification, and the use of capital. On the other hand, political responsibility for developing community infrastructure is needed for the distribution of energy (electricity, gas, or heating networks) and information technology.

Katsounaros et al. (2014) provide an important note that electrochemistry will play an important role in creating sustainable energy solutions in the future, especially for the conversion and storage of electricity into chemical energy in electrolysis cells, and reverse conversion and utilization of energy stored in galvanic cells. A common challenge in both processes is the development of nanostructured materials that can catalyze attractive electrochemical reactions at high speeds over long periods of time. An overall understanding of the processes and related mechanisms that occur under operating conditions is the need for rational material design that meets these requirements.

Meanwhile, Alanne and Saari (2006) asserted that power plants are large and centralized units. A new trend is developing towards distributed energy generation, which means that energy conversion units are located close to energy consumers, and large units are replaced with smaller ones. Distributed energy systems are an efficient, reliable, and environmentally friendly alternative to traditional energy systems. This distributed energy system is a good choice with respect to sustainable development.

Chu and Majumdar (2012) emphasized the importance of access to clean, affordable and reliable energy that has been the foundation for increasing the prosperity and growth of the world economy since the beginning of the industrial revolution. The use of energy in the twenty-first century must also be sustainable. Some examples of alternatives include solar and water-based energy generation, and microbial engineering to produce biofuels. This Perspective puts these opportunities into a larger context by linking them with a number of aspects in the transportation and power generation sector, while also providing an overview of the current energy landscape with a development that leads to a prosperous, sustainable and safe future for energy for the world.

Research conducted by Steg (2008) found that households must change their behavior to reduce problems caused by increasing levels of fossil energy use. Strategies for behavior change will be more effective if they target the most important causes of the intended behavior. There are factors that influence household energy use with three barriers to fossil fuel energy conservation, namely inadequate knowledge of effective ways to reduce household energy use, low priority and high cost of energy savings, and lack of alternatives worthy. The effectiveness and acceptance of information strategies on promoting household energy savings are very important to create household energy conservation.

Delmas et al. (2013) also conducted a study of strategies that provide information about the environmental impacts of effective activities to encourage energy conservation behavior. With the most comprehensive meta-analysis approach from information-based energy conservation experiments conducted to date, the average individual in the experiment reduced electricity consumption by 7.4%. This research also shows that strategies that provide individual audits and comparative consultations are more effective for energy conservation behavior than strategies that provide feedback. In this case, feedback in the form of money and incentives leads to a relative increase in energy use rather than encouraging energy conservation.

Other research from Carrico and Riemer (2011) found that limiting consumer demand for energy through behavioral interventions is an important component of efforts to reduce greenhouse gas emissions, especially in the short term. Behavior in an organizational



environment can pose special challenges for people who want to promote energy conservation because employees usually do not have direct financial incentives to reduce energy use and rarely have access to information about their level of consumption. These behavioral interventions have the overall potential to reduce energy use and their eligibility which is implemented in future organizational settings.

The study conducted by Ozturk (2015) focuses on the exploration of ecological indicators that are relevant to long-term sustainability in the food-energy-water nexus among BRICS (Brazil, the Russian Federation, India, China, and South Africa). The problem of sustainability arises with the EKC (Environmental Kuznets Curve) hypothesis and biodiversity that requires the appropriate allocation of resources to provide food security among BRICS countries. This is able to reveal that the lack of energy and inadequate water resources can damage food security in BRICS, economic growth can strengthen energy demand and environmental degradation, depletion of forests and natural resources will burden economic prosperity, driven by rapid industrialization, high growth, domestic investment, better water sources, and labor force participation.

In energy conservation in Indonesia, the government has a firm commitment to implement energy conservation as an effort to improve the economy and competitiveness, achieve energy security, and overcome global climate change through reducing CO<sub>2</sub> emissions (Laksmi et al., 2018). In the Law of the Republic of Indonesia No. 30/2007 concerning energy, energy conservation is a systematic, planned and integrated effort to conserve domestic energy resources and increase the efficiency of energy resource utilization.

The Government of Indonesia has targeted energy conservation until 2025 which refers to the National Energy Policy, which is to reduce energy intensity by 1% per year until 2025 and achieve a final energy savings of 17% in 2025. In this case, the government is implementing an energy conservation implementation strategy to achieving this target by implementing an energy management mandate for energy users greater than 6,000 TOE (Ton Oil Equivalent) per year, applying energy efficiency standards and labels for equipment, implementing energy conservation within ministries and government agencies as a pilot, encouraging private investment in the field of energy conservation, increasing the awareness of energy users towards energy conservation, increasing the capacity of human resources and mastering technology, and implementing an evaluation monitoring system, and supervision in the field of energy conservation.

In Indonesia, primary energy intensity up to 2017 has reached 400 SBM/billion rupiah from the target of 429 SBM/billion rupiah, and final energy savings of 231 SBM/billion rupiah. Meanwhile, the reduction in CO<sub>2</sub> emissions reached 43.802 million tons of CO<sub>2</sub> or 123% of the reduction target. Energy conservation investment of 0.00623 billion USD from the target of 0.005 billion USD. In addition, the application of energy management systems and SKEM and Labels provide support for achieving energy conservation targets that have been set.

This article will explore about energy conservation in Indonesia which includes the discussion of: first, a model of sustainable energy conservation in the Islamic economy that is linked to sustainable energy development policies in Indonesia; second, moral values in the energy conservation behavior as an implementation of the religious obligations of each person accompanied by a comparison between the 5 basic principles in the maqasid al-shariah (the objectives of Islamic law) and the 5 principles of sustainable development goals that are operationalized in energy conservation and values the morals of the Qur'an concerning energy conservation; and third, energy management in the industry for energy conservation in Indonesia..

## 2. LITERATURE REVIEW

The study of maqasid al-shariah (the objectives of Islamic law), energy conservation, and sustainable energy development will be discussed in three parts, namely the perspective of maqasid al-shariah on the environment, specifically energy conservation, maqasid al-shariah and development which includes energy goals, and the development of energy conservation in Indonesia with an Islamic economic perspective. This energy conservation becomes an important part of the life of the world's emergency community because it is related to the sustainability of human life itself. The following are some studies on energy conservation that focus on the above problems.

Dariah et al. (2016) conducted a study with a new approach in discussing Sustainable Development Goals (SDGs) from an Islamic perspective, especially the application of SDG in Muslim countries. The seven SDGs consist of the ultimate goal of development that is focused on community welfare, and the other objectives are the means to achieve that goal. Using an Islamic perspective, this study provides guidance for SDGs that are implemented from the trilogy of human relations, namely humans and God, humans, and humans, and humans and the environment. Islam not only promotes three relationships as an embodiment of spiritual power, but also provides a mechanism of reciprocal relations for human development and system development in the economic, social, educational, and governance fields.

Sarkawi et al. (2017) examine the philosophy of maqasid al-shariah and its explanation in environmental development in Malaysia. Conceptually, there is a relationship between environmental development and maqasid al-shariah that encourages the implementation of policies in realizing a sustainable environment. Jabar et al. (2015) examine green energy and sustainable development from an Islamic perspective. Islam has outlined a number of concepts such as wisdom, justice, public interest, and innovation (ijtihad) to ensure that the environment is managed responsibly and sustainably. These concepts as a framework of higher goals than the maqasid al-shariah in providing guidance on religion, soul, reason, ancestry, and property that must be protected or sustainable. Specifically, environmental issues including green energy production should not be ignored just for the achievement of material benefits, but to realize the sustainability of good life, including the importance of energy efficiency and conservation.

Astrom (2011) confirms that sustainable development is a general concept in the 21st century that targets changes that are quite slow. Expected changes in development must start from understanding SDG material. If sustainable development is the goal, then this will require a change in understanding, namely a paradigm shift needed for sustainable development in terms of Islamic economics, both in terms of content and analysis.

Fritz and Koch (2014) provide a critical view of ecological economics and a social science which shows that the problem of climate change, resource depletion, and environmental degradation cannot be effectively addressed under conditions of sustainable economic growth. Structural potential and policy challenges for welfare scale with economic development remain within the ecological carrying capacity. There is a three-dimensional concept to operationalize prosperity in terms of ecological sustainability, social inclusion, and quality of life which is measured using data from sources such as the World Bank, Global Footprint Network and OECD. All aspects of prosperity, including ecological performance related to unsatisfactory economic development, can even cause greater environmental damage.

Everett et al. (2012) conducted research on how people in providing a clean, safe and sustainable energy supply to the world, despite increasing population levels and rapid economic development. With an interdisciplinary approach and global perspective, this study

explores contemporary aspects of the economic, social, environmental and policy issues raised by current energy use systems, and illustrates the physical features and techniques that they use. The historical evolution of the world energy system, the principles underlying its use, as well as the current situation and future prospects are linked to important issues of sustainability. The increasing pattern of human energy needs at various levels requires consideration in the issue of energy sustainability, especially the use of fossil fuels and nuclear, and ways that require improvement along with technological and social developments, especially an increase in the use of renewable energy.

Nasreen et al. (2017) provide notes on the relationship between financial instability, energy consumption, environmental quality, carbon dioxide (CO<sub>2</sub>) emissions in South Asian countries during the 1980-2012 period and the multivariate framework. In this case, financial stability can improve the quality of the environment, while increasing economic growth, energy consumption, and population density can damage the quality of the environment in the long run. This study provides a new perspective for policymakers to design comprehensive financial, economic and energy supply policies to minimize the adverse effects of environmental pollution.

Delmas et al. (2013) conducted a study of strategies for providing information about the environmental impacts of effective activities to encourage conservation behavior. Using a meta-analysis approach from information-based energy conservation experiments, this study found that strategies in providing individual audits and comparative consultations would be more effective for conservation behavior than strategies that provide energy comparison feedback to fellow individuals, namely financial feedback and incentives leading to a relative increase in energy use rather than encouraging conservation itself.

Al-Mulali et al. (2016) investigated the renewable energy consumption that affects pollution and the relationship between income and pollution to form a U-shaped inverse relationship that indicates the existence of environmental Kuznets (EKC) curves. This research shows that renewable energy consumption has a significant negative effect on pollution in Central and Eastern Europe, Western Europe, East Asia and the Pacific, South Asia, and the Americas, while renewable energy consumption has no significant effect on pollution in the Middle East and Africa North and Sub-Saharan Africa. In this research, the EKC hypothesis is only found in areas where renewable energy has a significant correlation with pollution in the short and long term.

Based on some of the studies above show that maqasid al-shariah as a basic concept in realizing the sustainability of human life in various aspects, including the sustainability of energy through conservation in providing human needs. Therefore, this study is very important to be carried out to provide a new perspective based on religious principles in the Islamic economy by focusing on energy conservation laws, so that it can be applied by policyholders, especially in energy conservation programs in Indonesia..

### 3. METHODOLOGY

This article has been prepared in the following steps: *first*, identification of problems regarding the maqasid al-shariah relationship, energy conservation, energy management, and sustainable development in Indonesia; *secondly*, data collection related to energy conservation and energy management policies in Indonesia obtained from official government documents in 2018 and 2019, as well as sustainable energy development policies at the Ministry of Energy, Resources and Minerals of the Republic of Indonesia; *third*, the collection, study, and analysis of traditional sources in the field of Islamic economics and Islamic law, especially the concept of maqasid al-shariah and *maslahah* (goodness/benefit); *fourth*, analysis of energy

conservation and energy management policies for industry and sustainable energy conservation in Indonesia from an Islamic economic perspective; and *fifth*, draw conclusions from discussions on this study.

#### **4. THE SUSTAINABLE ENERGY CONSERVATION MODEL IN ISLAMIC ECONOMY**

Science provides a framework for the existence of a sustainable and stable human life, especially the way humans develop their species by realizing ecological sustainability as a top priority. In this case, Salonen and Konkka (2015) state that without a functioning biosphere, there would be no community, and without a functioning society, certainly there would be no stable economy. This framework explains that in a sustainable world, the economy is a subsidiary of ecological and social sustainability itself.

Despite the alarming trends in the lives of the world's people today stemming from global warming and ecosystem degradation, economic growth must continue to achieve stability as the first priority for national and global development. As released by the United Nations since 2015, the sustainable development goals of the UN Agenda until 2030 are based on the idea of green and fair growth which can provide basic concepts to meet basic needs for all people on earth (United Nations, 2015). Likewise the 2015 UN Climate Change Conference in Paris, also sought to find solutions to the green growth paradigm. However, a development model that does not have economic growth as the basis for such a solution seems to be politically incorrect.

Sustainable energy development, as formulated by the CSD (Commitment on Sustainable Development) (2020) states that energy for sustainable development can be achieved by providing universal access to a mix of cost-effective energy resources that are compatible with the different needs and requirements of different countries and regions. This should include providing a greater share of the energy mix to renewable energy, increasing energy efficiency and greater reliance on advanced energy technologies, including fossil fuel technology. Energy-related policies for sustainable development that are intended to promote these goals will address many economic and social development problems and facilitate responsible management of environmental resources.

To realize sustainable energy development in Indonesia, conducive policies are needed that are supported by financial, technological and human resource independence. Financial independence can be achieved if it is able to independently finance the national energy supply and use operations. Technology independence must be carried out through long stages. The initial stage is to increase the ability of national technology in the supply of goods and services in the energy sector so that the local content of national technology in these goods or services is even greater. While the independence of human resources can be achieved by continuing to improve the ability of domestic human resources in the energy sector that actively involve the community.

Sustainable development is an agenda or action plan for people, the earth and prosperity that can strengthen universal peace in greater freedom. Eradication of poverty in all its forms and dimensions, including extreme poverty is the biggest global challenge and an indispensable requirement for sustainable development. All countries and stakeholders must act through collaborative partnerships in realizing this action plan.

The SDGs have 17 Sustainable Development Goals and 169 targets as the scale and ambition of this universal agenda. SDGs also as a continuation in building the Millennium Development Goals (MDGs) and resolving what was not achieved. Some important goals of

the SDGs are to strive to free humanity from the tyranny of poverty, heal and secure planet earth, and to realize human rights, achieve gender equality, and empower all women and girls. This agenda is integrated and inseparable and balances three dimensions of sustainable development, namely economic, social and environmental (United Nations, 2015). The SDGs targets and targets cover five main areas for humanity and the earth, namely people, planet, prosperity, peace, and partnership.

Thus, SDGs are: (a) a new development agreement to replace the MDGs (Millennium Development Goals). Term of 2015-2030; (b) a 35-page document agreed upon by more than 190 countries; and (c) contains 17 goals and 169 development goals. Seventeen goals with 169 goals are expected to be able to answer the underdeveloped development of countries around the world, both in developed countries (excessive consumption and production, as well as inequality) and developing countries (poverty, health, education, protection of marine and forest ecosystems, urban areas, sanitation and availability of drinking water) (Hoelman et al., 2015).

In the Islamic economy, SDGs or sustainable development goals have the goal of saving lives on this earth, upholding human rights, alleviating poverty, securing energy sustainability, and others to be part of the objectives of the shariah which reduce the goals objectives of Islamic law itself. In the view of Auda (2007), maqasid al-shariah reflects a broad and comprehensive understanding of the objectives of the Islamic law that are operationalized and implemented for the benefit of all humans. Maqasid al-shariah is the ultimate goal set by God so that all people reach salvation in this world and the hereafter. According to Ashur (2013), the basic concept of maqasid al-shariah is in the form of *maslahah* which means benefits. In this case, Ashur gave an opinion that the maqasid al-shariah was intended to realize safety, goodness, usefulness, and welfare for humans, and also to avoid or prevent all forms of crime, destruction, backwardness, and damage to humans, including this planet. The main concepts of "realizing good" and "preventing damage" are the concepts of the sustainability of human life itself.

Meanwhile, al-Shatibi (2006) divides the general objectives of sharia into three types, namely *daruriyat* (basic needs), *hajiyyat* (comfort, complementary benefits), and *tahsiniyat* (additional needs, luxury). According to Dusuki and Bouheraoua (2011), basic needs become the main element of each individual in life. Human life will not be complete and prosper if these five aspects (*al-kulliyat al-khamsah*) are not fulfilled, as confirmed by al-Ghazali (2000) and Auda (2007), namely protection of religion, protection of life or life, protection of reason or intelligence, lineage protection and property or property protection.

In the view of Naim (2003), the implementation of an action in a way that is contrary to Islamic law with the reason to fulfill the objectives of sharia must be rejected. Its main purpose is to carry out this action in a way that is guided by Islamic law. Therefore, it is important to achieve sharia goals in a way that is in accordance with Islamic law (Kamali, 2002). Technically, energy conservation as an action taken for the continuation of human life in meeting energy needs is commendable in accordance with sharia objectives, so that energy conservation is in accordance with Islamic law. In other words, energy conservation is a must for everyone and part of religious obligation, because this energy is needed by all people.

The five indicators of developing the objectives of Islamic law for sustainable energy conservation in a review of Islamic economics can be seen in figure 1 below:

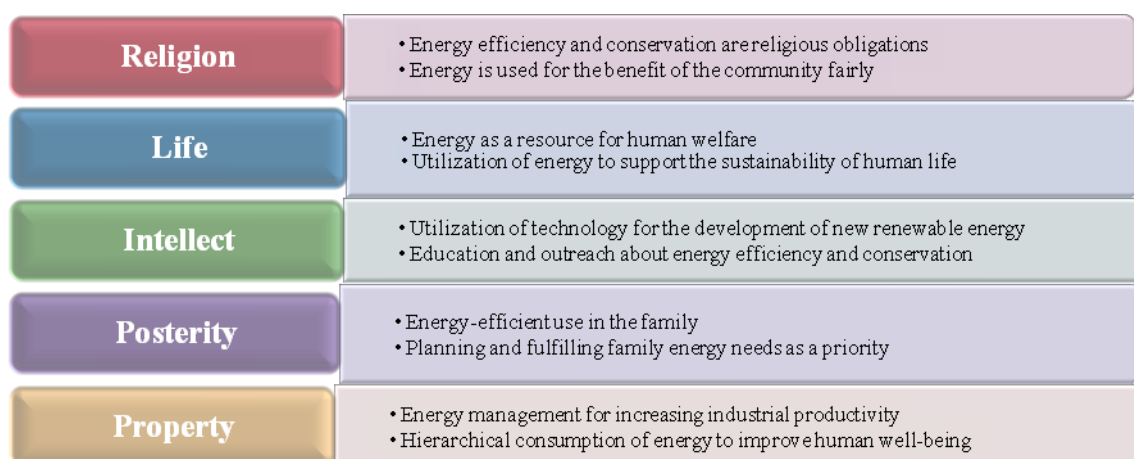


Figure 1: Maqashid al-Shariah Development Model for Sustainable Energy Conservation

In the goal of sustainable development, energy is one of the goals scheduled for all countries, because these goals are related to the environment, clean energy, and efforts to deal with climate change. In Indonesia, the 7th goal of SDGs is energy for all, which is clean and affordable energy as an effort to improve the economy and competitiveness, achieve energy security and overcome global climate change through reducing CO<sub>2</sub> emissions. Therefore, the Indonesian government is firmly committed to implementing energy conservation.

## 5. MORAL VALUES IN ENERGY CONSERVATION BEHAVIOR

Blumstein et al (1980) provide an analysis that although economically there are many rational responses to energy crises, energy conservation measures can be hampered by social and institutional barriers. It is important to consider not only the efficiency of the strategy in achieving energy conservation goals but also their impact on others competitively in emphasizing social and economic goals. Other research from Finlay and Palmer (2003) explores the ecological worldview of eleven major world religions and considers how this can help shape effective environmental policies. The authors discuss that religion can work with organizations that focus on the environment and development, both to provide alternative models of conservation approaches, and to develop programs for humanity themselves. World religions can, through storytelling, celebrations, training, spiritual guidance, community activism, and advocacy throughout the world become strong and effective partners in various conservation initiatives.

An important study by Islam S. (2017) that connects sustainable development with the concept of Islam and international law. By focusing on sustainable development in a world that places a balance between economic, social and environmental development along with increasing population and prosperity in the world, the challenges of sustainable development have created increasing concerns. Various environmental challenges have resulted in many studies that seek to find religious teachings in creating attitudes for environmental protection. In this case, Islam can play an important role in the conflicts that arise between development and the environment. By emphasizing the importance of environmental ethics, Islam provides an important reflection on the development of a sustainable environment for the future of human life.

Sarkawi et al (2017) examine the relations of maqasid al-shariah and the environment which find an application of its philosophy to environmental development. If seen as a result of

human thoughts and actions on the environment to meet the needs, desires, and human values, the built environment is closely related to Islam's view of humans as caliphs on earth. In this case, maqasid al-shariah plays the same role by establishing a way of life for humans with the principles of the Qur'an and Sunnah. Basically, the human reaction in daily life affects these elements, because human welfare for humanity is the ultimate goal of shariah. This goal is achieved by actualizing the role of humans in producing the best quality of environmental development.

In developing alternative futures, including sustainable energy development, the use of scientific knowledge to understand the relationship between economics, welfare, and ecological sustainability is very important to find possible solutions (Laininen, 2019). According to Max-Neef (2010), there are five postulates for a new sustainable economy, namely 1) the economy is to serve the people, and not the people to serve the economy; 2) development is about humans and not about objects; 3) growth is not the same as development, and development does not always require growth; 4) no economy is possible without ecosystem services; and 5) economics is a sub-system of a larger and more limited system, namely the biosphere, so permanent growth is not possible.

Max-Neef's (2010) view shows that the most important contribution of the human-scale economy is to make a transition from a paradigm based on greed, competition, and accumulation, to a paradigm based on solidarity, cooperation, and compassion. Furthermore, a new economic model must accept the limits of the earth's carrying capacity, move from efficiency to sufficiency and qualitative well-being, and resolve current economic imbalances and inequalities. Transition must lead to societies that can adapt to reduced levels of production and consumption, and support local economic organization systems.

The implementation of energy conservation in Indonesia is carried out at all stages of energy management which includes energy supply, energy exploitation, energy utilization and energy resource conservation. Because of this, energy conservation is not just to save fossil energy that can not be renewed, but also to use renewable energy to be more environmentally friendly. Policies relating to energy for sustainable development aim to solve economic and social development problems and facilitate responsible management of environmental resources.

A model of developing the five basic principles of the maqasid al-shariah and the five pillars of sustainable development can be seen in table 1 below:

Table 1: Five Basic Principles of Maqasid al-Shariah and the Five Pillars of Sustainable Development

No.	5 Basic Principles of Maqasid al-Shariah	Objectives and Goals	5 Pillars of SDGs	Objectives and Goals
1	Religion	a. Humans have the responsibility of managing the universe properly as part of religious obligations b. Humans do not make damage on earth, such as exploitation which is detrimental to humans and the environment as a religious order. c. Humans must act efficiently in the use of energy resources d. To create a peaceful, just and inclusive society that is free from	People	a. To end poverty and hunger b. Guaranteeing the fulfillment of human potential, dignity, equality in a healthy environment

		fear and violence.		
2	Life	a. Humans as potential creatures who have the main task to manage and prosper the earth b. Man's obligation is to create goodness in realizing the lives of all beings on the planet.	Planet	a. Protect the planet from degradation through consumption and production and manage natural resources sustainably b. Take quick action on climate change that supports the needs of present and future generations
3	Intellect	a. Humans have the potential for reason in creating technology to manage the earth and natural resources b. Humans think of the entire universe in glorifying the greatness of God and enjoy all His gifts to meet the needs of life and carry on with his life.	Prosperity	a. To create a prosperous and satisfying life for all humans b. Aligning economic, social and technological progress with nature.
4	Posterity	a. Realizing human survival with efficiency measures in meeting energy consumption needs and avoiding energy crises for future generations. b. Develop new renewable energy and energy conservation for energy savings that have an impact on human life in the future.	Peace	Fostering a peaceful, just and inclusive society that is free from fear and violence
5	Property	a. Carry out environmental and energy conservation as a religious obligation b. Commit exploitation and damage to the environment, as well as mistakes in the management of natural resources as an evil deed	Partnership	Mobilize global partnerships to achieve sustainable development focused on the needs of the poorest and most vulnerable

Based on table 1, the five basic principles of the maqasid al-shariah and the five pillars of sustainable development have material and substance similarities, namely realizing the welfare of individuals and society by developing the five principles in sustainable energy development. Even in religion, sustainable energy development is the duty of every religious adherent in carrying out energy conservation and energy efficiency, as well as the prohibition of everyone from exploiting and damaging the environment. In this context, the five basic principles can be developed harmoniously through the description of sustainable development goals in the energy sector. Thus it can be understood that Islam teaches its adherents to do environmental conservation. Environmental conservation as a duty and responsibility of humans to reflect the relationship between living organisms and their environment and to maintain the ecological balance created by God.

In Islamic economics, some ethical values found in the texts of the Qur'an relating to energy conservation include justice, goodness, self-sacrifice, generosity, gratefulness, consideration for others, and saving energy. These universal environmental values can overcome challenges in future energy sustainability and overcome shared environmental challenges. These ethical principles can be incorporated into economic models to develop policies that can better protect these values and at the same time become a major part of managing energy.

There is a need for further reflection on the biocentric and ecocentric viewpoints that place critical environmental destruction actions that need to be resolved quickly. These Islamic



economic values will help in conceptualizing the values of energy conservation that are used by the human community and allow for broader global action in resolving together on the issue of energy sustainability.

Energy conservation can be traced from 3 interrelated aspects in the energy economy, namely the task of man as the caliph of God who is in charge of the welfare of mankind and the earth, the environment as a place of human life that contains natural resources, and human needs for energy. These three aspects are important in building a shared awareness and energy conservation policy for the sustainability of all mankind, which can be seen in table 2 below:

Table 2: Moral Values for Energy Conservation in the Qur'an

No	Moral Values	Surah and Verses of the Qur'an	Issues of Energy Conservation
1	Justice	Al-Nisa', 4: 135;	Energy management that is fair and equitable
		Al-An'am, 6: 152	Fair energy policy
2	Benefit	Al-Baqarah, 2: 195	Utilization of energy for the welfare of the community as worship; keep the environment from pollution, and make energy savings.
		Al-Qashash, 22: 76-77	Prohibition of doing damage on earth, such as exploitation of energy sources, environmental pollution, and energy waste.
3	Self Sacrifice	Al-Hashr, 59: 9	Promote energy saving, energy subsidies, energy conservation.
		Hud, 11: 61	The role of everyone in the welfare of the earth, the use of geothermal energy, the development of renewable energy sources.
4	Generosity	Al-Mu'minin, 23: 18-22	Encouragement of research and technology creation to find renewable energy sources (rainwater, plants and fruit, oil-producing timber trees, livestock, marine), and energy conservation.
5	Gratefulness	Ibrahim, 14: 7	Give thanks for Allah's blessings through environmental preservation and energy utilization, energy conservation, and energy efficiency.
		Al-Isra', 17: 29-30	Prohibition of exploitation and waste of energy, conduct energy efficiency, and plan for sustainable energy.
6	Consideration for Others	Al-Hadid, 57: 23-24	Preventing energy crisis by making energy savings in daily life, and sustainable energy.
7	Energy saving	Al-An'am, 6: 141	Energy management, the use of plants and fruits as energy, supporting and fulfilling energy needs, and prohibiting energy waste.

Source: Hasanuz Zaman (1999)

In sustainable energy development, the Indonesian government has formulated policies to meet the energy needs of the community, one of them is by using new and renewable energy as a substitute for fossil fuels. However, Citraningrum (2019) asserts that some of the challenges of developing renewable energy in Indonesia are: 1) relatively low demand in meeting the energy needs for electricity, transportation, and the subsidized industry for fossil energy; 2) subsidies for fossil energy cause prices to be relatively low resulting in the price of renewable energy not being able to compete; 3) a centralized electricity system, even though the diversification of renewable energy types depends on location and is more suitable for use with a decentralized approach; 4) government policies are not conducive for investors to invest in the renewable energy sector; 5) human resource capacity needs to be increased, especially for the process of maintaining and maintaining renewable energy power plants; and 6) renewable energy research and development is inadequate and not integrated with industry.

The development of renewable energy for electricity and various other sectors should get high priority and clear support. With the development of existing technology and information, small scattered power plants such as roof solar electricity installations will be the choice of many electricity customers and can, therefore, encourage disruption of the use of large scale plants such as Steam Power Builders (PLTU). In addition, the use of renewable energy for electricity generation can reduce the risk of rising costs due to fluctuations in fossil energy prices. By increasing the share of renewable energy, electricity prices will not be affected by fuel prices. In the next few years, renewable energy technology will also continue to develop so that it is expected that the price of electricity generation will be even lower.

## 6. ENERGY MANAGEMENT IN THE INDUSTRY FOR ENERGY CONSERVATION IN INDONESIA

Energy management as an integrated activity to control energy consumption in order to achieve effective and efficient energy utilization to produce maximum output through structured and economic technical measures to minimize consumption of raw materials and supporting materials. The goals of energy management are saving resources, climate protection and cost savings. For consumers, energy management makes it easy to get access to energy according to what and when they need. Energy management is concerned with environmental management, production management, logistics and other business-related functions.

As for the scope of energy conservation in Indonesia, it can be carried out at all stages of energy management which includes the supply of energy, energy utilization, and energy utilization. This energy conservation is carried out by taking into account the provisions of the Government of the Republic of Indonesia's policy on national energy policies (KEN) (Jaelani, et al., 2017) which can be seen in figure 2 below:

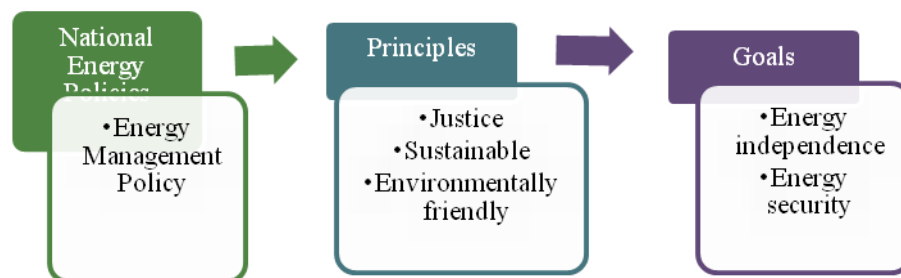


Figure 2: National Energy Policies (KEN) in Indonesia

The Directorate of Energy Conservation of the Ministry of Energy and Mineral Resources of the Republic of Indonesia, as stated by [Laksmi et al. \(2018\)](#), that various energy conservation implementation strategies implemented to achieve these targets include implementing an energy management mandate for energy users  $\geq 6,000$  TOE per year, applying energy efficiency standards and labels for equipment, Implementing energy conservation in ministries/institutions for example, encouraging private investment in the field of energy conservation, raising the awareness of energy users towards energy conservation, increasing the capacity of human resources and mastering technology, implementing a system of monitoring, evaluation, and supervision in the field of energy conservation.

To realize the goal of energy conservation in Indonesia, the Government Regulation of Republic of Indonesia No. 70/2009 concerning energy conservation has been established which regulates the responsibilities of entrepreneurs in implementing energy conservation at all stages of energy management and using energy-efficient technologies. In Article 11 paragraph 1 it is stressed that individuals, business entities, in the form of permanent businesses in undertaking energy exploitation are required to carry out energy conservation. Therefore, organizations or companies that are users of energy sources and energy users can implement an Energy Management System based on ISO 50001: 2011.

The ISO 50001 concept uses a management system model with a Plan, Do Check, Action (PDCA) cycle approach for continuous improvement. In Indonesia, the standard becomes SNI ISO 50001 Energy Management System which can be seen in Table 3 below:

Table 3: Plan, Do, Check, Action (PDCA) Cycles in Energy Management

<b>PLAN</b>	<b>DO</b>	<b>CHECK</b>	<b>ACTION</b>
Conduct energy reviews and establish baselines, energy performance indicators, objectives, targets and action plans needed to provide results that will improve energy performance in accordance with the organization's energy policy.	Implement energy management action plans	Monitor and measure the processes and key characteristics of operations that determine energy performance against energy policies and objectives and report results	Take action to continuously improve energy performance and the Energy Management System (EnMS)

Silva et al. (2019) explain that energy management is a relatively new and less explored field of interdisciplinary knowledge that focuses on organizational aspects rather than on more popular studies of system improvement and technological aspects related to energy efficiency. Difficulties explained in the scientific literature for successful energy management in industry are in the form of obstacles and their origins: 1) external, such as markets, government or politics, suppliers, technology or services, designers, producers, suppliers, energy suppliers, and financiers; and 2) intra-organization: from an economic-behavioral and organizational perspective. Regarding intra-organizational barriers, different aspects stand out: 1) lack of effective internal management in the company; 2) complex decision making chains; 3) lack of strength and influence of an energy manager; 4) organizational culture that leads to neglect of energy and environmental aspects; and 5) low importance is given to energy efficiency programs (not the company's main business).

In Indonesia, energy management as an integrated activity to control energy consumption in order to achieve effective and efficient energy utilization to produce maximum output through structured and economic technical measures to optimize energy utilization including energy for production processes and to optimize the consumption of raw materials and supporting materials, and energy users  $\geq 6,000$  TOE (tons oil equivalent) per year must implement energy management. Energy management obligations include activities to appoint energy managers to develop energy conservation programs, conduct energy audits regularly, carry out energy audit results recommendations, and report on energy management implementation. This energy management is important because industrial growth contributes to Indonesia's economic growth, but on the other hand, the industry uses energy as well as being a significant greenhouse gas-producing sector.

In 2019, Indonesia's energy needs could reach 1,316 million SBM (equivalent to a barrel of oil). In this case, the government has tried to encourage the public to save energy by

controlling the distribution system of fuel oil (BBM) at every public fueling station, government vehicles are prohibited from using subsidized BBM, prohibiting subsidized BBM for plantation and mining vehicles, conversion of BBM to gas fuel for transportation, saving electricity and water use in central and regional government offices, BUMN, BUMD, as well as saving on street lighting.

Silva et al. (2019) with a complete conceptual map approach can also explain energy management for industry, specifically by combining and making explicit relationships between the functional areas of intra-organization and external organizations involved in the energy management process for Energy-intensive industries (EII) which can be seen in figure 4 below:

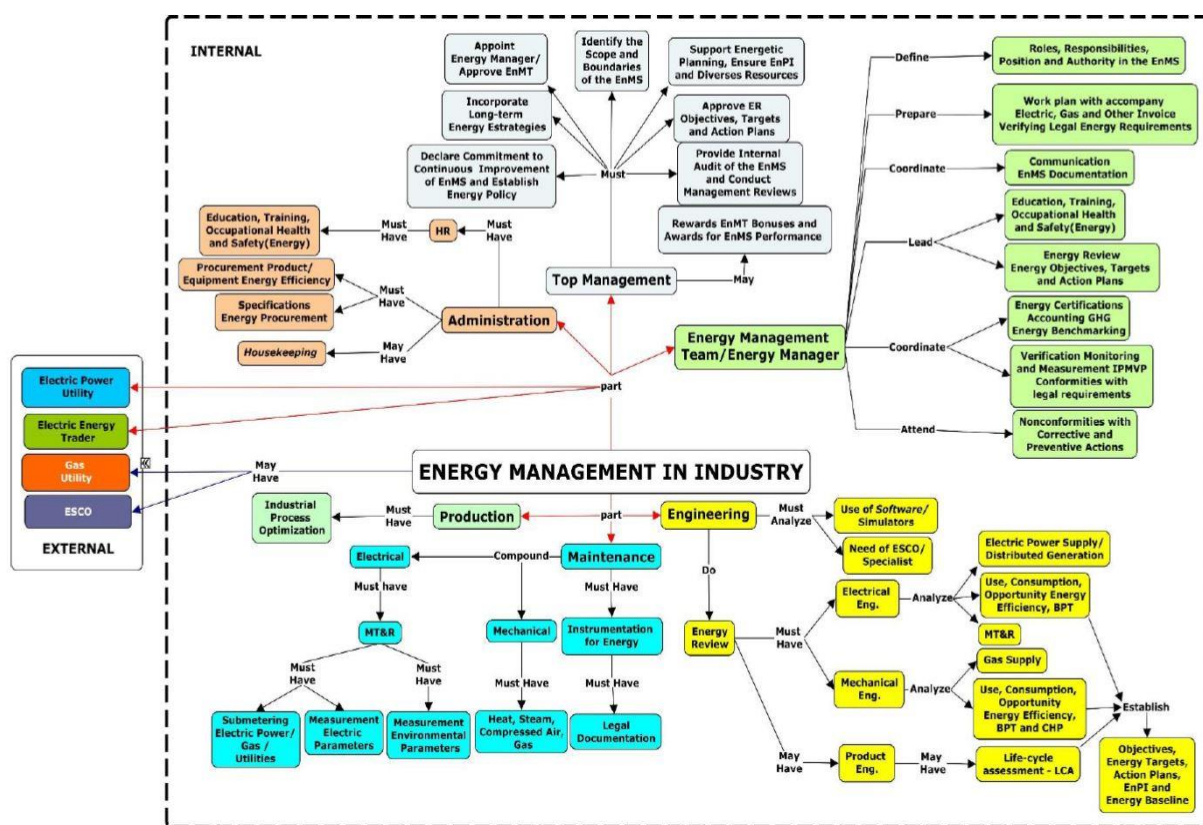


Figure 3: Conceptual Map for an Energy Management System in an Industrial Company

National energy is still dominated by fossil energy so it must be reduced by energy conservation efforts. This condition needs to be responded to for energy security because energy demand continues to rise along with economic growth. In addition, energy efficiency and conservation are very important to be implemented in order to improve the competitiveness of national industries. Energy conservation efforts need to be increased for savings. The success of the industry in energy conservation will be applied by other industries because it will produce efficiency and savings so that it will benefit the industry concerned.

There are several drivers of energy conservation policies in Indonesia (Laksmi et al., 2018)) which can be seen in the following table 4:

Table 4: Drivers of energy conservation policies in Indonesia

No	Boosters	General Purposes
1	Economic Growth and Competitiveness	a. Reducing energy intensity b. Increase industrial competitiveness c. Reducing production costs d. Energy costs are more affordable
2	Energy resistance	a. Reducing energy imports b. Maximizing for domestic needs and reducing exports c. Increase reliability d. Control the growth of energy demand e. Encourage energy diversification by maximizing new and renewable energy (EBT)
3	Climate Change	a. Global mitigation and adaptation efforts b. Fulfill international obligations under the United Nations Framework Convention on Climate Change UNFCCC

A study conducted by Ibtissem (2010) found that various economic, social and ecological crises experienced by humanity were caused by human behavior, especially the behavior of production and consumption (Jongen and Meerdink, 1998). In this case, modes of production and consumption can be considered as the cause of this crisis. To ensure a balance at the economic, social and ecological levels both now and in the future, sustainable development trends suggest a number of actions for different actors. Kaiser (1998) and Kaiser and Willson (2004) propose the importance of awareness of the dangers of using certain consumable resources, especially water, and the side effects of excessive consumption of other resources, such as fossil energy, are at the beginning of the call for conservation behavior. Therefore, energy conservation is considered as a dimension of conservation behavior.

Thus, energy conservation is the behavior of everyone who consumes less energy. Energy conservation is focused on human behavior of energy users so that the reduction in energy consumption is done in rational ways without reducing the use of energy needed, or without reducing safety, comfort, and productivity. In industry, energy conservation behavior includes reducing the use of plastic, paper, metal funds, recycling materials such as soda cans and steel, and utilizing waste heat recovery power generation (WHRPG).

The view of the Qur'an states that everything on earth was created for all humans as a pleasure, so that the earth and existing resources including energy, need to be protected from exploitation and damage for the sustainability of human life. The main thing that humans need to do is to maintain environmental harmony (Khalid, 2002), one of which is by balancing energy needs through energy efficiency and conservation. As for the perspective of maqasid al-shariah that mainstreams aspects of benefit for humans, then everyone's energy needs need to consider the hierarchy of objectives selectively, starting in terms of basic energy needs, supporting or complementary energy requirements, or only to improve conditions that do not affect anything for energy users.

## 7. CONCLUSION

Energy conservation in Indonesia is done by improving energy management as a form of energy savings in the industry and promoting energy conservation behavior in everyone. In the perspective of maqasid al-shariah, energy conservation is part of religious obligation, because energy is the source of human life and has valuable benefits for survival on this planet. To consume energy, people and industries have a hierarchy of needs in fulfilling them, ranging from priority to complementary scales. This is because everyone is obliged to take energy conservation measures, not only to meet basic needs but to prevent the energy crisis that can destroy humans and other life on this earth.

## REFERENCES

- Alanne, K., Saari, A. (2006), Distributed energy generation and sustainable development. *Renewable and sustainable energy reviews*, 10(6), 539-558. <https://doi.org/10.1016/j.rser.2004.11.004>.
- Al-Ghazali, A. H. M. B. (2000), Muhammad. *Al-Mustashfa*. Beirut: Dâr al-Kutub al-‘Ilmiyah.
- Al-Mulali, U., Ozturk, I., Solarin, S. A. (2016), Investigating the environmental Kuznets curve hypothesis in seven regions: The role of renewable energy. *Ecological indicators*, 67, 267-282. <https://doi.org/10.1016/j.ecolind.2016.02.059>.
- Al-Shatibi, A. I. (2006), *al-Muwafaqât fî Ushul al-Syari’ah*. Kairo, Dar al-Hadith.
- Ashur, Muhammad Al-Tahir Ibn. (2013), *Treatise on Maqasid Al-Shariah*. International Institute of Islamic Thought. London.
- Aström, Z. H. O. (2011), Paradigm Shift for Sustainable Development: The Contribution of Islamic Economics. *Journal of Economic and Social Studies*, 1(1), 73. <https://www.questia.com/library/journal/1P3-2948489641/paradigm-shift-for-sustainable-development-the-contribution>.
- Auda, J. (2007), *The Goals and Objectives of the Shariah as philosophy of Islamic Law : A System Approach*. International Institute of Islamic Thought. United States of America.
- Blumstein, C., Krieg, B., Schipper, L., York, C. (1980), Overcoming social and institutional barriers to energy conservation. *Energy*, 5(4), 355-371. <http://www.sciencedirect.com/science/article/pii/0360544280900365>.
- Carrico, A. R., Riemer, M. (2011), Motivating energy conservation in the workplace: An evaluation of the use of group-level feedback and peer education. *Journal of environmental psychology*, 31(1), 1-13. <https://doi.org/10.1016/j.jenvp.2010.11.004>.
- Chu, S., Majumdar, A. (2012), Opportunities and challenges for a sustainable energy future. *Nature*, 488(7411), 294. <http://doi:10.1038/nature11475>.
- Citraningrum, M. (2019), “Sudahkah Indonesia Menggunakan Energi Terbarukan?”, *Energi Kita: Buletin Strategic Partnership Green and Inclusive Energy*, Jakarta Selatan: Institute for Essential Services reform, Juli 2019, 5.
- CSD. (2002), *Report of the Ninth Session*. Commission on Sustainable Development, United Nation.
- Dariah, A. R., Salleh, M. S., Shafiai, H. M. (2016), A New approach for sustainable development goals in Islamic perspective. *Procedia-Social and Behavioral Sciences*, 219, 159-166. <https://doi.org/10.1016/j.sbspro.2016.05.001>.
- Delmas, M. A., Fischlein, M., Asensio, O. I. (2013), Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012. *Energy Policy*, 61, 729-739. <https://doi.org/10.1016/j.enpol.2013.05.109>.
- Delmas, Magali, Fischlein, M., Asensio, O.I. (2013), Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012; *Energy Policy*, Volume 61, October 2013, 729-739. <https://doi.org/10.1016/j.enpol.2013.05.109>.
- Dusuki, A.W., Bouheraoua, S. (2011), The framework of Al-Shariah and its implication for Islamic finance. In *Islam and Civilisation Renewal* 2(2), 316-336.
- Everett, R., Boyle, G., Peake, S., Ramage, J. (2012), *Energy systems and sustainability: Power for a sustainable future*. Oxford University Press.
- Finlay, V., Palmer, M. (2003), Faith in conservation: new approaches to religions and the environment. *The World Bank*. Available at: <http://hdl.handle.net/10986/15083>.

- Fritz, M., Koch, M. (2014), Potentials for prosperity without growth: Ecological sustainability, social inclusion and the quality of life in 38 countries. *Ecological Economics*, 108, 191-199. <https://doi.org/10.1016/j.ecolecon.2014.10.021>.
- Hasanuz Zaman, S. M. (1999), *Economic Guidelines in the Qur'an*. Islamabad Pakistan: International Institute of Islamic Thought.
- Hoelman, M. B., Parhusip, B. T. P., Eko, S., Bahagijo, S., Santono, H. (2015), Panduan SDGs Untuk Pemerintah Daerah (Kota dan Kabupaten) dan Pemangku Kepentingan Daerah. In *Jakarta: International NGO Forum on Indonesian Development (INFID)*.
- Ibtissem, M. H. (2010), Application of value beliefs norms theory to the energy conservation behaviour. *Journal of Sustainable Development*, 3(2), 129. <http://dx.doi.org/10.5539/jsd.v3n2p129>.
- Islam, S. S. (2017), Sustainable Development in Islam and International Law: An Investigation. In *Qur'anic Guidance for Good Governance* (pp. 169-192). Palgrave Macmillan, Cham. [https://link.springer.com/chapter/10.1007/978-3-319-57873-6\\_8](https://link.springer.com/chapter/10.1007/978-3-319-57873-6_8).
- Jabar, A., Ilham, Saifuddeen, Rahman, A. (2015), Green Energy towards Sustainability from the Islamic Perspective. *International Journal of Sustainable Future for Human Security*, 3(2), 31-34. <http://eprints.um.edu.my/16724/>.
- Jaelani, A., Firdaus, S., Jumena, J. (2017), Renewable Energy Policy in Indonesia: The Qur'anic Scientific Signals in Islamic Economics Perspective. *International Journal of Energy Economics and Policy*, 7(4), 193-204.
- Jongen, W., Meerdink, G. (1998), *Food Product Innovation: How to Link Sustainability and the Market*. Wageningen Agricultural University. <http://agris.fao.org/agris-search/search.do?recordID=NL2012063641>.
- Kaiser, F. G. (1998), A general measure of ecological behavior. *Journal of applied social psychology*, 28(5), 395-422. <https://doi.org/10.1111/j.1559-1816.1998.tb01712.x>.
- Kaiser, F. G., Wilson, M. (2004), Goal-directed conservation behavior: The specific composition of a general performance. *Personality and individual differences*, 36(7), 1531-1544. <https://doi.org/10.1016/j.paid.2003.06.003>.
- Kamali, M.H. (2002), *Principles of Islamic Jurispence, The Islamic Texts Society*. United Kingdom**
- Katsounaros, I., Cherevko, S., Zeradjanin, A. R., Mayrhofer, K. J. (2014), Oxygen electrochemistry as a cornerstone for sustainable energy conversion. *Angewandte Chemie International Edition*, 53(1), 102-121. <https://doi.org/10.1002/anie.201306588>.
- Khalid, F. M. (2002), Islam and the environment. In P. Timmerman (Ed.), *Encyclopedia of global environmental change* (pp. 332-339). Chichester: Wiley. <https://www.ifees.org.uk/wp-content/uploads/2015/04/1379668728.pdf>.
- Laininen, E. (2019), Transforming Our Worldview Towards a Sustainable Future. In *Sustainability, Human Well-Being, and the Future of Education* (pp. 161-200). Palgrave Macmillan, Cham.
- Laksmi, D., Prasetyaningsih, F.R., Murdiyati, S., Supriyadi, Hakim, F.A.B., Mustika, H.S., Sembodo, B.A.A., Utama, P.A., Fahmi, M.T., & Kurnianingsih, A. (2018), *Data dan Informasi Program Konservasi Energi di Indonesia Edisi II*. Jakarta: Direktorat Konservasi Energi.**
- Max-Neef, M. (2010), The world on a collision course and the need for a new economy. *Ambio*, 39(3), 200-210.
- Marechal, F., Favrat, D., & Jochem, E. (2005). Energy in the perspective of the sustainable development: The 2000 W society challenge. *Resources, Conservation and Recycling*, 44(3), 245-262. <https://doi.org/10.1016/j.resconrec.2005.01.008>.**
- Naim, A.M. (2003), *Maqasid Syariah dan Pemikiran Pengurusan Islam*. Kuala Lumpur: Penerbit Universiti Utara Malaysia.

- Nasreen, S., Anwar, S., Ozturk, I. (2017), Financial stability, energy consumption and environmental quality: Evidence from South Asian economies. *Renewable and Sustainable Energy Reviews*, 67, 1105-1122. <https://doi.org/10.1016/j.rser.2016.09.021>.
- Ozturk, I. (2015), Sustainability in the food-energy-water nexus: Evidence from BRICS (Brazil, the Russian Federation, India, China, and South Africa) countries. *Energy*, 93, 999-1010. <https://doi.org/10.1016/j.energy.2015.09.104>.
- Salonen, A. O., Konkka, J. (2015), An ecosocial approach to well-being: A solution to the wicked problems in the era of Anthropocene. *Foro de Educación*, 13(19), 19-34.
- Sarkawi, A. A., Abdullah, A., Dali, N. M., Khazani, N. A. M. (2017), The Philosophy of Maqasid al-Shari'ah and Its Application in The Built Environment. *Journal of Built Environment, Technology and Engineering*, 2(3), 215-222. [http://irep.iium.edu.my/60588/13/60588\\_The%20philosophy%20of%20Maqasid%20al-Shariah.pdf](http://irep.iium.edu.my/60588/13/60588_The%20philosophy%20of%20Maqasid%20al-Shariah.pdf).
- Silva, V. R. G. R. D., Loures, E. D. F. R., Lima, E. P. D., Costa, S. E. G. D. (2019), Energy Management in Energy-Intensive Industries: Developing a Conceptual Map. *Brazilian Archives of Biology and Technology*, 62(SPE). <http://dx.doi.org/10.1590/1678-4324-00000000000>.
- Steg, L. (2008), Promoting household energy conservation. *Energy policy*, 36(12), 4449-4453. <https://doi.org/10.1016/j.enpol.2008.09.027>.
- United Nations. (2015), General Assembly Resolution A/RES/70/1. *Transforming Our World, the 2030 Agenda for Sustainable Development*. [cited 2016 Feb 10]. Available at: [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E).
- United Nations. (2015), *Transforming Our World: The 2030 Agenda for Sustainable Development, Resolution*. Adopted by the General Assembly on 25 September 2015. Available at: <https://sustainabledevelopment.un.org/post2015/transformingourworld>.
- Wall, G. (2002), Conditions and tools in the design of energy conversion and management systems of a sustainable society. *Energy conversion and management*, 43(9-12), 1235-1248. [https://doi.org/10.1016/S0196-8904\(02\)00010-9](https://doi.org/10.1016/S0196-8904(02)00010-9).