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**"Prospects and Challenges: Driving Sustainable Growth in Azerbaijan through Green
Energy"**

Fatima Fataliyeva, Shafiga Alakbarova, Vagif Mammadov

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STATEMENT OF AUTHENTICITY

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Signed: Fatima Fataliyeva

Signed: Shafiga Alakbarova

Signed: Vagif Mammadov

Date: 20.05.2023

Abstract

This research work aims to investigate policy options to facilitate the transition to green energy in Azerbaijan. Country, being the exporter of fossil fuels, also largely consumes conventional energy sources. However, adverse effects of fossil fuels on environment and public health, as well as exposure to volatility in energy prices in global markets and international commitment to reduce greenhouse emissions as part of the Paris Agreement and Sustainable Development Goals, encourage Azerbaijani government to introduce state policies to increase the stake of renewable energy in local energy mix. In spite of government's willingness to make transition to green energy, there is slow progress in this area as conventional energy constitutes largest portion in local energy consumption. In this context, government should critically assess obstacles which delay transition to renewables. Moreover, since investment is crucial to implement green energy projects, government should clearly identify financial and legal incentives to promote such projects for foreign and local investors. Therefore, this paper firstly assesses Azerbaijan's potential for renewable energy and concludes that country holds considerable resources. Afterwards, paper relies on analysis of existing literature to identify obstacles and reveals that lack of trained professionals and public support, along with shortage of investment from local and foreign businesses slow down development of green energy sector in Azerbaijan. These findings are later confirmed with survey which gathered 70 respondents. Paper then moves to analysis of each obstacle and utilizes information from interviews with experts to devise policy solutions for each challenge. It is found that training, financial incentives in the form of tax exemptions

and subsidies, public awareness campaigns, and well-developed legislative framework are required to attract and protect investment and secure public support.

Keywords: Sustainable development, Green energy, Renewable sources of energy, Solar energy, Greenhouse gas emission

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List of Abbreviations

ADB - Asian Development Bank

AmCham- American Chamber of Commerce

COP 26 - The 26th Conference of the Parties

EBRD - European Bank of Reconstruction and Development

IPO - Initial Public Offering

IRENA - The International Renewable Energy Agency

kW - kilowatt

kWh - kilowatt per hour

LCOE - Levelized Cost of Electricity

MOU - Memorandum of Understanding

MW - Megawatt

MWh - Megawatt per hour

NDC - Nationally Determined Contribution

NGO - Nongovernmental Organization

OJSC - Open Joint-Stock Company

PPA - Power Purchase Agreement

PV - Photovoltaic

RES - Renewable Energy Sources

RFP - Request for Proposal

RFQ - Request for Qualification

SAARES - State Agency for Alternative and Renewable Energy Sources

SD - Sustainable Development

SDG - Sustainable Development Goals

SSPs – Solar Panel Plants

TEPSCO - Tokyo Electric Power Service Co., Ltd.

UN - United Nations

VAT - Value-Added Tax

1. Introduction

1.1. Global Sustainable Growth and Transition to Green Energy

According to Dincer, “energy” is considered a key component of economic, social, and environmental aspects of Sustainable Development (Dincer, 1999). At the contemporary society, the analyses of energy pathways identified that it is possible to reduce negative impacts on environment, improve air quality, and reduce the effects of climate change. This raising trend has been observed in the world and is gaining momentum, being associated with Green Energy and Sustainable Development (SD), aimed at improving people's lives, protecting, and caring for the environment. Society started to attach more and more importance to the future of the planet and to the well-being of the next generations. In this regard, 17 Sustainable Development Goals (SDGs) have been developed by the United Nations (UN), which should solve a wide range of problems, from inequality and poverty to education and healthcare. For this reason, the governments of many countries, especially in the Western world, are guided by this factor when incorporating any policy and strategy for the development of the country, which are aligned with SDGs (Sustainable Development Goals) and the Paris Agreement.

One of the key areas of sustainable development is Green Energy. Green Energy may not assist immediately, but it can allow moving closer to achieving majority of SDGs, but specifically two SDGs, namely “Affordable and Clean Energy” (Goal 7) and “Climate Action” (Goal 13). In order to understand how Green Energy can contribute to SD, it is necessary to understand what Green Energy is and what its sources are. Green Energy is the energy generated by clean sources, including solar, wind, hydroelectric power, geothermal energy, biomass, and biofuels. From the above-mentioned aspects, it becomes clear why

green energy is so important. Using clean resources as a source of energy generation, green energy emits fewer greenhouse gases than other types of energy. Moreover, green energy is a renewable and clean source of energy, which allows it to be considered environmentally friendly. Green energy and its properties are fully in line with the current model of development of countries and their commitments. The transition to green energy will help to reduce the amount of CO₂ emissions, the negative impact on the environment and achieve zero-carbon footprint.

Furthermore, at the present time, fossil fuels are the main source of global energy accounting for 82% of primary energy use (bp Statistical Review of World Energy, 2022). As a matter of fact, when fossil fuels (e.g., coal, petroleum, and gas) are burned, they release large amounts of CO₂ and greenhouse gases into the atmosphere. For instance, as per United Nations (UN) Environment Programme (2019) fossil fuels account for 75% of global greenhouse gas emissions (p.11). The trap of greenhouse gases heats in the atmosphere is causing global warming. Over the past decades, the amount of greenhouse gas emitted has significantly increased, which caused the global temperature to rise by about 0.82°C, leading to negative impacts on the environment and climate change (Roston, 2021). Climate change has hugely devastating effects on the environment, human health, and ecosystems. Thus, in order to mitigate the impacts of climate change it is essential to reduce the consumption of fossil fuels, by nearly half by 2030 and net-zero by 2050 (IPCC,2019), which can be achieved through the transition to green energy sources – a direct opposite to fossil fuels.

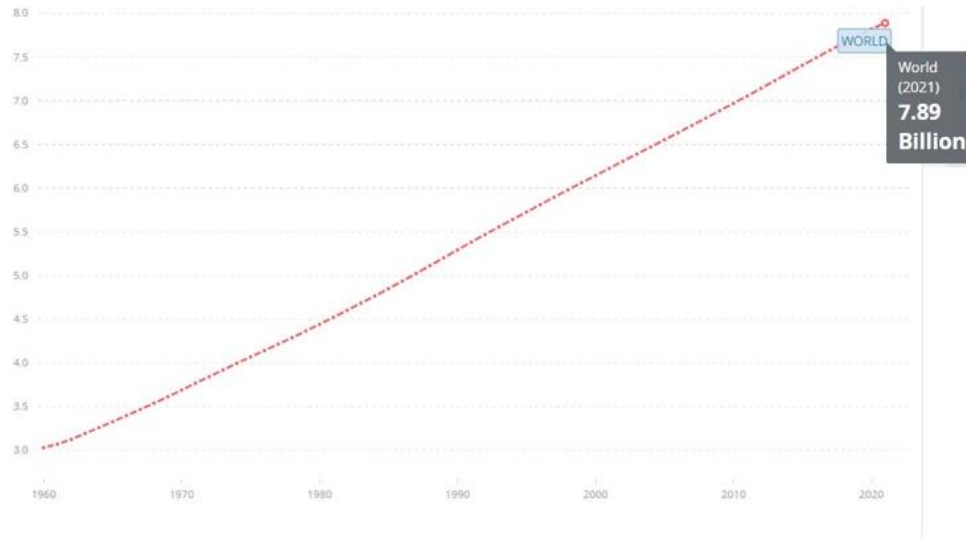


Figure 1 World Population (World Bank, 2021)

Considering the demographics, the world population is expected to grow and reach 8.5 billion in 2023 and 9.7 billion in 2050 (UN, 2022). As a consequence of population growth, humanity will require more energy, causing overconsumption of Earth’s resources. For this reason, reliance on fossil fuels is an unsafe and dangerous decision, that may cause serious environmental degradation and a severe increase in greenhouse gas emissions.

In addition, fossil fuels often become the cause of price wars or political blackmail due to their scarcity and limited supply since fossil fuels are non-renewable. On the contrary, Green Energy is an energy source produced from natural resources (e.g., solar, hydro, wind, etc.) that have the least environmental impacts (Midilli et al., 2006). From this perspective, green energy is a more reliable source of energy, which will ensure durable energy security for the majority of countries. Transition to green energy sources is the vital factor to achieve long-term sustainable development, since most kinds of renewable energy produce zero carbon emissions, reduce effects of traditional energy, and decrease reliance on imports of fuels. Moreover, the countries such as Sweden, Costa Rica, Scotland, and Iceland hit their target of

decreasing the percentage of greenhouse emission and increasing the usage of renewable energy to optimum (Climate Council, 2022). If most countries take green energy seriously and make technological progress, then this shortcoming will be minimized. Another important argument in favor of green energy is the creation of new job opportunities in the spheres of research and development, manufacturing, installation, and engineering. For instance, the International Renewable Energy Agency (IRENA) estimates that 43 million people might be employed in the renewable energy sector by 2050 (IRENA, Irena's World Energy Transitions Outlook re-writes energy narrative for a net zero world 2021). Therefore, green energy not only positively affects the environment and public health, but it does also contribute to the growth of the economy and the creation of job opportunities. By investing in green energy, countries may concurrently advance sustainable development and economic growth.

1.2. Sustainable Growth in Azerbaijan: Balancing Economic Development and Environmental Responsibility

Azerbaijan, located in the Caucasus region, has historically been an oil and gas-rich country. The heart of oil was chosen – “Bibi-Heybat” as the construction of the first oil well in 1848, and then Balakhani in 1872. In 1872 Azerbaijan extracted one million pods of oil. The “Contract of the Century” which was signed in 1994 underlined the importance of gas and oil for Azerbaijan. These resources have for many years served as the foundation of the economy, fostering its expansion, and brought out Azerbaijan to a new international level. According to the EU4Climate statistics, Azerbaijan contributes to 0,15% of total greenhouse emissions (EU4Climate, 2019). Since the independence of Azerbaijan, the evidence of a lack

of non-renewable energy became obvious and long-term reliance on fossil fuels as an only option was risky and unsustainable. For instance, around 37% of the GDP of Azerbaijan relied on the oil and gas sector in 2021 (State Statistics Committee, 2022). In addition, as per **Figure 2** it is apparent that natural gas and oil products make the dominant contribution to energy consumption during the period of 2017-2021.

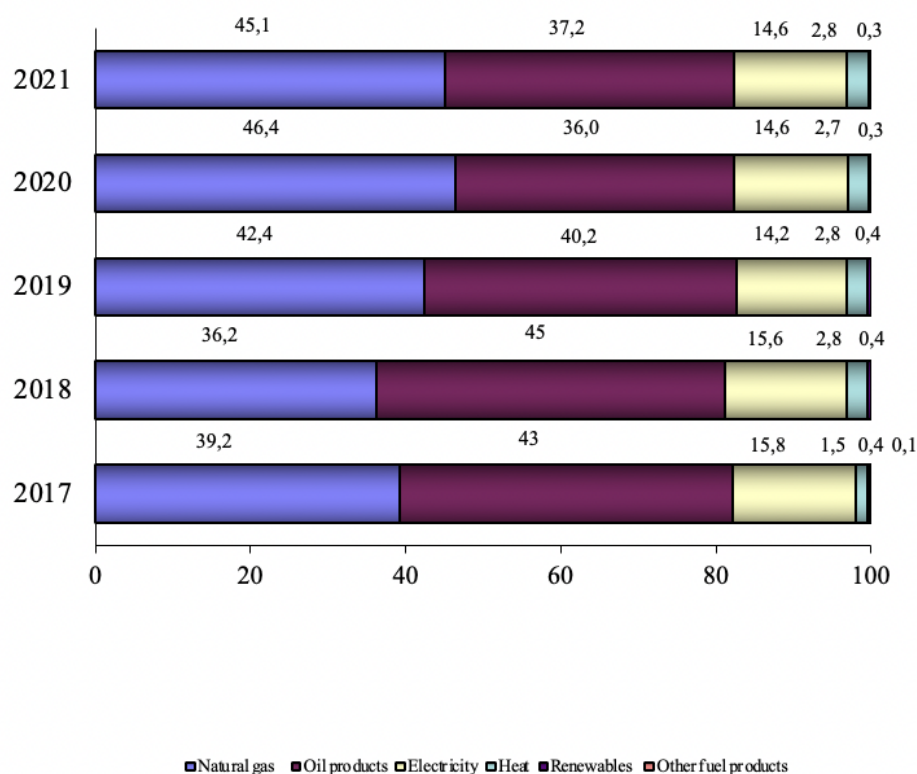


Figure 2 Final consumption of energy products, in percentage (State Statistics Committee, 2022)

In fact, the move toward Sustainable and Green Energy on a global scale has encouraged the government of Azerbaijan to attempt to switch to alternative energy sources and diversify the economy. Azerbaijan is the country with vast amount of valuable renewable energy

resources. According to the Ministry of Energy, Azerbaijan has a renewable energy potential of 27 000 MW (17.3% of total energy capacity) and the potential of Caspian Sea about 150 000 MW (Ministry of Energy, 2022).

The path to green energy and renewables is comparatively new and some challenges still persist. One of the first executed documents of the government in terms of transition to green energy is the “State Program on the Use of Alternative and Renewable Energy Sources” in the Republic of Azerbaijan in 2004, which serves as an action plan for the development path to renewable energy. In 2020, the Azerbaijan Renewable Energy Agency under the Ministry of Energy of the Republic of Azerbaijan was founded by the President of the Republic of Azerbaijan. By 2030, the Ministry of Energy set an objective to increase the capacity of renewable energy to 30% of the Azerbaijan’s total energy mix. In order to achieve this target, a total of 1500 MW of additional generation capacity – 440 MW (2023), 460 MW (2023-2025), and 600 MW (2026-2030) will be built at the cost of renewable energy sources. (Ministry of Energy, 2022).

Azerbaijan, as many other countries, is committed to achieving the 2030 Agenda under 17 Sustainable Development Goals (SDGs) and is developing its domestic policy in this direction. Moreover, Azerbaijan is committed in its Nationally Determined Contribution (NDC) to achieve a decrease of 35% emission in alignment with Paris Agreement, which was ratified in 2017.

In the direction of legal frameworks, in 2021 the law “On the use of renewable energy sources in the production of electricity” was adopted, which specifies the commitments to renewable energy in the electricity production as well as specific tariffs and procedures for selection of

electricity providers in the region (Azernews, 2021). Furthermore, the President of the Republic of Azerbaijan signed “Azerbaijan 2030: National Priorities for Socio-economic Development” that covers long-term strategic goals for the future decade, where among five priorities “green growth” and “clean environment” are placed with the purpose of increasing the usage of clean and renewable energy and “green” technologies.

The “Law on the Use of Renewable Energy Sources” (RES) was adopted by the Government of the Republic of Azerbaijan. Currently, Azerbaijan is in the course of development of five-year energy strategy (2022-2026) in terms of Renewable Energy Sources. The main purpose of the strategy is to focus national efforts on boosting the use of renewable energy sources and promoting sustainable development in the energy sector (Caspian News, 2022).

The recent progress in renewable energy is primarily focused on the development of wind and solar energy, with an estimated potential of 3000 MW and 23 000 MW of wind and solar energy respectively. For instance, agreements were signed between the Ministry of Energy, Saudi Arabia's ACWA Power, and Masdar Company of the United Arab Emirates for the execution of renewable energy pilot projects. According to the agreements, solar power plants with capacity of 230 MW and wind power plants with capacity of 240 MW will be built by Masdar and ACWA Power, respectively (Ministry of Energy, 2022). With another pilot project planned to be completed in March 2023, namely “Knowledge Exchange and Technical Assistance on the Development of Floating Solar Panels System” in cooperation with Asian Development Bank (ADB), about a photovoltaic system with a capacity of 100 kW will be installed on the Boyukshor Lake. Moreover, the project also includes the development of business models to boost the engagement of the private sector in the solar panel installation and development of trainings and capacity building activities. Another

initiative is the installation of hybrid power plant in Gobustan based on wind, solar, and bioenergy. Whereas the 4 SSPs (solar panel plants) located in Nakhchivan AR made up 2.5% of the total electricity generation. In January 2022 the 240 MW “Khizi-Absheron” Wind Power Plant was placed and in March 2022 “Garadagh” Solar Power Plant foundation was laid (Ministry of Energy, 2022).

As part of engagement of international organizations in the efforts toward green energy in Azerbaijan, European Bank for Reconstruction and Development (EBRD) is currently working on the project the "Support to Renewable Auctions in Azerbaijan", which is intended to establish guidelines for holding auctions for renewable energy sources and development of request for qualifications (RFQ) and request for proposal (RFP) related to procurement of electricity for auction processes. (Ministry of Energy, 2022). In February 2021, the Ministry of Energy and bp signed a Memorandum of Understanding (MOU) to collaborate on the evaluation of potential and necessary conditions for clean environment and decarbonization. This cooperation is intended to support economic diversification, promotion of environmentally friendly energy sources, and “green growth” (Azerbaijan to cooperate with bp on the decarbonization of its energy and mobility systems, bp, 2021). In November 2021, at the 26th Conference of the Parties to the UN Framework Convention on Climate Change (COP 26) conference in Glasgow, Azerbaijan voluntarily agreed to reduce its emissions by 40% by the year 2050 (EU4Climate, 2022). Furthermore, Azerbaijan is committed to establish a “Net-Zero Emission” zone on the territories that recently have been liberated (Ministry of Energy, 2022). For Azerbaijan, the use of “Green Energy” is especially crucial in the attempts to restoration of the liberated territories. As per the interview of one of the politicians, the goal is to transform the liberated territories into a sustainable and

environmentally friendly zones, then the knowledge obtained would be used in other regions of Azerbaijan.

One of the vital objectives in terms of economic development of the liberated territories highlighted by the President of Republic of Azerbaijan is the establishment of the Green Zone, thus in 2021 the President signed an order to establish “Green Energy Zone”. During an interview, the President mentioned that after the 44-day Karabakh War renewable energy potential of Azerbaijan extended to a new level, in fact, the liberated territories have more than 9000 MW potential in renewable energy, including all types of renewable energy sources, such as solar, wind, hydro and geothermal (Ilham Aliyev attended inauguration of "Gobu" energy junction, 2023). Moreover, the Cabinet of Ministers introduced the “Action plan for the establishment of the Green Energy Zone in the liberated territories of Azerbaijan in 2022-2026” (Ministry of Energy, 2022).

As part of the efforts towards establishment of “Green Energy Zone”, Ministry of Energy signed an agreement with “TEPSCO” Japanese consulting company in order to develop concept and master plan of the “Green Energy Zone”. As a matter of fact, the document is prepared, which includes the development of models, energy demand predictions and assessment of various scenarios. In addition, the work is proceeding to prepare the master plan implementation. According to the report of the Ministry of Energy, Zangilan, Jabrayil, and Fuzuli regions of Azerbaijan have solar radiation power which is favorable condition for the development of solar energy projects with an estimated potential of 7200 MW (Ministry of Energy, 2022).

In conclusion, this demonstrates that Azerbaijan with a long history of oil exploration dated to 1846 is continuously diversifying its energy supplies and significantly assisting Europe's efforts to reduce carbon emissions by transition to clean energy and raising the proportion of renewable energy in its own energy mix. Consequently, promoting green and clean energy has emerged as a key component of Azerbaijan's energy strategy.

Thus, the main purpose of the capstone project "Prospects and Challenges: Driving Sustainable Growth in Azerbaijan through Green Energy" is to examine the potential and challenges of green energy in Azerbaijan and its contributions to the sustainable growth in comparison to international practices. Moreover, the objective of the research is to identify economic, social and environmental opportunities of clean energy sources and further develop future strategic recommendations and regulatory requirements for the effective and efficient implementation and deployment of Green Energy in Azerbaijan.

1.3. Methodology

The research "Prospects and Challenges: Driving Sustainable Growth in Azerbaijan through Green Energy" is based on qualitative methods of analysis, both by inquiry of primary and secondary data, to ensure that the research is valid and reliable. The primary data is collected by the use of face-to-face semi-structured interviews with two foreign experts and two local experts in the sphere of green energy power system, in order to in-depth understand the policy problem from the perspective of professionals and develop future recommendations.

The following six questions were asked during the interview:

- | |
|--|
| <ol style="list-style-type: none">1. In your opinion, what is the level of current green technology in Azerbaijan?2. What are the main challenges, which restrain Azerbaijan in the transition to green energy?3. Do you think people are not aware of it or there is no enough regulatory framework?4. If you believe that there are problems in financial terms, why do you think they occur and how solve them?5. Why do you think there is investment problems if price of electricity is nearly the same from fossile fuels and renewables? |
|--|

Figure 3 List of questions

The interviews with the professionals working with a direct connection to green energy power systems were recorded and transcribed. Moreover, confidential consent was asked before the interview in order to prevent any ethical issues.

Furthermore, a survey was designed and directed through social networks and e-mail, in which in total of 70 individuals participated, to ascertain the mindset and cultural awareness of people in the sphere of Green Energy. The survey consisted of eight questions and was intended to understand the focus group. The focus group consisted of people of the age range between 18-55 years old, whether the majority were aged 18-24 years old (46%) working in the private sector (60%), and in the field of education (34%). Owing to confidentiality, none of the participants' personal information, including names and job positions, was disclosed. The survey questions are presented in the Appendices part of the project.

Moreover, questionnaires were developed, which were intended to understand the possible solutions for the challenges in the transition to green energy in Azerbaijan. The questionnaires consisted of six open-ended questions and distributed to four local experts working in public sector in the sphere of Green Energy and Sustainable Development in Azerbaijan.

Pursuing this further, we used secondary data sources, such as published literature, governmental strategies, legal strategies, media sources, and statistical information in order

to make a comparative analysis of foreign and local practices and complement the primary data. The analysis of secondary data provided a broader perspective on the research problem. These methods will guarantee relevant and current data collection.

The identified main limitation of the study is the lack of comprehensive data, previous research, and literature specifically related to Green Energy practices in Azerbaijan.

2. Challenges in the Transition to Green Energy in Azerbaijan

2.1. Problem Statement

Azerbaijan, being an oil-rich country, has historically relied heavily on fossil fuels to meet its energy needs. However, this has led to various negative impacts, such as environmental degradation, adverse effects on public health, and increased exposure to vulnerability in global oil price fluctuations. As a result, Azerbaijan has recognized the need to move towards more sustainable and renewable energy sources such as wind, solar, hydro, geothermal, and biomass. While the adoption of renewable energy has the potential to bring significant benefits, including a reduction in greenhouse gas emissions, increased energy security, and decreased reliance on fossil fuels, there are also challenges to this transition.

Thus, considering the significance and numerous advantages that green energy may offer, question of the issue of stagnation in the transition to Green Energy in Azerbaijan arises. Despite the fact that Azerbaijan has committed to many targets to transit to Green Energy, as it can be seen from the official strategies of the government, still there has been little progress in this area and Azerbaijan remains reliant on fossil fuels.

What factors slow down or even hinder the transition of Azerbaijan from fossil fuels to green energy? In general, it is worth noting that at the moment, green energy generates only 14% of the energy produced in the world (e.g., in the United States, the share of green energy is 8% of all energy produced), which is an important indicator that the problem with the transition to green energy exists not only in Azerbaijan¹. An example of transitional

¹ *Why don't we use more renewable energy?: Inspire Clean Energy.* (n.d.).
<https://www.inspirecleanenergy.com/blog/clean-energy-101/why-dont-we-use-more-renewable-energy>

problem to green energy is the fact that many countries cannot fully use the potential of green energy due to their disadvantageous geographical location.

After all, if a country attempts to use solar (solar panels), wind (windmills) or hydroelectric power, then the country needs to have the appropriate suitable climatic conditions. The sun must shine clear without clouds in order for the solar panels to generate the maximum amount of energy (efficient use); the wind must also blow strong and have a certain minimum speed; moreover, the country should have the necessary specific areas that can be used to build hydroelectric dams and wave turbines¹. In fact, if taking into consideration conditions stated above, the climatic and geographical conditions of Azerbaijan allow it to use green energy sources, since there are enough opportunities for sun, wind, biofuels, or biomasses, though there are serious problems with water resources in the country, especially recently, thus Azerbaijan may not rely on hydroelectric power as the source of generating energy. Another significant problem that Azerbaijan is facing, is caused by large amount of land that green energy requires. Land is an important and exhaustible resource, as it can be used for various purposes: agricultural, urban, or for green energy. As a result, the country's government has to make a difficult choice, because distributing land among farmers and lands for use of green energy can cause serious discontent. Therefore, the government has to make trade-offs and weigh each of its decisions.

Azerbaijan faces the problem of making a smooth transition from a traditional strategy to a new one. The issue arises from three causes that have been identified through deep research and investigation. Therefore, it has several causes as financial barriers as the transition to green energy is quite costly; information barriers as limited public awareness slows the transition; and regulatory barriers as lack of regulatory framework which complicates

relationship between various parties more seriously. Most of the financial institutions are skeptical about the green energy transition as the new technology and skilled labor, communication, and transportation demand a huge amount of money. Thus, energy investors often miss the big picture and evaluate investment in green energy as a loss of money and time. Moreover, being unaware of the topic, in our case –green energy, restricts not only investors but also the public to support the idea of transition and state its opinion. It is obvious that by raising awareness of the public, more and more people would like to live in a country that values mother nature and would like to provide a good quality life to its citizens. It is important to underline that even the constitution of Azerbaijan highlights the right of its citizens to live in a clean and healthy environment. When it comes to the third cause of the problem, it much touches institutions and regulations which have the power to implement rules that could not be breached or ignored (Aydin, 2019). In this case, no other organization would venture to act as the opposite.

As a result of the Russian invasion to the Ukraine, costs of natural gas and coal plants escalated much, however, on the other hand, the construction of onshore wind turbines and solar panels cost 40% less. As Bloomberg reports, an onshore wind turbine costs \$46 per megawatt/hour which is not cheap but in contrast, gas plants cost \$81 per MWh (Battered California Faces Billions in Storm Damage to Crops, Homes and Roads, 2023). The irony is that even if fossil fuel plants become more expensive to build than solar panels there are still people who will try to prove that green energy is costly and deny the fact that fossil fuels are limited. But the question arises what one means when insists that switching to green energy is expensive? Is it cost-effective? If to answer from nature/planet's point of view, then it is definitely worth it. But if to answer from the consumer, development, and infrastructure side

then it has no definite answer. However, many pragmatists stick to the point that there will be no other choice than to switch to renewables as fossil fuels are running out. The Forbes journal underlines the article by Dominic Dudley, where he compares the costs of fossil fuels and renewable energy (Dudley, 2019). The logic of comparison is that by each year cost of implementing green energy falls as a result of developing and evolving infrastructure. He depicts that an electricity cost from a new fossil fuel factory is between \$0.05kWh to \$0.15kWh, whether for wind turbine, solar panel, and hydroelectric power cost ranges between \$0.05 to \$0.13kWh (Dudley, 2019).

The biggest challenge organizations face while making a decision is that the amount of money which has to be invested at the beginning for the purpose of green energy, scares them much. Of course, it demands huge investment, good example is a part of a multi-million project made between Azerbaijan and Saudi Arabia's ACWA Power and Masdar company of Abu Dhabi. An agreement was made with Masdar company to build a solar power plant in Qobustan region with a capacity of 230 megawatts, costing \$200 million. Also, a wind farm is to be built by ACWA Power company, costing \$300 million with a capacity of 240 megawatts, in Absheron and Khizi districts (Ministry of Energy, 2023). Despite all these immense numbers, it will pay off not only in profit terms but in living conditions and health terms. Imagine how a huge cut in emissions would reduce the number of patients with respiratory problems. Moreover, many people would find employment and get skilled in the renewable energy sphere.

The reason why green energy is so dependent on climate conditions and land availability is that green energy is a young industry and has not yet reached the required technological progress. So, the problem lies in the fact that green energy is technologically poorly

developed. Scientists and experts still have to make important scientific discoveries that will make the use of green energy to be much more efficient. Technological progress will make it possible to be less dependent on weather conditions and generate the maximum amount of energy even under unfavorable climatic conditions. A way will also be found that will reduce dependence on land availability, because new technologies can solve this problem e.g., more compact stations.

Above listed factors are one of the reasons why Azerbaijan cannot switch to green energy, but they are not the main and decisive ones, although they seriously slow down the process. The main problem why Azerbaijan still cannot make a significant leap towards the transition to green energy, despite the aspiration the government has, and all the policies adopted, is that Azerbaijan cannot move from theory to practice. In other words, Azerbaijan struggles to find ways (or these ways are difficult to access) for the implementation of its policies and ideas. So, Azerbaijan faces the problem of making a smooth transition from a traditional strategy to a new one. The three main constraints in the way to green energy are financial barriers, limited public awareness, and lack of regulatory framework. Further, in the paper, all three barriers will be described in detail, and it will explain the reasons of the stagnation in the transition to green energy.

2.2. Anticipated causes of the problem

2.2.1. Economic barrier: insufficient investments from both the private and public sectors

The economic barrier is one of the obstacles on Azerbaijan's path to green energy. However, it is worth having a clear idea of what kind of economic barrier Azerbaijan is facing. If the paper was describing global trends in the 2000s or the very beginning of the 2010s, then the

economic barrier would primarily mean the cost of electricity generated by various types of energy. Electricity can be generated from various types of energy: renewable sources (wind, solar, etc.) and traditional sources (coal, gas, oil – also known as conventional). At that time, the price gap between renewable and traditional sources was significant and it was much more profitable to use conventional sources. However, as green energy develops, the price of renewable sources drops every year, and at the moment the price between two different types of energy source is almost at the same level. To do this, it is important to pay attention to the official statistics of electricity prices, depending on the type of source. The main parameter by which the electricity price was set is based on the levelized cost of electricity (LCOE). There are special generators that generate electricity, and the levelized cost of electricity (LCOE) is an indicator of how much it will cost (average net present cost) to generate electricity by a generator over its lifetime. According to statistics, it turns out that the leaders among all types of energy are wind and solar (PV-Thin Film Utility Scale and PV-Crystalline Utility Scale). These types of energy account for the smallest price range for 1 MWh of electricity, averaging \$38, \$31.5, and \$35.5 respectively. The leader in price is also the representative source of green energy, namely Solar PV-Rooftop Residential at an average of \$184 per 1 MWh of electricity¹. It is also worth noting that from the conventional types of energy, the only serious competitor was Gas Combined Cycle. Other representatives of conventional sources were much inferior in price or were on par.

The fact that the prices of green energy sources are falling every year allowed them to equalize and impose competition on traditional energy sources. Every year the price will fall more and more, which will make them more preferable. An example of this is wind and solar PV-Crystalline, which in 2009 was among the most expensive types of energy, but after 12

years has fallen in price and is the cheapest type of energy. This trend will continue as green energy is a young industry that is constantly evolving and where technological and scientific discoveries can be decisive factors influencing the price.

Moreover, there is such a concept as capital cost for each generated 1 kW of energy, which also shows that representatives of green energy in this area are on the same level or even surpass their competitors from traditional energy. In this example, again, only Gas Combined Cycle can truly be considered an alternative to green sources, since this type of source is not much inferior in price (Combined cycle power plant: GE Gas Power).

From the above-mentioned information, it may seem that there is no terrific economic barrier to green energy. Indeed, in many respects and prices, green energy is more profitable and preferable. However, if this were true, then many countries would have switched a long time ago and would have generated most of their household energy through green energy. However, countries mainly rely on traditional types of energy, and it would not be an exaggeration to note that about 90% of the energy in most countries on average is generated from fossil fuels. The problem is that the energy system of the countries of the world is mainly focused on the consumption of fossil fuels and the generation of energy from them. This applies to all aspects of the energy industry: infrastructure, supply chain, market orientation, technological development, production, stations, and so on. Now the time has come to change and move from one the system from one to another. This means a complete rejection of the old and the transition to a new approach. This cannot happen overnight and will happen gradually. However, the pace of transition is still too slow in Azerbaijan. What is the reason? Undoubtedly, the expenses are huge, because the construction of solar or wind plants alone with the ability to generate several tens of kW of energy costs several hundreds

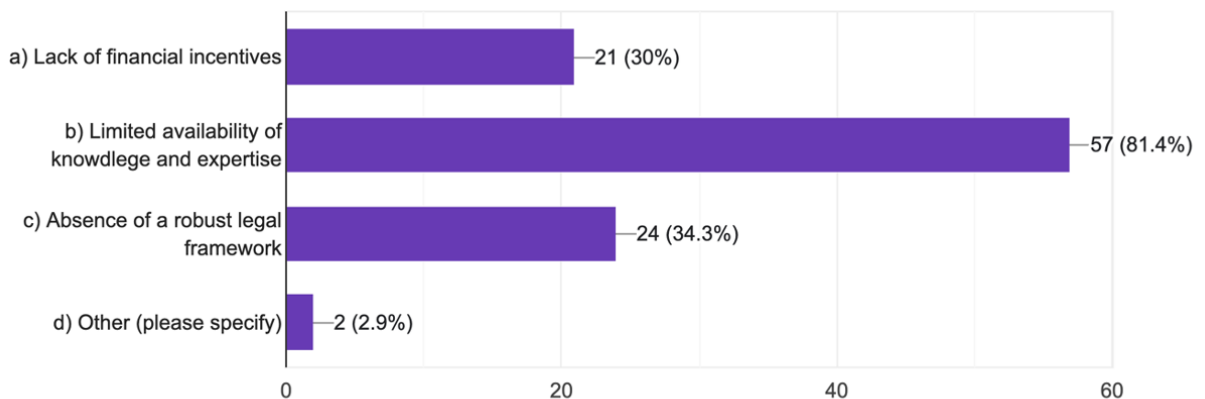
of millions of dollars. However, this is a global trend, and all countries are gradually switching to green energy. So, green energy will bring its benefits, both economic, environmental, and social, which means that investments in green energy will pay off.

2.2.2. *Limited public awareness about green energy*

One of the obstacles which was frequently mentioned by respondents in survey conducted as part of this research was limited knowledge and expertise in renewable energy. Out of 70 respondents of the survey for this research, 57 individuals (81.4%) stated that this problem constitutes the biggest challenge for development of green energy in Azerbaijan.

What is the biggest challenge facing the adoption of green energy in Azerbaijan?

70 responses



Public awareness about renewables is important because it is crucial to reshape the demand side of energy sector to encourage consumers to consider renewable energy sources in their energy consumption. For example, if an individual grasps full benefits and costs of solar panels for household, it is very likely that eventually this person will install solar panels at home, either due to environmental concerns or due to state support schemes (Khambalkar et al, 2011). On the other hand, public awareness is important because the public actively

participates in setting and approving energy policies, especially in democratic countries, therefore public support for renewable energy projects is critical for government.

In addition to the role awareness plays in public approval and acceptance of renewable energy, public awareness is critical to ensure demand for green energy. In the absence of such demand, renewable energy providers will not be able to sell energy, which would discourage any further investment in production and infrastructure due to low financial returns. According to an interviewed expert working in the department of energy efficiency and renewable energy, low public awareness in Azerbaijan is often mentioned as one of the bottlenecks for policies against climate change. In addition to low public awareness, there is deficiency of trained and educated specialists to support implementation of energy programs. To respond to this problem, the Cabinet of Ministers is charged with the duty to develop public awareness programs at national and local levels. On the other hand, to deal with lack of experience in energy efficiency projects, government strives to train more specialists in energy programs. Energy efficiency issues are expected to be communicated to small and medium businesses since production facilities equally require energy resources and therefore it is possible to attract those businesses to renewable energy consumption (UNECE, 2019). For businesses, awareness can be raised through special courses which will provide an overview on the opportunities for implementation of renewable energy projects in enterprises, information on government support schemes and benefits of shifting to green energy. The Ministry of Energy and the State Agency for Alternative and Renewable Energy Sources (SAARES) are government bodies which are charged with the duty to implement annual public awareness initiatives. Existing training facilities to educate specialists on renewable energy include the Gobustan Experimental Polygon and Training Center and

educational institutions. It is important to encourage even more training programs at local institutions to ensure capacity building for the latest technology development and learning from business cases abroad. Another measure to improve education on renewables is to attract foreign partners. In this context, the Ministry of Energy actively signs off Memoranda of Understanding (MOU) with foreign investors and institutions. In 2018 and 2019, consultative events under the title “Public-private partnership in the development of renewable energy legislation” were arranged to bring local stakeholders, international partners, and financial institutions to a single venue to discuss cooperation and possible projects, as well as various aspects of proposed legislation on renewable energy (IRENA, 2019). International cooperation can help facilitate knowledge-sharing between Azerbaijan and other countries, which can help Azerbaijan to learn from the experiences of other countries and develop its renewable energy sector more efficiently. Another vivid example of public awareness projects is “Support to Environmental and Energy Initiatives” project implemented by “Umid” Support to Social Development Public Union (NGO) in partnership with BP Exploration (Caspian Sea) in 2006-2007. Within this project, awareness-raising activities were implemented in 43 communities to educate community members about sustainable and safe management of energy resources (Energy Charter Secretariat, 2013).

Importance of public awareness for project approval is associated with the fact that lack of public approval may lead to social unrest and objection from local businesses. Large upfront investment and unclear environmental impact might create a public perception that renewable energy is intended only for wealthy individuals, while renewable energy projects are viewed as having limited scope to create new jobs in local community. As a result, the public would give more priority and require more resources for other local projects, such as

education and healthcare. Furthermore, involvement of local communities, agencies, universities, and businesses improves the quality of energy projects through utilization of local expertise, enhanced coordination of all parties to project, and improved confidence in key stakeholders who are empowered by direct and indirect participation in projects (C40 Knowledge, 2019).

Implementation of renewable energy sources in households is restricted by individuals' willingness-to-pay. Lack of public awareness about benefits of renewable energy makes renewables less attractive for individuals. On one hand, successful implementation of renewable energy projects requires fundamental changes in local culture and acceptance of innovation by community members. Renewables should be accepted by individuals as part of their lifestyle and culture rather than some unclear innovation. On the other hand, such shifts in culture require legislative and economic support from local agencies (Imanova, 2011).

2.2.3. Lack of Robust Regulatory Framework

Another obstacle for green energy development in Azerbaijan is lack of robust regulatory framework which would regulate issues and questions arising in this sector. As reported by a local expert working in a prestigious institution in the sphere of green energy, the regulatory framework is critical factor for renewables sector because many investors express concerns about ownership of assets, land use, and approval process for energy projects: much bureaucracy causes delay in approval of projects, which brings both financial and administrative losses for investors and further discourages them from green energy projects. Lack of regulations in renewables prevent investors from deriving sufficient returns from investment and can potentially cause future disputes over asset ownership, hence

governments need to implement respective regulations. A vivid example reflecting the importance of regulatory framework is found in Germany, which became one of the largest solar energy producers globally. Although Germany had economic policies to stimulate renewables sector since the 1970s, rapid growth in this sector was not associated with these policies. Instead, rapid development of green energy sector was facilitated by implementation of laws, such as tariff regulations and control over pricing (Persaud, 2021). Lack of robust legal framework was mentioned by 34.3% of respondents in survey conducted as part of this research work (24 individuals out of 70 participants). One area which requires regulation is investment and ownership of assets in green energy projects. Often developing countries view such projects as intended largely for local investors, yet in this case there is skewed ownership of assets. Furthermore, energy projects are usually capital-intense, which can impose restrictions on start-ups in renewables due to lack of sufficient financial resources or inability to attract investors. Another problem is lengthy approval process. Most projects require agreement among various agencies and stakeholders, including landowners whose lands will be a place for solar panels and wind turbines. Furthermore, neighborhoods for wind turbines frequently complain about noise pollution, thus individuals living nearby should consent to construction of such turbines. Government agencies need to review possible places for construction of renewable energy plants and sources for financing, which also takes time. Time required to reach mutual agreements and investigate all possibilities, delays projects and kills investors' enthusiasm. Eventually some investors even seek illegal ways to obtain approvals or submit incomplete applications to save time. Therefore, one possible regulatory change is to ensure parallel rather than sequential process of approval (Persaud, 2021). Another area where regulations are required is licenses for building and operation of systems: rules should be developed to reduce bureaucratic burden yet to ensure sufficient procedures

to grant licenses to credible producers. Laws on long-term investment security and guaranteed and prioritized grid access are required to persuade investors that they will not face obstacles in implementation of projects which could potentially distort financial returns and ensure that investors are protected against loss of investment in times of political or economic unrest (Tupy, 2009).

Other barriers which are resolved through regulatory framework include policy focus on renewables, regulations on transfer of renewable technology, lack of regulation over social relations between renewable energy producers and utility providers, high risk of energy projects, and absence of life-cycle analysis in economic feasibility analysis. First of all, frequently countries with abundant fossil resources include renewables in their energy agenda and commit to encourage green energy projects. Nevertheless, practically governments still give priority to fossils: in this context, it is crucial for government to have a well-established and integrated plan for development of renewables. In Azerbaijan, one obstacle is absence of laws on transfer of renewable technology. While foreign investors get involved in green energy projects locally, there is no regulation to govern technologies brought by those investors after projects are completely: as a result, country which hosts renewable energy projects lose equipment and technologies once the investor leaves. There is no regulation of social relations between existing utility providers, who control energy infrastructure and grid systems, and renewable energy producers. While providers favor existing infrastructure, it might be difficult for new producers to engage in energy sector and integrate renewable energy facilities in larger infrastructure if providers resist. Lack of sufficient facilities and infrastructure, coupled with insufficient skills in labor force, lead to another obstacle – perceived high risk of investment. Investors, who generally avoid high

risks, are therefore prone to avoid projects with uncertainties, which deteriorate investment in green energy. In this case, regulations are required to make such projects less risky, for instance, through investment security or tax incentives. Another reason why projects are frequently perceived unfavorable is omission of life-cycle analysis from economic feasibility analysis. Although renewables require considerable upfront investment and subsequent operating costs, in long-term they increase the price of houses with renewable energy panels and turbines and turn to zero costs to generate energy, which helps to recover initial investment (Cedeno et al, 2017).

Presently Azerbaijan does not have any binding climate targets which would affect business decisions or ensure firm state commitment to green energy. There are climate change mitigation actions for various economic sectors, yet those measures are focused primarily on reduction of adverse environmental effects rather than long-term state and private commitment to development of renewables. Environmental policies in Azerbaijan are focused on environmental security, efficient use of natural resources, and national requirements for global environmental issues. There is the Law on Environment Protection (1999) which governs principles of environmental protection, defines rights and obligations of the state, public agencies and citizens, outlines measures for environmental control and monitoring (International Energy Agency, n.d.). Key source for regulatory incentives for green energy projects in Azerbaijan is the law “On the Use of Renewable Energy Sources in the Production of Electricity” adopted in 2021. Regulations outlined in this law include guaranteed tariff for eligible investors, auction mechanism for potential energy generators, establishment of information system “the Atlas” which will be controlled by authorities, more favorable investment climate for foreign investment through guarantees and 10-years

protection against unfavorable legislative changes coupled with compensation for damages (Josefson & Rotar, 2022). The law “On Energy Resources Utilization” adopted in 1996 outlines provisions for certification and standardization of energy facilities. This law specifies terms on which independent electric and thermal energy providers can utilize state power supply system for transportation of generated energy. Another existing incentive for renewable energy sector in Azerbaijan was adopted in 2014: the Cabinet of Ministers exempted import of equipment and tools necessary for renewable energy industry from VAT and custom duties. As discussed previously, one weakness of current strategy for development of green energy in Azerbaijan is sequential approval process. At first, renewable energy producer needs to obtain permission to use land from local authorities. Once permission is granted, producer should obtain approval for construction from three ministries, namely the Ministry of Ecology and Natural Resources, the Ministry of Health, and the Ministry of Emergency cases. At the third stage, producer should apply to the Ministry of Energy for the permission to produce electricity. The next step is to obtain permission from Azerishiq/Azerenerji OJSC to connect to energy network. Afterwards, renewable energy producer should sign off commissioning act for power generation with the Azerbaijan Energy Regulatory Agency and negotiate Power Purchase Agreement with Azerishiq. Hence, there is a lengthy and ambiguous procedure to obtain all required permits, which adversely affects development of green energy in Azerbaijan.

To conclude, majority of respondents who participated in survey (81.4%) viewed lack of public awareness and restricted knowledge and expertise as primary obstacle to the adoption of green energy in Azerbaijan. Since the public does not fully comprehend the benefits of renewable energy, there is high risk that taxpayers would require public funds to be used for

other projects, such as healthcare or educational projects, rather than renewable energy projects, due to misconception that green energy does not generate sufficient benefits for society. On the other hand, lack of public awareness restrict demand for green energy in the market, which further discourages energy providers to supply this energy type. Another challenge to be addressed by government is lack of trained and skilled labor force to implement green energy projects. To resolve this problem, trainings should be delivered to business representatives and households, while topics about green energy should be included in school and university curriculum. The second obstacle mentioned by 34.3% of respondents is absence of robust legislative framework. Although Azerbaijani government adopted several laws to integrate renewable energy in country's energy mix, there are few actions taken to move from theory to practice. This trend is in line with global tendency where renewable energy still constitutes only small part of overall energy consumption even in developed countries, yet German experience shows that legal framework facilitates transition to green energy. As a result, laws should be implemented to regulate relationship between market participants in renewable energy sector and help green energy providers to enter electricity market. Furthermore, stronger legal protection is required for investors in green energy since absence of investment protection and laws on transfer of technologies increase risks for investors and make renewable energy projects unattractive. There is lack of laws on price setting and auctions in green energy as well. The last obstacle mentioned by 30% of respondents is lack of financial incentives. In spite of the fact that development of technologies made renewable energy more competitive in terms of costs, the public still perceive renewable energy sources as more expensive. Moreover, renewables require large upfront investment, which are paid off in long-term, yet such investment makes projects less attractive for investors.

3. Policy Solutions

Previous chapter outlined challenges faced by Azerbaijani government on the way to make transition to green energy. Challenges exist in various sectors; hence government needs to devise policies to address each challenge separately with the view to make green energy projects more attractive both for investors and for the public. Policies should be cost-effective, affordable, and attainable to yield maximum results, therefore the best practice is to refer to experience of developed countries and adapt foreign policies to local specifications. In this context, this chapter proposes policy options for each challenge to identify possible solutions for existing obstacles.

3.1. Development of Financial Incentives

During the course of the research, we identified several problems which caused stagnation in the transition to green energy in Azerbaijan, such as limited public awareness, lack of robust regulatory framework, and economic barriers. In order to resolve these problems, it is important to consider solutions. Further in this paper we will discuss the policy options for all three causes of the problem identified.

As noted in previous chapters, the main cause of the lack of financial incentives for the transition to green energy is not the high cost of electricity produced by green energy, not expensive technologies, or their shortage, nevertheless, according to the interviews we conducted and the opinions of experts, this transition will pay off in the near future and start to bring profit to the country. The main problem is the lack of investment from local entrepreneurs and foreign investors. It requires institutional centers to perform a high level

of R&D to be able to involve international investors, funds, and other countries to invest into development of green energy in Azerbaijan. It is necessary to create serious concessions for entrepreneurs involved in green energy. The state should create a condition for the inflow of investments and an incentive for foreign experts. To solve the investment problem, as the option, it can be possible to borrow the experience of the United States, where the Inflation Reduction Act (Inflation reduction act guidebook - clean energy, 2023) was recently adopted. The main essence of this act is tax breaks for enterprises engaged in the field of green energy. Entrepreneurs involved in green energy have such privileges as assistance from the state by reducing the amount of taxes levied or state subsidies. Moreover, the government is pushing to offer certain privileges to local green energy entrepreneurs if they use local components in the production of green technologies. Thus, the government encourages more local entrepreneurs to get involved in green energy. It is crucial to attract investments in green energy in Azerbaijan as the country has immense potential in generation of electricity from windmills. Azerbaijan has wind during 9 out of 12 months of the year and the average speed is 9-12 miles per hour, which is sufficient to generate big volume of electricity power and trade it.

It is worth mentioning that in spite of the fact that green energy requires investments, it also results in job place creation, so the logic lies: one invests in green energy, jobs are created, and it is an investment into the community. Experts did not pass by the importance and advantage of liberated zones. The liberated regions can become a self-sufficient area not depending on other regions, if to finance it properly. As marked by a foreign expert engaged in the financial department of green technologies, the first five years of monetary support as cheap loans, down payment incentives/support, and feed-in tariffs is necessary for industrial

attraction. Companies may be exempted from taxes and will be given certain benefits if they hire local people, use local materials and components in the production of their products, which are available in the local market, while certainly, chips are not produced in Azerbaijan. The government can also create more favorable conditions for local players. For example, if foreign companies are partially exempted from taxes (by 60-70%), then local ones will receive full exemption from taxation of all companies engaged in green energy, along with the issuance of grants or subsidies to local entrepreneurs. If the conditions for foreigners and locals are the same, then for foreign companies, as a condition for obtaining privileges and the opportunity to work in the market, there should be the following requirement for the members of company directors of the company to include local citizens or 50% of the company shares should be owned to local representatives. Moreover, it is worth opening a plant for the production of solar panels, as the demand for them will only grow. In addition, Azerbaijan will be able to cover its demand for solar panels. It is for this purpose that it is worth finding investors to open this production. At the moment, there are not so many manufacturers on the market yet, and Azerbaijan can take its niche. Azerbaijan can become the main supplier of solar panels in the Caucasus, Iran, and Central Asian countries, and possibly Pakistan.

3.2. Raising Green Energy Awareness and Green Energy Advocacy

According to the results of the survey, which was answered by diverse labor sectors, the biggest challenge of the transition to green energy in Azerbaijan is the lack of expertise and awareness of people (81%). Thus, as a possible solution to this problem, which was evaluated as the most important, several interviews were held with experts to take into consideration

their opinion. According to the majority of experts, raising public awareness option prevails over others. In this regard, an effective public awareness program should be implemented in three directions:

1. To educate policy makers about regulation, management and mechanisms for sustainable development;
2. To introduce professional training for technical personnel in secondary and tertiary schools;
3. To use mass media for better general awareness of society (Alakbarov, 2014).

If to refer to survey results, most people voted for usage of social media promotions. Nowadays, bloggers play a huge role in influencing the public. Sales of advertised stuff rise immediately, then what about promoting a topic that concerns humanity as a whole? Raising awareness through social media is effective way, taking into consideration the average time spent by an individual on social platforms. As a result of detailed information transfer and appealing coverages, the need to switch to green energy is to be created among people. Only after realizing and getting educated on an issue, one can take further steps towards a given goal. For instance, one of the most popular bloggers on Instagram is @Khaby00, he has 78.8 million followers, and the most influential person on Twitter is its owner, Elon Musk @elonmusk with 136 million followers. It is hard to imagine how one post or appeal to the auditorium can make followers to think about a given topic.

Nevertheless, raising awareness can be sowed in the education system. The Ministry of Ecology and Natural Resources is processing National Strategy for Low-Carbon Development and a Climate Change Adaption Plan, however, it would be more effective if

the Ministry of Education would work hand in hand with the Ministry of Ecology. A foreign interviewee proposed several expedient solutions concerning education institutions on an awareness issue. For instance, having “environment” course equally important as “math” course, would guarantee the respect toward environment and striving to make it better from an early age, which would significantly affect the culture and perspective on the environmental preservation from an early age. Another suggestion is to have solar panels on the roofs of the school buildings. The expectation is that they can positively influence students and make them think about the cons of its usage. Thus, different marketing skills should function simultaneously. As a result of new faculties on green energy adopted in universities, a new labor pool in the green energy sphere will arise, which is lacking now. To infix green energy importance, besides educational institutions, the government may hold workshops, workplaces can have more seminars devoted to environmental needs and its importance. Formal training is particularly important for individuals who work or young people who want to work in the green energy industry. Moreover, certification of professionals in this sphere can be beneficial to ensure that local market has highly educated professionals who can bring foreign experience. Government, NGOs, and other institutions should make use of every possible situation which may affect and influence people’s point of view about green energy. As known, time spent in huge traffic jams became part of our lives. Approximately every working person in Baku gets stuck for nearly one-two hour daily in car traffic. The perfect way, in addition to using radio programs to enlighten people about green energy, is to use banners. Banners with attractive print or video transmission would definitely capture drivers and passengers' attention. Events for general public are another possible measure to increase public awareness, particularly if such events exhibit technologies in renewables. Thus, it can potentially attract more individuals and therefore

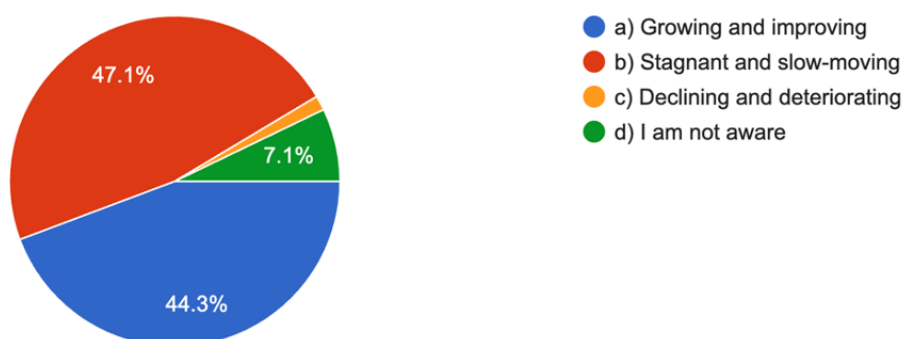
reach larger audience than social media which is often targeted at particular social groups. As mentioned in the Article, one way to raise public awareness is to increase exposure to renewable energy technologies, enhance education, and ensure that renewables are frequently discussed in media for information flow (Oluoch et al, 2020).

3.3. Integration of mandatory obligations and comprehensive legal approach by government

As per the survey conducted, more than half of the respondents answered that green energy is growing and important, while the rest underlined that it is stagnant and slow.

What is your perception of the current state of the green energy sector in Azerbaijan?

70 responses



In order to leverage challenges and increase use of green energy, the government should implement and develop a comprehensive, obligatory, and holistic approach specific for dominating sectors in Azerbaijan. As underlined by experts, currently Azerbaijan's legal framework considering green energy is on the right way. For instance, the government allowed to release the customs fees for electric cars, which is the easy start of taken commitments. However, this is not enough since there are still legislative boundaries in usage of the green energy for citizens, entities as well as international organizations i.e., there is a

limit in green energy usage (windmills) more than 50 kW. The following possible solution proposed by one of the interviewees, is to offer investment opportunities to foreign investors: to encourage this process, a new regulation can be passed to enforce companies in the green energy sector to engage in initial public offering (IPO) after three years of operations. In such case, investors who already have a stake in project can withdraw if project appears unattractive, while the public and large institutional investors can obtain shares in business which had already overcome startup and construction risks. Despite this convenient regulation, there is also potential regulation on taxation. As one of the foreign interviewees mentioned, renewable energy zones may be treated as special tax zones, applying only specific and flexible taxation. In short, the government can incentivize by allowing local companies to become a tax-free organization, whose main core of business is green energy.

According to one of the respondents, it is important to create institutional centers to develop high-level R&D in the sphere of Green Energy in order to involve investors, funds and other countries to build a robust legal framework suitable and applicable to all conditions for Azerbaijan. Thus, according to the opinions of one of the experts, the legal framework developed should be founded on the principles of adaptability, diversity, proportionality.

1. Adaptability: The legal framework should be consistent with financial systems and budget, while not creating material barriers to entry. Fintech is an applicable tool to increase innovation and guarantee that regulations are abolished or reviewed i.e., limit in renewable energy usage.
2. Diversity: The regulatory framework should be developed specifically for all sectors and in accordance with business practices against instability and ensure substitutability.

3. Proportionality: The regulations should be corresponding with the market instability and be based on the principle to create welfare.

Furthermore, the government should consider designing a single renewable energy law which would cover various aspects of relationships in renewable energy sector, for instance, government support mechanisms, principles of grid management, and private investment protection. Additionally, it is crucial to have an effective enforcement mechanism to ensure that regulations are properly implemented by involved parties. For instance, it is possible to assign an independent regulator which will be charged with the duty to oversight compliance with regulations and ensure contract enforcement.

Another critical step for government is to consider introduction of power purchase agreements (PPA), which would regulate sale and purchase of power and establish clear understanding of roles, responsibilities, cost-revenues, and risks. At present absence of standard PPA for renewable energy in Azerbaijan raises the risks of energy projects for investors and producers (IRENA, 2019).

As a best practice example, can be the “Feed-in Tariff” developed by the UK government, which is intended to incentivize the usage of small renewable installations (up to 5 megawatts). As a result, this would encourage people to take actions and achieve 2050 net-zero target. (“Feed-in Tariff”, n.d.).

In conclusion, it is important for government to use the combination of financial and tax incentives for investors and legislative framework to govern relationship between market participants to maximize investment in green energy projects from local and foreign investors. Partial or full exemptions from taxes might be introduced to local and foreign enterprises which operate in renewable energy sector, yet some special conditions should be

requested to protect the interests of local companies; for instance, foreign companies might be requested to have specific portion of local representatives in their board of directors. Policies to raise public awareness might include training for educational workers and inclusion of renewable energy as a separate topic in school curriculum. Moreover, banners and radio programs can be used to raise public awareness, particularly because many drivers listen to radio or observe banners when they are stuck in traffic jams. Influencers marketing can be utilized to attract public to green energy topics with the help of famous people and their promotion of subject. Finally, development of legislative framework would require government to devise policies which combine adaptability, diversity and proportionality to ensure that policies do not create any further obstacles, are consistent with existing market conditions, and help to resolve market imperfections with the view to raise public wellbeing. State laws might address IPO, power purchase agreements, and tariff setting because these areas create risks for investors, and lack of legal regulation here bring uncertainty. Another policy option is to bring an independent party which would oversee enforcement of obligations for each party in the project, for instance, compliance with contractual obligations.

4. Evaluation of Policy Alternatives

As a matter of fact, based on the in-depth analysis of the causes of the problems, three main solutions were identified, such as development of financial incentives, integration of mandatory obligations, comprehensive legal approach by government, and raising green energy awareness and green energy advocacy. Further the paper analyzes main strengths and weaknesses of the suggested policy alternatives based on five criteria: Effectiveness, Efficiency, Equity, Feasibility and Flexibility.

Policies	Effectiveness	Efficiency	Equity	Feasibility	Flexibility
Development of financial incentives	Will solve the problem to a huge extent	No <i>(Short-term)</i> Moderate <i>(Long-term)</i>	Moderate	Yes	Moderate
Integration of mandatory obligations and comprehensive legal approach by government	Will solve the problem to a huge extent	Yes	Moderate	Yes	Moderate
Raising green energy awareness and green energy advocacy	Will solve the problem to a huge extent	Moderate	Yes	Yes	Yes

a) Development of financial incentives:

Attracting investors and supporting local companies through subsidies and grants is a way to speed green energy growth in the country. However, some political niceties cannot be ignored. Since Azerbaijan is in conflict with Armenia and Iran, this affects the investors

decision in terms of security, bearing the fact that Green Energy technology is a long-term investment.

In fact, the suggested policy is considered to be moderately effective to achieve positive results in long-term perspective in transition to green energy in Azerbaijan. Introduction of incentives and penalties encourages both private and public sectors to invest and operate in accordance with financial incentives, which would ultimately lead to increase of green energy initiatives. In terms of efficiency, this policy solution mostly depends on the cost of the implementations, since Azerbaijan's main income is dependent from the oil and gas exploration and production. Thus, the implementation of financial incentives can create additional costs in the short-term. Equity as a fair allocation is moderate, since financial incentives would create not only benefits, but restrictions for some industries. Feasibility of financial incentives refers to the availability of resources and has a potential, since this requires cooperation between the government, private sector and foreign investors and with the undergoing situation in the world, as mentioned by the President, Azerbaijan has such privilege. However, the policy is moderately flexible, due to fast changing global conditions the financial incentives are moderately difficult to be changed and modified and can have certain effect on the economy in the long-term.

b) Integration of mandatory obligations and comprehensive legal approach by government:

Implementation of rules concerning green energy is a crucial part, as everything starts from rules and regulations. This policy option seems to be effective as if government understands and values it on its level, then it will also try to convince the population in its importance. If planned properly the result may appear immediately. An example of plastic bag regulation

may be considered as a proof of governments' effective actions. The outcome of the new regulation on plastic bags is obvious as it is a common sight in supermarkets that people carry their own fabric bags (Article 7 of the "Law on the Protection of the Environment"). Furthermore, incorporation of mandatory obligations and legal framework is efficient since the policy requires less additional spendings and expenses. Legal framework possesses moderate equity, since obligatory requirements of the government can pose restrictions on some individuals, companies, and industries. The policy is feasible, as there no encounters in the implementation of it by the government, although the policy is moderately flexible and the adoption any legal framework is a long process which cannot be easily changed.

c) Raising green energy awareness and green energy advocacy

Raising green energy awareness and green advocacy is deemed to be the most preferred policy option among others, due to the fact that we live in the century of innovations and digitalization. As already noted, informing people through workshops, trainings, advertisement banners, and social media is the solution. According to experts participating in interviews, overcoming the limited public awareness issue through social media seems to be effective, since it is just enough to only have a gadget and an Internet connection. If to refer to survey, 81.4% of respondents opt for lack of awareness among people to be the reason why green energy cannot be driven in an accelerated pace. Despite the fact that advertisement, promotion, or even a word told/written on social platforms costs money, it is beneficial in a way of speed. Social media create communities, pool of discussion, and help people to see what they have not paid attention to. The proof of the power held by social media about raising awareness was observed during the Black Lives Matter riots. The news

about the death of George Floyd scattered around the Internet within a few minutes. Individuals organized protests with the help of platforms such as Facebook, Twitter, and Instagram organized protests. Despite raising awareness benefits, raising funds became an often-faced activity. For example, an American model donated over \$500,000 to Australian fires in 2019. Improving and raising awareness through different means would result in an analytical way of thinking. Thus, with a new mindset, as suggested by one of local experts, habit of paying 30 AZN monthly and considering a solar panel purchase 5000 AZN as waste of money, will be reversed. In all raising awareness through different tools seems to be the easiest way for making people more prone to strive for green energy flourishing in Azerbaijan.

To sum up, the path to green energy in Azerbaijan can consist of gradual step-by-step approach, which should be addressed by the government of Azerbaijan in cooperation with the public needs, financial budget, private sector, and international organizations. As per **Figure 4** the below, policy solution consists of 4 levels with final step – Green Tax.

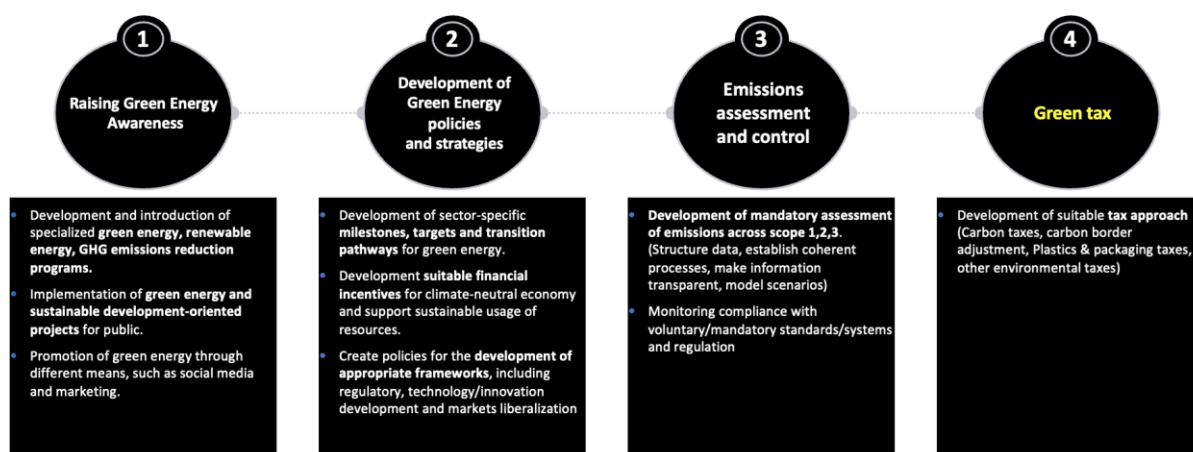


Figure 4 Path to Green Energy in Azerbaijan

The approach showed above is designed based on the expert interviews, in-depth research, benchmark analysis and evaluations. Thus, the first step is raising green energy awareness through the use of social media and build a strong focus on the education of people by development trainings, courses in schools and universities to increase the pool of future experts. Second step is creation of legal framework and obligations applicable to the industries in Azerbaijan with the help of foreign experts and practices. The legal frameworks should consist of clear vision and ensure governmental efforts in achievement of sustainable growth and increased usage of renewable, clean energy sources. The third step is to create mandatory control obligations of the use of fossil fuels, emission generated and establishment of reporting mechanism. Finally, after all steps are achieved, the government may develop Green Taxation. Green Tax brings major benefits in the achievement of sustainable usage of resources and prevention of adverse impacts of fossil fuels. Green Tax is intended to put a restriction on the usage of fossil fuels and other resources which creates greenhouse gas emissions. Only by the implementation of the step-by-step approach in policy incorporation, the government of Azerbaijan can achieve long-term success.

5. Conclusion and Recommendations

It is apparent from statistics provided in this paper that Azerbaijan enjoys favorable climatic and geographic position to fully utilize renewable energy sources. Although country is considerably reliant on fossil fuels in exports and consumption, Azerbaijani government is committed to increase the proportion of renewable energy in local consumption to comply with global commitment to green energy. This global and local commitment is dictated by the fact that traditional sources of energy i.e., fossil fuels, generate large environmental pollution, are non-renewable, create dependency on imports for countries with no oil and gas reserves, and indirectly contribute to deteriorated health conditions (increased pollution from use of fossil fuels causes health problems, such as respiratory diseases). Azerbaijani government recognizes country's potential for renewable energy, particularly solar and wind sources, therefore several agreements were signed with foreign investors and partners to establish infrastructure and build plants in Azerbaijan and on liberated territories. The government has long-term plans to establish Green Energy Zones in liberated territories as a way to secure their independence from other regions in economic and energy terms and develop them both in terms of infrastructure and economy. Renewable energy creates new jobs, therefore development of this sector in Azerbaijan can potentially decrease unemployment, especially in regions. Furthermore, green energy is important for country's energy security since it will reduce the risks of energy failure due to non-renewable nature of fossil fuels (in other words, the fact that fossil fuel will eventually be utilized completely). Although the benefits of green energy are largely recognized and government has already introduced several plans and policies to develop renewables, there are obstacles for development which were highlighted in this paper. One obstacle is the fact that in spite of

outlined commitment, government is still reluctant to make decisive actions because it is costly to change the whole infrastructure. This cost constitutes financial constraint. To overcome this problem, government should introduce financial incentives for investors in the form of tax deductions and subsidies. Moreover, it is possible to require companies to use considerable portion of local materials and labor to ensure that local market captures maximum benefit from green energy projects. Tax breaks can be granted both to local and foreign parties to encourage investment in renewables. Special economic zones can be created in liberated territories, particularly in proposed Green Energy Zones, to attract investment. Another obstacle is lack of legal framework which would govern relationship between market participants, investors and government. Survey conducted within this research work revealed that 34% of participants perceive lack of legal framework as a limiting factor for development of green energy. Government already introduced plans and strategies to expand the use of renewables in Azerbaijan, yet there is lack of laws which would protect investors' rights and ownership. Moreover, Azerbaijan wants to attract foreign investors because local investors possess restricted funds, yet lack of legal framework creates risks for investors, which, coupled with political risks, discourage them from investment. Lengthy process to obtain government licenses and approvals from stakeholders is another legal obstacle which discourage investors from participation in renewable energy projects. In terms of legal regulation, there is lack of legislation to secure transfer of technologies once international projects are completed: as a result, Azerbaijani side will not benefit from new technologies brought by foreign investors, which diminish opportunities for further development of green energy. Another potential problem is absence of regulation of social relations between existing utility providers and renewable energy producers. Providers largely favor existing infrastructure, which can create difficulties for new producers to enter

the grid. Possible policy options for problem of legislative framework are to develop new mechanisms of auctions and investment protection. Furthermore, it is important to replace sequential approval process with the parallel ones to facilitate the implementation of renewable energy projects. It is equally critical to ensure effective enforcement of contracts in this sector, hence an independent regulator can be assigned to oversight compliance with regulations and contractual obligations of all involved parties. Another recommendation is to introduce power purchase agreements, which will specify rights and obligations of all parties in project and split risks and costs. In this manner, coupled with investment protection laws, new legislation will reduce the risks for investors and create investment security. The final obstacle identified in this paper is lack of public awareness. This awareness is found both in terms of social skepticism about renewable energy and lack of technical personnel to implement green projects. Public awareness was deemed a critical problem for development of green energy in Azerbaijan by majority of respondents in survey conducted for this paper: nearly 82% of respondents stated that public awareness distorts development of this sector. Public awareness is crucial because public approval for green projects is required for politicians to allocate funds. Without such approval, public criticism will be drawn to allocation of restricted financial funds to renewable energy rather than healthcare or education. Moreover, lack of awareness results in lack of qualified personnel who can implement renewable energy projects and train other people. As a result, to resolve this problem it is crucial to launch public awareness campaigns and educate people at enterprise, educational institution, and individual levels. Professional trainings should be delivered to young individuals who want to develop in this sector. Improved public awareness will eventually translate into acceptance of green energy as a component of lifestyle and culture, which will ensure that individuals strive to protect environment and are willing to cooperate

with market participants for renewable energy projects. Another recommendation is to use social media and influencers to promote green energy in public. All materials should be prepared in an easy language which can be comprehended without prior knowledge of renewables. Study of green energy should be part of syllabus at educational institutions, while businesses should be informed about benefits of renewables.

Bearing in mind that AmCham (American Chamber of Commerce) is one of the leading private, non-profit business associations in Azerbaijan which protects the interests of foreign and local investors, it is important to attract this association to implementation of policy solutions. Potential steps to be undertaken by AmCham to facilitate the transition to green energy in Azerbaijan, which can be divided into three directions/roles:

AmCham as a learning facilitator to raise public awareness:

- To assist Azerbaijani government in design of training and educational projects for Azerbaijani schools and educational institutions by attracting foreign experts;
- To develop holistic comprehensive training workshops for professionals and government subsidized programs in cooperation with foreign institutions and local experts to educate professionals in green energy;
- To organize regular meetings and large scale conferences between local and foreign experts in green energy with the view to exchange experience and best practices, for instance organization of Trade Mission for businesses to assist in the exchange of knowledge;
- To regularly gather information about public awareness and perception of green energy projects and supply Azerbaijani government with reports to trace improvements and identify new problems.

AmCham as a developer of legal framework:

- To develop comprehensive legislative framework and policy recommendation papers. For instance, the Legal Committee of AmCham can propose Regulatory Frameworks directly to the government of Azerbaijan;
- To promote financial incentives, introduced by Azerbaijani government, among potential investors to attract them toward renewable energy projects;
- To develop position paper with detailed description of the Proposed Plan of Action for renewables. For instance, in the framework of existing Legal and SD&CI Committee.

AmCham as an advocate of attraction of investments by business communities:

- To promote green energy projects and its benefits in Azerbaijan among local and foreign investors;
- To use its social media pages to inform the public about benefits of renewable energy for private and public use and raise public awareness about principles of green energy;
- To act as an independent enforcement party in relationship of green energy providers and energy infrastructure operators in Azerbaijan;
- To promote investment opportunities overseas to attract new foreign investors to Azerbaijan;
- To arrange meetings between potential foreign investors and local authorities and act as a mediator during such meetings.

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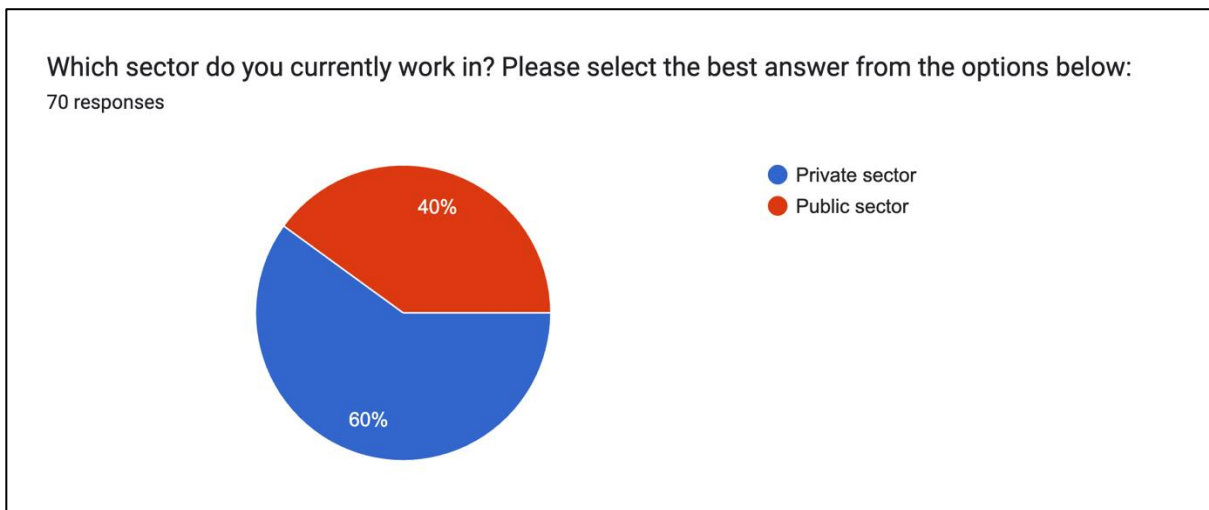
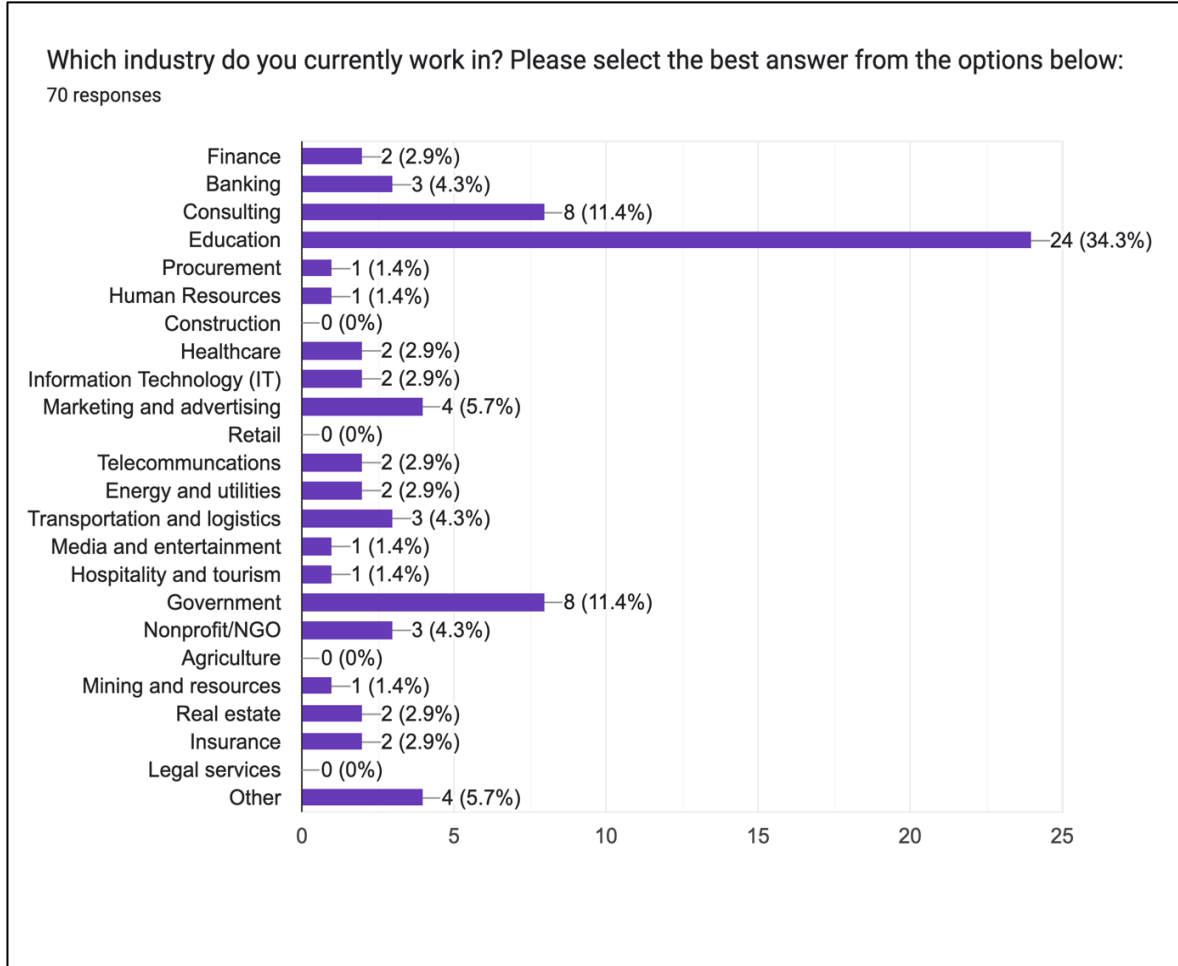
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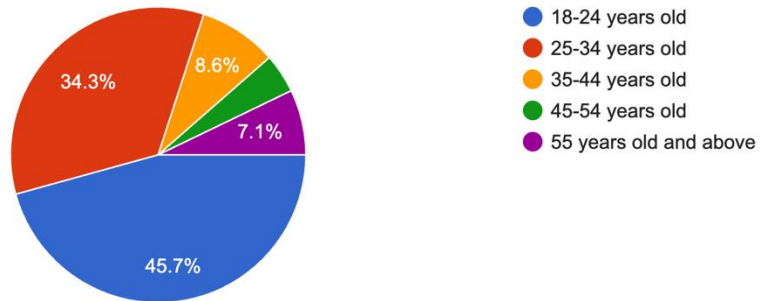
Appendix

Survey results:



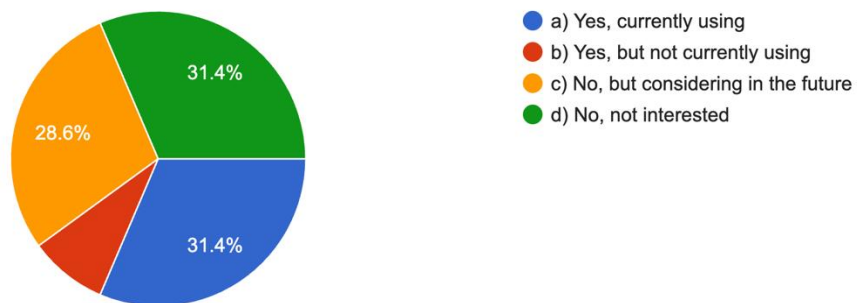
What is your age range? Please select the best answer from the options below:

70 responses



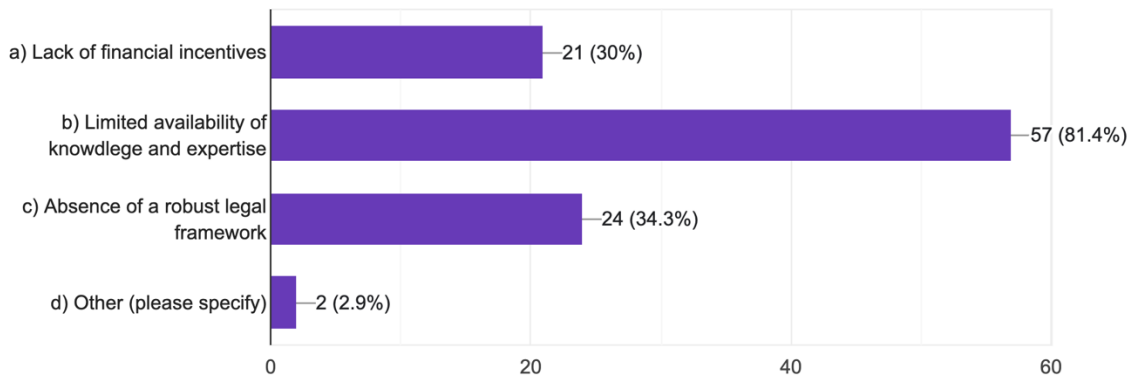
Have your organization ever invested in or used green energy or have any green energy initiatives ?

70 responses



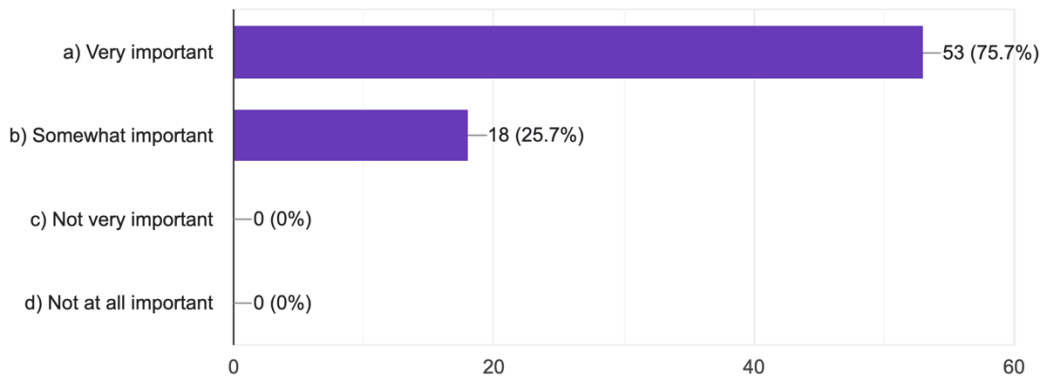
What is the biggest challenge facing the adoption of green energy in Azerbaijan?

70 responses



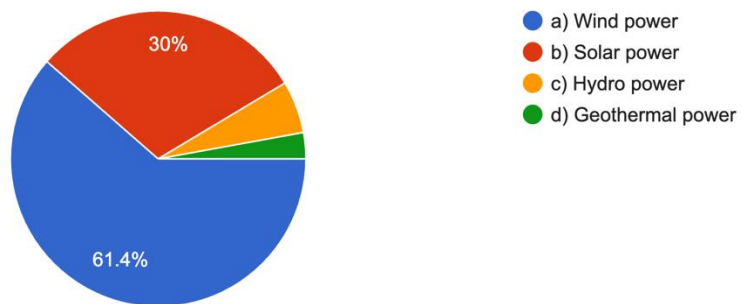
How important do you think it is for Azerbaijan to transition to green energy?

70 responses



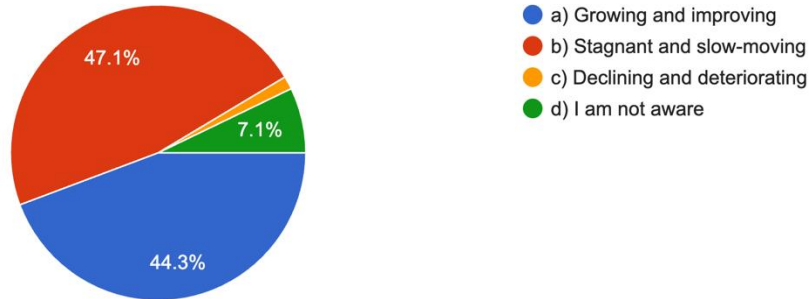
Which renewable energy source do you think Azerbaijan should focus on developing?

70 responses



What is your perception of the current state of the green energy sector in Azerbaijan?

70 responses



Questionnaire:

Questionnaire

"Prospects and Challenges: Driving Sustainable Growth in Azerbaijan through Green Energy"

Dear Mr. or Ms.,

This questionnaire is designed to analyze the visions of the challenges and prospects of transition to green energy in Azerbaijan for a Capstone Project of ADA University MPA students. Your answers are very important for us.

*Please don't use any information resources while answering the questions.
Thank you!*

Please indicate the name of your organization:

1. What is current state of green energy transition in Azerbaijan, and the main challenges to its growth in the country?
2. What are the environmental and social benefits achieved through the adoption of green energy in Azerbaijan?
3. What specific policies Azerbaijani government could implement to accelerate the transition to green energy, and how effective do you believe these measures would be?
4. What is the role of the international cooperation in supporting the development of renewable energy in Azerbaijan?
5. What are the solutions to raise public awareness about the green energy in Azerbaijan?
6. What is your opinion on the challenges of lack of robust regulatory framework and what are the solutions?