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## PROSPECTS OF AZERBAIJAN'S TRANSITION TO SUSTAINABLE PATTERS OF ENERGY GENERATION

### Abstract

Many nations now undertake programs that concentrate on the transition to renewable energy sources as part of their long-term energy policies to address climate change challenges. The extraction and export of oil and gas for both internal consumption and the global market has been a significant contributor to Azerbaijan's GDP over the years. The largest barrier to tackling environmental issues and ensuring that Azerbaijan has a diverse economy over the long run is the country's excessive reliance on traditional energy sources. This paper's goal is to investigate the initiatives and methods carried out in various states in response to the implementation and transition to renewable energy sources. As a result, the study's objective is to evaluate and examine global practices and to suggest necessary next moves in the transition to the production of sustainable energy.

**Keywords:** *conventional and alternative energy, oil and gas, sustainability, SDG, wind and solar energy*

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### Azərbaycanın davamlı enerji istehsalı modellərinə keçid perspektivləri

#### Xülasə

İndi bir çox dövlətlər iqlim dəyişikliyi problemlərini həll etmək üçün uzunmüddətli enerji siyasətlərinin bir hissəsi kimi bərpa olunan enerji mənbələrinə keçidi cəmləyən proqramlar həyata keçirirlər. Həm daxili istehlak, həm də dünya bazarı üçün neft və qazın hasilatı və ixracı bu illər ərzində Azərbaycanın ÜDM-də mühüm rol oynamışdır. Ekoloji problemlərin həlli və Azərbaycanın uzunmüddətli perspektivdə müxtəlif iqtisadiyyata malik olmasını təmin etmək üçün ən böyük maneə ölkənin ənənəvi enerji mənbələrindən hədsiz dərəcədə asılı olmasıdır. Bu sənədin məqsədi bərpa olunan enerji mənbələrinin tətbiqi və keçidinə cavab olaraq müxtəlif dövlətlərdə həyata keçirilən təşəbbüsləri və metodları araşdırmaqdır. Nəticədə, tədqiqatın məqsədi qlobal təcrübələri qiymətləndirmək, araşdırmaq və davamlı enerji istehsalına keçiddə zəruri növbəti addımları təklif etməkdir.

**Açar sözlər:** *ənənəvi və alternativ enerji, neft və qaz, davamlılıq, SDG, külək və günəş enerjisi*

#### Introduction

In the twenty-first century, mitigating climate change has become crucial. Many nations perceive plans to switch their reliance on non-renewable energy sources to alternate ones as necessary. In the case of Azerbaijan, the economy's reliance on traditional energy sources is non-negligible and it is vividly evident that as a recourse rich country Azerbaijan faces with many obstacles in development of other sectors of the economy. Azerbaijan should think about potential courses of action to be done toward deployment and use of other sources of energy in order to reduce environmental challenges and diversify its economy from excessive dependence on the oil and gas sector. Experts in this field highlight that sovereign states experience tragedy of the commons. In other words, states and prioritizing and action upon their national interest which

sometimes might be contrary to the addressing issues related to renewable energy transition. It is also worth mentioning the fact that the consumption of fossil fuels throughout the globe account for 80 per cent of overall energy market which heavily contributes and accelerates the process of global warming (Bulut, Suleymanov, Vidadili, 2016).

This paper will analyze prospect of development for Azerbaijan relying on international practices across the globe. The literature review section of this essay will therefore outline the significance of the issue, global trends among international actors, and the potential of Azerbaijan in terms of renewable energy sources. The discussion section will also center on the steps that Azerbaijan needs to take in order to move to sustainable energy generation patterns by relying on the international standards and best practices highlighted priorly. Indeed, several courses of action would be highlighted for the purpose of accelerating and fostering the process of diversification economy of Azerbaijan from excessive reliance on oil and gas, and contribution toward sustainable development of the country (Adedoyin, Bekun, Alola, 2019).

### **Literature review**

Today, sovereign states rely heavily on conventional energy sources, whereas just 10% of the world's population relies on alternative energy (Bulut, Suleymanov, Vidadili, 2016). In light of the harm that over reliance on conventional energy sources does to the environment, the global economy, and the political stability of the international order, many states make efforts to reduce it. To start, climate change is a crucial concern of the twenty-first century with severe effects in many regions of the world. It is fueled by a variety of human activities, including CO<sub>2</sub> emissions, ozone layer degradation, factory and automobile use, overly populous and dense places, the expansion of industrialized cities and districts, traditional usage, and an excessive reliance on oil and gas. Numerous experts and scientists projected the awful future of our planet in the event that no further action would be done, taking into account the catastrophic events that now occur in nature. Indeed, overcoming these challenges and tackling the issues of climate change in modern society is fraught with enormous barriers (Potrc, Cucek, Martin, Kravanja, 2021).

Leaders of sovereign states assembled in 2015 and adopted 17 sustainable development goals, the majority of which center on resolving existential problems facing the modern world. The seventh of these goals calls for the development of a transition to inexpensive, clean, and renewable energy by 2030 (4). According to expert opinions, attaining sustainable development objective 7, which is access to affordable and clean energy, depends on ongoing policy support, public mobilization, and private investments. Particularly among developing nations and third-world nations, such transitions are viewed as difficult and contentious. According to statistics, an average annual rate of development must be 3.2% in order to accomplish these goals by 2030 (4). The Paris Agreement, which binds and obligates parties to act on climate change mitigation, was also a global treaty that was adopted and signed by 196 members and representatives in Paris. It has been expected of sovereign states that are required by law to take part in this initiative to create an agenda for their actions and change their social and economic issues for the benefit of the environment and climate. This meant a transition away from an excessive dependence on oil and gas toward renewable energy sources including wind, solar, and hydropower (5).

According to Bulut, Suleymanov and Vidadili, globalization, which has made the world more interconnected, and overdependence on fossil fuels are both important causes of the climate problems that contemporary society is currently facing. The production of oil and gas is strongly dependent on the economies of the vast majority of international states, which is the main barrier to the development of renewable energy sources. For instance, as a post-Soviet nation, Azerbaijan is highly dependent on the extraction and production of fossil resources. According to scholars, the Republic of Azerbaijan's GDP is mostly dependent on the production of oil and gas (Bulut, Suleymanov, Vidadili, 2016). According to Kelly-Richards, Silber-Coats, Crootof, Tecklin and Bauer, the main reasons why all these problems continue to exist are a lack of awareness on the part of all socioeconomic classes and the lack of environmental legislation at the domestic level in developing nations that would enable the development of sustainable energy. To that objective, the

author advises establishing local laws and regulations that will facilitate and ensure the long-term integration of renewable energy in various regions of the world (Kelly-Richards, Silber-Coats, Crotoft, Tecklin, Bauer, 2017).

### **Azerbaijan potential in renewable energy and background of energy market**

According to studies, it would be very difficult to achieve the sustainable energy goal in Azerbaijan because the country's economy, that is dominated by traditional energy sources. In other words, oil has been crucial to Azerbaijan's progress during the past few decades based on statistical data disclosed by BP (7). The hefty 25% of oil and gas exports that Azerbaijan currently makes has a significant impact on the growth of the infrastructure, healthcare, and other sectors. However, Azerbaijan's government has started implementing several initiatives to move the country in the direction of renewable energy sources. For instance, state officials launched the State Program on the Use of Alternative and Renewable Energy Sources (SAARES) in 2009. Through this effort, businesses in the renewable energy sector received benefits like exemptions from customs fees (Bulut, Suleymanov, Vidadili, 2016). According to studies, the government of Azerbaijan has also taken an active role in ratifying and joining the United Nations Framework Convention on Climate Change as well as adopting the Kyoto Protocol (Bulut, Suleymanov, Vidadili, 2016).

Besides that, reports presented by Ministry of Finance of Baku illustrate that oil and gas sector constitutes 75 per cent of overall state's revenue while 95 per cent of exports also come from oil and gas sector. Such kind of excessive reliance on one sector and monopoly of this sector over other one's creating unfavorable conditions in country considering the shrinking prices of oil during different timelines (8). Disbalances also are vividly evident in average salary rate, while oil industry is quite profitable and provides opportunities with high wages other sectors remain less developed hence less profitable. For example, agriculture sector covers 45 per cent of workplaces in country since it a labor intensive sector however it provides less wages than oil sector which employs 7 per cent of overall labor force. Therefore, studies also emphasize that diversification of economy and provision of opportunities for other sector's development is crucial from eliminating overdependency on oil sector (Gibadullin, Sadriddinov, Kurbanova, Shedko, Shamraeva, 2020).

According to predictions, Azerbaijan's oil and gas production will peak in about 50 years and then progressively fall (10). Under these circumstances, Azerbaijani authorities should take proactive steps to diversify the economy away from dependence on exports of fossil fuels and to ensure a sustainable transition away from conventional energy sources and toward renewable ones while taking into account Azerbaijan's potential. It is noted that Azerbaijan's renewable energy potential is strong in sun, wind, hydro, geothermal, and biomass energy when geographic considerations are taken into account. Azerbaijan's Absheron Peninsula and mountainous regions are well known for their wind energy capability, which produces close to 2.4 billion kWh of electricity annually (Bulut, Suleymanov, Vidadili, 2016). Utilizing Azerbaijan's wind energy potential will help the country move toward renewable energy sources and diversify its economy to reduce its overdependence on the oil market. Regarding the area of Azerbaijan's potential for solar energy, its convenient geographic location implies that several locations may act as hubs for solar energy throughout the year. According to statistics, it can account for up to 2400-3200 hours of solar capacity annually. Furthermore, data shows that Azerbaijan's geothermal capability has the potential to eventually meet the country's need for heat energy (Bulut, Suleymanov, Vidadili, 2016).

According to Ministry of Energy of the Republic of Azerbaijan, capacity of Azerbaijan in terms of renewable energy generation is very promising. Statistical data indicates that overall energy capacity reaches 27 000 MW where solar, wind and bioenergy potential accounts up to 23 000 MW, 3 000 MW and 380 MW respectively. Government of Azerbaijan which is under the leadership of Mr. İlham Aliyev, the president of the country, puts its highest goals to implement policies related to energy security through making renewable energy generation stronger across all regions of the country. Besides that, considering the steps that are being undertaken by ruling elites of the country, there is a positive trend in transition toward sustainable energy. For instance, information provided by Ministry of Energy of the Republic of Azerbaijan indicates that in 2021 the generation of

electricity across the whole country reached a hefty 27.8 billion kWt while 5.8 per cent of its share came from renewable energy sources (10).

Furthermore, Azerbaijan took a proactive role in Paris Agreement process on December 2015 and has determined a goal to sustain and get rid of 35 per cent of the greenhouse emissions by 2030 in comparison with previous decades. Following this contribution, in November of 2021 Azerbaijan put its highest goal to eliminate toxic emissions by 40 per cent and establish a net zero zone in the newly liberated areas by 2050 (13).

### **World practices**

According to studies, the switch from conventional to alternative energy sources is a continuous process that calls for commitment, funding, capital, and gradual change. For instance, only 1% of Korea's energy consumption in 2008 came from renewable sources. The Korean government established a long-term electricity supply strategy that focused on increasing the production of electricity from renewable sources of energy because it is anticipated that demand for electricity will increase (Jeon, Park, Yun, 2013). The European Union (EU) has similarly committed to adhering by the Paris Agreement and becoming carbon neutral by 2050. Long-term establishment of competitive, secure, and sustainable energy systems has been decided upon for these reasons. According to the study, the growth of sustainable energy will lead to more employment becoming accessible on the labor market. In fact, during the course of the next 30 years, it is anticipated that 1.5 million new jobs would be created in all EU member states (Potrc, Cucek, Martin, Kravanja, 2021).

According to Connolly, Lund and Mathiesen, achieving the EU's goal of sustainable energy has political and social ramifications that should be taken into account when establishing policies in that direction. The Smart Energy System concept, which centered on integrating all sectors of the economy with one another, has been one of many scenarios implemented within the national borders of European Union member states. Indeed, achieving energy sustainability required important regulatory changes, policies, institutional adjustments, and technology advancements (Connolly, Lund, Mathiesen, 2016).

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According to research, Sweden was able to successfully implement strategies to reduce its excessive reliance on fossil resources. Experts point out that the Swedish government stopped using alternative energy sources while concurrently beginning to invest in renewable sources like solar and wind energy. In addition, they made investments in energy storage, smart grids, and renewable transportation. According to experts, such transitions necessitate cooperation between the public and commercial sectors, decent decision-making, and a supportive environment for regulatory changes and revisions (13). Similar to this, the German government was able to implement measures such that by the first half of 2022, alternative energy sources would have replaced 49% of the country's electricity production and would have continued to increase gradually (14).

### **Discussion and conclusion**

Extensive analysis of world practices and background of Azerbaijan's dependency on oil and actions taken in addressing issues related to renewable energy transition illustrate that although

Azerbaijan is moving currently in the right direction, achieving goals set on SDG, Paris Agreement and on net zero zone on liberated areas does not seem achievable considering the time restriction put which is 2030. Indeed, in order to foster the process which already has a positive trend the decision-making process and implementations of policies could be adopted based on the key action points taken by international actors. Constructive action should be taken on behalf of Azerbaijan, which significantly depends on the oil and gas sector, in order to lessen problems that come from the widespread use of fossil fuels. Since Azerbaijani oil will indeed soon reach its peak, as predicted by experts, policies and initiatives should be implemented to diversify the economy's dependency on the oil sector and to contribute to sustainability over the long term. The following points could also be updated on a top level in the case of Azerbaijan in light of steps taken by international actors to deploy sustainable forms of energy generation:

1. Setting up systems for regulation and enforcement to shift to workable energy;
2. Offering incentives and encouraging companies to invest in policies promoting renewable energy;
3. Changing and establishing institutions that will aid in the integration of all economic sectors, such as the public and private sectors;
4. Increasing awareness inside national borders and funding initiatives for research and development.

### Conclusion

In conclusion, there is a high chance of improvement given the success stories around the world in the shift toward sustainable energy consumption and production, as well as the rich capacity of Azerbaijan in terms of solar and wind energy potential. The long-term policy goals will likely involve increasing employment opportunities and wages across all sectors of the economy, promoting environmental sustainability and reaching objectives set on SDG and Paris Agreement, and reducing Azerbaijan's over-dependence on oil and gas once all the action points have been considered and the appropriate decision-making procedure has been developed.

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