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Investing in the energy transition at a time of multiple global crises

THE NEED FOR ENERGY TRANSITION

Energy transition is at the core of fighting against climate change and achieving net-zero by 2050. It refers to the global energy sector's shift from a fossil-fuels based energy system to one that is based on renewable sources such as solar and wind. It is a systemic change that involves a structural transformation in the production and consumption of energy. Therefore, it requires significant amounts of investment in energy transition technologies which includes power generation, storage and distribution, energy efficiency, electrified transport and district heat, hydrogen, and carbon capture and storage (CCS) (IRENA, 2023a). A truly net-zero economy also requires enhancement in power grids, upgrading green hydrogen pipelines, retrofitting of existing industries and buildings, and developing electric-charging infrastructure and hydrogen refueling stations (IRENA and CPI, 2023).

Since the COVID-19 pandemic in 2020, the world has witnessed major disruptions in energy production and use, severely affecting the critical transition to net-zero carbon emissions. Weak growth prospects hinder the implementation of national and international pledges for climate action. Despite renewed commitments at the 27th meeting of the United Nations Climate Change Conference (COP27) in 2022, new investments in clean energy[1] have faltered. The COVID-19 pandemic has had a mixed effect on the energy transition. While the stimulus plans provided a boost to clean energy investments, especially in developed countries, the ultimate impact in closing the investment gap was rather limited (Aulie et al., 2022).

Pandemic recovery spending diverted funds from climate-related investments in many developing countries (IRENA and CPI, 2023). Record-high inflation in the aftermath of the pandemic, and rising interest rates to contain inflation have tightened global financing conditions and constrained clean energy investments. Monetary tightening created additional challenges by further squeezing fiscal space and by increasing cost of private investment. As the cost of borrowing increase, developing countries, including some of the least developed countries (LDCs), face rising debt-servicing payments, constraining their capacity to scale up energy investments. The war in Ukraine and the spike in energy prices elevated energy security concerns, leading countries to search for cheap and quick solutions to meet their short-term demand. On the other hand, the same factors also created incentives to increase energy supply through alternative and more reliable energy sources, including renewables.

Amid mounting uncertainty, clean energy transition is presently driven by a combination of environmental factors, market forces and lately, energy security concerns. In terms of energy use, people in LDCs and low-income developing countries are far from having universal access to clean and safe energy for cooking, heating and cooling, and transport. 2.1 billion people worldwide still cook with wood and waste, resulting in indoor pollution and poor health (UN DESA, 2023). Many of these

KEY MESSAGES

- Investment in the clean energy sector showed an upward trend after the adoption of the Sustainable Development Goals (SDGs) and the Paris Climate Agreement in 2015. The COVID-19 pandemic interrupted the trend, but it has recovered strongly since 2021.
- Energy price levels and volatility, rising project costs, economic and geopolitical uncertainty, energy security concerns and climate imperatives contribute to factors bearing on global energy investment.
- A massive gap in investment and the adoption of low-carbon technologies between the developed and developing countries persist, threatening the urgent need to accelerate the energy transition as well as the achievement of the SDGs.

1 Clean energy is the energy that comes from zero-emission sources. The term is often used interchangeably with renewable energy, however, they are not the same. Renewable energy is power that is produced through resources that are constantly being replenished such as solar, wind, hydropower, tidal, and geothermal. Clean energy is derived from hydrogen, ammonia, and nuclear in addition to renewables. Key aspects of clean technologies include capacity additions, electric vehicles, and reducing energy intensity in GDP (IEA, 2021).

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countries are looking to increased use of hydrocarbons to meet their energy demand in the short-run, improve health, and raise standards of living.

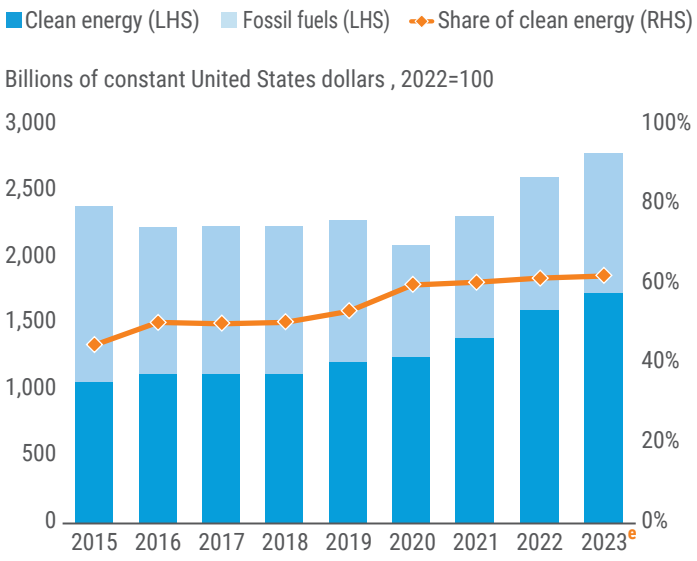
Climate change, however, is as much an economic problem as an environmental one. As the climate crisis intensifies, it creates ever-growing challenges for managing the impact on lives and livelihoods. The effects of climate change, including changing weather patterns, rising sea level, more frequent and intense droughts and floods impose enormous costs on economies. If climate action fails to meet the Paris climate goals, a 2°C and 2.6°C increase in global temperatures above pre-industrial levels is projected to lead to a 11 per cent and 14 per cent decline, respectively, in global GDP (Swiss RE, 2021). This figure could rise to 18 per cent of global GDP if temperatures were to increase by 3.2°C. In addition to the loss in global output, the International Panel on Climate Change estimates that climate change could drive an additional 100 million people into poverty by 2030 in the absence of climate adaptation measures and uneven mitigation by developed and developing countries (Shared Socioeconomic Pathways Scenario 4)[2] (IPCC, 2022).

Above all, the energy transition is essential for the achievement of the 2030 Agenda for Sustainable Development. It is intrinsically linked to several SDGs. The energy transition lies at the intersection of SDG 13, which urges countries to take action to combat climate change and its impacts, and SDG 7 which seeks to ensure universal access to affordable, reliable and modern energy services for all. As of 2023, 675 million people still lack access to electricity, mostly located in LDCs (UN DESA, 2023). Hundreds of millions more only have access to limited and unreliable energy. The energy transition bears the potential to simultaneously achieve net-zero, provide energy security, and facilitate economic growth and development. At the midpoint of the 2030 Agenda for Sustainable Development, it is crucial that the global uncertainty provides the turning point to accelerate the energy transition.

RECENT TRENDS IN INVESTMENT IN THE ENERGY SECTOR

Aggregate investment in the energy sector – clean energy and fossil fuels combined – picked up in 2021 after a long stagnation following the adoption of the Sustainable Development Goals (SDGs) and the Paris Climate Agreement in 2015 (figure 1). It has been on a steady

Figure 1
World total energy investment, by source



Source: UN DESA, based on World Energy Investment 2023 (IEA, 2023a).
Note: LHS=left-hand scale, RHS=right-hand scale, e=estimates.

rise since then. World energy investment is expected to increase by about 7 per cent in 2023, reaching a record of $2.8 trillion. Nevertheless, the total is still far short of the amount that is required to meet rising energy demand in a climate sustainable way. The International Energy Agency (IEA) estimates that a total of $37 trillion in investment is required by 2030 to keep the world on track for net-zero by 2050 (IEA, 2023a). The International Renewable Energy Agency's (IRENA) 1.5°C Scenario[3] estimates that investments of $150 trillion in transition technologies and infrastructure by 2050 amounting to $5.3 trillion per year on average is required to achieve climate goals (IRENA and CPI, 2023).

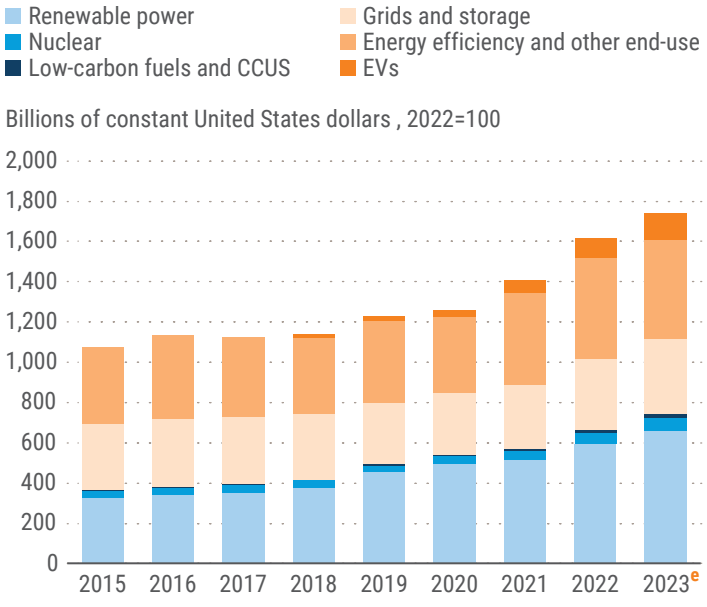
Clean energy investment continued to increase for the third consecutive year since the COVID-19 pandemic. It is expected to exceed $1.7 trillion in 2023, accounting for almost two-thirds of the global energy investment. This boost in clean energy investments is driven by a variety of factors. These include improved cost competitiveness at a time of high and volatile fossil fuel prices; enhanced policy support particularly in developed economies; a strong alignment of climate and energy security goals,

2 The Shared Socioeconomic Pathways (SSPs) are part of a new scenario framework, established by the climate change research community in order to facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation. For further details, see O'Neill et al. (2017).

3 IRENA's World Energy Transitions Outlook (WETO) outlines 3 possible trajectories based on different scenarios as pathways to achieve the energy transition. These are Planned Energy Scenario, Transforming Energy Scenario, and 1.5°C Scenario. The variation of these scenarios reflects different approaches and assumptions regarding the evolution of the key components of energy transition such as energy demand, energy supply mix, different targets in emission reduction and timelines, and policies. The 1.5°C Scenario pathway is the optimum scenario and provides global welfare significantly while limiting the temperature rise to 1.5°C by 2050 (IRENA, 2022).

Figure 2

Global investment in clean energy



Source: UN DESA, based on World Energy Investment 2023 (IEA, 2023a).

Note: e=estimates; CCUS=carbon capture, utilization and storage; EV=electric vehicle.

especially in energy-importing economies; and a focus on industrial strategy as countries seek to strengthen their footholds in the emerging clean energy economy (IEA, 2023a).

The share of clean energy in total energy investments, however, grew only 2 percentage points since 2020 from 60 per cent to 62 per cent in 2022, following a 15 percentage points increase from 45 per cent to 60 per cent from 2015 to 2020. Even as clean energy attracted more investments over the past years, fossil fuels did as well. The need to diversify national energy compositions away from Russian oil and natural gas encouraged countries, particularly the European countries, to find quick alternatives. Indeed, investment in fossil fuels surpassed its pre-pandemic levels in 2022 and 2023. Investment in coal supply responded the strongest to energy security concerns as it is much less capital-intensive than oil and gas, and has been less subject to large year-on-year variations in supply (IEA, 2023a). Around $136 billion was invested in the coal supply chain in 2022, an increase of 20 per cent from the previous year. A further 8 per cent increase is expected in 2023. China and India account for most of the increases in coal. Investment in upstream oil and natural gas, and refining also increased.

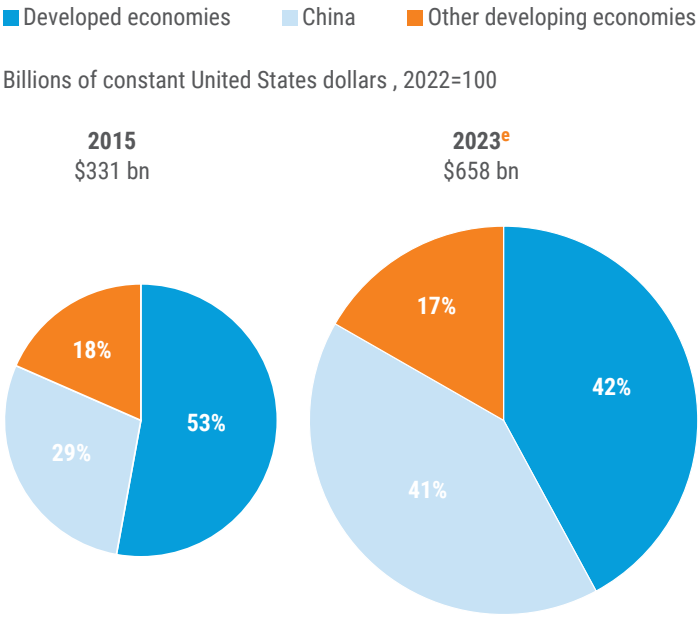
Investment in renewable power generation; grids and battery storage; and energy efficiency and other end-use account for the majority of investment in clean energy sectors (figure 2). Renewable power generation alone makes up 38 per cent of all clean energy. Electric vehicles (EVs) attract increasingly more investment supported by developments in EV infrastructure (i.e., charging stations) and investments in batteries and critical minerals.

PERSISTENT GAP IN RENEWABLE ENERGY INVESTMENTS

Despite the overall increase in investment in the energy sector, a massive investment gap[4] in renewables is currently evident. Global investment in renewable power generation has doubled from $331 billion in 2015 to $658 billion in 2023. However, the increase remains heavily concentrated in a small number of countries. While the share of developed economies' investment in renewable energy declined from 2015 to 2023, it is China – and not other developing countries – that saw its relative contribution go up (figure 3). China alone accounts for 41 per cent of global investment in renewable energy in 2023, while the rest of the developing countries account for only 16 per cent (down from 18 per cent in 2015). This

Figure 3

Global investment in renewable energy by country group, 2015 vs 2023



Source: UN DESA, based on World Energy Investment 2023 (IEA, 2023a).

Note: e=estimated values for 2023.

4 The word "gap" refers to the needs that should be filled to realize commitments in full. A significant increase in energy investment is essential to get back on track for net-zero emissions by 2050. Various pathways and scenarios forecast different levels on the energy needs. IEA estimates a total of $37 trillion in investment by 2030 leaving a gap of $19 trillion at current investment rate.

Table 1

Global installed capacity in renewable energy for power generation, by technology

	2015 (GW)	Share (%)	2022 (GW)	Share (%)	% Change in installed capacity 2015-2022	Projected capacity needed by 2030* (GW)	Share (%)
Solar	224	12	1,055	31	371	5,221	48
Wind	416	22	899	27	116	3,337	31
Hydropower	1,099	59	1,255	37	14	1,465	14
Other RE	115	6	172	5	50	749	7
Total	**1,854**	**100**	**3,382**	**100**	**82**	**10,772**	**100**

Source: UN DESA, based on Renewable Energy Statistics 2023 (IRENA, 2023).

Note: GW=gigawatts. Other renewable energy category includes bioenergy, geothermal and marine energy.

* Based on IRENA's 1.5°C Scenario.

growing gap stands in stark contrast to the importance of developing countries as they have an increasingly determinant role in the future of the energy transition and, hence, climate change.

Among the other developing countries, a few big economies stand out. Brazil and India are leading this group in new capital investments in renewables. Brazil produces 7 per cent of the world's renewable energy (Bennett et al., 2023). It has long been a major player in hydropower and biofuel technologies. It is expanding on solar photovoltaic (PV), wind, and bioenergy and other forms of clean energy including hydrogen, energy efficiency, and power storage. India's renewable capacity additions are expected to increase in 2023 and 2024 owing to faster onshore wind, hydropower and distributed solar PV deployment (IEA, 2023b). However, higher interest rates, unclear policy frameworks, faulty market designs and high cost of capital are holding back investment in many developing countries (fDi Intelligence, 2022).

In addition to the geographic disparity, a gap in the adoption of low-emission technologies also persists. Hydropower comprises the largest share in global installed capacity in renewable energy, albeit with a declining share (table 1). According to IRENA's 1.5°C Scenario, the overall share of hydropower is projected to see a steep decline from 59 per cent in 2015 to 14 per cent in 2030 due to the increase in the frequency and intensity of droughts, and high environmental and social costs (IRENA, 2022).

Conversely, installed capacity in solar PV is projected to almost quadruple thanks to technological advancements, high learning rates, policy support and innovative financing models (IRENA, 2022). Solar energy is expected to provide almost half of all installed capacity in renewable sources in 2030. It is followed by wind energy. Offshore and floating wind power plants are becoming particularly important in Europe. Other renewable energy sources including geothermal, marine, and bioenergy are expected to be stagnant.

The decreasing price of renewable technologies has been a significant driving force behind their growing deployment. Solar panels, wind turbines, storage batteries and EV batteries all saw significant price reductions since 2014 (figure 4). However, the notable decline from 2014 to 2019 did not continue in the past few years largely due to higher input prices for critical minerals, semiconductors and bulk materials like steel and cement. Although the price of solar PV started to come down in early 2023 due to easing input cost pressure and expanding manufacturing capacity (largely in Asia), wind turbine costs, especially from European manufacturers, remain high (IEA, 2023a).

CHALLENGES AND OPPORTUNITIES FOR DEVELOPING COUNTRIES

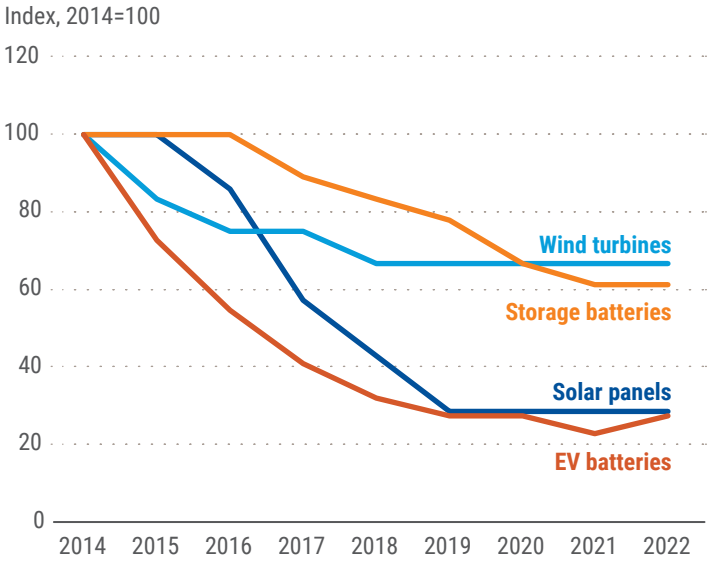
Uncertainty in the global economic, geopolitical, and financial landscape creates severe challenges in accelerating energy transition. The ongoing energy crisis forces countries, particularly the energy-importers, to urgently deploy alternative sources of energy that are sustainable, reliable and affordable (IRENA and CPI, 2023). However, tighter fiscal space and an uncertain macroeconomic outlook hinder flows of investment towards clean energy. The situation is more daunting in developing countries and LDCs as they face more pressing financing constraints.

Aggressive monetary tightening in major economies threatens further setbacks to the energy transition. The cost of borrowing, which is already high for developing countries due to their high country-risk ratings, has risen sharply, hindering private investment. Tighter fiscal space available to governments in developing countries also add constraints to public borrowing. Although the largest clean energy projects in developing countries are undertaken by private investors, public funding is essential in creating an enabling environment by mitigating the host-country risk (UNCTAD, 2023).

Figure 4

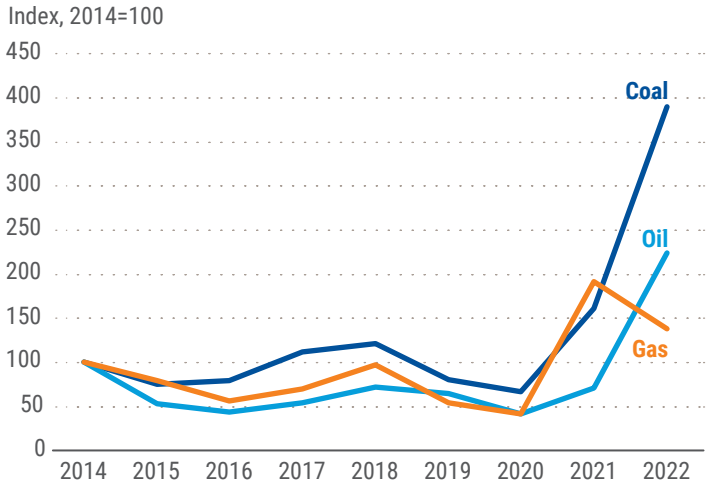
Average prices for selected renewable technologies

a) Renewable technologies



Source: UN DESA, based on World Energy Investment 2023 (IEA, 2023a).

b) Fossil fuels



Source: UN DESA, based on data from Energy Institute Statistical Review of World Energy (EI, 2023).

Note: Indices are based on Northwest Europe coal price index, Brent oil spot crude price index, and UK NBP gas price index.

In addition, developing countries face many competing spending needs – from tackling the consequences of high inflation and alleviating food shortages to supporting competitiveness and short-term growth. Renewable investments are competing for scarce public resources, presenting difficult trade-offs for governments (IRENA, 2023b).

Despite the challenges in the current global landscape, pursuing clean energy policies presents potential for competitive advantages for developing countries. To begin with, the energy transition bears immense potential for developing countries to integrate into global value chains. The accelerated deployment of renewable-energy technologies (particularly wind and solar energy) can enable localization of different stages of supply chains. Local businesses in developing countries can enter the renewable energy manufacturing value chains at different stages, for example, as provider of critical minerals; as local subsidiary of a foreign company; manufacturing under original equipment manufacturers (OEM); and locally assembling components of international providers (Davy et al., 2022).

Investing in the energy transition can also translate into broader development gains. Investment in green infrastructure projects with high economic returns can support economic growth in developing countries. Particularly, investments that are aligned with SDGs, such as in transport, power generation and distribution, can boost long-term growth by enhancing sustainable and inclusive development (World Bank, 2023). In addition to economic growth, the energy transition holds socioeconomic value and the potential for positive spillovers. Renewable energy sectors employed 12.7 million people in 2021 worldwide, up from 10 million in 2015 (IRENA and ILO, 2022). It is expected to create an additional 14 million jobs by 2030 (IEA, 2021).

Given the long-term development benefits of energy transition, the deployment of renewables in power generation and end-use sectors, and improved energy efficiency must accelerate. Yet, the cost associated with it is beyond the capacity of national governments, particularly in developing countries. Therefore, strong international collaboration and coordinated action between public and private sectors are required to scale up of renewables. It is essential that developing countries have a strong public sector to promote an enabling environment that reduces the cost of capital and makes it easier for the private sector to come in. The broader regulatory framework within which the public incentives operate should encompass a wide range of policy areas, including licensing and system permissions, land access, industry structure and areas specific to renewable energy, such as priority access to the grid (UNCTAD, 2023). In many developing countries, and especially LDCs, capacity-building and technical assistance are crucial to design detailed energy transition investment planning.

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