UNEP

STUDY GUIDE

POWER OF THE PAST
PEOPLE OF THE FUTURE

GITO MUN

TABLE OF CONTENTS

1. Letter from Secretary General

Most Esteemed Participants,

I, the Secretary-General of GITOMUN'24, am deeply honoured and privileged to welcome you to the seventh edition of our Model United Nations conference which will take place on 21-22-23-24 November 2024. I am delighted to see our journey continue as much as you, growing stronger each year to provide participants a conference that is fulfilling every aspect. From the earliest stages of planning, our academic and organizational teams have been working relentlessly to ensure that GITOMUN'24 upholds the high standards and enriching experiences that have come to define our conference. Our seventh edition marks not only a continuation but an evolution of what we aim to achieve, harnessing **the power of the past** to empower **the people of the future**.

This year, we are proud to host eight diverse committees, each providing a platform to delve into the pressing issues facing our world today. We are offering seven committees in English: the World Trade Organization (WTO), the United Nations Environment Programme (UNEP), the Disarmament and International Security Committee (DISEC), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Maritime Organization (IMO), the International Court of Justice (ICJ), and the Joint Crisis Committee (JCC). Additionally, we are honoured to present our sole Arabic committee: جامعة الدول العربية (the Arab League.)

In the light of reuniting for GITOMUN'24, we are lectured by the wise words of a world peace advocate: "If the United Nations is to survive, those who represent it must bolster it, those who advocate it must submit to it; and those who believe in it must fight for it."

On behalf of the entire GITOMUN'24 team, I wish you all a fruitful, challenging, and rewarding experience. May this conference inspire you to continue your journey as advocates for peace, justice, and equality.

Welcome to the seventh edition of our Model United Nations. Let us make it a memorable one.

Yours in service,
Secretary-General
Meryem Sönmez

2. LETTER FROM THE UNDER- SECRETARY GENERAL

Honorable Delegates,

It is my pleasure to welcome you to GITOMUN'24. The global community faces an unprecedented challenge: how to achieve sustainable development that meets today's needs without compromising the ability of future generations to meet their own. This is a complex endeavor that requires coordinated action, progressive policy shifts, and an unwavering commitment to a greener, more sustainable future.

Our agenda item, Promoting Sustainable Development and Transitioning to a Green Economy, addresses one of the most pressing concerns of our time. Traditional economic models, focused largely on growth without sufficient regard for environmental impacts, have accelerated resource depletion, biodiversity loss, and climate change. A green economy, in contrast, integrates environmental sustainability with economic resilience and social equity. It prioritizes low-carbon development, resource efficiency, and social inclusion—elements that are crucial for sustainable prosperity.

This committee session provides a unique opportunity for member states to collaborate and share solutions. I urge you to consider not only the environmental but also the economic and social dimensions of this transition. Key areas for discussion may include innovative financing mechanisms, incentives for green technology, sustainable trade practices, and strategies to reduce dependency on fossil fuels. Let us also focus on equitable transitions that empower developing nations and vulnerable communities, ensuring that no one is left behind.

As delegates, you have a crucial role to play in shaping the policies and frameworks that will drive sustainable development for decades to come. Together, let us forge a path toward a future where economic growth harmonizes with the health of our planet and well-being of our people.

I look forward to your insightful discussions and commend your dedication to this essential cause.

Sincerely,

Emir Elhatip

Under-Secretary-General for the United Nations Environment Programme (UNEP)

3. INTRODUCTION TO THE COMMITTEE

The United Nations Environment Programme (UNEP) was established in 1972 as the leading global environmental authority within the United Nations system. Its mission is to promote sustainable development, address environmental challenges, and support countries in implementing environmentally sound policies. UNEP works across key areas such as climate change, biodiversity, pollution, and resource management, collaborating with governments, private sector stakeholders, and civil society to create a sustainable future. By providing scientific expertise, policy advice, and capacity-building initiatives, UNEP plays a central role in guiding global efforts to protect the planet and foster a green economy that benefits both people and the environment.

4. INTRODUCTION TO THE AGENDA ITEM

The transition to a green economy is essential to achieving sustainable development and addressing the climate crisis. With rising environmental challenges, countries are increasingly focused on adopting eco-friendly practices that reduce carbon emissions, conserve resources, and promote social well-being. This agenda item seeks to explore policies, financial mechanisms, and technological advancements that can drive this transition, while ensuring economic growth and improving quality of life worldwide. Delegates are encouraged to discuss innovative solutions, collaborative frameworks, and actionable strategies to support a global shift toward a sustainable, resilient future.

5. KEY TERMINOLOGY AND DEFINITIONS

Interconnection Standards: Rules for connecting renewable energy sources (like solar or wind) to the main electricity grid.

Electrolysis: A process that uses electricity to split water into hydrogen and oxygen, often used to produce clean hydrogen fuel.

Decarbonization: The process of reducing carbon emissions in industries, energy production, and transportation to lessen the impact on the environment.

Surcharge: An additional charge or tax added to the price of electricity, often used to fund renewable energy projects.

Portfolio: A collection or range of investments or projects, in this context referring to various sources of renewable energy.

Modularity: The quality of a system to be easily expanded or customized by adding separate, compatible components.

Resilience: The ability of the energy grid to adapt, recover, and function reliably, even during disruptions or extreme conditions.

Infrastructure: The basic physical systems and structures needed for energy production and distribution, like power plants and transmission lines.

6. SUSTAINABLE DEVELOPMENT GOALS

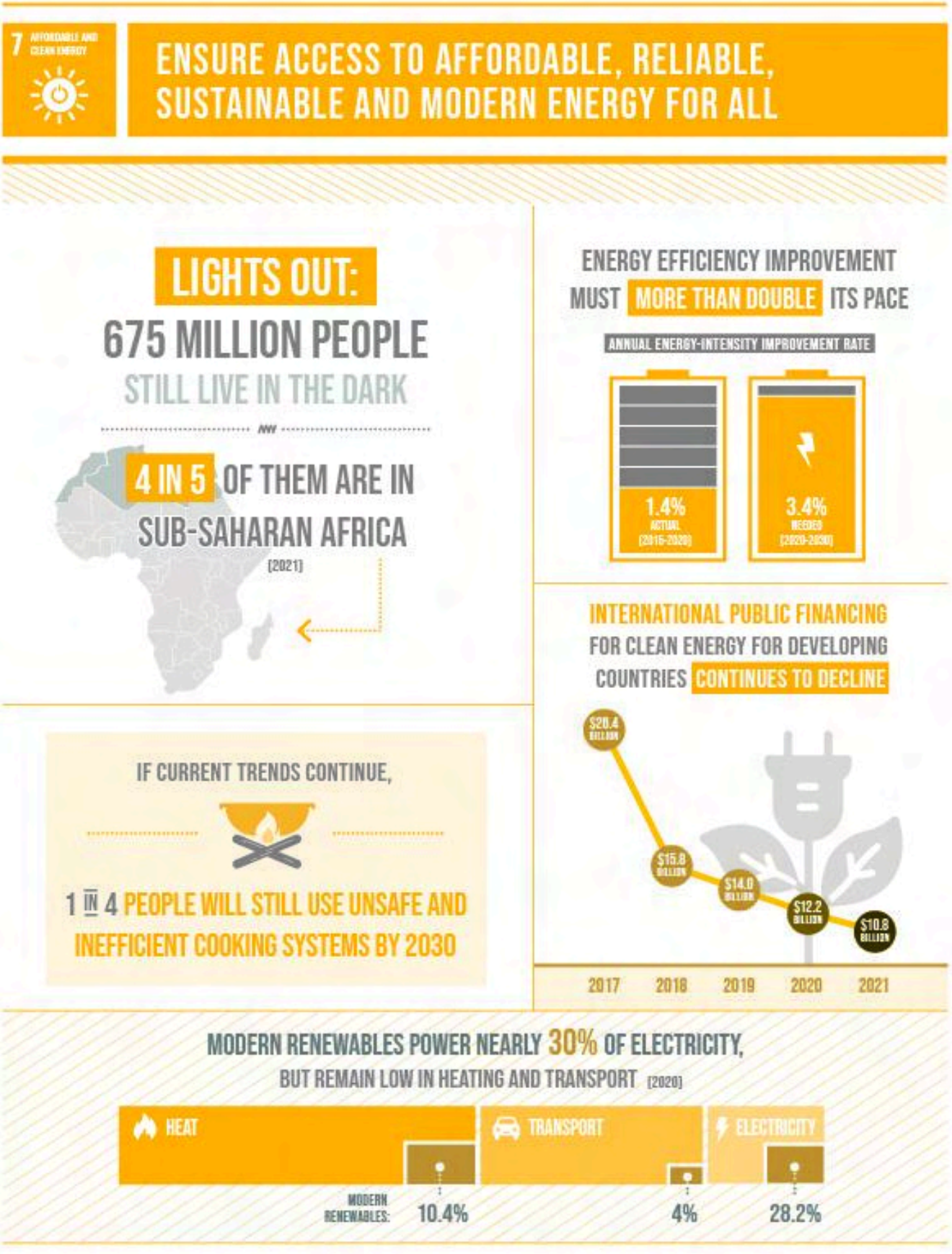
In 2015, the United Nations adopted 17 interconnected global goals to achieve the 2030 Sustainable Development Agenda. These goals mainly have the intention of eradicating poverty, enabling the advancement towards a prosperous society, and preserving the natural resources of the planet.

Each goal comes with a set of targets to be achieved within a certain time frame.

Achieving these goals requires an immense display of global cooperation and camaraderie between nations, civil society elements, and the private sector.

As visualized above, the Sustainable Development Goals are quite multifaceted, yet all of them ultimately have the same intention, eliminating all sorts of inequalities across the board. Although they all are interconnected, it is in our best interest to focus on a select number of Sustainable Development Goals, which are SDG #7 – Affordable and Clean Energy, and SDG #9 – Industry, Innovation, and Infrastructure.

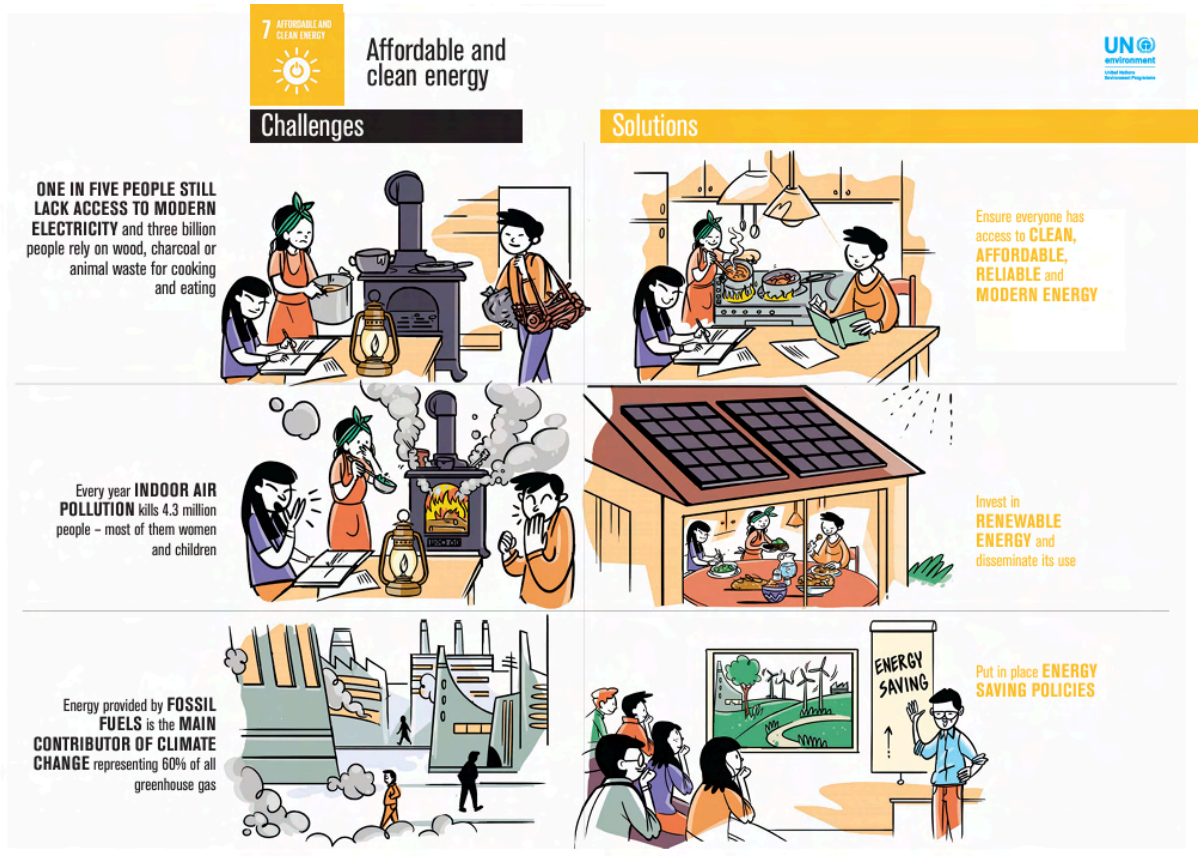
6.1. SDG #7 – Affordable and Clean Energy: Targets, Indicators, and Statistics



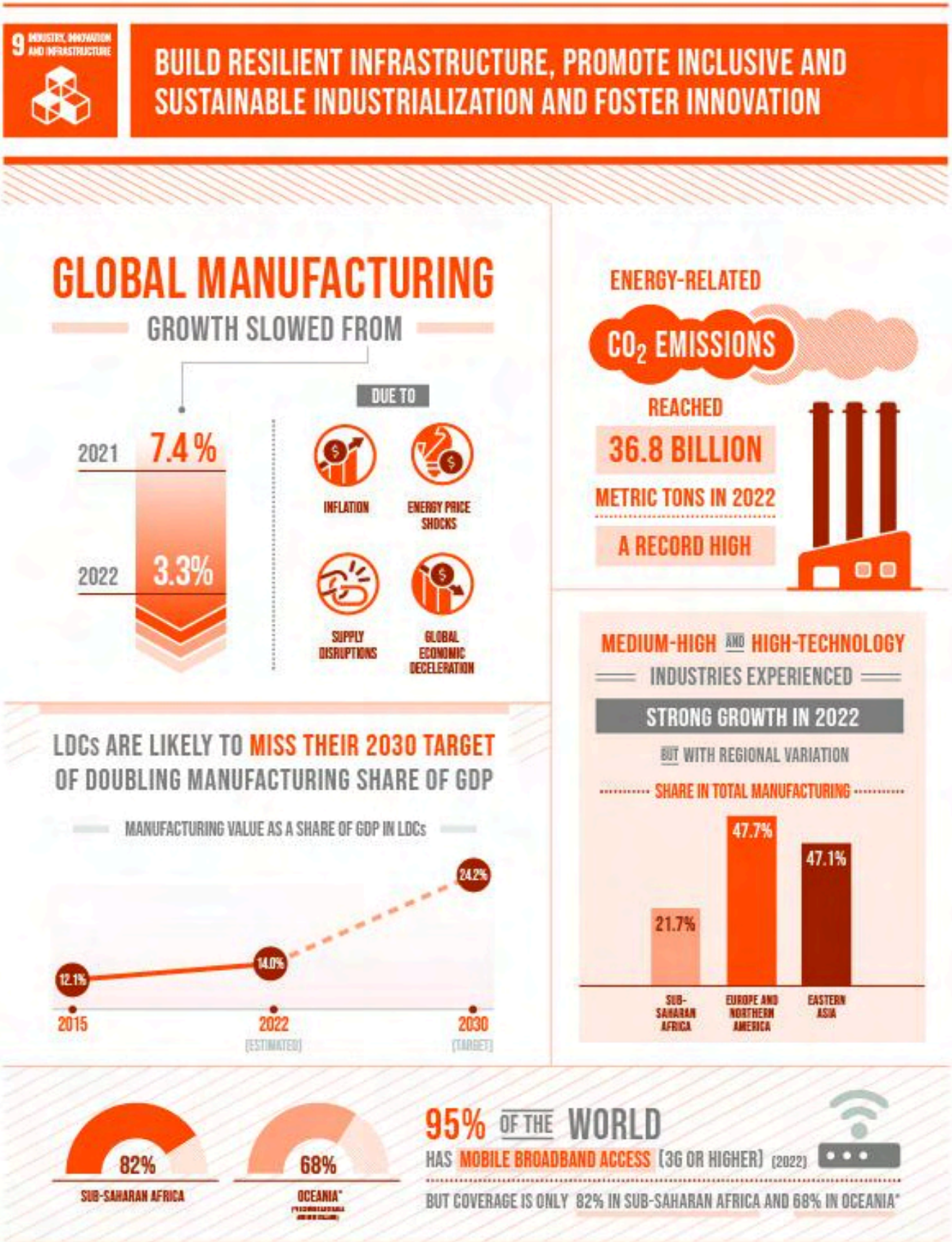
THE SUSTAINABLE DEVELOPMENT GOALS REPORT 2023: SPECIAL EDITION- UNSTATS.UN.ORG/SDGS/REPORT/2023/

SDG #7 has 5 main targets, which are as follows:

- Ensuring universal access to affordable, reliable and modern energy services.
- Substantially increasing the share of renewable energy in the global energy mix, doubling the global rate of improvement in energy efficiency.
- Enhancing international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology.
- Promoting investment in energy infrastructure and clean energy technology.
- Expanding infrastructure and upgrading technology to supply modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.



6.2. SDG #9 – Industry and Infrastructure: Targets, Indicators, and Statistics



SDG #9 has 8 main targets, which are as follows:

- Developing quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all, promoting inclusive and sustainable industrialization.

- By 2030, significantly raising industry's share of employment and gross domestic product, in line with national circumstances, and doubling its share in least developed countries, increasing the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets.

- Upgrading infrastructure and retrofitting industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities, enhancing scientific research, upgrading the technological capabilities of industrial sectors in all countries, in particular developing countries.

- By 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.

- Facilitating sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States.

- Supporting domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.

- Significantly increasing access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2030.

7. PAST IMPLEMENTATIONS AND LEGISLATIONS

7.1 Kyoto Protocol

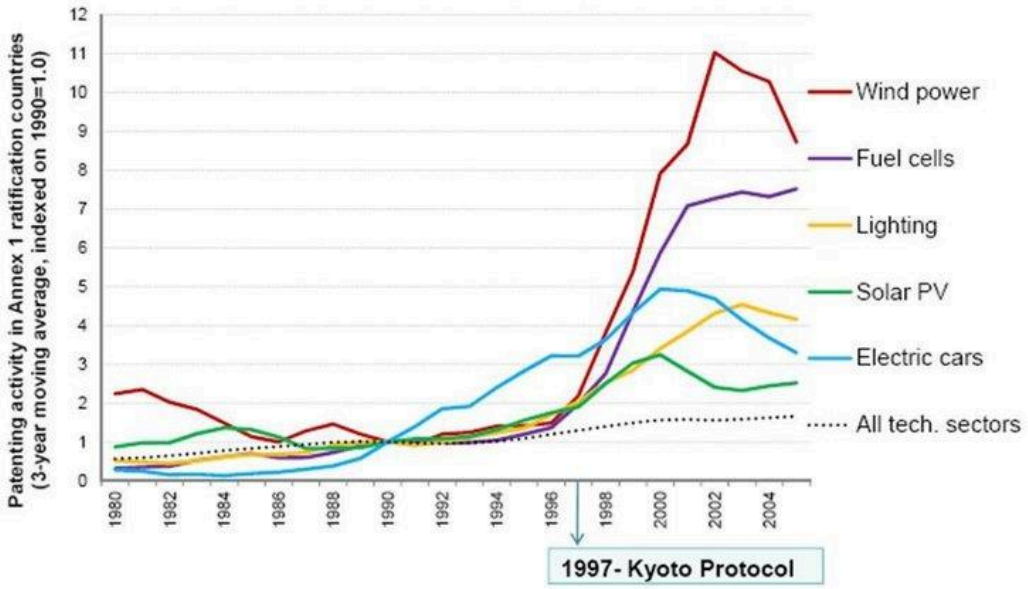
It was accepted at the 3rd Conference of the Parties (COP3) held in Kyoto in December 1997 and entered into force in 2005. Our country became a party to the Protocol in 2009. 191 countries and the European Union are parties to the Kyoto Protocol, which entered into force on February 16, 2005.

The protocol aims to share the burden of the UNFCCC. The main difference between them and a framework contract is that it is legally binding. The details of the protocol and its preparation for implementation were carried out at the 7th Conference of the Parties (COP7). The protocol placed more responsibilities on developed countries. UNFCCC ANNEX-1 countries, which are obliged to reduce or control the increase in emissions, constitute the ANNEX-B list of the Protocol. The aim of the Protocol is to reduce the total greenhouse gas emissions of Annex B countries to 5% below the 1990 level in the first commitment period between 2008 and 2012. . The second commitment period of the Protocol is determined as 2013-2020. In the second commitment period, it was decided that the countries in the Annex B list would reduce their emissions by at least 18% in 2020 compared to 1990. The USA, Japan, Russia and New Zealand did not take part in the second commitment period.

Countries that are party to the Protocol other than Annex B countries are called Non-Annex countries and they do not have numerical obligations for greenhouse gas emission reduction.

Since the Kyoto Protocol will expire in 2020 and none of its provisions could be fully implemented by the party countries, a new agreement was needed and the Paris Agreement was accepted for the period after 2020.

Carbon emission is one of the main problems that concern the whole world. 2.5 billion tons of carbon emissions occur every year from power plants in America alone. China follows it with 2.4 billion tons.



Source: OECD (2010), *The Invention and Transfer of Environmental Technologies*

Kyoto Protocol; It imposed some sanctions on the states, although they were not mandatory. Some investments had to be made within the scope of these sanctions. With these very expensive investments, it was expected that harmful gasses would be kept at the level before 1990. What needs to be done according to the protocol;

- Reducing the amount of harmful gasses affecting the atmosphere to 5%
- Reducing greenhouse gasses caused by industry, traffic and heating
- Environmentalism is at the forefront in many sectors, including industry
- Using minimum energy for heating and production
- Turning to alternative energy sources
- Evaluation of natural fuel options instead of fossil fuels
- Incorporating advanced waste systems in factories that require high energy, such as cement and steel

- Using better carbon filtration systems in thermal power plants

- More investment in nuclear and solar energy

- Collecting more taxes from businesses whose fuel consumption is above a certain limit compared to others.

Kyoto Protocol; It ended in 2020. The countries that signed this protocol could not fully fulfill their commitments. However, new steps are not being taken regarding global warming. The Paris Climate Agreement, signed by 196 countries in 2016, is a new agreement for global greenhouse gas emissions. This agreement aims to reduce the global temperature below 2 degrees Celsius; On the contrary, the Kyoto Protocol covers all countries in the world, not just developed countries.

We see that there are many agreements made for a better world. However, the dependence on fossil fuels is also obvious. Fossil fuels have a huge share in carbon emissions. Carbon emissions are rapidly changing climates. Pollution in seas and oceans, environmental pollution, deforestation and many other factors reduce carbon dioxide absorption.

7.2. Paris Agreement

The Paris Climate Agreement is an agreement with the participation of different countries. The Paris agreement aims to strengthen efforts to prevent the climate crisis. This agreement aims to reduce global temperature rise to pre-industrial levels. The current version of the process within the scope of the United Nations Framework Convention on Climate Change started in 2020. The language and articles of the agreement are based on the United Nations climate change conference held in Paris in 2015. It contains articles decided upon at this conference and approved unanimously. The agreement was designed to prevent the possible negative consequences of global climate change. The main goal; It is stated that the aim is to keep the global temperature change below 2 degrees Celsius, which is the pre-industrialization levels, and to limit this increase to 1.5 degrees.

What's the difference between 1.5 and 2 degrees?

Data presented by the Intergovernmental Panel on Climate Change (IPCC) emphasize that a 1.5°C warming would be relatively safer than 2°C. According to the IPCC, the flood risk, which is expected to increase by 100% when the average surface temperature increases to 1.5, will reach 170% with a 2°C warming. Additionally, the number of people exposed to severe drought could rise to 350 million with a 1.5°C increase and 410 million with a 2°C increase. Extreme heat waves can affect 28% of the world's population instead of 9%. However, it is known that every 0.5°C increase will further reduce crop productivity in agriculture.

If the global average temperature increase exceeds 2 degrees, there will be devastating consequences that will directly affect human life.

The signing date of the Paris Climate Agreement is 2015. It entered into force 1 year after this signature process. As of March 2021, there are 191 member countries. The long-term goals of the Paris Climate Agreement include controlling temperature and global average temperature increases. According to the Paris Climate Agreement, signatory member countries must regularly report what kind of contribution they have undertaken to reduce global warming. This report should also state their planning and financing. Scientists state that controlling the temperature increase will significantly reduce the possible effects and risks of climate change. To achieve this goal, emissions and greenhouse gases must be controlled, inspected and regulated. Some countries have to be more responsible in this agreement due to their emissions. But this does not mean that a clear calculation is possible.

In the light of the latest data published, it is stated that 50 percent of global emissions belong to China, the USA, the European Union and India. Türkiye is among the top 20 countries with the most emissions in this list. The countries that have been more responsible in historical terms are considered to be the USA, Russia and European countries, originating from the Industrial Revolution. On the per capita emissions side, the USA and China are at the forefront.

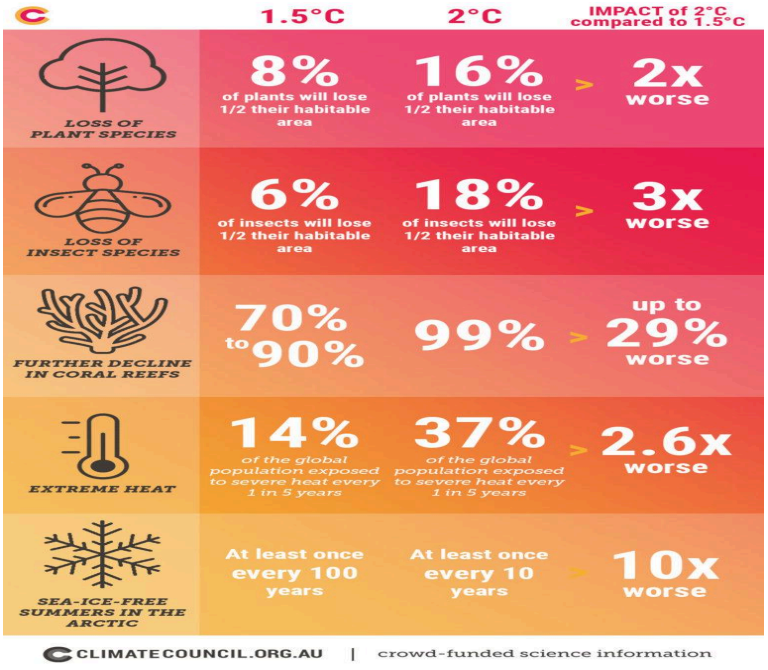
The Paris Climate Agreement came into force in 2016. The articles of this agreement develop and change over time. Today's most current Paris Climate Agreement articles are basically to keep the global temperature increase under control and prevent climate change. It also aims to complete the adaptation process of countries against all possible problems that may be caused by

climate change. These articles, designed to increase climate resilience, also include important issues on the financial flow side. The prominent article among the goals of the Paris Climate Agreement is as follows:

‘’The purpose of the Paris Climate Agreement is; to ensure sustainable development and to end poverty caused by non-sustainability.’’

This item is very important for many countries. Because development affects the future, economy, peace and many other issues of countries. At the same time, greatly reducing poverty, hunger and health problems is a very important issue for the whole world. However, the articles of the agreement also include:

- The global average temperature increase should be kept below 2 degrees.
- This temperature is the value that existed before industrialization.
- Member countries that have signed the agreement must adapt to the negative effects of climate change.
- Climate resilience should be increased.



7.3. Glasgow Pact

The 2021 United Nations Climate Change Conference, commonly known as COP26, is an organization held in Glasgow, Scotland, between 31 October and 12 November 2021, with the participation of 197 countries with the aim of reducing global warming and greenhouse gas emission rates.

It was the third conference held after the Paris Agreement came into force. For this reason, it is also called COP26 and CMA3.

Here are the key points that delegates agreed on:

- **Emission Reduction**

Current national plans to reduce emissions by 2030, also known as the National Contribution Statement, are insufficient to limit the temperature increase to 1.5 degrees. According to an analysis published during the negotiation process, current plans would lead to catastrophic warming of 2.4 degrees.

At the summit, only one major emitter – India – reported a new national contribution declaration. Therefore, the task of bringing the declarations into line with the 1.5 degree target was left until after Glasgow.

But under the 2015 Paris Agreement, nations must renew their targets every five years, and 2025 is set to discuss national declarations covering the period beyond 2030. Adhering to this timeline could push warming beyond 1.5 degrees. That's why one of the key goals for UK homeowners was to chart a roadmap for earlier revisions.

This goal has been achieved: the issue of reviewing National Contribution Declarations will be on the agenda of next year's COP27 in Egypt and the following year's COP28.

This gives countries that want higher targets for emissions cuts significant leverage to get countries that are lagging behind to step up. Glasgow would not be the final point in the fight

against the climate crisis anyway. Therefore, it is a good move to create a road map for revisions for next year (rather than years later).

- Coal

Coal is the dirtiest fossil fuel and the International Energy Agency has stated that if coal is not phased out urgently, the world will have no hope of staying within the target of limiting warming to 1.5 degrees. To achieve this goal, at least 40% of the existing 8,500 coal-fired power plants must be closed and no new power plants should be opened.

One of the most discussed issues in Glasgow was the commitment to "phase out" coal-fired electricity generation. Initially, this target was set as a "phase phase out of coal", but India insisted on the change despite demands from other developing countries.

This decision may seem hard to believe, considering that it is at the center of the dual crisis of fossil fuels. However, since the Kyoto Protocol was signed in 1997, no COP has made direct reference to fossil fuel phase-out.

This reflects fierce opposition from countries that depend on fossil fuel consumption because they produce oil and coal. Great progress was made in the meeting, which relied on consensus for all decisions taken. Even the eased commitments were welcomed as significant developments.

- **Adaptation and Climate Finance**

In 2009, rich countries pledged to transfer at least $100 billion to poor countries by 2020 to cut their emissions and combat the effects of the climate crisis. But by 2019 (the last year for which data is available) only $80 billion had been reached.

The anger of developing countries on this issue was also reflected in the negotiations. As a result, developing countries were promised that climate finance would be increased to 500 billion dollars over the next five years and the increases would be monitored. More importantly, aid recipient countries demanded that the funding be spent on adaptation rather than emissions cuts.

This development is important because existing climate finance goes to emissions-cutting projects, such as renewable energy schemes, which can be easily financed without aid because they can often be turned into a profit in middle-income countries. The poorest countries, which needed money to adapt to the effects of extreme weather events, received no funding at all.

As a result, the agreement agreed to double climate finance allocated to adaptation. The targets are still not enough, as the United Nations and some countries want emissions cuts and adaptation funds to be halved. But it is still an important step.

- **Loss and Damage**

Loss and damage refer to the ravages of the climate crisis that are too devastating to be prevented or adapted to. Such as storms, hurricanes, or inundation of low-lying areas by storm surges.

Countries have been talking about casualties and damage for several years, but negotiations have made little progress. Developing countries are already spending too much to repair the damage caused by the climate crisis by stretching their budgets, he said. But developed countries are cautious about treating the debate as a call for compensation for climate damage. Because this situation may leave them open to endless legal liability.

At the last COP, discussions progressed sufficiently to establish a database and communication and reporting system called the Santiago Network. Many developing countries hoped COP26 would go a step further with a funding mechanism for losses and damages. This expectation was not realized and the issue will be returned to negotiations in the coming years.

7.4. Katowice Climate Change Package

The 24th United Nations Climate Change Conference of the Parties (COP24), held in Katowice, Poland, between 2-14 December, went down in history as the longest climate summit.

The Katowice Climate Package, a compilation of Paris Rulebook documents, excluding rules on carbon trading, was adopted at COP 24, along with several resolutions and action items that brought minor progress in certain areas such as finance, gender, and ancient peoples. However,

looking at the overall picture, COP 24 remained far from a solution on the most fundamental issues such as increasing the target for national contributions, implementing human rights in the Paris Rulebook, and securing fair and reliable support that will help developing countries in their efforts to combat global climate change and its effects.

The Special Report on Global Warming of 1.5 degrees, published on October 8 by the Intergovernmental Panel on Climate Change (IPCC), the UN body tasked with evaluating the scientific side of climate change, gave a last-minute alarm to save the world. The main messages of the report were very clear and unwavering: Limiting the temperature increase to 1.5 degrees is only possible by halving carbon emissions by 2030 - that is, in just 11 years - and reaching "net zero" by 2050. Such radical emission cuts require massive transformations in global energy and transportation systems and the protection and restoration of natural ecosystems.

Therefore, almost 3 years after the adoption of the Paris Agreement, at the 24th Conference of the Parties (COP 24) of the United Nations Framework Convention on Climate Change (UNFCCC), which started on December 2 in Katowice, the heart of Poland's coal production.) More than 22,000 participants expressed great optimism about scaling up the targets – to reduce emissions and increase the financing needed for developing countries to implement those reductions.

1. The main purpose of COP24 was to finalize, decide and put into effect the rules and procedures on how the Paris Agreement, which entered into force in 2016, will be implemented in practice. The summit was an event in which this aim was achieved to a significant extent.

2. While countries have agreed on the rules of the Paris Agreement that provide flexibility in general terms on issues such as national contributions and mitigation, climate finance reporting, transparency, global stock reporting, losses and damages, discussions on some issues important for the implementation of the agreement, such as market mechanisms and international emissions trading, have been negotiated. left to the next peak.

3. At the climate summit, it was decided to set a new climate finance target for after 2025, with a base level of 100 billion dollars per year.

4. The Katowice Package basically includes guidance on what information countries should share in their National Contribution Declarations (NDC) on many issues such as mitigation, adaptation, financing, capacity development and technology transfer. Guidelines regarding the information that should be presented in the context of the transparency clause were defined within this package.

5. At the summit, it was agreed in principle to determine more ambitious policies and actions by going over the outputs of the facilitative dialogue process called Talanoa.

6. The World Bank has committed USD 200 billion in climate finance for the period 2021-2025.

7. Multilateral development banks declared that they would align their activities and goals with the Paris Agreement.

8. While the C40 Cities Coalition announced that it will intensify its efforts to ensure that efforts are made in line with climate targets in cities around the world, 15 international institutions announced that they will align their operations with climate targets.

8. GREEN ECONOMY MODELS

8.1. Recent Technological Advancements in Green Energy

The development in green energy systems has been quite rapid, especially after the Paris Agreement. Newly emerging technologies proved themselves quite effective at reducing carbon emissions. Additionally, implemented systems turned out to be running much smoother as well, providing more power at reduced rates of fuel. These developments paved the way for better integration of green energy systems, dramatically increasing the amount of sustainable energy sources. Overall, it is evident that the energy scene went through a massive transformation, towards a brighter, greener future.

Solar Power: Improved Solar Panel and Solar Cell Designs

Halide perovskites are a family of materials that have shown potential for high performance and low production costs in solar cells. Perovskite solar cells have shown remarkable

progress in recent years with rapid increases in efficiency, from reports of about 3% in 2009 to over 25% today. Bifacial solar panels, the reversible fashion accessory of the solar industry, are double-sided panels that absorb solar energy from both sides. Tests by solar manufacturers have found these panels can generate 11% to 23% more energy than their monofacial or single-sided counterparts.

Wind Energy: Offshore Wind Farms

The development of offshore wind farms, particularly in deeper waters, has expanded the potential for wind energy generation. Moreover, advanced wind turbine designs, such as vertical-axis turbines, are more efficient and can capture wind energy from any direction, increasing their usability in various environments.

Energy Storage: Redox Flow Batteries

Unlike conventional batteries (which are typically lithium-ion), in flow batteries the liquid electrolytes are stored separately and then flow (hence the name) into the central cell, where they react in the charging and discharging phase. The durability of the stored energy allows for periods of many hours - such as nighttime - to be covered without electricity production from any source. Furthermore, raw materials are used that are common or at least don't have particular supply problems: for example, the most mature technology, and currently the most widely used industrially, features vanadium, of which there are significant known mineral reserves in Norway and Finland. The use of raw materials is further reduced on account of their easy recyclability, and this becomes a negligible issue in the case of emerging technologies based on iron, zinc or organic electrolytes. Last but not least, flow batteries can be compactly and modularly allocated, provide high safety as there is no risk of fire, and they have a service life of at least 20 years because there is minimal degradation.

Hydropower: Flexible Production Rates on Hydropower Plants

Developing systems allow for hydropower to be harvested from even the smallest or the stillest water sources. Additionally, due to the utilization of advanced pumping techniques, hydropower plants are much safer and the electricity production per hour can be altered to serve for a wider variety of loads on the grid.

Geothermal Energy: Better Utilization of Underground Resources

Technological advancements allow for the utilization of low-temperature water reservoirs to be utilized for geothermal energy generation. Moreover, a new technique allowing the injection of heated water into rocks to create large fissures deep underground provides a much higher energy conversion rate for geothermal energy plants.

Bioenergy: Developments in Algae Processing

Advances in algae cultivation and processing have made biofuels a more sustainable alternative to fossil fuels. Improved technologies for converting organic waste into biogas or electricity have made waste-to-energy systems more efficient and environmentally friendly.

Smart Grids: Better Integration of Renewable Energy Sources

Smart grids are electricity networks that use digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end users. Smart grids coordinate the needs and capabilities of all generators, grid operators, end users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimizing costs and environmental impacts while maximizing system reliability, resilience, flexibility, and stability. Most of the technologies involved have already reached maturity, and so tracking investments provides insights on levels of deployment.

Hydrogen Economy: Electrolysis and Liquid Hydrocarbons

Electrolysis using renewable energy sources to produce hydrogen is gaining traction as a clean fuel source for various applications, including transportation and industrial processes. Hydrogen may be the only link between physical energy from renewable sources and chemical energy. It is also the ideal fuel for modern clean energy conversion devices like fuel cells or even hydrogen engines. But hydrogen is not the ideal medium to carry energy from primary sources to distant end users, which is where liquid hydrocarbons come in. Liquid hydrocarbons allow a much-reduced loss of energy during transportation, therefore are much more efficient than their hydrogenic counterparts.

8.2. Economies of Scale: State Approach to Green Energy

Governments use a variety of financial approaches to green energy systems.

Renewable Portfolio Standards

A renewable portfolio standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum percentage (or absolute amount) of customer demand with eligible sources of renewable electricity.

Many states have adopted RPS requirements because they are an efficient, cost-effective, market-based approach to achieving renewable electricity policy objectives. RPS requirements can be used in both regulated and restructured electricity markets. States have tailored their RPS requirements to satisfy particular state policy objectives, electricity market characteristics, and renewable resource potential. Consequently, there is wide variation in RPS rules from state to state regarding the minimum requirement of renewable energy, implementation timing, eligible technologies and resources, and other policy design details.

Public Benefits Funds for Renewable Energy

Public/system benefit funds are commonly supported through a very small surcharge on electricity consumption (e.g., $0.002/kWh)[6] to ensure continued support for renewable energy and low-income energy programs. This charge is sometimes referred to as a “system benefits charge” (SBC). Public/system benefit funds commonly support rebate programs, loan programs, research and development, and energy education programs.

Output–Based Environmental Regulations

Output-based environmental regulations (OBR) regulate emissions in relation to the energy output of a process (e.g., electricity generation or steam production) rather than the material inputs used in the process (e.g., fuel burned). OBRs use units of measure such as pounds of pollutant emitted per megawatt-hour generated (lbs/MWh) or pounds of pollutant emitted per unit of steam generated, rather than pounds of pollutant emitted per unit of fuel burned (lbs/MMBtu) or pollutant concentration (ppm).

Interconnection Standards

Interconnection standards are processes and technical requirements that delineate how electric utilities in a state will treat renewable energy sources that need to connect to the electric grid. The establishment of standard procedures can reduce uncertainty and delays that renewable energy systems can encounter when obtaining electric grid connection in states that have not established interconnection standards.

Net Metering

Net metering is an electricity billing mechanism that allows consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. This is particularly important with renewable energy sources like wind and solar, which are non-dispatchable (when not coupled to storage). Monthly net metering allows consumers to use solar power generated during the day at night, or wind from a windy day later in the month. Annual net metering rolls over a net kilowatt-hour (kWh) credit to the following month, allowing solar power that was generated in July to be used in December, or wind power from March to August.

Feed–In Tariffs

A feed-in tariff is a policy mechanism designed to accelerate investment in renewable energy technologies by offering long-term contracts to renewable energy producers. This means promising renewable energy producers an above-market price and providing price certainty and long-term contracts that help finance renewable energy investments. Typically, FITs award different prices to different sources of renewable energy in order to encourage the development of one technology over another. For example, technologies such as wind power and solar PV are awarded a higher price per kWh than tidal power. FITs often include a "digression": a gradual decrease of the price or tariff in order to follow and encourage technological cost reductions.

Property Assessed Clean Energy (PACE)

PACE is a financing option that attaches the obligation to repay the cost of renewable energy installations or energy efficiency retrofits to a residential property rather than an individual borrower. This mechanism encourages property owners to invest in clean energy

improvements even if the payback period is longer than the owner intends to keep the property.

8.3. The Private Sector: Friend or Foe?

The private sector is a key driver in the transition to green energy. Its investments, innovation, manufacturing capabilities, and market competitiveness are essential for the growth and sustainability of the green energy sector. Collaboration between the private sector and governments is crucial to creating a more sustainable and environmentally friendly energy landscape.

Private sector companies are often at the forefront of green energy investments. They provide the substantial capital required for the development, installation, and maintenance of renewable energy infrastructure. This includes financing renewable energy projects, such as wind farms, solar arrays, and hydropower plants. Their investments facilitate the growth of the green energy sector.

Private sector firms are known for their capacity to innovate and develop new technologies. They invest in research and development to create more efficient and cost-effective green energy solutions. By improving renewable energy technologies, they can make them more accessible and competitive in the market.

Private companies are often responsible for manufacturing the equipment and components necessary for renewable energy production, such as solar panels, wind turbines, and energy storage systems. They play a critical role in scaling up production, reducing costs, and ensuring a steady supply of green energy technology.

Private sector energy companies often operate the distribution networks and provide energy services to consumers. They can play a pivotal role in integrating renewable energy sources into the existing energy infrastructure, ensuring a reliable and efficient supply of green energy to homes and businesses.

Private sector competition drives innovation and cost reduction. As companies seek to gain a competitive edge in the green energy market, they invest in improving the efficiency and

affordability of renewable technologies, making them more attractive alternatives to fossil fuels.

The private sector's engagement in green energy projects leads to job creation. As the green energy sector grows, it generates employment opportunities in manufacturing, construction, maintenance, research, and development. This contributes to economic growth and a transition to a more sustainable economy.

Private companies are often multinational and have the resources and expertise to invest in green energy projects worldwide. Their global reach enables the expansion of green energy solutions, not only in developed countries but also in emerging economies, where access to clean energy is a critical need.

The private sector can collaborate with governments to establish policies and incentives that promote green energy adoption. Public-private partnerships can drive the development of favourable regulatory environments, subsidies, tax incentives, and other mechanisms that support the growth of the green energy sector.

Private sector companies can raise awareness and educate consumers about the benefits of green energy and energy efficiency. This can lead to increased demand for green energy solutions and a more environmentally conscious society.

Many private sector organizations are recognizing the importance of corporate social responsibility and are committing to reducing their carbon footprint. This commitment can drive internal efforts to adopt green energy and inspire other businesses to do the same.

8.4. Globalization of Markets & the Consumerism Dilemma

Globalization of markets is a very multi-faceted topic that is open to interpretations, except one single fact. The ability to influence markets beyond a company’s domestic borders turned competition in the worldwide market into a blood sport. Due to constant competition in the markets, corporations need to continuously improve both their goods and their customer service as stagnancy ends in obsolescence in modern times.

The spotlight on research & development efforts in technology and behavioral psychology & big-scale data studies paves the way for better utilization of technology and creates a business model that intends to ensure customer satisfaction, at any cost. In turn, constantly evolving

markets emerge. Nothing is stagnant anymore, all available products are “fresh out the oven”, however, all upgrades are merely incremental. It’s a ceteris paribus situation at all times. But that doesn’t seem to matter, because the human condition simply asks for the novel, needs the novel. Therefore, companies get away with it.

This obsession with novelty creates a consumerism problem that bears catastrophic fallouts. Resources of our planet are already at an all-time low, and the decline rate is rapidly accelerating. So, in summation, globalization of markets brings forth a dilemma that is quite easy to miss: Is constant development actually as beneficial as it appears on the surface level?

8.5. Globalized Energy Trade

Globalized markets massively transformed the landscape for energy trade. Due to constant efforts by developed countries, many multi-national and/or large-scale regional energy grids were implemented. Additionally, a trans-Atlantic energy grid was formed to connect North America to Europe in terms of energy trade. The newly formed network also doubled as development sites for offshore multi-purpose wind turbines.

Global markets now allow for countries to directly import both energy and means of energy production not only from neighbouring countries but also from across the globe. This situation creates a very competitive energy market, which essentially serves to drive down the prices for both direct-to-consumer energy provisions and importing clean energy production means like biofuel.

This much competition in the market also requires most large-scale producers to invest heavily both in research and development efforts and in customer satisfaction services as it becomes challengingly difficult for any company to thrive in such an environment where the respective market share they hold diminishes considerably day-by-day.

All these combined create an environment in which consumers are greatly valued and where progress is the sole focus of the corporate world. For example, in Scandinavian countries like Denmark, electricity production is so widespread and efficient that at times, it literally costs to have excess electricity as the load on their grids exceed the optimal amounts. Therefore, during peak hours, any and all sorts of electricity provisions in select parts of the country are totally free of charge to any consumer, whether it be a large-scale corporation or a single-family home.

In conclusion, it is fairly clear that the globalization of markets has had a very profound positive impact on energy trade. However, it is extremely important for governments, the private sector, and the civilians alike to further alleviate this transition from regional energy markets to a singular, global energy hub via all means possible.

9. PROMOTING SUSTAINABLE DEVELOPMENT

9.1. Historical Background on Sustainability Efforts

Sustainability is still a relatively-new topic in politics & economy, just like urbanization and industrialism, as they go hand-in-hand. The first concerns regarding rapid resource depletion and sustainability were raised during the early 20th century, in the form of environmental conservation movements. The movement mostly affected the United States, and focused on preserving natural resources, protecting wildlife and establishing national parks.

However, environmentalism as we know it today became the predominant norm in the mid-20th century. In the 1960s, modern environmentalism arose as both a social and a political movement. Environmentalists focused their efforts on raising public awareness, drawing attention to pollution, biodiversity loss, and ultimately rapid resource depletion.

Although past efforts were valiant and not in vain, environmentalism transcended from a “mere whimsical concern for the bourgeois” to a “global movement against a looming threat” when public displays of concerns garnered enough attention for governments to step in and take charge. Environmental governance, an array of policies adopted by most governments, became a key element to sustainable development, and allowed nations to pursue economic growth without harming the environment.

After environmentalist policies were enacted, sustainable technologies saw significant advancements. Renewable energy sources, such as solar, wind, and hydroelectric power, have become increasingly cost-competitive and widespread. Sustainable agriculture practices, green building standards, circular economy initiatives, and eco-friendly transportation solutions have also gained momentum.

Overall, we have come a long way in terms of sustainable economies, however, both governments and private practices will prioritize their bottom lines at the end, therefore it is

important to realize that this change was sparked by a few concerned citizens coming together and this flame must be constantly tended to.

9.2. Financial Concerns Regarding Sustainable Economy Models

Although green energy systems are bound to be for the greater good of both the public and the corporate scene, largely due to the environmental relief they provide over their fossil fuel counterparts, from a purely economic standpoint, they do not seem to be the optimal solution except if you only consider the very long run. This situation creates an imbalance in the interest in green energy systems as the public opinion largely favors the transition whereas governments and the private sector are far less enthusiastic in comparison to their civilian counterparts.

The first challenge in sustainable economy models is that most systems require state-of-the-art technological infrastructure, which is extremely costly to implement. Moreover, after the initial cost, these systems are also much more costly to maintain in comparison to their fossil-fuel counterparts.

Another obstacle in the trend towards sustainable economy models is that shifting from fossil fuels towards clean energy will completely disrupt the energy economy, as workers in the fuel supply-chain community will most likely lose their jobs and green businesses will struggle to replace this human capital as most tasks in green energy production require essential knowledge and training.

Finally, although sustainable economy models seem to be the trend as of now, market uncertainty is also a key factor to consider. Fluctuations in government policies, subsidies, or carbon pricing mechanisms can affect the profitability and viability of green investments, leading to uncertainty for businesses and investors.

So overall, while it is certain that sustainable economy models are a must for sustainable development, they do have their fair share of drawbacks.

10. QUESTIONS TO BE ADDRESSED

1. What are the recent advancements in green energy systems and how can developing nations adapt them into their energy infrastructure without hindering their economic growth?
2. Why are past climate change efforts practically invaluable for calculating green economy model cost analysis trajectories? (KEY)
3. What stage are most developing countries in in terms of infrastructure and industrialization efforts?
4. What advantages and drawbacks do sustainable economy models have over their fossil-fuelled counterparts?
5. Why are accountability and transparency so important for sustainable economic growth?
6. How can developing nations utilize a sustainable economy model without greatly sacrificing industrial growth?
7. How can infrastructure modernization be done so that the efforts yield a net-positive cost-benefit analysis without hindering economic growth in developing countries?
8. How does the globalization of markets affect the economies of developing nations and how can they utilize the transitioning economic scene to their benefit?
9. How can the United Nations Environmental Programme address the concerns listed in 7.2? And how can the United Nations Environmental Programme promote sustainable economy models?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