

# **The Role of Foreign Direct Investment (FDI) in Energy Infrastructure Development in Developing Countries**

## **Abstract**

*Foreign Direct Investment (FDI) is key in fixing energy problems in developing countries. Financial and tech challenges often slow down progress. This paper looks at how FDI helps energy development, including improving access to energy, updating infrastructure, and boosting the economy. Studies show that FDI in renewable projects like solar and wind can lead to sustainable energy. Fossil fuel investments may give quick economic benefits, but they also risk causing environmental harm. The paper will also discuss main factors that attract FDI, like resources, stable policies, and market potential, while noting possible risks, like heavy reliance on foreign investments and weak institutions. The findings stress the importance of good governance and coordinated efforts to fully benefit from FDI, using examples from Asia, Latin America, and Sub-Saharan Africa. Finally, the study outlines ways to balance economic growth, environment, and social factors to ensure that FDI truly supports sustainable energy development in the Global South.*

**Keywords:** Foreign Direct Investment, Energy Infrastructure, Governance, Development, Sustainability.

## **1. Introduction**

Energy is crucial for economic growth and reducing poverty. Sadly, many developing countries face serious shortages (Cantarero, 2020). FDI is seen as an effective solution, offering essential funding, technology, and expertise. This study will explore both the good and bad sides of FDI and how it can help solve current energy challenges (Miraz, & Soo, 2024). FDI means when a company from one country invests in commercial ventures in another country, typically to set up operations or buy assets there (Gutola & Milos, 2022). FDI is important for growth as it brings in capital, creates jobs, and helps develop local skills (Saha, 2024; Utouh & Kitole, 2024). Plus, FDI often sparks more spending on infrastructure, and enhances competitiveness through innovation (Ganda, 2024). This study will examine FDI's role in boosting energy development in emerging economies. It will look at current energy challenges and how FDI can help while addressing the problems this can create. Factors like resource availability, market potential, and government support attract FDI, though there are risks too. By looking at both successful and unsuccessful FDI cases, we will see how investments impact local economies and communities, from job creation to environmental issues (Danzman and Slaski, 2022). Government policies and global regulations are also key in shaping FDI outcomes (Adanma, & Ogunbiyi, 2024).

## **Historical Context of Energy Infrastructure Development in Selected Developing Countries**

Different factors like economic policies and the history of colonialism have impacted how energy infrastructure has developed in various countries (Utouh & Kitole, 2024). Some African nations inherited energy systems made primarily for extracting resources, often neglecting local needs (Ndasauka, 2024). The oil crisis in the 1970s pushed many countries to rethink energy independence (Priebe, 2024). In the 1990s, nations began opening their energy sectors to attract

foreign investors. Countries like Brazil and Mexico have updated their energy infrastructures following reforms that welcome FDI (Soto, 2024). In Asia, countries like Vietnam and India have set goals to meet rising energy needs and tackle climate change (Kilinc-Ata & Proskuryakova, 2024). This history shows how hard it is to upgrade energy infrastructure while balancing social fairness and economic growth.

### **Reasons Why Foreign Investors Are Interested in Developing Countries' Energy Sectors**

Developing nations often have untapped markets with rising energy needs due to growth and urbanization (Asghar, Ali, Hanif, & Ullah 2024). As the middle class grows, so does energy use, making these markets appealing to investors seeking new opportunities (Liang, Galiano, & Zhou, 2023). Many have rich natural resources, like fossil fuels, wind, and solar energy, that are attractive to investors (UNCTAD, 2021; Onifade, 2023). Large renewable projects can be profitable and support global sustainability goals, leading to more interest. Some developing countries have created favorable laws and incentives to attract FDI in energy (Kimiagari, Mahbobi, & Toolsee, 2023). Policies like feed-in tariffs for renewable projects help lower risks (Gema, 2023; Nyiwul & Koirala, 2024; Sare, Amoah, & Bawuah, 2024).

### **Characteristics of Energy Infrastructure in Developing Countries:**

**Limited Access and Reliability:** People in many developing countries face unreliable energy access, leading to frequent outages (Hussain, Xuetong, & Maqbool 2023). **Diverse Energy Sources:** Their energy mix often includes both fossil fuels and renewables, but investments vary widely (Hassan, Viktor, Al-Musawi, Ali, Algburi, Alzoubi, & Jaszczur, 2024). **Underdeveloped Infrastructure:** Many energy systems suffer from outdated technology and lack of investment, raising costs for users (Rashid, Ghosh, Alam, & Rahman, 2024). **Regulatory Challenges:** The regulatory environment is often complicated, which can slow investment and growth in the energy

sector industry (Hassan, Algburi, Sameen, Tariq, Al-Jiboory, Salman & Jaszczur 2024). Uneven Development: Urban areas receive more energy investments, causing more inequity in energy access (Soman, Lathika., Unnikrishnan, & Shetty 2023).

### **Key Types of Foreign Direct Investments (FDIs) in Energy Sectors:**

Renewable Energy Investments: A large share of FDI goes into renewable energy like solar and wind, reflecting global sustainability efforts (IRENA, 2021; Jayabal, 2024; Zhao, Wang, Yi, Cheng, Zhen, & Hu 2024). Petroleum Sector Investments: Historically, a lot of FDI focused on oil and gas, particularly in resource-rich African and Middle Eastern countries (World Bank, 2020; Olalere 2023; Fortune & Panicker 2024). Electricity Generation Projects: Investments also support building power plants to meet rising energy demands (IEA, 2021; Idroes, Hardi, Hilal, Utami, Noviandy & Idroes 2024).

## **2. Literature Review**

Recent studies have focused on how FDI affects the growth of energy sectors in developing nations (Oprea & Bâra 2024; Li, 2023; Liu, Shen & Razzaq 2023; Kimiagari, Mahbobi & Toolsee 2023; IEA, 2020; Asiedu's (2002)). Here are some key themes:

Economic Impact of FDI: Many studies highlight FDI's role in boosting energy supply, which helps with industrial growth (Aghion and Howitt 2009; Meyer, 2017). Sectoral Focus of FDI: Research shows how global policies encourage FDI in renewable energy. Regulatory Frameworks: Effective laws are crucial for attracting investment (Nielsen et al., 2021). Stable regulations promote investor confidence. Technology Transfer: FDI can bring in new tech, improving local energy sectors (Lei, Chen & Zhang 2024). Environmental Effects: There are concerns about fossil

fuel investments causing environmental harm but also positive impacts from renewable energy projects (Markandya and Tarazona, 2020).

### **Challenges and Risks of FDI in Energy Infrastructure in Developing Countries:**

Political Uncertainty: Instability can threaten the safety of foreign investments (Liu, He, Men, & Sun 2024; Koroso, & Zevenbergen, 2024). Regulatory Complications: Unclear rules can deter investors (Adelhardt & Berneiser, 2024). Economic Conditions: Fluctuating economies can affect energy investment effectiveness (UNCTAD, 2021; Lund and Mander, 2020). Infrastructure Deficits: Lack of infrastructure can hinder project success (OECD, 2021; Mahmood, Misra, Sun, Luqman & Papa 2024).

### **Impact of FDI on Local Economies and Communities:**

FDI significantly shapes local economies, especially in energy: Job Creation: Energy projects create many jobs, improving living standards (ILO, 2020, Khan et al., 2020; Hashemizadeh, Ju, & Abadi 2024). Technology Transfer: FDI helps local firms adopt new technologies and practices (Liu, Yu, Qian, Huang, You, Visscher, & Zhang 2023). Economic Growth: Increased energy supply supports industry growth and attracts more investment (Hoa, Xuan & Thu 2024; Hashemizadeh, Ju, & Abadi 2024).

### **Environmental Implications of FDI in Energy Sectors**

Investments in fossil fuels can harm the environment, while FDI in renewables supports sustainable practices (Nielsen et al., 2020). Poor management of fossil fuel projects can lead to pollution (World Resources Institute, 2020).

## **Role of International Organizations and Policies in FDI in Energy Infrastructure**

Organizations like the UNDP help create favorable policies for attracting FDI (UNDP, 2021). Treaties can protect investors, promoting a stable environment for investment (WTO, 2020). Capacity-building efforts also help countries manage FDI effectively. FDI is crucial for developing energy infrastructure in poor nations (Aluko, Opoku, Ibrahim & Kufuor 2023). It boosts economic growth and technology transfer but comes with risks like environmental damage and dependency on foreign investment (GEF, 2020). Policymakers must work towards clear regulations that attract quality investments while ensuring the benefits are shared with local communities.

### **2.1 Review of FDI in Energy Infrastructure**

Foreign Direct Investment (FDI) plays a big role in growing energy infrastructure, especially in developing countries that might struggle with resources. Many studies look at what drives FDI, its effects, and the problems it brings (Liu, Yu, Qian, Huang, You, Visscher, & Zhang 2023; Aluko, Opoku, Ibrahim & Kufuor 2023). This review aims to sum up what these studies have found about FDI in the energy sector.

### **How FDI Affects Energy Access and Infrastructure Development**

Many researchers agree that FDI helps increase energy access and improve infrastructure. **Energy Access:** Borensztein and team (1998) show that FDI helps bring in new technology. This is key for boosting energy access, especially in developing countries. For example, renewable energy projects in places like Africa and Latin America have greatly improved electricity access in rural areas. **Infrastructure Upgrade:** Zhang (2001) talks about how FDI can help the electricity sector. With foreign investment, countries like India and Brazil have modernized their power grids, making them more reliable.

## **What Drives FDI in Energy Infrastructure**

Several factors impact FDI in the energy sector: **Resource Availability:** Asiedu (2006) points out that having natural resources is a major factor in attracting FDI. Countries like Nigeria and Angola get a lot of foreign investment for oil and gas exploration. **Policies and Incentives:** A good regulatory environment and incentives like tax breaks are important for FDI, as noted by Wheeler & Mody (1992). Countries like Chile show how smart policy changes can bring in foreign investment for solar energy projects (Solarin & Sahu, 2023). **Market Demand:** Markets with rising energy needs, especially China and India, are seen as prime spots for FDI due to their growing consumer bases (UNCTAD, 2023).

## **Challenges and Risks of FDI in Energy**

Even with the benefits, FDI in energy infrastructure has problems to consider: **Environmental Concerns:** Renneboog and others (2020) warn that while FDI can grow the economy, it can also harm the environment, especially in fossil fuel projects. The oil spills in Nigeria's Niger Delta show the risks involved. **Economic Dependency:** Kaplinsky and colleagues (2002) talk about how reliance on foreign capital can be a downside for host countries. This is a problem in places like Sub-Saharan Africa, where local businesses struggle to compete with big foreign firms. **Social Displacement:** Big energy projects can also push communities out, and many people may not get fair compensation, as noted by Oyelaran-Oyeyinka (2004).

## **Comparing Renewable and Non-Renewable Investments**

Studies have also compared FDI in renewable energy to non-renewable energy: **Renewable Energy:** Investments here can bring big changes. Projects like solar farms in Chile can cut greenhouse gas emissions and improve energy access in rural areas (Renneboog et al., 2020). They also often fit with global sustainability goals, which helps attract funding. **Non-Renewable Energy:**

Fossil fuel investments can create jobs and boost GDP, but they come with higher environmental costs (Wang & Zhang 2023). Research shows the trade-offs, like those seen in Nigeria, where economic benefits clash with long-term sustainability (UNEP, 2021).

### **Regional Differences in FDI Impacts**

FDI impacts vary by region based on local factors: Asia: Zhang (2001) mentions that countries like China and India have used FDI to improve energy infrastructure thanks to strong institutions. Latin America: Renneboog and others (2020) note that countries like Brazil and Chile focus more on renewable energy and attract a good amount of foreign investment for these projects. Sub-Saharan Africa: Even with rich resources, FDI struggles due to weak governance and poor infrastructure (Asiedu, 2006). In summary, FDI is crucial for boosting energy infrastructure and access, which can also drive economic growth. However, issues like environmental harm, economic reliance, and community displacement point to the need for better policies and sustainable investment approaches.

### **Successful FDI Projects in Energy Infrastructure**

Here are some successful FDI cases in energy infrastructure from developing countries: Giza Solar Plant, Egypt: The Benban Solar Park has attracted over \$2 billion in foreign investment. It's expected to generate 1.5 gigawatts of electricity and boost Egypt's renewable energy efforts. This project shows how public-private partnerships can work well (IRENA, 2021). Indian Renewable Energy Sector: Foreign investment in India's solar energy sector has surged, with major companies leading big projects. Since the National Solar Mission started in 2010, India has grown its solar capacity, thanks to FDI making it cheaper and boosting local jobs (Ministry of New and Renewable Energy, India, 2021). Viettel Group in Vietnam: Viettel Group has put over \$1 billion into solar energy projects in Vietnam. This helps meet local energy needs and supports the goal of getting



20% of power from renewables by 2030 (Vietnam Electricity, 2020). These examples show that FDI in energy infrastructure can lead to big gains, helping local energy goals while supporting environmental aims.

### **3. Theoretical Review**

Understanding foreign direct investment (FDI) in energy infrastructure needs a solid theoretical framework. Here, we'll look at three key theories: Dependency Theory, Eclectic Paradigm, and Institutional Theory. Each offers different views on how FDI works (Luo, Liu, Pan, & Yang, 2024).

#### **Theoretical Frameworks**

**Dependency Theory:** This theory points out the dangers of depending too much on foreign money. It can lead to economic issues and keep inequality in place. **Eclectic Paradigm:** This model explains what drives FDI by focusing on three main parts: ownership, location, and internalization benefits (Bhandari, Zámorský, Ranta & Salo 2023). **Institutional Theory:** This theory shows how good systems and rules help create a favorable environment for steady FDI.

#### **Theoretical Models and Their Applications**

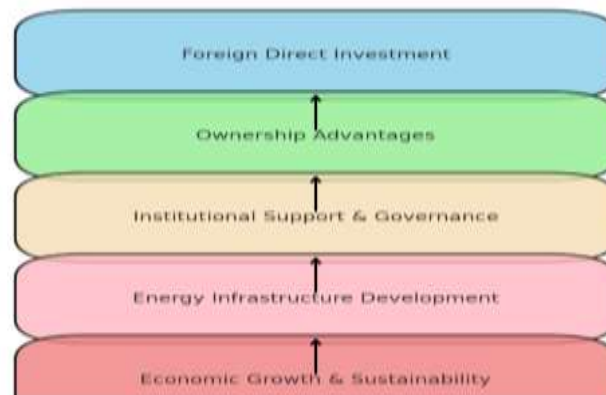
**Dependency Theory:** It criticizes the global economy, stressing that reliance on FDI can harm developing nations. For example, countries with energy resources like Nigeria might find themselves too dependent on foreign investors, making them vulnerable to global market changes. **Eclectic Paradigm:** Proposed by John Dunning (1977,1993), this framework looks at why FDI happens. Countries with rich energy resources, like Saudi Arabia, attract investments due to their natural wealth. However, it falls short in addressing social impacts like sustainability concerns. **Institutional Theory:** This highlights the role of institutions in shaping economic actions. Countries

with strong legal systems, like Chile, attract better FDI. These systems help reduce issues like corruption and ensure fair distribution of benefits (Prebisch, 1950; Frank, 1967).

## Synthesis and Implications

These theories provide different yet helpful views on FDI in energy. Dependency Theory warns about relying on foreign investment and calls for strong local policies (Cardoso & Faletto, 1979). The Eclectic Paradigm explains the factors behind FDI flows. Institutional Theory stresses the need for good governance. Together, they create a useful framework for understanding FDI in energy infrastructure (John Dunning, 1977, 1993).

Figure 1: Summary of the Flowchart for the Framework of FDI Impacts



*Source:* International Energy Agency (2021)

The flowchart shows how Foreign Direct Investment (FDI) affects energy infrastructure development. It highlights the steps that lead to the different results of FDI. Let's break down each part of the framework: i) Foreign Direct Investment (FDI): This is where it all starts. FDI brings in money, technology, and management skills to energy sectors in host countries. These resources set the stage for developing energy infrastructure. ii) Ownership Advantages of Multinational Corporations (MNCs): FDI makes use of the benefits MNCs have. These might include special technologies, industry know-how, and the ability to run big projects efficiently. Examples include

using new solar panel tech in renewable energy and expert knowledge for drilling in oil and gas.

iii) Institutional Support and Governance: The success of FDI heavily relies on how well the local government supports it. Good governance means clear rules and stability for investors. Strong environmental and social standards help balance economic growth with sustainability (Feng, Zhou, & Hussain 2024). iv) Energy Infrastructure Development: When FDI meets good governance, it leads to solid energy infrastructure. This includes building new power plants, expanding transmission lines, and upgrading existing systems for better efficiency. Renewable energy projects, like solar and wind, are crucial for meeting global sustainability goals (Hassan, Viktor, Al-Musawi, Ali, Algburi, Alzoubi & Jaszczur, 2024).

Outcomes: The result of all this is economic growth and better sustainability. Better access to energy can boost productivity and create jobs in many areas like construction and operations. Renewable energy projects can lead to long-term environmental benefits.

Key Interconnections: The flowchart shows how these steps depend on each other. Without the advantages of ownership, the benefits from FDI fall short. If local government structures are weak, it can hurt how well FDI works. Building sustainable energy infrastructure needs a careful balance of economic, environmental, and social factors.

Implications: This framework highlights the need for Strategic FDI Alignment: Make sure foreign investments support national goals. Institutional Strengthening: Improve governance to attract and manage FDI while addressing risks. Sustainability Focus: Invest in renewable energy for lasting social, economic, and environmental benefits. In short, this flowchart helps policymakers and others to use FDI effectively in the energy sector while reducing risks.

## 4. Data and Methods

### Data Sources

This study uses several data sources. We looked at the UNCTAD World Investment Report (2023), World Bank Indicators on Energy Access, International Investment Reports, energy development indices, and case studies from developing countries. We focus on renewable energy projects in Latin America. These resources help us compare data and highlight important trends.

Description of Variables: Here's what we looked at: i. FDI inflow - Money coming into the energy sector (in billion USD). ii. Energy access - The percentage of people with electricity. iii. Energy efficiency - Energy produced per dollar of GDP (measured in kWh/USD). iv. GDP growth - Yearly growth rate of GDP (in %). v. Regulatory quality - An index rating how well regulations work (scale: 1-10). Developing countries show mixed results in FDI for energy. This is mostly due to differences in regions and sectors. For example, Asia and Sub-Saharan Africa have opposite trends because of policy stability and available resources. We want to explore how FDI affects energy outcomes while considering economic and institutional factors. We think that more FDI means better energy access and efficiency.

Table 1: Comparison of Three Regions (2020–2023)

Year	Region	FDIinflow	Energyaccess	Energyefficiency	GDPgrowth	Regulatoryquality
2020	Asia	50.4	85	0.75	4.2	8.5
2020	Latin America	22.1	70	0.65	3.8	7.0
2020	Sub-Saharan Africa	12.5	45	0.40	2.1	5.5
2023	Asia	58.2	90	0.80	5.0	9.0
2023	Latin America	26.3	80	0.70	4.5	7.5

Year	Region	FDIinflow	Energyaccess	Energyefficiency	GDPgrowth	Regulatory quality
2023	Sub-Saharan Africa	17.1	55	0.50	3.0	6.0

Source: UNCTAD (2023)

FDI is key for building energy infrastructure. It helps with energy access, updates facilities, and boosts economies. But there are challenges like environmental damage, economic reliance, and social issues. We need strong policies and sustainable investment. FDI Inflows by Region (2020–2023) Here’s how FDI has changed in Asia, Latin America, and Sub-Saharan Africa from 2020 to 2023:

Figure 2: FDI Inflows by Region (2020–2023)

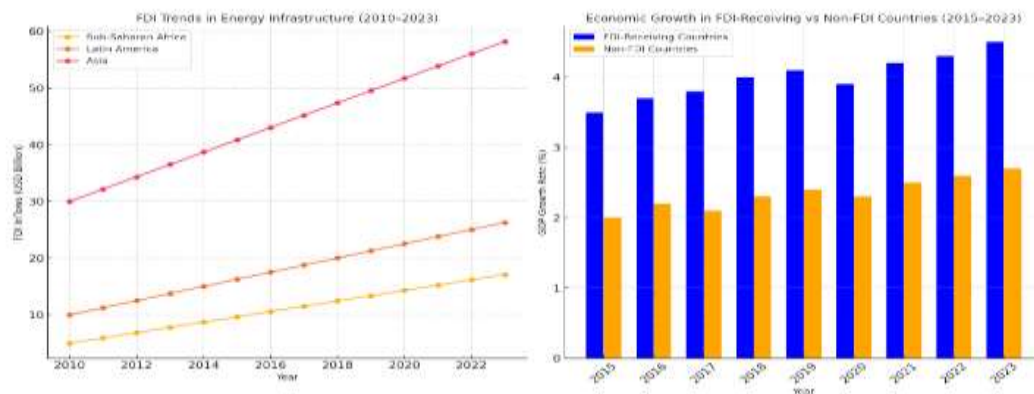
Region	2020 (USD Billion)	2021 (USD Billion)	2022 (USD Billion)	2023 (USD Billion)
Asia	50.4	52.0	55.6	58.2
Latin America	22.1	23.5	24.8	26.3
Sub-Saharan Africa	12.5	14.2	15.8	17.1

Source: World Bank (2023)

FDI effects differ widely between regions. Asia leads in FDI, starting at USD 50.4 billion in 2020 and growing to USD 58.2 billion in 2023. This is thanks to strong institutions and a large market. Countries like China and India have used FDI to improve their energy systems (Zhang, 2001). Latin America saw moderate growth from USD 22.1 billion in 2020 to USD 26.3 billion in 2023. Renewable energy projects are a big reason for this increase. Brazil and Chile are attracting FDI for wind and solar initiatives (Renneboog et al. (2020). Sub-Saharan Africa started at the lowest FDI, moving from USD 12.5 billion in 2020 to USD 17.1 billion in 2023. Growth comes from reforms and resource use, mainly in fossil fuels. While Africa has resources, issues like poor

governance and infrastructure can limit the benefits. Overall, each region shows unique challenges and strengths when it comes to FDI in the energy sector (World Bank, 2023).

Figure 1: FDI trends in energy infrastructure by region (2010–2023) & Economic growth comparison between FDI-receiving and non-FDI countries (2015–2023)



Source: World Bank (2023)

Asia: Asia gets the most foreign direct investment (FDI) in energy. This is because of its big markets and open economies. FDI went up from \$50.4 billion in 2020 to about \$58.2 billion in 2023. Latin America: FDI in Latin America is growing too. It's mainly because of investments in renewable energy. These investments rose from \$22.1 billion in 2020 to \$26.3 billion in 2023. This shows that investors are more confident in projects like solar and wind energy. Sub-Saharan Africa: FDI is also increasing in Africa, but not as fast as in Asia or Latin America. Resource-rich countries and better policies are driving this growth. FDI went from \$12.5 billion in 2020 to around \$17.1 billion in 2023. This shows that the energy sector is slowly developing. The amount of FDI a region gets often depends on stable policies, market potential, and how ready the infrastructure is. Latin America focuses more on renewable energy. In contrast, Sub-Saharan Africa still leans

heavily on fossil fuels. Now, let’s look at how renewable and non-renewable energy projects compare in three areas: job creation, environmental impact, and energy access (Noor, Khan, Khan, & Rasheed 2024).

Table 3: The impacts of renewable and non-renewable energy projects

Impact Category	Solar Farms (Chile)	Oil Exploration (Nigeria)
Job Creation	3	5
Environmental Impact	5	1
Energy Access	4	2

Source: World Bank (2023) & International Energy Agency (2021)

In job creation, oil exploration in Nigeria scores highest. It leads to 50,000 jobs. Solar farms in Chile score lower because they don’t need as many workers. When we look at environmental impact, solar farms do way better. They have low greenhouse gas emissions. Oil exploration is much worse, causing severe environmental damage like oil spills. For energy access, solar farms in Chile provide better sustainable energy. They score a 4. On the other hand, oil exploration in Nigeria scores a 2. Most of that energy goes for export and not for local use (Karanfil & Omgba 2023). From this analysis, it’s clear that Asia leads in FDI thanks to its good investment conditions. Latin America is growing as the world shifts to renewable energy. Meanwhile, Sub-Saharan Africa needs to improve policies to keep up. Lastly, renewable projects, like solar farms in Chile, support sustainability but have higher upfront costs. Fossil fuel projects, like in Nigeria, give quick economic returns but have lasting environmental and social issues.

5. Summary of Findings and Conclusion

Foreign Direct Investment (FDI) has played an important role in improving energy infrastructure in developing countries. When these investments match national energy plans and have strong

support from governance, they can make a real difference. However, challenges still exist, like limited local involvement, environmental risks, and possible over-reliance on external funding. Here are some key points from the analysis: i. Stronger Rules Lead to Better Results: Having clear regulations helps FDI work better in energy. ii. Long-Term Gains from Renewable Energy: Projects that focus on renewable energy can bring long-term social and economic benefits if they are well-planned. iii. Balancing Act: It's important to align what investors want with what the community needs for sustainable growth (Mvile, & Bishoge 2024).

The research shows several important conclusions about how FDI affects energy infrastructure in developing nations: Economic Growth: Studies show that FDI is linked to economic growth by boosting energy supply and spurring more economic activities. Countries like India and Vietnam have seen their energy sectors grow due to foreign investments in renewables (Mitra et al., 2022). Rising Interest in Renewables: There's a noticeable shift in where FDI is going. More money is flowing into renewable energy projects, driven by global climate goals and decreasing costs for green technologies (IRENA, 2021).

#### Need for Clear Guidelines

Effective regulations are crucial in attracting FDI. Countries that have clear and stable investment rules do better in securing foreign funds (UNCTAD, 2021). Tech and Skills Boost: FDI is a key way to bring in new technology and build local skills. This is especially true in renewable energy, where global best practices help local initiatives (Khan et al., 2020). Environmental Impact: While renewable energy investments usually help the environment, FDI in fossil fuels can harm local ecosystems and communities (Qamruzzaman, 2024). The research suggests that improving regulations will help ensure that FDI benefits do not hurt the environment (Caetano, Marques & Afonso 2024).



## **6. Conclusion and Policy Implications**

In conclusion, FDI is vital for building energy infrastructure in developing countries. It helps economic growth, boosts technology, and improves energy access. However, to make the most of these benefits while reducing risks, we need focused policies that strengthen regulations and encourage sustainable investments (Markandya & Tarazona, 2020; Nielsen et al., 2021). Also, FDI is key to solving energy shortages in developing countries (Ahmad, Peng, Awan, & Ahmed, 2023). But its success depends on how well it aligns with national goals, the strength of institutions, and the inclusion of all stakeholders. Even though FDI shows promise for growth, job creation, and tech progress, challenges like political instability and environmental issues remain. To get the most out of FDI while minimizing risks, cooperation among international bodies, governments, and private investors is crucial for achieving sustainable development (Leonidou, Theodosiou, Nilssen, Eteokleous & Voskou 2024).

### **Recommendation**

Policy Reform: Improve transparency and stability in regulations to attract better investments in energy infrastructure. 2. Capacity Building: Focus on developing the local workforce to fully benefit from technology transfer. 3. Sustainability Focus: Prioritize investments in renewable energy to support environmental goals and fight climate change. 4. Stakeholder Engagement: Create inclusive planning processes to ensure local benefits are part of FDI projects. By following these recommendations, developing countries can effectively use FDI to transform their energy sectors while keeping it sustainable.

## References

- Adanma, U. M., & Ogunbiyi, E. O. (2024). Evaluating the effectiveness of global governance mechanisms in promoting environmental sustainability and international relations. *Finance & Accounting Research Journal*, 6(5), 763-791. <https://doi.org/10.51594/farj.v6i5.1151>
- Adelhardt, N., & Berneiser, J. (2024). Risk analysis for agrivoltaic projects in rural farming communities in SSA. *Applied Energy*, 362, 122933. <https://doi.org/10.1016/j.apenergy.2024.122933>
- Ahmad, M., Peng, T., Awan, A., & Ahmed, Z. (2023). Policy framework considering resource curse, renewable energy transition, and institutional issues: Fostering sustainable development and sustainable natural resource consumption practices. *Resources Policy*, 86, 104173. <https://doi.org/10.1016/j.resourpol.2023.104173>
- Aluko, O. A., Opoku, E. E. O., Ibrahim, M., & Kufuor, N. K. (2023). Put on the light! Foreign direct investment, governance and access to electricity. *Energy Economics*, 119, 106563. <https://doi.org/10.1016/j.eneco.2023.106563>
- Asiedu, E. (2006). Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. *The World Economy*, 29(1), 63–77. <https://doi.org/10.1111/j.1467-9701.2006.00758.x>
- Asghar, M., Ali, S., Hanif, M., & Ullah, S. (2024). Energy transition in newly industrialized countries: A policy paradigm in the perspective of technological innovation and urbanization. *Sustainable Futures*, 7, 100163. <https://doi.org/10.1016/j.sftr.2024.100163>
- Bhandari, K. R., Zámorský, P., Ranta, M., & Salo, J. (2023). Digitalization, internationalization, and firm performance: A resource-orchestration perspective on new OLI advantages. *International Business Review*, 32(4), 102135. <https://doi.org/10.1016/j.ibusrev.2023.102135>
- Caetano, R. V., Marques, A. C., & Afonso, T. L. (2024). Can sustainable development induce foreign direct investment? Analysis of the complex inward and outward flows of investment in European Union countries. *Journal of the Knowledge Economy*, 15(2), 9756-9783. 10.1007/s13132-023-01473-9
- Cantarero, M. M. V. (2020). Of renewable energy, energy democracy, and sustainable development: A roadmap to accelerate the energy transition in developing countries. *Energy Research & Social Science*, 70, 101716. <https://doi.org/10.1016/j.erss.2020.101716>
- Danzman, S. B., & Slaski, A. (2022). Incentivizing embedded investment: Evidence from patterns of foreign direct investment in Latin America. *The Review of International Organizations*, 17(1), 63-87. 10.1007/s11558-021-09418-0
- Feng, X., Zhou, D., & Hussain, T. (2024). An investigation of fintech governance, natural resources and government stability on sustainability: Policy suggestions under the SDGs theme. *Resources Policy*, 96, 105184. <https://doi.org/10.1016/j.resourpol.2024.105184>
- Ganda, F. (2024). The influence of democracy, corruption, economic growth and ICT on carbon

- emissions in Sub-Saharan African countries: Does FDI matter?. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(3), 100324.  
<https://doi.org/10.1016/j.joitmc.2024.100324>
- Gema, S. B. (2023). Financing the Energy Transition: The New Paradigm for Renewable Energy Investors. In *The Palgrave Handbook of Zero Carbon Energy Systems and Energy Transitions* (pp. 1-44). Cham: Springer International Publishing.10.1007/978-3-030-74380-2\_4-1
- Gutola, B. R., & Milos, M. (2022). The impact of foreign direct investment on the economic growth of developing countries. Giving example of Kenya. In *Developments in Information & Knowledge Management for Business Applications: Volume 5* (pp. 379-401). Cham: Springer International Publishing. 10.1007/978-3-030-97008-6\_17
- Hashemizadeh, A., Ju, Y., & Abadi, F. Z. B. (2024). Policy design for renewable energy development based on government support: A system dynamics model. *Applied Energy*, 376, 124331. <https://doi.org/10.1016/j.apenergy.2024.124331>
- Hassan, Q., Viktor, P., Al-Musawi, T. J., Ali, B. M., Algburi, S., Alzoubi, H. M., ... & Jaszczur, M. (2024). The renewable energy role in the global energy Transformations. *Renewable Energy Focus*, 48, 100545. <https://doi.org/10.1016/j.ref.2024.100545>
- Hassan, Q., Algburi, S., Sameen, A. Z., Tariq, J., Al-Jiboory, A. K., Salman, H. M., ... & Jaszczur, M. (2024). A comprehensive review of international renewable energy growth. *Energy and Built Environment*. <https://doi.org/10.1016/j.enbenv.2023.12.002>
- Hoa, P. X., Xuan, V. N., & Thu, N. T. P. (2024). Nexus of innovation, foreign direct investment, economic growth and renewable energy: New insights from 60 countries. *Energy Reports*, 11, 1834-1845. <https://doi.org/10.1016/j.egyr.2024.01.050>
- Hussain, S., Xuetong, W., & Maqbool, R. (2023). Understanding the power disruption and its impact on community development: An empirical case of Pakistan. *Sustainable Energy Technologies and Assessments*, 55, 102922. <https://doi.org/10.1016/j.seta.2022.102922>
- Idroes, G. M., Hardi, I., Hilal, I. S., Utami, R. T., Noviandy, T. R., & Idroes, R. (2024). Economic growth and environmental impact: Assessing the role of geothermal energy in developing and developed countries. *Innovation and Green Development*, 3(3), 100144.  
<https://doi.org/10.1016/j.igd.2024.100144>
- Jayabal, R. (2024). Towards a carbon-free society: Innovations in green energy for a sustainable future. *Results in Engineering*, 103121. <https://doi.org/10.1016/j.rineng.2024.103121>
- Karanfil, F., & Omgba, L. D. (2023). The energy transition and export diversification in oil-dependent countries: The role of structural factors. *Ecological Economics*, 204, 107681. <https://doi.org/10.1016/j.ecolecon.2022.107681>
- Kilinc-Ata, N., & Proskuryakova, L. N. (2024). The contribution of energy policies to green energy transition in the Asia-Pacific region. *Renewable Energy*, 237, 121797  
<https://doi.org/10.1016/j.renene.2024.121797>
- Kimiagari, S., Mahbobi, M., & Toolsee, T. (2023). Attracting and retaining FDI: Africa gas and oil sector. *Resources Policy*, 80, 103219. <https://doi.org/10.1016/j.resourpol.2022.103219>
- Koroso, N. H., & Zevenbergen, J. A. (2024). Urban land management under rapid urbanization: Exploring the link between urban land policies and urban land use efficiency in Ethiopia. *Cities*, 153, 105269. <https://doi.org/10.1016/j.cities.2024.105269>
- Leonidou, L. C., Theodosiou, M., Nilssen, F., Eteokleous, P., & Voskou, A. (2024). Evaluating MNEs' role in implementing the UN Sustainable Development Goals: The importance of

- innovative partnerships. *International Business Review*, 102259.
- Li, B. (2023). The role of financial markets in the energy transition: an analysis of investment trends and opportunities in renewable energy and clean technology. *Environmental Science and Pollution Research*, 30(43), 97948-97964. 10.1007/s11356-023-29014-6
- Liang, Y., Galiano, J. C., & Zhou, H. (2023). The environmental impact of stock market capitalization and energy transition: Natural resource dynamics and international trade. *Utilities Policy*, 82, 101517. <https://doi.org/10.1016/j.jup.2023.101517>
- Lei, X., Chen, X., & Zhang, B. (2024). Unleashing the spillover potential: Exploring the role of technology-seeking investment in driving green innovation of host countries. *Technological Forecasting and Social Change*, 200, 123200. <https://doi.org/10.1016/j.techfore.2023.123200>
- Liu, W., Shen, Y., & Razzaq, A. (2023). How renewable energy investment, environmental regulations, and financial development derive renewable energy transition: Evidence from G7 countries. *Renewable Energy*, 206, 1188-1197. <https://doi.org/10.1016/j.renene.2023.02.017>
- Liu, Z., He, S., Men, W., & Sun, H. (2024). Impact of climate risk on financial stability: Cross-country evidence. *International Review of Financial Analysis*, 92, 103096. <https://doi.org/10.1016/j.irfa.2024.103096>
- Liu, Z., Yu, C., Qian, Q. K., Huang, R., You, K., Visscher, H., & Zhang, G. (2023). Incentive initiatives on energy-efficient renovation of existing buildings towards carbon-neutral blueprints in China: Advancements, challenges and perspectives. *Energy and Buildings*, 113343. <https://doi.org/10.1016/j.enbuild.2023.113343>
- Luo, C., Liu, Y., Pan, L., & Yang, F. (2024). Navigating mineral policy development challenges in the global south using analytic hierarchy process. *Resources Policy*, 90, 104797. <https://doi.org/10.1016/j.resourpol.2024.104797>
- Mahmood, S., Misra, P., Sun, H., Luqman, A., & Papa, A. (2024). Sustainable infrastructure, energy projects, and economic growth: mediating role of sustainable supply chain management. *Annals of Operations Research*, 1-32. 10.1007/s10479-023-05777-6
- Miraz, M. H., & Soo, T. S. M. (2024). Factors affecting the green economy: the mediating role of foreign direct investment. *Journal of Economic Studies*. <https://doi.org/10.1108/JES-01-2024-0012>
- Mvile, B. N., & Bishoge, O. K. (2024). Mining and sustainable development goals in Africa. *Resources Policy*, 90, 104710. <https://doi.org/10.1016/j.resourpol.2024.104710>
- Ndasauka, Y. (2024). Historical Origins of Technology in Africa. In *African Mind, Culture, and Technology: Philosophical Perspectives* (pp. 17-36). Cham: Springer Nature Switzerland. 10.1007/978-3-031-62979-2\_2
- Nyiwul, L., & Koirala, N. P. (2024). Renewable energy policy performance and technological innovation in Africa: A Bayesian estimation. *Energy Policy*, 193, 114279. <https://doi.org/10.1016/j.enpol.2024.114279>
- Noor, M., Khan, D., Khan, A., & Rasheed, N. (2024). The impact of renewable and non-renewable energy on sustainable development in South Asia. *Environment, Development and Sustainability*, 26(6), 14621-14638. 10.1007/s10668-023-03210-3
- Olalere, O. E. (2023). Chinese Investment in West African Infrastructural Development: Selected Case Studies. In *Perspectives on Africa-China Infrastructural and Industrial Cooperation: Empirical Findings and Conceptual Implications* (pp. 59-72). Cham: Springer International Publishing. 10.1007/978-3-031-38395-3\_4

- Onifade, S. T. (2023). Environmental impacts of energy indicators on ecological footprints of oil-exporting African countries: Perspectives on fossil resources abundance amidst sustainable development quests. *Resources Policy*, 82, 103481. <https://doi.org/10.1016/j.resourpol.2023.103481>
- Oprea, S. V., & Bâra, A. (2024). Generative literature analysis on the rise of prosumers and their influence on the sustainable energy transition. *Utilities Policy*, 90, 101799. <https://doi.org/10.1016/j.jup.2024.101799>
- Priebe, J. (2024). Glacial energy futures? The history of unbuilt hydropower in Greenland from the 1950s to the 1970s. *Water History*, 1-20. 10.1007/s12685-024-00351-8
- Qamruzzaman, M. (2024). Do natural resources bestow or curse the environmental sustainability in Cambodia? Nexus between clean energy, urbanization, and financial deepening, natural resources, and environmental sustainability. *Energy Strategy Reviews*, 53, 101412.
- Rashid, M. R., Ghosh, S. K., Alam, M. F. B., & Rahman, M. F. (2024). A fuzzy multi-criteria model with Pareto analysis for prioritizing sustainable supply chain barriers in the textile industry: Evidence from an emerging economy. *Sustainable Operations and Computers*, 5, 29-40. <https://doi.org/10.1016/j.susoc.2023.11.002>
- Saha, S. K. (2024). Does the impact of the foreign direct investment on labor productivity change depending on productive capacity?. *Journal of the Knowledge Economy*, 15(2), 8588-8620. 10.1007/s13132-023-01444-0
- Sare, Y. A., Amoah, J. O., & Bawuah, B. (2025). Assessing the impact of international trade and FDI in driving economic development in West Africa: the role of urbanization. *SN Business & Economics*, 5(1), 1-30. 10.1007/s43546-024-00765-9
- Solarin, S. A., & Sahu, P. K. (2023). Sectoral foreign direct investment and environmental degradation: new insights from diversification of energy mix containing fossil fuels and renewable energy. *Environmental Science and Pollution Research*, 30(40), 91853-91873. 10.1007/s11356-023-28741-0
- Soman, B., Lathika, A. R., Unnikrishnan, B., & Shetty, R. S. (2023). Tracing the Disparity Between Healthcare Policy–Based Infrastructure and Health Belief–Lead Practices: a Narrative Review on Indigenous Populations of India. *Journal of Racial and Ethnic Health Disparities*, 1-12. 10.1007/s40615-023-01810-3
- Soto, G. H. (2024). The role of foreign direct investment and green technologies in facilitating the transition toward green economies in Latin America. *Energy*, 288, 129933. <https://doi.org/10.1016/j.energy.2023.129933>
- Udemba, E. N., Magazzino, C., & Bekun, F. V. (2020). Modeling the nexus between pollutant emission, energy consumption, foreign direct investment, and economic growth: new insights from China. *Environmental science and pollution research*, 27(15), 17831-17842. 10.1007/s11356-020-08180-x
- Utouh, H. M., & Kitole, F. A. (2024). Forecasting effects of foreign direct investment on industrialization towards realization of the Tanzania development vision 2025. *Cogent Economics & Finance*, 12(1), 2376947. <https://doi.org/10.1080/23322039.2024.2376947>
- Wang, H., & Zhang, D. (2023). Examining the interplay between fossil fuel mining, sustainable growth, and economic prosperity. *Resources Policy*, 87, 104324. <https://doi.org/10.1016/j.resourpol.2023.104324>
- Zhao, L., Wang, K., Yi, H., Cheng, Y., Zhen, J., & Hu, H. (2024). Carbon emission drivers of China's power sector and its transformation for global decarbonization contribution. *Applied Energy*, 376, 124258. <https://doi.org/10.1016/j.apenergy.2024.124258>