

COP-29: HISTORY, CURRENT REALITIES AND VISION OF THE FUTURE

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Abstract. COP (Conference of the Parties) - The Conference of the Parties is considered the highest legislative body of the United Nations, overseeing the implementation of the Framework Convention on Climate Change. The first event of this organization took place in Berlin in 1995. At the COP 28 plenary meeting, held on the 11th of December, 2023 in Dubai, it was decided to hold the 29th session in Baku, the capital of Azerbaijan. In the article, the authors consider a number of measures implemented by the Azerbaijani state in order to prevent dangerous human interference in the climate system and refer to the provisions of adopted legislative acts in this area. In order to ensure the protection of the natural environment, the article also reflects the main directions for the creation of “Green energy” zones.

Keywords: COP, environment, climate change, renewable energy, solar energy, green energy.

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1. Introduction

COP (Conference of the Parties) is used in the meaning of “Conference of the Parties”. The Conference of the Parties is the highest legislative body overseeing the implementation of the Framework Convention on Climate Change. 198 countries of the world are parties to the Convention. The COP is held annually unless the parties decide otherwise. The 29th session of the UN Framework Convention on Climate Change will be held this year in Baku, Azerbaijan. This decision was made at the COP-28 plenary meeting held in Dubai on December 11 last year. To date, Azerbaijan has hosted many international events and conducted them at a high level and with dignity. However, as the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, said, COP-29 cannot be compared with the events organized so far. Within two weeks, Baku will become the centre of the world and will receive about 70-80 thousand foreign guests. The United Nations Framework Convention on Climate Change is an agreement signed at the World Summit in Rio de Janeiro in June 1992 to prevent dangerous human interference in the climate system. The first COP event took place in March 1995 in Berlin. The COP secretariat is located in Bonn. The presidency of the COP is carried out on a rotating basis by one of the five UN regions - Africa, Asia, Latin America, the Caribbean and Europe. The order of rotation among the countries belonging to the group from these regions is observed. The decision on Azerbaijan's chairmanship in the organization was made based on the unanimous opinion of the countries of the Eastern European Group. Along with Azerbaijan, Armenia and Bulgaria have put forward their candidacy for COP-29. As a result of direct negotiations between the Administration of the President of the Republic of Azerbaijan and the Office of the Prime Minister of Armenia, in a statement published on December 7 last year, it was announced that Armenia withdrew its candidacy in favour

of Azerbaijan. After that, he took the same step regarding his candidacy in Bulgaria. The COP-29 conference in Baku can be considered the most important event of 2024 for Azerbaijan and a logical continuation of the country's transition strategy to a "green economy". In accordance with this mission, by Order of the President of the Republic of Azerbaijan, 2024 was declared the "Year of Solidarity of the Green World" in Azerbaijan (Decree of the President 25.12.2023).

As an oil and gas country, Azerbaijan will prove itself in this area and the whole world will see that the agenda of the Baku conference is related to "green energy". The creation of types of "green energy" and the transportation of "green energy" to world markets is currently a priority of our country's energy policy. "This is a reality and the whole world will see it again", said Ilham Aliyev, who emphasized the importance of this event at a meeting organized within the framework of COP-29 in the country (From a speech 25, 2023). The importance of the country for "green energy" is confirmed by the practical activities of Azerbaijan. For example, Azerbaijan aims to reduce greenhouse gas emissions by 35 percent by 2030 and by 40 percent by 2050 compared to 1990. Azerbaijan is one of the countries with high renewable energy potential. According to the Ministry of Energy, the technical potential of the country's renewable energy sources is 135 GW on land and 157 GW at sea, including 3,000 megawatts of wind energy, 23,000 megawatts of solar energy and 380 megawatts of bioenergy potential. The potential of mountain rivers is estimated at 520 megawatts. In accordance with the "Azerbaijan 2030: National Priorities of socio-economic Development", approved by the Decree of the President of the Republic of Azerbaijan dated February 2, 2021, the foundations of a renewable energy production policy have been laid in the country (Azerbaijan 2030). One of the five national priorities identified in the above-mentioned document is related to a clean environment and "green development", which, in turn, sets new goals for the transition to a "green" economy. Prior to the adoption of these Priorities, on January 9, 2020, executive agreements were signed between the Ministry of Energy of the Republic of Azerbaijan and the companies ACWA Rover of the Kingdom of Saudi Arabia and Masdar of the United Arab Emirates. regarding the implementation of pilot projects on renewable energy. According to the agreement, pilot projects related to the construction of 240 MW wind farms with ACWA Rover and 200 MW solar power plants with Masdar will be implemented. Today, the projects implemented in the direction of the development of alternative and renewable energy sources and the transition to "green energy" are a continuation of the energy policy laid down by Great Leader Heydar Aliyev in 1994. Humanity's fight against climate change is becoming stronger and more globalized every day. Reducing the amount of harmful waste released into the atmosphere and replacing it with "green energy" has become one of the most important issues on the global agenda. National leader Heydar Aliyev, who saw this danger, in his congratulatory letter addressed to the participants of the meeting of Ministers of Ecology and Environmental Protection in Istanbul on July 5, 1994, on the development of international cooperation in the field of ecology, the 1992 UN Conference on Environment and Development, held in Rio de Janeiro, stressed the importance of the conference. The final document "Agenda of the XXI Century" adopted at the conference was called a program of concrete actions aimed at solving many urgent problems of modern human development (Istanbul Meeting, Baku-1997).

Since the beginning of the coronavirus pandemic and with the entry of the global economy into the "lull" stage, the renewable energy sector has shown an increase in production by 7% against the background of a general drop in electricity demand by 5%.

This clearly demonstrates the increasing role of alternative energy sources in the future. And it is no coincidence that, according to the forecasts of the International Energy Agency (IEA), investments in the amount of \$ 440 billion per year are expected in the development of the renewable energy sector over the next 10 years. According to the same IEA, only last year the share of energy produced by renewable sources increased by 5% and in the next 5 years an increase of 50% is expected. By 2025, it is expected that green energy will outstrip the amount of electricity generated by burning coal in terms of reproduction. At the same time, solar energy is projected to account for 60% of the growth and wind energy - 30%. China remains the world leader in alternative energy, which has achieved 3.34 times growth over the past 10 years. According to the IEA forecasts, 40% of the growth in the next 5 years will be credited to China. As for the European Union, it has demonstrated an increase in the share of alternative energy in total energy production from 8.5% in 2004 to 19.7% in 2019. By 2030, Brussels intends to increase this share to 27%, while significantly reducing coal-based electricity production. The war in Ukraine also unwittingly made adjustments to the plans of the European Union for the use of natural gas and fuel oil. The importance of green energy has increased even more in this regard. Azerbaijan also has a huge potential for green energy. It should be noted here that a quick transition from traditional methods of generating electricity to environmentally friendly ones is impossible. We need investments, time and great efforts. Oil, gas and coal as energy sources will not be written off overnight. They will still remain, the need for them will remain. Therefore, Azerbaijan has adopted a strategy for a smooth transition from traditional methods to new ones while maintaining a reasonable proportion and realistic pace. In his speeches, President Ilham Aliyev has repeatedly noted the leading role of our country in ensuring the energy security of other states. In particular, speaking at the Gulistan Palace on January 13 during the groundbreaking ceremony of the 240 MW Khizi-Absheron wind farm, the head of state said: "The energy security of our country is fully ensured and the growing exports of natural gas and electricity have a positive impact on the energy security of other countries. But we also need to know that the country is developing rapidly. According to the results of last year, our non-oil and gas industry, that is, the non-oil industry, grew by about 20 percent. The country's population is growing and demand is increasing. Therefore, of course, we must seriously engage in the production of new types of energy" (PH).

2. Materials and methods of research

National leader Heydar Aliyev attached special importance to environmental protection and measures to combat soil erosion. So, he drew attention to these topical issues in his speech at the opening ceremony of the week "Combating Ecology", initiated by the Turkish Foundation for Erosion, Landscaping and Environmental Protection (THEME), which took place on November 27, 1999 in the conference hall of the "Chankaya Pavilion" in Ankara, he said: "The earthly wealth of each A country is its land, forest, forest, sea, water, river, spring, spring. If a person cannot withstand them, his life will undoubtedly become harder and harder every year and human life will also decrease" (Speech at the opening ceremony of the week Baku-2007). The address of the national leader to the participants of the international conference "Preservation of the national cultural and Natural Heritage of Azerbaijan - the program of national Parks", held in Baku on May 1, 2002, shows that "caring for natural resources, protecting the planet's gene pool, environmental health and other problems are separate problems,

although each state seriously considers them, they can only be solved by joint efforts. Special care for the rich resources that nature has given to our country, the protection of such unique treasures for the sake of the future of mankind is one of our main tasks. However, with a sense of regret, I would like to note that the military aggression of neighboring Armenia against our country also dealt a heavy blow to our national cultural and natural resources” (For the international conference Baku-2011). In 2025, renewable energy sources will account for 95 percent of the power generation growth capacity. Unlike renewable energy sources, non-renewable sources of fossil fuels, nuclear and nuclear thermal energy lead to additional warming and pollution of the environment, intensive use of oxygen in the atmosphere, an increase in harmful waste and man-made disasters. For this reason, the countries of the world have recently considered the transition to renewable alternative energy sources as a priority issue. Taking into account the gradual depletion of traditional energy sources and the enormous damage caused to the environment when using them, environmentally friendly alternative (renewable) energy sources are widely used in the developed countries of the world. Among energy sources, the only growth in 2020 is observed in renewable energy. Despite a 5 percent decline in global energy demand in 2021 due to the pandemic, renewable energy production increased by 7 percent. According to the forecast of the International Energy Agency (IEA), an average of \$440 billion is expected to be invested in the renewable energy sector over the next 10 years. The production of alternative energy sources will increase by 50 percent in the next 5 years and will account for 33 percent of global electricity production in 2025. In total, renewable energy sources will account for 95 percent of the increase in electricity generation capacity in 2025. The largest growth is expected in the production of solar and wind energy - 60 percent and 30 percent, respectively. Since 2013, China has maintained global leadership in the development of alternative energy sources. Over the past 10 years, it has managed to increase the capacity of renewable energy sources by 3.34%. According to the forecast of the International Energy Agency, China will account for 40 percent of the growth of renewable energy in the next 5 years.

3. Results of the study

President of the Republic of Azerbaijan Ilham Aliyev, who brought to life all the ideas of the national leader, not only achieved the development of Azerbaijan as a powerful energy state in 20 years, but at the same time, thanks to his resolute and iron will, fully ensured the territorial integrity and sovereignty of our country and created new historical realities under his leadership. Karabakh and Eastern Zangezur occupy their place in the course of Azerbaijan's “green energy”, the integration of the energy network of the liberated territories into a single energy system, strengthening the energy potential of our country and obtaining new opportunities for the successful continuation of the mission of an energy supplier are separate elements. this reality. Despite the fact that Azerbaijan is rich in energy resources, the use of renewable energy sources has always been in the spotlight in Azerbaijan. One of the main goals of the implemented energy security policy is to strengthen the use of renewable energy sources in our country. One of the steps taken to effectively use the potential of renewable energy sources in our country is the adoption in 2004 of the State Program on the Use of Renewable Energy Sources in the Republic of Azerbaijan. The main purpose of this Program, approved by Decree of the President of the Republic of Azerbaijan No. 462 dated October 21, 2004,

is to ensure the creation of new energy capacities at the expense of renewable energy sources available in the country using world experience (Decree of the President of the Republic of Azerbaijan dated 21.10.2004).

The main objectives of the state program are defined as:

- To determine the potential of renewable energy sources in the production of electricity;
- To increase the efficiency of using the country 's energy resources by involving renewable energy sources in the operation;
- To ensure the opening of additional jobs by creating new energy production areas;
- Taking into account the existing total capacity of traditional energy sources in the Republic of Azerbaijan, increasing energy capacity through renewable energy sources and thereby improving the energy security of the country;

Its favorable geographical location and climatic conditions make it possible to widely use environmentally friendly renewable energy sources in Azerbaijan, as well as in developed countries of the world. In addition to saving a large amount of fuel burned at thermal power plants, this will also significantly reduce the amount of waste released into the environment. The use of the country's natural potential, the attraction of alternative energy sources in the production of electric and thermal energy will allow for progressive changes in the further directions of the development of the electric power industry. The potential of renewable energy in Azerbaijan is quite high. In the field of renewable energy sources, targeted work was carried out at the Institute of Physics of the National Academy of Sciences of Azerbaijan, the Institute of Radiation Problems, the Azerbaijan Research Institute of Energy and Energy Projects, as well as the Baku Hydroelectric Power Station. Wind energy is the most profitable among other renewable sources of solar, hydropower, geothermal and biomass energy due to its cost, environmental friendliness and inexhaustibility. There is a great prospect of using wind energy facilities in many regions of Azerbaijan. According to calculations, the Republic of Azerbaijan, due to its geographical location and economic infrastructure, has annual reserves of wind energy of about 800 MW. This reserve means approximately 2.4 billion kWh of electricity per year. This, in turn, means saving about 1 million tons of conventional fuel per year and most importantly, preventing the annual release into the atmosphere of a large amount of waste, including carbon dioxide, which destroys the ozone layer. As a result of long-term observations, it was found that the most favorable wind conditions are on the Absheron Peninsula, the islands of the Caspian Sea coast and the northwestern part of the equator. In the west of Azerbaijan, in the Ganja-Dashkasan zone and in the Sharur-Julfa district of the Nakhchivan Autonomous Republic, the average annual wind speed is 3-5 m/s, therefore, medium-capacity wind power plants can be used in these areas. The Japanese company Tomen, together with the Azerbaijan Institute of Scientific Research and Energy, has installed two towers with heights of 30 and 40 meters on Absheron. A wind farm with a capacity of 30 MW has been installed. The natural and climatic conditions of Azerbaijan open up wide opportunities for increasing the production of electric and thermal energy through the use of solar energy. Thus, the number of hours of sunshine is 2500-3000 hours in the USA and Central Asian countries, 500-2000 hours in Russia and 2400-3200 hours in Azerbaijan. The development of the use of solar energy can partially solve the energy problem in many regions of Azerbaijan. Recently, the Photovoltaic Program (PVP) has become widespread in a number of advanced countries around the world. Azerbaijan's participation in this

program can play an important role in the implementation of this type of energy systems in the region.

The efficiency of solar installations directly depends on the natural climate and geographical location of the country. Thus, the amount of solar energy per 1 m² of the earth's surface during the year is 1500-2000 kWh in the USA, 800-1600 kWh in Russia, 1200-1400 kWh in France, 1800-2000 kWh in China and 1500 kWh in Azerbaijan -2000 kWh. As can be seen, the amount of solar energy coming to the territory of Azerbaijan, It surpasses other countries, which can be considered as one of the criteria for the effectiveness of attracting investments in the use of solar energy. The share of the production capacity of hydroelectric power plants in the total energy system of the Republic of Azerbaijan is 17.8 percent. The country has ample opportunities to exploit the hitherto untapped reserves of hydropower. As a result of the research conducted in this direction, the total hydropower potential of the rivers of the Republic of Azerbaijan is 40 billion kWh and the technically profitable potential is 16 billion kW.s. has been determined, of which 5 billion kW.s. is the share of small hydroelectric power plants. The construction of hydroelectric power plants plays an important role in solving issues of national importance, such as the regulation of flood waters, the production of environmentally friendly electricity and the creation of the same irrigation systems. Dozens of small hydroelectric power plants can be located on rivers and water management facilities in the Republic of Azerbaijan, the energy generated by them amounts to 3.2 billion dollars per year. In the near future, it is considered advisable to build 61 small hydroelectric power plants. These hydroelectric power plants can be located on irrigation canals, on rivers being cleaned and near reservoirs under construction. In the country, the use of microelectric power plants in the power supply of residential areas and facilities located far from power transmission lines and substations of the Unified Energy System may provide an opportunity to solve other social issues in addition to electric power problems. The rapid development of industry, agriculture and social services in Azerbaijan opens up new opportunities for energy production using biomass! The following types of biomaterials are available in the country:

- Combustible industrial waste;
- Waste from forestry and wood processing enterprises;
- Agricultural waste and waste of organic compounds;
- Household and municipal waste.

The conducted research shows that most of the composition of industrial waste in all sectors of the economy is made up of biomass substances. From these biomass substances, biogas, biofluid and solid biomass can be obtained, which are used in the production of electricity. Thus, more than 2 million tons of solid household and industrial waste are thrown into landfills in Azerbaijan every year. In Baku and other large industrial cities of the country, the export (processing) of solid waste can ensure the elimination of these problems, at least partially. Solutions to these problems have already been found in many European countries. For example, incinerators are being built in densely populated areas, where household waste is burned. The surrounding residential areas are provided with heat and electricity due to the energy generated by incineration of garbage. The remains of burnt waste are widely used as fertilizer to increase soil fertility. As you can see, the construction of such plants of complex importance is very important for Azerbaijan. Geothermal heat is widely used in many countries in industry, agriculture, household and communal services and medicine. The advantage of using geothermal energy sources in energy production and consumption is that their use does not require

large financial resources. The territory of the Republic of Azerbaijan is rich in thermal waters. They cover large territories such as the Bolshoy and Maly Gafaz Mountains, the Absheron Peninsula, the slope zone of the Talysh Mountains, the Kura Depression and the Khazarian Guba region. Part of the heat energy needs in domestic and other premises can be met by using the thermal waters of these territories. On January 13, 2022, the ceremony of laying the foundation stone of the Khizi-Absheron wind farm took place. This station will play an important role in ensuring the energy security of Azerbaijan. Speaking at the groundbreaking ceremony, President Ilham Aliyev stressed the station's role in the field of renewable energy and said: "The creation of this plant once again shows that the Azerbaijani state attaches great importance to the production of renewable energy" (<https://president.az/az/articles/view/55248>).

In April 2021, an "Investment Agreement" was concluded between the Ministry of Energy, Azerenergy OJSC and Masdar Company of the United Arab Emirates on a 230 MW solar power plant project and the solar power plant is currently operating in Karabakh. The agreement provides for the annual production of 500 million kWh of electricity, which, in turn, leads to savings of 110 million m³ of natural gas, reduction of carbon dioxide emissions by 200 thousand tons, creation of new jobs, attraction of new jobs. The agreements concluded with the companies ACWA Rover of Saudi Arabia and Masdar of the United Arab Emirates, for the first time as a result of the implementation of such projects based on foreign investments, will save 330 million m³ of gas during the year. It will prevent the release of more than 600 thousand tons of CO₂ into the atmosphere per year and will also create hundreds of new jobs. The holding of COP 29 in Azerbaijan is a vivid example of Azerbaijan's efforts to transition to a green economy. On March 14, 2024, the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, said at the opening ceremony of the 11th Global Baku Forum "Restoring a Divided World": "Our intention is to contribute to solving climate problems. All the work that we have done on the "green transition" now has practical results. Last October, we opened the largest solar power plant in the Caucasus and Central Asia with a capacity of 230 megawatts. Two more stations are under preparation and construction. By 2030, we plan to have 5,000 megawatts of renewable energy production capacity. This is a very real goal, since numerous agreements and memoranda of understanding have been signed for this purpose" (Azerbaijan Newspaper No.58 (9513), March 15, 2024). Recently, one of the most discussed global problems is the serious reduction of freshwater resources, the construction of sources of water suitable for drinking and irrigation. Currently, due to climate change, environmental problems, an increase in the world's population, inefficient use of water, the problem of water scarcity is finally acutely felt. Experts have been sounding the alarm about this for many years.

According to reports from international organizations, after 2025, this global problem will become a means of political and socio-economic pressure for a number of countries around the world. In such a situation, effective use of existing water resources and reliable protection of water sources from pollution are of great importance. This problem, which worries the whole world, is also observed in our country. In recent years, we have been feeling its effects more strongly. Rza Mahmudov, Head of the Department of Hydrology and Water Resources at the Hasan Aliyev Institute of Geography of the National Academy of Sciences of Azerbaijan, notes that "if there are two natural problems in the world today, then one of them is related to climate" changes and the other is related to water resources. Although these two issues are somewhat related to each other, water resources are highly dependent on climate change. Climate change has occurred

throughout history. It didn't always depend on the human factor. However, recent global climate changes on the planet are associated with both natural and anthropogenic factors" (Azerbaijan Newspaper No.47 (9502), March 1, 2024). Climate change affects water bodies in both ways. "Fresh water reserves in our country mainly consist of rivers and groundwater. Unfortunately, the average annual precipitation in our region has decreased in recent years. Observations of the last 20 years show that the amount of average annual precipitation has decreased to 30-35 millimeters. Rising temperatures and evaporation are one of the reasons leading to a reduction in freshwater sources. For example, if the average long-term water consumption of the Kura River is 450-500 cubic meters per second, then currently water consumption is up to 50-60 percent per month" (Azerbaijan Newspaper No.47 (9502), March 1, 2024). Since irrigation agriculture is widely developed in our country, the reduction of freshwater reserves has a direct impact on agriculture. Therefore, the construction of small reservoirs, the efficient use of water resources and other similar preventive measures are being taken to solve the problem. The use of water resources in the territory of Karabakh will have a positive impact on meeting the demand for water. Thus, water resources in our territories liberated from occupation are important. The water resources of the territory of Karabakh account for 5-7 percent of the total water resources of the country. Recently, research has been conducted in these areas using a new integrated method of water balance. The results of the last three-year study show that by 1990, the water reserves in the territory of Karabakh, which amounted to 2.13 km³, had decreased to 1.87 km³. In other words, the regional effects of climate change have had a negative impact on the territory of Karabakh. In our country, the work on the protection of freshwater resources is carried out by the state, individual institutions and even individual citizens. The main goal is to protect the quantitative and qualitative indicators of water resources, at the same time to prevent their pollution, in short, to eliminate indicators that lead to a decrease in water resources. In addition, small reservoirs should be built, as well as underground, artesian waters and alternative water sources should be used. One of the methods of efficient use of water resources is the transition from traditional irrigation agriculture to a drip irrigation system, therefore, to prevent water loss, it is necessary to replace earthen channels with concrete ones when using river water. It should be noted that most industrial enterprises and car washes use drinking water, which is unacceptable. In developed and developing countries, fresh water is not used for irrigation of gardens and greenery. Water-resistant plants are grown in these areas. At the same time, it can be reused by purifying fresh water. Desalination of the Caspian Sea water is also a measure taken to meet the needs of our country in fresh water. A way out to prevent the irrational use of water resources can be found as a result of joint efforts of countries. Everyone should be careful when using water in everyday life and not waste it. On March 1, 2024, the second ministerial meeting within the framework of the Advisory Council of the Southern Gas Corridor was held at the Gulistan Palace in Baku. President of the Republic of Azerbaijan Ilham Aliyev, who took part in the event, emphasized and said: "We have a huge potential in terms of renewable energy reserves, whether in the Caspian Sea or on land. As you know, we intend to become one of the important exporters of green energy to Europe through the Black Sea Green Cable project. It has already been decided that this project, being comprehensive, will go from windmills on the Caspian Sea to Europe through the bottom of the Black Sea with new power transmission lines. So, these are our plans. Of course, the more renewable energy sources we have, the more we will save on natural gas, which we currently use to generate electricity" (Azerbaijan Newspaper No.48

(9503), March 2, 2024). Climate change in the world affects every person or country. The effects of climate change that concern humanity today are actually the result of problems caused by long-term processes. Thus, the increase in the level of carbon dioxide in the atmosphere for many years has been intensively associated with the burning of oil, gas and coal by humans, as well as with the intensive use of cars. Or that between 2011 and 2020, glacier melting increased by 75 percent compared to the previous 10 years. Last year was marked as the hottest year in the world. All of this is just part of the endless effects of climate change. The Republic of Azerbaijan is currently experiencing a period of economic growth. In the general concept of the country's development, based on large-scale socio-economic reforms, issues of environmental protection, people living in a healthy natural environment and the use of natural resources to improve the well-being of the people occupy an important place. In recent years, the rapid development of the economy, mining and processing industries and the construction complex has been accompanied by increased anthropogenic impact on the environment. Thus, pollution of soil, reservoirs and the atmosphere in some regions exceeds the permissible formative indicators. At the same time, the processes of reducing the supply of drinking fresh water, thinning forests, soil erosion, landslides and desertification have intensified. Pollution of territories with oil, petroleum products, agrochemical products and household waste has increased on the Absheron Peninsula, the Kura-Araz plain and industrial centers such as Baku, Ganja, Sumgait, Mingachevir and Shirvan. The discharge of industrial and domestic wastewater into adjacent territories increased the water in artificial ponds on the Absheron Peninsula and significantly expanded the area of existing lakes. As a result of anthropogenic impact, there is a danger of shrinking forests and the disappearance of natural biocenoses. It is necessary to implement a number of important measures to prevent factors that have a negative impact on the environment and improve the environmental situation in the country, including wastewater treatment to restore the natural quality of reservoirs, air and soil in the coastal strip. Sewerage networks should be restored in the Caspian Sea, the Absheron Peninsula and other regions of the country, polluted lands should be reclaimed, forests and green spaces should be planted in large areas, landscaping and other works should be carried out. Exhaust gases are formed as a result of combustion in the car engine. However, in addition to cars, other sources of exhaust gases are known, for example: industrial enterprises, agricultural machinery (tractors, combines, etc.), water transport (ships, boats, other watercraft with internal combustion engines), aviation (airplanes, helicopters), household heating systems (solid fuel or liquid fuel stoves, boilers). Although there are many sources of exhaust fumes, vehicles remain the main source of pollution. In the early 70s of the last century, scientists discovered that cars accounted for 13 percent of total pollution. Today, this level has increased several times and has already reached 50 percent. In large cities and industrial centers, it can be 70 percent or even higher. As of 2021, there are 1,446,000,000 cars in the world. Every year the number of cars in the world is growing faster. It is almost impossible to determine their exact number on a planetary scale. The fact is that vehicle registration and reporting vary greatly from country to country and some vehicles may not be registered. Therefore, their number can be estimated (Decree of the President of the Republic of Azerbaijan dated 28.09.2006).

According to World Energy Outlook 2022, a flagship publication on analysis and projections by the International Energy Agency (IEA), we are in the middle of the first global energy crisis. 90% of the increased global pressure on electricity prices is due to

high gas, oil and coal prices. The global energy shock makes us realize that this weak energy system, which relies heavily on non-renewable resources, is unsustainable.

4. Discussion of the results

According to the IEA, this energy crisis has stimulated the installation and usage of solar photovoltaic cells and wind energy in 2022, which will continue to grow in the coming few years. These renewables are crucial to cutting down on pollution, generating clean energy and addressing energy security issues. Moreover, the energy created will be cheaper and more affordable. Tapping the huge potential of solar, wind and hydropower can accelerate the energy economy.

Climate change (CC) is an inter-governmental complex challenge globally with its influence over various components of the ecological, environmental, socio-political and socio-economic disciplines (Leal Filho *et al.*, 2021).

It is reported that the immediate attention and due steps might increase the probability of overcoming its devastating impacts. It is not plausible to interpret the exact consequences of climate change (CC) on a sectoral basis (Izaguirre *et al.*, 2021; Jurgilevich *et al.*, 2017), which is evident by the emerging level of recognition plus the inclusion of climatic uncertainties at both local and national level of policymaking (Ayers *et al.*, 2017).

We focused on various articles, with research articles, feedback pieces, short notes, debates and review articles published in scholarly journals. Reports used to search for multiple keywords such as “Climate Change”, “Mitigation and Adaptation”, “Department of Agriculture and Human Health”, “Department of Biodiversity and Forestry” etc. in summary, keyword list and full text have been made. Initially, the search for keywords yielded a large amount of literature (Figure 1).

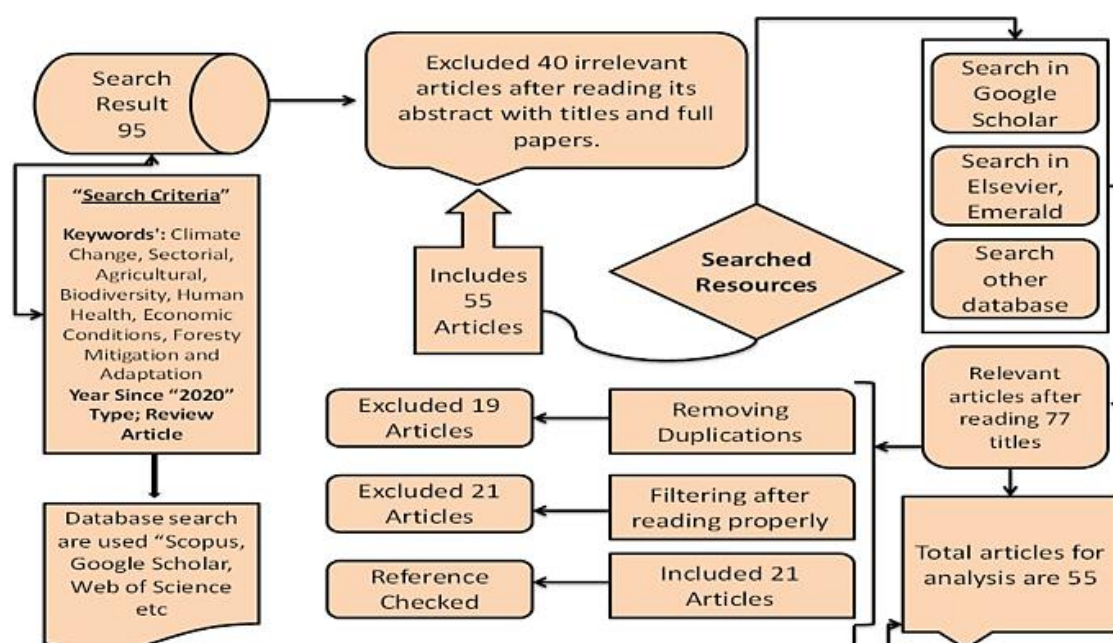


Figure 1. Methodology search for finalized articles for investigations

In this study analyzes closely related areas to provide unique research opportunities in the future. The study also discussed future direction opportunities and research questions by understanding the research findings of climate change and other affected sectors.

Natural and environmental disasters can be highly variable from year to year; some years pass with very few deaths before a significant disaster event claims many lives (Symanski *et al.*, 2021). Approximately 60,000 people globally died from natural disasters each year on average over the past decade (Ritchie *et al.*, 2022; Wiranata & Simbolon, 2021). So, according to the report, around 0.1% of global deaths. Annual variability in the number and share of deaths from natural disasters in recent decades are shown in Figure 2.

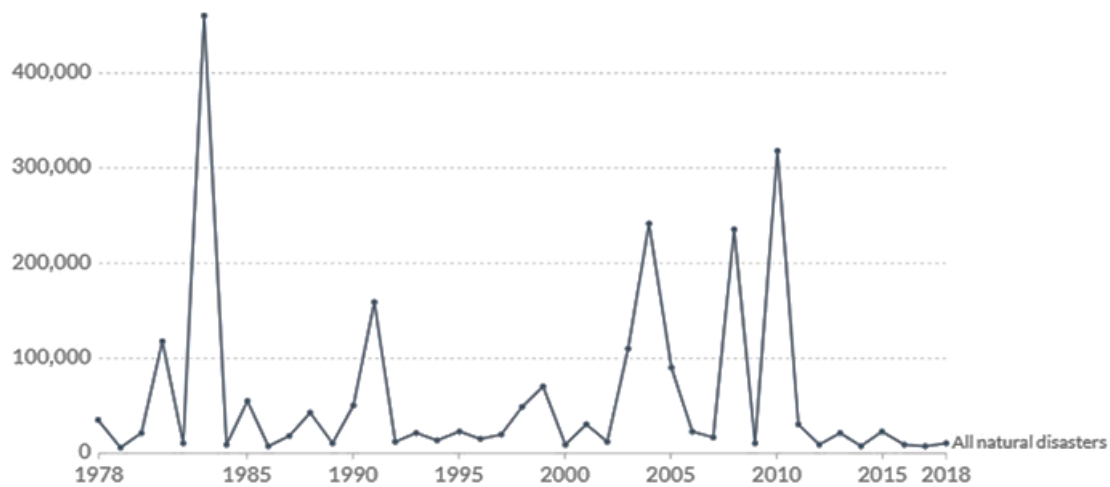


Figure 2. Global deaths from natural disasters, 1978 to 2020

The interior regions of the continent are likely to be impacted by rising temperatures (Dimri *et al.*, 2018; Goes *et al.*, 2020; Mannig *et al.*, 2018; Schuurmans, 2021). Weather patterns change due to the shortage of natural resources (water), increase in glacier melting and rising mercury are likely to cause extinction to many planted species (Gampe *et al.*, 2016; Mihiretu *et al.*, 2021; Shaffril *et al.*, 2018). On the other hand, the coastal ecosystem is on the verge of devastation (Perera *et al.*, 2018). The temperature rises, insect disease outbreaks, health-related problems and seasonal and lifestyle changes are persistent, with a strong probability of these patterns continuing in the future (Abbass *et al.*, 2021; Hussain *et al.*, 2018). At the global level, a shortage of good infrastructure and insufficient adaptive capacity are hammering the most. In addition to the above concerns, a lack of environmental education and knowledge, outdated consumer behavior, a scarcity of incentives, a lack of legislation and the government's lack of commitment to climate change contribute to the general public's concerns. By 2050, a 2 to 3% rise in mercury and a drastic shift in rainfall patterns may have serious consequences (Huang *et al.*, 2022; Gorst *et al.*, 2018). Natural and environmental calamities caused huge losses globally, such as decreased agriculture outputs, rehabilitation of the system and rebuilding necessary technologies (Ali & Erenstein, 2017; Ramankutty *et al.*, 2018; Yu *et al.*, 2021). Furthermore, in the last 3 or 4 years, the world has been plagued by smog-related eye and skin diseases, as well as a rise in road accidents due to poor visibility.

A shift in investment in clean energy over fossil fuels has been observed, as per a report by the IEA, with the projection of clean energy almost doubling in 2023 (Figure 3).

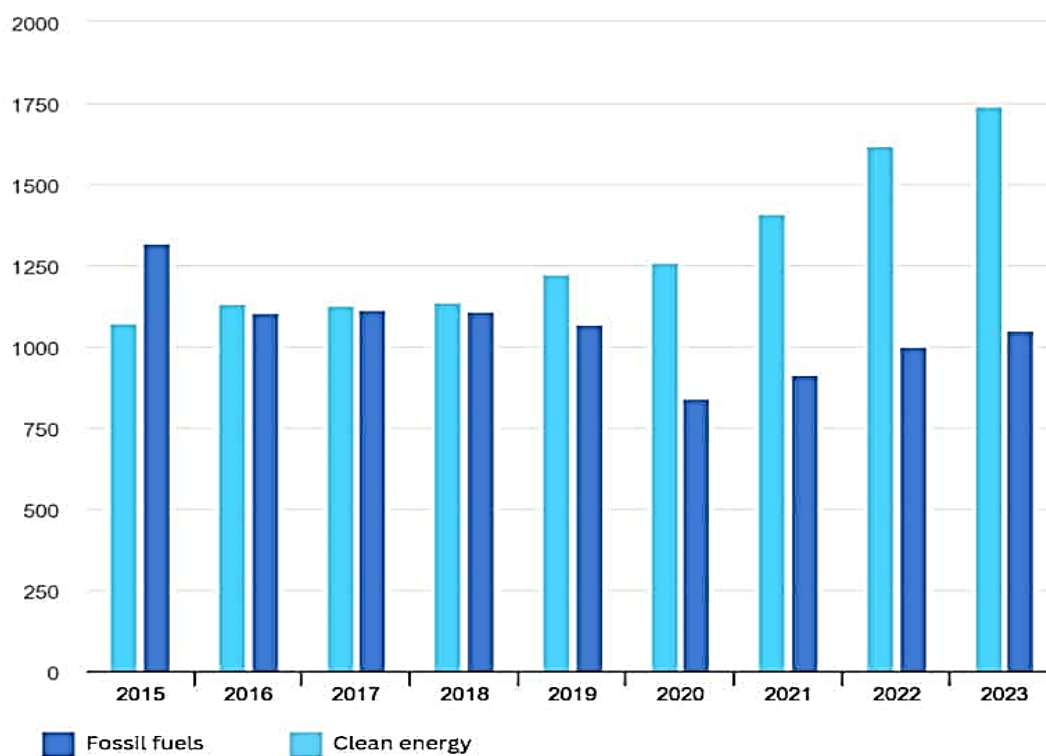


Figure 3. Investment in clean energy over fossil fuels

According to another IEA report, the energy crisis sparked by the Russia-Ukraine war has already steered the renewable capacity to be upped by 40% in Europe by 2024. Increased policy support and affordable installation in Germany, Italy and the Netherlands have made small-scale rooftop solar photovoltaics (PV) more lucrative. Globally, approximately 100 million households will rely on rooftop solar PV by 2030.

Hydropower has been used on a small scale since time immemorial in flour mills. Fast-running water, ocean waves and tides can be leveraged to create energy from water. Water energy contributed to one-sixth of electricity globally in 2020. Though hydropower is the largest renewable source for generating energy, it decreased by 0.4% in 2021 due to intermittent droughts in rich hydropower countries such as Brazil, the United States, Turkey, China, India and Canada, according to the IEA.

Wind can be harnessed by using turbines in windmills to generate energy. It is the second-largest renewable source of energy. Electricity production from wind grew by a record 273 TWh in 2021 (up by 17%), says the IEA, making the growth rate 55% higher if compared with 2020. The leading contributors to wind generation growth in 2021 were China (70%), the United States (14%) and Brazil (7%).

Geothermal power plants release heat that generates inside the Earth's core to produce energy. This energy can be used for generating electricity or for direct usage through heat pumps. According to the IEA's 2021 Annual Report, electricity generation has been overtaken by the direct use of geothermal energy globally. With over 25% of

the world's total online capacity, the US remained at the top globally in installed geothermal capacity.

Supporting policies for green energy across nations is an impetus for gaining energy independence and boosting the economy. The economic assistance plan for growth is promising. Approximately US\$108 billion earmarked for clean energy and \$470 billion in energy-related stimulus packages by individual countries are estimated to be invested (Figure 4).

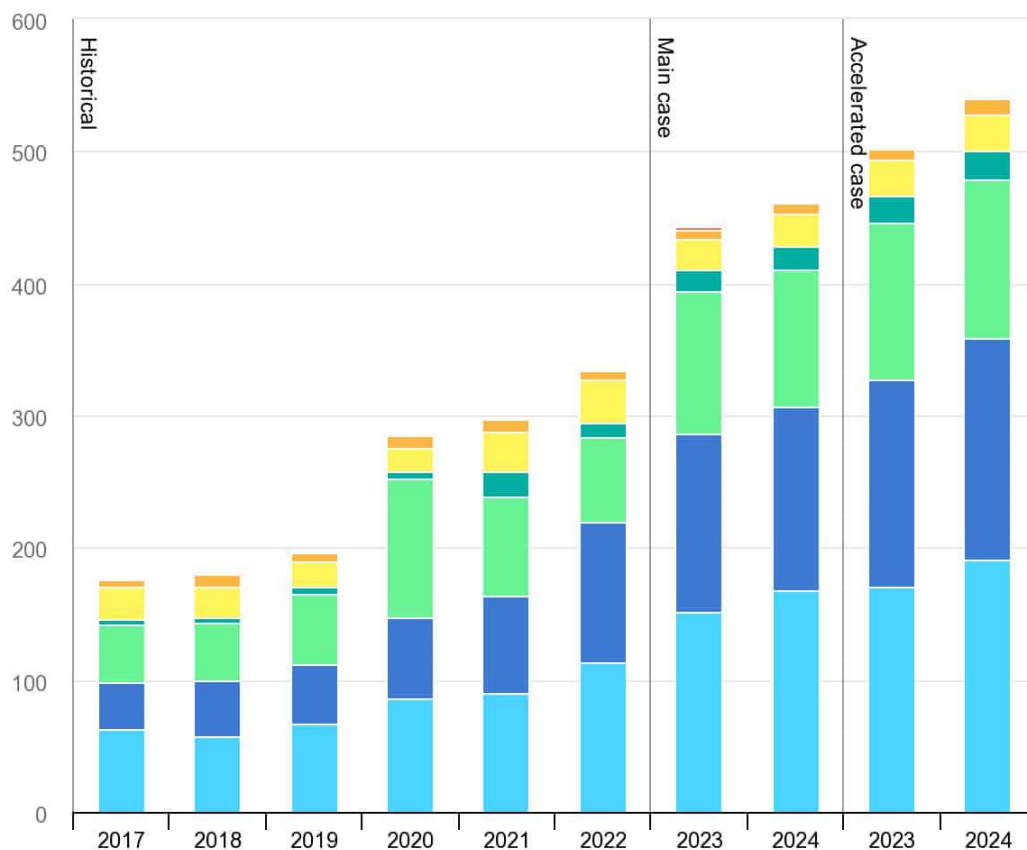


Figure 4. Net renewable electricity capacity additions by technology, 2017-2024
Source: IEA

The IEA also predicts that the implementation of solar PV and wind power will increase significantly this year due to an increase in policy momentum, fossil fuel prices and concerns about energy security. The growth is expected to match the combined power output of China and the United States, with the total global capacity for renewable electricity reaching 4,500 GW.

China is the leader in the number of cars. The number of vehicles in this country is 313 million, in the USA - 116 million 300 thousand and 1 million 774 thousand 77 vehicles are registered in Azerbaijan. In total, 3,138 units of cars in our country are electric vehicles, which is 0.0018 percent of the country's fleet. The vast majority of the fleet (62%) belongs only to Baku. Environmental pollution from car exhaust fumes causes a number of environmental problems:

- Poisoning of vegetation. Plants located near busy roads and large parking lots are more susceptible to this. Harmful compounds settle on leaves, stems, branches and flowers. Such vegetation wilts and dies quickly. If these are fruit trees or shrubs, then they become unsuitable for human consumption;
- Acid rain. The high concentration of exhaust gases in the air also affects the composition of precipitation (rain, snow, fog). They have a high level of acidity, which leads to the following negative situations: decreased productivity, deterioration of soil fertility due to the leaching of important minerals and nutrients, a decrease in the pH of reservoirs (because of this, many aquatic organisms die), pollution of building materials. Climate change.
- Exhaust gases contain CO₂, which is the main greenhouse gas causing global warming. An increase in the concentration of this substance in the atmosphere leads to an increase in the greenhouse effect.

Presently, the amplification of drug resistance cases has made common illnesses like pneumonia, post-surgical infections, HIV/AIDS, tuberculosis, malaria, etc. too difficult and costly to be treated or cure well (WHO, 2018). From a simple example, it can be assumed how easily antibiotic-resistant strains can be transmitted from one person to another and ultimately travel across the boundaries (Berendonk *et al.*, 2015). Talking about the second- and third-generation classes of antibiotics, e.g., most renowned generations of cephalosporin antibiotics that are more expensive, broad-spectrum, more toxic and usually require more extended periods whenever prescribed to patients (Lemery *et al.*, 2021; Pärnänen *et al.*, 2019). This scenario has also revealed that the abundance of resistant strains of pathogens was also higher in the Southern part (WHO, 2018). As southern parts are generally warmer than their counterparts, it is evident from this example how CC-induced global warming can augment the spread of antibiotic-resistant strains within the biosphere, eventually putting additional economic burden in the face of developing new and costlier antibiotics. The ARG exchange to susceptible bacteria through one of the potential mechanisms, transformation, transduction and conjugation; Selection pressure can be caused by certain antibiotics, metals or pesticides, etc. (Figure 5).

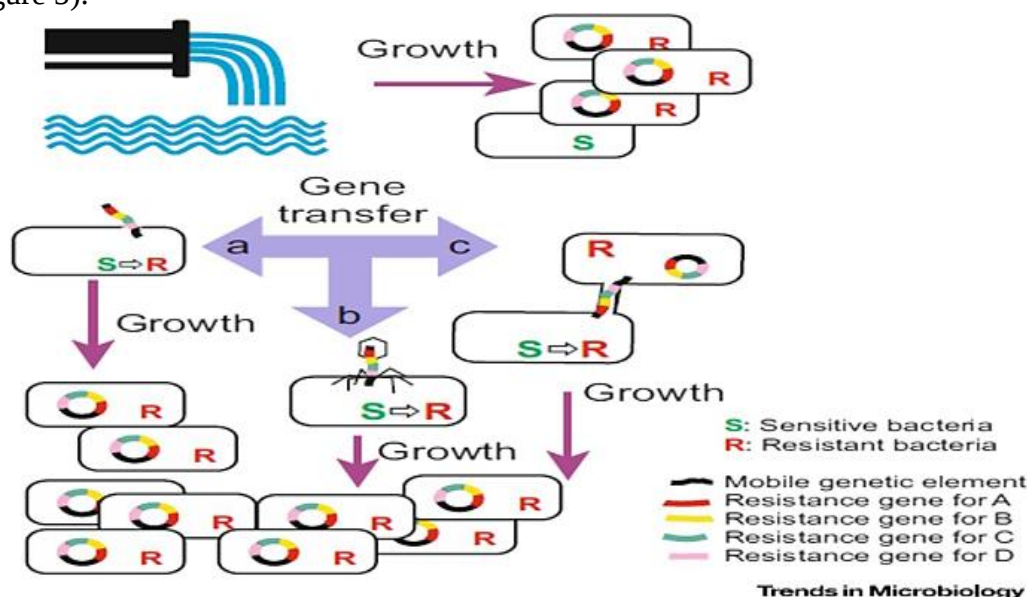


Figure 5. A typical interaction between the susceptible and resistant strains

Climate change is a long-lasting change in the weather arrays across the tropics to poles. It is a global threat that has embarked on to put stress on various sectors. This study is aimed to conceptually engineer how climate variability is deteriorating the sustainability of diverse sectors worldwide. Specifically, the agricultural sector's vulnerability is a globally concerning scenario, as sufficient production and food supplies are threatened due to irreversible weather fluctuations. In turn, it is challenging the global feeding patterns, particularly in countries with agriculture as an integral part of their economy and total productivity. Climate change has also put the integrity and survival of many species at stake due to shifts in optimum temperature ranges, thereby accelerating biodiversity loss by progressively changing the ecosystem structures. Climate variations increase the likelihood of particular food and waterborne and vector-borne diseases and a recent example is the coronavirus pandemic. Climate change also accelerates the enigma of antimicrobial resistance, another threat to human health due to the increasing incidence of resistant pathogenic infections. Besides, the global tourism industry is devastated as climate change impacts unfavourable tourism spots. The methodology investigates hypothetical scenarios of climate variability and attempts to describe the quality of evidence to facilitate readers' careful, critical engagement. Secondary data is used to identify sustainability issues such as environmental, social and economic viability.

5. Conclusion

In conclusion, it should be noted that environmental protection is universal. And to eliminate these problems, a system of measures should be implemented jointly by all countries of the world. Only in this case can Mother Nature be protected and preserved in a state suitable for future generations. In connection with the above, we consider it advisable to implement a number of measures:

- Decarbonization of an oil and gas field;
- Minimizing the importation of vehicles with internal fuel engines into the country and legal measures;
- Application of the principle of “one family - one car”;
- Stimulating the import of electric vehicles into the country;
- Facilitating the transition to a bicycle, which is a convenient means of transportation from the point of view of environmental safety and health and the creation of appropriate infrastructure;
- Gradual abandonment of fossil fuels in the production of electricity in all sectors of the economy;
- Construction of tram and trolleybus lines with clean ecological modes of transport;
- Efficient use of the potential of renewable energy sources in the production of electricity;
- Promotion and implementation of the regime of economical use of freshwater reserves related to climate change.

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