

Columbia Law School

Scholarship Archive

Columbia Center on Sustainable Investment

Research Centers & Programs

12-2022

Scaling Investment in Renewable Energy Generation to Achieve Sustainable Development Goals 7 (Affordable and Clean Energy) and 13 (Climate Action) and the Paris Agreement: Roadblocks and Drivers

Mithatcan Aydos

Perrine Toledano

Martin Dietrich Brauch

Ladan Mehranvar

Theodoros Iliopoulos

See next page for additional authors

Follow this and additional works at: https://scholarship.law.columbia.edu/sustainable_investment



Part of the [International Law Commons](#)

Authors

Mithatcan Aydos, Perrine Toledano, Martin Dietrich Brauch, Ladan Mehranvar, Theodoros Iliopoulos, and Sunayana Sasmal



**SCALING INVESTMENT IN RENEWABLE ENERGY GENERATION
TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS 7 (AFFORDABLE AND
CLEAN ENERGY) AND 13 (CLIMATE ACTION) AND THE PARIS AGREEMENT:
ROADBLOCKS AND DRIVERS**

Mithatcan Aydos, Perrine Toledano, Martin Dietrich Brauch,
Ladan Mehranvar, Theodoros Iliopoulos and Sunayana Sasmal

Table of Contents

List of Acronyms and Abbreviations	3		
Executive Summary	4		
1 Introduction	7		
2 The Economics of Renewable Energy	10		
2.1 Little to No Operating Costs, But High Upfront Capital Costs	12		
2.2 Cost Saving in Developing Economies	13		
2.3 Project-Based Risk Profile	14		
2.4 The Availability of Private Finance	14		
3 Renewable Power Generation: From Roadblocks to Drivers	15		
3.1 Access to Low-Cost Finance	15		
3.1.1 Capital Cost in Renewable Energy	15		
3.1.2 International Public Finance Flows	17		
3.1.3 Concessional Development Finance	19		
3.1.4 Government or State Bank Guarantees	19		
3.1.5 Hybrid Structures	21		
3.1.6 Blended and Catalytic Finance	22		
3.1.7 DFI Participation in Syndication	22		
3.1.8 On-Lending Structures	24		
3.1.9 The Depth of Local Capital Markets	24		
3.1.10 The Role of Export Credit Agencies	26		
3.2 Access to the Grid and the Off-Taker Risk	26		
3.2.1 Interconnection, Grid Management, and Transmission Infrastructure	26		
3.2.2 Curtailment and Storage Capacity	27		
3.2.3 Power Off-Taker Risk	28		
3.2.4 Healthy Utilities and an IPP Framework	29		
3.2.5 Corporate PPAs	30		
3.2.6 Unbundled Electricity Segments	32		
3.2.7 Net Metering	34		
3.3 Fiscal Policy Tools	35		
3.3.1 Carbon Pricing	35		
3.3.2 Support Schemes	38		
3.4 Enabling Institutional Frameworks	43		
3.4.1 Legal Stability	43		
3.4.2 Building a Pipeline of Bankable Projects	54		
3.4.3 Renewable Energy Siting and Permitting	55		
3.4.4 Roadmaps, Master Plans, and Macroeconomics	57		
3.4.5 Global Governance Around the Security of Mineral Supply	59		
4 Conclusion	60		
Appendix. Columbia Center on Sustainable Investment—E3G Survey on the Economic, Financial, and Regulatory Factors Driving or Limiting Investments in Renewables	61		

SUGGESTED CITATION

Mithatcan Aydos, Perrine Toledano, Martin Dietrich Brauch, Ladan Mehranvar, Theodoros Iliopoulos, and Sunayana Sasmal. *Scaling Investment in Renewable Energy Generation to Achieve Sustainable Development Goals 7 (Affordable and Clean Energy) and 13 (Climate Action) and the Paris Agreement: Roadblocks and Drivers*. New York: Columbia Center on Sustainable Investment (CCSI), December 2022. <https://ccsi.columbia.edu/content/renewable-energy-investment-roadblocks-drivers>.

List of Acronyms and Abbreviations

AfDB	African Development Bank
ADB	Asian Development Bank
CBAM	Carbon Border Adjustment Mechanism
CCS	Carbon Capture and Storage
CCSI	Columbia Center on Sustainable Investment
CfD	Contract for Differences
CJEU	Court of Justice of the European Union
CRA	Credit Rating Agency
CSP	Concentrated Solar Power
DFI	Development Finance Institution
ECT	Energy Charter Treaty
ETS	Emissions Trading System
EU	European Union
FET	Fair and Equitable Treatment
FONSIS	Fonds Souverain d'Investissements Stratégiques
GDP	Gross Domestic Product
GW	Gigawatt
IBRD	International Bank for Reconstruction and Development
IEA	International Energy Agency
IFC	International Finance Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
ISDS	Investor-State Dispute Settlement
ITC	Investment Tax Credits
LCOE	Levelized Cost of Electricity
MDB	Multilateral Development Bank
MIGA	Multilateral Investment Guarantee Agency
MW	Megawatt
NPV	Net Present Value
PCS	Preferred Creditor Status
PPA	Power Purchase Agreement
PRI	Political Risk Insurance
PTC	Production Credit Tax
PV	Photovoltaic
SDG	Sustainable Development Goal
SME	Small and Medium-Sized Enterprise
SPV	Special Purpose Vehicle

ACKNOWLEDGMENTS

We thank the following reviewers for their helpful comments and guidance on this report: Jérôme Schmitt, Miguel Muñoz Rodriguez, Gonzalo Saenz De Miera, Marco Serena, and Bruce Usher. We were also guided and supported enormously by Lisa Sachs throughout the project, from its inception to its final stages. We would like to thank Jack Arnold, who spent countless days fixing (and refixing) the footnotes in the report; Ethan Henry Goldstein, Yuko Hashimoto, Aarushi Sahu, and Duoye Xu for their invaluable contributions to the design, analysis, and research of this report and the CCSI-E3G survey; and Jérôme Schmitt and Tom Mitro, who were instrumental at the design phase of the CCSI-E3G survey. We were privileged to have had insightful conversations on various topics throughout the research and writing of this report with Jérôme Schmitt, Lou Wells, Joe Bell, George Kahale III, Haydn Palliser, and the AES team. We also want to thank Susan McGregor, who helped us decipher the data and extract important conclusions from it. Frank Qiankun, Zachary Hanson, and Reed Vettel kindly helped in the dissemination of the survey. The CCSI-E3G survey would not have been possible without the support of E3G, especially Ignacio Arroniz Velasco and Lisa Fischer. And finally, we would like to thank all the industry expert respondents who completed the survey, especially those that went the extra mile to speak to us virtually for follow-up questions. Thank you so much.

Executive Summary

The zero-carbon energy transition is the solution to the 2022 energy crisis and a fundamental part of the solution to the global climate crisis. Yet, there are relatively low levels of investment in renewable energy in developing countries, hindering their achievement of the Sustainable Development Goals (SDGs) and contribution to the Paris Agreement goals.

In 2021, the Asia-Pacific region (excluding China) accounted for less than 8% of investments in energy transition technologies, Latin America and the Caribbean for less than 4%, and Africa and the Middle East for less than 2%. Annual investment in zero-carbon energy in developing economies other than China has stagnated since the Paris Agreement was signed in 2015. To put the world on track to reach net-zero emissions by 2050, annual capital spending on zero-carbon energy in developing countries must increase by more than seven times, to more than USD 1 trillion, by the end of the 2020s.

There is therefore an urgent need to address the drivers of public and private finance for investment in renewable electricity generation, network infrastructure, and end-use sectors to meet the Paris Agreement and two complementary SDGs: ensuring access to affordable, reliable, sustainable, and modern energy for all (SDG 7); and taking urgent action to combat climate change and its impacts (SDG 13).

This report **sheds light on roadblocks to scaling up investments in renewables** while distilling solutions from international experience and **brings clarity to where international and national efforts should urgently be focused** to address the deterrents of investment in renewables and enable zero-carbon energy security and prosperity.

This study identifies five main roadblocks to investment in renewables:

- 1. Developing countries lack the necessary access to low-cost capital to invest in renewables.** Being more capital-intensive than fossil fuels, renewable energy projects can be significantly less attractive at high-interest rates than at low-interest rates. The cost of nominal financing is up to seven times higher in developing countries than in Europe and the United States, with higher levels in geographies considered riskier. The perception of investment risks exacerbated by sovereign credit scores and ratings, and the lack of concessional finance, catalytic finance, and guarantees make the cost of capital much higher than in developed countries.
- 2. There is a lack of investment in grid and storage infrastructure and a lack of solutions addressing the off-taker risk**—the risk that the power producer will not be paid by the buyer (or off-taker) for the power produced. The off-taker risk, compounded by the currency risk and the lack of sufficient modern grid deployment, is currently considerably hampering the deployment of renewable generation.

- 3. There are insufficient domestic regulatory frameworks for renewable electricity and ill-designed incentives as well as an under-developed institutional capability** to develop bankable projects, competitive bidding procedures, and efficient permit and siting processes.
- 4. Existing regulatory frameworks—in law, contract, and investment treaties—can limit developing country governments’ policy space to implement and adapt policies to promote and leverage investment in renewables.**
- 5. Developing countries’ national energy roadmaps and master plans are either non-existent or ill-designed.**

In light of these roadblocks, this report makes the following key recommendations:

- 1. To lower upfront capital costs and encourage public and private finance for investment in renewables**, international and national financial institutions should develop efficient and adequate debt financing policies; reorient international climate finance toward long-tenor, low-interest concessional finance and away from high-cost, short-term financing that causes liquidity crises in developing countries; and enable guarantees and catalytic finance.
- 2. To reduce the off-taker risk, exacerbated by the currency risk, and ensure grid reliability**, developing country governments should build, bolster, digitize, and upgrade the transmission grid and energy storage solutions; set up strong and healthy power utilities; allow independent power producers (IPPs); hold transparent and efficient bids; introduce standardized utility–investor power purchasing agreement (PPA) templates and develop corporate PPA frameworks, and promote gradual and controlled unbundling of the electricity market. Developing the local capital and financial market and the use of currency risk guarantees are key to reducing the currency risk.
- 3. To orient and support renewables investment**, developing country governments should design fiscal policy tools, including carbon pricing set at high levels and support schemes such as feed-in tariffs, feed-in premiums, renewable energy quotas and certificates, bidding procedures, and tax benefits. Developing country governments should periodically review and adjust fiscal policy tools in light of changed national and global economic realities, to ensure that the policy tools achieve their goals efficiently. In addition, **developing country governments should build expertise in building a pipeline of bankable projects**; ensure that the permits required are suitable to address economic, social, and environmental concerns, according to a framework integrating land use in energy planning; and introduce a “one-stop shop” model, with a single administrative body to centralize and streamline permitting processes and reduce transaction costs.
- 4. Developing country governments should establish robust and stable institutional, legal and regulatory frameworks**, which are instrumental to investor confidence. Investors are attentive to legal frameworks that are fair, flexible, transparent, and predictable, and that establish a strong rule of law with effective dispute settlement

mechanisms. The existence of these conditions establishes a conducive investment climate in a country while providing governments with the necessary flexibility and policy space to adapt the regulatory framework if or when circumstances change. These changes, however, must be proportionate, reasonable, non-discriminatory, and in line with due process. Investment treaties are not an effective tool for attracting investment, and they can be extraordinarily costly for states and for the broader policy objective of encouraging renewable energy investments. Instead, developing country governments should build or strengthen domestic legal frameworks that promote a mutually beneficial, long-term, flexible, and durable investment climate.

5. At the core of their institutional, legal, and regulatory framework, developing country governments should develop ambitious national energy roadmaps, outlining the national energy sector strategy, setting targets and milestones according to a back-casting approach, identifying and addressing constraints, defining what will be common vs. project infrastructure, and delineating how infrastructure will be financed and remunerated.

The necessary global transition to a net-zero energy system will entail significant and front-loaded shifts in demand, capital allocation, costs, and jobs. The phase-out and rerouting of investments in fossil fuels must be accompanied by increased investment in renewable energy. Because so much of the infrastructure and capital stock of contemporary economic systems depend on fossil fuel use, the transition will require extensive restructuring and new investment.

Even though private markets will be essential to this process, **significant changes in governmental policies are required** to support the transition. In addition, much of this investment will be cross-border in nature, as capital and technology must flow to developing economies to bridge the wide differences between regions in the rate and amount of renewable energy investment.



1 Introduction

Energy is central to achieving the 2030 Agenda for Sustainable Development, in which two complementary Sustainable Development Goals (SDGs) have particular relevance: (i) ensuring access to affordable, reliable, sustainable, and modern energy for all (SDG 7) and (ii) taking urgent action to combat climate change and its impacts (SDG 13).¹ The Paris Agreement also requires financial flows to be aligned with low-carbon and climate-resilient development as a critical measure to strengthen the response to climate change² and put the world on a path that limits global warming to 1.5°C above pre-industrial levels. To achieve these global goals, increased investment is needed in renewable electricity generation, network infrastructure, and end-use sectors.

While trends in investments, capacity additions, and levelized costs all point to progress in the renewable energy sector, they still fall short of what is required.³ According to the International Energy Agency (IEA), to achieve Paris Agreement goals, annual transmission and distribution grid investment should rise from the current USD 260 billion to USD 820 billion in 2030.⁴ McKinsey also reports that targeting net-zero greenhouse gas emissions by 2050 requires around USD 275 trillion in cumulative investments over 30 years, which means a 60% increase in annual energy spending compared to today's level, as well as a massive reorientation of spending from high-emission assets to low-emission assets.⁵ Likewise, the International Renewable Energy Agency (IRENA) estimates that total global energy spending needs between 2021 and 2050 amount to USD 131 trillion. Investment in energy under current government strategies already amounts to USD 98 trillion over the period, but the figure includes investments in fossil fuels. IRENA assesses that USD 24 trillion must be diverted from fossil fuels to low-carbon energy.⁶

Global investment in renewables remains below its potential—and COVID-19 has widened the gap between investment needs and current investment flows.⁷ According to BloombergNEF, the world committed more than USD 500 billion to decarbonization projects in 2021,

1 United Nations General Assembly (UNGA), “Transforming Our World: The 2030 Agenda for Sustainable Development” (2015), <https://sdgs.un.org/2030agenda>.

2 Paris Agreement, adopted December 12, 2015, entered into force November 4, 2016, UN Doc. FCCC/CP/2015/10/Add.1, Art. 2.1(c), https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

3 “To ensure a climate-safe future, annual investment in renewables – including various types of power generation, solar heat and biofuels – would have to almost triple to USD 800 billion by 2050.” International Renewable Energy Agency (IRENA) and Climate Policy Initiative (CPI), *Global Landscape of Renewable Energy Finance 2020* (Abu Dhabi: IRENA, 2020), <https://www.irena.org/publications/2020/Nov/Global-Landscape-of-Renewable-Energy-Finance-2020>.

4 International Energy Agency (IEA), *Net Zero by 2050: A Roadmap for the Global Energy Sector* (Paris: IEA, May 2021), 21, <https://www.iea.org/reports/net-zero-by-2050>.

5 McKinsey Global Institute, *The Net-Zero Transition: What It Would Cost, What It Would Bring* (New York: McKinsey & Company, January 2022), 19, Exhibit 6, <https://www.mckinsey.com/capabilities/sustainability/our-insights/the-net-zero-transition-what-it-would-cost-what-it-could-bring>.

6 International Renewable Energy Agency (IRENA), *World Energy Transitions Outlook 2021: 1.5°C Pathway* (Abu Dhabi: IRENA, 2021), 28, <https://irena.org/publications/2021/Jun/World-Energy-Transitions-Outlook>.

7 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, World Energy Investment 2021 Special Report in collaboration with the World Bank and the World Economic Forum (Paris: IEA, 2021), 13, <https://www.iea.org/reports/financing-clean-energy-transitions-in-emerging-and-developing-economies>.

driven by the urgent need to combat climate change.⁸ Over half of the money was spent on renewable energy generation, and the other half was spent on domestic heat pumps, electric vehicles, hydrogen technology, and carbon capture and storage (CCS) systems.⁹ A total of 257 GW of renewable energy generation capacity was added in 2021 globally, 60% of which was in Asia.¹⁰ China was the major contributor to the 121 gigawatts (GW) added to Asia's capacity.¹¹ Europe added 39 GW, and North America added 38 GW, taking second and third place, respectively.¹² According to IRENA, approximately 84% of investments in energy transition technologies in 2021 were made in China, India, Europe, Japan, and the United States, with the rest of the Asia-Pacific region accounting for less than 8%, Latin America and the Caribbean for less than 4%, and Africa and the Middle East for less than 2%.¹³ And according to the IEA, annual investment in zero-carbon energy in developing economies (China excluded) has stagnated since the Paris Agreement was signed.¹⁴

The relatively low levels and shares of renewable energy investments in developing countries stand in contrast to their increasingly determinant role in the world's energy and climate future. With two thirds of the world's population, they account for only one fifth of low-carbon energy investment and one tenth of global financial wealth.¹⁵ The COVID-19 pandemic has also harmed corporate balance sheets and consumers' ability to pay, putting further strain on the government's finances. In 2020, total low-carbon energy investment in developing economies "fell by 8% to less than USD 150 billion." To put the world on track to reach net-zero by 2050, annual capital spending on zero-carbon energy in developing economies must increase "by more than seven times, to more than USD 1 trillion, by the end of the 2020s," according to the IEA.¹⁶

Thus, the crux of achieving SDGs 7 and 13 and the Paris Agreement is plugging the finance gap in developing economies. The IEA anticipates that around 70% of sustainable energy investments over the next decade will need to be carried out by private developers, consumers, and financiers. To mobilize capital on a much larger scale, the private sector will need to play a much bigger role, while multilateral development banks (MDBs) and development finance institutions (DFIs) will need to ramp up their support to both de-risk private investment and support public finance. Indeed, despite the expectation that the private sector will play a major role in renewable energy generation, public finance—including the participation of state-owned enterprises in energy markets—will continue to play an important role, particularly in grid infrastructure and transitions in emissions-intensive sectors.¹⁷

8 "Energy Transition Investment Hits \$500 Billion in 2020 – For First Time," Bloomberg NEF, 2021, <https://about.bnef.com/blog/energy-transition-investment-hit-500-billion-in-2020-for-first-time>.

9 Ibid.

10 International Renewable Energy Agency (IRENA), *Renewable Energy Statistics 2022* (Abu Dhabi: IRENA, July 2022), <https://www.irena.org/publications/2022/Jul/Renewable-Energy-Statistics-2022>.

11 Ibid.

12 Ibid.

13 "IRENA Goes Beyond the Talk to Address Financing Challenges in Developing Countries," IRENA Newsroom (July 2022), <https://www.irena.org/newsroom/articles/2022/Jul/IRENA-Goes-Beyond-the-Talk-to-Address-Financing-Challenges-in-Developing-Countries>; International Renewable Energy Agency (IRENA), *World Energy Transitions Outlook 2022: 1.5°C Pathway*.

14 International Energy Agency (IEA), *World Energy Outlook 2022* (Paris: IEA, 2022), <https://www.iea.org/reports/world-energy-outlook-2022>.

15 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, supra n. 7.

16 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, 14, supra n. 7.

17 Ibid.

For mobilizing and catalyzing this finance, it will be critical for governments to develop a robust institutional, legal and regulatory framework to reduce the actual and perceived country risk, including political, economic, and legal risks. The framework should be characterized by fairness, flexibility, transparency, and predictability, and establish a rule of law upheld by effective dispute settlement mechanisms. Separate legal instruments, like international investment treaties, are ineffective at addressing legal and political risks or attracting investments and are, in fact, harmful and costly to governments and the public interest.

This paper examines the constraints and levers of the investment necessary to meet SDGs 7 and 13 and the Paris Agreement, focusing in particular on renewable energy generation. Section 2 outlines the economics of renewable energy. Section 3 explores current constraints on scaling investment in renewables while analyzing the necessary policy, regulatory, and institutional frameworks to eliminate those roadblocks and drive investment. Section 4 concludes the paper with the main takeaways.



2 The Economics of Renewable Energy

Renewable energy is unlimited in that natural processes are constantly replenishing it. However, the availability (or technical potential) of renewable energy is limited because it varies over time and space. The use of wind or solar energy is particularly suitable for some geographical areas. For instance, the southwest of the United States, parts of Australia, the Middle East, South America, and Northern Africa, have the highest potential for solar energy. Northern Europe, the southernmost point of South America, and the United States' Great Lakes region are a few of the best places for wind energy.¹⁸ Solar generation capacity increased by 19% and wind by 13% in 2021. Together, the two technologies made up 88% of the share of newly installed renewable capacity in 2021.¹⁹ Other sources of renewable energy include hydropower, biomass, and geothermal (see Box 1).

This section examines key concepts to understand the basics of renewable energy economics.

BOX 1. RENEWABLE ENERGY SOURCES

Solar

Solar energy is increasingly used for generating electricity and heating, or even desalinating water. It can be generated in two main ways:²⁰

1. Photovoltaic (PV) technology converts sunlight directly into electricity and is one of the fastest-growing renewable energy technologies. Solar PV installations are flexible and can serve industrial and commercial needs or community and household needs. The cost of manufacturing solar panels has dropped considerably in the last decade (by nearly 90%), turning them into the cheapest form of electricity after wind.
2. Concentrated solar power (CSP) uses mirrors to concentrate sunlight that heats fluid. The fluid, in turn, creates steam to turn a turbine and generate electricity in large-scale power plants. The advantage of a CSP plant is that it can be equipped with molten salts to enable the storage of heat energy. CSP remains much more expensive than PV, and CSP technology is still in development with low deployment currently.

Wind

The energy in moving air is what drives wind turbines.²¹ The number of locations where the energy source can be developed affordably limits the potential for wind power in most areas. However, wind energy can be safely transported over great distances.²²

Most wind energy projects have been onshore, but offshore wind power has several benefits. Land-based wind power is generally deemed weaker and less regular than offshore winds. The capacity factor of wind energy rises with greater wind consistency, decreasing the need for energy storage.

18 David Timmons, Jonathan M. Harris, and Brian Roach, *The Economics of Renewable Energy* (Global Development and Environment Institute, 2014), 5, <https://www.bu.edu/eci/files/2019/06/RenewableEnergyEcon.pdf>.

19 International Renewable Energy Agency (IRENA), *Renewable Capacity Statistics 2022* (Abu Dhabi: IRENA, 2022), <https://irena.org/publications/2022/Apr/Renewable-Capacity-Statistics-2022>; International Renewable Energy Agency (IRENA), "Renewables Take Lion's Share of Global Power Additions in 2021," (April 11, 2022), <https://www.irena.org/newsroom/pressreleases/2022/Apr/Renewables-Take-Lions-Share-of-Global-Power-Additions-in-2021>.

20 "Solar Energy," International Renewable Energy Agency (IRENA) (IRENA, n.d.), <https://irena.org/solar>.

21 Timmons, Harris, and Roach, *The Economics of Renewable Energy*, 9, supra n. 18.

22 Id., 5.

Due to the ease with which larger turbine components can be transported by water, offshore turbines may ultimately be larger than onshore turbines.²³ Offshore wind power, however, is produced at a higher cost than land-based wind power, with the latter being the cheapest source of electricity.²⁴

Hydropower

To generate energy, hydropower needs precipitation and an elevation change; the best hydropower potential is found in wet, mountainous regions. The total amount of energy produced by hydropower depends on the flow and vertical drop of the water (head).²⁵ High head and high flow are characteristics of the best hydropower locations. These sites may offer a lot of electricity for a fair price, yet their energy potential is limited due to the land restrictions.

The external costs of hydropower, particularly those related to dam construction, are the most notable issue in hydropower economics. External costs and negative environmental impacts resulting from dam construction can be reduced—but at a price. A hydropower plant without a dam structure will likely be less profitable (or more costly), as the process of piping water from a higher elevation to a lower one is generally more expensive than the construction of a dam.²⁶

Although hydropower accounts for the biggest portion of the world's total renewable generation capacity (at 1,230 GW), solar and wind power continued to outpace new producing capacity.²⁷

Biomass

Wood, crops, crop residues, and animal waste all fall under the category of biomass, which is a fuel produced from plant matter. Biomass energy can take on various forms in industrial economies. It can be burned in its most basic form, which is wood chips, wood pieces, or sawdust, while grass and crop residues can also be compressed into bricks or pellets and burned. Similar to burning coal in a power plant, biomass combustion can be used to generate electricity.²⁸

In comparison to current energy consumption, the total amount of biomass energy that is currently available is limited for several reasons. The feedstocks required for conventional biomass that is economically viable can lead to deforestation and compete with food production for agricultural land, which can result in a large increase in carbon dioxide (CO₂) emissions associated with land clearing. Non-conventional biomass that relies on feedstocks based on waste—and therefore does not lead to land-use change—has high costs, but a lot of current research is directed at drastically reducing costs in the future.²⁹

Geothermal

The heat that rises from the Earth's interior is known as geothermal energy. The source of the heat is steam produced from the molten rock, or magma, that makes up the Earth's crust. Mile-deep wells are drilled into underground reservoirs to access the steam, which is then used to drive turbines attached to electrical generators. Due to its activity occurring along the tectonic plates of the Earth's crust, it is one of the most location-specific energy sources known.

Geothermal energy is not an intermittent source of energy like wind or solar, and it only creates one sixth of the CO₂ that a fossil gas plant would. This means geothermal allows renewable heat supply regardless of the day, time, season, and weather. However, geothermal has certain disadvantages. It has been linked to other emissions, such as sulfur dioxide and hydrogen sulfide, despite producing little CO₂. Even though an enormous base load energy reserve is provided by geothermal heat, the initial drilling stage is the most challenging for project firms and investors because if the planned geothermal reservoir cannot produce enough output, the project is typically abandoned, and the investment is wasted. Besides, building a geothermal power plant comes with a high initial cost, and therefore, financing geothermal projects is challenging. They might also cause minor tremors in the areas where they operate, as fracking does.³⁰

23 Ibid.

24 International Renewable Energy Agency (IRENA), *Renewable Power Generation Costs in 2021* (Abu Dhabi: IRENA, July 2022), <https://www.irena.org/publications/2022/Jul/Renewable-Power-Generation-Costs-in-2021>.

25 Timmons, Harris, and Roach, *The Economics of Renewable Energy*, 8, supra n. 18.

26 Id., 5.

27 IRENA, "Renewables Take Lion's Share of Global Power Additions in 2021," supra n. 19.

28 Timmons, Harris, and Roach, *The Economics of Renewable Energy*, 5, supra n. 18.

29 International Energy Agency (IEA), *World Energy Outlook 2019* (Paris: IEA, 2019), <https://www.iea.org/reports/world-energy-outlook-2019>.

30 Jack Unwin, "What is Geothermal Energy?," *Power Technology*, January 28, 2020, <https://www.power-technology.com/analysis/what-is-geothermal-energy/>; Josef Weber and Inga Moeck, *Heat Transition with Geothermal Energy: Chances and Opportunities in Germany* (Hannover: Leibniz Institute for Applied Geophysics (LIAG), September 2019), https://www.geotis.de/e_learning/playtype/download/WEB_heat_transition.pdf.

2.1 Little to No Operating Costs, But High Upfront Capital Costs

Most renewable energy sources demand higher capital expenditures than fossil fuels.³¹ But this does not mean that renewable energy is more expensive than fossil fuels when the entire investment cycle is considered. Deploying renewable energy technologies requires large upfront investments that must be financed. The cost of capital thus accounts for a sizable portion of the lifespan expenditures of a renewable energy project.³² Renewable energy sources like solar and wind benefit from low operating costs.³³ In contrast, a significant portion of the total cost of fossil fuel-fired electricity generation comes from fuel purchases, which are dispersed over a long period.³⁴

The investment cost of a renewable energy facility should be compared to that of a fossil fuel facility, including the operating costs. The levelized cost of electricity (LCOE) is used to make such cost comparisons between various energy sources. Levelized costs, which are expressed in real terms to offset the impact of inflation, represent the net present value (NPV) of constructing and running a plant over an assumed lifetime. Future fuel prices are assumed for energy sources that depend on fuel. To make direct comparisons between various energy sources, the levelized (or NPV) construction and operating costs are divided by the NPV of the energy obtained during the lifetime of the project.³⁵

According to IRENA, “the global weighted average LCOE of newly commissioned projects utility-scale solar PV projects declined by 88% between 2010 and 2021, that of onshore wind and CSP by 68%, and offshore wind by 60%,” contributing to “a seismic shift in the balance of competitiveness between renewables and incumbent fossil fuel and nuclear options.”³⁶ In 2021, as compared to the cheapest new fossil fuel-fired power generation, the global weighted average LCOE of both new utility-scale solar PV and hydropower was lower by 11%, and that of new onshore wind generation was lower by 39%.³⁷ On the other hand, on average, the costs of geothermal and bioenergy globally remain higher than the least expensive fossil fuel-fired power plant. However, they do provide a secure supply, and their competitiveness can be enhanced in developing countries (see Figure 1 and Table 1). Capacity factors for solar and wind are also constantly improving, which contributes greatly to the decrease in their LCOE.³⁸

31 Bjarne Steffen, “Estimating the Cost of Capital for Renewable Energy Projects,” *Energy Economics* 88 (May 2020): 104783, <https://www.sciencedirect.com/science/article/pii/S0140988320301237>.

32 Lion Hirth and Jan Christoph Steckel, “The Role of Capital Costs in Decarbonizing the Electricity Sector,” *Environmental Research Letters* 11, no. 11 (2016), <https://iopscience.iop.org/article/10.1088/1748-9326/11/11/114010>.

33 Steffen, “Estimating the Cost of Capital for Renewable Energy Projects,” supra n. 31; Ottmar Edenhofer, Lion Hirth, Brigitte Knopf, Michael Pahle, Steffen Schloemer, Eva Schmidt, and Falko Ueckerdt, “On the Economics of Renewable Energy Sources,” *Energy Economics* 40 (2013), 12–23, <https://doi.org/10.1016/j.eneco.2013.09.015>.

34 Hirth and Steckel, “The Role of Capital Costs in Decarbonizing the Electricity Sector,” supra n. 32.

35 Edenhofer et al., *On the Economics of Renewable Energy Sources*, 24, supra n. 33.

36 IRENA, *Renewable Power Generation Costs in 2021*, supra n. 24.

37 Ibid.

38 Ibid.

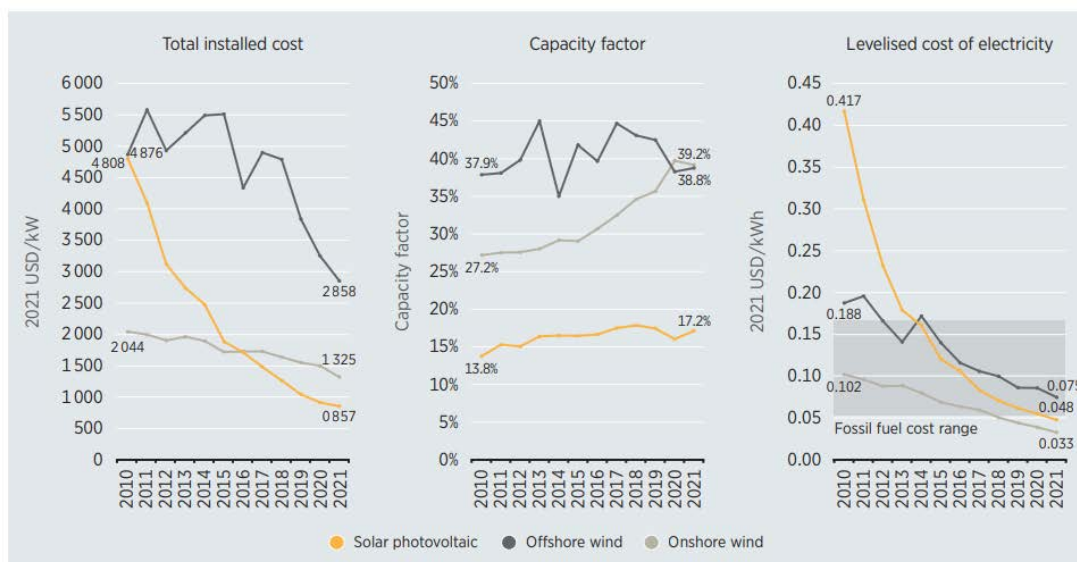


Figure 1. Change in the economics of newly commissioned utility-scale solar PV, onshore and offshore wind, LCOE, 2010–2021.

Source: IRENA.³⁹

Table 1. The economics of renewable energy by technology, LCOE: 2010 and 2021.

	Total installed costs			Capacity factor			Levelised cost of electricity		
	(2021 USD/kW)			(%)			(2021 USD/kWh)		
	2010	2021	Percent change	2010	2021	Percent change	2010	2021	Percent change
Bioenergy	2 714	2 353	-13%	72	68	-6%	0.078	0.067	-14%
Geothermal	2 714	3 991	47%	87	77	-11%	0.050	0.068	34%
Hydropower	1 315	2 135	62%	44	45	2%	0.039	0.048	24%
Solar PV	4 808	857	-82%	14	17	25%	0.417	0.048	-88%
CSP	9 422	9 091	-4%	30	80	167%	0.358	0.114	-68%
Onshore wind	2 042	1 325	-35%	27	39	44%	0.102	0.033	-68%
Offshore wind	4 876	2 858	-41%	38	39	3%	0.188	0.075	-60%

Source: IRENA.⁴⁰

2.2 Cost Saving in Developing Economies

Sources of renewable energy will save developing countries USD 156 billion in costs, according to IRENA.⁴¹ In comparison to adding the same amount of fossil fuel-fired power, the renewable projects introduced in 2021 will lower electricity sector prices by at least USD 6 billion annually in developing economies.⁴² Two thirds of these savings will be attributed to onshore wind, and hydropower and solar PV will account for the rest. Since 2010, 534 GW of renewable energy capacity has been added in developing countries at prices lower than the cheapest coal option, bringing annual electricity bills down by about USD 32 billion (1% of Africa’s current GDP).⁴³

39 Ibid.

40 Ibid.

41 Ibid.

42 Ibid.

43 Ibid.

2.3 Project-Based Risk Profile

While utilities have often built many fossil fuel-based power facilities through corporate finance structures, which is reflected on balance sheets, and continue to do so when investing in renewable energies, a much larger set of sponsors drawing on project finance drove the drastic rise of renewable energy investments over the last two decades.⁴⁴ When financing a project, the sponsor establishes a separate legal entity, generally referred to as a special purpose vehicle (SPV), which is subsequently used to hold the renewable energy assets and is financed by both debt and equity. Thus, debt holders and investors depend on the future cash flows of the renewable energy project and cannot rely on other project sponsors' assets. The investment risk profile of the renewable energy project and the associated cost of capital are designed uniquely for each investment project.⁴⁵ This situation makes it unimportant for investors or lenders whether the sponsor has a strong balance sheet. Even companies with a strong balance sheet could not easily reduce the costs arising from project-based risks and therefore may lose their leverage to access low-cost finance.

Another characteristic of renewable energy projects is that they often change hands after the construction stage and are then refinanced for better financial returns since the risk has subsided.⁴⁶

2.4 The Availability of Private Finance

Despite the current petroleum shock, with oil and gas prices at sky-high levels and oil and gas companies experiencing extraordinary profits, the long-term trend established by the IEA is marked by subdued prices for both.⁴⁷ Before the petroleum shock, a 2020 study comparing the 5-year and 10-year financial performance of listed companies engaged in fossil fuel supply with those in renewable energy has revealed that “renewables investments in Germany and France yielded returns of 178.2% over a five-year period, compared with -20.7% for fossil fuel investments.”⁴⁸ In the United Kingdom and the United States, renewable investments yielded 75.4% and 200.3%, respectively, compared to 8.8% and 97.2% for fossil fuels.⁴⁹ Returns were also less volatile in renewables than in fossil fuels.⁵⁰ Despite these results and the steady growth of dedicated financial instruments—such as green bonds and sustainability bonds—in the past decade,⁵¹ the market for renewables is still not deep and liquid enough for institutional investor financing.⁵²

44 Steffen, *Estimating the Cost of Capital for Renewable Energy Projects*, 2, supra n. 31.

45 Ibid.

46 Robert Gross and William Blyth, *Renewable Energy Risk and Reward: Key Trends and Territories* (Lloyd's, 2020), https://assets.lloyds.com/assets/pdf-renewable-energy-risk-and-reward-renenergy-keytrendsandterritories/1/pdf-renewable-energy-risk-and-reward-RenEnergy_KeyTrendsandTerritories.pdf.

47 IEA, *World Energy Outlook 2022*, supra n. 14.

48 Charles Donovan, Milica Fomicov, Lena-Katharina Gerdes, and Michael Waldron, *Energy Investing: Exploring Risk and Return in the Capital Markets* (Paris: IEA, 2020), 14, <https://www.imperial.ac.uk/business-school/faculty-research/research-centres/centre-climate-finance-investment/research/energy-investing-exploring-risk-and-return-the-capital-markets>; David Vetter, “Just How Good an Investment is Renewable Energy? New Study Reveals All,” *Forbes*, May 28, 2020, <https://www.forbes.com/sites/davidvetter/2020/05/28/just-how-good-an-investment-is-renewable-energy-new-study-reveals-all/?sh=479165714d27>.

49 Donovan et al., *Energy Investing*, 12, supra n. 48.

50 Buchner et al., *Global Landscape of Climate Finance 2021* (Climate Policy Initiative, December 2021), <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2021>; Climate Bonds Initiative, *Sustainable Debt: Global State of the Market 2020* (Climate Bonds Initiative, 2020), https://www.climatebonds.net/files/reports/cbi_sd_sotm_2020_04d.pdf.

51 Ibid.

52 Donovan et al., *Energy Investing*, 12, supra n. 49.

3 Renewable Power Generation: From Roadblocks to Drivers

As shown above, despite the pressing need for scaling renewable energy projects and their extensively improving economics, these projects still suffer from an investment gap in developing and developed countries alike. This section sheds light on the determinants of scaling investment in renewable power generation in developing countries in particular. It explores how to remove roadblocks and enhance drivers of renewable energy investment by increasing access to low-cost finance, securing access to grid networks, reducing the off-taker risk, designing fiscal instruments, and improving the quality of the regulatory and institutional framework.

The section leverages existing analyses as well as the findings of a survey conducted by the Columbia Center on Sustainable Investment (CCSI), in partnership with E3G, an independent climate change think tank. The results of the survey are summarized in the Appendix.

3.1 Access to Low-Cost Finance

3.1.1 Capital Cost in Renewable Energy

High financing costs are the major obstacle to expanding investments in renewable energy, according to IRENA and IEA.⁵³ As explained above, the net-zero carbon energy transition requires higher upfront capital financing, in particular through debt financing, reflecting the fixed element in cost and revenue structures.⁵⁴ Because renewable energy projects are more capital intensive than fossil fuels, renewables can be significantly less attractive at high interest rates than at low interest rates. At high interest rates, compared to a fossil fuel project, the relatively higher capital cost of renewable energy will offset the savings from lower operating expenditures and raise the LCOE of renewables above that of fossil fuels. During the petroleum shock following Russia's invasion of Ukraine, nominal interest rates have hurt the economics of renewables.⁵⁵ Thus, tackling the high cost of capital⁵⁶ and developing efficient and adequate policies for debt financing are crucial for shifting to renewable energy and increasing the participation of private finance.

According to the IEA, electricity consumption in developing economies is expected to increase at a rate three times that of developed economies, and the low costs of wind and solar power, in particular, should make them the technologies of choice to meet

53 IRENA, "IRENA Goes Beyond the Talk," supra n. 13; IEA, *World Energy Outlook 2022*, supra n. 14.

54 International Energy Agency (IEA), *The Cost of Capital in Clean Energy Transitions* (Paris: IEA, 2021), <https://www.iea.org/articles/the-cost-of-capital-in-clean-energy-transitions>.

55 "New Analysis Demonstrates How Covid Crisis and Russia's Invasion of Ukraine Are Derailing Energy Development in Emerging and Frontier Economies," The Rockefeller Foundation (August 23, 2022), <https://www.rockefellerfoundation.org/news/new-analysis-demonstrates-how-covid-crisis-and-russias-invasion-of-ukraine-are-derailing-energy-development-in-emerging-and-frontier-economies>.

56 "The cost of capital expresses the expected financial return, or the minimum required rate, for investing in a company or a project. This expected return is closely linked with the degree of risk associated with a company or project cash flows. Another way of referring to the cost of capital is to talk about 'financing costs' or the discount rate." Hurdle rate" is also a commonly used term, though this refers to the minimum cost of funds, or internal rate of return (IRR), required to fund a particular investment, in contrast to the overall cost of funds for a firm. At a fundamental level, the cost of capital is the sum of a base rate plus a premium." IEA, *The Cost of Capital in Clean Energy Transitions*, supra n. 59.

rising demand, so long as the necessary infrastructure and regulatory frameworks are in place.⁵⁷ But developing countries cannot invest in renewable energy without access to low-cost capital, which they currently lack. Capital in developing economies is currently more expensive than in developed economies, even if there is considerable variance across countries of similar levels of economic development.⁵⁸ With a high cost of capital, developing countries are more likely to invest in fossil fuel-fired power generation because its LCOE is lower.

The cost of nominal financing is up to seven times higher in developing countries than in Europe and the United States, with higher levels in riskier segments.⁵⁹ Despite their growth prospects, fossil fuel-dependent and carbon-intensive developing economies are more vulnerable to shifts in a net-zero carbon energy transition than services-based developed economies. Because their economies depend more on exposed sectors, developing countries are more vulnerable to changes in output, capital stock, and employment. For instance, to support economic development and build low-carbon infrastructure, sub-Saharan Africa would need to spend a minimum of 1.5 times more than developed economies do today as a share of GDP.⁶⁰

Even before the COVID-19 pandemic, public debt levels in many developing economies were already high and rapidly growing, and the pandemic worsened the situation.⁶¹ The International Monetary Fund (IMF) and the World Bank have warned of an impending developing market debt crisis.⁶² Many developing economies will face a lengthy fiscal and debt restructuring period,⁶³ reducing public spending on the transition while the cost of their access to finance increases.

As evidenced by survey results, the cost of capital serves as an important benchmark to evaluate investors' preferences for risk and return. Decision-makers do not always have access to trustworthy financing metrics across industries and regions, particularly in developing economies.⁶⁴ The net-zero carbon energy transition can be affected by inaccurate assumptions regarding the cost of capital, which can result in the mispricing of risk and the possibility of under- or overinvesting in various markets and sectors. For this reason, the role of credit rating agencies (CRAs) will become increasingly important.

Initially designed as a resource for investors to bridge information asymmetry gaps and allocate investments in an economically efficient manner, CRAs have accumulated power to the point that a downgrade can have significant detrimental effects on the ability of a country to fund its energy projects. Though many investors see CRAs as unbiased third-party assessors of risk, this may not be true. The nature of CRA assessments means that they can amplify already volatile economic trends, and a small downgrade could have outsized implications (see Box 2).

57 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, 16, supra n. 7.

58 Steffen, *Estimating the Cost of Capital for Renewable Energy Projects*, 14, supra n. 31.

59 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, 16, supra n. 7.

60 McKinsey Global Institute, *The Net-Zero Transition*, supra n. 5.

61 "Sovereign Debt," *International Monetary Fund (IMF)*, <https://www.imf.org/en/Topics/sovereign-debt>.

62 Eric Martin, "IMF Chief Warns of Debt Crisis as Higher Rates Follow Covid, War," *Bloomberg News* (July 12, 2022), <https://www.bloomberg.com/news/articles/2022-07-12/imf-chief-warns-of-debt-crisis-as-higher-rates-follow-covid-war>; "IMF, World Bank Warn of 'Huge Buildup of Debt' in Poorest Nations," *Al Jazeera* (April 20, 2022), <https://www.aljazeera.com/economy/2022/4/20/imf-world-bank-warn-of-huge-buildup-of-debt-in-poorest-nations>.

63 "Sovereign Debt," *International Monetary Fund (IMF)*, supra n. 61.

64 International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies*, 16, supra n. 7.

BOX 2. THE DISRUPTIVE IMPACT OF CREDIT RATINGS: THE HIGH COST OF BORROWING⁶⁵

Since ratings tend to reflect reduced risk in economic booms and increased risks in economic downturns, they tend to reinforce procyclical investment patterns. During times of economic stress, including the onset of the COVID-19 pandemic, developing economies often see larger downgrades than developed economies, despite experiencing a less severe adverse growth shock. This procyclicality causes exacerbated volatility in sustainable investment, precluding the possibility of continuous investment necessary for a successful energy transition. In addition, if a downgrade—even a small one—brings a country down to a “speculative grade” from an “investment grade” rating, the cliff effects of forced sell-offs from investors who are prevented from holding speculative grade assets can be monumental, shattering demand for the country’s debt and forcing the country’s interest rates up. This situation worsens the country’s fiscal position and makes eventual default more likely. In this way, a negative assessment by a CRA can negatively affect a country’s creditworthiness and, ultimately, its ability to repay its debt obligations.

CRA methodology is less comprehensive than its profound influence warrants. Tending to underemphasize long-term issues and risks (such as sustainability, resilience, environmental, and social risks) and overemphasize short-term risks, CRAs disincentivize renewable energy projects because they incur short-term debt in exchange for long-term benefits. Undertaking these long-term investments would allow developing countries to enhance their ability to repay debt in the face of climate change and other long-term resilience risks. However, CRAs do not account for the impacts of receiving investment on their ratings. Rather, according to an environmental, social, and governance project lead managing director at Moody’s Investors Service, the main factors in determining sovereign ratings are economic strength, institutional or governance strength, fiscal strength, and political or external risk. No consideration is given either to climate risks or to the beneficial impacts of renewable energy projects. Similarly, countries are punished for participating in debt relief programs, although such participation lightens the debt burden on these countries and makes future payments more manageable. Furthermore, sovereign ratings are generally more subjective than corporate ratings, which rely mostly on quantitative factors. By focusing on factors including political risks and willingness to pay, CRAs open themselves to accusations of bias, undercutting confidence in their quality and accuracy. These accusations are only compounded by the opaqueness of CRAs’ assumptions.

Overall, CRAs have an outsized influence on investors’ decisions regarding where and in which projects to invest. CRAs may even be considered, to a certain extent, to be decision-makers themselves. At the same time, CRA methodology is not equipped to make these decisions effectively due to numerous concerns, including prioritizing short-term costs over long-term benefits, no consideration of SDG contributions, and accusations of bias, unwitting or otherwise. CRAs must undergo serious reforms if they are to accomplish their expected objectives in an impartial, fair, and sustainable manner.

3.1.2 International Public Finance Flows

A small group of beneficiary countries continues to concentrate international public finance flows. From 2010 to 2018, Argentina, India, Nigeria, Pakistan, and Türkiye jointly received 30% of total public finance commitments from MDBs and DFIs.⁶⁶ In comparison, the 46 Least

65 Based on the discussions of the United Nations Department of Economic and Social Affairs (DESA) High-Level Meeting on the Role of Credit Rating Agencies in the implementation of the 2030 Agenda for Sustainable Development; Griffith-Jones, S. and Kraemer, M. (2021), “Credit Rating Agencies and Developing Economies,” DESA Working Paper No. 175, ST/ESA/2021/DWP/175 (UN Department of Economic and Social Affairs, December 2021), <https://www.un.org/en/desa/credit-rating-agencies-and-developing-economies>.

66 International Energy Agency (IEA), International Renewable Energy Agency (IRENA), United Nations Statistics Division (UNSD), World Bank, World Health Organization (WHO), *Tracking SDG 7: The Energy Progress Report* (Washington, DC: World Bank, 2021), https://trackingsdg7.esmap.org/data/files/download-documents/2021_tracking_sdg7_chapter_5_international_public_financial_flows_0.pdf.

Developed Countries received only 20% of commitments during the same period.⁶⁷ Similarly, between 2016 and 2020, low-income countries received only 8% of the total climate finance provided and mobilized by MDBs and DFIs.⁶⁸ In 2019, public international financial flows to developing countries in support of renewable energy totaled less than USD 11 billion, or less than 3.5% of total investments in renewables worldwide.⁶⁹ In addition, most of the funding was through loans rather than grants, while concessional funding has been on the decline.⁷⁰ The combination of increased reliance on commercial borrowing and a relative decline in official development assistance has led to increasing financial vulnerabilities, such as risks of sudden stops, in many developing countries.⁷¹ This trend is incompatible with the need to accelerate renewable energy deployment.

Thus, not only must the pace of renewable energy investment accelerate considerably for the world to meet the SDGs and the Paris Agreement, but international public financing for renewable energy projects must also be made equitably and affordably accessible, in particular in the developing countries where it is mostly lacking.⁷²

Moreover, in 2019, every USD 1 of MDB climate finance mobilized less than USD 1 from the private sector, except for the African Development Bank (AfDB) (see Figure 2).⁷³ Therefore, along with making up just around 30% of all climate finance, concessional finance (loans and grants) also has an insufficient multiplier effect on the participation of the private sector in mixed-finance programs run by development banks.



Figure 2. The extent of private co-financing for each dollar of MDB climate finance to low- and middle-income countries in 2019.

Note: ADB: Asian Development Bank; AfDB: African Development Bank; EBRD: European Bank for Reconstruction and Development; EIB: European Investment Bank; IDBG: Inter-American Development Bank; IsDB: Islamic Development Bank; WBG: World Bank Group

Source: World Resource Institute.⁷⁴

67 Jeffrey D. Sachs, Perrine Toledano, Martin Dietrich Brauch, Tehtena Mebratu-Tsegaye, Efosa Uwaifo, and Bryan Michael Sherril, *Roadmap to Zero-Carbon Electrification of Africa* (New York: CCSI, 2021), <https://ccsi.columbia.edu/content/roadmap-zero-carbon-electrification-africa>.

68 Organisation for Economic Co-operation and Development (OECD), *Aggregate Trends of Climate Finance Provided and Mobilised by Developed Countries in 2013-2020* (Paris: OECD, 2022), 9, <https://www.oecd.org/environment/climate-finance-provided-and-mobilised-by-developed-countries-in-2016-2020-286dae5d-en.htm>.

69 IRENA, *World Energy Transitions Outlook 2022*, 49, supra n. 13.

70 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

71 United Nations Inter-agency Task Force on Financing for Development, *Financing for Sustainable Development Report 2021* (New York: United Nations, 2021), 125, https://developmentfinance.un.org/sites/developmentfinance.un.org/files/FSDR_2021.pdf.

72 Isabelle Gerretsen, "Rich Countries Fall \$17bn short of 2020 Climate Finance Goal," *Climate Home News* (July 29, 2022), <https://www.climatechangenews.com/2022/07/29/rich-countries-fall-17bn-short-of-2020-climate-goal>.

73 International Energy Agency (IEA), *Africa Energy Outlook 2019* (Paris: IEA, 2019), <https://www.iea.org/reports/africa-energy-outlook-2019>.

74 Joe Thwaites, *The Good, the Bad and the Urgent: MDB Climate Finance in 2019* (Washington, DC: World Resources Institute, 2020), <https://www.wri.org/insights/good-bad-and-urgent-mdb-climate-finance-2019>.

3.1.3 Concessional Development Finance

While improving the domestic enabling environment for investment is critical to financing the low-carbon energy transition (see Section 3.4), efforts by developing-country governments alone are insufficient to close investment gaps. The energy sector in developing countries has suffered from a drop in annual investments of 20% since 2016, which is, to a large extent, due to difficulties in mobilizing finance for renewable energy projects.⁷⁵

With longer loan tenors, lower interest rates, and extended grace periods, concessional lending plays a vital role in filling the gap in affordable debt finance. Public finance institutions may provide concessional loans for renewable energy projects in developing countries to overcome the problem of the cost of capital.⁷⁶

Increasing concessional finance will entail reassessing MDB and DFI profitability targets and “transparently analyzing whether the capital adequacy ratio is too conservative and the extent to which it could be lowered without compromising the AAA rating given by the credit rating agencies.”⁷⁷ It will also entail revising the IMF–World Bank Debt Sustainability Analysis, conflating solvency and liquidity⁷⁸ and increasing debt-to-GDP ceilings, provided that:⁷⁹

1. “they use the funds for highly productive SDG-related long-term productive investments (e.g., electrification, digital connectivity, schooling, healthcare, protection of natural capital, etc.);
2. the loans are with long maturities at fixed rates (within 200 bp of AAA-borrowers); and
3. the borrowing countries have long-term fiscal frameworks that aim to raise future tax revenues to service the higher level of debt, and long-term trade policies to promote net exports needed for future debt servicing.”

3.1.4 Government or State Bank Guarantees

Investors and lenders often seek government guarantees, usually issued by the treasury or the ministry of finance, for projects in developing countries. A government’s promise to fulfill an obligation in the event that the principal obligor defaults is called a sovereign guarantee. Although sovereign guarantees typically pertain to payment defaults, they can cover any form of promises or responsibilities. Sovereign guarantees are frequently utilized in the renewable energy sector to entice independent power producers (IPPs) to invest in generation in markets carrying high-risk perception. They can cover the following:⁸⁰

⁷⁵ International Energy Agency (IEA), *Financing Clean Energy Transitions in Emerging and Developing Economies: Executive Summary* (Paris: IEA, 2021), <https://www.iea.org/reports/financing-clean-energy-transitions-in-emerging-and-developing-economies/executive-summary>.

⁷⁶ Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

⁷⁷ Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

⁷⁸ The IMF’s definition of debt sustainability “includes both solvency and liquidity requirements.” International Monetary Fund (IMF), *IMF Policy Paper: Review of the Debt Sustainability Framework for Market Access Countries* (Washington D.C: IMF, 2021), 6, <https://www.imf.org/en/Publications/Policy-Papers/Issues/2021/02/03/Review-of-The-Debt-Sustainability-Framework-For-Market-Access-Countries-50060>.

⁷⁹ Jeffrey Sachs, *Recommendations of the Ad Hoc High-Level Working Group (HLWG) for an SDG Stimulus* (Sustainable Development Solutions Network, July 14, 2022).

⁸⁰ Caitlin MacLean and Katie Olderman, *Innovative Financing Models for Energy Infrastructure in Africa* (Santa Monica: Milken Institute, 2015), <https://milkeninstitute.org/sites/default/files/reports-pdf/Milken-Institute-Lab-Energy-Infrastructure-Africa.pdf>.

- The off-taker’s failure to pay (insofar as it is a state-owned enterprise),
- The utility’s additional duties, as described in the power purchase agreement (PPA),
- Unilateral modifications to tax laws,
- Termination provisions, and
- Restrictions on currency transfers and currency conversion.

There are several types of guarantees:⁸¹

- **Credit guarantees:** For a specific period of the debt term, a partial credit guarantee can cover part of the debt service default by the borrower, regardless of the cause of the default. Partial credit guarantees can be used for renewable energy projects to address currency transfer and convertibility risks caused by host government actions.
- **Political risk insurance (PRI):** Whether provided by a public institution such as the Multilateral Investment Guarantee Agency (MIGA) or a private insurer, PRI generally covers (a) war, terrorism, and civil disturbance, which may include losses from revolution, insurrection, coups, sabotage, and terrorism; (b) currency inconvertibility and transfer restriction due to government action (or inaction); (c) breach of contract (e.g., breach of a PPA by a government entity); (d) expropriation; and (e) failure to honor a financial obligation.
- **Partial risk guarantee:** A partial risk guarantee is used to cover a broader range of political risks (and for a longer tenor) than those covered by the insurance market, depending on the specific coverage of the contractual agreement. Because government entities frequently own transmission lines and grid interconnection systems, partial risk guarantees can be fundamental in covering transmission line and grid interconnection risk.

Sovereign guarantees have been more challenging to secure in recent years for a number of plausible reasons. First, sovereign guarantees have been deemed by the IMF—and other development institutions—as a contingent liability that is included in the national debt when determining a country’s level of debt (as a percentage of the GDP). Second, in some jurisdictions, in order to acquire the guarantee, the off-taker must pay a sizable sum to the government. Third, because of the use of investor–state dispute settlement (ISDS) by IPPs, governments are now more aware of the exposures involved in issuing guarantees. Thus, sovereign guarantees are not always the best instrument to address sovereign/PPA risks in order to protect the investors’ appetite.⁸²

Particularly for PPAs, some countries have recently started to eliminate conventional termination clauses that asymmetrically allocate sole responsibility to the government. Instead, they have inserted symmetrical provisions, which enable the termination of the agreement irrespective of who breached the PPA—the IPP, the off-taker, or the government. In addition, traditional termination clauses can overburden the government’s debt in case of default by the national utility. Thus, some countries have replaced such termination clauses with a Put and Call Option Agreement.⁸³ This agreement enables the IPPs to sell the

81 Ibid.

82 International Renewable Energy Agency (IRENA), *Renewable Energy Finance: Sovereign Guarantees* (Abu Dhabi: IRENA, 2020), <https://www.irena.org/publications/2020/Jan/RE-finance-Sovereign-Guarantees>.

83 A call option gives the holder the right to buy a stock, and a put option gives the holder the right to sell a stock.

entire project to an SPV at a price specified in the PPA in the event that the off-taker or the government fails to honor its obligations. In this manner, the government joins a business agreement rather than incurring debt. Similar to a conventional termination clause, the IPP experiences a reduction in perceived risk.⁸⁴

IRENA also advances that mobilizing the “preferred creditor status” (PCS) of the MDBs and DFIs can also alleviate the problem of sovereign guarantee. The PCS leads to a formal agreement with the beneficiary government and ensures that if actions on the part of a government beneficiary directly or indirectly cause a loss for the MDBs and DFIs, the government has to take measures to resolve the issues or compensate for the loss. The Asian Development Bank’s (ADB’s) Pacific Renewable Energy Program demonstrates the mobilization of an MDB to cover the need for a sovereign guarantee. Its partial risk guarantee program, with an overall budget of USD 100 million, devised a financing structure supporting the offtake obligations of national power utilities where governments were unable to guarantee them due to fiscal constraints⁸⁵ (see Figure 3).

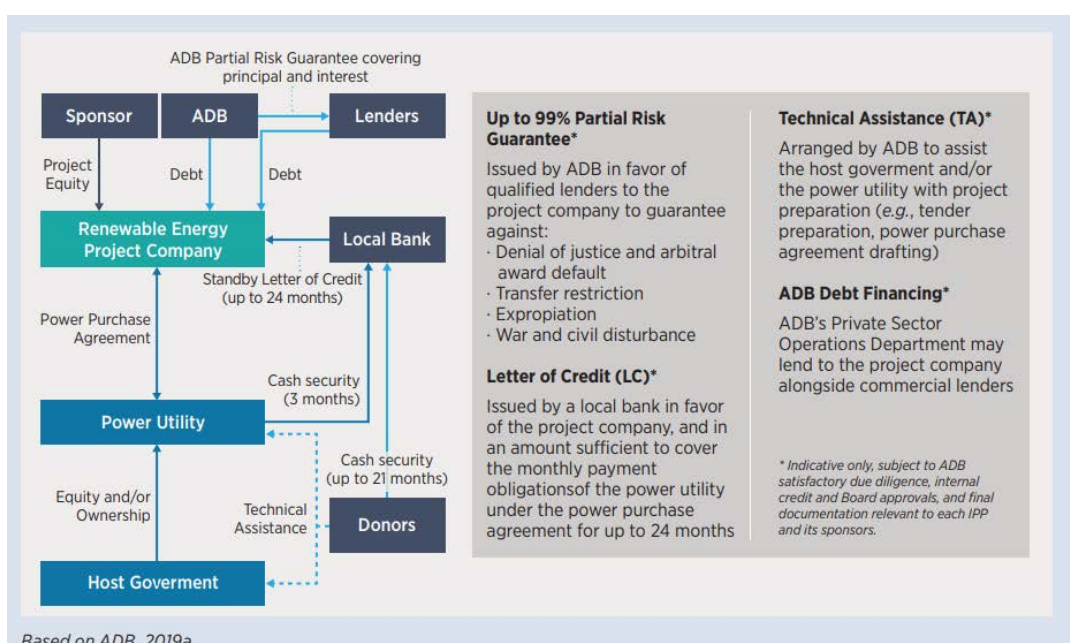


Figure 3. The ADB’s Partial Risk Guarantee Program.

Source: IRENA.⁸⁶

3.1.5 Hybrid Structures

Hybrid structures have both debt and equity characteristics, allowing projects to reap the benefits of both instruments while reducing and transferring risk. Mezzanine finance, for example, is a hybrid structure that is subordinated to senior debt with priority over equity. Convertible grants involve shifting funding from the grant to the loan; by doing so, they provide a valuable way for public finance institutions to support high-risk, early-stage project development with the potential to profit from loan interest. Convertible loans, which offer contingent claims to capture the equity upside, are a third option for lowering the cost of capital.⁸⁷

84 IRENA, *Renewable Energy Finance*, 7, supra n. 82.

85 IRENA, *Renewable Energy Finance*, 9, supra n. 82.

86 Ibid.

87 International Renewable Energy Agency (IRENA), *Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance* (Abu Dhabi: IRENA, 2016), 38, <https://www.irena.org/publications/2016/Jun/Unlocking-Renewable-Energy-Investment-The-role-of-risk-mitigation-and-structured-finance>.

Hybrid finance can be essential for attracting private investors unfamiliar with renewable energy projects. Public finance institutions can also use these instruments to reduce the cost of capital. However, their promise to catalyze the private sector in developing countries has been overstated so far, and therefore their design should be reviewed and their use concentrated in more mature markets.⁸⁸

3.1.6 Blended and Catalytic Finance

Reducing the cost of capital also involves developing innovative financing structures that will de-risk early-stage investments in renewables in countries where investors' appetite is limited. For instance, the Africa50 fund—comprising 23 African countries, AfDB, the Central Bank of West African States, and the Bank Al-Maghrib—aims to provide “early-stage risk capital, as well as expertise and support engaging investors and stakeholders, from project development to financial close.”⁸⁹ The Africa50 fund's approach was inspired by India's multi-pronged strategy to attract private sector financing in infrastructure (see Box 3).

BOX 3. INDIA'S PRIVATE FINANCING STRATEGY

In 2000, the Indian government established the India Infrastructure Project Development Fund to ensure the development of bankable public-private partnerships by bearing the pre-financial close risk in the development of large infrastructure projects.⁹⁰ In 2004, the Viability Gap Financing scheme was set up to enable infrastructure projects that are not financially viable but justified for the public interest: the scheme provides subsidies when user charges cannot be increased to commercial levels.⁹¹ In 2006, the wholly state-owned company India Infrastructure Finance Company Limited⁹² was established to finance viable infrastructure projects in a consortium by providing long-term senior or subordinated debt directly to infrastructure project companies or refinancing to banks.

3.1.7 DFI Participation in Syndication

DFIs can partner with commercial banks to co-lend senior debt and spread the risk across a larger group of lenders, limiting each bank's risk exposure, particularly in more extensive, riskier projects like offshore wind. While no single commercial bank could provide the large loans required, many banks collaborate to fund such large-scale projects through a syndicate. DFI involvement in loan syndications facilitates not only local bank participation but also foreign banks' participation as they find DFI involvement in transactions politically reassuring (see Box 4 on Cameroon's Nachtigal Hydropower Plant).⁹³

88 Ibid.; International Renewable Energy Agency (IRENA), and Climate Policy Initiative (CPI), *Global Landscape of Renewable Energy Finance 2020*, supra n. 3.

89 “Investment Vehicles,” Africa50 (n.d.), <https://www.africa50.com/investing-for-growth/investment-vehicles>.

90 “India Project Development Fund (IPDF),” World Bank Group's Public Private Partnership Legal Resource Center (January 1, 2000), <https://ppp.worldbank.org/public-private-partnership/library/india-project-development-fund-ipdf>.

91 “What is the Viability Gap Funding (VGF) Scheme?,” *Civils Daily* (November 12, 2020), <https://www.civildaily.com/news/what-is-the-viability-gap-funding-vgf-scheme>.

92 “India Infrastructure Finance Company Ltd (IIFCL),” Government of India Department of Financial Services, [https://financialservices.gov.in/banking-divisions/Financial-Institutions-and-others/India-Infrastructure-Finance-Company-Ltd-\(IIFCL\)](https://financialservices.gov.in/banking-divisions/Financial-Institutions-and-others/India-Infrastructure-Finance-Company-Ltd-(IIFCL)).

93 IRENA, *Unlocking Renewable Energy Investment*, 42, supra n. 87.

BOX 4. CASE STUDY: CAMEROON'S NACHTIGAL HYDROPOWER PLANT

In 2018, the World Bank issued its Project Appraisal Document for the Nachtigal Hydropower Plant along the Sanaga River in Cameroon, a greenfield, 420-megawatt (MW), run-of-river hydropower plant that is supposed to enable very inexpensive access to power. This document laid out the financial details of the planned project, including the World Bank's financing mechanisms, through the International Bank for Reconstruction and Development (IBRD), International Finance Corporation (IFC), and MIGA.

Numerous points regarding the economic determinants of investment decisions in renewable energy projects stand out in this project, which showcases three main determinants in particular: creating correct incentive and risk-sharing structures; ensuring the government will pay its bills to the sector, including through DFI guarantees in the event of nonpayment; and using DFI expertise to craft regulations and other government policy in a way amenable to private investment flows.

Each of the DFIs plays a complementary role: "IBRD focuses on the regulatory framework, capacity building as well as the provision of critical risk mitigation instruments, which is important for project bankability and effectively enables a local debt tenor of an unprecedented 21 years. IFC, as the co-developer, senior lender and swap provider for the Project, provides the project company with significant equity, debt, hedge instruments and mobilizes other lenders. MIGA provides its political risk insurance to equity and potential swap providers to de-risk the Project."⁹⁴ Together, the DFIs act to facilitate private sector financing, such as the project developer, Electricity of France (Electricité de France S.A. – EDF), as well as local and international commercial banks.

IBRD's role is particularly interesting in this project. The government is incentivized to work toward profitability by the existence of put options held by domestic banks at one third and two thirds of the duration of their 21-year loans. This duration, backed by the IBRD, "extends the tenor to three times the tenor allowed by Bank of Central African States in the absence of such a loan guarantee."⁹⁵ If exercised, the options would obligate the government to purchase the loans (in the absence of a replacement bank being found). Thus, the government would be penalized if the project turned unprofitable by their obligation to buy domestic banks out of the project after either 7 or 14 years. In addition to ensuring long-term domestic financing, the IBRD brings the advantages of mitigating foreign exchange and currency risks, as well as strengthening local knowledge of these types of projects to secure further domestic financing for any potential subsequent projects that may be undertaken.

Finally, the World Bank also works with the government to develop sector reforms that will promote private financing. Government reforms will be crucial, as Cameroon requires "improvements in the business climate, important investments in infrastructure, better governance, and more efficient public spending, as well as fiscal policies that specifically target the needs of the poor"⁹⁶ to effectively exploit its energy resource potential. More broadly, the government and the World Bank continue to collaborate on sector-wide reforms, including transparent bidding, clearance of arrears of the state-owned utility that has created a liquidity crisis in the energy sector, and reduced reliance on subsidies. Without active government participation—including through the establishment of a licensing process, communication with affected people, and assistance with compensation—a large infrastructure project such as Nachtigal would not be viable.

94 World Bank, *Project Appraisal Document, Report no. 122876-CM* (Washington, D.C.: World Bank, 2018), 7, <https://documents1.worldbank.org/curated/en/677811532921465831/pdf/Nachtigal-PAD-final-clean-mark-up-para-105-002-07242018.pdf>.

95 Id., 17.

96 Id., 2.

3.1.8 On-Lending Structures

The limited availability of local debt finance is a key obstacle to investing in renewable energy, especially in developing countries.⁹⁷ When it comes to domestic investors investing in off-grid solar, access to debt finance has been challenging for investments that are still considered high-risk projects.⁹⁸ Local banks in developing countries generally prefer high-yielding, low-risk, short-term investment tools.⁹⁹

On-lending (also known as intermediary lending) can help increase the availability of local debt, thereby improving access to local financing. Many MDBs and DFIs use their high credit quality and market access to borrow debt at low rates and then re-lend it to the government or another institution via credit lines.¹⁰⁰ This practice lowers the risk for local banks, making them more willing to lend and improving the investment's overall effectiveness. From the perspective of a project developer, it can increase the availability of financing, possibly at better terms than would otherwise be available in the local market.¹⁰¹ The case study of Cameroon's Nachtigal mentioned in Box 4 features an example of an on-lending program. Liquidity extension guarantees to local banks serve similar purposes.¹⁰²

3.1.9 The Depth of Local Capital Markets

Like on-lending, co-investment by local pension funds, along with foreign investors, can reduce the risk of an investment.¹⁰³ In developing countries, these institutional investors prefer investing in risk-free assets due to their general lack of expertise to run robust credit risk evaluations. Developing their investment capacity can help deepen the domestic capital market. For instance, Fonds Souverain d'Investissements Stratégiques (Sovereign Fund for Strategic Investments, FONSIS) was created in 2012 as an investment holding company acting as a private equity investor domestically on behalf of the Senegalese government. FONSIS invests through equity co-investment from private investors and non-recourse debt from commercial and development banks.¹⁰⁴ FONSIS owns equity in four solar energy projects totaling 120 MW in Senegal.¹⁰⁵

A sound institutional investor base is critical to the development of infrastructure project bonds, which in turn can “lower costs through lower interest rates and longer maturities as compared to bank loans while providing access to local currency financing, which mitigates

97 This is a key obstacle to investing in renewable energy, especially in developing countries. African Development Bank (AfDB), Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), Inter-American Development Bank Group (IDBG), and World Bank Group (WBG), *2015 Joint Report on Multilateral Development Banks' Climate Finance* (Mandaluyong: ADB, 2016), <https://www.adb.org/documents/joint-report-mdbs-climate-finance-2015>.

98 IRENA, *Unlocking Renewable Energy Investment*, 37, supra n. 87.

99 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

100 IRENA, *Unlocking Renewable Energy Investment*, supra n. 87.

101 Ibid.

102 “Kékéli Efficient Power,” GuarantCo (November 2019), <https://guarantco.com/our-portfolio/kekeli-efficient-power>.

103 Max Messervy, Alex Bernhardt, Daniel Bond, and Aymeric Saha, *Investment in African Infrastructure: Challenges and Opportunities* (New York: Mercer LLC., September 2018), <https://www.mmc.com/content/dam/mmc-web/insights/publications/2018/dec/innovations-in-infrastructure/Investment-in-African-Infrastructure/gl-2018-wealth-investment-opportunities-in-african-infrastructure-full-report-mercer.pdf>.

104 Havard Halland and Michael Noel, “Development Finance Frontline: Senegal’s Strategic Investments Fund,” *World Bank Blogs* (April 22, 2016), <https://blogs.worldbank.org/psd/development-finance-frontline-senegal-s-strategic-investments-fund>.

105 “ENGIE, Meridiam and FONSIS Commission Solar Projects in Senegal,” *African Review of Business and Technology* (June 1, 2021), <https://www.africanreview.com/energy-a-power/renewables/engie-meridiam-and-fonsis-commission-solar-projects-in-senegal>.

foreign exchange risk.”¹⁰⁶ For instance, in both Kenya and Nigeria, there are successful examples of project bonds issued by project companies and subscribed by institutional investors, with corporate bonds being tax exempt under certain conditions.¹⁰⁷ There, credit enhancement facilities bringing local currency guarantees over the long term can play a critical role.¹⁰⁸

In this context, supporting national and sub-national governments in creating a government bond market to create liquidity and higher confidence in the market for corporate and project bonds to be issued can be critical to lowering the cost of capital.¹⁰⁹

In addition, local capital providers such as national commercial and development banks can bring in-depth knowledge of the local renewable energy sector in terms of investment potential and processes. They can also act as intermediaries with local communities to decrease the perception of risk for international investors.¹¹⁰

Once capital markets deepen, innovative financial instruments can be devised and implemented to attract more finance to renewable energies. For instance, infrastructure projects can be pooled in one instrument to attract a larger pool of investors and ensure the diversification of risk by bundling commercially viable and non-viable projects. India adopted this approach with the Infrastructure Investment Trusts (InvITs) promoted by the Securities and Exchange Board of India.¹¹¹ India also promotes green bonds (see Box 5). Covered bonds backed by a pool of loans for various infrastructure projects can also help unlock financing by lowering the risk. In covered bonds, bond investors have a claim over a dedicated “cover pool” of assets and against the issuer itself.¹¹²

106 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

107 “Project Bonds: An Alternative Source of Financing Infrastructure Projects,” Deloitte (n.d.), <https://www2.deloitte.com/za/en/pages/finance/articles/project-bonds-an-alternative-to-financing-infrastructure-projects.html>.

108 “About Us,” InfraCredit (n.d.), <https://infacredit.ng/about-us>.

109 Existing initiatives—including the G20’s Compact with Africa, the World Bank Group J-CAP Program, the Financial Sector Reform and Strengthening Initiative (FIRST), the IMF/World Bank’s Debt Management Facility II and III, and Switzerland’s Government Debt and Risk Management Program—have recently bolstered technical assistance efforts in building government bond markets in emerging or low-income countries. MDBs have even issued bonds in local currencies to catalyze the development of capital markets. For instance, the World Bank has issued bonds in local currencies in 32 countries while the IFC has done so in 20 countries. Jeffrey Gutman, Amadou Sy, and Soumya Chattopadhyay, *Financing African Infrastructure: Can the World Deliver?* (Washington, DC: Brookings Institute, March 2015), https://www.brookings.edu/wp-content/uploads/2016/07/AGIFinancingAfricanInfrastructure_FinalWebv2.pdf; International Monetary Fund (IMF) and World Bank Group, *Recent Developments on Local Currency Bond Markets in Emerging Economies* (Washington, DC: World Bank, January 2020), <https://documents1.worldbank.org/curated/en/129961580334830825/pdf/Staff-Note-for-the-G20-International-Financial-Architecture-Working-Group-IFAWG-Recent-Developments-On-Local-Currency-Bond-Markets-In-Emerging-Economies.pdf>.

110 *Scaling-Up Renewable Energy in Africa: A NetZero Pathfinders Report* (New York: BloombergNEF, November 9, 2022), https://assets.bbhub.io/professional/sites/24/BNEF-Scaling-Up-Renewable-Energy-in-Africa-A-NetZero-Pathfinders-report_FINAL.pdf.

111 “What is the Definition of ‘Infrastructure Investment Trusts,’” *The Economic Times* (n.d.), <https://economictimes.indiatimes.com/definition/infrastructure-investment-trusts>.

112 Frank Damerow, Sean Kidney, and Stuart Clenaghan, *How Covered Bond Markets Can Be Adapted for Renewable Energy Finance and How This Could Catalyze Innovation in Low Carbon Capital Markets* (London: Climate Bonds Initiative, 2012), https://www.climatebonds.net/files/uploads/2012/05/Climate-Bonds_RE-covered-bonds_22May20121.pdf.

BOX 5. CASE STUDY: INDIA'S GREEN BONDS

In India, private and public sector banks have been proactive in issuing green bonds, starting with Yes Bank in 2015. In 2020, the State Bank of India—the country's largest state-owned commercial bank—introduced the Green Bond Framework, in which the proceeds of the Green Bond are allocated to projects in renewable energy, low-carbon buildings, energy-intensive industries, waste and pollution control, and sustainable transportation.¹¹³ More recently, Adani has launched its first green bond for USD 750 million, which was 4.7 times oversubscribed.¹¹⁴ Currently, the government has not introduced a standardized green bond policy applicable to the banks and financial institutions issuing the green bond. However, most of the policy framework governing green bond issuances is based on the Climate Bonds Standard developed by Climate Bonds Initiative.¹¹⁵

3.1.10 The Role of Export Credit Agencies

Export credit agencies have long been key components of financing bundles, especially for large fossil fuel projects and hydropower projects.¹¹⁶ They protect financial institution lenders from hazards like equipment failure or contract violations by power off-takers by reducing their exposure to the projects. Since it takes some of the risks away from lenders, it lowers the interest rate owed on loans, which may determine whether a project is economically feasible or not.¹¹⁷ However, their legally and internationally determined mandate has yet to be aligned with clear and ambitious climate goals, besides a few exceptions; other than for a few hydropower projects, export credit agencies have not been an engine of financing in renewable energy.¹¹⁸

3.2 Access to the Grid and the Off-Taker Risk

3.2.1 Interconnection, Grid Management, and Transmission Infrastructure

The fully loaded unit cost of electricity production—accounting for operating costs, capital costs, and depreciation of existing and new assets—will rise by about “25% from 2020 to 2040 and still be about 20% higher than today in 2050” on average globally as the power sector will be still building renewables generation, transmission, and distribution capacity.¹¹⁹ Yet, because of the lower operating costs of renewables, “the delivered cost could fall below 2020 levels over time” if flexible, reliable, and low-cost grids are built.¹²⁰ It is therefore crucial to reduce the risk of investments in renewable energy by building, bolstering, and upgrading the transmission grid concurrently with, and in anticipation of, building up generation capacity. Yet “only a third of African countries have transparent grid extension plans in force,” for instance.¹²¹

113 State Bank of India (SBI), *Green Bond Framework* (Mumbai: State Bank of India, n.d.), <https://sbi.co.in/documents/17836/24259/Green+Bond+Framework.pdf>.

114 Capital Market, “Adani Green Raises USD 750 mn via Issuance of Green Bond,” *Business Standard* (September 2, 2021), https://www.business-standard.com/article/news-cm/adani-green-raises-usd-750-mn-via-issuance-of-green-bond-121090200769_1.html.

115 “Climate Bonds Standard and Certification Scheme,” Climate Bonds Initiative (n.d.), <https://www.climatebonds.net/standard>.

116 Christopher Wright, “Export Credit Agencies and Global Energy: Promoting National Exports in a Changing World,” *Global Policy* 2, no. 1 (2011): 133–143, <https://doi.org/10.1111/j.1758-5899.2011.00132.x>.

117 Robert Gross and William Blyth, *Renewable Energy Risk and Reward*, supra n. 46.

118 Jacob Atkins, “How Export Credit Agencies Can Catch Up on Climate Action,” *Global Trade Review* (April 8, 2021), <https://www.gtreview.com/news/global/export-credit-agencies-can-catch-climate-action>.

119 McKinsey Global Institute, *The Net-Zero Transition*, 7, supra n. 5.

120 Ibid.

121 *Scaling-Up Renewable Energy in Africa*, supra n. 110.

To this end, regions with large renewable energy potential should be connected with large consumption areas; output fluctuations of naturally variable power sources such as solar and wind power should be addressed with adequate storage capacity; and grid stability during emergencies such as power supply dropouts should be maintained. Grid constraints will need to be overcome, and digitization will be key to addressing all constraints in the most cost-effective way.¹²² According to the CCSI–E3G survey, physical infrastructure was a critical factor for almost all renewable energy investors.

In addition, international and regional grid interconnection is required because it enhances the reliability of the energy supply and enables the complementarity of renewable energy sources with diverse profiles. Smart grids, together with interconnection, allow for the control of power supply and demand while rationalizing the development of storage technologies and balancing out the irregular nature of renewable energy. Once this connectivity is established, the conversion of the energy production system to 100% renewable energy may proceed more quickly and economically (see the example of Greece and Crete discussed in Section 3.4.3).¹²³

A paper analyzing determinants of foreign direct investment in wind energy in developing countries showed that economic support policies are insufficient and should be complemented by “credible regulatory support policies.” Among these policies, “guaranteed access to the electricity grid” is fundamentally important because “the logistics and delay in grid connection can significantly affect the cost of the projects.”¹²⁴

Once the grid is in place, a key measure is making dispatch a priority over thermal generation. In India and China, where it is in place, it has been instrumental in generating the rapid expansion of renewable energy in both countries.¹²⁵

3.2.2 Curtailment and Storage Capacity

Curtailment refers to any activity that lowers the amount of power produced in order to keep supply and demand in balance, which is essential for preventing blackouts.¹²⁶ With rising intermittent renewable energy production and electricity demand, curtailment is a significant risk for electricity systems. To contain the risk, storing electricity during periods of high production and low demand is critical. The extent to which it is deployed will determine “the likelihood of brownouts during peak demand, and allow for more renewable resources to be built and used.”¹²⁷

122 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

123 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

124 Alexander Ryota Keeler and Yuichi Ikeda, “Determinants of Foreign Direct Investment in Wind Energy in Developing Countries,” *Journal of Cleaner Production* 161, (2017): 1451–1458, <https://www.sciencedirect.com/science/article/abs/pii/S0959652617310466?via%3Dihub>.

125 Moody’s Investor Service, “Research Announcement: Moody’s – Policy Support Will Fuel Emerging Asia’s large, Uneven Steps Toward Decarbonization,” Moody’s (August 31, 2022), https://www.moody.com/research/Moodys-Policy-support-will-fuel-Emerging-Asias-large-uneven-steps--PBC_1340327.

126 Theodore J. Kury, “What is Curtailment? An Electricity Market Expert Explains,” *The Conversation* (June 22, 2022), <https://theconversation.com/what-is-curtailment-an-electricity-market-expert-explains-185279>; John Sterling, Christine Stearn, Ted Davidovich, Paul Quinlan, John Pang, and Chris Vlahoplus, *Proactive Solutions to Curtailment Risk: Identifying New Contract Structures for Utility-Scale Renewables* (Smart Electric Power Alliance (SEPA), n.d.), <https://www.firstsolar.com/en-Emea/-/media/First-Solar/Documents/Grid-Evolution/Proactive-Solutions-to-Curtailment-Risk.ashx?la=en>.

127 Environmental Protection Agency (EPA), “Electricity Storage,” (EPA, n.d.), <https://www.epa.gov/energy/electricity-storage>.

“Energy Storage [has been] the missing link in a Renewable Energy System,”¹²⁸ slowing down the ability of the grid to integrate renewables, but the economics of energy storage are rapidly changing. The IEA anticipates that utility-scale battery storage capital costs will “decline from 310 USD/kWh in 2020 on average globally to 155 USD/kWh in 2030 and 110 USD/kWh in 2050,”¹²⁹ which will boost the global demand for energy storage. In some areas, this price point has already been reached.¹³⁰

3.2.3 Power Off-Taker Risk

As also demonstrated by the CCSI–E3G survey, despite the potential returns, investors frequently associate investments in renewable energy with a high level of sovereign risk, which mainly comprises power off-taker risk. Financing, building, and running renewables-based power plants entails risks, just like with all significant infrastructure projects. To address and allocate them, long-term (10- to 25-year) PPAs are negotiated.

Some of the most crucial risks are:¹³¹

- **Price risk:** Losses brought on by changes in the energy market, such as when the open market spot price is consistently lower than the PPA price.
- **Volume risk:** If resource levels (e.g., wind speed, solar irradiation) are different than anticipated, the renewable energy plant may not produce the predicted amount of electricity.
- **Liquidity risk:** If electricity cannot be traded quickly enough or sold quickly enough to the off-taker, the investment is subject to a liquidity risk.
- **Profile risk:** Time-of-use tariffs (such as high tariffs during peak times) can have an impact on the overall value of the electricity produced because many renewable energy facilities can only generate electricity at certain hours, depending on the conditions.

The structure of the PPA plays a significant role in risk allocation. For instance, in a pay-as-produced system, the producer is responsible for any under- or overproduction while the off-taker bears the pricing, liquidity, and profile risks. On the other hand, in baseload-type systems, the off-taker is in charge of price and liquidity risks, while the producer is in charge of profile and volume risks.¹³²

Take-or-pay clauses assure the producer that the energy not taken would nevertheless be paid for. These clauses act as a risk-sharing mechanism between the supplier, who has invested significant funds and thus seeks a level of guaranteed income, and the customer, who needs supply security and some price flexibility.¹³³

128 Bo Normark, *Energy Storage, The Missing Link in a Renewable Energy System* (Eindhoven: InnoEnergy, 2021), https://www.renewable-ei.org/pdfdownload/activities/REvision2021_BNormark_210310.pdf.

129 International Energy Agency (IEA), *World Economic Outlook 2021* (Paris: IEA, 2021), <https://www.iea.org/reports/world-energy-outlook-2021>.

130 Bo Normark, *Energy Storage*, supra n. 128.

131 “Corporate PPAs: Are You Covering All the Risks?” DNV (n.d.), <https://www.dnv.com/article/corporate-ppas-are-you-covering-all-the-risks--179426>.

132 Ibid.

133 Masedi Tlhong, “Power Purchase Agreements – To Take or Pay, Take and Pay or Take or Cancel?” *Tlhong Attorneys* (April 4, 2022), <https://tlhongattorneysinc.co.za/2022/04/04/povwer-purchase-agreements-to-take-or-pay-take-and-pay-or-take-or-cancel>.

Renewable energy investors are wary of PPAs with national power utilities that allow unilateral tariff revision¹³⁴ with no take-or-pay terms¹³⁵ and no compensation on curtailment.¹³⁶ New contractual forms rebalancing the needs of the utilities with the risk taken on by generators are yet to be fully developed.¹³⁷

PPAs also pose a currency risk for power utilities, which can increase the default risk. Most large-scale renewable energy projects require international funding, typically structured in hard currencies like the USD or EUR. Even if the PPA is linked to a fixed amount in terms of the funding currency, it does not alleviate the financial pressures that a developing-country government may face in repaying debt in hard currency, especially when most utility revenues are generated in local currency. Because utilities' revenues are in local currency, currency depreciation increases the effective international cost of debt, with the utility having limited ability to raise the local tariff charged to customers at the same time.¹³⁸ Strengthening the local financial sector (through an on-lending structure, for instance—see Section 3.1.8) to sustain a flow of long-term financing to infrastructure projects can help alleviate this currency risk for national utilities.¹³⁹ Mobilizing currency risk guarantees is also needed (see Section 3.1.4).

3.2.4 Healthy Utilities and an IPP Framework

Setting up strong and healthy power utilities, allowing IPPs, having standardized PPA templates, holding transparent auctions, and making transparent and fair rate adjustments based on inflation are important steps in building policies to manage the off-taker risk. Indeed, in the CCSI-E3G survey, regulated, transparent utility power arrangements were one of the highest-scored factors by most investors.

Although the World Bank has a standard model for utility unbundling (discussed in Section 3.2.6), the World Bank's Doing Business database reveals a low correlation between unbundling and operational efficiency in power sectors. "The World Bank has noted that more important than full unbundling is the ability to recover costs through tariffs (...), the operation efficiently grounded in sound least-cost planning (...), competitive procurement (...), and the ability to give IPPs the rights and obligations associated with discrete investments in generation."¹⁴⁰

In this context, in national power sectors characterized by the monopoly of the state-owned utility, the operational and financial health of the power utility is critical because the utility will be the main off-taker. For instance, a World Bank study revealed that, among 39 African countries, only the Seychelles and Uganda fully recovered their operation and

134 Abhishek Tripathi and Anura Gupta, "Enforcing PPA: Guarding Against Unilateral Change," *The Legal 500* (July 15, 2020), <https://www.legal500.com/developments/thought-leadership/enforcing-ppa-guarding-against-unilateral-change>.

135 Jurg Van Dyk, "Power Purchase: Africa's Shift to Take-and-Pay Clauses," *Pinsent Masons* (July 31, 2020), <https://www.pinsentmasons.com/out-law/analysis/power-purchase-africa-take-pay-clauses>.

136 Ethan Howland, "Report Eyes PPA Options to Address Renewable Curtailment," *American Public Power Association* (March 23, 2017), <https://www.publicpower.org/periodical/article/report-eyes-ppa-options-address-renewable-curtailment>.

137 Van Dyk, "Power Purchase: Africa's Shift to Take-and-Pay Clauses," supra n. 131; Howland, "Report Eyes PPA Options to Address Renewable Curtailment," supra n. 136.

138 IEA, *Africa Energy Outlook 2019*, supra n. 73.

139 Ibid.

140 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

capital costs.¹⁴¹ While the decentralization of installed capacity offered by renewable energy can alleviate costs, compared to a centralized system, the financial and operational health of the state-owned power utility remains critical to the stability and attractiveness of the energy sector (see Box 6).

BOX 6. CASE STUDY: LESSONS FROM THE LEBANESE ENERGY CRISIS AND A PROPOSAL FOR A LONG-TERM SOLUTION¹⁴²

Lebanon's long-standing energy crisis reached its peak in the summer of 2021. The country was plunged into darkness when the power system failed, and the army was forced to intervene by providing fuel. While this crisis has many causes, including technical and political ones, we look into the energy and economic issues that have plagued Lebanon's electricity sector for decades.

For the last 30 years, the energy sector has suffered from data access issues, failure to bill for energy usage, failure to collect bill revenues, and outright theft of electricity. Furthermore, Electricité du Liban (EDL), the state-owned electric utility company, is a "vertically integrated monopoly," controlling all facets of the formal energy market. Its power plants depend on imports of fossil fuels. The private sector plays a very limited role, mainly in the informal economy, through private diesel generators collectively worth USD 2 billion.

In this context, EDL is heavily in debt due to running annual deficits averaging USD 1.6 billion for the past decade. Overall, the electricity sector was responsible for USD 39.5 billion in debt, amounting to 43% of total Lebanese public debt in 2020. In March 2020, Lebanon was forced to default on its public debt for the first time in its history, with Lebanon's debt-to-GDP ratio surpassing 194%.

The current system is seen as highly centralized and inefficient. A decentralized renewable energy system could provide a solution if an appropriate regulatory and oversight system is in place. Indeed, the development of hybrid solar-diesel microgrids that are separate from the national power grid and serve defined geographic ranges could provide more reliable electricity at a lower cost and with fewer blackouts. Rooftop solar systems and solar microgrids can run on- or off-grid and generate sufficient power for whole communities. Moreover, Lebanon has great potential for wind power, thanks to its auspicious coastal and rural areas. Smaller wind farms can be installed almost anywhere and reduce the need for transmission lines. By having more sources to balance loads, utilities can avoid non-economical spending on grid infrastructure. A system of decentralized renewables-based generation would reduce reliance on fuel imports, allowing Lebanon to preserve the country's already-depleted foreign exchange reserves, as well as improve business competitiveness.

To this end, a powerful regulator is needed that is separate from political whims, could facilitate increased competition, and would work toward greater decentralization. The necessary reform faces significant political obstacles; however, it stands to challenge established political interests by distributing influence to the local level, away from vested interests in fossil fuels.

3.2.5 Corporate PPAs

Deploying corporate PPAs (i.e., between corporate buyers and corporate generators) can enable the diversification of the off-taker risk. There are two kinds of corporate PPAs: physical and virtual. Physical PPAs involve the physical supply of power from the generator to the buyer according to a fixed price specified for a long-term period, often subject to agreed annual escalation. Virtual PPAs do not involve the physical delivery of energy and

141 Masami Kojima and Chris Trimble, *Making Power Affordable for Africa and Viable for Its Utilities* (Washington, DC: World Bank, 2016), <https://openknowledge.worldbank.org/bitstream/handle/10986/25091/108555.pdf>.

142 Jessica Obeid, "Lebanon: The 3-Decade Impossible Power Sector Reforms," (Italian Institute for International Political Studies, March 13, 2020), <https://www.ispionline.it/en/publicazione/lebanon-3-decade-impossible-power-sector-reforms-25377>.

are financial transactions: the buyer pays for a renewable energy certificate, even though it does not receive the power directly. Generally, the generator and the buyer enter into a contract for difference, based on the difference between a contractually agreed fixed (“strike”) price (as if it were a physical PPA) and the variable spot market price.¹⁴³ The use of corporate PPAs is rising in renewable energy investment, particularly given the global trend to reduce subsidy programs (see Section 3.3.2),¹⁴⁴ but they remain less common in many developing countries and often are not authorized by law.¹⁴⁵ Box 7 discusses the increased use of corporate PPAs in the European Union (EU) and associated legal challenges.

BOX 7. IPPS AND PPAS IN THE EU

Aiming to facilitate the entry of new independent actors in energy markets and to boost renewable energy development without using public funding, EU law acknowledges the importance of renewables PPAs. Under PPAs, private actors spearhead the efforts to promote renewables. Rather than relying on subsidies or other regulatory support schemes, investors in renewable energy projects reach long-term agreements with private actors to feed them with energy. This trend is gaining ground with the maturation of renewable technologies, as well as with the increase of corporate social responsibility. On the other hand, investors will not be interested in concluding PPAs if support is still granted and is more lucrative or if the market price is so high that conventional energy trading is more profitable than a PPA, which is currently the case during Europe’s unprecedented energy price crisis.¹⁴⁶

PPAs for renewable energy are not particularly developed in the EU, but they are currently “limited to certain Member States and large customer-facing companies.”¹⁴⁷ Even so, since 2018 and the revised Renewable Energy Directive 2018/2001, EU member states have been required to “assess the regulatory and administrative barriers to long-term renewables PPAs,” “remove unjustified barriers,” and “facilitate the uptake of such agreements.” EU member states are also required to ensure that PPAs are open and accessible to small and medium-sized enterprises (SMEs), as well as to the promising groups of self-consumers and energy communities and that they are “not subject to disproportionate or discriminatory procedures or charges.”¹⁴⁸ (The 2021 proposal to amend the directive also refers to “heat purchase agreements,” aiming to expand the use of such contracts beyond the electricity sector.)

EU law does not dictate what a PPA should contain, what types of PPAs are allowed (or preferred), or any other concrete requirement. It is for EU member states to determine such issues within the broad framework set by the directive. However, recent soft law instruments of the European Commission share best practices for the uptake of renewables PPAs in EU member states, including setting targets for their share in the total contracted capacity, combining them with other types of support, or facilitating access to renewables PPAs for SMEs.¹⁴⁹

143 Rob Broom, Peter Wright, Henry Davey, Igor Hanas, Paul O’Hop, and Manuel Mingot, *Corporate Power Purchase Agreements: The Preferred Route for Corporates to Secure Renewable Energy Supplies in a Decarbonized World* (Squire Patton Boggs, 2020), <https://www.squirepattonboggs.com/-/media/files/insights/publications/2020/02/corporate-power-purchase-agreements/enrcorporate-power-purchase-agreementspitch.pdf>.

144 Broom, Wright, Davey, Hanas, O’Hop, Mingot, *Corporate Power Purchase Agreements; “The Continued Rise of Corporate PPAs,” WindESCO* (December 17, 2021), <https://www.windesco.com/blog/corporate-ppas>.

145 “PPA Structures and Parties Involved,” DLA Piper Intelligence (n.d.), <https://www.dlapiperintelligence.com/corporateppa/countries/index.html>.

146 Cristian Stet, *Growing European PPA Markets Adapt to New Power Markets Reality*, (Utrecht: RaboResearch – Economic Research, June 16, 2022), <https://economics.rabobank.com/publications/2022/june/growing-european-ppa-markets-adapt-to-new-power-markets-reality/>; Louis-Narito Harada and Marie Coussi, “Power Purchase Agreements: A Developing Tool at the Centre of the European Energy Transition. A Focus on France” *European Energy and Environmental Law Review* 195 (2020).

147 European Commission, *Commission Staff Working Document: Guidance to Member States on Good Practices to Speed Up Permit-Granting Procedures for Renewable Energy Projects and on Facilitating Power Purchase Agreements* SWD(2022/0149 final (May 18, 2022), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022SC0149>.

148 European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources, OJ L 328, December 21, 2018, Art. 2.17 and Art. 15, <http://data.europa.eu/eli/dir/2018/2001/oj>.

149 European Commission, *Commission Recommendation of 18.5.2022 on Speeding Up Permit-Granting Procedures for Renewable Energy Projects and Facilitating Power Purchase Agreements*, C(2022) 3219 final (May 18, 2022), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282022%293219.

While long-term PPAs were heralded as the driver of renewables expansion in an era of rapidly changing economics for renewables, they can be useful to buyers that want to avoid locking themselves into terms that might appear too onerous after a short period of time. In sophisticated markets, the off-taker risk can be addressed by buying and selling renewables-based power on a well-functioning and flexible wholesale market,¹⁵⁰ but this opportunity is still distant for many developing countries,¹⁵¹ and short-term PPAs might be a good compromise.¹⁵²



3.2.6 Unbundled Electricity Segments

The monopoly of state-owned utilities over power systems and grid networks can create challenges for the penetration of renewable energy.¹⁵³ Unbundling is often advanced as the regulatory answer to the risk that vertically integrated energy (power and gas) utilities abuse their control over the transmission or distribution network to prevent the entry of new players in the competitive markets of energy production and supply. Through unbundling, an actor involved in a competitive activity in the energy market cannot also be involved in a monopolistic activity in the energy market. There are different models of unbundling. The main dichotomy is the one between legal and ownership unbundling. Under legal unbundling, a distinct legal entity is entrusted with managing and operating the networks, but the entity can still be owned by the incumbent energy utility, and hence the parent company can still significantly influence the subsidiary. The highest degree of separation is attained with ownership unbundling, under which the companies active in generation, trade, or supply cannot own or operate transmission or distribution networks¹⁵⁴ (see Box 8 on EU energy markets).

150 Rahul Kar, “The Long and Short of It: When Planning Cycles Go from 20 Years to Next-Day,” *Greentech Media* (July 24, 2020), <https://www.greentechmedia.com/articles/read/the-long-and-short-of-it-when-planning-cycles-go-from-20-years-to-next-day>.

151 Hugh Rudnick and Constantin Velasquez, “Taking Stock of Wholesale power Markets in Developing Countries: A Literature Review,” World Bank Group Policy Research working paper (Washington, DC: World Bank, 2018), <https://openknowledge.worldbank.org/handle/10986/29992>.

152 “Corporate Renewable Power Purchase Agreements (PPAs),” WBCSD (2022), <https://www.wbcd.org/Programs/Climate-and-Energy/Energy/REscale/Corporate-renewable-power-purchase-agreements-PPAs>.

153 Nicolas Maennling and Perrine Toledano, *The Renewable Power of the Mine: Accelerating Renewable Energy Integration* (New York: CCSI, 2018), <https://ccsi.columbia.edu/content/renewable-power-mine>.

154 Kota Sugimoto, “Ownership Versus Legal Unbundling of Electricity Transmission Network: Evidence from Renewable Energy Investment In Germany,” *Energy Economics* 99, (2021), <https://www.sciencedirect.com/science/article/pii/S014098832100195X>; Paul Nillesen and Michael Pollitt, “Ownership Unbundling of Electricity Distribution Networks,” *Economics of Energy and Environmental Policy* 1 (2021), <https://ideas.repec.org/a/aen/eeepj/eeep10-1-nillesen.html>; Andrew Ebrill, “CEER Reports on TSO and DSO Unbundling,” *European Networks Law and Regulation Quarterly* 4, no. 2 (2016): 83–87, <https://enlr.lexxion.eu/article/enlr/2016/2/4>.

BOX 8. LIBERALIZATION FOR MORE COMPETITIVE ENERGY MARKETS IN THE EU

In the EU, energy (power and gas) markets have traditionally been characterized by the monopolistic power of state-controlled, vertically integrated incumbents. This arrangement was inefficient and obstructed the completion of the internal market for electricity and intra-EU trade. Since the mid-1990s, the EU legislature has initiated a liberalization process. This process has so far yielded four Energy Packages (delivered in 1996–1998, 2003, 2009, and 2019) consisting of directives and regulations. The main pillars of these packages are the following:

- The openness of generation and supply to competition, free cross-border trade, and empowerment of consumers, including through freedom to choose their supplier.¹⁵⁵
- Unbundling to separate the generation and supply from transmission and distribution (ownership unbundling applies to transmission and legal unbundling to distribution).
- EU electricity and network codes.¹⁵⁶
- Establishment of independent national regulatory authorities and the creation of the European Union Agency for the Cooperation of Energy Regulators.¹⁵⁷
- Recognition that households, vulnerable consumers and tenants, and energy communities need to be empowered to actively participate in the energy markets and take ownership of the efforts toward an energy transition; a related requirement is that EU member states enact an enabling regulatory framework and rights to ensure and facilitate their participation in energy markets.¹⁵⁸

However, the liberalization and integration process seems to be facing hurdles after the energy price crisis that started in late 2021 and was exacerbated by the Russian-driven energy security crisis that started with the invasion of Ukraine in 2022. In response to the emergency situation, EU member states have been intervening in the energy markets in various ways, including price regulation.¹⁵⁹ The same emergency situation has shown the need for more interconnectors (and liquefied natural gas terminals), in which EU member states are now investing.¹⁶⁰

155 European Union, Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU, OJ L 158, June 14, 2019, Chapters II and III, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944>; European Union, *Proposal for a Directive of the European Parliament and of the Council on Common Rules for the Internal Markets in Renewable and Natural Gases and in Hydrogen*, COM (2021) 803 final (December 15, 2021), Chapters II and III, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0803>.

156 European Union, Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the Internal Market for Electricity, OJ L 158, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0943>.

157 European Union, Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 Establishing a European Union Agency for the Cooperation of Energy Regulators, OJ L 158, June 14, 2019, <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32019R0942>.

158 European Union, Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU, OJ L 158, June 14, 2019, Articles 15 and 16, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944>; European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources, OJ L 328, December 21, 2018, Articles 21 and 22, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG; European Union, Directive of the European Parliament and of the Council on Common Rules for the Internal Markets in Renewable and Natural Gases and in Hydrogen, COM(2021) 803 final, December 15, 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0803>.

159 “Energy Prices: Commission Proposes Emergency Market Intervention to Reduce Bills for Europeans,” *Electric Energy Online* (September 15, 2022), <https://electricenergyonline.com/article/energy/category/financial/51/979505/energy-prices-commission-proposes-emergency-market-intervention-to-reduce-bills-for-europeans-.html>.

160 European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*, COM(2022)360 final, (July 20, 2022), https://eur-lex.europa.eu/resource.html?uri=cellar:55edf05c-08d0-11ed-b11c-01aa75ed71a1.0001.02/DOC_1&format=PDF; “RE-PowerEU: Affordable, Secure, and Sustainable Energy for Europe,” (European Commission, May 18, 2022), https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en; Robert Cluley and Hafez Abdo, “Ukraine Has Made a Major Move Towards Integrating With Europe—by Plugging into Its Electricity Grid,” *The Conversation* (March 29, 2022), <https://theconversation.com/ukraine-has-made-a-major-move-towards-integrating-with-europe-by-plugging-into-its-electricity-grid-180164>.

A possible hybrid model is unbundling with one or more independent network operators: on the one hand, vertically integrated companies are still allowed to own the network companies; on the other, the decision-making with regard to the networks belongs to the totally independent companies that are responsible for their operation. Research suggests that the market participation needs of renewable energy investments by independent new entrants are equally served by a model of legal unbundling mixed with a strong regulatory framework and the empowerment of independent transmission and distribution operators.¹⁶¹ A creative model inspired by this hybrid approach and diversifying the off-taker risk is taking root in Africa through the Africa GreenCo Group: it plays the intermediary off-taker and service provider, purchasing power from IPPs and selling it to utilities, private sector off-takers, or the South African Power Pool.¹⁶²

3.2.7 Net Metering

The most liberalized markets have evolved toward involving consumers in distributed generation schemes, which refer to the management of electricity “in a decentralized and small-scale manner, thereby siting generation close to load.”¹⁶³ Distributed generation is linked with energy efficiency, as the demand for electricity from the traditional power network is reduced, especially during peak hours, and with the promotion of renewable energy, since such systems mostly exploit solar, wind, or geothermal power or biomass.¹⁶⁴ Consumers involved in distributed generation can self-consume the electricity they generate within their premises, feed any excess production to the central grid, and either receive a credit on their electricity bill through various net-metering schemes or procure and trade electricity.

Net-metering schemes are widely used in the United States and are gaining ground in the EU.¹⁶⁵ In the United States, several states, and especially California, have also used another interesting model: community choice aggregation. Under this model, local governments, municipalities, counties, or even groups of cities “combine the electricity demand of customers in their jurisdictions and procure electricity on their behalf, either through their own generation or through the market.”¹⁶⁶

While these models are most widespread in liberalized power markets,¹⁶⁷ they can help alleviate typical power sector challenges in developing countries, such as the inability to meet the power demand or to stabilize the grid.¹⁶⁸ However, developing the policy, institutional, and regulatory framework is a prerequisite to making net metering work.

161 Sugimoto, “Ownership Versus Legal Unbundling of Electricity Transmission Network,” supra n. 154; Nillesen and Pollitt, “Ownership Unbundling of Electricity Distribution Networks,” supra n. 154; Ebrill, “CEER Reports on TSO and DSO Unbundling,” supra n. 154.

162 “About Us,” Africa GreenCo Group (n.d.), <https://africagreenco.com/about-us>.

163 Cutler J. Cleveland and Christopher Morris, *Dictionary of Energy* (Elsevier, 2006), 120.

164 European Commission, Communication From the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions, *Renewable Energy: A Major Player in the European Energy Market*, COM(2012) 0271 final (June 6, 2012), <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52012DC0271>.

165 Theodoros G. Iliopoulos, Matteo Germeglia, and Bernard Vandheusden, “The EU’s 2030 Climate and Energy Policy Framework: How Net Metering Slips Through its Net,” *Review of European, Comparative & International Environmental Law* 29, no. 2 (2020): 245–256. <https://onlinelibrary.wiley.com/doi/full/10.1111/reel.12339>.

166 Sean F. Kennedy and Bailey Rosen, “The Rise of Community Choice Aggregation and its Implications For California’s Energy Transition: A Preliminary Assessment” *Energy & Environment* 32, no. 2 (2020), 263, <https://doi.org/10.1177/0958305X20927381>.

167 Less than a third of African countries have net metering policies. See: *Scaling-Up Renewable Energy in Africa*, supra n. 110.

168 “Implementing Net Metering in Country ‘X,’” *Distributed Energy* (April 1, 2020), <https://de.energy/blog/case-study-for-the-implementation-of-net-metering>.

3.3 Fiscal Policy Tools

3.3.1 Carbon Pricing

Carbon pricing is crucial to encouraging renewable energy investments. Carbon pricing relies on classic environmental economics theory, according to which emitters should be charged for the social costs that their activities impose on societies.¹⁶⁹ In this regard, the social cost of each unit of carbon (or greenhouse gas) emissions should be calculated and reflected in market transactions. In response, demand for carbon-intensive activities and products will drop, and emitters will be incentivized to reduce emissions; in the energy field, a carbon price leads to a shift toward investments in low-carbon technologies, such as renewable energy sources.

Carbon pricing can be put into practice through carbon taxation (see Box 9) or through emissions trading systems (see Box 10); it is a market-based climate policy instrument, as opposed to command-and-control instruments. Carbon pricing has been proven to be an overall effective climate policy instrument: countries with a carbon price have noticeably lower annual CO₂ emission growth rates than countries without one, all else equal, and even better results can be expected in the long run.¹⁷⁰ Indeed, carbon pricing has been gaining ground globally (see Figure 4), and since 1990, when Finland adopted the first carbon tax, some 40 more jurisdictions (mostly developed ones) have resorted to it.¹⁷¹

BOX 9. CARBON TAX IN INDIA

The Indian government introduced a Clean Energy Cess in 2010, which was levied on coal at the time of production or import. However, the introduction of the 2017 Central Goods and Service Tax Act subsumed the Clean Energy Cess into the Compensation Cess.¹⁷² Under the regime of the Compensation Cess, introduced for the period 2017–2022, coal is taxed at INR 400 per tonne at every point of supply and not only at the source.

The main criticisms of the Compensation Cess center on (i) the applicable rate—INR 400 per tonne levied on coal has been the consistent rate since 2010, and there has been no movement to hike the Compensation Cess rate; (ii) the volume of the emissions have not been taken into the account; a flat rate of INR 400 per tonne will be levied irrespective of the quantum of the emissions; and (iii) the type and variety of coal used is neglected; coal products of varying carbon intensities are charged at the same rate.¹⁷³

169 See “Pricing Carbon,” World Bank (n.d.), <https://www.worldbank.org/en/programs/pricing-carbon>.

170 Organisation for Economic Co-operation and Development (OECD), *Effective Carbon Rates 2021: Pricing Carbon Emissions Through Taxes and Emissions Trading* (Paris: OECD Publishing, 2021), <https://doi.org/10.1787/0e8e24f5-en>; Rohan Best, Paul J. Burke, and Frank Jotzo, “Carbon Pricing Efficacy: Cross-Country Evidence,” *Environmental and Resource Economics* 77, (2020): 69–94 <https://link.springer.com/article/10.1007/s10640-020-00436-x>; Suphi Sen and Herman Vollebergh, “The Effectiveness of Taxing the Carbon Content of Energy Consumption,” *Journal of Environmental Economics and Management* 92, (2018): 74–99, <https://doi.org/10.1016/j.jeem.2018.08.017>.

171 Simon Black, Ian Parry, and Karlygash Zhunussova, “More Countries Are Pricing Carbon, but Emissions Are Still Too Cheap,” *IMF Blog* (July 21, 2022), <https://www.imf.org/en/Blogs/Articles/2022/07/21/blog-more-countries-are-pricing-carbon-but-emissions-are-still-too-cheap>; OECD, *Effective Carbon Rates 2021*, supra n. 164; Best, Burke, and Jotzo, “Carbon Pricing Efficacy,” supra n. 170.

172 Government of India, *The Central Goods and Services Tax Act, 2017*, (2017), <https://cbic-gst.gov.in/pdf/CGST-Act-Updated-30092020.pdf>.

173 “Compensation Cess (Rate) Notifications,” Central Board of Indirect Taxes and Customs, Government of India Ministry of Finance – Department of Revenue, <https://cbic-gst.gov.in/compensation-tax.html>; Alok Perti, “Clean Energy Cess-Tax on Coal,” *ETNowNews* (November 19, 2020), <https://www.timesnownews.com/business-economy/industry/article/clean-energy-cess-tax-on-coal/683809>.

This particular reform has not proved to be successful in curbing emissions, and at the time of writing, the government had not extended the applicability of the Compensation Cess beyond 2022.¹⁷⁴ State governments have introduced other taxation measures. The Green Cess introduced by Goa in 2013 is levied on polluting products and substances.¹⁷⁵ However, there is still a need for a stronger policy framework and regulation for carbon taxation.

BOX 10. THE EU EMISSIONS TRADING SYSTEM (ETS)

Emissions trading schemes aim to internalize the negative externalities that the activities of emitters entail by capping the total volume that they are allowed to emit and allowing them to trade permits, whether to purchase additional permits to emit beyond the cap or to sell unused ones. The 1997 Kyoto Protocol set legally binding targets for emissions reduction, which paved the way for various emission trading schemes to be developed.

The EU is a pioneer in such schemes. The EU ETS was introduced in 2005; after several reforms, it still constitutes a central pillar of the EU climate and energy policy. Under the current “phase 4” of the EU ETS, covering the years 2021–2030, the overall number of emission allowances is to decline at an annual rate of 2.2%. These allowances are normally allocated by EU member states through auctioning, and the revenues are used (mostly) for climate and energy purposes. However, there are certain derogations under which allowances can be allocated for free. Such derogations include the granting of support to innovation in low-carbon technologies or the construction and operation of projects that aim at innovative renewable energy and energy storage technologies. They also include the granting of support to certain energy-intensive industries that are at risk of carbon leakage— that is, the transfer of production to other countries outside the EU, where laxer emission rules apply and, hence, compliance is less costly.¹⁷⁶ However, according to some observers, for a long time, the EU ETS did not achieve significant results in curbing emissions or changing behaviors, and the encouragement to shift to renewables came from other policy instruments.¹⁷⁷ Phase 4 of the EU ETS’s reduced free allowances combined with the energy crisis has led to much higher carbon prices, which should support the EU in achieving its decarbonization goals, despite political tensions.¹⁷⁸

To tackle carbon leakage, in 2021 the European Commission proposed introducing the Carbon Border Adjustment Mechanism (CBAM). According to the EU, the CBAM is designed in accordance with World Trade Organization rules and aims to create a level playing field between domestic products and imports by applying an equivalent set of rules to imports.¹⁷⁹ The pursued implementation of CBAM is, however, fraught with political challenges.¹⁸⁰

174 International Institute for Sustainable Development (IISD), *The Evolution of the Clean Energy Cess on Coal Production in India* (Winnipeg: IISD, n.d.), <https://www.iisd.org/system/files/publications/stories-g20-india-en.pdf>.

175 Government of Goa, The Goa Cess on Products and Substances Causing Pollution (Green Cess) Act, 2013, Act 15 (May 22, 2013), http://www.dstegoa.gov.in/1-The_Goa_Cess___Green_Cess__Act2013.pdf; “Govt Introduces Green Cess Bill in Assembly,” *India Times* (April 26, 2013), <https://timesofindia.indiatimes.com/city/goa/Govt-introduces-Green-Cess-Bill-in-assembly/articleshow/19733340.cms>.

176 European Union, Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 Establishing a Scheme for Greenhouse Gas Emission Allowance Trading Within the Community and Amending Council Directive 96/61/EC, L 275, October 25, 2003, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0087>.

177 “EU Emissions Trading: 5 Reasons to Scrap the ETS,” *Corporate Europe Observatory* (October 26, 2015), <https://corporateeurope.org/en/environment/2015/10/eu-emissions-trading-5-reasons-scrap-ets>.

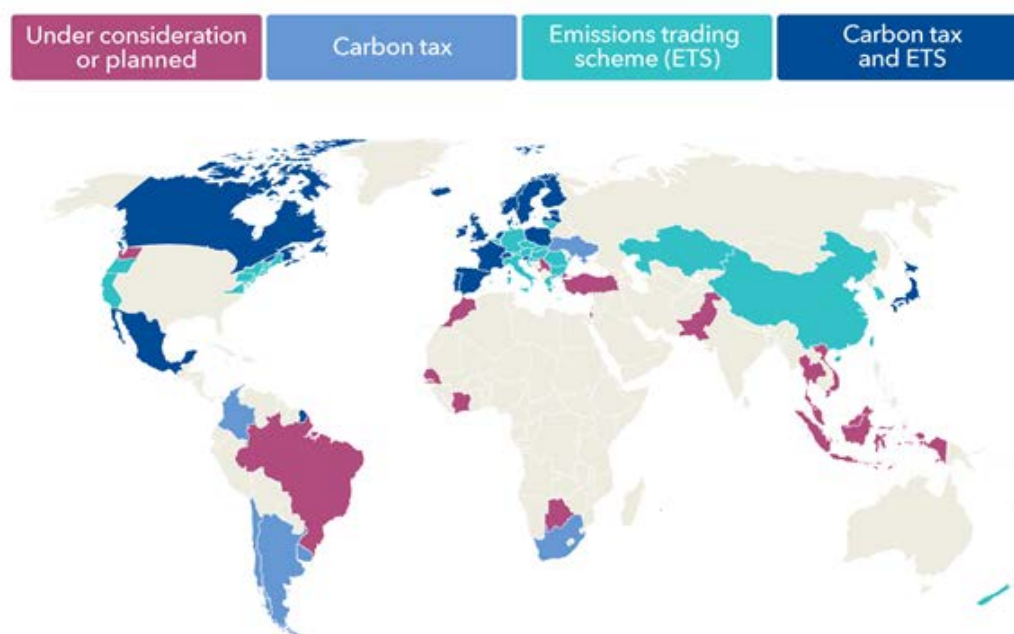
178 Matt Farmer, “Record EU Carbon Price Continues to Rise; Sucks up Fossil Fuel Profits,” *Power Technology* (December 13, 2021), <https://www.power-technology.com/news/industry-news/eu-ets-emissions-trading-scheme-price>; Elisabetta Cornago, *High Energy Prices Threaten the EU Emissions Trading System* (London: Center for European Reform, March 23, 2022), <https://www.cer.eu/insights/high-energy-prices-threaten-eu-ets>.

179 European Commission, *Proposal for a Regulation of the European Parliament and of the Council Establishing a Carbon Border Adjustment Mechanism*, COM(2021) 564 final (July 14, 2021), https://ec.europa.eu/info/sites/default/files/carbon_border_adjustment_mechanism_0.pdf.

180 Dijedon Imeri and Petya Barzilska, “Challenges for the Planned Carbon Border Tax Measures in the EU,” *Markit* (November 9, 2021), <https://ihsmarkit.com/research-analysis/challenges-for-the-planned-carbon-border-tax-measures-in-the-eu.html>.

Carbon price choices

Countries and states are choosing different approaches to carbon pricing based on their own circumstances and objectives.



Source: WBG, IMF staff calculations, and national sources. Note: The boundaries and other information shown on any maps do not imply on the part of the IMF any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

Figure 4. Carbon pricing around the world.

Source: Black, Parry, and Zhunussova (2022).¹⁸¹

Despite the proliferation of carbon-pricing initiatives and the increasing trend of carbon prices, most carbon emissions are priced too low. While it is estimated that “holding the increase in the global average temperature to well below 2°C above pre-industrial levels” requires a price of USD 50–100 per tonne of CO₂-equivalent (tCO₂e) by 2030, less than 4% of global emissions in 2022 are covered by a carbon price at or above that range; achieving net-zero by 2050 to keep warming to 1.5°C above pre-industrial levels would require an even higher price on carbon, with estimates at USD 50–250/tCO₂e.¹⁸² A higher price on carbon emissions is necessary for the decarbonization of developing economies, which have higher capital costs; investing in low-carbon technologies in lieu of the continued use of fossil fuels is, in principle, even costlier.¹⁸³

Therefore, instruments to lower capital costs need to be considered supplemental policies to decarbonize the power sectors of developing economies. In fact, most jurisdictions have resorted to distributive policies, such as subsidies or feed-in tariffs, or direct regulation, such as target-setting (see Section 3.4.4). Such policies often complement carbon pricing,

181 Simon Black, Ian Parry, and Karlygash Zhunussova, “More Countries Are Pricing Carbon, but Emissions Are Still Too Cheap,” IMF Blog, (July 21, 2022), <https://www.imf.org/en/Blogs/Articles/2022/07/21/blog-more-countries-are-pricing-carbon-but-emissions-are-still-too-cheap>.

182 World Bank, *State and Trends of Carbon Pricing 2022* (Washington, DC: World Bank, 2022), <https://openknowledge.worldbank.org/handle/10986/37455>.

183 Hirth and Steckel, “The Role of Capital Costs in Decarbonizing the Electricity Sector,” supra n. 32.

and such a mix is regarded as an optimal regulatory intervention because, among other reasons, carbon pricing is politically costly, while directly subsidizing low-carbon energy technologies is politically easier.¹⁸⁴

3.3.2 Support Schemes

Support schemes promote the deployment of renewables in different ways, including by reducing the generation costs, increasing the selling price, or increasing the demand or supply of energy from renewable sources.¹⁸⁵ But they are not always efficient at attaining their objectives, as discussed below. As shown by the CCSI–E3G survey, more than half of investors considered financial or tax incentives offered by states as critical or important to their decision-making process.

According to a classic law and economics analysis, support schemes are divided into a) direct price instruments that guarantee certain remuneration for producers; b) quantity instruments, such as quota obligations on suppliers or producers and bidding procedures; c) tax instruments, referred to as “secondary instruments” because they are mostly used in a complementary manner.¹⁸⁶

3.3.2.1 Feed-in Tariffs, Feed-in Premiums, and Contracts for Differences

Feed-in tariffs are the most widespread price support scheme for renewable energy in the world. They are generally long-term (e.g., 20-year) contracts that require grid operators to purchase the low-carbon energy produced at a guaranteed fixed price. As they ensure a certain long-term remuneration period for the producers and reduce investment risk, feed-in tariffs are simple and attractive and can lead to fast uptake of renewable energy projects. However, because they remain stable and do not react to market signals, feed-in tariffs can be costly schemes that distort the energy markets. With the cost reduction of renewables, the use of feed-in tariffs is declining worldwide.¹⁸⁷

Feed-in premiums are more market-oriented alternatives to feed-in tariffs: they grant a fixed or floating add-on fee on top of the market price. Beneficiaries of feed-in premiums are not relieved of the burden of finding buyers for their low-carbon energy (see Box 11 for Japan’s example).¹⁸⁸

184 Leigh Raymond, “Policy Perspective: Building Political Support for Carbon Pricing—Lessons from Cap-And-Trade Policies,” *Energy Policy* 134 (November, 2019), <https://www.sciencedirect.com/science/article/abs/pii/S0301421519305737>; Jonas Meckling, “A New Path for U.S. Climate Politics: Choosing Policies That Mobilize Business for Decarbonization,” *The Annals of the American Academy of Political and Social Science* 685, no. 1 (2019): 82–95, <https://journals.sagepub.com/doi/10.1177/0002716219862515>.

185 See also the legal definition in: European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources, OJ L 328, December 21, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG.

186 See Penelope Crossley, *Renewable Energy Law: An International Assessment* (Cambridge: Cambridge University Press, November 2019), <https://doi.org/10.1017/9781316888490>; Pablo del Río and Pere Mir-Artigues, “Combinations of Support Instruments for Renewable Energy in Europe: A Review,” *Renewable and Sustainable Energy Reviews* 40(C), (2014): 287–295, <https://ideas.repec.org/a/eee/rensus/v40y2014icp287-295.html>; Reinhard Haas, Christian Panzer, Gustav Resch, Mario Ragwitz, Gemma Reece, and Anne Held, “A Historical Review of Promotion Strategies for Electricity from Renewable Energy Sources in EU Countries,” *Renewable and Sustainable Energy Reviews* 15, no. 2 (2011): 1003–1034, <https://doi.org/10.1016/j.rser.2010.11.015>.

187 “Clean Energy Solutions Center (CSC),” Clean Energy Ministerial, <https://www.cleanenergyministerial.org/initiatives-campaigns/clean-energy-solutions-center>.

188 Crossley, *Renewable Energy Law*, Chapter 5.2, supra n. 180; Toby Couture and Yves Gagnon, “An Analysis of Feed-In Tariff Remuneration Models: Implications for Renewable Energy Investment,” *Energy Policy* 38, no. 2 (2010): 955–965, <https://www.sciencedirect.com/science/article/abs/pii/S0301421509007940>.

BOX 11. JAPAN'S FEED-IN PREMIUM SCHEME

Japan launched a feed-in tariff system in July 2012 to promote the widespread use of renewables-based electricity but replaced it in June 2020 with a feed-in premium system, which encourages power generation linked to electricity market prices to progressively integrate renewable energy into the electricity market.

The feed-in premium market mimics a corporate PPA market, with a market transaction plus a premium. In lieu of the fixed electricity price set by the Ministry of Economy, Trade, and Industry under the feed-in tariff program, the feed-in premium program ensures that power producers get a premium in addition to the market price for the electricity they generate. Thus, the feed-in premium system allows renewable energy producers to sell electricity on the spot market for a higher price than wholesale, lowering customer cost burdens while increasing competitiveness in the renewable energy sector.¹⁸⁹ On the other hand, in a feed-in premium system, it is difficult to forecast revenues because of the fluctuating sales price. Critics have indicated that the biggest issues in Japan relate to land availability and grid access restrictions and that the feed-in premium system does not address those issues.¹⁹⁰

Another direct price support instrument derived from the principle of a feed-in premium is the contract for differences (CfDs), in which renewable energy generators are entitled to a payment from the government that equals the difference between a contractually agreed “strike price” and the market price (or reference price) when it is lower than the former (similar to a virtual PPA, as discussed in Section 3.2.5). CfDs work in two ways: if the reference price (market price) is higher than the agreed strike price, the generators pay back the difference.¹⁹¹ The United Kingdom is a pioneer in CfDs,¹⁹² but the instrument is gaining ground, with more European states resorting to it.¹⁹³ What makes the CfDs attractive for policy-makers and investors is that they ensure a certain stable profitability for renewable energy projects, but the “strike price” also caps the generators’ revenues and obliges them to pay back windfall profits that go beyond the agreed level. The latter element has revealed its effect during the excessive spike of electricity prices in Europe in 2022, as it has assisted in putting a brake on the expenditure for electricity and in partially alleviating the consumers’ burden. Indeed, not only are the generators covered by CfDs not entitled to benefit from the excessive prices, but they are also contractually obliged to pay back the difference. As much in line with the principles of fairness and social solidarity as this might be, it has also caused problems, as generators do not find it easy or commercially viable to pay back the large difference between the strike price and the market price. In this regard, European states are considering and enacting special regulatory regimes to mitigate the risk accompanying CfDs (see Box 12).

189 Ministry of Economy, Trade and Industry (METI), Agency for Natural Resources and Energy, *Outline of Strategic Energy Plan* (2021), https://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/6th_outline.pdf.

190 International Renewable Energy Agency (IRENA), *Renewable Energy Auctions in Japan: Context, Design and Results* (Abu Dhabi: IRENA, 2021), <https://www.irena.org/publications/2021/Jan/Renewable-energy-auctions-in-Japan>.

191 Phillip Wild, “Determining Commercially Viable Two-Way and One-Way ‘Contract-for-Difference’ Strike Prices and Revenue Receipts,” *Energy Policy* 110, (2017): 191–201, <https://www.sciencedirect.com/science/article/pii/S0360544217310000>.

192 Michael G. Pollitt and Karim L. Anaya, “Can Current Electricity Markets Cope with High Shares of Renewables? A Comparison of Approaches in Germany, the UK and the State of New York” *The Energy Journal* 37, (2016), <https://www.iaee.org/en/publications/ejarticle.aspx?id=2731>.

193 Hellenic Republic, Law no. 4986/2022, Official Gazette 204/A/28-10-2022, October 28, 2022, <https://www.e-nomothesia.gr/energeia/n-4986-2022.html>; European Commission, State Aid SA.43697 (2015/N) – Poland: Polish Support Scheme for RES and Relief for Energy-Intensive Users, C(2017)8334 final, December 13, 2017, https://ec.europa.eu/competition/state_aid/cases/261495/261495_1965594_372_2.pdf; European Commission, *Communication from the Commission: Guidelines on State Aid for Climate, Environmental Protection and Energy 2022*, C 80/2 (February 18, 2022), 121, [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC0218\(03\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022XC0218(03)).

BOX 12. REGULATORY CHANGES IN EUROPE TO ADDRESS THE CFD-RELATED RISKS FOR RENEWABLE GENERATORS

France is considering allowing certain projects that have recently signed 20-year CfDs for the future but have not been completed and have not been operative yet “to sell electricity directly into the wholesale market for 18 months prior to triggering their CfDs.”¹⁹⁴ Poland and the United Kingdom are already using similar regulatory techniques,¹⁹⁵ while Spain has capped the amount of electricity covered by CfDs, which means that generators can freely sell on the market the surplus and benefit from the high prices.¹⁹⁶ The EU legislature has excluded CfD beneficiaries, who are required to pay back money, from the application of the emergency legislation that addresses high energy prices and caps market revenues.¹⁹⁷

3.3.2.2 Renewable Energy Quotas and Certificates

Through quantity regulation, the authorities set the minimum amount of energy from renewable sources to be produced and consumed. Quantity regulation can be implemented through the introduction of quotas, often complemented by the use of tradeable renewable energy certificates, which become a distinct commodity. This model relies on the functioning of two markets from which investors can profit, namely energy markets and renewable energy certificates markets, and hence has been considered less market distortive. While renewable certificates are still widely in use, their current design is increasingly criticized for not avoiding detrimental market distortions¹⁹⁸ and not contributing to decarbonizing the energy buyers.¹⁹⁹

The practical application of renewable energy quotas and certificates in Europe has resulted in a surprising increase in energy prices. At the same time, certificate markets also face the risk of a market failure, in which certificates remain unsold, requiring corrective regulatory intervention. For example, when this occurred in Flanders, Belgium, in the mid-2010s, the Flemish regulators imposed mandatory purchasing obligations on the system operators, in turn, causing them financial hardship.²⁰⁰ Another drawback of renewable energy certificates is that a company might buy such certificates to account for them in reducing its carbon footprint instead of displacing its fossil fuel consumption.²⁰¹

194 Neil Ford, *France’s Contract Action Highlights Threats to Renewables Growth* (London: Reuters Renewables, September 22, 2022), reutersevents.com/renewables/wind/frances-contract-action-highlights-threats-renewables-growth.

195 Cristian Stet, *Growing European PPA Markets Adapt to New Power Markets Reality*, supra n. 146.

196 Zsombor Garzo and Paul Butterworth, *Spanish Solar Not as Cheap as Auction Prices Suggest* (London: CRU Group, August 11, 2022), <https://sustainability.crugroup.com/article/spanish-solar-not-as-cheap-as-auction-prices-suggest>.

197 Council of the European Union, Council Regulation (EU) 2022/1854 of 6 October 2022 On an Emergency Intervention to Address High Energy Prices, OJ L 261I, July 10, 2022, 1–21, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1854>.

198 Julieta Schallenberg-Rodríguez, “Renewable Electricity Support Systems: Are Feed-In Systems Taking the Lead?” *Renewable and Sustainable Energy Reviews* 76, (2017): 1422–1439, <https://doi.org/10.1016/j.rser.2017.03.105>; Pablo del Río and Emilio Cerdá, “The Policy Implications of the Different Interpretations of the Cost-Effectiveness of Renewable Electricity Support,” *Energy Policy* 64, (2014): 364–372, <https://doi.org/10.1016/j.enpol.2013.08.096>; Aviel Verbruggen and Volkmar Lauber, “Assessing the Performance of Renewable Electricity Support Instruments,” *Energy Policy* 45 (2012), 635–644, <https://doi.org/10.1016/j.enpol.2012.03.014>.

199 Anders Bjørn, H. Damon Matthews, Matthew Brander, and Shannon M. Lloyd, “Most Companies Buying Renewable Energy Certificates Aren’t Actually Reducing Emissions,” *The Conversation*, June 9, 2022, <https://theconversation.com/most-companies-buying-renewable-energy-certificates-arent-actually-reducing-emissions-183176>.

200 Schallenberg-Rodríguez, “Renewable Electricity Support Systems,” supra n. 198; Verbruggen and Lauber, “Assessing the Performance of Renewable Electricity Support Instruments,” 635, supra n. 198. See also Kingdom of Belgium, Decree houdende bepalingen tot begeleiding van de begroting 2016, C–2015/36624, December 29, 2015, <https://emis.vito.be/sites/emis/files/legislation/1332/2016//sb291215-2.pdf>.

201 Shannon Hughes and Samuel Huestis, “Clean Energy 101: The REC Market,” *RMI* (June 2, 2022), <https://rmi.org/clean-energy-101-the-rec-market>.

Renewable energy quotas and certificates still have the merit of ensuring that the regulatory objective will be attained. Accordingly, despite the problems revealed by practical experience, policy-makers should not reject renewable energy quotas and certificates outright but diligently select and design them.

3.3.2.3 Bidding Procedures

Bidding procedures are another quantity instrument: the authorities request the installation of a project for a certain capacity (MW), generation level (MWh), or specific characteristics (e.g., location or technology), and potential investors compete for the contract to undertake the project.²⁰² The auction process has a number of benefits, which account for its adoption in many countries, including:²⁰³

- Providing a predictable and reliable revenue stream after the award, which facilitates project funding;
- Encouraging producer competition, leading to lower tariffs;
- Allowing the promotion of technologies with different degrees of techno-economic maturity; and
- Enabling the introduction of other bidding criteria, such as employment creation.

Because of these advantages, many countries have replaced the feed-in tariff and feed-in premium systems with the auction system.²⁰⁴ One drawback of auctions is that they discourage the entry of new and smaller companies into the market by favoring large current participants.²⁰⁵ Consequently, auctions should be complemented with a policy that specifically targets small and decentralized renewable energy projects. For example, EU member states have kept feed-in tariff or feed-in premium systems to support small-scale installations and demonstration projects.²⁰⁶

In countries with less-developed public procurement systems, renewable energy investors need to navigate cumbersome decision-making processes while dealing with exposure to financial crimes and reputational risks. Capacity building in planning and managing competitive tenders is necessary to provide a high degree of transparency and predictability, boost market confidence, and promote price discovery.²⁰⁷ The case study on the bidding procedure in Japan (see Box 13) illustrates how designing bidding procedures for renewables can be challenging. In Africa, only half of the countries have policies in place to hold auctions for renewable energy projects, much less successfully have held tenders.²⁰⁸

202 Press Information Bureau, “Year End Review 2018 – MNRE,” (Ministry of New and Renewable Energy, Government of India, December 10, 2018), <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1555373>.

203 Germán Bersalli, Philippe Menanteau, and Jonathan El-Methni, “Renewable Energy Policy Effectiveness: A Panel Data Analysis Across Europe and Latin America,” *Renewable and Sustainable Energy Reviews* 133 (2020), <https://doi.org/10.1016/j.rser.2020.110351>.

204 Ibid.

205 Ibid.

206 European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources, OJ L 328, December 21, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG.

207 IEA, *Africa Energy Outlook 2019*, supra n. 73.

208 *Scaling-Up Renewable Energy in Africa*, supra n. 110.

BOX 13. THE BIDDING PROCEDURE IN JAPAN

Japan shifted the scale of commercial PV power generation to a bidding system in 2017 and gradually expanded the scale eligible for bidding, reaching 250 kW or more in 2020. However, the result was that the number of applications for bidding was far below the capacity offered, and accordingly, Japan had to improve the bidding system to increase participation²⁰⁹ In particular:²¹⁰

- To increase price predictability, the maximum price for each bid is now announced in advance;
- To support timeline preparations for project implementation, the number of bids for solar power generation has been increased from twice a year to four times a year, and the review period has been reduced from three months to two weeks;
- The reasons for forfeiture of the bid deposit have been relaxed; and
- The deadline to evidence a connection agreement with the grid has been extended.

3.3.2.4 Tax Benefits

Many countries resort to tax benefits that aim to incentivize investments in renewable energy projects, regardless of the operation of a project over the years. For instance, EU countries grant tax exemptions and tax credits for investments in renewable energy installations,²¹¹ as well as value-added tax reductions,²¹² or guarantees of income tax coefficient stabilization.²¹³

However, tax instruments can also be designed as generation-based mechanisms, granting benefits depending on the energy generated.²¹⁴ For a long time, in the United States, the renewable electricity production credit tax (PTC) has been a per kilowatt-hour tax credit for electricity generated by the taxpayer from qualified energy resources at a qualified facility.²¹⁵ (See Box 14 on the tax benefits for renewables contained in the U.S. Inflation Reduction Act.)

Empirical studies show that tax benefits alone are insufficient to encourage the deployment of renewable technologies and investment in developing markets.²¹⁶

209 Japanese Agency for Natural Resources and Energy, *Remaining Issues Regarding Bidding System, Procurement Prices, Etc. After FY 2021* (2022), https://www.meti.go.jp/shingikai/santeii/pdf/066_01_00.pdf.

210 Ibid.

211 See for example Kingdom of Belgium, Administration générale de la Fiscalité – Impôts sur les revenus – Avis relatif à la déduction pour investissement, C-2017/11103, March 15, 2017, 35928, https://www.ejustice.just.fgov.be/mop-df/2017/03/15_1.pdf#page=220; Revenue: Irish Tax and Customs, Notes for Guidance – Taxes Consolidation Act 1997: Finance Act 2021 Edition, December 2021, Section 285A and Schedule 4A Taxes Consolidation Act 1997, <https://www.revenue.ie/en/tax-professionals/documents/notes-for-guidance/tca/schedules.pdf>; Kingdom of the Netherlands, 2001 Income Tax Act, BWBR0011353, 2001, Art 3.42, <https://wetten.overheid.nl/BWBR0011353/2022-04-01>.

212 France, for instance, applies a reduced value-added tax to the installation of renewable energy heating equipment. See République Française, Code Général des Impôts, Sourced on November 4, 2022, Art. 200 Quater (1)(d), https://www.legifrance.gouv.fr/codes/section_lc/LEGITEXT000006069577/LEGISCTA000006147017/#LEGISCTA000006147017.

213 Greece, for instance, has enacted a 12-year stabilization of income tax coefficient for investors in certain renewable energy projects. See Hellenic Republic, Law no. 4399/2016, Official Gazette 117/A/22-6-2016, Arts. 7(4) and 57, <https://www.e-nomothesia.gr/kat-epikheireseis/nomos-4399-2016-phek-117a-22-6-2016.html>.

214 Crossley, *Renewable Energy Law*; Friedemann Polzin, Michael Migendt, Florian A. Täube, Paschen von Flotow, “Public Policy Influence on Renewable Energy Investments – A Panel Data Study across OECD Countries,” *Energy Policy* 80, (2015): 98–111, <https://doi.org/10.1016/j.enpol.2015.01.026>; Pablo del Río and Pere Mir-Artigues, “Combinations of Support Instruments for Renewable Energy in Europe,” 287, *supra* n. 186.

215 As per the law, qualified energy resources are (a) wind, (b) closed-loop biomass, (c) open-loop biomass, (d) geothermal energy, (e) solar energy, (f) small irrigation power, (g) municipal solid waste, (h) qualified hydropower production, and (i) marine and hydrokinetic renewable energy. United States of America, United States Code, 2006 Edition, Supplement 5, Title 26 – Internal Revenue Code, Y 1.2/5, January 3, 2012, Section 45, <https://www.govinfo.gov/app/details/USCODE-2011-title26/USCODE-2011-title26-subtitleA-chap1-subchapA-partIV-subpartD-sec45/summary>.

216 Bersalli, Menanteau, and El-Methni, “Renewable Energy Policy Effectiveness,” *supra* n. 203.

BOX 14. THE U.S. INFLATION REDUCTION ACT AND RENEWABLE ENERGY²¹⁷

With the enactment of the Inflation Reduction Act (IRA) in the United States in August 2022, the legislation's climate change provisions—covering a multitude of topics from electric vehicles to renewable power—have garnered much attention.

Most aspects of the IRA's energy credits programs make renewable energy projects more affordable and enable the low-carbon transition. Tax credits for consumer products, ranging from electric vehicles to rooftop solar panels and more efficient HVAC systems, will expand the marketability of these products by augmenting consumer demand. Further, extended (10+ years) tax incentives are included for renewable energy generation and storage; long-term policy stability will also spur investment in renewables. These incentives take the form of both investment tax credits (ITCs) and PTCs and expand both to more technologies than had previously been eligible. For example, solar projects could now qualify for PTCs in addition to ITCs, whereas they used to only qualify for ITCs, which tend to be less beneficial than PTCs for big projects. Also, in a departure from previous policy, storage can now qualify for ITCs without accompanying solar assets.

Previous versions of what became the IRA included even more tax benefits for transmission system expansions and the integration of renewables into the grid, and the enacted text includes funding only for projects that are “modest” in size in relation to the planned investments through 2027. However, transmission and distribution companies should benefit as a result of the cheaper energy they will be able to offer consumers, which will open a margin to invest while keeping affordable tariffs even at a cost-recovery level.

The continued negotiations around permitting reform will likely shape the broad effects that it will have on the renewable sector.

3.4 Enabling Institutional Frameworks

3.4.1 Legal Stability

Assessing the risks that are unique to a potential host country represents one of the key elements in the decision-making process of foreign investors, particularly in long-term, capital-intensive projects like renewables. “Country risk” refers to the perceived economic, political, and legal instability associated with investing in the country and, specifically, the degree to which that instability could render an investment inviable. Political risk is the risk an investment's profitability could suffer as a result of the political context of a state, politically motivated drivers, or political changes in a country. Economic risk refers to the degree to which the macroeconomic conditions of a country—including its exchange rates, general interest rates, and inflation rates—may affect the financial viability of a business enterprise. Legal risk is the potential that the regulatory framework or the contractual terms governing an investment will fundamentally change, that the investor will be subject to undue legal claims or enforcement actions, or that local courts will not resolve disputes in accordance with the law and expeditiously without undue delay, all of which may affect the viability of an investment.

²¹⁷ Based on the work of Moody's Investors Services, “Inflation Reduction Act's Renewable, Nuclear and Other Energy Credits Are Credit Positive,” [subscription service].

The CCSI-E3G survey results confirm the importance of stability to investment decision-making. Among the legal and regulatory factors driving foreign investment in renewables in developing markets, an overwhelming majority of respondents considered “legal stability,” “political stability,” and “stability of fiscal and energy markets” as critical or very important issues in their investment decisions. This section focuses on the stability of legal frameworks, which includes both contractual and regulatory frameworks, in the renewables sector.

When scoping out a new market, investors will assess, among other factors, whether a state’s legal institutions are well developed, whether the substance of the law is conducive to foreign investment, whether they will have access to effective dispute settlement processes, and whether the rule of law (in both substance and process) is well entrenched. A stable investment climate is in the interest of states as well. The lack of legal stability—for instance, by way of frequent, unpredictable, and arbitrary regulatory changes by the state—can discourage investments or provoke disputes with investors, which will ultimately affect the development of the renewable energy sector of a country.²¹⁸ Likewise, the potential benefits for the state (and the public) depend on the stability of an investment project; if renewables projects are stalled, targets related to sustainable, low-carbon, and affordable energy may not be met or realized.

A number of key characteristics define the type of stability expected of a state’s legal and regulatory framework: laws and regulations should serve clear policy objectives, such as economic development, social welfare, or environmental protection;²¹⁹ be based on sound legal and empirical evidence; be responsive to changes in the sector and beyond; include effective and efficient means to resolve disputes; have clarity about the substance and process of the rules, as well as how the risks and benefits of the investment are shared among various stakeholders;²²⁰ and hold relevant actors accountable to principles of the rule of law. These elements can also be reflected in investor–state contracts.

Below, we present a detailed discussion of the four key elements of a robust regulatory framework—fairness, flexibility, transparency and predictability, and effective dispute settlement mechanisms and rule of law—that are critical to the stability of the legal framework.

3.4.1.1 Characteristics of Legal Stability of the Investment Climate

Fairness

The fairness of a regulatory framework describes the principle that regulatory frameworks should allow for the mutual benefits of investors and the state. Fairness in the regulatory framework “creates the foundation of mutual trust and long-term partnership that is

218 Miguel Mendonça, Stephen Lacey and Frede Hvelplund, “Stability, Participation and Transparency in Renewable Energy Policy: Lessons from Denmark and the United States,” *Policy and Society* 27, no. 4 (2009): 379–398, <https://academic.oup.com/policyandsociety/article/27/4/379/6420858>.

219 OECD/Korea Development Institute, *Improving Regulatory Governance: Trends, Practices and the Way Forward* (Paris: OECD Publishing, 2017), 20, https://read.oecd-ilibrary.org/governance/improving-regulatory-governance_9789264280366-en#page22.

220 Lisa E. Sachs, Perrine Toledano, Jacky Mandelbaum, with James Otto, “Impacts of Fiscal Reforms on Country Attractiveness: Learning from the Facts,” in *Yearbook on International Investment Law and Policy* 2011-12 (Oxford: Oxford University Press, 2013), 345-386, <https://oxia.ouplaw.com/view/10.1093/law-iic/9780199983025.016.0008/law-iic-9780199983025-document-8?prd=IC>.

necessary to maximize the mutual benefits of long-term [...] investments,”²²¹ and minimizes the need for changes to the regime. In the case of renewable energy, regulations, like feed-in tariff schemes, might be enacted to incentivize the finance and capital necessary to scale up renewables. However, when such schemes are excessively tilted in favor of investors and imply excessive costs for the state—either in the design of the incentives or as cost structures and other contextual factors evolve—states may need to restructure and redesign their policies to ensure continued mutual benefit. In an evolving industry like renewables, imbalances in the regulatory framework may be the result of asymmetrical information, changes in underlying assumptions about costs and markets, or a lack of experience in designing durable, mutually beneficial contracts or laws.²²² So, while the fairness of the laws, regulations, and contractual terms could and should be provided at the outset of an investment, many unknowns ultimately affect the balance of risks and benefits agreed to at that time.

Flexibility

When such unknowns surface, it is in the mutual interest of both parties to adapt to the new circumstances in order to rebalance the distributional effects and promote the sustainability of the investment. Freezing regulatory frameworks or contractual terms over the life of an investment, especially long-term ones—through stabilization clauses, for instance—ignores the mutual needs of the state and investors to adapt to changing circumstances and is often unsuccessful at reducing risk.²²³ This is especially true in a dynamic and uncertain global market. In a study of 1,000 concession contracts awarded in Latin America and the Caribbean from 1989 to 2000, the concessionaries or operators requested renegotiation of the contract for their benefit in the majority of cases (61%), relative to states.²²⁴ States also routinely adjust their laws to adjust to changing circumstances or request renegotiation of contracts. For instance, the petroleum regime in the United Kingdom has gone through the highest number of fiscal reforms in the world to better align with the state’s evolving policy objectives over the past several decades.²²⁵ The volatility of the price of petroleum has also forced many states to adjust their contractual terms to account for the structural changes in the petroleum market.²²⁶ Such circumstances often cannot be controlled, for instance, changes in technology costs, market fluctuations, natural disasters, or global pandemics.

221 Ibid., 375.

222 Fabio Antoniou and Nikos Tsakiris, “On the Informational Superiority of Quantities Over Prices in the Presence of an Externality,” *Environmental & Resource Economics* 65, no. 1 (2016): 227–250, 227, https://ideas.repec.org/a/kap/enreec/v65y2016i1d10.1007_s10640-015-9884-2.html; Frank C. Krysiak and Iris Maria Oberauer, “Environmental Policy à la Carte: Letting Firms Choose Their Regulation,” *Journal of Environmental Economics and Management* 60, no. 3 (2010): 221–232, 221, <https://www.sciencedirect.com/science/article/pii/S0095069610000744>; Jean Jacques Laffont, “More on Prices vs. Quantities,” *The Review of Economic Studies* 44, no. 1 (1997): 177–182, 177, <https://doi.org/10.2307/2296982>; Nicholas Kozeniaskas, Anna Orlik, and Laura Veldkamp, “What are Uncertainty Shocks?,” *Journal of Monetary Economics* 100 (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3358305.

223 Sachs et al., “Impacts of Fiscal Reforms on Country Attractiveness: Learning from the Facts,” 375, *supra* n. 220. See also Lou Wells, *It’s Just a Clause, Isn’t It?* (CONNEX Support Unit, n.d.), <https://www.connex-unit.org/wp-content/uploads/2022/05/Clause-1-EN.pdf>. The author provides some guidance and recommendations on the use of stabilization clauses in government contracts with foreign investors.

224 J. Luis Guasch, *Granting and Renegotiating Infrastructure Concessions: Doing it Right* (Washington, D.C.: The World Bank Group, 2004), 83, <https://ideas.repec.org/b/wbk/wbpubs/15024.html>.

225 Sachs et al., “Impacts of Fiscal Reforms on Country Attractiveness: Learning from the Facts,” 354, *supra* n. 220.

226 George Kahale III, *The Uproar Surrounding Petroleum Contract Renegotiations* (Oxford: Oxford Energy Forum, 2010), https://ora.ox.ac.uk/objects/uuid:c810ce68-8000-4e61-bfea-c552e6550c2/download_file?file_format=application%2Fpdf&safe_filename=OEF_82_3_5.pdf&type_of_work=Journal+article.

The gravity of a discussion on the need for flexibility in regulatory frameworks is best illustrated by what happened in the wake of the 2008 financial crisis in Europe. For many European countries, the continuation of their renewable energy support policies was impossible to maintain. While many contracts—guaranteeing producers a high price—had been signed for energy production from renewable sources, the recession led to an unexpected decrease in demand for energy, largely due to consumers’ unwillingness and inability to pay (as part of a passing-on chain). As a result, sustaining the contractually agreed high tariffs with investors became impossible for many states. This unforeseen situation made the existing policies unaffordable and led to regulatory reforms.²²⁷ The COVID-19 pandemic has led to similar challenges with renewable energy support policies. The scarcity of resources due to the recession and the simultaneous need to support practically all sectors of the economy, in conjunction with the fact that operating renewable energy projects managed to retain their profitability while fossil fuel industries were taking the major hit by the reduction in energy demand, gave rise to voices doubting the need to insist on support policies for renewables, at least in the short term.²²⁸

Prudent investors recognize that changes may occur in the regulatory framework of a particular country that may impact their economic activities.²²⁹ These possible changes are part of the risk they bear, especially when they are investing in a new market. However, investors expect states to pursue such changes in a manner that is proportionate,²³⁰ reasonable,²³¹ non-discriminatory,²³² and in line with due process. It is therefore critical to ensure that contracts and regulatory frameworks are responsive to new information by way of built-in flexibility mechanisms,²³³ including defining in advance the duration of and amount to be spent on the policy,²³⁴ adequate prior knowledge of the modification,²³⁵ the

227 Theodoros Iliopoulos, “Renewable Energy Regulation: Feed-in Tariff Schemes under Recession Conditions,” *Lexxion: The Legal Publisher* 4, no. 2 (2016), 110–117, 110, <https://enlr.lexxion.eu/article/ENLR/2016/2/7>; Sofia-Natalia Boemi and Agis M. Papadopoulos, “Times of Recession: Three Different Renewable Energy Stories from the Mediterranean Region” in Evanthie Michalena and Jeremy Maxwell Hills, *Renewable Energy Governance: Complexities and Challenges* (Springer, 2013), https://books.google.com/books?id=DSq5BAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

228 On this discussion, see Theodoros Iliopoulos, “The Purposefulness and Serviceability of Renewable Energy Support Schemes in View of the COVID-19 Crisis” in *Environmental Taxation in the Pandemic Era: Opportunities and Challenges* (Edward Elgar Publishing, 2021), 214–227, <https://www.elgaronline.com/view/edcoll/9781800888500/9781800888500.00026.xml>. The author argues in favor of support policies for renewables.

229 Diego Zannoni, “The Legitimate Expectation of Regulatory Stability Under the Energy Charter Treaty,” *Leiden Journal of International Law* 33, (2020), 451–466, <https://www.semanticscholar.org/paper/The-legitimate-expectation-of-regulatory-stability-Zannoni/483ecf5bacae314322641be36406243b44391ffa# citing-papers>.

230 In *Charanne v. Spain*, the tribunal stated that it considers the proportionality criterion “satisfied as long as the changes are not capricious or unnecessary and do not suddenly and unpredictably eliminate the essential characteristics of the existing regulatory framework.” See *Charanne v. Spain*, Arb. no. 062/2012, Final Award, January 21, 2016, para. 517, https://jsumundi.com/en/document/decision/en-charanne-b-v-and-construction-investments-s-a-r-l-v-spain-final-award-thursday-21st-january-2016#decision_112.

231 See Federico Ortino, “Ensuring Reasonableness in the Conduct of Host States” in *The Origin and Evolution of Investment Treaty Standards: Stability, Value, and Reasonableness* (Oxford University Press, 2019), 101–103, <https://academic.oup.com/book/36802/chapter-abstract/321956103>.

232 *Renergy v. Spain*, ICSID Case no. ARB/14/18, Dissent on Liability and Quantum, April 22, 2022, para. 32, <https://jsumundi.com/en/document/decision/en-renergy-s-a-r-l-v-kingdom-of-spain-award-friday-6th-may-2022>.

233 Jenik Radon, *Initiative for Policy Dialogue Working Paper Series* (Initiative for Policy Dialogue, 2006), 95, <https://policydialogue.org/files/publications/Ch04.pdf>. Also, in its Guiding Principles for Regulatory Quality and Performance, the OECD suggests that countries must “assess impacts and review regulations systematically to ensure that they meet their intended objectives efficiently and effectively in a changing and complex economic and social environment.” See *OECD Guiding Principles for Regulatory Quality and Performance* (OECD, 2005), <https://www.oecd.org/fr/reformereg/34976533.pdf>.

234 Zannoni, “The Legitimate Expectation of Regulatory Stability Under the Energy Charter Treaty,” 462, *supra* n. 229.

235 Gregory F. Nemet, Michael Jakob, Jan Christoph Steckel, and Ottmar Edenhofer, “Addressing Policy Credibility Problems for Low-Carbon Investment,” *Global Environmental Change* 42, (2017), 47–57, <https://www.sciencedirect.com/science/article/pii/S0959378016305829>.

inclusion of transitional measures where appropriate,²³⁶ and the impact of such changes on investments already in operation. Periodic review mechanisms will not only set reasonable expectations that regulatory frameworks can change over the life of the project but that they will change in a predictable and transparent way.

The EU legislature has introduced such a link between stability and flexibility. More specifically, article 6 of the recast Renewable Energy Directive 2018/2001, which sets down certain requirements for the “stability of the financial support” granted to renewable energy projects, in principle, precludes member states from revising the level of support granted “in a way that negatively affects the rights conferred thereunder and undermines the economic viability of projects that already benefit from support.” But paragraph 2 explicitly allows member states to “adjust the level of support in accordance with objective criteria, provided that such criteria are established in the original design of the support scheme.”²³⁷ This language also raises the importance of predictability, as discussed below.

Transparency and Predictability

According to the OECD, regulatory transparency includes making laws and regulations publicly available, guaranteeing uniform administration and application of the law, informing concerned parties when relevant laws are modified and what the policy objectives of those modifications are, and providing a means for affected actors to communicate with relevant authorities.²³⁸ Another important element is the transparency and accessibility of monitoring data showing the success or failure of relevant policies. Transparency in the administration of the law and observance of due process requirements strengthen the predictability of the governing framework and can thus reduce the risk associated with a state’s investment environment.²³⁹

In renewable energy sectors, there are several stages in the operation of an investment when a state should ensure transparency and predictability as they involve administrative actions by the state. For example, states should ensure the transparency and predictability of the permitting and bidding processes by using objective criteria and providing clear information on application materials and timelines for decisions. States should also ensure the transparency and predictability of when, how, and under what conditions modifications may take place, in line with the foregoing principle of flexibility; the complementary investments by the state that will limit off-taker risks;²⁴⁰ and the guarantee system in place. Similarly, states should be transparent when introducing and implementing modifications to the existing regulatory regime so that investors have complete knowledge of the compliance requirements and can avoid higher costs arising from those changes.

236 Zannoni, “The Legitimate Expectation of Regulatory Stability Under the Energy Charter Treaty,” 463, *supra* n. 229.

237 European Union, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources, OJ L 328, December 21, 2018 Art. 6.1 and Art. 6.2, <http://data.europa.eu/eli/dir/2018/2001/oj>.

238 *Transparency and Predictability for Investment Policies Addressing National Security Concerns: A Survey of Practices* (Paris: OECD, 2008), <https://www.oecd.org/daf/inv/investment-policy/40700254.pdf>.

239 *Guidelines for Recipient Country Investment Policies Relating to National Security* (Paris: OECD, 2009), <https://www.oecd.org/daf/inv/investment-policy/43384486.pdf>.

240 Leigh Hancher, Pierre Larouche, and Saskia Lavrijssen, “Principles of Good Market Governance,” *Competition and Regulation in Network Industries* 4, no. 4 (2003): 339–349, <https://journals.sagepub.com/doi/10.1177/178359170300400402>.

Effective Dispute Settlement Mechanisms and Rule of Law

A final important element of legal stability for investors is strong domestic dispute settlement mechanisms and the rule of law.²⁴¹ Investors are interested in ensuring their property rights are protected, that governments will not make arbitrary or discriminatory decisions that adversely impact their investments, and that host states will uphold their legal rights and enforce their commercial contracts.²⁴² Domestic courts and administrative bodies that are given the power to enforce the rule of law and resolve disputes that arise are expected to constrain illegal and adverse actions by the government, uphold contractual and other rights, and provide investors with legal recourse.²⁴³ The efficiency and effectiveness of judiciaries and institutions may be ascertained by factors such as the independence and impartiality of the judiciary or decision-maker, the ability of the judiciary or decision-maker to accord due process, and the time taken and costs incurred in resolving disputes and addressing grievances. An independent domestic court system can also contribute to the political stability of the state, which can provide a predictable climate that fosters investor confidence.²⁴⁴

3.4.1.2 Specific Commitments and Risk Mitigation Measures

Some states have well-developed legal institutions and processes and a strict rule of law with its associated mechanisms. In countries where legal and administrative institutions are perceived to be less well-developed or that are more politically, economically, or legally risky, investors may seek specific assurances to mitigate those risks.²⁴⁵ However, when such specific assurances are used—for example, stabilization clauses—governments must ensure they are “limited in time and scope [for instance, through an explicit “compliance with international law” exception²⁴⁶], manageable, and drafted to create as few ambiguities as possible.”²⁴⁷ Moreover, when investors perceive that the domestic legal system cannot provide for effective, timely, and impartial resolution of disputes, an investor–state agreement could specify alternative dispute settlement processes, as negotiated and agreed by the parties. Requests for these types of assurances should decrease as legal institutions and processes—and the rule of law—are strengthened in a given country.²⁴⁸

241 The World Justice Project considers the following as the elements of rule of law: Constraints on Government Powers, Absence of Corruption, Open Government, Fundamental Rights, Order and Security, Regulatory Enforcement, Civil Justice, Criminal Justice. See: “WJP Rule of Law Index Factors,” World Justice Project (n.d.), <https://worldjusticeproject.org/rule-of-law-index/factors/2022>.

242 Joseph L. Staats and Glen Biglaiser, “The Effects of Judicial Strength and Rule of Law on Portfolio Investment in the Developing World,” *Social Science Quarterly* 92, no. 3 (2011), 609–630, 613, <https://www.jstor.org/stable/42956540>.

243 William M. Landes and Richard A. Posner, “The Independent Judiciary in an Interest-Group Perspective,” *The Journal of Law & Economics* 18, no. 3 (1975): 875–901, 882, <https://www.jstor.org/stable/725070>; Staats and Biglaiser, “The Effects of Judicial Strength and the Rule of Law on Portfolio Investment in the Developing World,” 613, *supra* n. 242.

244 Staats and Biglaiser, “The Effects of Judicial Strength and the Rule of Law on Portfolio Investment in the Developing World,” 614, *supra* n. 242.

245 Andrea Shemberg, “Investment Agreements and Human Rights: The Effects of Stabilization Clauses” Corporate Social Responsibility Working Paper no. 42 (Cambridge: Harvard University, 2008), 32–33, https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/programs/crj/files/workingpaper_42_shemberg.pdf.

246 Lorenzo Cotula, “Regulatory Takings, Stabilisation Clauses and Sustainable Development,” 80 in *OECD Investment Policy Perspectives 2008* (Paris: OECD, 2008), 69–90, https://www.oecd-ilibrary.org/finance-and-investment/oecd-investment-policy-perspectives-2008/regulatory-takings-stabilisation-clauses-and-sustainable-development_ipp-2008-4-en.

247 Wells, *It’s Just a Clause, isn’t it?*, *supra* n. 216. Also, see Lorenzo Cotula, “Regulatory Takings, Stabilisation Clauses and Sustainable Development,” wherein the author provides an analysis of how to best reconcile stabilization and evolving social and environmental standards.

248 Shemberg, “Investment Agreements and Human Rights,” 32–33, *supra* n. 245. Also, Abdullah Al Faruque, “Validity and Efficacy of Stabilisation Clauses: Legal Protection Versus Functional Value,” *Journal of International Arbitration* 23, no. 4 (2006), 317–336, https://www.researchgate.net/publication/333433993_Validity_and_Efficacy_of_Stabilisation_Clauses_Legal_Protection_versus_Functional_Value.

3.4.1.3 Investment Treaties and ISDS

One of the most controversial tools advocated by some lawyers and international institutions to address legal and political risks is the use of international investment treaties, including their centerpiece, the ISDS mechanism.²⁴⁹ Putting forward investment treaties and ISDS as a solution to mitigate regulatory risks deserves deep critical analysis. Investment treaties provide guarantees of protection and treatment that contracting states promise to investors of counterparty states.²⁵⁰ Most of these treaties grant foreign investors the right to sue host governments and seek damages based on alleged treaty violations before ad hoc, party-appointed international arbitration tribunals. These tribunals issue binding awards, which may necessitate the host state to pay monetary compensation to claimant investors, often in the order of tens of millions of dollars—and occasionally billions.²⁵¹ There have been 1,190 publicly known ISDS cases as of December 31, 2021.²⁵²

Investment Treaties Do Not Appear to Promote Investment Flows

Investment treaties have been advocated on the premise that additional legal protections for foreign investors enforceable outside of the domestic judicial system of the host state will encourage further investment by addressing the inherent political, economic, or legal risks in foreign jurisdictions.²⁵³ The suggestion is that investment treaties will deter capricious, arbitrary, and discriminatory state conduct and protect investors from costs

249 Paul E. Comeaux and N. Stephan Kinsella, “Reducing Political Risk in Developing Countries: Bilateral Investment Treaties, Stabilization Clauses, and MIGA & OPIC Investment Insurance,” *New York Law School Journal of International and Comparative Law* 15, no. 1 (1994), art. 2, https://digitalcommons.nyls.edu/journal_of_international_and_comparative_law/vol15/iss1/2/; Priyanka Kher and Dongwook Chun, *Policy Options to Mitigate Political Risk and Attract FDI* (Washington, D.C.: The World Bank Group, 2020), <https://openknowledge.worldbank.org/handle/10986/34380>. Also, a number of law firms have published articles on managing political risk through bilateral investment treaties. See e.g., Matthew Coleman and Thomas Innes, “Managing Political Risk Through Bilateral Investment Treaties” (Steptoe & Johnson LLP, October 2, 2018), <https://www.steptoelaw.com/en/news-publications/managing-political-risk-through-bilateral-investment-treaties.html>.

250 Columbia Center on Sustainable Investment, “Primer on International Investment Treaties and Investor-State Dispute Settlement,” (January 2022), https://ccsi.columbia.edu/content/primer-international-investment-treaties-and-investor-state-dispute-settlement#_ftn14.

251 Carolina Moehlecke and Rachel L. Wellhausen, “Political Risk and International Investment Law,” *Annual Review of Political Science* 25 (2022), 485–507, 486, <https://www.annualreviews.org/doi/abs/10.1146/annurev-polisci-051120-014429>; Susan Franck, *Arbitration Costs: Myths and Realities in Investment Treaty Arbitration* (Oxford: Oxford University Press, 2019), Abstract and 3, <https://global.oup.com/academic/product/arbitration-costs-9780190054434?cc=us&lang=en&>.

252 “ISDS Navigator Update: 1190 Known Investment Treaty Cases by 31 December 2021,” Investment Policy Hub (UNCTAD, April 26, 2022), <https://investmentpolicy.unctad.org/news/hub/1688/20220426-isds-navigator-update-1190-known-investment-treaty-cases-by-31-december-2021>.

253 Lise Johnson, Lisa Sachs, Brooke Güven and Jesse Coleman, *Costs and Benefits of Investment Treaties: Practical Considerations for States* (New York: CCSI, 2018), <https://ccsi.columbia.edu/sites/default/files/content/pics/Cost-and-Benefits-of-Investment-Treaties-Practical-Considerations-for-States-ENG-mr.pdf>; Joachim Pohl, “Societal benefits and costs of International Investment Agreements: A critical review of aspects and available empirical evidence” (2018) OECD Working Papers on International Investment, 16–17, <https://www.oecd-ilibrary.org/docserver/e5f85c3d-en.pdf?expires=1668261267&id=id&accname=guest&checksum=EA66F1BE0FEB35907ED01B401CC8C53>; Eric Neumayer and Laura Spess, “Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries?,” *World Development* 33, no. 10 (2005): 1567–1585, <https://www.sciencedirect.com/science/article/pii/S0305750X05001233>. The authors conclude that investment treaties appear to be useful “substitutes” for domestic political reform. However, see Jason Yackee, “Do BITs Really Work? Revisiting the Empirical Link Between Investment Treaties and Foreign Direct Investment” in Karl Sauvant and Lisa E. Sachs (eds), *The Effect of Treaties on Foreign Direct Investment: Bilateral Investment Treaties, Double Taxation Treaties and Investment Flows* (New York: Columbia Center on Sustainable Investment Books, 2009), Chapter 14, 379, https://scholarship.law.columbia.edu/sustainable_investment_books/6/. Here, the author criticizes the study by Neumayer and Spess, finding that replication with a larger dataset does not produce the same result of a positive correlation between bilateral investment treaties and foreign direct investment. In fact, Yackee writes that investors have little awareness or appreciation of specific investment treaties as “multinational corporations have historically only haphazardly and imperfectly institutionalized general ‘political risk assessment’ procedures” (381).

incurred in the event of a breach of those commitments,²⁵⁴ thereby reducing a barrier to investment and increasing investment flows.

This assertion, however, is inconsistent with decades of research that has failed to establish that legal protections contained within investment treaties have a discernable impact on promoting foreign investment flows. A 2021 meta-analysis of 74 studies looking at the effects of investment treaties on foreign direct investment found that investment treaties “have an effect on [foreign direct investment] that is so small as to be considered as negligible or zero.”²⁵⁵

The findings of the CCSI–E3G survey and interviews similarly show that investment treaties are not important to the investment decisions of most renewable energy investors. Not a single respondent to the CCSI–E3G survey identified international legal protection by way of investment treaties as among the top five factors that deterred their company from investing in renewable energy in developing countries, and treaty-based investment arbitration was one of the two lowest-ranked options of six risk mitigation strategies, together with green insurance.

While investors may not be aware of—or place much emphasis on—the existence of an investment treaty between their home state and a potential host state when they are making a decision about where to invest, they may take advantage of the strong protections afforded by investment treaties when or if a dispute arises post establishment. Indeed, law firms often advise their clients that have already decided to invest in a specific jurisdiction to structure their investments to benefit from additional treaty-based protections.²⁵⁶ This does not mean, however, that those investors would not have made their investments in the absence of a treaty. Despite the inconclusive link, investment treaty proponents perpetuate the suggestion that investment treaties are necessary or useful to mobilize renewable energy investments.²⁵⁷

254 Zachary Elks, Andrew T. Guzman and Beth A. Simmons, “Competing for Capital: The Diffusion of Bilateral Investment Treaties, 1960–2000,” *International Organization* 60, no.4 (2006): 811–846, 823 & 824, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1518011; Neumayer and Spess, “Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries?,” 1572; Also see: Julia Calvert and Kyla Tienhaara, “Beyond ‘Once BITten, Twice Shy’: Defending the Legitimacy of Investor-State Dispute Settlement in Peru and Australia,” *Review of International Political Economy*, (2022), <https://www.tandfonline.com/doi/pdf/10.1080/09692290.2022.2134172?needAccess=true>. The authors discuss the perception of stability and good governance as created by investment treaties. For e.g., “MINCETUR officials asserted that [the Peru-US Trade Agreement] would ‘reinforce the stability of economic policy and institutions’ and ‘reduce perceptions of country risk amongst international economic agents’” (7).

255 Josef C. Brada, Zdenek Drabek, and Ichiro Iwasaki, “Does Investor Protection Increase Foreign Direct Investment? A Meta-Analysis,” *Journal of Economic Surveys* 35, no. 1 (2021), 34–70, <https://onlinelibrary.wiley.com/doi/full/10.1111/joes.12392>. This is a meta-analysis of 74 studies looking at the effects of International Investment Agreements on foreign direct investment. They found that International Investment Agreements “have an effect on [foreign direct investment] that is so small as to be considered as negligible or zero.” See also Christian Bellak, “Economic Impact of Investment Agreements,” Department of Economics Working Paper Series no. 200, (Vienna: Vienna University of Economics and Business, 2015), 19, <https://research.wu.ac.at/en/publications/economic-impact-of-investment-agreements-3>. This is another meta-analysis, which concludes that “the empirical evidence on the basis of a meta-analysis suggests that the FDI promotion effect of [bilateral investment treaties] . . . seems to be economically negligible”.

256 For example, Jones Day, “Restructuring Recommended after CJEU Decision on Intra-EU Bilateral Investment Treaties,” (2018), <https://www.jonesday.com/en/insights/2018/03/restructuring-recommended-after-cjeu-decision-on-i>; Jones Day, “Climate Change and Investor-State Dispute Settlement,” (2022), <https://www.jonesday.com/en/insights/2022/02/climate-change-and-investorstate-dispute-settlement>.

257 “Agreement in Principle Reached on Modernised Energy Charter Treaty,” (European Commission—Directorate-General for Trade, June 24, 2022), https://policy.trade.ec.europa.eu/news/agreement-principle-reached-modernised-energy-charter-treaty-2022-06-24_en; Karel Beckman, “Interview: A New Energy Charter Treaty as a Complement to the Paris Agreement,” *Borderlex* (June 18, 2020), https://www.energycharter.org/fileadmin/DocumentsMedia/Other_Publications/A_new_Energy_Charter_Treaty_as_a_complement_to_the_Paris_Agreement.pdf; Samantha J. Rowe, Meryll Lawry-White and Alma M. Mozetič, *Debevoise & Plimpton: Renewable Energy Investments – International Protections to Mitigate Risks* (Washington, D.C.: American Investment Council, November 30, 2021), <https://www.investmentcouncil.org/debevoise-plimpton-renewable-energy-investments>.

Investment Treaties Are, in Fact, Harmful and Costly

Treaty-based arbitration cases can be extremely costly for governments. As of June 2021, the average amount sought by investors²⁵⁸ in ISDS claims is USD 1.16 billion.²⁵⁹ States are ordered to pay an average of USD 437.5 million.²⁶⁰ Both the average amount claimed and the average amount awarded are increasing.²⁶¹ The average legal costs for states are approximately USD 4.7 million,²⁶² and the average arbitration tribunal's fees are USD 1 million.²⁶³

Another substantial and often hidden cost of treaty-based arbitration is its potential for “regulatory chill” because of the substantial costs that states may have to pay for even good-faith regulations or enforcement.²⁶⁴ As of September 2022, there have been at least 80 publicly known ISDS cases related to changes in renewable energy policies, the majority of which have been brought under the Energy Charter Treaty (ECT).²⁶⁵ Most notable are the claims brought against Czechia, Italy, and Spain. These countries (as well as others in the EU) used feed-in tariffs as their main policy mechanism in the early to mid-2000s to induce investment in renewable energy. Initially, the feed-in tariff policies were successful in attracting significant investment. However, in the context of the profound financial crisis of 2008 and the consequent reduction of electricity consumption, the incentives policies turned out to be financially unsustainable for many governments as they accumulated massive tariff deficits in the electricity system.²⁶⁶ For instance, at the end of 2012, this deficit was equal to more than EUR 29 billion in Spain, or 3% of the Spanish GDP.²⁶⁷ As a result, governments rolled back or revoked renewable energy incentives policies to stop the tariff deficit from growing further. This situation is now being revisited, given the high energy prices resulting from the current energy crisis (see Section 3.3.2.1).

258 Matthew Hodgson, Yarik Kryvoi, and Daniel Hrcka, *2021 Empirical Study: Costs, Damages and Duration in Investor-State Arbitration* (British Institute of International and Comparative Law and Allen & Overy, June 2021), https://www.biicl.org/documents/136_isds-costs-damages-duration_june_2021.pdf.

259 Removing a set of particularly large claims against Russia for tens of billions of dollars, the average amount sought in each case is USD 817.3 million. See: Columbia Center on Sustainable Investment, “Primer on International Investment Treaties and Investor-State Dispute Settlement,” supra n. 250.

260 Removing the awards against Russia, which are particularly large outliers ordering that government to pay USD 50 billion to investor claimants, the average ISDS award is USD 169.5 million. See: Columbia Center on Sustainable Investment, “Primer on International Investment Treaties and Investor-State Dispute Settlement,” supra n. 250.

261 Hodgson, Kryvoi, and Hrcka, *2021 Empirical Study: Costs, Damages and Duration in Investor-State Arbitration*, supra n. 258.

262 Deborah Ruff, Julia Kalinina Belcher, and Charles Golsong, *Financing a Claim or Defense* (London: Global Arbitration Review, January 14, 2022), <https://globalarbitrationreview.com/guide/the-guide-investment-treaty-protection-and-enforcement/first-edition/article/financing-claim-or-defence>; Hodgson, Kryvoi, and Hrcka, *2021 Empirical Study: Costs, Damages and Duration in Investor-State Arbitration*, supra n. 258.

263 Hodgson, Kryvoi, and Hrcka, *2021 Empirical Study: Costs, Damages and Duration in Investor-State Arbitration*, supra n. 258; Lea Di Salvatore, Nathalie Bernasconi-Osterwalder, and Lukas Schaugg, *Despite Consensus on the ECT's Incompatibility with the Global Climate Agenda, Claims that It Is Well-Suited for the Clean Energy Transition Persist* (Winnipeg: IISD, October 8, 2021), <https://www.iisd.org/itn/en/2021/10/08/malgre-le-consensus-quant-a-lincompatibilite-du-tce-avec-lagenda-climatique-mondial-les-arguments-selon-lesquels-il-est-approprie-pour-la-transition-vers-une-energie-propre-persiste-lea-di-salvatore-n/>.

264 Kyla Tienhaara, “Regulatory Chill in a Warming World: The Threat to Climate Policy Posed by Investor-State Dispute Settlement,” *Transnational Environmental Law* 7, no. 2 (December 22, 2017), 229–250, <https://www.cambridge.org/core/journals/transnational-environmental-law/article/regulatory-chill-in-a-warming-world-the-threat-to-climate-policy-posed-by-investorstate-dispute-settlement/C1103F92D8A9386D33679A649FEF7C84>.

265 *Treaty-Based Investor-State Dispute Settlement Cases and Climate Action* (Geneva: UNCTAD, September 2022), https://unctad.org/system/files/official-document/diaepcbinf2022d7_en.pdf.

266 Theodoros G. Iliopoulos, *Price Support Schemes in the Service of the EU's Low-Carbon Energy Transition in Zachariadis et al., Economic Instruments for a Low-Carbon Future* (Edward Elgar Publishing, July 28, 2020), <https://www.elgaronline.com/view/edcoll/9781839109904/9781839109904.00011.xml>; Carmen Otero García-Castrillón, *Spain and Investment Arbitration: The Renewable Energy Explosion* (Ontario: Centre for International Governance Innovation (CIGI), 2016), <https://www.cigionline.org/static/documents/documents/ISA%20Paper%20No.17.pdf>.

267 Pablo del Río and Pere Mir-Artigues, *A Cautionary Tale: Spain's Solar PV Investment Bubble* (Winnipeg: International Institute for Sustainable Development (IISD), 2014), 9, <https://www.iisd.org/gsi/reports/cautionary-tale-spains-solar-pv-investment-bubble>.

Because of the alleged impact of these regulatory changes on their investment profitability, investors (both domestic and foreign) have implemented diverse legal strategies to defend their economic interests. In most (if not all) of the cases, investors have claimed the regulatory changes violated general principles of legal certainty and the protection of legitimate expectations, both under EU law and under investment treaties, including the ECT. The Court of Justice of the EU (CJEU) and the Spanish Supreme Court have held that investors do not have a legitimate expectation that an existing regulatory framework, which could be lawfully modified by national authorities, would remain unchanged for the life of their investments, especially in the face of a financial and deficit crisis (see Box 15).

BOX 15. RENEWABLE INVESTMENT PROTECTION IN THE EU

In the context of the EU, most investors impacted by renewable energy policy changes have argued that the change violated the general principles of legal certainty and the protection of legitimate expectations, in addition to provisions of the Charter of Fundamental Rights of the EU concerning the freedom to conduct a business and the right to property (articles 16 and 17, respectively), and article 10 of the ECT, which provides an investor “fair and equitable treatment” (FET) in the host state. The CJEU has consistently held that, “where a prudent and circumspect economic operator could have foreseen the adoption of a measure likely to affect his or her interests, he or she cannot plead that principle if the measure is adopted. Moreover, economic operators cannot justifiably claim a legitimate expectation that an existing situation which may be altered by the national authorities in the exercise of their discretionary power will be maintained.”²⁶⁸

In terms of the Charter of Fundamental Rights of the EU, the CJEU has held that the right to property does not cover expected future payments that do not constitute an established legal position, and the regulatory reduction of the future payments does not equate to an expropriation of the investment. Moreover, the granting of support without any guarantee by the authorities that the terms will not change does not restrict the investors’ freedom to conduct a business, as they are free to choose whether or not they enter the contract offered.²⁶⁹

In the domestic claims brought against Spain, the Spanish Supreme Court has held that the facilities’ owners do not have an “unmodifiable right” to unaltered maintenance of the economic regime establishing their remuneration when they have opted not to go to the market.²⁷⁰ In addition, the court held that any diligent operator should have known that the energy sector is subject to intense administrative intervention due to its significance to the general public interest.²⁷¹ Accordingly, the court did not find that the Spanish government infringed upon investors’ legitimate expectations, especially in the face of a financial and deficit crisis experienced in the electricity sector.²⁷²

268 Italian Court (Tenth Chamber), Joined Cases C-180/18, C-186/18 and C-287/18, ECLI:EU:C:2019:605, para. 31, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=ecli:ECLI%3AEU%3AC%3A2019%3A605>; Italian Court (Fifth Chamber), Joined Cases C-798/18 and C-799/18, C 217/2, para. 42, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=ecli:ECLI%3AEU%3AC%3A2021%3A280>. In the latter case, brought by investors against Italy, the CJEU reaffirmed the Italian Constitutional Court’s reasoning that the reform in the incentives policy “constitutes an intervention that, as regards the fair balancing of the opposing interests at stake, addresses a public interest intended to combine the policy of supporting the production of energy from renewable sources with making the related costs payable by end users of electricity more sustainable. It held, furthermore, that the alteration of the incentive scheme at issue in the main proceedings was neither unforeseeable nor unexpected, so that a prudent and circumspect economic operator would have been able to take account of possible legislative developments, considering the temporary and changeable nature of support schemes” (para. 16).

269 Italian Court (Fifth Chamber), Joined Cases C-798/18 and C-799/18.

270 Spanish Supreme Court Judgment 2320/2012, Appeal no. 40/2011, April 12, 2012, <https://www.poderjudicial.es/search/TS/openDocument/00198bc67afb84c0/20120427>.

271 García-Castrillón, *Spain and Investment Arbitration: The Renewable Energy Explosion*, supra n. 266.

272 Spanish Supreme Court Judgment 2320/2012, cited in *NextEra v. Spain*: “The agents or private operators [...] knew or should have known that the public regulatory framework [...] could not ignore subsequent relevant changes to the economic database, to which the reaction from public authorities to attune it to the new circumstances is logical. If the latter involve adjustments in many other productive sectors [...], it is not unreasonable that it is also extended to the renewable energy sector, which wants to continue receiving the regulated tariffs [...]. And all the more so when faced with situations of widespread economic crisis and, in the case of electricity, with the increased tariff deficit which, in some part, arises from the impact on the calculation of the access fees made by

However, many ISDS tribunals have held that general legislation (even in the absence of specific stabilization commitments) can give rise to legitimate expectations that the regulatory framework would remain unchanged.²⁷³ While these tribunals acknowledge that states have the right to regulate (within limit), they have focused narrowly on the existence of an adverse regulatory change to the profitability of investors²⁷⁴ without considering the need for flexibility or the reasonableness of the change in the midst of a financial crisis.²⁷⁵ Indeed, in some of the Spanish cases, the investors had already sold their interests and profited substantially from those transactions yet received further compensation as a result of their arbitration claims.²⁷⁶

One well-known example of how a tribunal has interpreted the FET standard as implicating an absolute stability obligation is in the case of *Occidental v. Ecuador I.*²⁷⁷ That tribunal noted that under the FET standard, “there is an obligation not to alter the legal and business environment in which the investment has been made,”²⁷⁸ and that the stability requirement

the remuneration of such by way of the regulated tariff, in terms of cost attributable to the electricity system.” See: *NextEra Energy Global Holdings B.V. and NextEra Energy Spain Holdings B.V. v. Kingdom of Spain*, ICSID Case no. ARB/14/11, Rejoinder on the Merits, October 20, 2016, para. 126, <https://jsumundi.com/en/document/pdf/other/en-nextera-energy-global-holdings-b-v-and-nextera-energy-spain-holdings-b-v-v-kingdom-of-spain-respondents-rejoinder-on-the-merits-thursday-20th-october-2016>. For further analysis of the Spanish Supreme Court Judgement, see also: Pedro Corvinos Baseca, “Modificación del regimen retributivo de las energias renovables y seguridad jurídica,” *Noticias Juridicas* (May 29, 2012), <https://noticias.juridicas.com/conocimiento/articulos-doctrinales/4766-modificacion-del-regimen-retributivo-de-las-energias-renovables-y-seguridad-juridica/>.

273 *SolEs Badajoz GmbH v. Kingdom of Spain*, ICSID Case no. ARB/15/38, Award, July 31, 2019, para. 313, <https://jsumundi.com/en/document/decision/en-soles-badajoz-gmbh-v-kingdom-of-spain-none-currently-available-monday-24th-august-2019>; *Cube Infrastructure Fund SICAV and others v. Kingdom of Spain*, ICSID Case no. ARB/15/20, Award, July 15, 2019, para. 388, <https://jsumundi.com/en/document/decision/en-cube-infrastructure-fund-sicav-and-others-v-kingdom-of-spain-award-monday-15th-july-2019>; *OperaFund Eco-Invest SICAV PLC and Schwab Holding AG v. Kingdom of Spain*, ICSID Case no. ARB/15/36, Award, September 6, 2019, para. 295, <https://jsumundi.com/en/document/decision/en-operafund-eco-invest-sicav-plc-and-schwab-holding-ag-v-kingdom-of-spain-none-currently-available-tuesday-11th-august-2019>; *9REN Holding S.a.r.l. v. Kingdom of Spain*, ICSID Case no. ARB/15/15, Award, May 31, 2019, <https://jsumundi.com/en/document/decision/en-9ren-holding-s-a-r-l-v-kingdom-of-spain-decision-of-the-ad-hoc-committee-on-the-non-disputing-partys-application-to-file-a-written-submission-friday-19th-november-2021>. A small number of other tribunals have held that such general legislation cannot give rise to legitimate expectations that the regulatory framework would remain unchanged. For example, see *Charanne v. Spain*, *Arb. no. 062/2012*, Final Award, January 21, 2016, para. 499, https://jsumundi.com/en/document/decision/en-charanne-b-v-and-construction-investments-s-a-r-l-v-spain-final-award-thursday-21st-january-2016#decision_112; *Isolux Infrastructure Netherlands B.V. v. Kingdom of Spain*, SCC Case no. V2013/153, Award, July 12, 2016, para. 775, <https://jsumundi.com/en/document/decision/es-isolux-infrastructure-netherlands-b-v-c-reino-de-espana-laudo-sunday-17th-july-2016>; *WA Investments-Europa Nova Limited v. The Czech Republic*, PCA Case no. 2014-19, Award, May 15, 2019, para. 569, <https://jsumundi.com/en/document/decision/en-wa-investments-europa-nova-limited-v-the-czech-republic-none-currently-available-tuesday-1st-january-2013>.

274 Federico Ortino, “Guarantees of Legal Stability in the Strict Sense,” *The Origin and Evolution of Investment Treaty Standards: Stability, Value, and Reasonableness* (2019), <https://academic.oup.com/book/36802/chapter-abstract/321954622>.

275 To date, Spain has been subject to at least 51 known investment arbitration cases. Of those cases, 27 have been resolved, 21 of those in favor of the investor(s). Spain owes more than EUR 1.2 billion in compensation to these investors and EUR 101 million in associated legal and arbitration fees. See: Lucía Bárcena and Fabian Flues, *From Solar Dream to Legal Nightmare: How Financial Investors, Law Firms and Arbitrators are Profiting from the Investment Arbitration Boom in Spain* (Transnational Institute and Powershift, May 31, 2022), 4, <https://www.tni.org/en/publication/from-solar-dream-to-legal-nightmare>.

276 In her dissenting opinion in the *Watkins v. Spain* case, Dr. Helene Ruiz Fabri states: “Last but not least, contrary to what the Majority considered (at para 593(ii) of the Award), the investment of the Claimants was not ‘destroyed’. The investment was bought at €91 million in 2011, valued €98 million at the moment of the alleged intervention of the wrongful act in 2014 and sold at €133 million in 2016 (which meant a return of 11.2%). What is the Majority considering as ‘destroyed’ and what is the Tribunal repairing exactly, when awarding damages in the sum of €77 million, without taking into account the date of the investment and the impact of the context on reparation?” See *Watkins Holdings S.à r.l. and others v. Kingdom of Spain*, ICSID Case no. ARB/15/44, Award, January 21, 2020, para. 16, <https://jsumundi.com/en/document/decision/en-watkins-holdings-s-a-r-l-and-others-v-kingdom-of-spain-none-currently-available-wednesday-4th-november-2015>.

277 Federico Ortino, “The Obligation of Regulatory Stability in the Fair and Equitable Treatment Standard: How Far Have We Come?,” *Journal of International Economic Law* 21, no. 4 (2018): 845–865, 846–847 & 851, <https://ideas.repec.org/a/oup/jieclw/v21y2018i4p845-865.html>.

278 *Occidental Exploration and Production Company v. Republic of Ecuador (I)*, LCIA Case no. UN3467, Award, July 1, 2004, para. 191, <https://jsumundi.com/en/document/decision/en-occidental-exploration-and-production-company-v-republic-of-ecuador-i-award-thursday-1st-july-2004>.

is “an objective requirement that does not depend on whether the Respondent has proceeded in good faith or not.”²⁷⁹ Some tribunals after *Occidental*, however, have “requir[ed] a weighing of the Claimant’s legitimate and reasonable expectations on the one hand and the Respondent’s legitimate regulatory interests on the other.”²⁸⁰ Others, including several of the Spanish cases, have maintained the strict standard of absolute stability over the objections of dissenters. As one dissenting arbitrator opined in the *Renergy v. Spain* case, “[t]he expectation of a relatively (or absolutely) immutable rate of return identified by the Majority is not supported by the evidence or the case-law. It is an approach that is neither legitimate nor reasonable.”²⁸¹ Reading a commitment of absolute stabilization into the FET standard, therefore, appears to go beyond general principles of legal certainty, including those of the EU’s Renewable Energy Directive 2018/2001, discussed above.

The proliferation of claims and threatened claims challenging changes to incentive schemes substantially increase the cost to states of implementing policy tools that necessarily require flexibility in light of complex and evolving technologies, financial factors, and assumptions about costs and markets, among other changing circumstances.²⁸² Accordingly, the “regulatory chill” that is emerging in light of increasingly costly investor–state disputes may indeed undermine the very tools that may be effective at promoting investments in renewable energy.

In summary, the most important elements of a stable legal regime for investors and states alike include fairness, transparency and predictability in substance and process, flexibility, and effective dispute settlement and the rule of law. Investors may require specific assurances in some jurisdictions where they perceive the legal systems to be less developed. Investment treaties are not an effective tool for attracting investment, but they can be extraordinarily costly for states and for the broader policy objective of encouraging renewable energy investments. The legal stability sought by investors is quite different from the blunt overreaching form of stabilization that arbitral tribunals have read into treaties. States should instead focus on the elements of their domestic legal framework that promote a mutually beneficial, long-term, flexible, and durable investment climate.

3.4.2 Building a Pipeline of Bankable Projects

Attracting finance and investment in renewable energy projects requires expertise in building a pipeline of bankable projects. This expertise is still lacking and underfunded in developing

279 *Id.*, para. 186.

280 *Saluka Investments BV v. The Czech Republic*, PCA Case no. 2001-04, Partial Award, March 17, 2006, para. 306, <https://jsumundi.com/fr/document/decision/en-saluka-investments-bv-v-the-czech-republic-partial-award-friday-17th-march-2006>.

281 *Renergy v. Spain*, para 48. Also see *EDF (Services) Limited v. Republic of Romania*, ICSID Case no. ARB/05/13, Award, October 8, 2009, para 217, <https://jsumundi.com/en/document/other/en-edf-services-limited-v-republic-of-romania-procedural-order-no-3-friday-29th-august-2008>. “The idea that legitimate expectations, and therefore FET, imply the stability of the legal and business framework, may not be correct if stated in an overly-broad and unqualified formulation. The FET might then mean the virtual freezing of the regulation of economic activities, in contrast with the State’s normal regulatory power and the evolutionary character of economic life.”

282 See: James Zhan and Joachim Karl, “Investment Incentives for Sustainable Development” in Ana Teresa Tavares-Lehman, Lisa Sachs, Lise Johnson, and Perrine Toledano (eds), *Rethinking Investment Incentives* (Columbia University Press: New York, 2016) 204, <http://cup.columbia.edu/book/rethinking-investment-incentives/9780231172981>; Lise Johnson and Perrine Toledano, *Investment Incentives: A Survey of Policies and Approaches for Sustainable Investment* (New York: CCSI, 2022), 55 & 119, <https://ccsi.columbia.edu/sites/default/files/content/docs/publications/Investment-Incentives-policies-approaches-sustainable-investment-CCSI-Oct-2022.pdf>.

countries in particular. While central dedicated project development funds for conducting feasibility studies and providing transaction advisory support exist in many countries, most often, these remain under-capacitated in developing countries. Generally, infrastructure project preparation costs make up between 5% and 10% of the total project investment and are mostly covered by government budgets.²⁸³ “This situation may lead to either abuse of government spending on inefficient project preparation if there is no rigorous budgetary oversight (...) or renouncing project preparation funding due to a lack of government budget.”²⁸⁴ In addition to securing help from MDBs and DFIs, one avenue is for the project proponent to reimburse these preparation costs at financial close.²⁸⁵

3.4.3 Renewable Energy Siting and Permitting

Since renewable energy resources are diffuse, variable, and intermittent, siting is a crucial parameter for their optimal exploitation. Siting is important for increasing the certainty of production and supply for projects that exploit wind or solar energy, which both depend on weather conditions. Developers face the challenge of finding the most favorable and productive sites. These sites might be already occupied by other economic uses or older technologies, or it might be impossible to fully use their potential because of grid connection problems (as mentioned above). Accordingly, the development of prediction models is very helpful to assist developers in properly siting their projects.²⁸⁶ According to the CCSI-E3G survey, access to land was critical to the majority of investors.

An example of such siting challenges comes from Greece and the island of Crete. Until 2021, with the interconnection between Crete and Peloponnese in mainland Greece, the island’s electricity system was isolated, which meant that Greece could not make full use of its wind potential. Even if there had been greater investments in more or larger windmills, a large part of the additional generation would have been wasted because the excess energy generated would not have found an outlet. Now an additional interconnection project called Ariadne has started, which is expected to link Crete with Attica, the capital region of Greece, by 2023.²⁸⁷

It might also be hard or costly to access the best sites. For example, placing windmills on mountainous tops or offshore is difficult not only because of grid connection challenges but also because of access and construction difficulties. This challenge can be compounded by environmental or human rights concerns. Hydropower projects may cause population

283 Stephanie Barker and Matthew Jordan-Tank, “Project Preparation – Financing Project Preparation: How Can Governments Effectively Utilise Project Preparation Financing Sources?,” *Global Infrastructure Hub Blog* (March 19, 2019), <https://www.gihub.org/blog/financing-project-preparation-governments-effectively-utilise-financing>.

284 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

285 World Economic Forum (WEF), *A Call for Infrastructure Development Through Unsolicited Proposals: Tapping Into Private-Sector Innovation to Improve Infrastructure Delivery* (Cologne: World Economic Forum, 2020), http://www3.weforum.org/docs/WEF_UPs_Note_2020.pdf.

286 See: Seyed Morteza Alizadeh, Sakineh Sagedhipour, Cagil Ozansoy, and Akhtar Kalam, “Developing a Mathematical Model for Wind Power Plant Siting and Sizing in Distribution Networks,” *Energies* 13, no. 3485 (July 2020), <https://www.gihub.org/articles/financing-project-preparation-governments-effectively-utilise-financing>; Athanasios P. Vavatsikos, Aikaterini Arvanitidou, and Dimitrios Petsas, “Wind Farm Investments Portfolio Formation Using GIS-Based Suitability Analysis and Simulation Procedures,” *Journal of Environmental Management* 252 (2019), <https://www.sciencedirect.com/science/article/pii/S030147971931388X>.

287 See “Interconnection of Crete with Attica,” Independent Power Transmission Operator (IPTO), <https://www.admie.gr/en/erga/erga-diasyndeseis/diasyndesi-tis-kritis-me-tin-attiki>; “Interconnection of Crete with Peloponnese,” Independent Power Transmission Operator (IPTO), <https://www.admie.gr/en/erga/erga-diasyndeseis/diasyndesi-tis-kritis-me-tin-peloponniso>.

displacement, biodiversity loss, and deforestation.²⁸⁸ More recently, wind and solar projects have suffered setbacks from not considering land and human rights.²⁸⁹

In this context, permitting is often a lengthy process, and investors often need to spend lots of effort, time, and resources to obtain the necessary permits. Many different authorities may need to be involved in the screening and permitting process, which entails significant delays and the risk of economic losses for investors, endangering the realization of a project. For instance, among “53 utility-scale wind, solar, and geothermal energy projects that were delayed or blocked between 2008 and 2021” in the United States, “34% faced significant delays and difficulties securing permits, 49% were cancelled permanently, and 26% resumed after being stopped for several months or years.”²⁹⁰ Similarly, the IEA found that “permitting and construction of a single overhead electricity transmission line can take up to 13 years, with some of the longest lead times in advanced economies.”²⁹¹ Another study found that securing permits for a wind project can take five times longer than the EU’s binding limit, which is a maximum of two years.²⁹²

To reduce transaction costs for potential investors in renewables, states should:²⁹³

- Ensure that the permits required are suitable to address economic, social, and environmental concerns, according to a framework integrating land use in energy planning (see Figure 5).
- Reform bureaucracies and introduce a “one-stop shop” model, with a single administrative body centralizing all permitting processes. For example, the European Commission has recommended that member states adopt such a model and identify “renewables go-to areas,” locations that are particularly suitable for renewable energy projects.²⁹⁴
- Organize bidding procedures for investors to submit their proposals to carry out specific projects (see Section 3.3.2.C).

288 IUCN Water, *The Future of Dams: Viable Options or Stranded Assets?* (Gland: International Union for Conservation of Nature (IUCN), August 29, 2019), <https://digital.iucn.org/water/the-future-of-dams>; Jeff Opperman, “Crocodiles Are Not Geckos: The Realities Of Run-Of-River Hydropower,” *Forbes* (June 6, 2019), <https://www.forbes.com/sites/jeffopperman/2019/06/06/crocodiles-are-not-geckos-the-realities-of-run-of-river-hydropower>; Michelle Hay, Jamie Skinner, and Andrew Norton, “Dam-Induced Displacement and Resettlement: A Literature Review,” FutureDAMS working paper 004 (Manchester: University of Manchester, September 2019), <https://hummedia.manchester.ac.uk/institutes/gdi/publications/workingpapers/futuredams/futuredams-working-paper-004-hay-skinner-notron.pdf>.

289 Soledad Mills, Sebastian Perez, and Josh Garrett, *Defining and Addressing Community Opposition to Wind Development in Oaxaca* (Equitable Origins, January 2016), https://d2oc0ihd6a5bt.cloudfront.net/wp-content/uploads/sites/1738/2016/05/Equitable_Origin_Case_Study_Wind_Development_in_Oaxaca_JAN_2016_1.pdf; Peter Fairley, “The Pros and Cons of the World’s Biggest Solar Park,” *IEEE Spectrum* (January 22, 2020), <https://spectrum.ieee.org/energy/renewables/the-pros-and-cons-of-the-worlds-biggest-solar-park>.

290 Lawrence Susskind, Jungwoo Chun, Alexander Gant, Chelsea Hodgkins, Jessica Cohen, and Sarah Lohmar, “Sources of Opposition to Renewable Energy Projects in the United States,” *Energy Policy* 165 (2022), <https://lawrencesusskind.mit.edu/sources-opposition-renewable-energy-projects-united-states>.

291 IEA, *World Energy Outlook 2022*, supra n. 14.

292 Harriet Fox, *Ready, Set, Go: Europe’s Race for Wind and Solar* (London: Ember, July 27, 2022): <https://ember-climate.org/insights/research/europes-race-for-wind-and-solar/>.

293 See also Pablo del Río, Marie-Christin Haufe, Fabian Wigan, and Simone Steinhilber, *Overview of Design Elements for RES-E Auctions* (Aures, 2015), http://aures2project.eu/wp-content/uploads/2021/07/design_elements_october2015.pdf; David Toke, “Renewable Energy Auctions and Tenders: How Good Are They?,” *International Journal of Sustainable Energy Planning and Management* 8 (2015): 43–56, <https://journals.aau.dk/index.php/sep/article/view/1197>.

294 European Commission, *Commission Recommendation of 18.5.2022 on Speeding Up Permit-Granting Procedures for Renewable Energy Projects and Facilitating Power Purchase Agreements*, C(2022) 3219 final (May 18, 2022), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282022%293219.

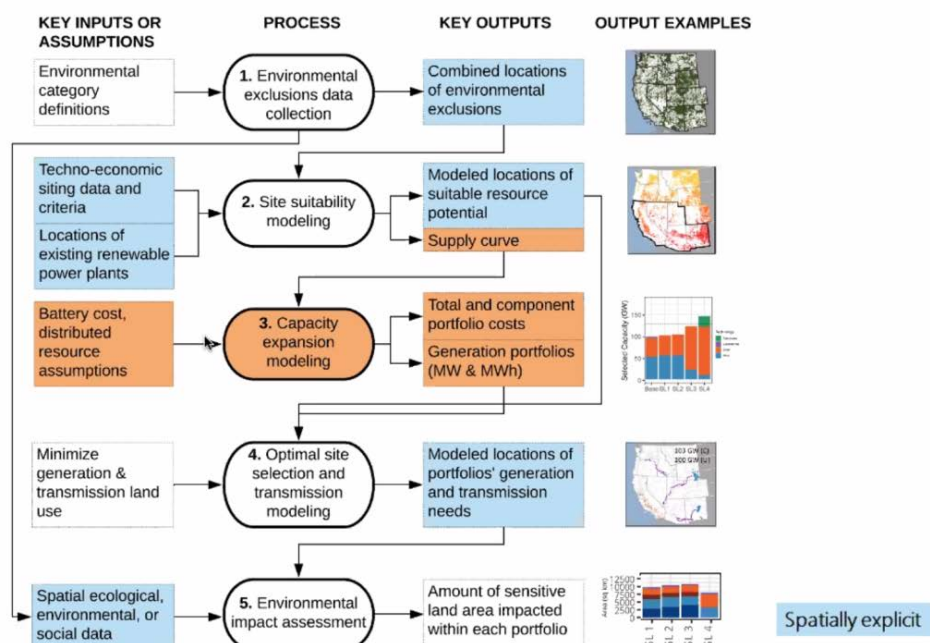


Figure 5. An example of a framework integrating land use in energy planning.

Source: Wu et al. (2020).²⁹⁵

3.4.4 Roadmaps, Master Plans, and Macroeconomics

Developing countries should fine-tune and organize the deployment of the various policy tools mentioned throughout this paper under a national roadmap to achieving SDGs 7 and 13 and energy sector decarbonization by 2050 in line with the Paris Agreement. The roadmap—which should be an integral part of a country’s nationally determined contribution under the Paris Agreement—will be ambitious enough if it follows “a backcasting approach, which means starting from the end goal, which is carbon neutrality and decarbonized infrastructure [that allows universal access to sustainable, low-carbon electricity], and working backwards to understand what needs to be done in the short- and mid-term.”²⁹⁶

Designing the roadmap will involve setting mandatory renewable energy targets for power generation, one of the critical factors in shifting the electricity mix of a country,²⁹⁷ as well as targets to fully adapt and reform the energy sector and institutions to the penetration of renewable energy investors, based on the identification of country-specific risks that deter investment and hamper the deployment of renewable energies (see Table 2).

295 Grace C. Wu, Emily Leslie, Oluwafemi Sawyerr, D. Richard Cameron, Erica Brand, Brian Cohen, Douglas Allen, Marcela Ochoa, and Arne Olson, “Low-Impact Land Use Pathways to Deep Decarbonization of Electricity,” *Environmental Research Letters* 15, 074044 (2020), <https://iopscience.iop.org/article/10.1088/1748-9326/ab87d1/meta>.

296 Columbia Center on Sustainable Investment (CCSI), Quadracci Sustainable Engineering Lab at Columbia University, and Centro de Recursos Naturales, Energía y Desarrollo (CRECE), *Decarbonization Pathways for Paraguay’s Energy Sector* (New York: CCSI, October 2021), <http://ccsi.columbia.edu/content/paraguay-energy>.

297 *Renewable Energy – Asia (Emerging Markets) Policy Support for Renewables is Key to Hitting Net-Zero Emissions Targets*, (New York: Moody’s Investor Service, August 31, 2022).

Table 2. Mapping of risks deterring investments and raising the cost of capital in renewable energies.

Type of Risk	Description
Regulatory Risk	<ul style="list-style-type: none"> • Inconsistent energy policy such as tariff regime, fiscal policies • Unattractive pricing policy for renewables • Country’s long-term investment plan not in line with energy and environment policies
Political Risk	<ul style="list-style-type: none"> • Market access • Uncertainty in political environment
Off-taker Risk	<ul style="list-style-type: none"> • Credit rating of off-taker • Sponsor risks • The financial distress of power distribution firms
Land Acquisition Risk	<ul style="list-style-type: none"> • Permitting processes • Possibility of cost overrun • Land rights
Currency Risk	<ul style="list-style-type: none"> • Currency violation (for hard currency denominated investors) • Forex risk
Transmission Risk	<ul style="list-style-type: none"> • Reliable, modern transmission system • Lack of financing for transmission and distribution networks
Inflation	<ul style="list-style-type: none"> • Higher interest rate • Consumer Price Index (CPI) estimations
Lack of Project Pipeline	<ul style="list-style-type: none"> • Market depth and experience in financing projects • Delays in the signing of power sales agreement • Local financial institution perception of renewable energy as risky

Source: Adapted from IEA.²⁹⁸

The roadmap should anticipate the building of skills both at the institutional level and in the workforce. At the institutional level, the government needs to build capacity to prepare a pipeline of bankable projects (see Section 3.4.2), administer transparent and efficient bidding procedures (see Section 3.3.2), develop a strong and efficient siting framework (see Section 3.4.3), and conceive a complete and cost-effective master plan (see below). At the workforce level, the government needs the capacity to respond to the needs of the new labor market created by the energy transition.

The roadmap should be supported by strong electricity master plans that cover electricity development in generation, storage transmission, and distribution. It should also indicate how the country will support the increased electrification of end uses and higher energy efficiency gains among electricity consumers. The master plan should identify the constraints for further electrification through renewable energy and ways to lift them.

298 International Energy Agency (IEA), *Cost of Capital Observatory* (Paris: IEA, October 3, 2022), <https://www.iea.org/data-and-statistics/data-tools/cost-of-capital-observatory>.

Most often in developing countries, the roadmap will outline how to develop and finance the common infrastructure (for example, grid and logistic chains) that will then enable project infrastructure. Leveraging the anchor demand in existing energy-intensive industries (for example, mining and petroleum) through mutually beneficial commercial arrangements is often critical to laying the first stones of the supporting infrastructure framework and attracting the first renewable energy investments to a country.²⁹⁹ Similarly, in off-grid settings, the master plan will have to anticipate the anchor demand in productive uses of renewables to make the projects viable and sizable, which in turn will ensure their affordability for households and reduce the need for public subsidies.³⁰⁰

While designed to cover long-term needs, the master plan should be flexible enough to adapt to changing generation technologies and associated costs. It should also be based on an LCOE analysis, justifying the choice of generation technology. Finally, the master plan should present where renewables should be sited to minimize their land footprint while maximizing their potential.

Importantly, the roadmap and the master plan jointly outline the national energy sector strategy. They should consider the impacts of the broader macroeconomic environment on energy sector development and devise solutions to shield local actors in the renewable power sector, SMEs in particular, from growing risks and liabilities.³⁰¹

These roadmaps can also support international just transition partnerships, such as those spearheaded by Indonesia³⁰² and South Africa,³⁰³ bringing much-needed international support and finance to ensure the twin goal of energy security and social resilience to changes.

3.4.5 Global Governance Around the Security of Mineral Supply

Demand for minerals necessary for zero-carbon energy technologies is expected to double by 2030 compared to today's levels.³⁰⁴ Copper, which is used across a range of energy applications, will see the largest rise in volumes, whereas minerals such as lithium, silicon, and rare earth elements will experience an even faster rate of demand growth. The increased materiality of zero-carbon technologies brings vulnerability linked to high and volatile mineral prices as well as geographically concentrated supply chains. Developing a global governance system and pursuing circular economy strategies (material reduction, reuse, and recycling) will be critical to addressing these vulnerabilities.³⁰⁵

299 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 66; Sudeshna Ghosh Banerjee, Zayra Romo, Gary McMahon, Perrine Toledano, Peter Robinson, and Inés Pérez Arroyo, *The Power of the Mine: A Transformative Opportunity for Sub-Saharan Africa* (Washington, DC: World Bank, 2015), <http://hdl.handle.net/10986/21402>.

300 Sachs et al., *Roadmap to Zero-Carbon Electrification of Africa*, supra n. 67.

301 Selahattin Murat Sirin, Dilek Uz, and Irem Sevindik, "How do Macroeconomic Dynamics Affect Small and Medium-sized enterprises (SMEs) in the Power Sector in Developing Economies: Evidence from Turkey," *Energy Policy* 168 (September 2022), <https://www.sciencedirect.com/science/article/pii/S0301421522003524>.

302 USAID, "Indonesia and United States Deepen Clean Energy Partnership," (August 4, 2022), <https://www.usaid.gov/indonesia/press-releases/aug-04-2022-indonesia-and-united-states-deepen-clean-energy-partnership>.

303 Prime Minister's Office, 10 Downing Street and The Rt Hon Boris Johnson MP, "Joint Statement: International Just Energy Transition Partnership," (November 2, 2021), <https://www.gov.uk/government/news/joint-statement-international-just-energy-transition-partnership>.

304 IEA, *Net Zero by 2050*; Kirsten Hund, Daniele La Porta, Thao P. Fabregas, Tim Laing, and John Drexhage, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* (Washington, DC: World Bank, 2020), <http://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-ClimateAction-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf>. See also: Perrine Toledano, Martin Dietrich Brauch, Solina Kennedy, and Howard Mann, *Don't Throw Caution to the Wind: In the Green Energy Transition, Not All Critical Minerals Will Be Goldmines* (New York: CCSI, 2020), <https://ccsi.columbia.edu/content/dont-throw-caution-wind-green-energy-transition-not-all-critical-minerals-will-be-goldmines>.

305 IEA, *World Energy Outlook 2022*, supra n. 14.

4 Conclusion

The necessary global transition to a net-zero energy system will entail significant and front-loaded shifts in demand, capital allocation, costs, and jobs. The phase-out and rerouting of investments in fossil fuels must be accompanied by increased investment in renewable energy. Because so much of the infrastructure and capital stock of contemporary economic systems depend on fossil fuel use, the transition will require extensive restructuring and new investment. Even though private markets will be essential to this process, significant changes in governmental policies are required to support the transition. In addition, much of this investment will be cross-border in nature, as capital and technology must flow to developing economies to bridge the wide differences between regions in the rate and amount of renewable energy investment.

The main roadblocks identified to large-scale investment in renewable energy are:

- Insufficient public and private finance, especially but not only in developing countries, where sovereign credit scores and ratings, as well as the lack of concessional finance, catalytic finance, and guarantees, make the cost of capital much higher than in developed countries;
- A lack of investment in grid and storage infrastructure;
- A lack of solutions addressing the off-taker risk;
- Insufficient domestic regulatory frameworks for renewable electricity and ill-designed incentives;
- Under-developed institutional capability to develop bankable projects, competitive bidding procedures, and efficient permit and siting processes;
- Under-developed public roadmaps and master plans anticipating how to develop and finance renewable energy and grid deployment in partnership with the private sector to ensure zero-carbon electrification over the short to medium term; and
- Regulatory frameworks—in law, contract, and investment treaties—that limit governments’ policy space to implement and adapt policies to promote and leverage investment in the sector.

According to the IEA, the 2022 energy crisis has shown that “energy transitions are the solution, rather than the problem” and that “the lasting gains from the crisis accrue to low-emissions sources, mainly renewables.”³⁰⁶ This report has shed light on roadblocks to scaling up investments in renewables while distilling solutions from international experience and brought clarity to where international and national efforts should urgently be focused to address the deterrents of investment in renewables and enable zero-carbon energy security and prosperity.

³⁰⁶ Ibid.

Appendix. Columbia Center on Sustainable Investment–E3G Survey on the Economic, Financial, and Regulatory Factors Driving or Limiting Investments in Renewables

To contribute to the understanding of the key constraints and determinants of investments in renewable energy, the Columbia Center on Sustainable Investment (CCSI)—in partnership with E3G, an independent climate change think tank— designed and carried out a survey targeting industry experts in the renewable energy space in June and July 2022. The survey was designed to determine the fundamental determinants and constraints of renewable energy investments, green finance, and the corresponding ways in which economic, financial, and regulatory frameworks can be strengthened to accelerate renewable energy investments.

Methodology

The survey was disseminated to three types of renewable energy stakeholders:

- (a) Renewable energy companies or utilities and investors of these companies;
- (b) Sponsors of renewables projects, i.e., individuals and entities that provide the necessary funds or financing for a particular venture in renewable energy; and
- (c) Consultants and advisors to governmental authorities, renewable companies or utilities, investors, sponsors, etc.

The respondents were all senior officers or executives at their respective companies and were familiar with or responsible for their company’s investment decisions in the renewable energy space.

The type of questions included in the survey fell into the following categories:

3. What are the top barriers that deter renewable energy investors from investing in a new foreign market?
4. Which specific elements are most critical to renewable energy respondents considering investing in foreign markets?
5. How are international investment treaties evaluated as part of the legal or regulatory factors that renewable energy respondents consider when choosing a foreign market for their investment?
6. How important is treaty-based investor–state arbitration , compared to other mitigation tools, in the decision-making process of renewable energy respondents entering into a new foreign market?

The majority of the questions posed were multiple choice but allowed for the expansion of answers in relevant sections. The bulk of the questions asked respondents to rate a number of factors (i.e., drivers and constraints) in terms of their importance to the respondents’ decision-making process when considering renewable energy investments in foreign

markets. We divided these factors into four broad categories—economic factors, financial factors, political factors, and legal or regulatory factors. Each category consists of several targeted factors that may or may not play a role in the decision-making process. Respondents were asked to score each factor on a scale of 1 to 5 on the basis of its importance, with 1 being “not at all important” and 5 being “critical” to their investment decisions. In addition, we interviewed 10 of the respondents, including executives from multinational and national utilities, portfolio companies, investment funds, and financial institutions, over video conference to follow up on certain issues and obtain clarification on others.

Findings

Here, we present the empirical findings obtained from the survey. This data includes only foreign investors investing in emerging markets, of which there were 26. Because the sample is not a statistical selection (random or representative), the results of the survey offer descriptive and qualitative insights.³⁰⁷

Top Deterrents to Investing in Foreign Renewable Energy Markets

When asked to choose the **top five factors that deter their company from investing** in emerging markets, the majority of respondents (all foreign investors) chose the following factors:

- Political instability (15 respondents)
- Regulatory or legal instability in energy sectors (13 respondents)
- Rate of return on investment or profitability (7 respondents)
- Robust domestic legal investment protections (7 respondents)
- Macroeconomic profile of the country (e.g., level of development, GDP, debt-to-budget ratio, inflation differentials, local currency-related depreciation) (6 respondents)
- Instability of fiscal and/or energy market (6 respondents)
- Corruption (public or private) (6 respondents)

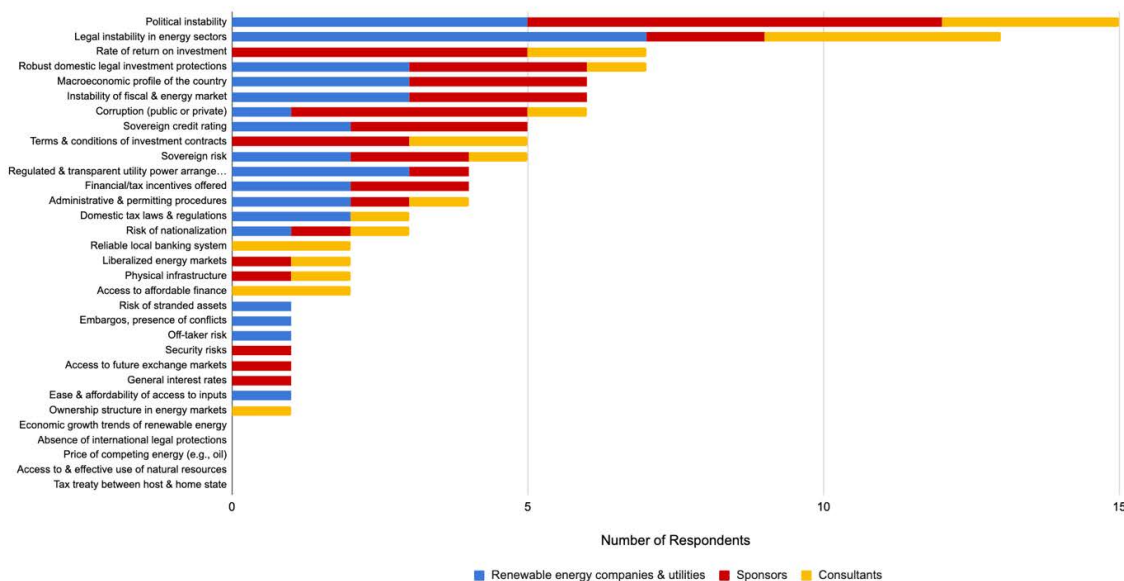


Figure A1. Top deterrents to investing in renewable energy abroad.

³⁰⁷ Because the sample may not be representative of the population of renewable energy investors, the outcomes could be perceived as skewed. Because survey respondents were by invitation, the sample is best understood as a cluster (rather than a random) sample, which will indicate tendencies in the views of the particular senior officers sampled.

Drivers of Foreign Renewable Energy Investments in Emerging Markets

The following four figures illustrate the various factors included in each of the four categories: economic, financial, political, and legal/regulatory (on the y-axis) and the percentage of respondents who scored that factor as 1, 2, 3, 4, 5 or “I don’t know” (on the x-axis).

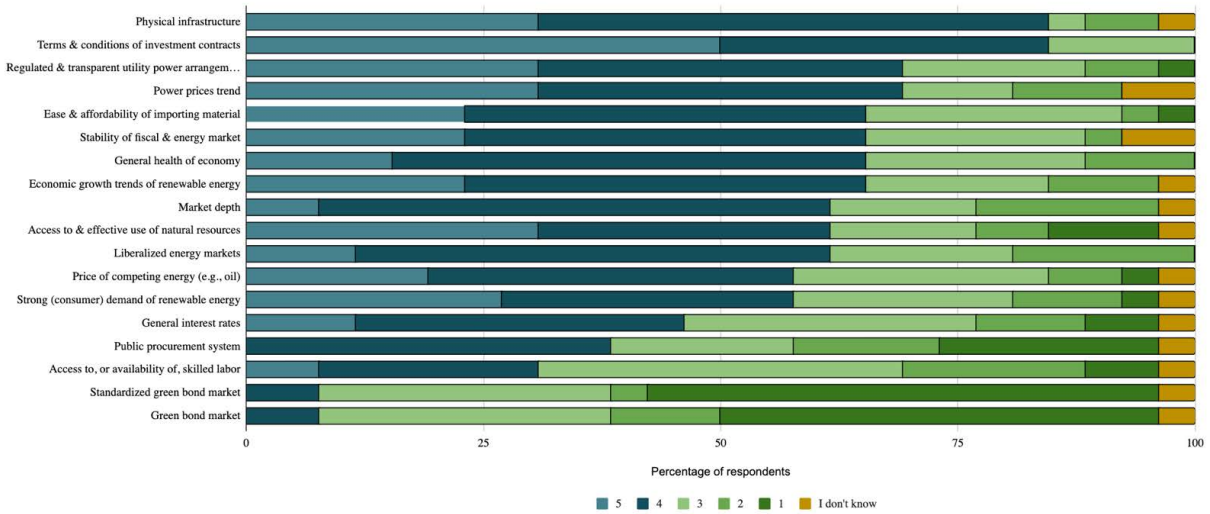


Figure A2. The importance of economic factors in the decision-making process of foreign investors.

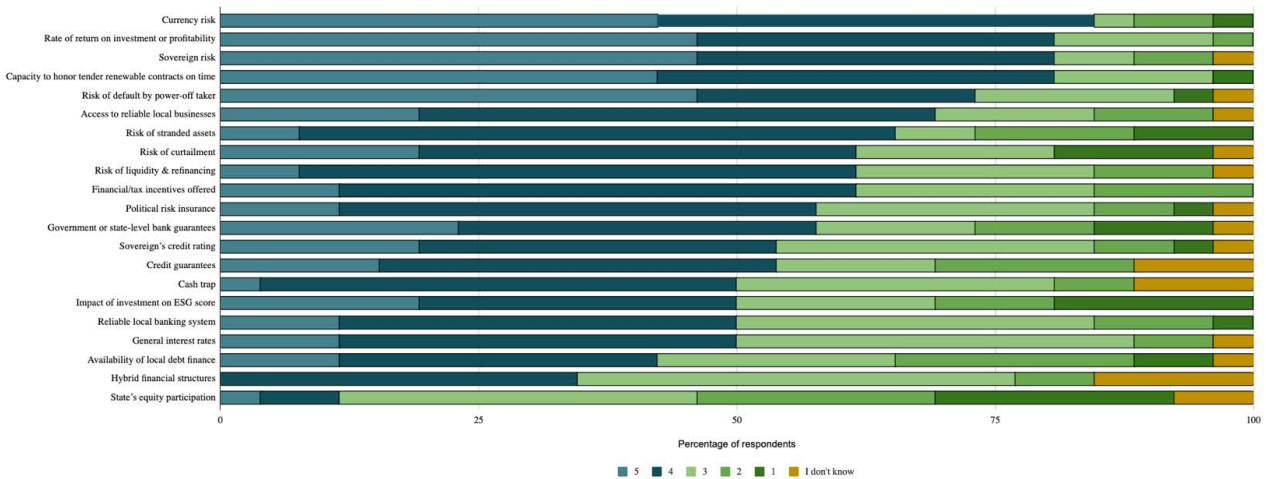


Figure A3. The importance of financial factors in the decision-making process of foreign investors.

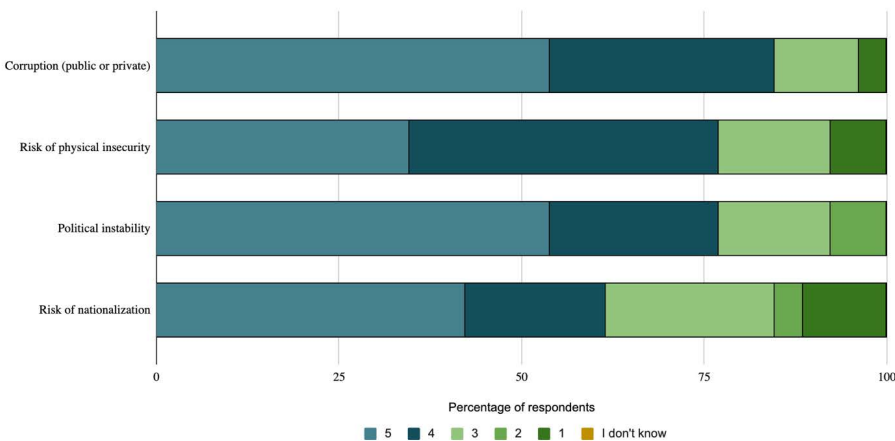


Figure A4. The importance of political factors in the decision-making process of foreign investors.

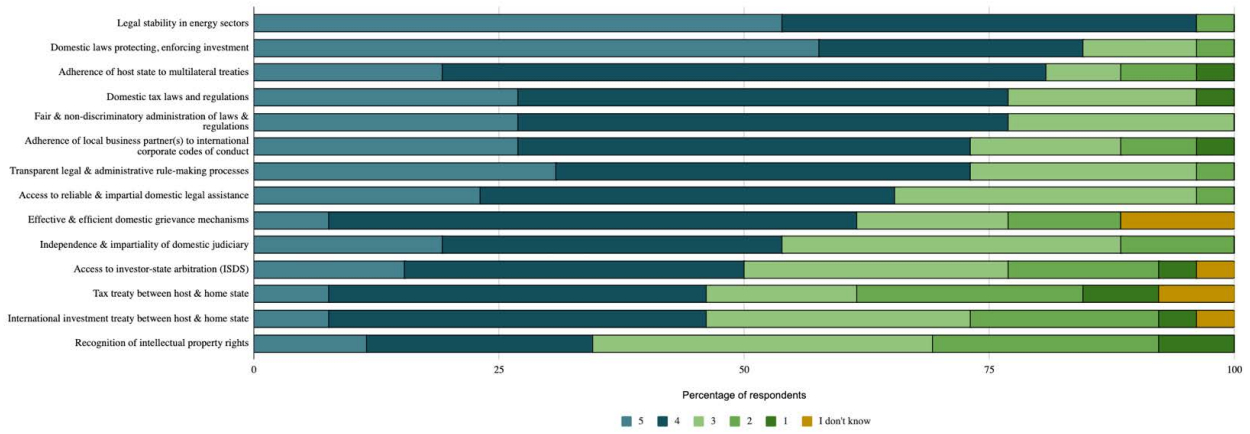


Figure A5. The importance of legal/regulatory factors in the decision-making process of foreign investors.



**Columbia Center
on Sustainable Investment**
A JOINT CENTER OF COLUMBIA LAW SCHOOL
AND COLUMBIA CLIMATE SCHOOL

Columbia Center on Sustainable Investment

Jerome Greene Hall 435 West 116th Street New York, NY 10027

Phone: +1 (212) 854-1830

ccsi.columbia.edu