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COP 29 AND AZERBAIJAN: DIGITAL TECHNOLOGIES AND GREEN ENERGY IN GLOBAL CLIMATE GOVERNANCE

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Abstract

This study examines the pivotal role of COP29 in global climate governance, with a particular focus on Azerbaijan's contributions to the green energy transition and the integration of digital technologies in climate protection. COP, under the United Nations Framework Convention on Climate Change (UNFCCC), is a key platform for international cooperation in addressing climate challenges. With Azerbaijan hosting COP29, the event highlights the nation's growing involvement in the global transition toward sustainable energy, driven by its strategic focus on renewable resources like wind, solar, and hydropower. Azerbaijan's commitment to reducing its greenhouse gas emissions by 35% by 2030, aligned with its national policies, emphasizes its ambition to contribute significantly to global climate targets. The study also explores the integration of digital technologies-such as artificial intelligence (AI), Internet of Things (IoT), and blockchain – in monitoring emissions, optimizing energy systems, and fostering climate resilience. These innovations enhance the effectiveness of climate action by improving energy efficiency and transparency in climate finance. By examining Azerbaijan's policies and the potential outcomes of COP29, this paper provides a comprehensive analysis of the nation's role in advancing global climate cooperation and technological innovation in the context of green energy.

Keywords: COP29, Azerbaijan, green energy, digital technologies, climate governance

Introduction

The Conference of the Parties (COP) is an annual series of high-level meetings organized under the framework of the United Nations Framework Convention on Climate Change (UNFCCC). Established in 1992 during the Earth Summit in Rio de Janeiro, the UNFCCC marked the first significant international effort to combat the growing threat of climate change (Vacchi, & others, 2021). The primary aim of the convention was to establish a global framework for addressing the causes and consequences of climate change, encouraging countries to take collective action to reduce greenhouse gas emissions and mitigate the global impact of environmental degradation. The first COP was held in Berlin in 1995, and since then, these meetings have become a platform for global leaders to negotiate agreements and strategies for addressing the climate crisis (COP1. Report of the Conference of the Parties on its first session,1995).

Over the years, the COP has evolved to encompass broader goals, including the establishment of financial mechanisms, promoting sustainable development, and enhancing adaptation efforts, particularly for vulnerable countries. The Paris Agreement, adopted at COP 21 in 2015, is one of the most significant milestones, setting out legally binding commitments to limit global warming to well below 2°C. COP meetings have served as a critical space for countries to reaffirm their commitments, adjust their targets, and introduce new measures to accelerate the green transition (Viñuales, Depledge, Reiner, & Lees, 2017). As the climate crisis intensifies, COP remains central to the international community's efforts to foster climate resilience and create a sustainable future.

In recent years, the significance of the Conference of the Parties (COP) has grown, especially as global climate challenges have intensified. A closer examination of recent COP conferences sheds light on the increasing importance of COP29. COP26, held from October 31 to November 12, 2021, in Glasgow, United Kingdom, marked a pivotal moment in global climate action. One of its primary goals was to strengthen international cooperation and renew commitments to reduce greenhouse gas emissions, with a focus on limiting global warming to well below 2°C, while striving for 1.5°C as outlined in the Paris Agreement. Key outcomes of COP26 included efforts to enhance resilience to climate impacts, reduce emissions across multiple sectors, and address loss and damage associated with climate change. The Glasgow Climate Pact emerged from this conference, emphasizing accelerated progress towards a sustainable and resilient future (BBC. COP26, 2021).

COP27, held from November 6 to November 20, 2022, in Sharm El-Sheikh, Egypt, took significant steps in addressing the impacts of climate change. The most notable achievement was the establishment of a loss and damage fund to support communities affected by climate-related disasters (UN. COP27, 2022). This conference also called for the acceleration of efforts to mitigate emissions and adapt to the changing climate. Looking ahead, COP28, scheduled from November 30 to December 12, 2023, in Dubai, UAE, promises to build on these efforts by emphasizing an equitable global energy transition and advancing international climate cooperation. Among its key initiatives is the UAE Accord, which highlights the importance of maintaining global temperature increases below 1.5°C, in line with the Paris Agreement. Additionally, COP28 will focus on enhancing climate finance, particularly for developing nations, and fostering sustainable development through its Action Agenda (UN. COP28, 2023).

In this regard, the purpose of this study is to explore the role of COP29 in shaping global climate governance, with a particular focus on Azerbaijan's contributions to the green energy transition and the integration of digital technologies in climate protection. The relevance of this topic is underscored by the increasing urgency to combat climate change and the pivotal role of international cooperation in driving sustainable solutions. This study contributes to the literature by providing a comprehensive analysis of COP29's global impact and highlighting Azerbaijan's position in the evolving green energy landscape.

Key objectives of the COP: Fostering global climate cooperation

The Conference of the Parties (COP) is an annual international summit held under the United Nations Framework Convention on Climate Change (UNFCCC), established in 1992 during the Rio Earth Summit. As the world grapples with the growing climate crisis, COP serves as a crucial platform where global leaders, environmental experts, and stakeholders converge to negotiate climate policies and initiatives. Over the years, the primary objectives of COP have evolved, but the overarching goal remains the same: fostering international cooperation to address the causes and effects of climate change. This cooperation is critical for achieving key climate milestones, including reducing greenhouse gas emissions, adapting to the impacts of climate change, and supporting developing countries in their climate-related efforts.

One of the primary objectives of COP is to facilitate global consensus on reducing greenhouse gas emissions, which are the leading cause of global warming. Through initiatives such as the Paris Agreement, adopted at COP21 in 2015, nations have committed to limiting the global temperature increase to well below 2°C above pre-industrial levels, with efforts to further limit the increase to 1.5°C. To achieve these targets, COP facilitates the development and enhancement of Nationally Determined Contributions (NDCs), which outline each country's commitments to reducing emissions. COP provides a platform for countries to review, update, and strengthen these commitments periodically. The collaborative nature of COP encourages nations to increase their ambition levels, driven by the understanding that collective action is essential for curbing the worst impacts of climate change (Slakmon, Gideon, & Keynan, 2023).

Another key objective of COP is to enhance climate adaptation efforts, particularly in vulnerable regions that are already experiencing the devastating effects of climate change. While reducing emissions remains a core priority, adaptation measures are equally important for protecting communities, ecosystems, and economies from climate-related disasters such as floods, droughts, and rising sea levels. COP negotiations emphasize the need for developed nations to provide financial and technical assistance to developing countries to help them build resilience. Instruments like the Green Climate Fund, established at COP16 in Cancun, play a pivotal role in supporting adaptation projects in the Global South. At recent COP meetings, there has been an increasing focus on promoting nature-based solutions and innovative technologies to strengthen climate adaptation. By fostering cooperation among nations, COP enables the sharing of knowledge, resources, and best practices in adaptation strategies, ensuring that the most vulnerable populations are not left behind (Obergassel, Hermwille, & Oberthür, 2021).

Finally, COP aims to address climate finance, recognizing that the global fight against climate change requires significant financial investments. A central theme of COP negotiations has been the need to mobilize resources from developed countries to support both mitigation and adaptation efforts in developing nations. At COP15 in Copenhagen, developed countries pledged to mobilize $100 billion annually by 2020 to assist developing countries in their climate initiatives, a goal that remains crucial in subsequent

COP meetings. Climate finance enables developing nations to invest in renewable energy, build climate-resilient infrastructure, and implement low-carbon technologies. Furthermore, COP facilitates the creation of frameworks that ensure transparency and accountability in climate finance, encouraging countries to honor their financial commitments. In addition to public funding, COP also encourages the involvement of private sector investments, recognizing that a multi-faceted approach is essential to meet global climate targets (Wright, 2021).

To sum up, the key objectives of COP revolve around fostering global climate cooperation by addressing emissions reductions, climate adaptation, and climate finance. These objectives are interlinked, as effective climate action requires not only ambitious commitments but also the necessary financial and technical support to implement them. As the world faces increasing environmental challenges, COP continues to be a vital mechanism for driving international efforts to combat climate change, promoting a sustainable and resilient future for all nations. Through collaborative dialogue and shared responsibility, COP remains at the forefront of global climate governance.

Global impact and benefits of COP 29

The 29th Conference of the Parties (COP29) under the United Nations Framework Convention on Climate Change (UNFCCC) will be held from November 11 to 22, 2024, in Baku, the capital of Azerbaijan. This international event provides a platform for nations from around the world to convene and discuss urgent climate-related challenges, while also collaborating on solutions for both mitigating and adapting to climate change. Azerbaijan's selection as the host for COP29 reflects the country's commitment to climate action on the global stage. President Ilham Aliyev has emphasized Azerbaijan's readiness to host the conference and reiterated the nation's dedication to implementing energy efficiency measures and contributing to international climate initiatives (Kazimbeyli, 2023). This decision highlights Azerbaijan's willingness to take an active role in combating climate change and underscores the importance of multilateral cooperation in addressing global environmental challenges.

As the host of COP29, Azerbaijan is expected to engage in comprehensive planning and coordination efforts to ensure the success of the event. The COP28 Presidency, in collaboration with the newly established COP29 Presidency, will work together to facilitate a transparent and inclusive preparatory process. This process aims to lay the groundwork for productive negotiations and meaningful outcomes during the conference in Baku. Azerbaijan's role as host comes at a critical time when international climate cooperation is needed more than ever to meet global climate goals and strengthen resilience against climate impacts. However, Azerbaijan's hosting of COP29 has also brought attention to the country's energy policies and the challenges it faces. The nation's plans to expand natural gas extraction have raised concerns among environmental advocates, who argue that such expansions could lead to an increase in carbon dioxide emissions and undermine global efforts to combat climate change (Gavin & Mathiesen, 2024). This situation underscores the need for Azerbaijan to balance its energy policies with its commitments to climate action and environmental sustainability.

In the lead-up to COP29, there is significant anticipation surrounding how Azerbaijan will navigate these challenges while also showcasing its commitment to climate action. The conference represents a unique opportunity for the country to demonstrate leadership on the international stage by addressing its energy-related challenges and aligning its policies with broader global sustainability efforts. Azerbaijan's energy policy, particularly its reliance on fossil fuels, will be scrutinized as the international community looks for clear signals of the country's dedication to transitioning towards greener alternatives. Nevertheless, COP29 offers Azerbaijan a platform to reaffirm its role in fostering international cooperation on climate change and to highlight its efforts in advancing the green energy transition. Through dialogue, cooperation, and action, COP29 has the potential to drive progress toward a more sustainable and resilient future (Bichelman, 2023).

In addition to Azerbaijan's role, COP29 will likely focus on broader global priorities such as enhancing climate finance, particularly for developing countries, and ensuring an equitable energy transition. The conference is expected to catalyze international efforts toward fulfilling the goals of the Paris Agreement, particularly the commitment to limit global temperature increases to 1.5°C above pre-industrial levels. The event will also serve as a forum for discussing advancements in climate technologies and innovation, with a special emphasis on the role of digital technologies in monitoring and mitigating the impacts of climate change (Poynting, 2023). As the world faces increasing climate risks, COP29 represents a critical juncture for global climate governance, and Azerbaijan's role as host will be instrumental in shaping the outcomes of this pivotal event.

COP29, to be held in Baku, Azerbaijan, is expected to have a profound global impact by advancing the international climate agenda and reinforcing global cooperation to combat climate change. The conference will bring together world leaders, policymakers, scientists, and climate activists to engage in discussions on how to accelerate the implementation of climate goals outlined in the Paris Agreement. One of the primary global benefits of COP29 will be its potential to push nations toward more ambitious emissions reduction targets, particularly through enhanced Nationally Determined Contributions (NDCs). By providing a platform for countries to review and update their climate commitments, COP29 can catalyze more effective and coordinated international efforts to limit global temperature rise and avert the most catastrophic impacts of climate change.

Moreover, COP29 is likely to focus on addressing climate finance, a critical area for ensuring that developing countries have the resources needed to adapt to and mitigate the effects of climate change. One of the expected outcomes of the conference is the expansion and accessibility of climate finance mechanisms, such as the Green Climate Fund, to support vulnerable nations in building climate resilience (Green Climate Fund. ED remarks at plenary session, 2024). These financial commitments are crucial for bridging the gap between developed and developing countries, ensuring that all nations, regardless of their economic status, can participate in global climate efforts. COP29 could play a key role in ensuring that climate finance pledges are fulfilled, and innovative financing solutions are introduced to enhance the overall effectiveness of climate mitigation and adaptation strategies.

Additionally, COP29 will likely underscore the importance of a just and equitable energy transition, promoting renewable energy as a cornerstone of sustainable development. By focusing on the global transition from fossil fuels to cleaner energy sources, COP29 has the potential to influence national policies and promote investments in renewable energy technologies. The conference will provide a platform to highlight successful case studies and encourage cross-border collaborations on energy innovations. As Azerbaijan hosts the event, the country's position as a strategic energy hub will spotlight the challenges and opportunities of balancing fossil fuel dependency with commitments to green energy. Globally, COP29 can serve as a driving force for accelerating the green transition, fostering collaboration, and ensuring that all countries can benefit from the technological and economic opportunities arising from clean energy advancements.

Azerbaijan's role in the Green energy transition

In recent years, Azerbaijan has increasingly focused on the diversification of its energy sector, recognizing the urgent need to transition from fossil fuels to renewable energy sources. As global efforts to combat climate change intensify, Azerbaijan's role in the green energy transition is becoming more prominent, with the country taking steps to reduce its carbon footprint and invest in sustainable energy solutions. Azerbaijan's renewable energy potential is vast, particularly in wind, solar, and hydropower. The country's geographical location offers favorable conditions for harnessing these resources. The Caspian Sea coastline, for instance, presents excellent opportunities for both onshore and offshore wind energy production, while the sunny climate in various regions of Azerbaijan is ideal for solar energy development. Hydropower has been a traditional renewable source for Azerbaijan, and while it remains an important component of the country's energy mix, there is growing interest in expanding the use of wind and solar energy. Azerbaijan's renewable energy transition is not only a response to global climate imperatives but also a strategy to enhance energy security by diversifying energy sources and reducing dependence on fossil fuels (Aghazada, 2024).

In line with global climate goals, Azerbaijan has committed to reducing its greenhouse gas emissions by 35% by 2030 compared to 1990 levels, as part of its Nationally Determined Contribution (NDC) under the Paris Agreement. This ambitious target highlights the country's commitment to playing a role in the global effort to mitigate climate change. To achieve this goal, Azerbaijan is focusing on the development of renewable energy projects and improving energy efficiency across various sectors (Minister: Azerbaijan will reduce heat-generating waste by 35 percent by 2030, 2016). In 2020, Azerbaijan announced its "Strategic Roadmap for the Development of Public Services and Utilities in the Field of Energy," which outlines key steps for promoting renewable energy and integrating it into the national grid. This roadmap serves as a guiding document for the country's long-term energy strategy, prioritizing investments in clean energy technologies and encouraging international partnerships in the renewable energy sector (Aghazada, 2024).

Azerbaijan's transition to renewable energy is not without challenges. The country's economy remains heavily dependent on oil and gas exports, which account for a significant portion of government revenue and foreign exchange earnings. This dependence poses a challenge to diversifying the energy sector, as shifting away from fossil fuels could have short-term economic repercussions. Additionally, the development of renewable energy infrastructure requires substantial investments, and Azerbaijan faces competition for international financing in a global market where many countries are seeking to expand their green energy portfolios. To address these challenges, Azerbaijan is actively seeking foreign investments and partnerships with international financial institutions, such as the European Bank for Reconstruction and Development (EBRD) and the Asian Development Bank (ADB), to fund renewable energy projects and related infrastructure. Furthermore, the government has also implemented regulatory reforms to attract private sector investments in the renewable energy sector (Dinçer, 2023). In 2021, Azerbaijan adopted a new law on the "Use of Renewable Energy Sources in Electricity Generation," which provides incentives for investors in the form of tax exemptions and guarantees access to the national grid for renewable energy producers (Law of the Republic of Azerbaijan on the use of renewable energy sources in the production of electricity. 2021). These policy measures are designed to create a more favorable business environment for renewable energy projects and to encourage both domestic and international investors to participate in Azerbaijan's green energy transition. Despite the challenges, Azerbaijan's green energy transition holds significant potential for transforming the country's energy sector and contributing to global efforts to combat climate change. The government's commitment to renewable energy development, coupled with its strategic location and renewable energy resources, positions Azerbaijan to play a leading role in the regional and global energy transition. By investing in renewable energy technologies, promoting energy efficiency, and fostering international cooperation, Azerbaijan is taking important steps toward a sustainable and resilient energy future.

Azerbaijan's "Azerbaijan 2030: National Priorities for Socio-Economic Development" has been aligned with the United Nations' 2030 Agenda for Sustainable Development, demonstrating the country's commitment to the international green energy transition (Azerbaijan 2030: National Priorities for socio-economic development, 2021). By integrating global sustainability goals into its national priorities, Azerbaijan aims to foster a balanced approach to economic growth while addressing environmental challenges. This alignment reflects Azerbaijan's dedication to promoting renewable energy, enhancing energy efficiency, and reducing carbon emissions in line with global climate objectives. The country's strategy highlights the importance of sustainable development as a key pillar of its long-term economic and environmental policies.

Azerbaijan's renewable energy potential is vast, particularly in offshore wind, with the Caspian Sea offering an estimated technical capacity of 157 GW. In partnership with international organizations like the World Bank, Azerbaijan is developing roadmaps for utilizing this capacity (Aghazada, 2024). Recent agreements with companies like Masdar and Fortescue Future Industries highlight plans to develop large-scale solar and wind projects, as well as green hydrogen initiatives, further demonstrating the country's dedication to sustainable energy

development. The country has also introduced key legislative frameworks to promote the use of renewable energy. A 2021 law provided a foundation for competitive bidding processes and incentivized the adoption of renewable energy technologies by prosumers. These efforts are part of Azerbaijan's broader vision to position itself as a "clean environment and green growth" country, with significant investments in energy efficiency, sustainable infrastructure, and international green energy collaborations

The Role of Digital Technologies in the Protection of Climate Change

Digital technologies have increasingly become essential tools in addressing the challenges posed by climate change. From improving the efficiency of energy systems to enhancing environmental monitoring, digital innovations play a crucial role in protecting the planet and mitigating the impacts of global warming. The integration of digital technologies into climate action strategies is not only helping to track and reduce emissions but also facilitating the adoption of sustainable practices across various sectors.

One of the primary ways digital technologies contribute to the protection of climate change is through the monitoring of greenhouse gas (GHG) emissions. Advanced technologies, such as satellite imaging, Internet of Things (IoT) sensors, and big data analytics, enable real-time monitoring of environmental conditions and emissions levels. For instance, IoT sensors can be deployed in urban areas, factories, and energy plants to measure CO2 levels, providing accurate data that can inform climate policies and interventions. This data-driven approach allows governments and organizations to better understand their carbon footprints and adjust their operations to meet climate targets. According to a study by the International Energy Agency, the implementation of IoT and AI technologies in energy systems has the potential to reduce global CO2 emissions by up to 15% by 2030 (Perrone & Glena, 2022).

In addition to monitoring, digital technologies are pivotal in mitigating the effects of climate change by optimizing energy consumption and reducing reliance on fossil fuels. Smart grids, powered by artificial intelligence (AI) and machine learning algorithms, enable more efficient energy distribution by balancing supply and demand in real-time. These technologies facilitate the integration of renewable energy sources, such as solar and wind, into national grids, reducing the need for carbon-intensive energy production. The International Renewable Energy Agency (IRENA) estimates that digitalization in the energy sector could lead to energy savings of up to 30% by 2050, significantly lowering global emissions. Furthermore, AI-driven energy management systems can forecast energy demand and automatically adjust the output of renewable energy plants to meet fluctuations, enhancing the reliability of clean energy sources (Xiao & Su, 2022).

Digital innovations also play a critical role in climate adaptation, particularly in vulnerable regions that are already experiencing the adverse effects of climate change. Climate modeling tools, powered by AI, can simulate future climate scenarios based on current environmental data, allowing policymakers to design better strategies for disaster risk reduction. For example, machine learning models can predict the likelihood of extreme weather events such as floods, droughts, and heatwaves, enabling governments to take preventive measures and protect communities from climate-induced disasters. In agriculture, digital technologies are enhancing climate resilience through precision farming techniques. Sensors and drones provide real-time information on soil conditions and crop health, allowing farmers to make informed decisions that optimize water and fertilizer use, thus reducing the environmental impact of agriculture and improving food security in the face of climate change (Xie & others, 2024).

Furthermore, the role of digital technologies in climate change protection extends to social sustainability by promoting public awareness and engagement. Digital platforms, including social media, mobile apps, and online portals, are powerful tools for raising awareness about climate issues and mobilizing public action. For example, the use of mobile applications to track individual carbon footprints encourages citizens to adopt more sustainable lifestyles by providing them with real-time feedback on their energy consumption, transportation choices, and waste production. By making climate data accessible to the public, digital technologies empower individuals to contribute to global climate goals through personal actions, reinforcing the collective effort needed to combat climate change.

Recent trends in the role of digital technologies in climate protection focus on the integration of Artificial Intelligence (AI) and big data analytics into environmental monitoring and climate modeling. AI is now being used to process vast amounts of climate data, enabling more accurate predictions of weather patterns, sea level rise, and other climate-related events. For instance, machine learning algorithms can analyze satellite imagery to detect changes in deforestation rates, ice sheet melting, or urban heat islands, providing real-time insights into the environmental impact of human activities (Alestra, Cette, Chouard & Lecat, 2023). These data-driven insights help policymakers make informed decisions on climate adaptation strategies, enabling proactive responses to emerging threats. Additionally, AI is being employed in energy management systems to optimize the use of renewable energy sources, balance grid demand, and reduce energy wastage (Xie, H., & others., 2024).

Another key trend is the development of digital twin technologies for climate resilience and urban planning. Digital twins are virtual models of physical systems, such as cities or infrastructure, that can simulate various scenarios based on real-time data. For example, cities can use digital twins to predict the impact of rising sea levels or extreme weather events on infrastructure and urban planning. This allows for better preparedness and adaptive planning in the face of climate risks. Moreover, blockchain technology is emerging as a tool for enhancing transparency in climate finance, particularly in tracking carbon credits and ensuring accountability in global climate agreements. Blockchain enables secure, transparent tracking of carbon offsets and renewable energy certificates, providing a more reliable way to verify climate action efforts by governments and corporations (Table 1).

Table 1. Newest Trends in Digital Technologies for Climate Protection

Trend	Description	Impact
AI and Big Data in Climate Modeling	AI and big data analytics are used to improve climate predictions and analyze environmental data for more accurate forecasting.	Improved accuracy in climate forecasting and better policy decisions based on reliable data.
Digital Twin Technologies	Digital twins simulate real-world systems, allowing for predictive urban planning and resilience building against climate risks.	Enhanced urban resilience and infrastructure planning in the face of climate challenges.
Blockchain for Climate Finance	Blockchain enhances transparency in carbon trading, tracking climate finance and ensuring accountability in emissions reductions.	Increased transparency and trust in carbon markets, ensuring credible climate action.
IoT for Real-Time Environmental Monitoring	IoT sensors provide real-time data on environmental factors like air quality, temperature, and CO2 levels, helping in adaptive strategies.	Real-time monitoring enables quicker responses to environmental changes and disaster risk reduction.
AI in Renewable Energy Management	AI systems optimize the integration of renewable energy sources, balancing grid supply and demand to reduce energy wastage.	Better efficiency in energy systems, promoting greater use of renewables and reducing carbon emissions.

Source: It was prepared by the author through various analyses.

Looking to the future, the role of digital technologies in climate protection is expected to expand significantly as advancements in Artificial Intelligence (AI), blockchain, and Internet of Things (IoT) continue to evolve. AI is predicted to play an even more central role in optimizing energy systems, managing large-scale renewable energy grids, and refining climate models for better predictive accuracy. In the coming decades, AI-powered climate models could offer more precise long-term projections, enabling more proactive adaptation strategies. Additionally, blockchain is likely to become a standard in climate finance, ensuring transparency and accountability in carbon credit markets and international climate agreements. The growing integration of digital twin technologies will also enable cities and industries to simulate and test climate scenarios, improving resilience planning. As these technologies mature, they will be crucial in accelerating the global transition to a more sustainable, low-carbon economy, while also facilitating the development of smart cities, green infrastructure, and enhanced environmental governance.

Conclusion

As a conclusion, COP (Conference of the Parties) plays a central role in fostering international collaboration to address climate change. The key objectives of COP have evolved over the years, emphasizing emissions reduction, climate adaptation, and climate finance. COP29, to be held in Baku, Azerbaijan, is expected to advance these goals, with a focus on global energy transition and increased climate finance mechanisms for developing countries. Azerbaijan has committed to reducing its greenhouse gas emissions by 35% by 2030 and is focusing on diversifying its energy sector. The country is leveraging its renewable energy potential, particularly in wind, solar, and hydropower. However, Azerbaijan's reliance on fossil fuels remains a challenge, and the country is seeking international partnerships and investments to overcome financial barriers and advance its renewable energy agenda.

In conclusion, Azerbaijan's role in the green energy transition is multifaceted, involving both domestic efforts to reduce emissions and international cooperation to promote sustainable energy solutions. While the country faces challenges related to its dependence on fossil fuels, it is making significant strides in diversifying its energy mix and investing in renewable energy infrastructure. As Azerbaijan prepares to host COP29, its leadership in the green energy transition will be in the global spotlight, offering the country a unique opportunity to demonstrate its commitment to climate action and to contribute to the global effort to build a more sustainable and climate-resilient world.

Digital technologies are increasingly playing a pivotal role in climate governance. Key areas of impact include real-time monitoring of greenhouse gas emissions, optimizing energy consumption, and enabling more accurate climate modeling. Technologies such as AI, IoT, and blockchain are revolutionizing climate strategies, enhancing transparency in climate finance, and promoting resilience against climate risks. In conclusion, digital technologies are indispensable in the fight against climate change, offering innovative solutions for monitoring, mitigating, and adapting to the environmental crisis. From enhancing energy efficiency and reducing emissions to improving climate resilience and fostering public engagement, digital tools are reshaping the way societies respond to the climate challenge. As the world moves towards achieving the Sustainable Development Goals (SDGs), particularly SDG 13 on climate action, the integration of digital technologies into climate strategies will be critical for ensuring a sustainable and resilient future. Governments, private sectors, and international organizations must continue to invest in and scale up the deployment of these technologies to accelerate global climate action and protect the planet for future generations.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The authors confirm being the sole contributor of this work and have approved it for publication.

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References and notes:

Aghazada, A. (2024). The role of renewable energy resources in the future of Azerbaijani economy. Istanbul University press. (in Turkish)

Alestra, C., Cette, G., Chouard, V., & Lecat, R. (2023). How can technology significantly contribute to climate change mitigation? Applied Economics, 56(41), 4925-4937. doi.org/10.1080/00036846.2023.2227416

Azerbaijan 2030: National Priorities for socio-economic development. (in Azerbaijani). (2021). URL: https://president.az/az/articles/view/50474

BBC. COP26: What was agreed at the Glasgow climate conference? BBC, (2021). URL:https://www.bbc.com/news/science-environment-56901261

Bichelman, J. (2023) Azerbaijan to Host COP29 in 2024, Despite Global Tensions and the Country's Major Oil Reserves. Greenmaters.URL:https://www.greenmatters.com/environmental -leaders/where-is-cop29-taking-place

COP1. Report of the Conference of the Parties on its first session, held at Berlin from 28 March to 7 April 1995. Part one: Proceedings. (1995). URL: https://unfccc.int/sites/default/files/resource/docs/cop1/07.pdf

Dinçer, M. (2023). The role of Azerbaijan as the EU's energy supplier: a secondary alternative partner in natural gas. European Politics and Society, 25(4), 624–642. doi.org/10.1080/23745118.2023.2288867

Law of the Republic of Azerbaijan on the use of renewable energy sources in the production of electricity. (2021). № 339-VIQ. (in Azerbaijani) URL: https://e-qanun.az/framework/47842

Gavin, G., & Mathiesen, K. (2024). Azerbaijan president: COP29 won't stop us investing in 'god-given' gas. Politico. URL: https://www.politico.eu/article/azerbaijan-president-ilham-aliyev-cop29-climate-change-gas/

Green Climate Fund. ED remarks at plenary session, The COP29 landscape on finance and means of Implementation and ambition. URL:https://www.greenclimate.fund/speech/ed-remarks-plenary-session-cop29-landscape-finance-and-means-implementation-and-ambition

Kazimbeyli, Y. (2023). Azerbaijan to Host Global COP29 Climate Summit in 2024. Caspian News, URL:https://caspiannews.com/news-detail/azerbaijan-to-host-global-cop29-climate-summit-in-2024-2023-12-13-51/

Minister: Azerbaijan will reduce heat-generating waste by 35 percent by 2030. (2016) (in Azerbaijani) URL: https://az.trend.az/azerbaijan/society/2686364.html

Obergassel, W., Hermwille, L., & Oberthür, S. (2021). Harnessing international climate governance to drive a sustainable recovery from the COVID-19 pandemic. Climate Policy, 21(10), 1298-1306. doi.org/10.1080/14693062.2020.1835603

Perrone, N. M., & Glena, N. S. (2022). Technology transfer and climate change: a transnational law analysis. Transnational Legal Theory, 13(2–3), 261–286. URL: https://doi.org/10.1080/20414005.2023.2171997

Poynting, M. (2023). What is COP28 and why does it matter for the future of the planet. BBC. URL: https://www.bbc.com/portuguese/articles/ce9l811l8j1o

Slakmon, B., Gideon, I., & Keynan, O. (2023). Framing engagement and public participation in local climate conferences. Environmental Education Research, 1–20. URL: https://doi.org/10.1080/13504622.2023.2295783

UN. COP27. (2022). United Nations Climate Change. URL: https://unfccc.int/event/cop-27

UN. COP28 UAE. (2023). URL: https://www.cop28.com/en/

Vacchi, & others. (2021). Technological sustainability or sustainable technology? A Multidimensional Vision of Sustainability in Manufacturing. Sustainability, 13(17). URL: https://www.mdpi.com/2071-1050/13/17/9942

Viñuales, J. E., Depledge, J., Reiner, D. M., & Lees, E. (2017). Climate policy after the Paris 2015 climate conference. Climate Policy, 17(1), 1–8. URL: https://doi.org/10.1080/14693062.2016.1242060

Wright, C. (2021). Local government leading climate action. The round table, 110(5), 587–596. URL: https://doi.org/10.1080/00358533.2021.1985270

Xiao, D., & Su, J. (2022). Role of technological ınnovation in achieving social and environmental sustainability: Mediating roles of organizational ınnovation and digital entrepreneurship. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9001986/.

Xie, H., & others. (2024). Sustainable development: Uncovering the synergy between natural resources, clean technologies, and economic progress. Resources Policy, Volume 88. URL: https://www.sciencedirect.com/science/article/pii/S0301420723010917.