



EGYPT: ECONOMIC DEVELOPMENT AND POLICIES CONFERENCE

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Energy-The Tensions Between Renewable and Non-Renewable

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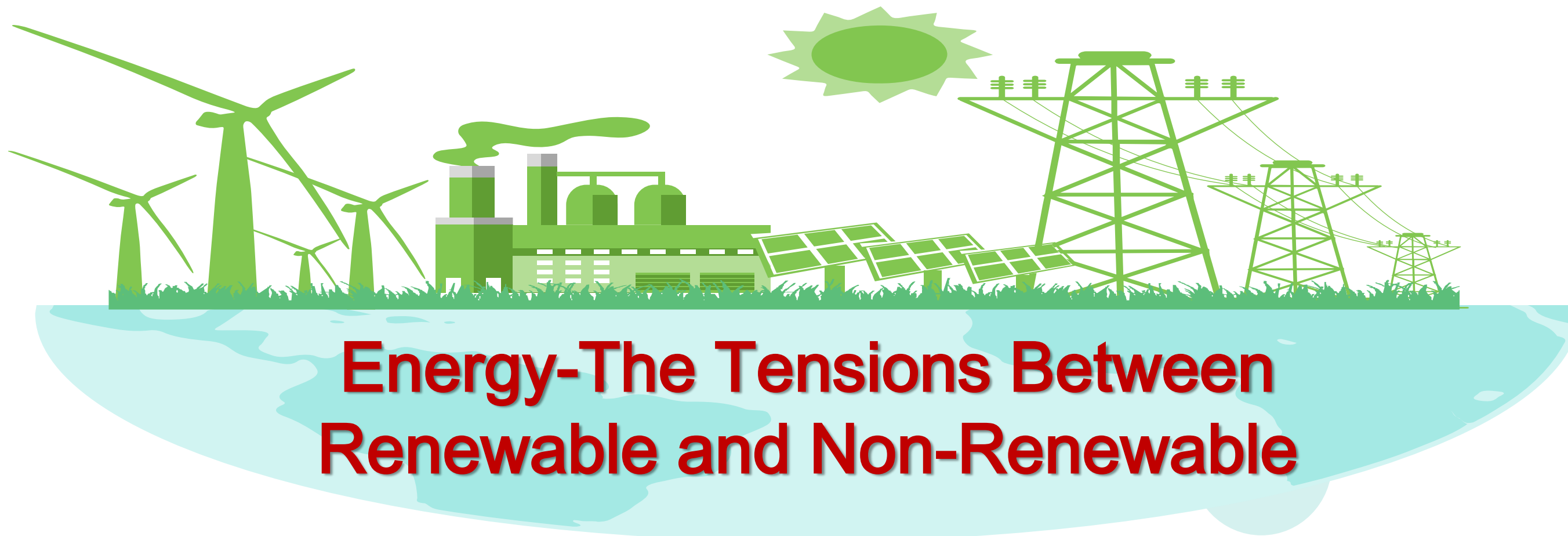
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Objective

To analyze ***Egypt's energy transition*** in a low carbon era and the tensions between renewable and non-renewable energy in moving towards the decarbonization age.



Outline

- 01 Introduction
- 02 A closer look at Egypt's energy sector
- 03 Energy pricing mechanism subsidy and its impact on Egypt's economy
- 04 Policies and challenges related to Egypt's clean energy transition
- 05 Proposed implementation mechanisms and policies for sustainable energy transition
- 06 Conclusion



1. Introduction

- Concerns regarding energy security, affordability and sustainability has been **growing** at different speeds in different regions.
- Limiting global warming and avoiding global risks related to increased global temperature calls for transitioning energy systems to **less** carbon intensive fuels.
- The growing GHG emissions due to energy-use has been a global concern and transitioning energy systems to low-carbon energy systems has been the **main theme** in energy policy.
- In the **transition** to a low-carbon economy, **renewable energy supplies** will have an essential part.



1. Introduction

- The rapid growth of Egypt has been accompanied by a **rapid increase** in usage of energy and carbon dioxide releases.
- With the **acceleration** of urbanization and the transition of economic structure, **fossil energies** have become one of the industries with the fastest growth in carbon dioxide emissions.
- Egypt's **energy sector** is the **top contributor** to these emissions, responsible for **73%** in 2020.
- Egypt's **carbon footprint** in 2021 totalled **259.3 million tonnes** (2.7 t/person) compared to 5.7 t/person in the EU and 14.3 t/person in the USA.



1. Introduction

- Following Algeria, Egypt is the **second-largest producer** of natural gas in Africa.
- Egypt is the **fourth largest holder** of gas **reserves** in Africa.
- In line with Egypt Vision 2030, the Ministry of Petroleum and Mineral Resources **structured** its actions to transform the country into an **LNG export hub**.
- Egypt has the **largest sources** of renewable energy from wind and sun in the Middle East and North Africa, which qualifies it to be one of the **largest producers** of clean energy.
- Parallel with different governments' policies and schemes, Egypt's industries are striving in the direction of energy transformation, directed by initiatives like the **Integrated Sustainable Energy Strategy (ISES)** for **2035**, and the **National Climate Change Strategy 2050** (NCCS).
- Therefore, the country is **accelerating** its steps in adopting plans to attract more foreign investments in the fields of **renewable energy** production and **green hydrogen** production.

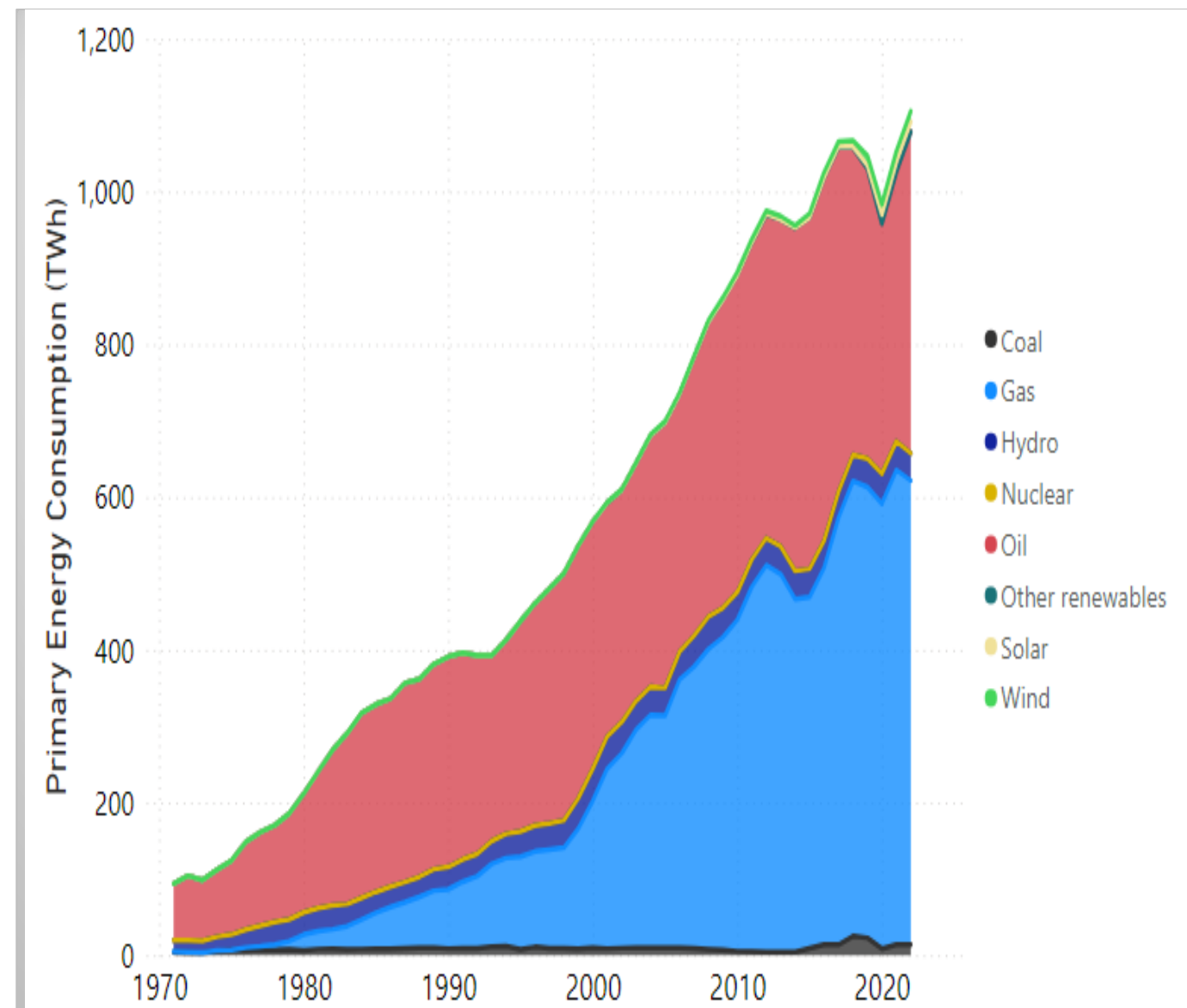


2. A Closer Look at Egypt's Energy Sector

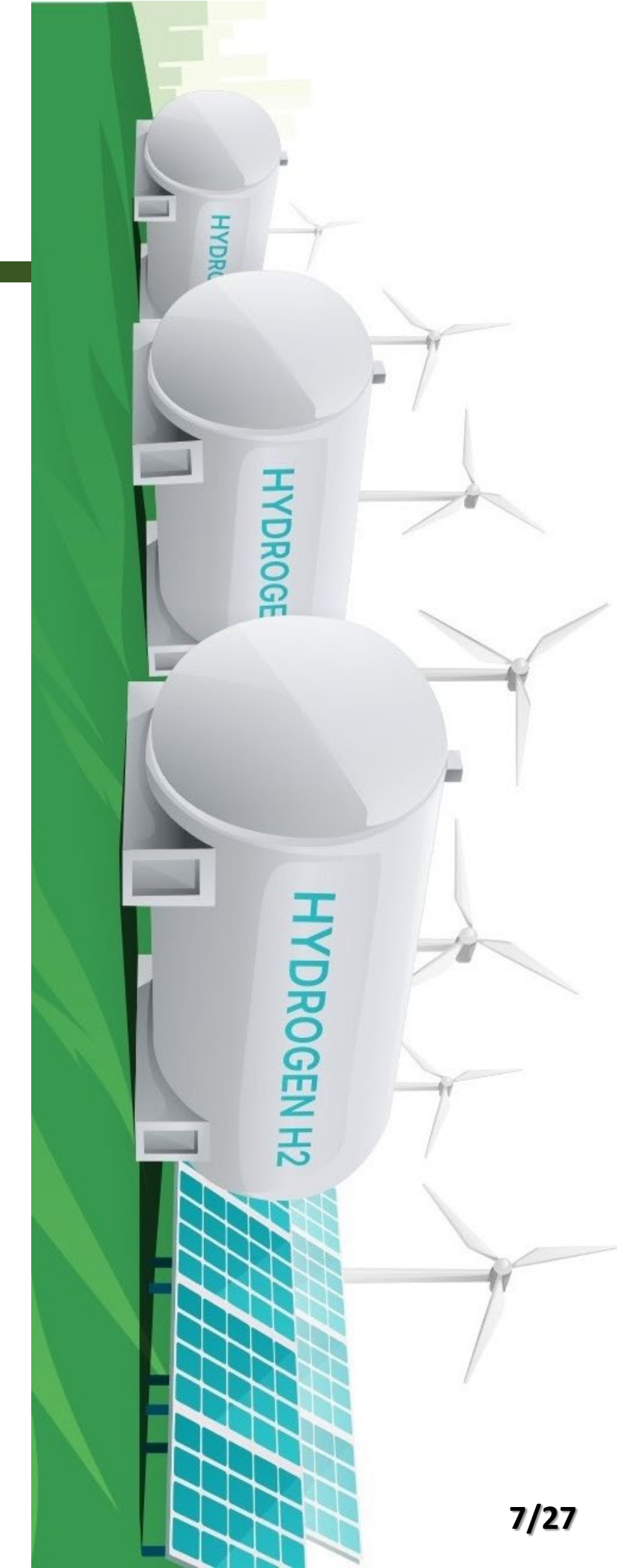
2.1. Egypt's Energy Demand

2.1.1 Primary energy demand

- Egypt's energy demand has been on **the rise** over the past 50 years driven by **increased population and urbanization**.
- The use of fossil fuels in Egypt makes up **94.3%** of the country's primary energy demand.



(Enerdata and Energy Institute Statistical Review of World Energy, 2023)

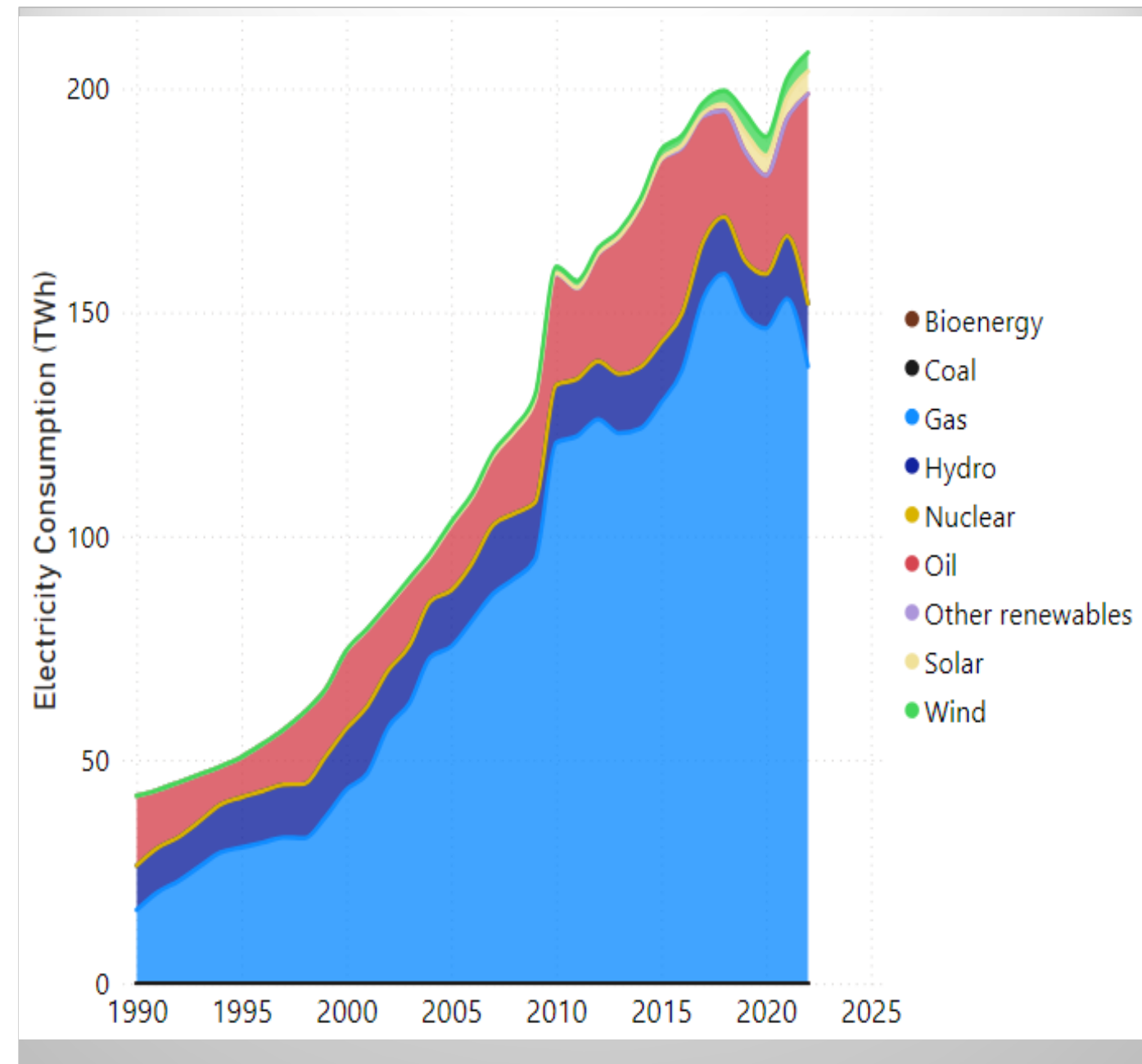


2. A Closer Look at Egypt's Energy Sector

2.1 Egypt's Energy Demand

2.1.2. Electricity generation demand

- Egypt's electricity consumption has been **on the rise** over the past three decades.
- **Fossil fuels dominate** the power generation sector accounting for **89%** of total electric generation.



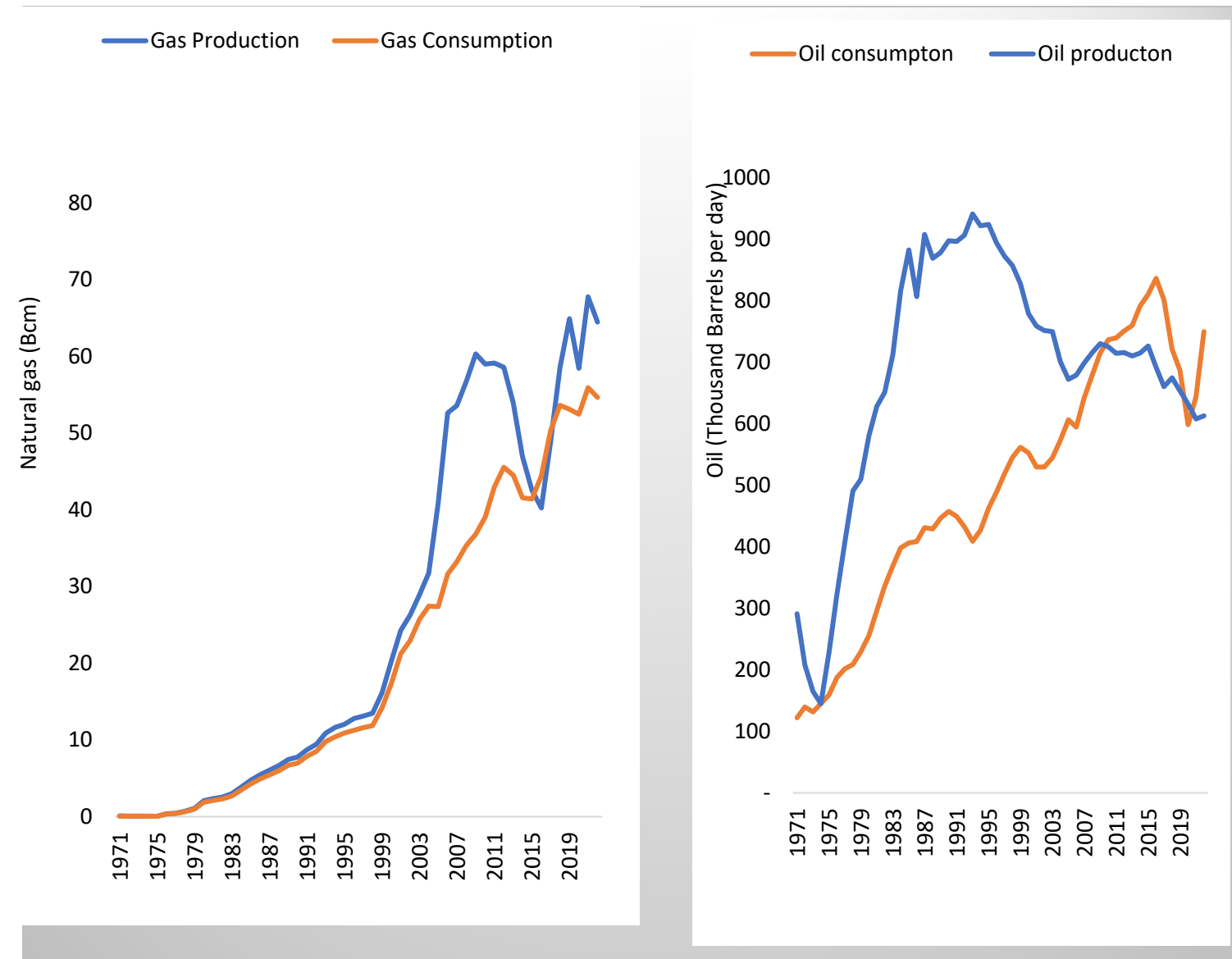
(Energy Institute Statistical Review of World Energy, 2023)

2. A Closer Look at Egypt's Energy Sector

2.2. Egypt's Energy Supply

2.2.1. Primary energy supply

- Oil and natural gas **production** growth **outpaced** Egypt's **domestic consumption** helped in boosting economic development and added towards exports from the 1970s to the beginning of the 20th century.
- Egypt's domestic oil production **declined sharply** from 2012 to below domestic consumption.
- The increased exploration efforts led to the **discovery** of significant natural gas reserves in the Mediterranean Sea, particularly the **Zohr gas field** in 2015, and fast-tracking its development to go into production in 2017, changed the energy profile of the country.



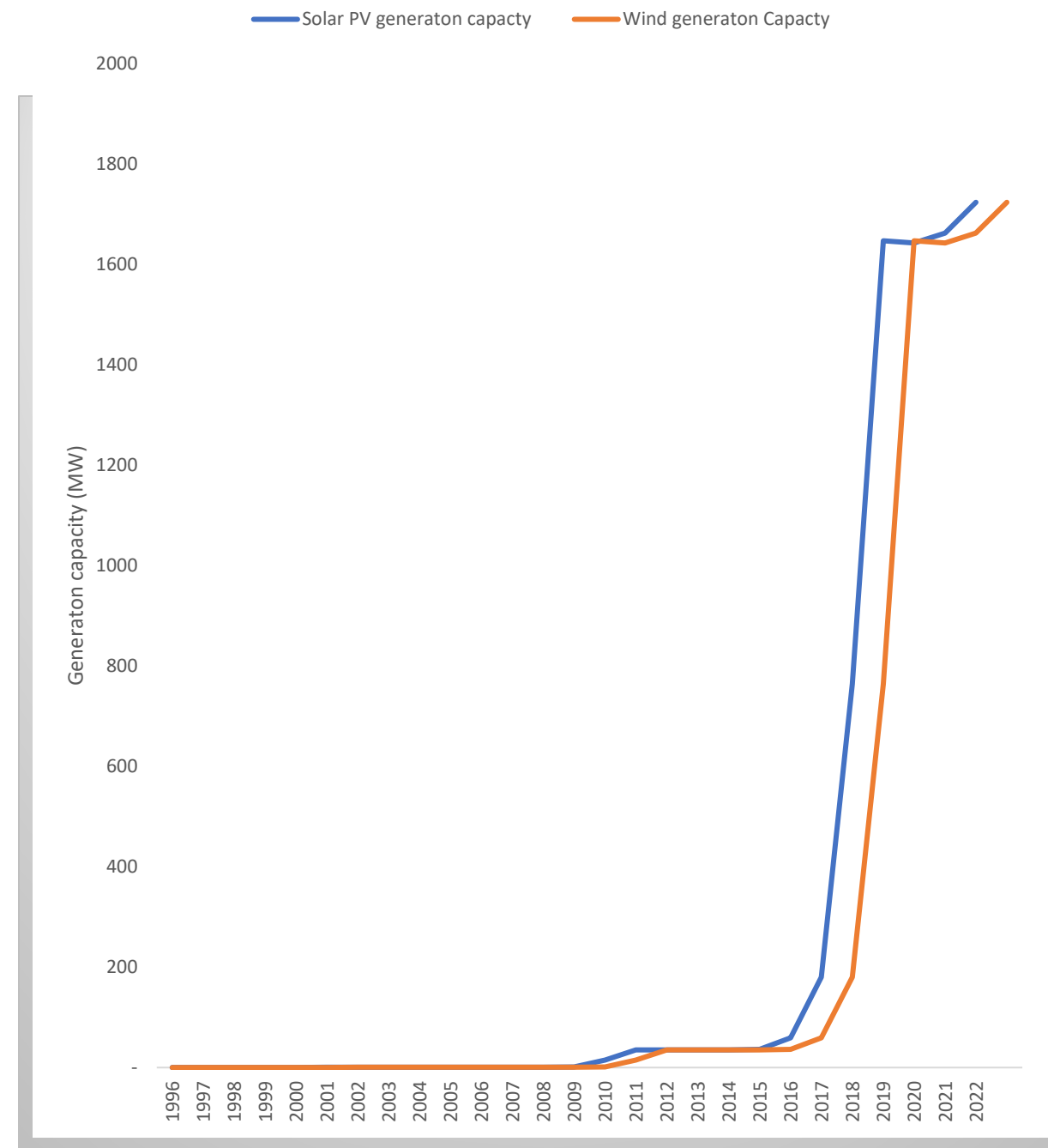
(Energy Institute Statistical Review of World Energy, 2023)

2. A Closer Look at Egypt's Energy Sector

2.2 Egypt's Energy Supply

2.2.1.2. Non-fossil fuel energy supply

- Egypt's Vision 2030 targets **increasing** the role of renewable energy especially in power generation to increase energy security through diversification and reducing dependence on fossil fuels.
- The vision targets **32.5%** of power generation by 2030 from renewable energy.



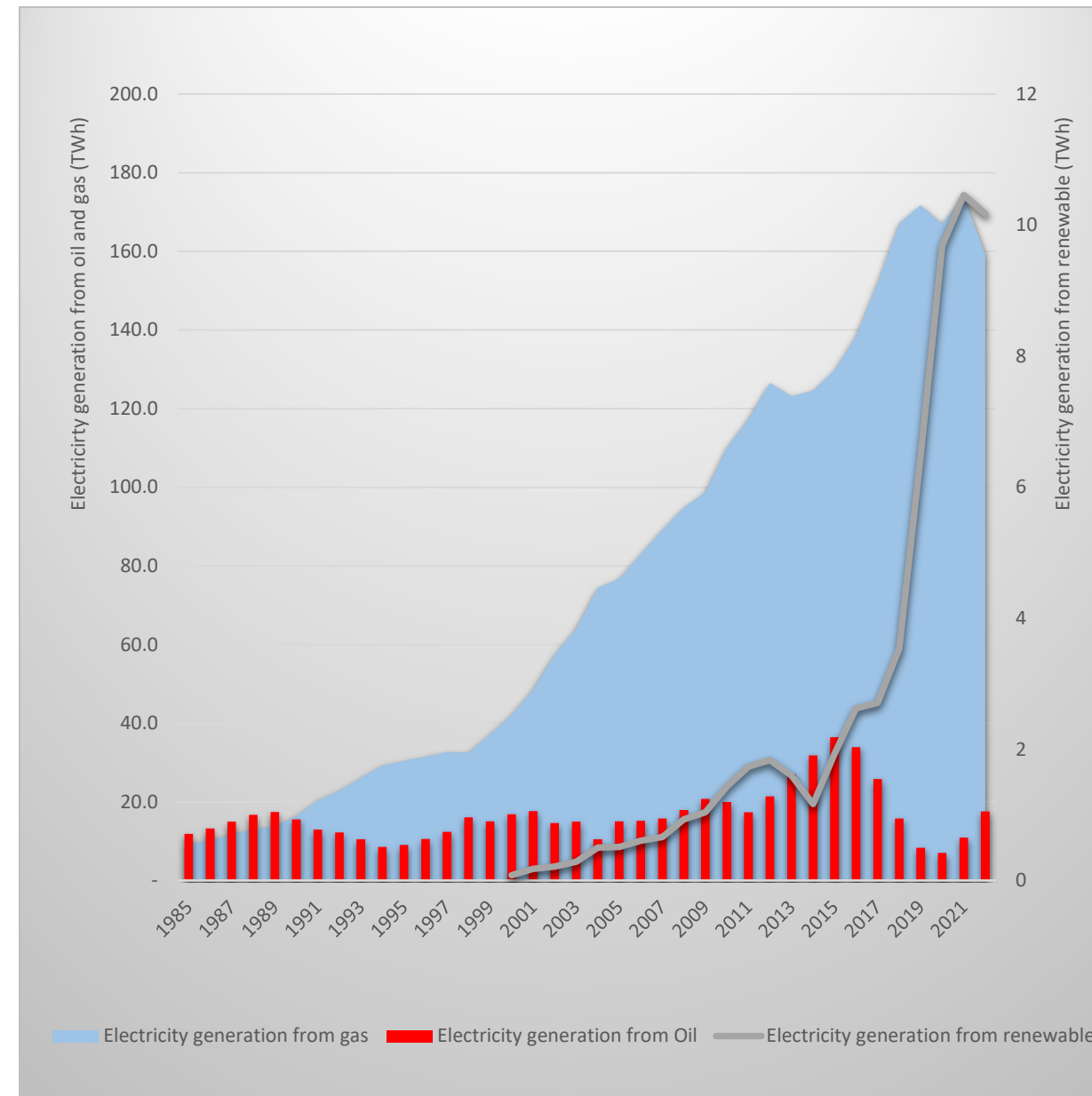
(Energy Institute Statistical Review of World Energy, 2023)



2. A Closer Look at Egypt's Energy Sector

2.2.2. Electricity generation supply

- Egypt's main power portfolio shows that electricity production mainly **depends** on the gas and oil industry.
- Despite objectives by the government to increase diversity in the energy mix, natural gas still makes up the **main component** of Egypt's energy structure.



(Energy Institute Statistical Review of World Energy, 2023)

2. A Closer Look at Egypt's Energy Sector

2.2.3 Egypt's Hydrogen Current Status

- Egypt was one of the **first countries** in the Middle East and North Africa to generate and use green hydrogen.
- Green hydrogen was first produced **in 1960** by the Egyptian Chemical Industries (**KIMA**) firm, which used hydroelectricity from the adjacent Aswan dam to generate green ammonia.
- KIMA transitioned to **grey hydrogen** production.
- **Grey hydrogen** is currently created from natural gas and is categorized as grey hydrogen because the **CO₂ emitted** during the production chain is **not** controlled.
- On the sidelines of the COP27 climate conference, Orascom established the first phase of the **green hydrogen** plant in Sokhna Zone (**SCZone**).



2. A Closer Look at Egypt's Energy Sector

Hydrogen Potential Production and Exports

- Egypt has ambitious plans in the hydrogen sector, targeting up to **8%** of the global tradable market by **2040**.
- Egypt should **step up** its efforts to produce **blue hydrogen** from natural gas.
- It is **possible** to start a new path of natural gas-sourced blue hydrogen exports to key **Asian nations** like Japan, India, China, and South Korea.
- By 2030, the European Union wants to have **80 gigawatts of green hydrogen**, **40 gigawatts** of which will be used to import hydrogen from **North Africa**.
- Egypt may look to be a prospective provider of hydrogen imports to Europe given its **proximity** to Europe and its capacity to produce **affordable** renewable energy.



3. Energy pricing mechanism subsidy and its impact on Egypt's economy

- **Energy subsidies** have long been a practice in Egypt, especially for fossil fuels.
- Egypt's governmental finances have been significantly **strained** by energy subsidies, resulting in **budget deficits** and **rising national debt**.
- Energy subsidies are frequently intended to help **the poor**, but they **benefit the rich** because people with **greater incomes consume more** of the energy goods that the government subsidizes.
- Energy subsidies may also **spread** to other areas of the economy and **hurt pricing distortions**, and the subsidization of energy goods in Egypt may **discourage technical advancement** and **impede development**.



3. Energy pricing mechanism subsidy and its impact on Egypt's economy

- The government **started** a program to overhaul energy subsidies **in 2004**.
- **In 2008**, the government significantly raised the cost of electricity and natural gas for sectors that use a lot of energy.
- However, due to worries about the worldwide recession, the program **was discontinued in 2009**.
- The government made **sectoral reform** a **top priority** because energy subsidies were a significant factor in the deficit.
- Energy subsidies made up a significant portion of Egypt's budget **in 2013 (22%)** while energy-related subsidies made up **7%** of Egypt's GDP, which was more than the sum of health and education spending (**5%**).
- The cabinet **adopted Decree No. 1257 in July 2014** to gradually raise energy selling prices.
- FYs 2020–2021 and 2021/22, the subsidies for petroleum goods decreased by **46.7%** and **34.7 %**, respectively.

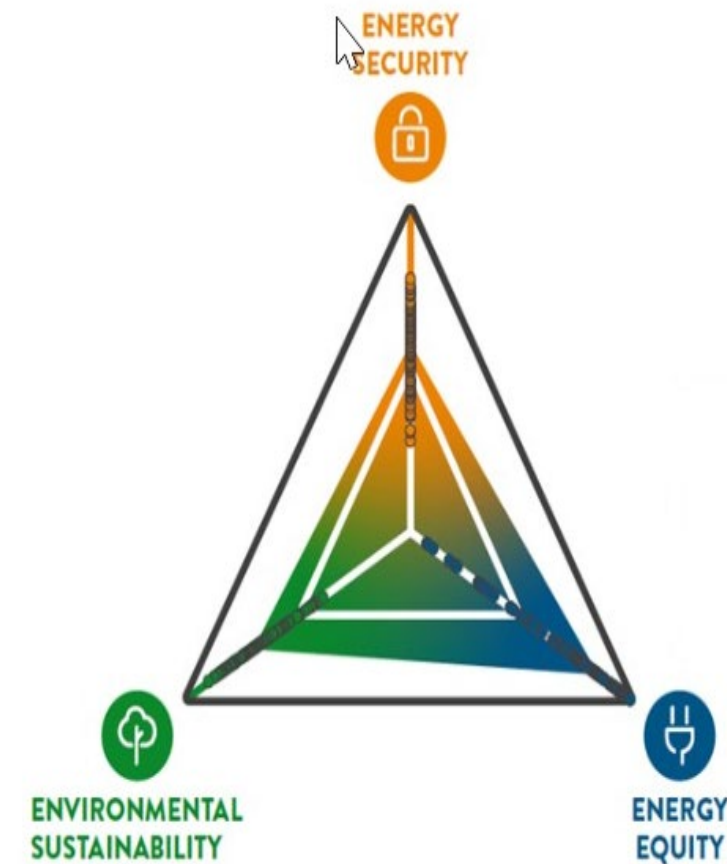


4. Policies and challenges related to Egypt's sustainable energy transition

- Concerns about how to create **pathways** for a sustainable energy transition have been brought to light **globally**.

Energy Trilemma Triangle (Index)

- Understanding the possible pathways for the energy system change requires striking a balance between **energy security**, **energy equity**, and **environmental sustainability**.



(World Energy Council, 2022)



4. Policies and challenges related to Egypt's sustainable energy transition

- Egypt is among the countries featured in the World Energy Trilemma (WETI) Reports.
- Its performance in the energy trilemma dimensions has **historically increased**, and it ranks among the **top fifty** in the WETI 2022 ranking.
- It is anticipated that Egypt's economy will reach the **low-carbon transition** targets and experience **notable economic growth**.
- Egypt is the most **energy-equitable** country in Africa owing to its increased **access to electricity (100%)**.
- Egypt is **ranked** among the **top five countries** in Africa in terms of **energy security**.
- Therefore, Egypt aims to connect its **strategies** for energy reform to the **energy trilemma index**.



4.1 Policies adopted by Egypt's policymakers to enhance sustainable energy transition

4.1.1 Strengthening the legislative structure

The government has implemented several initiatives to promote private sector involvement in renewable energy projects:

- **Law 102 of 1986** establish a New and Renewable Energy Authority in 1986.
- The **electric feed-in tariff** system in September 2014.
- **Law No. 72 of 2017** (Investment Law) where the renewable energy sector is one of the sectors that benefited from the advantages of the new investment law.

4.1.2 Fiscal and monetary policies

- **Taxation** is one significant fiscal policy tool, with the capital components of renewable energy subject to a value-added tax (VAT) of only **5%** rather than the VAT law's **14%**.
- **The Central Bank** incorporated the renewable energy sector into the initiative (**a 200 billion EGP initiative**) in February 2017, to motivate banks to provide financing to small and medium-sized enterprises.

4.1.3 Establishing the National Green Hydrogen Council

- The Egyptian Cabinet has approved the establishment of the **National Council for Green Hydrogen** to encourage green investment.
- Its goal is to **guarantee** the nation's competitiveness both **domestically and globally**.
- **National green hydrogen strategy** has been approved at the end of 2023.



4.2 Challenges confronting Egypt's sustainable energy transition

4.2.1 Technological difficulties

- Technological obstacles include the **lack** of **operation** and **management** requirements.
- Egypt's solar energy investments and technology **are still** in the **experimental stage** and have not reached the point of mass production.
- This is on top of the **lack** of **appropriate storage techniques** and a **shortage** of **workers** with the necessary skills in renewable energy technology.

4.2.2 Economic difficulties

- Numerous economic problems exist, and purchasing pricey renewable energy would be **unaffordable** for impoverished commsome rural unities.
- Due to **high** **payback rates** and persistently **high** **annual interest** rates in the private sector, medium-sized as well as small-sized enterprises find it difficult to participate in the field of clean energy.

4.2.3 Political difficulties

- The **existence** of **uneven** regional regulatory frameworks.
- The **existence** of **conflicting** regulations among various government ministries.



4.2 Challenges confronting Egypt's sustainable energy transition (Hydrogen)

4.2.4 Finance

- One major financial risk to the advancement of green hydrogen projects is the **cost of capital**.
- Alkaline water electrolyzers range in price from **\$500 to \$1,000** per kW, while PEM electrolyzers are more expensive, costing between **\$700 and \$1400** per kW.
- Egypt's current supply of grey hydrogen would require a **sizable total electrolyzer capacity** to be **replaced** with green hydrogen.
- This may require a substantial investment of anywhere from **US\$11 billion to US\$29 billion**.
- **Encouraging** public-private partnerships can help in overcoming this challenge.

4.2.5 Scarcity of water

- For the electrolysis process to yield **one kilogram** of green hydrogen, about **nine liters** of water are needed.
- Egypt is a country with **limited freshwater resources** that mostly depends on the Nile River, which receives less than 80 millimeters of rain annually.
- **Desalination** can be one of the proposed solutions to overcome this challenge.

4.2.6 Transportation

- Extended usage of low-carbon hydrogen would necessitate **long-distance transit needs**.
- It would be necessary to build new, **specialized infrastructure** for the hydrogen pipeline.
- However, according to research, **pipelines** that currently transport natural gas **could be modified** to transport hydrogen or mixed with it up to 20% of the time.



5. Proposed implementation mechanisms and policies for sustainable energy transition

Related to Natural Gas
as a transitional fuel

Related to Solar and
Wind Energy

Related to Hydrogen
Energy



5.1 Proposed implementation mechanisms and policies related to Natural Gas as a transitional fuel

5.1.1 Natural Gas Exports

- Egypt could try to **maximize its exports** of LNG, which would **offset** some of the **expenses** of **importing oil** and petroleum products.
- **Reducing consumption** to export some of the natural gas used for electricity is one of the government targets.
- Measures were proposed by the cabinet, including **shutting off** indoor and outdoor **lighting** of state-affiliated buildings outside of working hours.
- Public places are required to set their **AC temperatures** at 25 C.
- Many power stations have transitioned from using **natural gas** to **mazut**, leading to a greater **surplus** to export since October 2021.

5.1.2 Transportation

- Speeding up the transition to relying on natural gas for transportation by working on converting cars to use natural gas.
- Within the framework of the Egyptian state's plan to shift to clean energy sources, a total of 500,000 cars were converted to work with natural gas.



5.2 Proposed implementation mechanisms and policies related to Solar and Wind Energy

5.2.1 Subsidies

- Subsidies are considered **crucial fiscal incentives** and they can include R&D for the creation and manufacturing of essential equipment for renewable energy sources.
- **Subsidizing solar energy** in air conditioning operations as in **Germany**.
- **Subsidized loans for wind and solar projects** as implemented by **Germany** where they were accessible through regional commercial banks.
- Encouraging the **usage of solar energy to heat water** as the **United Arab Emirates**

5.2.2 Taxes

- **Revenues from taxes** can be directed towards financing wind and solar energy projects.
- **China** uses revenues from taxes and surcharges on electricity to **support** renewable energy production.
- This financial incentive is also adopted by various countries such as **Germany** and **India**.

5.2.3 Encourage Local manufactures

- Incorporating **local elements** into new energy development is a challenge.
- The primary financiers of large-scale new energy creation, **are reluctant** to accept a different local requirement than competition.
- In 2004, wind turbines were a foreign industry until, in 2008, **China** gave grants to manufacture wind energy equipment **locally**, until in 2010 it financed nearly half of the global market for wind turbines.



5.3 Proposed implementation mechanisms and policies related to Hydrogen

5.3.1 Research and Development Efforts

- The oil crisis of the 1970s spurred public support for **hydrogen research and development** initiatives, with the **United States** and **Europe** taking the lead in this effort.
- Thus, the **Egyptian hydrogen strategy** process can typically begin with the establishment of R&D programs to comprehend the fundamental principles of the technology.

5.3.2 Green Hydrogen Partnership

- As proposed by the **European Union**, the Green Hydrogen Partnership is a **public-private partnership** on research and innovation in the field of green hydrogen.
- They committed to **intensifying** and **accelerating** the pace of joint work in research, development, and deployment of hydrogen production.
- **Egypt** may be able to partially overcome the cost of capital constraint by utilizing the public-private partnership (PPP) finance mechanism.

5.3.3 Hydrogen Hub Initiative

- As proposed by **India**, a green hydrogen hub can be established in **Egypt**, and funded through several competitive grants.
- This hub can connect regions where there are many users and producers of hydrogen across the industrial, transportation, and energy markets.
- R&D projects and facilities can also be linked to the hubs.



5.3 Proposed implementation mechanisms and policies related to Hydrogen

5.3.4 Establish well-designed energy taxation systems

- Several **tax measures**, including **fuel taxes** and **carbon taxes**, can be used to **equalize** the cost of the energy market between green hydrogen producers and carbon producers.
- **Taxes** must be **reduced** and support provided to **green hydrogen producers** to encourage them to produce in the short and medium term.
- With the passage of time and the emergence of economies of scale, this will lead to **reducing** the cost and increasing their competitiveness in the long term.

5.3.5 Coordination between all ministries

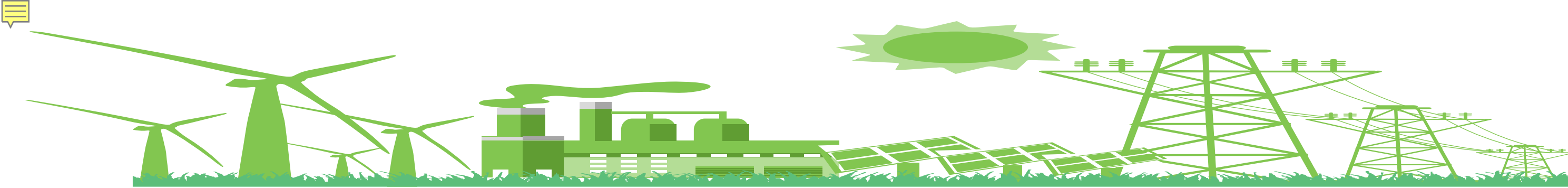
- All relevant ministries, departments, and institutions in the country come together to implement targeted and well-coordinated actions to **guarantee** the **localization** of hydrogen production.



6. Conclusion

- Egypt's **commitment** to attaining energy security and lowering greenhouse gas emissions is **driving** the country's energy transition.
- Egypt **anticipates** building a **more resilient and sustainable** energy system in the future by expanding the proportion of **renewable energy sources** and diversifying its energy sources.





Thank you

