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# ADDRESSING ENERGY REQUIREMENTS THROUGH THE EXTENSIVE ADOPTION OF RENEWABLE ENERGY SOURCES

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***ABSTRACT***

*The traditional energy system is at a critical juncture due to the escalating impacts of climate change, and its significance is increasingly recognized worldwide. While this system has evolved over decades, the current urgent circumstances necessitate a transition to alternative energy sources. Traditional energy systems operate in an unsustainable manner, leading to various issues such as environmental degradation, resource scarcity, habitat destruction, and deforestation. Consequently, there is a growing demand for more sustainable and innovative approaches to energy development.*

*Renewable energy presents a promising solution for the future, providing cleaner, reliable, and sustainable energy options for humanity. Before delving deeper into this topic, it is essential to clarify what is meant by a renewable energy system. Renewable energy refers to energy generated from resources that are naturally replenished, such as sunlight, water, wind, and geothermal heat, while also considering the needs of future generations. In contrast to fossil fuels, which contribute to environmental harm, renewable energy sources are abundant and offer a viable pathway to address climate change. Furthermore, renewable energy systems are generally more secure than traditional fossil fuel-based systems, which are associated with numerous global challenges.*

***Key words:*** *Green economy, renewable energy, solar panels, wind energy, environmental protection, green future, reliable energy, environmental degradation, fossil fuels, economic development.*

## 1. Introduction

Renewable energy represents a vital component of future energy solutions, capable of providing sustainable energy for long-term development. It plays a crucial role in addressing significant global challenges, including climate change, reducing reliance on fossil fuels, and achieving energy security, thereby minimizing interdependence among nations regarding energy resources.

To understand the current advancements in renewable energy, it is essential to consider its historical context. Historical records indicate that ancient civilizations, such as the Greeks and Romans, utilized wind-powered water pumps for irrigation, which proved to be more efficient than conventional watering methods of their time. Similarly, ancient Chinese societies harnessed wind power for milling grain. The most notable advancements in renewable energy systems emerged in the 20th century when awareness of the detrimental environmental impacts of traditional energy sources became more pronounced. Beginning in the 1970s, numerous European countries actively pursued the development of renewable energy technologies and sought to educate individuals in this field to foster expertise in “green” energy initiatives.

## 2. Literature Review

Godfey Boyle[1] provided an important overview when it comes to development of renewable energy with the technological development by taking into account global demand for sustainable energy sector. He delved into not only clean energy, but also its economic , environmental social adoption.

Charles W. Donovan’s works in the development of clean energy analyses the economic at the same time financial aspects of “green” energy. Moreover, he discussed strategies, financial modeling plans, management of “green” technologies. David Elliot[3] deeply analyzed how to combine new technologies in the development of renewable energy system in his works. In his book he tried to compare the

competitiveness of renewable energy to fossil fuel or traditional energy system. M. J. Ivanov[4] is famous Russian professor in this area who provided current status.

He analyzed the potential of Russian producing energy from renewables, especially, from solar, wind and hydro energy by taking into account its environmental factor also. He not only analyzed the opportunities but also challenges in the development of "green" energy in Russia. Maria Petrova[5] examined the economic relationship of renewable energy as well as energy policies in Russia by taking account the incentives of government and how to promote this system and how to attract more investment in this area in her book. Moreover, she recommended some new technologies in the promoting of renewable energy which are suitable in the situation of Russian.

Djalilova N[6] discussed the future of renewable energy in the area of Central Asia by taking account the area's location, situation, weather, potential, investment attractiveness and investment dynamics. In his book he examined statistical analyzes when it comes to capacity of installation of renewable energy

## 3. METHODOLOGY.

To investigate the intersection of sustainability and economic development, a comprehensive review of relevant literature and case studies was conducted. Academic journals, industry reports, and reputable sources were consulted to gather insights on sustainable business practices, green initiatives, and successful examples of environmentally conscious economic growth. Before moving to renewable energy usage, we should know the intersection of green economy and renewable energy to each other. So, what is green economy? Green economy is the sustainable way to achieve sustainable future. That's why many international organizations, such as "The World Bank", "The United Nations Environmental Protection" programs have been working for decades to support this system. Moreover to solve the problem of "Climate change" many international organizations are organizing conferences to discuss the

problems together with young people from all over the world. So renewable energy is the only solution in this world where we have huge demand for energy sources. When we talk about the advantages of the renewable energy, they are huge. First and foremost benefit of renewable energy is “Environmental Sustainability”.

If we compare the fossil fuels to renewable energy system, by using renewable energy we can achieve our sustainable future and sustainable targets. Moreover, “Energy security” is another factor which we should take into account. If we use from fossil fuels, the country may be dependent to energy of another countries while if we produce energy from renewable sources, we can cover over every supply on our own. Even if we have huge opportunity from using renewable energy, we have some challenges at the same time. First challenge which we may face is “Intermittency and variability”. Renewable energy is dependent to location as well as weather condition. Moreover, implementing green energy projects may demand huge amount of land which means people may destroy some natural and environmental habitats. Moreover, resource availability is another challenge in our current situation.

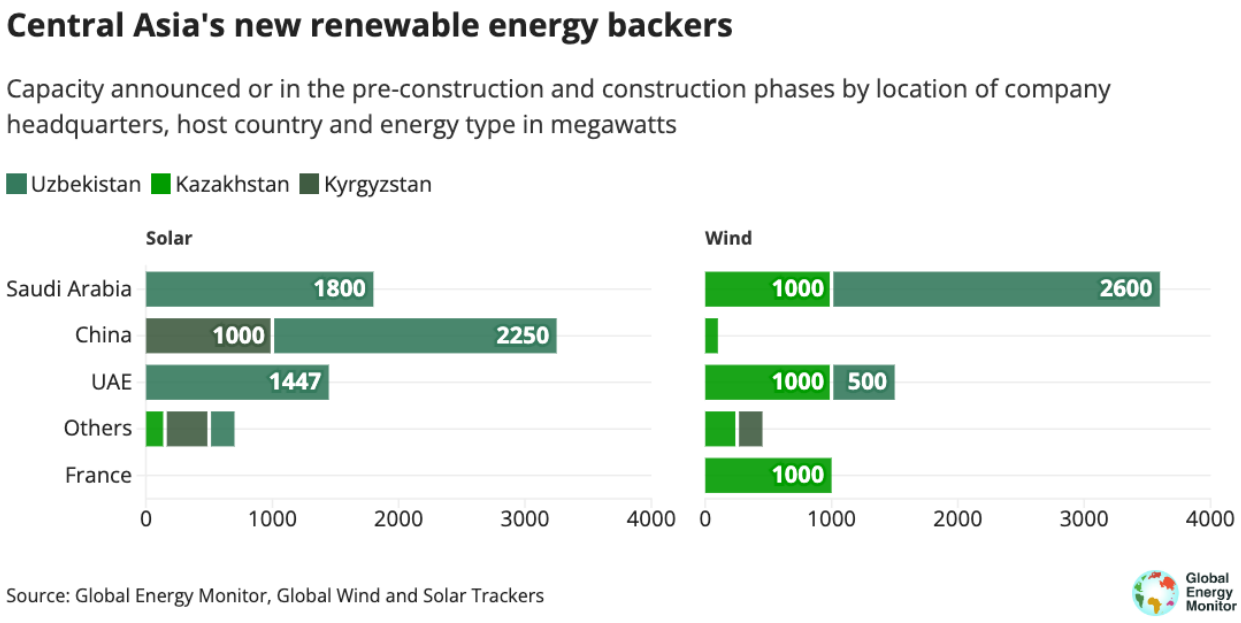


**Figure 1**-Central Asia’s new renewable energy backers

In the above mentioned picture we can see that, Saudia Arabia is the country which wants to invest more compared to other countries in the renewable energy development in Uzbekistan, Kazakstan and Kyrgyzstan. It is clear that, Saudi Arabia is ready to invest for 1800 Solar projects in Central Asia and more than 2600 wind-

energy related projects. The next country which want to implement renewable energy projects in Central Asia is China with the share of 3250 solar projects and 1500 wind energy projects. At the same time, UAE is trying to support 1447 Solar energy projects and 1500 wind energy projects. Why do these rich countries want to spend huge amount of spendings in Central Asia? There are some agreements among these countries and Central Asian counties to share the profit from these renewable energy projects as well.

If we talk about current situation of Uzbekistan by taking into account climate change, Uzbekistan is in more difficult situation in the problems of climate change as well as global warming compared to other countries as the government is situated in the central part of Central Asia and do not have any opportunity to the ocean to agricultural system. Also, green economy development and supporting renewable energy improves the lives of people in the country.

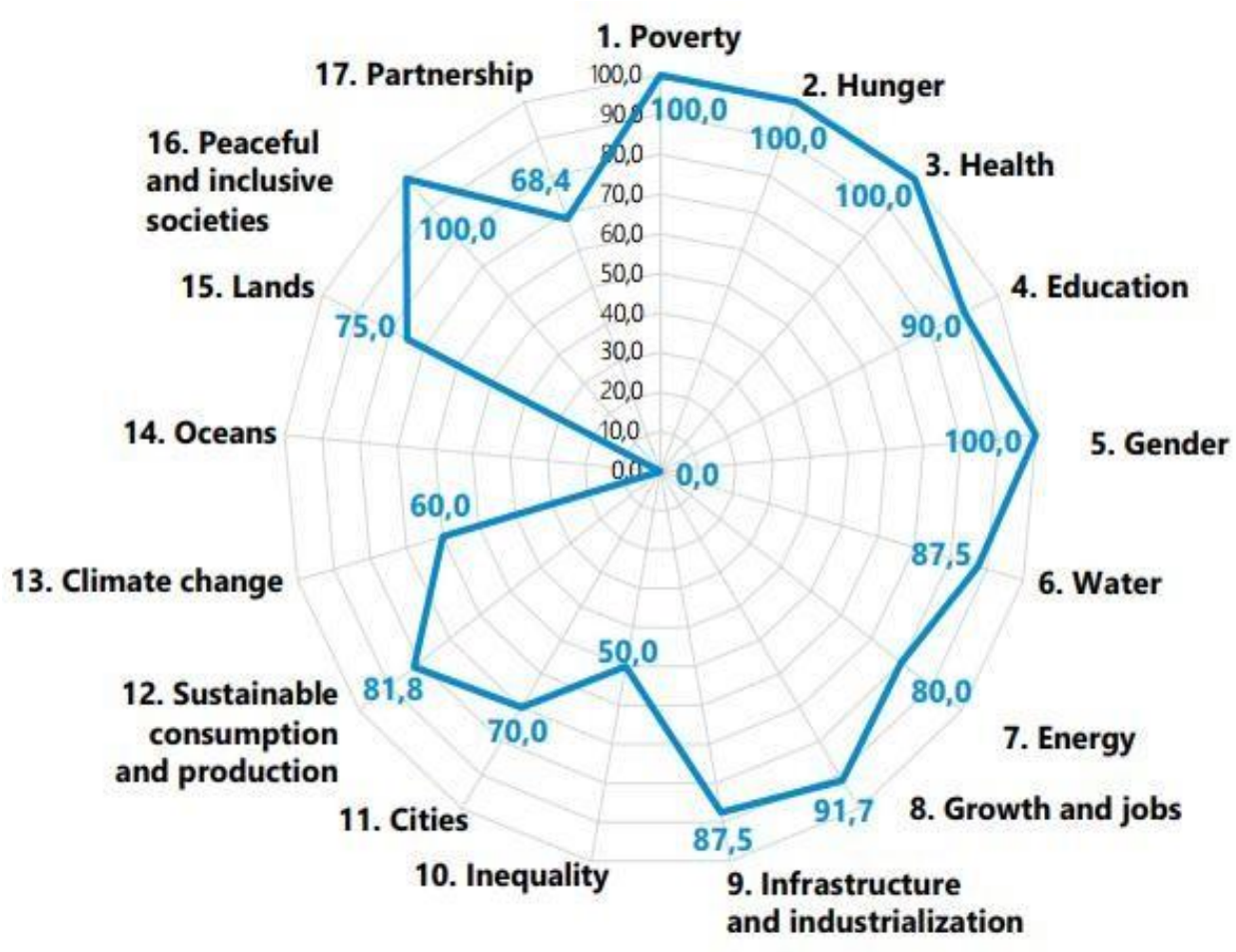


**Figure 3**-Sustainable Development Map

Uzbekistan's path sustainable development by 2030 is marked by progress and a strong across various key areas. At core of its efforts is a dedicated on eliminating poverty and, ensuring that every citizen is in the journey forward Through extensive healthcare programs and robust initiatives, Uzbekistan nurturing a healthier and more educated population, the stage for prosperity and improved well-being.

A strong emphasis on gender equality, Uzbekistan empowering women and girls, unlocking their potential to positively to society. By prioritizing access to water and sustainable energy, the country is protecting its resources and building resilience environmental challenges. Uzbekistan forward-thinking approach to economic growth and job creation fostering innovation and entrepreneurship creating opportunities for inclusive and sustainable development

## 4. RESULT AND DISCUSSION

Sustainability refers to the ability to meet present needs without compromising the ability of future generations to meet their own needs. It involves balancing economic, social, and environmental factors to ensure a holistic approach to development. On the other hand, economic development refers to the process of improving the economic well-being of a society through the creation and utilization of resources to produce goods and services.

Integrating sustainability and economic development is crucial for several reasons:

1. Environmental Protection: Economic development can often result in environmental degradation if not managed sustainably. By integrating sustainability principles, we can ensure that economic activities are conducted in a way that minimizes negative impacts on the environment, promotes conservation of resources, and reduces pollution.
2. Long-Term Prosperity: Unsustainable economic practices can lead to short-term gains but may have detrimental long-term consequences. By embracing sustainable approaches, such as investing in renewable energy, efficient resource management, and environmentally friendly technologies, we can foster long-term economic growth and stability.
3. Social Equity: Sustainability recognizes the importance of social well-being and equity. Economic development should aim to improve the quality of life for all

individuals, promote social inclusion, and reduce poverty. By considering social factors alongside economic goals, we can create more equitable and inclusive societies.

4. Innovation and Competitiveness: Sustainability can drive innovation and enhance a country's competitiveness. Embracing sustainable practices often leads to the development of new technologies, business models, and markets. By encouraging sustainable entrepreneurship and research and development, economic growth can be driven by environmentally friendly and socially responsible initiatives.
5. Resource Efficiency: Sustainable development emphasizes the efficient use of resources. This includes reducing waste, optimizing resource allocation, and promoting circular economy principles. By improving resource efficiency, we can reduce costs, increase productivity, and minimize environmental impacts.

To integrate sustainability and economic development effectively, governments, businesses, and individuals must collaborate and take collective action. This can involve implementing sustainable policies and regulations, investing in renewable energy and clean technologies, promoting sustainable consumption and production patterns, and fostering awareness and education about sustainability.

| Indicator | Long term (10 years) | Medium term (3 years) | Details |
|---|---|---|---|
| GDP growth | Positive | Positive | Growth over 5% was achieved for most of the time frame |
| Employment (registered) | Positive | Positive | Improved trend for the numbers for employees and self-employment |
| Production change (%) | Positive | Positive | Significant improvements in production over the time frame |
| Primary fuel and energy production | Stable | Positive | The indicator indicates improved energy efficiency |
| Water demand by industry | Negative | Negative | With growing production, the water intensity stays high |
| Energy from renewable sources | Negative | Slightly positive | In 2021–2023, solar and hydro power is being developed |

**Figure 4**-Key indicators for sustainable development

From the figure 4, it is clear that, for sustainable development there are some main indicators including, GDP growth, Employment, Production change, Primary fuel and energy production, Water demand by industrial sectors, Energy from renewable energy sources and other main factors as well. We can see in the example of Uzbekistan is,

GDP growth is a significant factor in medium-term development as well as long-tern development. Moreover, we know that, the percentage of employment is another crucial key indicator, but it has huge positive share in long and short term development. Also, fuel and energy production is another aspect, as this sector is one of the main share of the economy, which has stable growth in long-term growth. Moreover, water and water-related issues are occurring especially in Central Asia, which means, if the country has water related issues, it has negative impact to the medium, short-term, long-term sustainable growth.

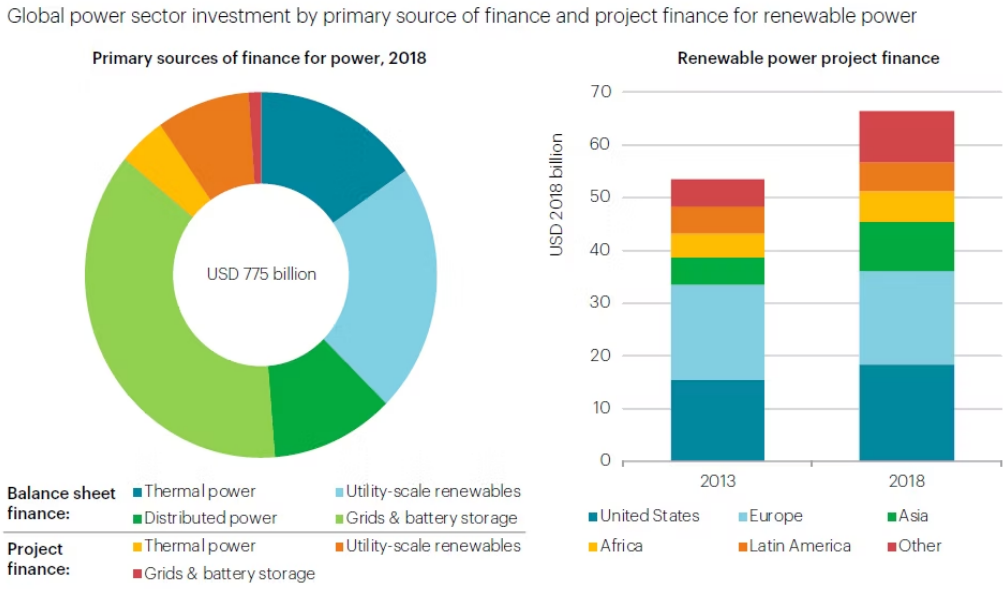


**Figure 5-** Global Power Sector Investment

As it is clear from the picture, total investment for "Green projects" was $ 775 billion in the world, with the high share of United States, European Countries and Asia. It is shown in the graph that, almost $ 15 billion was spent for the development of Thermal power energy in 2013. This share was almost $ 20 billion in 2018, $ 5 billion more than initial year. Moreover, more than $ 30 billion was spent directly for the "Utility-scale renewables" in 2013, while it was almost $ 35 billion in 2018. At the same time, Distributed power's share was almost $ 40 billion in 2013, while it had gradual increase in 2018 and made up almost $ 45 billion in 2018.

According to recent data, bank loans cover around 20% of the cost of renewable energy projects in Uzbekistan. However, this high reliance on loans raises hazards to debt sustainability and financial stability.

Given these obstacles, applying the aforementioned solutions can assist diversify finance sources, minimize debt burdens, and encourage long-term development in Uzbekistan's renewable energy sectors. By creating an environment conducive to investment and innovation, Uzbekistan may realize the full potential of renewable energy resources while avoiding financial risks and attaining long-term energy security and sustainability objectives.

Moreover, there is another problem in the development of renewable energy system which is lack of innovative technologies. Innovative technologies have an important role in enhancing the efficiency and performance of renewable energy systems, boosting their competitiveness and appeal as viable energy sources. Advanced solar photovoltaic (PV) panels, wind turbines with optimized designs, and smart grid solutions all improve energy capture, storage, and distribution efficiency. Technological developments reduce the costs involved with renewable energy installations, making it more accessible and economically viable. According to the International Renewable Energy Agency (IRENA), the cost of solar PV modules has reduced by more than 80% since 2010, while onshore wind turbine prices have fallen by around 40%. Countries that lead in renewable energy deployment, such as Germany, China, and the United States, have made major investments in research, development, and adoption of breakthrough technology. For example, Germany's Energiewende plan has boosted investment in solar PV, wind, and energy storage technologies, resulting in technological innovation and cost savings.

## 6. Conclusion

In conclusion, the transition towards meeting energy demand with renewable energy sources represents a pivotal step towards achieving a sustainable, resilient, and equitable energy future. Throughout this thesis, we have explored the multifaceted

dimensions of renewable energy adoption, examining its technological, economic, environmental, and social implications. As global energy demand continues to rise, driven by population growth, urbanization, and economic development, the imperative to decarbonize our energy systems has never been more urgent.

The statistics underscore the transformative potential of renewable energy. According to the International Renewable Energy Agency (IRENA), renewable energy capacity witnessed a remarkable increase globally in 2020, reaching 2,799 gigawatts (GW), with an annual growth rate of 10.3%. Notably, solar photovoltaics (PV) emerged as a frontrunner, accounting for 48% of total renewable capacity additions. Moreover, investments in renewable energy projects soared to $303.5 billion in 2020, reflecting growing confidence from investors and financial institutions in the viability and profitability of renewable energy ventures.

Environmental Imperatives

Economic Opportunities

Economically, renewable energy offers unparalleled opportunities for job creation, economic growth, and energy security. The renewable energy sector employed over 11.5 million people worldwide in 2019, with projections suggesting significant job growth in sectors such as solar photovoltaics, wind energy, and energy efficiency. Moreover, the declining costs of renewable energy technologies have made them increasingly competitive with fossil fuels, with 2020 seeing 162 GW of new renewable capacity installed at lower costs than new coal or natural gas plants globally.

Social Equity and Inclusion

Crucially, the transition to renewable energy must prioritize social equity and inclusion to ensure that all communities benefit from the energy transition. Disadvantaged communities, particularly those disproportionately affected by the adverse impacts of fossil fuel extraction and combustion, must be empowered to participate in and benefit from renewable energy projects. Initiatives such as

community-owned renewable energy cooperatives and workforce development programs can foster local ownership, economic empowerment, and social cohesion, thereby advancing a just transition to a renewable energy future.

As we navigate the complexities of the energy transition, it is evident that meeting energy demand with renewable energy requires a holistic and collaborative approach. Governments, businesses, academia, civil society, and individuals must work in concert to overcome barriers, accelerate deployment, and scale up investment in renewable energy infrastructure and innovation. Policy frameworks that incentivize renewable energy deployment, support research and development, and internalize the true costs of fossil fuels are essential for unleashing the full potential of renewable energy. In conclusion, meeting energy demand with renewable energy is not merely a technological or economic imperative but a moral imperative grounded in our responsibility to safeguard the planet for current and future generations. By harnessing the power of renewable energy, we can create a more sustainable, prosperous, and equitable world for all. As we embark on this journey, let us seize the opportunities before us, embrace innovation and collaboration, and chart a course towards a renewable energy future that leaves no one behind.

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