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Investment in Renewable Energy – The Case of Algeria

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Abstract: Algeria possesses substantial renewable energy potential, including solar, wind, and geothermal sources, thereby presenting opportunities to diversify its energy portfolio, which has traditionally been dependent on fossil fuels. The government's strategic trends aim to augment its renewable capacity by 2035 and enable prompt energy transition, targeting both domestic consumption and export markets. However, progress is impeded by financial, regulatory, and infrastructure challenges, as well as by the high costs associated with imported technologies and administrative procedural delays. This contribution will underscore Algeria's principal renewable energy projects and potential, emphasising governmental initiatives to attract investment through new legislation and to address the obstacles that must be surmounted to realise the renewable energy targets set for 2035.

Keywords: Algeria; Energy Transition; Investment; Renewable; Solar and Wind power.

1. Introduction

The drive for renewable energy is crucial to achieving the global goal of a better future, as demonstrated by the 195 Parties at the UN Climate Change Conference (COP21), which committed to the 2016 Paris Agreement on Climate Change (*The Paris Agreement | UNFCCC*, n.d.)Transitioning from fossil fuels to renewable energy sources, such as hydropower, solar energy, and wind, is essential for achieving social, economic, and environmental progress. This transition will affect the lives of a billion people who currently lack access to electricity, create new job opportunities, and significantly reduce air pollution that affects the lives of millions each year. The yearly Global Trends in Renewable Energy Investment report highlights this progress, showing the sector's rapid growth and unexploited potential.

Algeria, a prominent North African country and a developing economy, benefits from its strategic location, strong economic attributes, and abundant energy resources. It has continually developed and introduced various legal measures to attract investment in renewable energy, creating a prosperous and reliable investment climate that supports business sustainability, enables the energy transition and improves the domestic economy.

Throughout this paper, we aim to shed light on Algeria's potential for renewable energy and the policies that foster investment in these energy sources, encompassing various elements such as financial measures, incentives, facilitative actions for the energy transition, decrees, and institutional frameworks. Furthermore, we will endeavour to address one of the pivotal

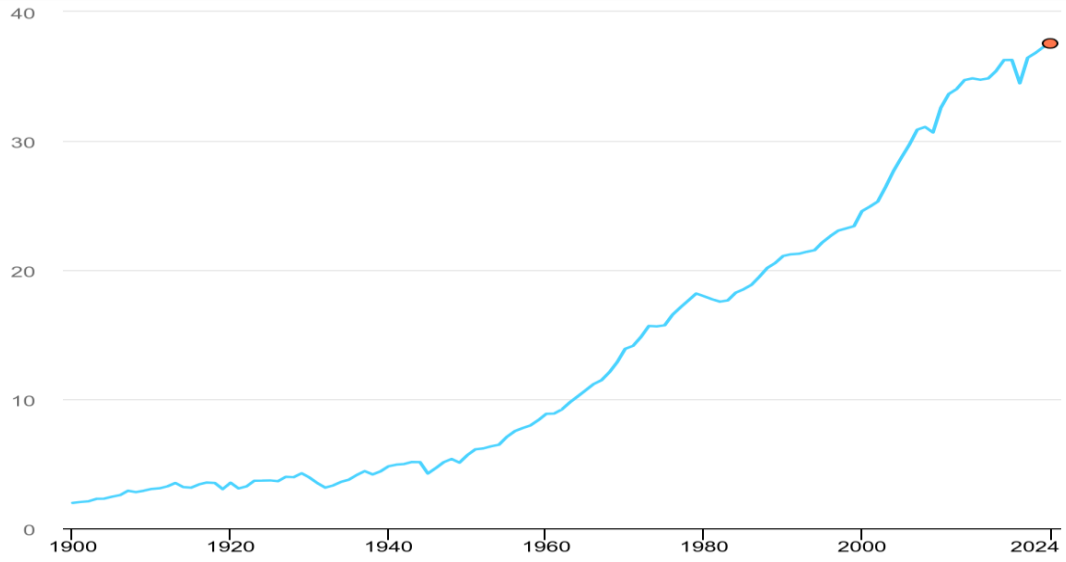
questions for foreign investors: Is the legal framework for investing in renewable energy sufficiently attractive and practical? Additionally, what is Algeria's potential in renewable energy that renders it a worthwhile investment opportunity?

2. Understanding the importance of renewable energy

The success of the energy transition depends on shifting the global energy sector from fossil fuels to zero-carbon alternatives by the latter half of this century. This transition seeks to cut energy-related carbon dioxide (CO2) and greenhouse gas (GHG) emissions. These emissions primarily originate from the combustion of fossil fuels, which have increased significantly since the Industrial Revolution. A small number of countries produce most of the world's GHG emissions. China, the United States, and the European Union are the top three emitters in absolute terms. Per capita GHG emissions are highest in the United States and Russia. Figure 1 below shows the trend of these alarming carbon dioxide emissions since 1900. Approximately 50 billion tons of GHG emissions are released annually, with about three-quarters of global CO2 emissions originating from the energy sector (IEA, 2025).

Thereby mitigating climate change and limiting the rise in global temperature to within 1.5°C of pre-industrial levels. (IRENA 2050 Outlook, 2025)

Fig. 1. Global CO2 emissions from energy combustion and industrial processes and their annual change, 1900-2024.

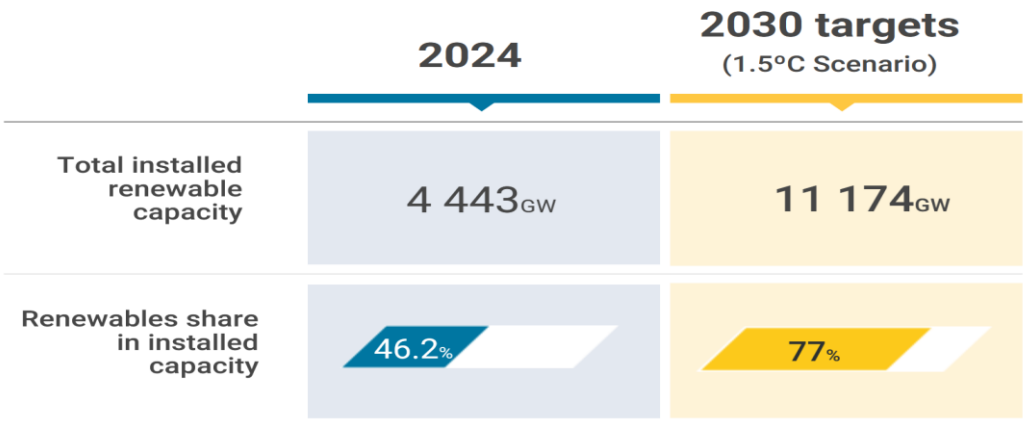


Source: International Energy Agency (2025)

The goal of tripling renewable energy capacity is a strong sign of the International Renewable Energy Agency's (IRENA) efforts. Reaching a threefold increase in global renewable energy capacity to surpass 11,000 gigawatts (GW), or 11 terawatts (TW), by 2030 requires an average annual growth rate of over 1,000 gigawatts until then. Figure 2 below illustrates this goal graphically. (Tracking Progress, 2025)

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Fig. 2. Progress and plan in renewable power capacity deployment by 2030



Source: IRENA 2025

3. Potential of different renewable energy sectors in Algeria

Algeria possesses ample renewable energy resources, presenting opportunities to diversify its energy mix, currently dominated by fossil fuels. The country's strategic plans aim to increase installed renewable capacity by 2035 to reach 15 gigawatts (وزارة الطاقة والمناجم والطاقات المتجددة, 2025) targeting both local use and exports. The solar and wind sectors are prioritised within development initiatives, with a focus on localising component manufacturing to support the growth of the national industry.

Solar energy remains the most frequently mentioned sector in Algerian energy diversification strategies, owing to its remarkable potential and its relative technological maturity (Yaiche et al., 2014). The country is home to some of the world's highest solar irradiance levels, with the capacity to generate 1,850 to 2,100 kilowatts per hour and up to 3,500 hours per year in a significant portion of the Saharan region, and exploitable potential estimated to be among the highest worldwide.(US International Trade Administration, 2023) This geographical position confers on Algeria a distinct comparative advantage over many nations undertaking similar transitions. Additionally, authorities have acknowledged this reality by prioritising solar energy as a key element in achieving the objectives outlined in national plans for 2035.

Renewable energy, often referred to as "sustainable energy", is widely recognised as essential for sustainability, security, and a high standard of living. It encompasses energy generated from solar radiation, wind, biomass (such as plant crops), rivers (hydropower), ocean waves, tides, geothermal heat, and other sustainable sources. These are all encompassed within the following general definition:

"Renewable energy is energy obtained from naturally repetitive and persistent flows of energy occurring in the local environment."

A prominent example is solar energy, which varies daily; however, it is inherently variable and not a constant source. Likewise, plants exhibit an annual growth cycle, during which they store energy from sunlight within their structures and subsequently release it through combustion and metabolic processes. In the case of renewable energy resources, the energy is already traversing the environment as a current or flow, regardless of whether a device is present to intercept and utilise it. The term 'local environment' pertains to the location of such a device for intercepting the flow. The natural energy flows, commonly harnessed for energy purposes, such as energy derived from these flows, may also be classified as green or sustainable energy.

In contrast, non-renewable energy is "the energy obtained from static stores of energy that

remain underground unless released by human interaction."

Examples include nuclear fuels and fossil fuels such as coal, oil, and natural gas. These sources contain energy as an inherent potential, but external intervention is necessary to start the energy supply for practical use.(Twidell & Weir, 2015)

Renewable energy and fossil fuels differ in their origin, environmental impact, availability, and economic implications. A key difference is that fossil fuels are finite resources, formed from ancient biomass over millions of years under high pressure and temperature, thereby limiting their supply. Conversely, renewable energy derives from ongoing flows, such as solar radiation, wind, or hydrological cycles, which are directly or indirectly driven by solar activity.

Both environmental concerns and political motivations drive the demand for renewable energy, further fuelled by ongoing efforts to transition to cleaner energy sources that emit fewer greenhouse gases. The latest International Energy Agency (IEA) report shows a 45% increase in renewable energy demand in 2020, despite pandemic-related challenges. Countries including the USA, China, Brazil, Argentina, Germany, Australia, Singapore, Indonesia, Malaysia, South Africa, and Kenya are increasingly integrating renewables into their energy systems, particularly in electricity generation and transportation.(Abdul Latif et al., 2021)

The main environmental benefits of renewable energy include lower greenhouse gas emissions, conservation of natural resources, and a reduced impact on biodiversity. Conversely, the main drawbacks tend to be economic and financial, including high upfront costs, intermittency issues in some cases, and technological or logistical hurdles. As mentioned by Freires et al. (2023) The decision is no longer between "expensive energy" and "cost-effective energy," but between "bearing the costs of sustainability" and "endangering the continuity of life on Earth."

Recent developments include large-scale projects, such as the 400 MW photovoltaic initiative, which extends across the highlands and southwest regions. The setup includes 13 power plants with a combined capacity of 265 MW in the plateaux region, along with seven additional plants situated in Adrar and In Salah. This spatial distribution reflects a dual strategic approach: maximising the sunlight capture in the Sahara while strategically relocating production closer to local consumption zones. Additionally, solar thermal generation is scheduled via concentrated solar power plants equipped with storage facilities, with initial testing traces dating back to the Hassi R'Mel pilot projects that implemented gas-solar coupling.

These technologies enhance the management of intermittency by utilising thermal storage, providing more flexibility than relying solely on photovoltaics. An important aspect is their projected economic impact. Studies show that increasing solar power capacity could significantly reduce hydrocarbon imports for electricity, thereby improving the trade balance.

International projections indicate that large-scale deployment of solar power in Algeria could surpass domestic consumption and enable exports to neighbouring regions or Europe through high-voltage interconnections. Initiatives like Desertec outlined this possibility as early as 2010, but were abandoned by Algeria in 2022 due to this eco-energy Algerian-German project in southern Algeria "…the partnership was not economically viable and violated the basic foundations, including economic profitability and the win-win partnership on which any economic project is based," as per Mr. Mahmah Bouziane, the General Secretary of Algerian Energy Ministry, where he also announced the raise of "*Solar 1000*" project, where over 111 international renewable energy operators have shown their interest in investing in this 1,000 MW photovoltaic power plant project. (Partenariat: Les Raisons de l'abandon du Projet « Desertec » – Algeria-Watch, 2022)

Wind energy plays a vital role in Algeria's energy mix, though it is not yet fully utilised. The country's climate and geography offer significant wind potential to its regions,

particularly in the southwest, where average wind speeds exceed 6 m/s, making it an ideal location for industrial projects.

Development of notable achievements is still ongoing. The Adrar wind farm serves as a significant example, situated in an area with high wind potential and launched after nearly three years of effort. Additional pilot projects have been explored along the northern coast, where winds are more consistent year-round but occasionally lack the strength needed for optimal load factors. Comparing coastal and desert regions highlights a trade-off between flow stability and wind intensity. Economically, multiple analyses indicate that the levelized cost of electricity from onshore wind is increasingly comparable to, or even lower than, that of natural gas in some global markets.

This approach to key renewable energy sources enables various strategies, such as combining wind and solar power in isolated locations or focusing on industrial hubs supplied directly by nearby wind farms. Future research should aim to develop hybrid models that consider seasonal variability, logistical efficiency, and social acceptance. These models can help determine the most effective locations and methods for investment in Algeria's growing energy sector.(Sari Hassoun Salah Eddine, 2019)

4. Historical evolution of investment law in Algeria

During a period characterised by the expansion of cross-border economic activities and a heightened demand for energy, governments tend to compete by establishing favourable conditions to attract investments in renewable energy, which, in turn, generate benefits for the country’s economy across various sectors and activities.

Economic and financial policies, along with legal texts, are vital elements of the business and investment environment. They serve as indicators of the government's willingness and commitment to investors. These texts, typically established under the Investment law, are shaped by accumulated experience and lessons learned from previous loopholes, failures, or international geopolitical trends.

Algeria has been working continuously since the 1990s to improve its investment laws and facilitation measures, aiming to compete effectively with increasing local and foreign investments. These efforts have had a positive impact on the economy by reducing reliance on fossil fuels, encouraging private-sector participation, generating wealth, and helping reduce unemployment. Various key political and economic players and institutions have been involved in creating a more favorable and supportive environment for both domestic and foreign investors, aiming to attract and facilitate investment in the country.

- Decree 93-12 abolished all previous investment laws except those concerning oil and gas, though it somewhat overlooked the renewable energy sector. It represented Algeria's first modern investment law, following the country's shift toward a market-driven economy that encouraged foreign investment through incentives and protections. The decree was issued during a turbulent period of political unrest, marked by the rise of radical groups that negatively affected the economy and discouraged foreign investment. This period also saw an oil price shock, with prices dropping below $20 per barrel.

- Law No. 02-01, enacted on February 5, 2002, addresses electricity and public gas distribution via pipelines. It liberalises these sectors and promotes electricity generation from renewable sources, including its grid integration. The law ensures renewable energy purchase guarantees and covers any additional costs associated with them. It also establishes a special regime for renewable energy-based electricity production, serving as an exception to the standard framework. According to this law, especially Article 26, Decree No. 04-92 on diversification costs (feed-in tariffs) offers preferential rates for renewable energy electricity, covering connection costs and providing a green bonus of 100 to 300% of the

cost per kWh.(Hamaz & Ait Taleb, 2020)

- Ordinance No. 01-03 on the Development of Investment in Algeria significantly improved the guarantees and incentives offered to investors. This order introduced several beneficial features, primarily legal guarantees and financial incentives for investors, which were previously lacking in legislation and are crucial for those in the renewable energy sector. Additionally, this ordinance marked the creation of the National Investment Council (CNI) as a strategic body with a broader composition that includes several ministries. Its primary role was to promote investment by serving as a body for planning, proposing, and initiating projects. However, it has expanded its role to include intervention in administrative tasks that are under the authority of the National Agency for Investment Development, especially in approving major incentive decisions for investments of five billion Dinar or more and projects of significant importance to the national economy, such as renewable energy projects, *Desertec*, among others.

- Law No. 04-09, enacted on August 14, 2004, emphasises advancing renewable energies within sustainable development. It establishes a national initiative to promote renewable energy, offers incentives for related projects, and creates a National Renewable Energy Observatory to encourage and develop renewable energy sources.

Algeria has strengthened its regulations on new and renewable energy through the release of various legislative texts, primarily interministerial and administrative decrees, to encourage investment in general and in renewable energy in particular.

The program welcomes both public and private investments from domestic and international sources. It receives backing from the Algerian government, primarily through the National Fund for Renewable Energy and Cogeneration (FNERC). To encourage investment, 20-year guaranteed purchase tariffs are established for the photovoltaic and wind power sectors.

Projects in other sectors will be financed at rates between 50% and 90%, depending on the technology and sector, by the FNERC, which funds this through a 1% levy on oil royalties. Sectors without guaranteed purchase tariffs can also benefit from the FNERC measures. The "guaranteed feed-in tariff / tarifs d'achat garantis" system has been implemented to provide renewable energy producers with tariffs that ensure a fair return on investment (ROI) over a 20-year eligibility period for solar and wind power, and 15 years for cogeneration. After these periods, installations no longer qualify for these incentives due to depreciation, but their production will continue to be paid at the standard energy rate.

The supporting measures for the renewable energy program include subsidies to balance additional costs imposed on the national electricity system. Financial laws outline specific funding mechanisms for renewable projects. For instance, the 2011 Supplementary Finance Act (LFC) increased the allocation of oil royalties to renewable energy and cogeneration activities from 0.5% to 1%. Additionally, a national renewable energy fund was established through the 2010 Finance Act. Article 63 specifies that the account for this fund must be opened in the Treasury and funded by 0.5% of oil taxes. Regulatory measures will also govern state contributions, creating conditions and control mechanisms to ensure the proper use of public funds for this initiative. (Hamaz & Ait Taleb, 2020)

5. Challenges and perspectives

Algeria's strategic plans aim to expand renewable capacity by 2035. However, progress is constrained by financial, regulatory, and infrastructure barriers, including high costs of

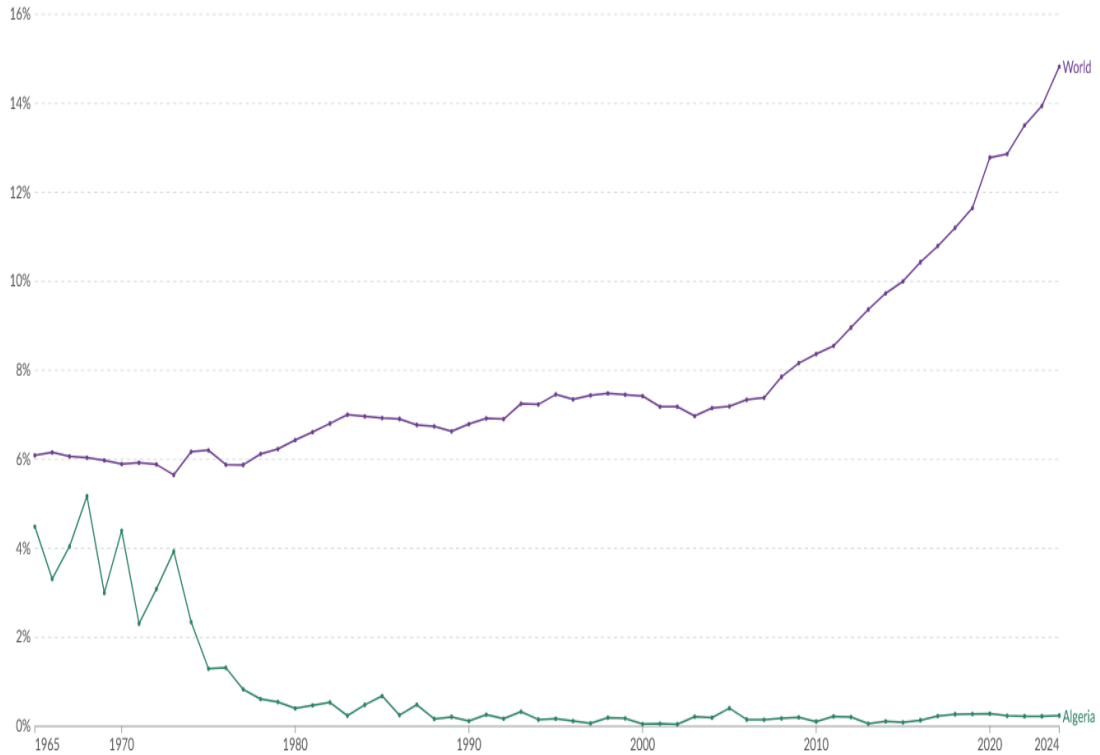
imported technologies, bureaucratic delays, and electricity grids that are not yet fully adapted.

The figures below clearly indicate that Algeria continues to struggle to increase its share of primary energy consumption from renewable sources compared to fossil fuels, particularly in light of the global trend.

The financial limitations associated with investing in renewable energy in Algeria represent a significant structural barrier to achieving the goals outlined in national policies. Various studies indicate that upfront and infrastructure costs remain high for many sectors, particularly photovoltaic solar, concentrated solar thermal power (CSP), and onshore wind energy. (Benflis & Harouni, 2023) The Algerian banking system remains the most criticised challenge for the Government. Despite efforts to modernise the sector and legislation promoting investment, there have been no significant tangible measures to support a more conducive investment policy across all industries, not just the renewable energy industry.

Regulatory governance also includes energy planning, which has specific requirements for integrating key local elements. For instance, the national program anticipates that, from 2021 to 2035, sectors such as wind power will achieve over 80% local integration through domestic manufacturing. This measure aims to maximise the multiplier effect on the national economy, but it presupposes an established industrial base capable of meeting the necessary technical standards. In many cases examined, this condition remained theoretical due to insufficient parallel investments in vocational training and industrial equipment.(Smai & Zahi, 2016)

Fig. 3. Algeria Vs. World Share of primary energy consumption from renewable sources



Source: Energy Institute - Statistical Review of World Energy (Ritchie et al., 2020)

Fig. 4. Algeria's reliance on fossil fuels compared to renewable energy in generating electricity



Source: Ember (2025); Energy Institute - Statistical Review of World Energy (2025) (Share of Electricity Generation from Fossil Fuels, Renewables and Nuclear, 2025.)

The Oil and Gas cartel could be one of the main obstacles to promoting renewable energy in Algeria. Access to capital and credit can be challenging for some private investors. Financing was only available for fossil fuel projects. External funding was restricted on the grounds that it would burden the state. This includes the USD 160 million concessional loan planned to be provided by the Global Environment Facility (GEF) under the climate fund managed by the World Bank. These funds were set to finance the program launched by NEAL, a commercial law firm responsible for developing renewable energy, which includes three hybrid power plants, each with a capacity of 300 MW. However, the oil lobby pressured the authorities to reject this funding. Additionally, the oil lobby demanded that any investment in renewable energy must involve local manufacturing of the equipment. Yet, the number of local manufacturers of renewable energy technologies is limited, and their production costs are significantly higher than those of imports (Ghania, 2024).

5. Conclusion

An in-depth review of renewable energy investment in Algeria reveals a significant energy potential, particularly in the solar and wind sectors. Despite notable legislative and strategic progress since the 2000s, these resources remain largely underutilised. The country boasts an ideal natural environment, characterised by some of the highest sunshine levels worldwide and windier areas that are well-suited for efficient electricity generation. However, these advantages are limited by structural challenges, primarily financial, regulatory, and infrastructural barriers, which restrict the growth of installed capacity and the actual electricity delivered to the grid.

Financial constraints, such as the high upfront costs of imported technologies, the cautious and weak attitude of the banking system, and the lack of innovative financing options, pose significant obstacles. Additionally, ongoing fossil fuel and power subsidies

unfairly distort the competitiveness of renewable energy, making widespread adoption more difficult. Institutional issues also impact progress: although incentive programs such as guaranteed feed-in tariffs are in place, their effectiveness is limited by bureaucratic delays and poor infrastructure. It is also essential to enhance coordination among institutional, industrial, and scientific stakeholders to optimise energy planning, improve vocational training, and promote technology transfer. Incorporating renewable energy into the national energy mix requires considering socio-economic, territorial, and environmental contexts to ensure a fair and equitable transition while adhering to international climate commitments.

Ultimately, expanding multidisciplinary research is essential for developing integrated models that incorporate local physical data, economic analyses, and socio-environmental assessments. These models will enable the development of realistic and suitable scenarios, supporting strategic decisions and investment priorities. In essence, Algeria's shift towards a more sustainable energy system depends on a comprehensive and forward-looking approach that seamlessly integrates national efforts and ambitions, thereby making it a worthwhile investment.

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