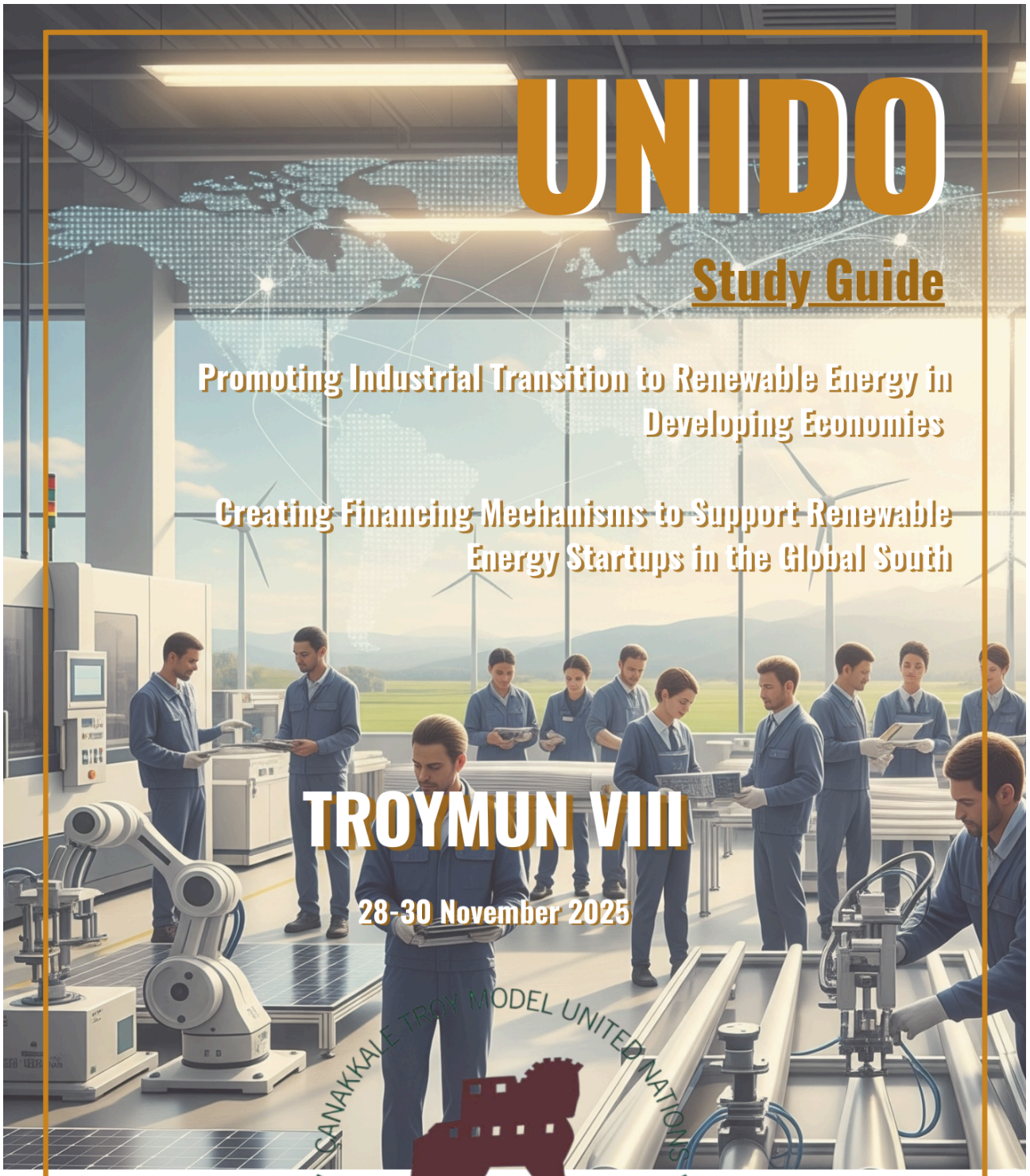

UNIDO

Study Guide

Promoting Industrial Transition to Renewable Energy in Developing Economies

Creating Financing Mechanisms to Support Renewable Energy Startups in the Global South

TROYMUN VIII

28-30 November 2025

ÇANAKKALE TROY MODEL UNITED NATIONS

TROY MUN 2017

USG: Nur Elif BATTAL

troymun.org

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I. Letter from the Secretary-General

Highly Esteemed Delegates,

First and foremost, I would like to express my sincere gratitude for your interest and enthusiasm regarding our conference. My name is Yaren Keçili, and I have the honor of serving as your Secretary-General for the 8th edition of the Troy Model United Nations Conference this year. I embrace this role with immense appreciation. Similar to previous years, we have dedicated our efforts to creating a range of engaging and diverse committees for your benefit. We take great pride in the work we have prepared for you and sincerely hope that you will find it beneficial as well. Both the academic and operations teams have been working very hard to serve you to the best of their abilities and give you an unforgettable experience.

I wish to show my gratitude to the chair board and Nur Elif Battal, who is going to serve as your Under-Secretary-General. All my teammates made great efforts in the process leading up to the conference. Hence, they need all the praise for their hard work.

I trust that all our delegates will engage in enlightening discussions throughout the three days they are with us, cultivate creative solutions to global challenges, be at the forefront of diplomacy and academia, and enjoy the experience in the process. Once again, I would like to welcome you all to both the conference and the committee. Buckle up and get ready because we have prepared an incredible ride for you.

Yours Sincerely,

Yaren Keçili

Secretary-General of Troy Model United Nations 2025

II. Letter From The Under-Secretary-General

Esteemed Delegates,

It is an honour to welcome you all to the UN Industrial Development Organization of TROYMUN'25 on behalf of my chair board. I am Nur Elif Battal and incredibly excited to have you join us in what I hope will be an impactful committee.

Our agenda items focus on issues that lie at the heart of today's climate and development challenges. While global conversations about green energy are gaining momentum, many developing nations are still trying to bridge the gap between ambition and reality.

This committee will challenge you to think critically about how we can make the global shift to renewable energy without leaving anyone behind. How can developing economies transition without compromising growth? How do we support the small startups with big ideas that just need a financial push to make a difference? The answers aren't easy — but they're in this room.

You are encouraged to debate passionately, listen openly, and have a little fun along the way. Don't be afraid to think big, challenge each other, and bring in your own perspectives. Whether this is your first MUN or your tenth, your ideas matter.

Lastly I would like to thank Ms. Cağlayan Nazlıca and Ms. Arzu Kotan for their years of efforts to make TROYMUN conferences a reality for all. And I also would like to thank my Secretary-General Yaren Keçili for supporting us until now.

Sincerely,

Nur Elif Battal

Under-Secretary-General responsible for UN Economic and Social Council

III. Introduction to the Committee: United Nations Industrial Development Organization

A. What is UNIDO?

UNIDO is a specialized agency of the United Nations with a unique mandate to promote, dynamize and accelerate industrial development.

UNIDO's mandate is reflected in Sustainable Development Goal (SDG) 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", but UNIDO's activities contribute to all the SDGs.

UNIDO's vision is a world without poverty and hunger, where industry drives low-emission economies, improves living standards, and preserves the livable environment for present and future generations, leaving no one behind.

UNIDO provides support to its 173 Member States through four mandated functions: technical cooperation; action-oriented research and policy-advisory services; normative standards-related activities; and fostering partnerships for knowledge and technology transfer.

UNIDO's work is concentrated on three focus areas: **ending hunger** by helping businesses from farm to fork; **supporting sustainable supply chains** so that developing country producers get a fair deal and scarce resources are preserved; and **stopping climate breakdown** by using renewable energy and energy efficiency to reduce industrial greenhouse gas emissions.

The guiding principle of UNIDO's activities is low-emission, climate-resilient development. This means promoting policies, technologies and practices so that countries can take climate action and, in doing so, create millions of new, decent jobs.

UNIDO's strategy in response to climate breakdown is maximizing synergies with other priority areas such as energy, agribusiness development and food security, circular economy and biodiversity.

UNIDO sees innovation as key to mitigating and adapting to climate change. Technological options for avoiding and reducing greenhouse gas emissions must be further developed. **UNIDO provides a platform for technology transfer, investment mobilization and climate partnerships** to accelerate this process.

B. Sustainable Development Goals

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all

A well-established energy system supports all sectors, from businesses, medicine and education to agriculture, infrastructure, communications and high technology.

Energy services are key to preventing disease and fighting pandemics – from powering healthcare facilities and supplying clean water for essential hygiene, to enabling water for essential hygiene, to enabling communications and IT services that connect people while maintaining social distancing.

For many decades, fossil fuels such as coal, oil or gas have been major sources of electricity production, but burning carbon fuels produces large amounts of greenhouse gases which cause climate change and have harmful impacts on people's well-being and the environment. This affects everyone, not just a few. Moreover, global electricity use is rising rapidly. In a nutshell, without a stable electricity supply, countries will not be able to power their economies.

Without electricity, women and girls must spend hours fetching water, clinics cannot store vaccines for children, many schoolchildren cannot do homework at night, and people cannot run competitive businesses. Slow progress towards clean cooking solutions is of grave global concern, affecting both human health and the environment, and if we don't meet our goal by 2030, nearly 22 per cent of the world's population – mostly women and children – will continue to be exposed to harmful household air pollution.

To ensure access to energy for all by 2030, we must accelerate electrification, increase investments in renewable energy, improve energy efficiency and develop enabling policies and regulatory frameworks.

Progress towards Goal 7 has been notable: from 2015 to 2023, global electricity access rose from 87 to 92 per cent, access to clean cooking fuels increased by 16 per cent, and renewable electricity continued to grow. However, progress is slowing –renewables lag in the transport and heating sectors, and energy efficiency gains have stalled. Moreover, only a small portion of global energy investment reaches the areas most in need. Achieving Goal 7 will require a significant boost in investment in emerging and developing economies, in particular in sub-Saharan Africa, to expand access to electricity and clean cooking, scale up renewable energy, improve energy efficiency and strengthen policy and regulatory frameworks.

Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Economic growth, social development and climate action are heavily dependent on investments in infrastructure, sustainable industrial development and technological progress. In the face of a rapidly changing global economic landscape and increasing inequalities, sustained growth must include industrialization that first of all, makes opportunities accessible to all people, and second, is supported by innovation and resilient infrastructure.

Since 2015, notable progress has been made however, stark regional disparities persist, and many developing countries continue to face systemic barriers to inclusive and sustainable industrialization. To advance Goal 9, countries must boost investment in resilient infrastructure and research and development, expand access to finance for small manufacturers and bridge the digital divide by prioritizing affordable broadband and innovation systems in the world's most underserved regions. The United Nations is advancing digital inclusion through initiatives such as the Technology Bank for the Least Developed Countries and the Global Digital Compact, which is aimed at closing connectivity gaps, expanding access to innovation and ensuring digital transformation benefits

Goal 13 Take urgent action to combat climate change and its impacts

Every person, in every country in every continent is impacted in some shape or form by climate change. Climate change is caused by human activities – primarily the burning of fossil fuels like oil, coal and gas – and threatens life on Earth as we know it. With rising greenhouse gas emissions, the impacts of climate change are intensifying and accelerating,including more frequent extreme weather events like droughts, floods and storms, and rising sea levels.

If left unchecked, climate change will undo a lot of the development progress made over the past years. It can also intensify conflicts over resources and force people to move.

Human-induced climate change reached alarming new levels in 2024, with some impacts already irreversible for centuries. Global temperatures broke records and temporarily exceeded the 1.5°C threshold, highlighting the urgent need to curb greenhouse gas emissions. Extreme weather events – including tropical cyclones, floods and droughts – led to the highest number of new displacements in 16 years, worsening food crises and bringing massive economic losses and social instability. Nonetheless, with bold action, limiting long-term global warming to 1.5°C is still possible. Every fraction of a degree matters in reducing risks, lowering costs and preventing catastrophic and irreversible damage to people and the planet. At the twenty-ninth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, States set a new collective quantified goal on climate finance and completed guidance to fully operationalize article 6 of the Paris Agreement on carbon markets, along with making additional commitments on mitigation, adaptation and the operationalization of the Fund for Responding to Loss and Damage.

Goal 17 Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Goal 17 is about revitalizing the global partnership for sustainable development. The 2030 Agenda is universal and calls for action by all countries – developed and developing – to ensure no one is left behind. It requires partnerships between governments, the private sector, and civil society.

The Sustainable Development Goals can only be realized with a strong commitment to global partnership and cooperation to ensure no one is left behind in our journey to development.

Global progress on Goal 17 has shown both advancement and persistent challenges over the past decade. While financial flows to developing countries have increased, driven by both official and private finance, record-high debt servicing costs in 2023 strain low- and middle-income economies. This is compounded by a $4 trillion annual investment gap for Goal achievement in developing countries. Access to information and communications technology has grown steadily, although digital divides remain stark, in particular in lower-income regions. While data systems and national statistical capacities have improved, many countries still struggle to secure the necessary funding to fully track and implement the Goals, slowing progress in key areas. Strengthened support and renewed global cooperation are critical to bridge these divides and accelerate Goal progress.

IV. Introduction to the Agenda Item I: Promoting Industrial Transition to Renewable Energy in Developing Economies

Ever since the beginning of the industrial revolution, it has been recognized that enterprises have impacts – sometimes severe impacts – on their environments: rivers and groundwater, air quality, and local land use. Broadly speaking, it can be argued that, since the start of the modern environmental movement in the 1960s, the developed countries have been managing the environmental impacts of industries more effectively. The picture is less rosy in the developing countries, where environmental management is lagging behind industrial growth, the result being pockets of severe local pollution caused by industry. Nevertheless, the improvements seen in developed countries show that, in most cases, this is a problem that can be solved , and solving it could be a source of major business opportunities for enterprising companies.

Of much greater long-term impact are global environmental threats, which reflect the natural environment’s growing inability to absorb the wastes that are the by-product of world

economic growth. By their nature, these are much more difficult threats to tackle, being multi-country and multi-stakeholder in nature, and they are of much greater concern, since failure to tackle them can result in broad ecosystem – and consequent economic – collapse.

Climate change is the most prominent example of such threats. It is so dramatic because it has truly worldwide impacts and because it will require us to make fundamental changes to our economies, transforming them from the high-carbon economies they have been for the last two centuries – completely dependent on fossil fuels – into low-carbon economies.

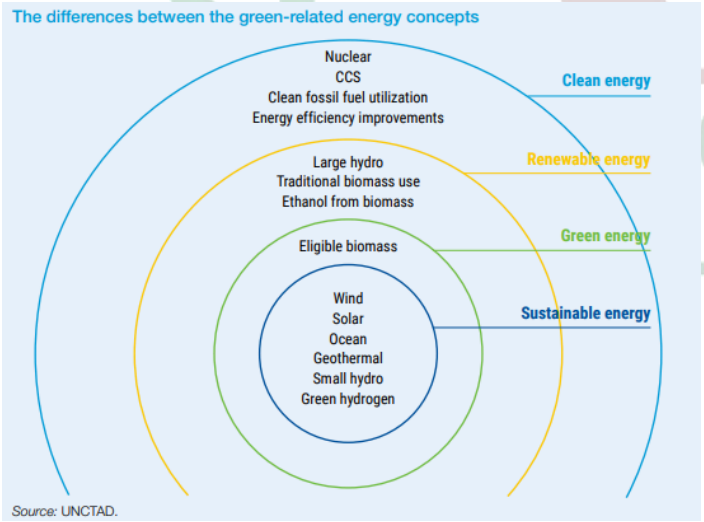
Recently overshadowed by climate change but nevertheless of growing concern is the coming global crisis in water. Population growth, economic development and urbanization are leading to increased water consumption. When all three occur simultaneously, as is currently the case, the result is very rapid increases in water consumption: While the world's population tripled in the twentieth century, the use of renewable water resources grew sixfold. The World Water Council estimates that, on average, the world has a level of water stress of 40% , with a highly variable distribution – the arid parts and most heavily populated parts of the world exhibiting water stress levels above 80%. Adding to current water stress levels is the fact that one of the more significant impacts of climate change is that regions that already receive little water will receive even less.

Industry is related to a greater or lesser extent to all these environmental impacts. Because human economies are intimately intertwined with global ecosystems, through the feedback loops established, they will have growing impacts on industry. Efforts by the international community to reverse ozone depletion has intimately involved industry, since it is both the producer of ozone-depleting substances and the prime consumer of them. For the same reasons, any attempts to control the manufacture and commercialization of chemicals will have a strong impact on industry. As for efforts by the international community to minimize

climate change, they can be expected to have a very large impact on industry. Enterprises will almost certainly be required to find ways of drastically reducing their use of fossil fuels, or drastically reducing their **use of electricity generated from fossil fuels**.

But the impact of climate change on industry will not stop there. Industries, along with the rest of society, will need to adapt to climate-induced changes by relocating out of newly flood-prone zones, making do with less water, adapting to higher temperatures, and so on. And it can be expected that industry will become involved in making available the technologies and other goods and services that society will require to adapt to climate change. As for water, globally, it is estimated that 15% of worldwide water use is already industrial, and that level is set to grow with industrial development. It can be expected that industry will have to "run drier" than it has historically, especially since, in many areas of the world, climate change will have an impact on the availability of water. [1]

A. Renewable Energy Technologies



Renewable energy includes resources that rely on fuel sources that restore themselves over short periods and do not diminish. Such fuel sources include the sun, wind, moving water, organic plant, and waste material (eligible biomass), and the earth's heat (geothermal). Although the impacts are small, some renewable energy technologies can have an impact on the environment. For example, large hydroelectric resources can have environmental trade-offs on such issues as fisheries and land use. Not all renewable energy is

sustainable but improving the sustainability of renewables can have environmental benefits. [2]

Solar Energy

Solar photovoltaic (Solar PV) technology transforms sunlight into direct current electricity using semiconductors within PV cells. In addition to being a renewable energy technology, solar PV can be used in off-grid energy systems, potentially reducing electricity costs and increasing access.

Wind Energy

Wind energy is used to produce electricity using the kinetic energy created by air in motion. This is transformed into electrical energy using wind turbines. Many parts of the world have strong wind speeds, but the best locations for generating wind power are sometimes remote and offshore.

Green Hydrogen

Green hydrogen is hydrogen generated entirely by renewable energy or from low-carbon power. The most established technology for producing green hydrogen is water electrolysis fuelled by renewable electricity. Compared to electricity, green hydrogen can be stored more easily. The idea is to use excess renewable capacity from solar and wind to power electrolysers which would utilize this energy to create hydrogen, which can be stored as fuel in tanks.

Biofuels

Biofuels are liquid fuels derived from biomass and are used as an alternative to fossil fuel-based liquid transportation fuels such as gasoline, diesel, and aviation fuels. In 2020, biofuels accounted for 3 per cent of transport fuel demand.

Biogas and biomass

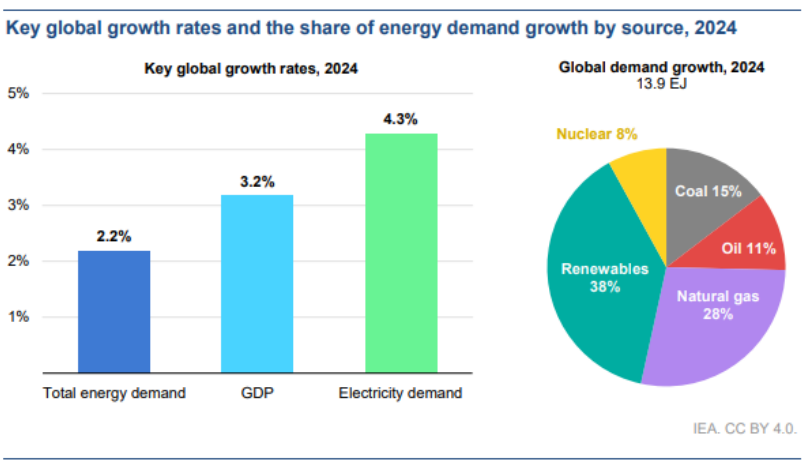
Biogas is a mixture of methane, CO2 and small quantities of other gases produced by anaerobic digestion of organic matter in an oxygenfree environment. In comparison, biomass is renewable organic material from trees, plants, and agricultural and urban waste. It can be used for heating, electricity generation, and transport fuels.

Geothermal Energy

Geothermal energy is the heat produced deep in Earth's core. Geothermal energy is a clean, renewable resource that can be harnessed for use as heat and electricity.

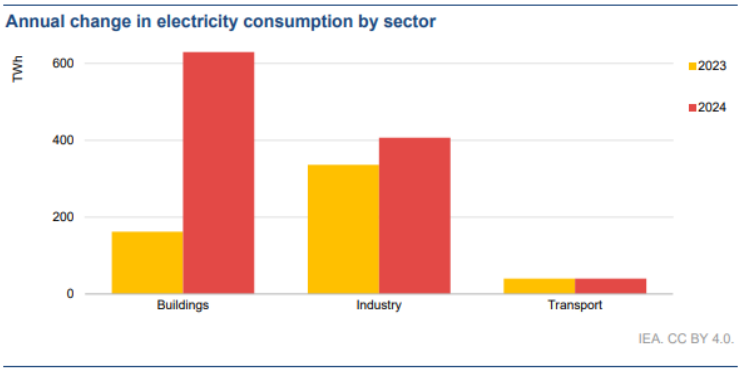
B. Recent Global Energy Trends

Global energy demand grew by 2.2% in 2024, a notably faster rate than the annual average of 1.3% seen between 2013 and 2023. This uptick was partly due to the effect of extreme weather, which we estimate added 0.3 percentage points to the 2.2% growth. Despite this, energy demand grew more slowly than the global economy, which expanded by 3.2% in 2024, close to its long-term average.



Electricity demand grew more rapidly than both overall energy demand and GDP, increasing by 4.3% in

2024. The absolute increase in demand was the largest ever recorded (excluding the jumps in years when the global economy recovered from recession). This reflects structural trends such as growing access to electricity-intensive appliances like air conditioning and a shift towards electricity-intensive manufacturing, as well as increasing power demand from digitalisation, data centres and AI, and the increasing electrification of end-uses. In all, the power sector made up three-fifths of the total increase in global energy demand. Renewables accounted for the largest share of the growth in total energy supply (38%), followed by natural gas (28%), coal (15%), oil (11%) and nuclear (8%).

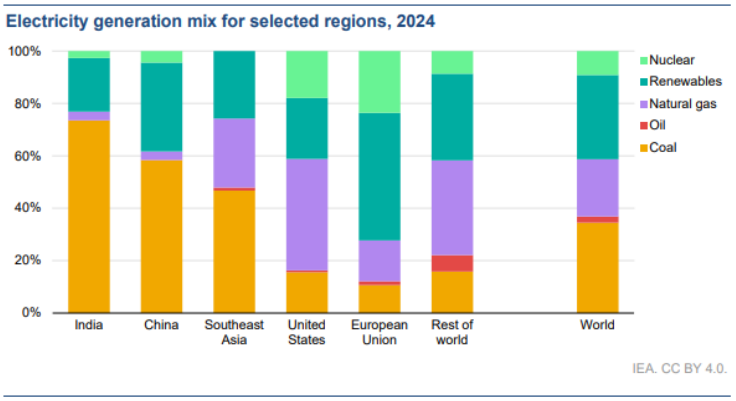


Global energy demand was impacted by extreme temperatures in 2024 – the warmest year recorded, surpassing the previous record set in 2023. Global cooling degree days (a measure of cooling needs) were 6% higher in 2024 than in 2023, and 20% higher than the long-term average between 2000 and 2020. Regions with high cooling demand were particularly affected, including China, India and the United States. In addition to driving cooling demand, temperature trends can also impact electricity generation, including from hydropower. In all, we estimate that weather effects contributed about 15% of the overall increase in global energy demand. The effects were higher for electricity, coal and natural gas consumption, as electricity demand is directly impacted by cooling, while coal and gas stepped in to meet higher electricity demand in several regions. We estimate that temperature effects contributed around 20% to the increase in electricity and natural gas demand and drove the entire increase in coal demand. For CO2 emissions, weather effects contributed around half of the 2024 increase.

The primary energy intensity improvement of the economy, a key metric of energy efficiency, continued to slow in 2024. After improving at an average rate of around 2% annually from 2010 to 2019, the measure declined to 1.2% in recent years (2019-2023) and fell to around 1% in 2024. Key reasons for this slowdown in recent years include investment- and manufacturing-intensive economic recoveries in major emerging market and developing economies such as China and India; high energy demand due to extreme temperatures; and a trend of poor growth in hydropower output that was only partially reversed in 2024, leading to greater consumption of less-efficient coal power in some regions.

In 2024, energy intensity improvements slowed in advanced economies after several years of rapid progress due to high energy prices and weaker economic conditions in energy-intensive sectors. In contrast, China and India saw faster energy intensity improvements, although still below pre-Covid-19 rates.

Fossil fuels made up nearly 60% of 2024 electricity generation, but the power mix is evolving. Coal remained the largest source of electricity generation in the world, a position it has held for more than 50 years. In 2024, it accounted for 35% of total power generation. Natural gas was the second-largest source of electricity, marking more than two decades in which it has provided over 20% of global electricity. Oil-fired power plants generated just a few percent of the total. However, the global power mix is evolving. For the first time ever, power generation from renewables and nuclear power covered two-fifths of total global generation in 2024. Renewables collectively accounted for one-third of electricity generation, led by hydropower (14% of total electricity generation), wind (8%), solar PV (7%) and bioenergy and waste (3%). Nuclear power covered 9% of global electricity generation. Simply put, the



growth in renewables could not keep pace with rising demand, leaving fossil fuels dominant in the electricity mix.

The next phase in the journey to a safer and more sustainable energy system is set to take place in a new energy market context, marked by continued geopolitical hazards but also by relatively abundant supply of multiple fuels and technologies. The rapid rise in clean energy deployment in recent years came during a period of price volatility for fossil fuels. Clean technology costs are coming down, but maintaining and accelerating momentum behind their deployment in a lower fuel-price world is a different proposition. How consumer choices and government policies play out will have huge consequences for the future of the energy sector, and for tackling climate change. [3]

C. Industry with Renewable Energy

Considering first the production systems, enterprises should adopt business strategies where they look to maximize resource efficiency and cleaner production. More simply, they should adopt "three Rs" strategies – Reduce, Recycle, Reuse. This requires them to first maximize the efficiency with which they use their energy and raw materials, adopting cleaner production, pollution prevention, green productivity or similar approaches. Experience gained through **UNIDO's national cleaner production centres (NCPCs),** as well as information from the broader literature, suggest that enterprises in the developing countries are often using three or more times more materials and energy than their equivalents in the developed countries. Therefore, not only is it necessary from an environmental point of view that the three Rs strategy be adopted; there is also a pressing economic case for enterprises to adopt it, especially in the current economic downturn, since greater efficiency in the use of materials and energy will reduce operating costs. Costs in respect of materials and energy account for between 40 and 60% of the operating costs of enterprises in the developing countries.

Governments can assist enterprises by supporting awareness-raising, capacity-building, the development and transfer of more efficient production technologies, and the creation of specialized industry support institutions such as the NCPCs. They can also reduce if not eliminate any existing subsidies on energy, water and other raw materials; the existence of these subsidies artificially reduces industry's input costs, making it more difficult for enterprises to make the economic case for efficiency. Enterprises can also promote decoupling by switching from non-renewable to renewable sources of energy and materials. In the case of renewable energy, decoupling will come about when the electricity-production sector shifts to renewable sources of energy and offers the rest of the industry green electricity. It will also come about when enterprises directly increase their use of renewable energy, for instance by substituting biomass for fossil fuels in boilers, using solar energy for certain forms of drying, and so on. Governments have a very important role to play in creating the market conditions to allow the renewable-energy industry to grow. They also have an important role in ensuring that renewable materials – primarily biomass – are produced sustainably.

The use of management systems is the most effective means for any enterprise to ensure that it efficiently and continuously implements three Rs strategies. Certification of such systems by third parties increases their value to the enterprise. Which of the various possible standards an enterprise should adopt will depend on its specific business model. However, given the current trends in management system standards, adoption of a corporate social responsibility approach, which broadly embraces all aspects of environmental (and social) impacts, might be the best. Governments can play an important role in supporting awareness-raising, capacitybuilding, the creation of industry-support institutions that can help enterprises implement management systems, and the creation of the necessary accreditation and certification bodies. [1]

D. Environmental Services Industry

In the developed countries, the elaboration of environmental legislation and its implementation over the last 40 years have led to the creation of a new industrial sector, the environmental services sector, which assists enterprises to assess, measure and manage their environmental impacts, as well as to manage the pollution and waste they generate and to dispose of it in an environmentally sound way. Specialized engineering companies have come into existence to design, install and operate environmentally sound technologies – from windmills to waste-water treatment plants, from biodigesters to incinerators – as have a host of environmental consulting firms specializing in an array of management or technical skills. Recent statistics suggest that the industry is worth around USD 300 billion annually in the developed countries alone . The size of the sector in the developing countries is unknown, but is definitely much less for the time being.

The key to the phenomenal growth of the environmental services sector in the developed countries has been the rapid and continuing increase in the body of **environmental legislation** in these countries, but even more important is the consistent enforcement of this legislation. This legislation is driven by the "polluter pays" principle, that is, it internalizes into enterprises the environmental costs that they had previously been externalizing onto local communities and the environment. By definition, internalization increases costs for the enterprises and therefore there is a continuing incentive for companies to avoid or attenuate implementation of environmental legislation. Only proper enforcement of legislation, or, to put it in a more positive light, the creation of adequate incentives, can keep implementation on track and therefore maintain an economically viable environmental services sector. Precisely because both enforcement and the incentives package are generally weak in the developing countries (it is normally not laws and regulations that are lacking), the level of implementation of environmental laws is low. Therefore, the environmental services sector

has not been able to develop in these countries to the extent that it has in the developed countries.

This having been said, there are certain environmental services which can thrive even in the absence of proper enforcement or incentives packages because they actually create value for companies rather than just forcing them to bear a cost, even under current economic conditions. An obvious example is cleaner production services, an area where **UNIDO has been offering countries technical assistance for nearly 15 years.** By definition, cleaner production creates value for a company by reducing its operational costs through the elimination of inefficiencies in the use of materials and energy, which in turn happens to have environmental benefits. As UNIDO's experience has shown, it is possible for environmental services providers (in this case, national cleaner production centres) to do business by offering cleaner production services to enterprises. [1]

E. Barriers Against Transition

To be able to assist developing countries to transition we first have to understand the barriers that prevent the enterprises in these countries from doing so. Four major barriers can be identified:

Lack of knowledge and skills: Numerous enterprises are either not aware of the challenges that lie ahead, or they do not have the necessary skills to deal with them. They are also not aware of the business opportunities that environmental issues afford them.

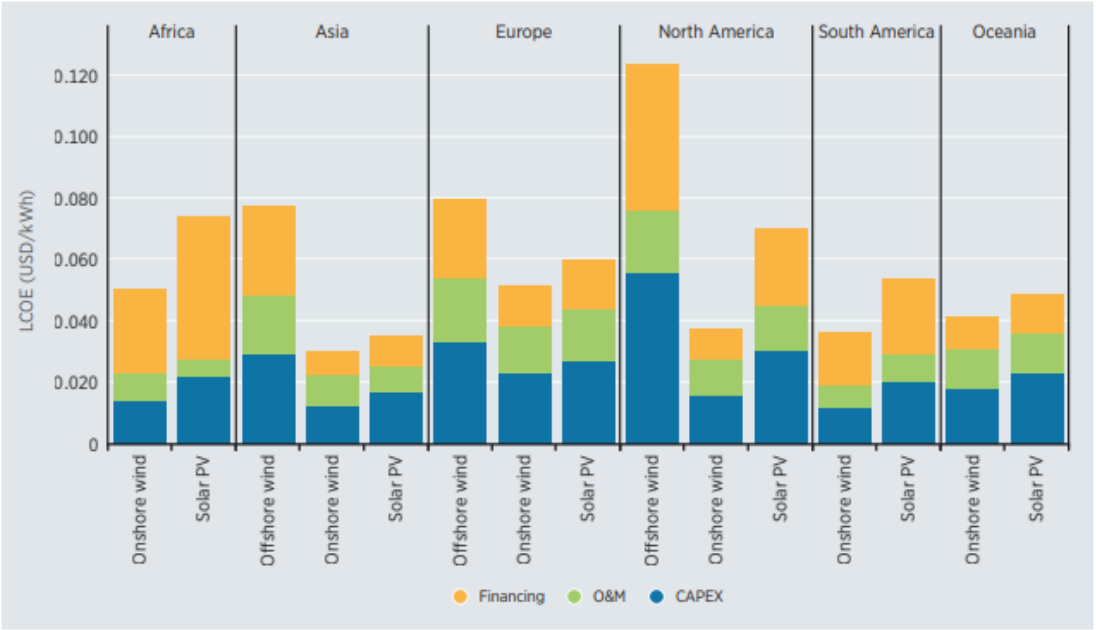
Absence of an adequate external support system: Even where enterprises are aware of the challenges that lie ahead, or of the business opportunities that these open up for them, they do not have at hand the necessary specialized industry-support institutions to assist them.

Fragmented and ineffective policy frameworks: Government policies are not creating sufficient incentives to allow enterprises to take on and overcome the challenges ahead, or to take advantage of the business opportunities available.

Difficulties in accessing finance: Banks fail to recognize the potential of investments for resource-efficient and cleaner production, and eco-efficiency initiatives. SMEs (Small and Medium-sized Enterprises), too, have difficulty in obtaining access to conventional loans and credit. This lack of collateral often leads SMEs to be risk-averse and less willing to invest in new environmental technologies. [1]

While fossil fuel-based system costs tend to be dominated by variable fuel expenditures, renewable energy projects are characterised by relatively high upfront CAPEX (Capital Expenditure) requirements. These are typically incurred at the pre-project, construction and commissioning phases, and are recovered at a later stage over the operational lifetime of the plant. The LCOE (Levelised Cost of Electricity) of such systems is highly dependent on the time value of project cashflows, which are driven by the cost of capital.

Figure 1.12 LCOE breakdown in selected regions, 2024



Notes: CAPEX = capital expenditure; kWh = kilowatt hour; LCOE = levelised cost of electricity; O&M = operation and maintenance; PV = photovoltaic; USD = United States dollar.

Beyond country risk, several structural factors influence financing costs:

Revenue certainty

Stable offtake structures significantly reduce risk premiums. Power purchase agreements (PPAs), regulated tariffs and state-backed contracts enhance creditworthiness and lower financing costs.

Macroeconomic conditions

Inflation and rising central bank rates have increased the cost of debt globally. Higher risk-free rates and equity risk premiums (ERPs) are reflected in the WACC across countries and regions.

Policy and regulatory environment

Comprehensive fiscal support, such as the Inflation Reduction Act (IRA) in the United States, can increase investor confidence by lowering financial risk. Conversely, regulatory uncertainty or retroactive policy changes can undermine the viability of financing.

Technology risk

Established technologies such as solar PV and onshore wind attract lower cost of capital due to high maturity and performance data. Conversely, offshore wind, geothermal and biomass face higher hurdle rates owing to longer construction cycles and perceived operational risks.

Market risk exposure

Projects selling into merchant markets bear greater volatility, resulting in higher equity return expectations. For instance, merchant solar PV and wind projects are associated with higher WACC levels than their contract-for-difference backed counterparts. [4]

While NGOs have had impressive performances in the provision of green energy and advocacy of sustainable practices, they have also faced many challenges. These include financial inadequacy, poor support from the government and hostility from local communities. This situation aligns with extant knowledge of the challenges faced by NGOs in carrying out their functions in developing areas.

“Inadequate funding is our main challenge. This is because green energy projects are capitalintensive, though they later become cost-effective. It is always difficult getting the start-up capital for many of the projects”

The statement aligns with the world-acknowledged fact that **funding is the principal barrier** to green energy adoption and energy transition in general. The slow pace of energy transition in developing countries is caused by financial challenges. In the specific case of Nigeria, transitioning into green energy is proving costlier than maintaining the status quo with fossil fuel. Khan et al. opine that to address this challenge, stakeholders must enarmour the process with a robust financial system that can support and mitigate risks involved in the energy transition.

“Many local communities are averse to adopting new technologies. The pervasive lack of understanding of the benefits of green energy makes it strenuous”.

This affirms the position of literature that social and cultural barriers can affect the adoption of new technologies. It is also known that the traditional attachment to fossil fuels in developing countries such as Nigeria is a major impediment to the integration of renewable energy in local communities. Governments also slow the adoption of renewable energy. This comes to the fore in the form of bureaucratic bottlenecks and other issues in the officialdom.

“Government policies in many cases affect green energy projects negatively. In some situations, the necessary speed and flexibility to get things done are lacking. Hence, this allows for bureaucratic issues that make it difficult for noble green energy and sustainability projects to get approval”.

This shows that there are regulatory impediments to the ease of adoption of green energy in Lagos State and they can be a challenge to green energy transition, especially in areas where they are weak or non-existent. [5]

V. Introduction to the Agenda Item II: Creating Financial Mechanisms to Support Renewable Energy Startups in the Global South

A. Renewable Energy Startups in Global South

The transition to renewables is not just about new technology. The rise of renewables has engendered a new generation of local and international renewable energy entrepreneurs who are reshaping the energy sector. Their arrival reflects a dynamic shift towards more agile entrepreneurship, which is reinvigorating the energy space and helping to address otherwise unmet demand through place-based solutions. Challenged by renewable energy startups, established operators are forced to adopt more fluid business models themselves.

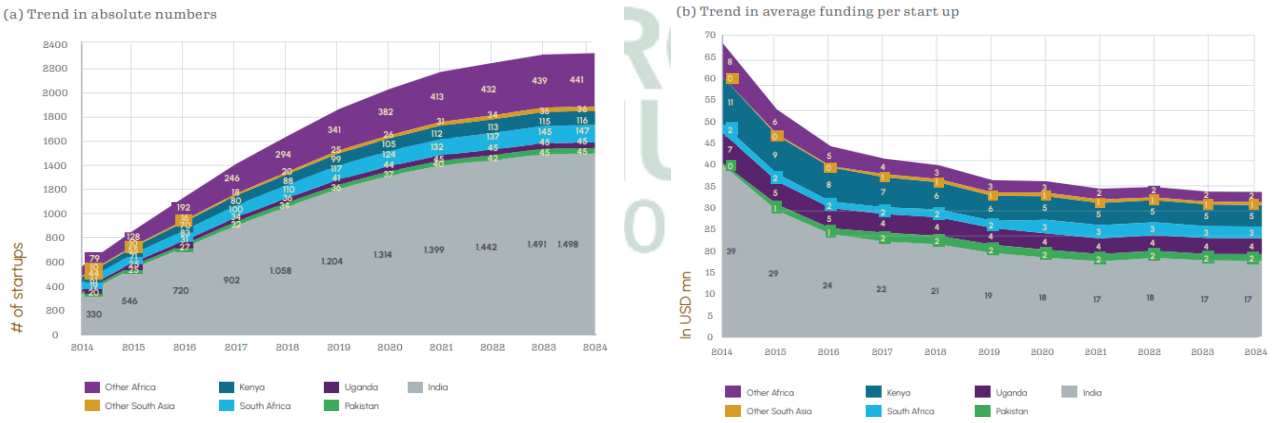
The renewable energy landscape is much more varied than traditional energy sectors. The latter were organised around economies of scale, which favoured large operators and vertically integrated solutions. Renewable energy lends itself to smaller scales of operation, greater localisation and proximity to markets. Hence there is a natural alignment of many features of this new decentralised system with bottom-up entrepreneurship.

Utility-scale companies, both local and international, prevail in regions with strong electricity demand and well-developed power grids, such as Latin America. But in less developed

markets, such as Africa, traditional energy utilities are also challenged by retail-oriented firms, local mini-grids companies and integrated energy service providers. Most of these market entrants are still small, but they are growing in number. We have identified more than 2,300 renewable energy startups – companies that have entered the energy market after 2010 – across Africa and South Asia.

The highest number of renewables startups are found in the largest economies – India, South Africa and Nigeria. Together with Kenya, these countries have also attracted the highest amount of investment, but funding levels remain low. African startups have received less than 2% of cumulative global investment in renewable energy over the past 20 years.

When analysed relative to GDP, Namibia, Lesotho, Rwanda and Kenya display the highest density of renewables startups relative to their economic size, suggesting that in the right business environment even smaller economies can become leaders in renewable energy. Uganda and Pakistan also have relatively vibrant renewable energy sectors, but in many other countries renewable energy entrepreneurship is still negligible.



The past decade has seen a steady increase in renewable energy startups, and many of the new market entrants remain active today. The average rate of closing a business is estimated

at 15.5% over the past five years (2019-2023) and 13.7% over the past ten years (2014-2023). However, the rates of market entry are leveling off. Macroeconomic and geopolitical trends, the lingering effects of the COVID-19 pandemic, and changes in funding dynamics have created a more challenging environment for new entrants. The slowdown in market entry goes hand in hand with a steady decline in the average funding per startup. The aggregate funding trend remains positive, but decreased investor confidence and concerns about startup quality have led to more conservative investment strategies. This means that an increasing number of startups are vying for the same amount of funding. Access to funding remains a binding constraint for many renewable energy firms. [6]

B. Financing Renewable Energy

Climate change poses significant risks to ecosystems, human health, and economic stability. Yet financing constraints remain one of the greatest barriers to unlocking capital at scale for climate action and achieving the Sustainable Development Goals (SDGs). Nowhere is this challenge more pressing than in developing economies.

To meet the moment, governments must not only mobilize domestic resources but also deploy innovative finance tools – such as green bonds, blended finance mechanisms, and sustainability-linked instruments – and build pipelines of bankable projects.

UNDP is also working at the forefront of this challenge. For example one of its newest tools is PISTA (Platform for Investment Support and Technical Assistance). Supported by Italy's Ministry of Environment and Energy Security, PISTA is a catalytic climate finance platform that helps translate national climate priorities into bankable investments.

Ethiopia’s small and medium enterprises (SMEs) are the backbone of its economy, yet access to finance remains a major barrier to their growth and green transition. As climate risks – like

drought and land degradation – intensify, SMEs are increasingly exposed to shocks that threaten their operations and livelihoods. Therefore, expanding access to sustainable finance is essential to help these businesses invest in resilient, low-carbon solutions that support both economic stability and climate goals.

Supported by PISTA, the Innovative Finance Lab – a joint initiative by the National Bank of Ethiopia, the Ethiopian Capital Market Authority, and UNDP – has developed the Enterprise Financing Facility (EFF), a $100 million blended finance fund-of-funds. The EFF is designed to mobilize and deploy capital into SMEs and startups, while anchoring venture capital and private equity funds that will primarily target the Ethiopian market. The initiative aims to catalyze private investment, close the financing gap, and support the country's broader economic transformation agenda. In 2024, Kuramo Capital was selected to manage the facility. PISTA's support will be key for designing a green screening and taxonomy framework for EFF, as well as for developing social and environmental guidelines aligned with UNDP standards and national regulations. This strategic support ensures that EFF investments are both environmentally and socially responsible, unlocking new capital flows for climate-smart businesses across Ethiopia. [7]

We need innovative financing for successful transition to renewable energy while leaving no one behind.

Innovative finance includes mechanisms and solutions, which increase the volume, efficiency, and effectiveness of financial flows. With traditional development finance (Official Development Assistance, ODA) falling far short of what is needed globally to finance the SDGs, particularly post-COVID-19, new financing mechanisms and solutions are essential if we are to succeed. New partnerships, enhanced roles and institutional capacity

will be required for governments, central banks, private finance, development actors and academia to succeed and sustain action.

With estimates on financing the SDGs globally, in the region of US$3.3trn to US$4.5trn per year and for developing countries alone facing an average annual financing gap of about $2.5 trillion, the onus on innovative financing as a mean to bridge this gap is high, particularly at traditional (ODA) financing flows of US$160 billion per annum.

Some examples of early innovative finance mechanisms and solutions include:

Solidarity Levies applied to airline travel with a small tax added to airline tickets.

Advance Market Commitments (AMC) are where donors commit to guarantee the price of vaccines once developed and so reducing the uncertainty and prospects for creating a sustainable market.

Emissions and particulate trading (cap and trade) is used to cap the carbon emissions by developing a market for the sale of emissions licences.

While innovative finance flows will have increased substantially since 2013, they remain below their potential. Given the size of the SDG funding gap of developing countries, advancements in new mechanisms and solutions will need to take place quickly. [8]

VI. Questions to Address

1. What incentives (e.g., subsidies, tax breaks) can governments implement to encourage industrial sectors to adopt renewable energy?
2. How can developing economies accelerate industrial decarbonization?
3. What role can regional organizations play in this transition?
4. How should UNIDO balance economic growth and environmental goals?

5. How can risks be mitigated to attract private investment?
6. What role can international donors and development banks play in financing startups?
7. How can we fund green transition besides traditional funding systems?

VII. Further Reading

Selected examples of UNIDO's work in the field of renewable energy

https://www.unido.org/our-focus/safeguarding-environment/clean-energy-access-productive-use/renewable-energy/selected-projects-worldwide

Financing the Green Transition: How UNDP's PISTA is Helping Countries Turn Climate Ambition into Action

https://www.undp.org/romecentre/blog/financing-green-transition-how-undps-pista-helping-countries-turn-climate-ambition-action

Partner on board to manage a $100M fund facility for Ethiopian startups and SMEs

https://www.undp.org/ethiopia/news/partner-board-manage-100m-fund-facility-ethiopian-startups-and-smes

Firms and banks to benefit from early adoption of green policies, ECB's economy-wide climate stress test shows

https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210922~59ade4710b.en.html

Innovative Financing Mechanisms and Solutions

https://www.un.org/sites/un2.un.org/files/innovative_fincancing_14_march.pdf

What are NCPCs?

https://www.unido.org/our-focus/cross-cutting-services/partnerships-prosperity/networks-centres-forums-and-platforms/national-cleaner-production-centres-ncpcs-networks

Technology and Innovation Report 2023

https://unctad.org/system/files/official-document/tir2023_en.pdf

Why financing development starts with effective governance

https://www.undp.org/blog/why-financing-development-starts-effective-governance

How clean energy is transforming Asia and the Pacific

https://www.undp.org/stories/how-clean-energy-transforming-asia-and-pacific

The Renewable Energy Entrepreneurs of the Global South

https://www.smithschool.ox.ac.uk/sites/default/files/2024-11/The-renewable-energy-entrepeneurs-of-the-Global-South.pdf

Technology and innovation for cleaner and more productive and competitive production

https://unctad.org/system/files/official-document/dtltikd2023d2_en.pdf

Renewable Power Generation Costs in 2024

https://tecsol.blogs.com/files/irena_tec_rpgc_in_2024_2025.pdf

Key COP29 Outcomes

https://www.woodwellclimate.org/key-cop29-outcomes/

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