Chapter 18
The Contribution of Sustainable Energy Policies to the Economic Improvements of the Countries

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18.1 Introduction

The concept of sustainability is increasingly present in our daily lives. Although it has a history as old as human history, its consideration within a institutional framework is a relatively new approach. We can roughly define sustainability as meeting our needs without compromising the rights of future generations. Institutionally, sustainability was first addressed in the context of development. Development is among the priorities of all societies. Improving living standards and increasing levels of prosperity are among the top goals of societies. However, the problems arising from development have led to the evolution of development thinking and the discussion of sustainability (Martínez et al., 2022). In this context, the concept of sustainable development has entered our lives. Sustainable development has also given rise to the concept of sustainable energy. When we examine the Sustainable Development Goals declared by the United Nations, the importance of sustainable energy stands out.

In these days when the importance of the concept of sustainability is increasing, efforts to transition from a fossil fuel-based economic model to a sustainable energy-based economy are continuing rapidly. The trend towards renewable and green energy sources is increasing day by day. In order for sustainability to fully enter our lives, energy demand and supply must also be sustainable. In particular, energy needs should be met using environmentally friendly technologies. Renewable energy sources are prominent in this regard. Energy can be obtained from renewable energy sources without damaging the environment (Sun et al.,

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2022). Renewable energy sources do not have to deal with the problem of limited resources. They are sustainable sources because they are renewable. In order for the transition from fossil fuels to renewable energy sources to be realized, appropriate policies need to be implemented. Sustainable energy policies should be sufficient to achieve the desired transformation.

Sustainable energy policies are the collection of policies that have been determined to make sustainable energy applicable. Policy makers can be political institutions or civil society organizations. In order to create a social consensus and roadmap, sometimes even households can determine and implement policies on their own. The involvement of all sections of society in determining policies is due to the fact that energy is used intensively in our daily lives. Parties that use energy in every aspect of life can be opinion leaders in terms of the problems encountered and better practices (Kafka et al., 2022). When these opinions are combined with the knowledge and skills of experts, they turn into successful policies. Ensuring the participation of social actors in the creation of sustainable energy policies will increase the success of these policies.

Although the process of creating policy may seem simple, it is actually quite complex and requires careful thought and consideration. The determination of appropriate policies can be achieved through a thorough evaluation of all societal layers and a clear understanding of the current situation. Each society faces certain constraints when creating its policies, due to both geographical and economic reasons (Mukhtarov et al., 2022). In order to achieve policy goals, objectives and constraints must be optimized and combined at the most suitable point. When all these factors are taken into consideration, it becomes clear that policy-making is not an easy process. The selection of appropriate tools for sustainable energy policies is a sensitive issue. Any wrong choice can lead to serious problems.

18.2 The Objectives of Sustainable Energy Policy

Every state needs energy to develop and raise its level of prosperity. Energy is the foundation of industrial production. Without energy, factories cannot produce. The breakdown of production systems can trigger many problems, from declining national income to unemployment and social distress. In addition to these factors, energy has a deep potential to affect daily life. The rapid and intense increase in demand for energy has been facilitated by developments in the field of information technology (Dong et al., 2022). At this point, it is impossible to manage daily life without energy. In order to raise or maintain the level of prosperity, it is necessary to meet the energy needs. The ability to constantly meet energy needs is of vital importance to states. It has a significant impact on both economic and social factors. This situation has made it necessary for every state to develop its own energy policy. Sustainable energy is a state policy that is implemented by all states. When developing policies in such a sensitive and important area as energy, one of the first steps to be taken is to outline the policy objectives in order to achieve the desired results. If

the objectives are not adequately defined, there may be deficiencies in the selection and use of policy tools. Policy tools can only be effectively evaluated in the context of objectives.

The aim of sustainable energy policy is to meet energy needs in a way that respects future generations and does not create negative externalities, as with all sustainability elements. Energy is one of the main factors that cause negative externalities. The idea of negative externalities is to avoid damaging the environment. The damage caused by fossil fuels to nature is a serious problem (Dinçer et al., 2022a–c). It causes greenhouse gas formation. The climate crisis and carbon constraints that we face today are mainly caused by the burning of fossil fuels. In order to prevent or minimize these negative effects, renewable energy sources must be used. Renewable energy sources do not cause negative externalities. In this way, the goal of sustainable energy policy is to meet the energy needs of the present without compromising the ability of future generations to meet their own needs. The use of renewable energy sources is an important step in achieving this goal. The selection of appropriate policy tools for achieving the goals of sustainable energy policy is a crucial issue. The wrong choice can cause serious problems.

In addition to the general objectives of sustainable energy policies, there are specific objectives. Every policy has specific objectives in addition to its general objectives. This is also the case for sustainable energy policies. Policies can vary depending on the situation of the society in which they are implemented (Zhang et al., 2022). All societies aim to achieve the highest level of their interests. It is inevitable that there will be specific objectives in such an important and sensitive area as energy for societies. In the face of the transformation happening in the world, every nation must both adapt and maximize its own benefit. Although similar policies may appear to be applied, in reality, each state designs and uses its policy toolset according to its own situation. Providing clean energy, smooth access to energy, energy efficiency, healthy functioning of the energy market, and energy security are the objectives of sustainable energy policies.

18.3 Providing Clean Energy

At the top of the objectives of sustainable energy policies is the provision of clean energy. Clean energy, also known as green energy, is the name given to all energies that meet our energy needs without harming nature. Renewable energy sources are also clean energy sources. When fossil fuels are burned, they release energy and carbon dioxide gas into the environment (Yüksel & Dinçer, 2022). Carbon emissions are one of the important parameters that cause climate change. Renewable energy sources do not produce carbon emissions. For this reason, providing clean energy is an important objective of sustainable energy policies. The use of renewable energy sources is an important step in achieving this objective. The choice of appropriate policy tools for this purpose is crucial. Wrong choices can cause serious problems.

Climate change refers to the changes in natural events. Climate crisis is used to refer to the negative changes in natural events. Both climate change and climate crisis are undesirable. Changes in the current system have always led to difficult processes. The increase in uncertainty also increases risk. Experts show that climate change will lead to climate crisis, that is, its effects will be quite negative. The studies show the irreversible problems caused by global warming and carbon emissions from all angles (Carayannis et al., 2022).

Global warming refers to the increase in the temperature of our planet. Fossil fuels cause the formation of greenhouse gases when burned. Greenhouse gases are essential for separating harmful radiation from beneficial radiation in the atmosphere. Naturally occurring greenhouse gases contribute to the balance of the earth and support the sustainability of life. However, the unnatural increase in greenhouse gases disrupts the balance (Li et al., 2022a, b). The disrupted balance turns the greenhouse effect, which should provide a more suitable environment for living beings, into negative effects. The increase of gases such as carbon in the atmosphere is an undesirable situation. In order to maintain the breath and heat balance of our world, greenhouse gases should be kept at a level that does not disrupt the natural balance.

The energy we get from fossil fuels causes global warming. Fossil fuels, which release greenhouse gases into the atmosphere when burned, pose a threat to the earth and humanity. Greenhouse gases contain high levels of carbon. The increase of carbon in the atmosphere means that the earth will become even warmer (Yüksel et al., 2022). The increase in global temperature causes changes in climate, such as rain no longer falling in places that used to rain. As a result of the increase in temperature, glaciers are melting and the water level is rising. The melting of glaciers means the disruption of the world order. The rise in water level and temperature affects both land and sea creatures. The increase in temperature puts many species at the brink of extinction. If action is not taken, the diversity of life will decrease rapidly and the current order will evolve into a difficult path that is impossible to predict (Mikhaylov et al., 2022).

In the context of global warming and climate change, the energy we use is very important. Choosing nature-friendly and green energy sources is a must for the future of our world. Care must be taken to prevent the loss of biodiversity and damage to the ecosystem. Renewable energy sources are also green and nature-friendly energy sources. They are among the sustainable energy sources. When formulating a sustainable energy policy, energy sources that do not harm the environment, cause climate change, or emit gases that heat the planet should be preferred (Eti et al., 2023). When formulating policies, it is essential to focus on clean energy sources.

18.4 Ensuring Uninterrupted Access to Energy

Energy is vital in today's world. All sectors are integrated with energy processes. A well-designed energy system has a great impact on all sectors and services, from the pharmaceutical industry to the chemical industry, from education to health. If there is no energy, many sectors will be negatively affected and unable to function. In this sense, access to energy is very important. Energy should be provided wherever it is needed and should ensure the smooth functioning of life (Li et al., 2022a, b). In addition to economic sectors, energy is also an indispensable element for our individual lives. The ability to meet basic needs is parallel to access to energy.

To achieve sustainable development, the eradication of energy deficiency is necessary. Equal distribution of energy will support equal development and fair income distribution. Equal human development is also related to access to energy. The education that took place online instead of face-to-face during the Covid-19 period is one of the best examples. Unfortunately, education, which is essential for human development, could not be implemented in places where there was no electricity or internet (Haiyun et al., 2021). These and similar situations show us how important access to energy is. As a requirement of equal citizenship, the state should provide equal opportunities to everyone. Access to energy can be accepted as one of the fundamental human rights.

Energy access is also a technical issue. Steps must be taken to ensure the accessibility of energy. This can be achieved in two ways. The first is to identify centers in need of energy and make sustainable energy investments according to the structure of the area (Yuan et al., 2021). The energy investment referred to here is the availability of the appropriate energy source. For example, if the region has a high wind energy potential, investments in wind energy should be made. The second is the distribution of energy from a specific area to other areas thanks to advancements in energy storage technology and transportation. The energy needs can be met in this way. Energy access can be achieved by sending stored energy to the required areas through certain channels.

When determining sustainable energy policies, ensuring the smooth access to energy is one of the goals of energy policies. As a result of its meaning, energy access is an indispensable and irreplaceable element of policies. Policy makers must organize an energy network that meets the needs of all segments of society and living in any position, and ensure the functioning of the process. It is also the responsibility of policy makers to make the necessary infrastructure investments and support research projects that will enable technological development. Ensuring the smooth access to energy is also one of the goals of sustainable development in terms of improving the quality of life and raising the living standards of future generations (Fang et al., 2021). Ensuring the access to energy is not only necessary for the sustainability of development, but also for the realization of human rights.

18.5 Energy Efficiency

We feel more and more that we need to change our approaches and attitudes towards energy every day. It is a well-known fact that if we continue with our current patterns of energy production and consumption, we will face serious problems. Focusing on energy efficiency will cause our production and consumption patterns to change (Kayacık et al., 2022). Sustainable energy policies should be implemented to increase energy efficiency. One of the goals of sustainable energy policies is to increase energy efficiency. As a result of increased energy efficiency, waste is prevented and economic benefits are increased. In addition, increasing energy efficiency reduces the negative impact on the environment to a minimum. In today's world where the effects of climate change are increasing, energy efficiency is a very sensitive issue.

Efficiency is the process of maximizing output by optimizing the relationship between the factors used to achieve the desired output. In this context, energy efficiency can be defined as reducing energy consumption without reducing the quality or quantity of energy supply. It can also be expressed as preventing energy waste by using energy more carefully. There are many definitions in the literature (Eti et al., 2022). It is the process of maximizing the benefits obtained from a unit of energy. These processes are carried out to increase the productivity of energy. It is not to reduce the amount of energy or to obtain the same output with less quality energy. Increasing energy efficiency does not necessarily mean decreasing social welfare or economic development. It means increasing the marginal benefit of energy resources through various methods. When we think about how important energy is, it is clear how important energy efficiency is.

Energy waste is the most important obstacle to energy efficiency. The most important step in increasing energy efficiency is to prevent energy waste. Energy conservation can also be possible by preventing energy waste. Unnecessary energy consumption should be avoided, and only the necessary amount of energy should be used when needed. Every sector and group in society, from the industrial sector to households, should be sensitive to energy conservation. Although it is possible to prevent energy waste to a certain extent by creating a legal infrastructure, the basic approach is to increase the level of awareness to implement energy conservation. The consciousness that each energy lost to energy waste is a value stolen from our national wealth and the future lives of our generations should be established (Dinçer et al., 2023). Education should be provided on how energy conservation can be implemented. Policies should be created in this direction.

Another way to increase energy efficiency is to determine energy efficiency standards. Energy efficiency standards for conventional energy sources should be determined, as well as for renewable energy sources. If the energy performance of products is regulated by energy efficiency standards, effective energy use will be achieved. If the standards are supported by legal regulations, it will be possible to increase energy efficiency and promote technological development (Xu et al., 2022). Research and development activities and technological investments will increase.

Energy efficiency standards should regulate energy performance gradually and regulate sanctions accordingly. The functioning of the monitoring mechanism is necessary for the implementation of the standards. The construction of the institutional structure will have a positive impact on increasing energy efficiency.

Some of the energy efficiency standards can be mandatory, while others can be voluntary. The basic goals can be determined politically, and mandatory applications and conditions can be determined. The separation of standards into mandatory and voluntary will increase the effectiveness of policies. If standards are only determined to be mandatory, a level that is optimal for everyone to implement will be preferred. However, if voluntary standards are determined and special advantages are offered to those who reach those standards, the policy goal can be pulled from the optimal level to the maximum level (Bhuiyan et al., 2022). Tax exemptions and financing facilities to be applied will provide opportunities to increase the orientation towards energy efficiency. Standards may also vary according to the renewable energy source. Efficiency approaches for the characteristics of the used source may vary. Energy efficiency standards can be created based on the source, taking into account the characteristics of the energy source.

18.6 The Healthy Functioning of the Energy Market

The healthy functioning of the energy market is another of the goals of energy policies. The sources used in energy production must be constantly supplied. There must be facilities that can supply enough energy for sufficient energy production. For this, it is important that the market has functioned and a supply-demand balance has been formed. The quality and efficiency of energy production must be increased by making the necessary investments. A market with a large number of energy suppliers and demanders must be created in order to introduce low-cost and environmentally friendly energies to the market. It must be financially strong, stable and transparent in structure (Kou et al., 2022).

The clear definition of the areas of activity and rights and responsibilities of the actors in the energy market will ensure the healthy functioning of the market. The performance of the market should be monitored and performance standards should be established and followed. Regulations and regulations should be updated and regulated accordingly. The transmission, storage and infrastructure requirements of energy should be organized according to the market situation. Market supervision processes are also essential elements of a healthy market, like other processes. Necessary institutions should be established to enable market supervision and regulation. Particular attention should be paid to the regulations on the sustainable energy market.

For the energy market to be healthy, it is necessary to organize it properly by taking into account market failures. In normal conditions, the market must be free of entry and exit barriers in order to be efficient. However, there are barriers to entry and exit in the sustainable energy market. In general, having a license is often

required to enter the market. Regardless of the sustainable energy tool, a license is generally required to enter the market. Similarly, it is not easy to exit the market. The main reason for the barriers to entry and exit is the strategic importance of the energy market. There is also asymmetric information. Companies that want to enter or enter the market do not have as much information as players in the market. The energy market is not a perfectly competitive market.

Another failure of the energy market is externalities on the network. Each user can affect other users. The positive or negative nature of externalities on the network varies depending on the use of energy and their impacts. An individual who burns fossil fuels for heating creates a negative externality by polluting the air with fossil fuels. This is a negative externality on the network. Investments made for energy access positively affect many people. The resulting positive effect creates a positive externality on the network.

Considering the unique dynamics of the energy market mentioned above, it is clear that increasing the efficiency of the market is necessary for the success of sustainable energy policies. When the healthy functioning of the market is combined with the sustainability perspective, it becomes one of the objectives of policy makers. When developing sustainable energy policies, policies must be developed to support and ensure the healthy functioning of the market.

18.7 Energy Security

One of the goals of sustainable energy policies is to ensure energy security. In today's world where energy is so important for societies, ensuring energy security is very valuable. Ensuring energy security will allow current processes to continue without interruption. Ensuring energy security with sustainable energy sources is easier than with conventional energy sources. Policy makers must act responsibly on the strategically important issue of energy security. Steps must be taken in the direction of ensuring energy security when policies are determined.

The use of sustainable energy sources has advantages in terms of energy security. One of the most important risks for countries that need energy is the possibility of not being able to obtain the energy they need. Countries with a difference between energy demand and supply must import from outside to close this gap. Renewable energy sources can offer solutions for increasing existing capacity. It provides the opportunity to develop solutions quickly without harming the environment.

Another problem for countries with an energy deficit is that they become dependent on the countries they import energy from. Countries with an energy surplus sometimes use this as soft power, sometimes as hard power. During the last energy crisis we had the opportunity to observe clearly how this situation could have consequences. Many energy-dependent countries had to face very difficult conditions. A country that exports energy may not always use energy as a power. Even if the exporting country does not use energy as a weapon, there will always be psychological pressure on the importing country. Sustainable energy sources obtain

energy from local sources. Energy is obtained by using the most appropriate energy source for the region. In this way, sustainable energy use reduces energy dependence and will ensure progress in this direction. Having the country meet its own energy needs will eliminate the problem of energy dependence.

Another dimension of energy security is economic factors. Countries that need energy have to bear some economic costs in order to import energy. The need for foreign exchange arises because energy payments are made in dollars. This can cause a deficit in the current account and cause problems for the country's economy. Dollars must be obtained to meet energy needs. Any disruptions in energy supply will also have economic impacts. The operation of all sectors depends on the availability of energy. Any problems that arise will directly affect production. Disruptions in production will affect national income, economic growth, and the labor market. The economic effects of any difficulties in energy security can be very deep.

18.8 Tools of Sustainable Energy Policy

The most important tool used to implement sustainable energy policies is the guidelines and goals set by policy makers. Inclusive, transparent, and continuous legal regulations are crucial for increasing the importance of sustainable energy in our lives. Legal frameworks must be designed to be comprehensive, understandable, and implementable. The legislation and regulations to be established must be prepared in parallel with the objectives of sustainable energy policies (Ermiş & Güven, 2022). The market must function efficiently and respond to problems with a solution-oriented approach.

Network services must be designed to meet the needs of producers and consumers. Priorities and investment choices in network services must be transparent. To achieve this, necessary legal regulations must be made. Both producers and consumers must be considered on their own scale. There may be some differences in regulations for small, medium and large-scale producer companies and regulations for small-scale companies. Similarly, household energy consumption expenses should be different from industrial energy consumption expenses. Tariffs should be flexible. Legal infrastructures should be regulated taking into account these possibilities and requirements. Self-consumption and self-production plans should be allowed, but a suitable area should be created without allowing it to disrupt the market.

Sustainable energy legislation can be created from scratch, but it may also need to be updated from time to time due to changing conditions. Especially since technological changes have significantly affected and transformed the game system, it is inevitable to review legal regulations. Changes made should not create additional costs for market actors. Legal regulations must be made to create the confidence of investors. Investors should be able to invest easily.

Feed-In Tariff is one of the policy tools used to promote the use of renewable energy sources. It means that energy producers are guaranteed to sell their energy at a fixed amount above the market price. A certain amount above the market price is paid to producers for the energy they provide to the grid. It generally gives effective results in areas where producers are hesitant to enter the market and there are economic barriers. Because sustainable energy is still in its development phase, it may not be as economic as conventional energy sources in some cases within the network. Investment in sustainable energy sources is necessary, which increases costs. The tariff guarantee policy tool is aimed at achieving the desired results by overcoming economic concerns.

Tariff guarantee is also a policy tool used to achieve strategic objectives. It can be used to guide the market and increase technological investments as part of an energy strategy. Long-term contracts and price guarantees provide investors with the opportunity to invest. The contracts are generally for more than 10 years. The price is determined in proportion to the costs incurred and capital used in production. Different prices are determined according to the technology used, the region, and the location of the energy source. It is a vital policy tool for sustainable energy investments around the world. When we look at countries that make intensive investments in the field of sustainable energy, we see that they actively use the tariff guarantee policy tool. The tariff guarantee tool provides successful results with appropriate strategies without disturbing the market order.

Financial incentives are used as a tool in sustainable energy policies. The aim is to solve the financial difficulties of investors who want to invest in sustainable energy sources. In addition, the aim is to direct investments to this area with the incentives given. Financial incentives vary according to the size of the investment. Large-scale investment incentives aim to increase the energy capacity. In general, it is an incentive given to projects that will raise the technological level. Regional incentives aim to increase the country's access to energy and ensure that no region remains without access to energy. In addition, the most suitable energy source is planned to be selected according to geographical features. Another dimension is the strategic dimension. Incentives are given to areas or regions that are prioritized according to long-term strategic plans within the scope of national policies.

Generally, flexible loans, cheap financing, grants, tax breaks and exemptions are used in financial incentives. The aim of using flexible loans is to provide payment convenience. In particular, cash flows from new investments may not be regular. Flexibility in payment amounts and dates is an important incentive for investors. Flexible loans provide payment convenience and cheap financing opportunities are also offered within the scope of financial incentives. Financial costs are significantly reduced with a special interest rate. In some projects, grant support is also provided. Financial support provided is non-repayable. Grant support is provided especially in strategic priority areas. Tax breaks and exemptions are also financial incentives that help reduce investment costs.

18.9 Conclusion

Currently, we are going through a process of redesigning the world order and the economic system. In this period of restructuring, policies are being designed to provide long-term gains, rather than focusing on the present state of the country. The concept of sustainability, which has become the key word for transformation, brings both opportunities and challenges in every field. Every state is trying to position itself in the new order and maximize its gains. At this point, policies become very important. Long-term and comprehensive policies will enable countries to develop and gain competitive advantage. Policy makers must accurately determine strategic goals and carry out micro actions within the scope of those goals, designing them on a macro level. Only in this way can the desired goals be achieved. Policies should be created through the blending of participation in a broad framework and different perspectives. The weight of the concept of sustainability in policies should be increased. In other words, policies should be increased. Previous approaches and evaluation criteria should be changed, and political processes should be activated. The sub-elements of political approaches should be determined, and their content should be designed accordingly.

The concept of sustainability has begun to become the key to our energy system, as it has entered all areas of our lives. Meeting the energy needs without damaging the environment and without experiencing resource shortages is only possible with sustainable energy sources. The use of fossil fuels is being reduced and replaced with sustainable energy sources due to the damage they cause. The process that is targeted to be completed will be completed in a very short time in essence. Developing countries are also seriously considering the opportunities in line with the intense investments of developed countries. Many steps need to be taken in this context. Feasibility studies on sustainable energy sources should be carried out. The most suitable energy source should be created and used in the most suitable places. The aim is to increase resource efficiency to the highest levels. The benefit of sustainable energy is also important for all sections of the community. In the later stages of sustainable energy, it will not only meet our energy needs but will also play a role in meeting our basic needs. Electric vehicles are the most basic example of this. Electric vehicles will also change many sub-manufacturing items and businesses that provide complementary products such as petrol stations will have to change. An important transformation will also take place in the economic context. Sectoral transformations will bring new professions and updating of the education system. To summarize, the sustainable energy revolution means a social transformation.

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