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CHAPTER 3

THE ECONOMICS OF RENEWABLE ENERGY: COST, MARKET TRENDS, AND INVESTMENT

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ABSTRACT

Renewable sources of energy have become and are going to remain constant through any transformational shift in the global energy space with respect to sustainable development and climate resilience. This chapter highlights the elaborate economics of renewable energy on the touchpoints of its whirling cost dynamics; evolving markets; and investment opportunities. In the wind of governments, industries, and societies, turning towards low-carbon energy choices, the understanding of financial narratives towards renewables is imperative for greater use and sustainability. Before discussing market trends, the cost dynamics of renewable energy would first highlight extensive reductions in the cost of renewable energy technologies over the decades. Innovations in technology have increased the scale economies due to the declining levelized cost of electricity (LCOE) for renewable sources like solar and wind. In turn, this has made these resources

competitive with fossil fuels. The analysis considers hidden costs and externalities-e.g., environmental damages relating to traditional energy sources; these, too, underscore the true economic advantages of renewables. In the next chapter, market trends indicate the expanding capacity of renewable energy in the total energy mix of the world. Solar, wind, and hydroelectric power are already growing immensely, thanks to recent technology research developments in energy storage and grid integration. International agreements, such as the Paris Accord, serve as the backbone of such policy frameworks.

There are, however, challenges that remain relevant over the years but in this case include intermittency issues and the need for robust infrastructure for supporting high-level deployment. There is also a significance of this investment landscape which discusses. The concept of renewable energy has generated tremendous investments-in-either public or private and driven both dividends and sustainability through its lofty imperatives. Green and flipped bonds or venture capital financing, and community development financing, can be said to be new paradigms for financing. This chapter discusses the risk-return profile associated with investments in renewable energy and shows innovative financing facilities, such as the PPAs coupling crowdfunding, which may lower the barriers to entry for investors. It analyzes the investment trends across regions and the resultant comparative analysis indicates how developed economies continue to lead and the rising participation of emerging economies in renewable. It lays out prospects and strategy pathways aimed at amplifying the adoption of renewables. This captures everything-from highlighting economic-as well as social opportunities-renewables bring forth, like jobs and the industry perspective, to the need for creativity as barriers persist. Policymaking recommendations are made for improving public-private engagement, creating incentives for research and development, and enhancing international collaboration

3.1 INTRODUCTION

The energy world is undergoing radical change-wrought with urgency by the need to tackle climate change and tree green gas emissions for the march toward sustainable energy systems-all spent. Renewable energy would be the very foundation of this shift, in this case, offering cleaner, more sustainable alternatives to what were originally fossil fuels. The economics of renewable energy, in terms of costs, market conditions, and investment flow, shape any speed and scale for adopting it. This chapter addresses the economic features of renewable energy to describe fully its potential to reshape the energy landscape and set-in motion strides toward achieving global sustainability. Really, never has there been a more urgent need for renewable energy than that of today. Increasing temperatures in the world, growing demands for energy, and understanding that fossil fuel resources are limited make one see the necessity of shifting to other sources of energy. Renewable energy technologies, including solar, wind, hydro, geothermal, and biomass, point downhill to energy security with minimum adverse environmental impact. However, much of their adoption hinges on economic considerations. It is very important that governments, businesses, and individuals understand the costs associated with renewable energy-from capital investment all the way down to operating savings over life-to make an informed decision as to whether to invest in the renewable energy alternatives. In addition, the market trends as well as new technology continues to redefine the thresholds of cost-effectiveness and scalability of these energy sources.

Historically, the economics of renewable energy were most often thought to be a hindrance to widespread adoption in favor of other, cheaper alternatives. The high upfront cost and technological immaturity and dominance of fossil fuels have acted as barriers for decades; however, the story is altogether different in the last several decades. Not only costs have dropped, owing to new technologies, economies of scale, and favorable policies, enabling renewable energy to turn out to be increasingly competitive, much more low-priced than traditional sources. For instance, the levelized costs of electricity (LCOE) for solar and wind energy can drop to levels that pave the way for these technologies to stand as substitutes in both developed and developing economies. It is something more than a technological accomplishment; it is bringing into play the muscle of market dynamics and strategic investments.

Furthermore, the trends in the market specify the going importance of renewables. The share of renewables in the global and national energy mix has been rising steadily in the past years, as nations and international agencies set up ambitious targets for themselves. Today, countries worldwide are busy making their announcements about renewable energy mandates, feed-in tariffs, and tax incentives to widen this adoption exponentially. The introduction of energy storage systems and smart grid technologies has increased reliability and efficiency in renewable energy, particularly around concerns about intermittent supply and stability in the grid. The emergence of decentralized energy systems has shifted power-from decentralized solar photovoltaic installations to community-based wind projects-where individuals and local communities can actively engage in the energy transition. Both the public and private sectors have shifted their investment focus toward renewable energy. In this, governments rightly earn the dual purpose of economic growth and environmental stewardship and so invest huge amounts in renewable energy development.

However, there are still issues related to all these developments. There will be a large investment in infrastructure ranging from building new smart grids to putting energy storage into place to transition into renewables. In fossil-fuel-dependent regions, economic and social impacts need to be managed very carefully when it comes to moving toward renewables. In addition to that, renewable energy has other major co-benefits, such as energy independence and improved public health, among others. There is also promise for the even more advantageous economics of renewable energy in the foreseeable future. Continued advancement of technology promises even lower cost developments, such as the more efficient photovoltaic cells and advanced wind turbine designs. It would also bring stronger supply chains dedicated to the scale-up of renewable energy generation, coupled with economy of scale, to push the costs downward. Meanwhile, the increasingly φenecial alignment of public policies within the contours of sustainability would add a further enabling environment towards the adoption of renewable energy. In the context such as this, the role of international cooperation towards enhanced exchange of knowledge, transfer of technology, and financing mechanisms cannot be downplayed. This chapter, therefore, attempts to complete each important section in a comprehensive approach towards the economic dimensions of renewable energy. Such analysis starts with the cost dynamics of renewable energy technologies-from looking back at their historical trends to the underlying cost-reducing factors. In addition, market trends are addressed, such as the expanding footprint of renewables on the global

energy scene, the interface of policy and technology, and hurdles to further market expansion.

3.2 COST DYNAMICS RENEWABLE

Much has changed in terms of cost dynamics in renewable energies, and this has blurred all the lines between the world's energy landscape and renewable technologies. They can now compete with conventional fossil fuels. Affordability has been a key reason that made the previous use of renewable energy technologies difficult among most beneficiaries. Thus, they required huge investments, like solar panels and wind turbines, and many prototypes of renewable systems, to make them applicable to people, companies, and governments. In fact, many went ahead and passed their laws in favor of renewable energy technologies that have undergone advancement through technological changes, economies of scale, and supportive policies. These made all their costs go down steadily; hence, renewable energy has been more affordable and attractive than ever. Technological innovation is among the critical drivers of a reduction in renewable energy costs. For instance, in the field of solar energy, there has been a marked increase in the efficiency of photovoltaic (PV) cells over the last few decades. This means that more electricity can be produced from more sunlight, which reduces the costs when measured in price per watt. Improvements in the design of wind turbines have similarly allowed more effective capture of the wind energy available.

Greater blade-tower height and breadth allow taller turbines to "tap" into more predictable, stronger winds at altitudes nearer to the top of the atmosphere and more consistently populate the large surface. Cost reductions per kilowatt hour generally result from such technological advancements in renewable energy systems without being limited to that. As much, economies of scale have played an equally important role. By scaling up production and deployment of renewable energy technologies, the manufacturers have enjoyed the benefits of mass production and lean operation, thereby achieving significant cost savings. The remarkable growth of the renewable energy market has established a competitive space where producers are encouraged to innovate and promote efficiency in production. As a result, significant price drops have been recorded for some of the major components such as wind turbine parts, solar panels, and energy storage systems.

For instance, solar PV modules have seen a more than 80% decline in cost compared to the last ten years, making solar energy a cost-competitive electricity source in many regions. Governments have also set the costs of renewable energy in different directions. Government policy and incentives work together to shape the cost dynamics with respect to renewable energy subsidies, tax credits, feed-in tariffs, and renewable portfolio standards, which have provided very important support to renewable energy projects. Most of these measures have been put in place to compensate for the high upfront costs of such renewable energy systems so that they are more affordable to consumers and investors alike. Moreover, most nations around the world have heavily endowed into R&D on advanced renewable energy technologies. Public funding for R&D has indeed improved the speed of innovation, allowing it to result in breakthroughs that in turn lower costs and enhance efficiency. Policies internalizing environmental and social costs into fossil fuels - carbon pricing or emissions trade schemes - have further increased the economic attractiveness of renewables through degree leveling in the competitive environment. Alongside a price drop in renewable energy, market dynamics have also been changing as well. Many parts of the world are now at or well beyond grid parity for renewables-suffice it to say they generate power equally at or below the price of power from conventional fossil fuels without subsidies. Such achievements widen the market for renewable energy and bring in investments from both public and private sides.

The power generation from renewable sources continues to catch the eye of utilities, businesses, and individuals as a more cost-effective and reliable energy opportunity. Added to the benefits of renewables when determined high cost is low operating costs. Fuel-burned plants spend money on an ongoing basis for the purchase of fuel. Initial capital investments (CapEx) in renewable energy projects are still beyond the reach of some communities and developing nations. Access to affordable financing will be critical for such barriers to be overcome. Innovative new financing models include, but are not limited to, power purchase agreements (PPAs), green bonds, and crowdfunding platforms as innovative tools for lifting the high front-end cost of renewable energy systems. The mechanisms make it convenient for project developers to obtain financial support without much exposure to risk for the investors. International development organizations and multilateral banks have also assisted in funding renewable energy programs in marginalized regions, thereby ensuring equal opportunities in clean energy access. In recent years, a number of energy storage technologies, such as lithium-ion batteries and pumped hydro storage, have become greatly less expensive due to, on

the one hand, advances in technology and economies of scale. However, it is cost-effective to continue optimizing costs for the storage part of renewable energy systems. The investments required to upgrade and expand grid infrastructure fit with the decentralized model of renewables and are expected to incur significant costs in the overall project costs. In addition, renewable energy cost dynamics vary regionally because of such factors as the geography, availability of resources, and the structures of the local market. Research in materials science, artificial intelligence, and processes of manufacturing will enhance both the effectiveness and cost-effectiveness of renewable energy systems by keeping technological innovation at a high level.

The growth of renewable energy supply across the world will generate strong supply chains and increase competition, which leads to lower prices within them. Furthermore, as an increasing number of nations and companies turn to the net-zero emissions goal, demand will skyrocket and create a large impetus for cost optimization. Under those circumstances, however, this would probably leave renewable energy cost dynamics to change the entire energy landscape toward becoming an ever more attractive and viable alternative to fossil fuels. It has significantly reduced the cost of renewable energy systems via technological innovation, economies of scale, and the enablers of policy support, opening possibilities for widespread adoption worldwide. High initial capital costs may continue to be a challenge, along with intermittency and unevenness of regions. Some of the innovative financing models, innovations in energy storage, and high-impact investments in grid infrastructure are currently addressing these challenges.

3.3 INVESTMENT LANDSCAPE RENEWABLE

Recently, the investment appraisal in renewable energy underwent dramatic changes as the worldwide acceptance of this sector as a point of view for sustainable growth and profit has gained momentum. The shift rests on the rationale of controlling, therefore, the global level of greenhouse gas emissions, ensuring energy indigenization, and heading into low-carbon economies. Indeed, such enormous investment drives renewable energy by government or private investors, institutional funds, and multilateral institutions. The dynamic investment ecosystem has resulted from an economic, environmental, and social interplay as it constructs a whole new picture of the global energy sector, hence innovation. Governments have substantially contributed to the initiation of investments that are geared towards renewable energy generations. Public investment goes into setting

up the necessary infrastructures for the development and dissemination of renewable technologies, mainly requirements in terms of subsidies, grants, and tax incentives, with the object of reducing initial project costs and making return attractive to private investors. Feed-in tariffs and production tax credits are designed to produce income assurances for renewable energy developers in order to reduce economic risk while enhancing long-term investments (Renewable Energy Policy Network for the 21st Century [REN21], 2023). Governments have also formulated certain renewable energy targets and mandates so as to dedicate a stable policy environment that increases the confidence of investors. For example, the national strategies mentioned have set very ambitious targets for the installation of renewable energy capacity: from the Green Deal of the European Union to the Chinese Renewable Energy Law (European Commission, 2023).

The private sector has now been the most important participant in the market for renewable energy investment. As part of their initiatives to enhance renewable energy in their activities, most corporates are opting for it to ensure they meet their sustainability goals, lower energy costs, and demonstrate ESG compliance. Known major corporates, such as Google, Amazon, and Apple, are undertaking great investments on renewable energy projects which include solar farms, wind parks, and energy storages. All these help companies to achieve their carbon neutrality goals while also sending a signal that there lies a whole market direction towards better sustainable business practices (Harris, 2022).

In addition, the energy companies are nowadays broadening their portfolios to include renewable assets, signifying the potential of the sector in terms of long-term growth. Green bonds financing environmental projects have not only become attractive investment vehicles for institutional investors but have also opened the global green bond market, which has scaled up multiple folds to run in billions of dollars in capital raising for renewable energy 'initiatives (Climate Bonds Initiative, 2023). Green bonds are important because they are consistent with several international sustainability frameworks, such as the United Nations Sustainable Development Goals (SDGs), thus making them attractive for institutional investors who want to build ESG aspects into their portfolios. Innovative financing mechanisms have boosted renewable energy investments. Power purchase agreements (PPAs) are one of the emerging key instruments for financing renewable energy projects.

Greening corporate operations is thus increasingly being introduced in energy

sourcing as a means to meet the sustainability objectives of companies, lower costs related to energy procurement, and meet the environmental, social, and governance (ESG) criteria.Again, research concludes that giant companies like Google, Amazon, and Apple are now investing hugely in renewable energy projects, from solar farms and wind parks to energy storage systems. Green bonds, which are used for financing environmentally friendly projects, become, by that, a very attractive investment vehicle for institutional investors. Having leapfrogged around the world, the green bond market has raised billions of dollars for financing renewable energy projects (Climate Bonds Initiative, 2023). Green bonds are consistent with many international sustainability frameworks, such as the United Nations Sustainable Development Goals (SDGs), and are therefore beneficial for institutional investors wishing to invest their portfolios in ESG. The growth of renewable investment has been aided with innovating financing mechanisms. A power purchase agreement (PPA) is becoming one of the key instruments in financing renewable energy projects. Under a PPA, a renewable energy developer enters a long-term sales contract for electricity with an offtaker, such as a corporation or a utility, at a fixed price. This results in providing a revenue stream predictably to the developer and, thus, reduces market risks, making it easier for attracting financing (Schneider & Cooper, 2022).

Over and above these, multilateral organizations and development banks are some of the most active actors in channeling investments into renewable energy, especially in emerging markets and developing countries. World Bank, the International Finance Corporation (IFC), and the Asian Development Bank (ADB) are all associated with providing concessional finance, guarantees, and technical assistance towards the realization of renewable energy projects in private-capital-deficient areas of the world, cut-off on poor access to capital. These measures have very significantly closed the gap between financing limits and investment barrier challenges, such as perceived risks and high upfront costs (World Bank, 2023). Additionally, multilateral organizations have cooperated with governments, including private sector partners in the development of such innovative financing solutions like blended finance, where concessional funds and private capital de-risk investments and attract further funding. Significant progress has been achieved in renewable energy investments but challenges remain. The high upfront costs associated with renewable energy projects remain one of the greatest barriers to entry for many potential investors. A decrease in the levelized cost of electricity (LCOE) associated with renewable energy has lessened the burden of this problem.

Initial capital expenses, however, remain extremely high for project development and infrastructure. The final nail to the coffin shows it most clearly in (IEA, 2023).

For this reason, making finances affordable will go a long way in tackling such issues especially in developing countries that have less developed financial markets. Regulatory and policy uncertainty also presents another problem that can limit investment in renewable energy. Unpredictable investment climate is characterized by inconsistent policies, delay in permitting processes, and an unclear status about incentives can turn the investment environment against domestic and foreign investors. Governments need to put in place transparent and stable regulatory frameworks that will give long-term view and reduce risks associated with investments to address these concerns (REN21, 2023). Besides, strengthening public-private partnerships and improving dialogue among stakeholders may help build trust and align interests. Without any surprise, the geographical pattern of renewable energy investment also clearly presents inequalities between the world of investment on developed regions as opposed to developing countries. Although most renewable energy investments still occur in developed countries, the emerging world is increasingly becoming an important part of the renewable energy investment landscape. It has been further reported by the UN that many developing countries still suffer huge challenges in attracting foreign investment owing to poor infrastructure, limited access to finance and political instability (United Nations, 2023).

Interventions will include such measures as capacity building programs, risk mitigation tools and international cooperation to facilitate technology transfer and knowledge sharing in an inclusive approach addressing many different aspects of these barriers. The investment future of renewable energy remains an area for growing investments. The transition to net-zero carbon economies across the globe will entail hitherto unseen investments to develop renewable energy sources, running into estimated trillions of dollars in years to come (IRENA, 2023). Investors can therefore look into opportunities under this transformation, especially in new developing technologies like offshore wind, advanced energy storage, and green hydrogen. Unlocking the capital invested through utilizing digital technologies including AI and blockchain in renewable energy systems comes with efficiency, reliability, and transparency. Moreover, renewable energy investment will set the framework for future investment in a broader spectrum of sustainability. Increased demand will therefore translate to increased investments as net-zero emissions commitments of government and corporate entities loom. "Financing

institutions are increasingly making investment decisions based on ESG criteria and prefer investing in projects that provide measurable benefits for the environment and society," as asserted by Harris (2022). Of course, some of the challenges, such as high upfront investment, uncertainty in regulation, and regional disparities, still exist, but special interventions and strategic collaborations can address these barriers and open new avenues. As the sector continues to grow and diversify, one of the central arenas in the investment landscape will be laying the groundwork for the future of global energy systems and the transition to a sustainable low-carbon economy.

3.4 FUTURE DIRECTION

Such a shift in the global economy from traditional energy sources to sustainable energy sources will unravel one of the significant transitions of the energy industry. Future direction depends on a complex interplay of the following three factors: economic factors, technological advancements, and market dynamics. While seeking efforts to study and understand such complexities while mitigating climate change impacts and changing dependence on fossil fuels, securing energy for all is essential to shaping future energy systems on a global scale. Primarily, three key trends will shape the future of renewable energy: decentralization, digitalization, and decarbonization. The actual state-of-the-art development encompasses the most progressive field of optimizing renewable energy systems through deliberation, forecasting, smart grids, advanced sensors, data analytics, and artificial intelligence, remaking energy generation and consumption systems.

The technologies will use for improvements on forecasting renewable generation, optimizing of energy, and enhancing demand-side management. Finally, in the future, decarbonization would be the aspect of energy policy and investment. The reducing carbon targets have kept shaping investments in renewable energy, energy efficiency, and sustainable infrastructure. It is not only the energy sector but also the transport industry where electric vehicles and infrastructure for charging will become important elements of a decarbonized economy. It is rapidly evolving; the economics of renewable energy. A dramatic decline in costs, the expansion of markets, and more investment are making it easier than ever to create a sustainable energy future. As societies develop and improve energy technology, so will investment and adaptation by markets to renewable energy central to any solutions for climate change or for economic growth, certainly not least to ensure future

energy security. The way ahead is forward: the renewable future is energy, and the opportunities it presents for the economy are enormous.

3.5 CONCLUSION

Indeed, the shift to renewables constitutes the most powerful economic reshaping worldwide in modern times and is motivated not just by environmental imperatives, but also can enhance energy security and promote sustainable development. Over the last few decades, changes in cost, technology, market dynamics, and investment patterns in the sector have transformed renewable energy into a credible alternative source of energy to replace fossil fuels. One promising new horizon amid all this is the recognition increasingly accorded to the critical importance of clean, sustainable energy solutions, but it bears sharp reminders that the way to transitioning requires investment, strategic planning, and innovation. Most revealing of the renewable energy revolution is the almost straight drop in costs, especially for solar and wind technologies and for battery storage. Thanks to innovation, mass production, and scaling economies, the cost reductions push renewables farther into the competitive threshold today than they've ever been. Today, in many regions, renewable energy is not just a cleaner option but often the least expensive form of new energy generation.

Solar energy has become a reliable solution for both big infrastructure projects and individual households. Wind, particularly offshore wind, also appears very promising, and innovative energy storage solutions are tackling the intermittency issue of renewables on the grid. But such drastic cost reductions would have far-reaching consequences for market trends. Very much around the world seem to be adopting ambitious renewable energy targets and policies; scream solar and wind. The increase in the integration of renewables into the national grid has also been increasing newly creating market dynamics. There are, however, some challenges that come with this expansion. The existing energy infrastructures designed around fossil fuels are going to have to be upgraded to support decentralized and intermittent renewable sources; that is quite costly especially in terms of circuitry and grid management, but such costs are investments necessary to construct a future-proof energy system.

Also, renewable energy has become the avenue through which investments can certainly not go wrong. The global investment community has understood that renewable energy projects are very good financially in addition to their

environmental benefits. Institutional investors such as pension funds and sovereign wealth funds are increasingly seeking to include renewable energy projects in their portfolios since they provide long-term profitability, stable cash flows, and lessen risk aspects. In addition, ESG (Environmental, Social, and Governance) investing is increasingly preferred, in which investors wish to fund projects that fit into sustainability goals. The renewable energy sector, by definition, is low carbon and economically viable with these goals, thus record investments in renewable technologies are creating further impetus for cost reductions and an accelerating transition. As the dimension of the renewable energy sector grows, so does the urgent need for productive innovation in financing mechanisms. The establishment of new financing models-like green bonds and power purchase agreements (PPAs)-facilitated the task of governments, businesses, and consumers in financing projects. In addition, the advent of distributed energy systems-rooftop solar, community wind farms, microgrids-makes it a reality whereby individuals and local communities can invest in and enjoy renewable energy, certainly making access to clean energy more democratic. In other words, the future renewable energy will be framed by three central ideas: decentralization, digitalization, and decarbonization.

Thus, decentralization takes power from the grid and brings energy independence and resilient energy, especially in remote or underserved areas. Digitalization is crucial in improving the efficiency and reliability of renewable energy systems. Smart grids will be developed with advanced sensors, artificial intelligence, and data analytics and would make it possible to optimize energy production, energy distribution, and energy consumption. This data will provide real-time management of renewable energy's intermittency, giving utilities live information to balance supply and demand. Such forms of digital technologies also enable more efficient energy storage, which will be a panacea to integrating large renewables with the grid. Digital platforms for energy trading and decentralized energy exchanges are making a significant headway into the area of consumer-business interaction with energy markets. The third major theme which is decarbonization will act as a major propellant in renewable energy in relation to the economy at large. The process of transitioning to renewable energy becomes pivotal for net-zero emissions targets set by countries and corporate bodies.

Decarbonizing sectors other than the generation of electric energy such as transport, industry, and heating is important for dealing with climate challenges at a global scale. Development in green hydrogen, electrification of transport, and

energy efficiency improvements will be the key components of the decarbonization process. Clear signs of this transformation are the sinking prices of renewable technology, rising consumer demand for clean energy, and the increased financing inflow into the sector. But even more, for the rosy future of renewable energy, the very strong need would be continuing innovation and strategic investments as well as sustainable commitments at every level of society-from individual consumers to global policymakers. Decarbonization is the third major tenet about which renewables will propel the economy at large into new directions. Transitioning to renewable energy becomes integral to achieving these targets. The transition of the decarbonization process beyond electricity generation-such as transport, industry, and heating-is undergoing critical works constellated to mitigating climate changes on a global level.

One of the most symbolic changes associated with the "renewable energy revolution" is that it will be a wealth of promise with respect to the economy and for possible jobs for the future, and environmental sustainability in which case it has set forth its dimensions. Direct evidence of the transformation underway-from greater declines in prices of technologies to increasing consumer demand for clean energy and rising financing inflow into the sector-are very obvious; but for future rosy bright days of renewable energy, even on that score, the very strong need would be continuous innovation and strategic investments as well as sustainable commitments at every level of society-from individual consumers to global policymakers.

3.6 REFERENCES

- Climate Bonds Initiative. (2023). *Green bonds market overview*. https://www.climatebonds.net
- European Commission. (2023). *The European Green Deal*. https://ec.europa.eu/green-deal
- Harris, M. (2022). *Corporate sustainability and renewable energy investments*. Renewable Energy Journal, 45(3), 123-135.
- International Energy Agency (IEA). (2023). *Renewable energy market update*. https://www.iea.org
- International Renewable Energy Agency (IRENA). (2023). *World energy transitions outlook*. https://www.irena.org
- Renewable Energy Policy Network for the 21st Century (REN21). (2023). *Renewables 2023 Global Status Report*. https://www.ren21.net

- Schneider, J., & Cooper, T. (2022). *Financing renewable energy through power purchase agreements*. Energy Finance Review, 9(4), 220-232.
- United Nations. (2023). *Renewable energy in developing countries*. https://www.un.org/sustainabledevelopment/energy
- World Bank. (2023). *Energy investments in developing countries*. https://www.worldbank.org