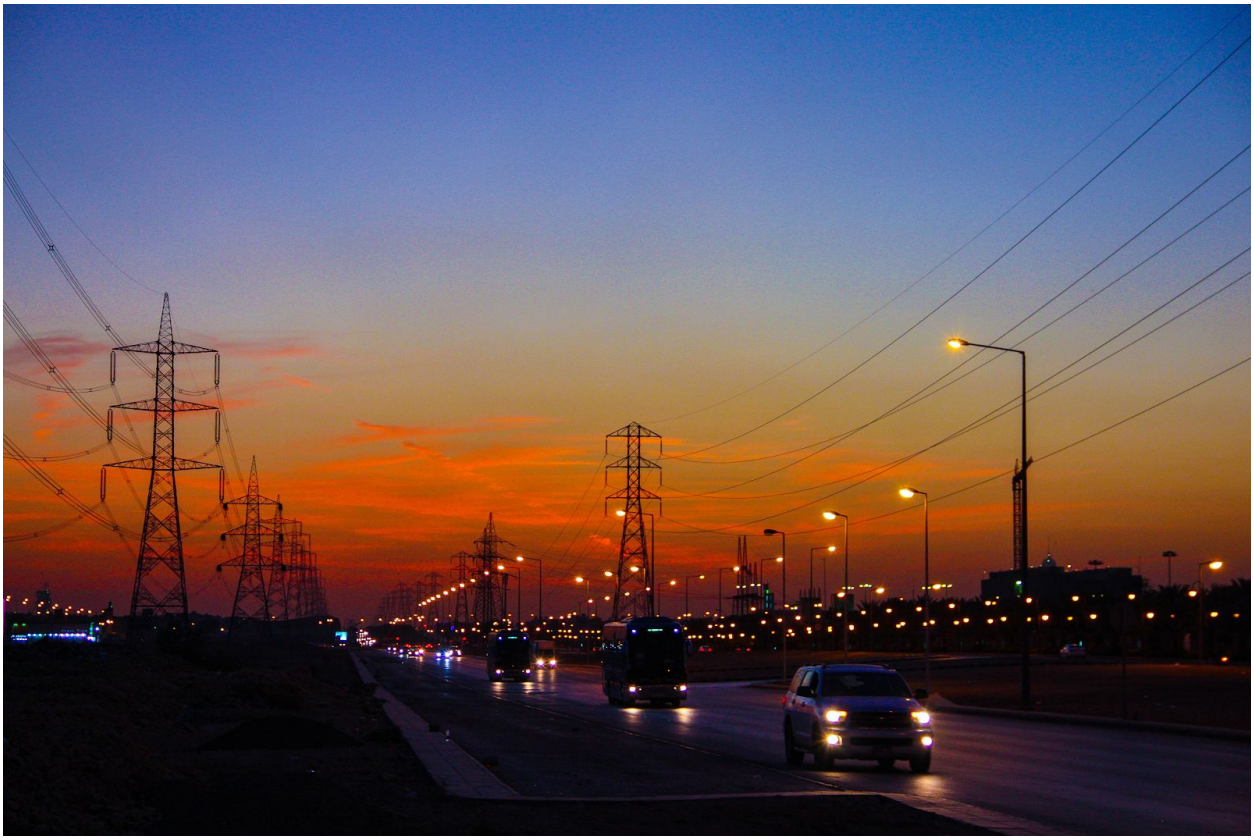

NDC, Saudi Arabia

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Overview

Saudi is a semi-arid, oil-rich middle eastern country, situated between the Arabian Gulf and the Red Sea. It is the 3rd largest producers of oil in the world and holds a strategic position in the world economy due to its resources and location. *[Appx. 1.1]*

NDC

1. The main aim is to diversify the economy and reduce the dependence on oil
2. Aims to achieve mitigation benefits up to 130 million tons of Carbon annually
3. Dynamic baseline has to be developed based on two scenarios:
   a. Economic diversification with robust contributions of oil export revenues
   b. Accelerated domestic industrialization based on sustainable utilization of all resources including oil, gas and minerals.

Contribution to economic diversification with mitigation co-benefits

Since the first development planning process, the main aim has been to diversify the economy with an integrated solution to climate change. There is **13 times increase in GDP** contribution from 1974 to 2014 in the non-oil sector. *[Appx. 1.3]*

I. Energy Efficiency [bib 1]

- Saudi Energy Efficiency Centre (SEEC) works to reduce growth in peak electricity demand along with the development of energy efficient technology.
- Reduce the demand in Industry, building and transport which is 90% of the total load.
- Projects on biofuel, fuel cell technology and high octane compound production

- **INDUSTRIAL SECTOR:**
  - A substantial increase in the number of combined cycle power plants.
  - A decrease in the energy intensity of the oil sector with improvement in production, gas flaring & liquid hydrogen discharge mitigation and refining.

- **BUILDING SECTOR:**
  - The Saudi Green Building Council (SGBC) has taken various steps to promote environmentally responsible, energy and resource efficient green buildings.

- **TRANSPORT SECTOR:**
  - Heavy-duty Vehicles(HDV) initiatives include anti-idling initiatives, retirement programs and aerodynamic additives.
  - Steps to reduce the size of carbon capture units and increasing the carbon capturing capacity are taken.

II. Renewable Energy

- Renewable energy could help in increasing energy demand of the Kingdom and the exports revenue of the saved primary energy.
- Main targets are diversification of energy sources, for the production of electricity and water desalination.
- The scope of economical renewable sources is solar photovoltaics, solar thermal, wind and geothermal energy.
- Major initiatives taken by the KSA are :
    - **Solar energy conversion initiatives:**
        1. Phase-wise construction of solar powered desalination plants.
        2. Construction of solar thermal plants for district heating grid.
        3. Implementation of various projects saving the CO_2 emissions. *[Appx. 1.4]*
    - **Wind Energy Conversion Initiative:**
        1. Identification of various potential sited for the establishment of wind farms.
        2. Installing wind farms along the Red Sea and the Arabian Gulf.

III. Carbon Capture and Utilization/Storage

- There are five stages in the roadmap prepared for the CCS of KSA:
    1. Capturing carbon from stationary sources
    2. Capturing carbon from mobile sources
    3. Industrial application of carbon and CO_2
    4. Geological sequestration of CO_2
    5. CO_2 - Enhanced oil recovery

IV. Utilization of Natural Gas

- It has lower CO_2 emission per unit of energy generated as compared to other fuels.
- Thus, many steps are taken to increase investment in the natural gas exploration and to increase its production for a better energy mix.
- Thus, its success in providing the co-benefit depends on the success of finding new sources of natural gas and its production.
- However, with these efforts the natural gas consumption increased by 73% and 86% during the periods 1990- 2000 and 2000- 2010 respectively.

Means of implementation

Even though Saudi Arabia is not dependent on any international financial assistance, it knows the importance of technical cooperation to achieve the goal and has taken various steps to make these changes sustainable. Some of the ways which could be explored to achieve the NDC goals are:

- Setting up a stage for economic diversification by the liberalization of the economy.

- Taking proper measures to mitigate the negative impact of UNFCCC on fossil fuel exporting countries.
- Taking some assistance from the international community in terms of finance, technology transfer & dissemination and market access in order to diversify its economy.
- Building the future wealth of the country by increasing the skill of the young population with proper education so that KSA could generate a more competitive workforce.
- Evaluating the economic and technical aspect of renewable energy resources with the conventional fossil fuel resources, alternative resources and future technological improvement in these sectors.
- Actively working towards the advancement in research & development and technology such as "Carbon Capture and Utilization/Storage (CCS) Technologies" and "Green Oil Technologies".
- Taking a step toward making Saudi Arabia a knowledge-based economy. *[Appx. 1.5]*
- Setting up economic cities for the purpose of:
    - Making the Saudi economy more competitive
    - Increasing the jobs
    - Increasing the skill level of the Saudi workforce
    - Economic diversification
    - Sustainable development all the regions of the Kingdom

Comment & Critique - Comparison with India

Saudi Arabia is one of the top twenty economies in the world. It is dependent on oil as the country has the second-largest petroleum reserves, and it's the 3rd largest exporter of petroleum in the world. It also has the fifth-largest natural gas reserves and is considered "Energy Superpower". With a total worth of US$34.4 trillion, Saudi Arabia has the second most valuable natural resources in the world.

Renewable energy initiatives

SAUDI ARABIA

Saudi Arabia has been installing a number of renewable energy sources mainly solar energy systems. According to the planned SEC upgrades:

- Approximately 14GW renewables will be integrated into the grid by 2020. Research on geothermal energy development has been gathering significant momentum in recent years.

INDIA

- India has declared to increase solar capacity 100 gigawatts (GW) by 2022, to more than 60 GW by 2022 and to raise nuclear capacity to 63GW in 2032. In total, India is aiming to install 175 GW of renewables by 2022.

Energy Efficiency Initiatives

SAUDI ARABIA

Saudi Arabia launched the first National Energy Efficiency Program (NEEP). in 2003 as a three-year temporary program to improve the management and the efficiency of electricity

generation and consumption in the Kingdom ended in 2006. Building on the experiences gained between the period of 2003-2006 and seeking to sustain and unify energy efficiency efforts.

- Saudi Arabia launched the various energy efficiency in the building sector, transport sector, industrial sector.

INDIA

National Mission for Enhanced Energy Efficiency (NMEEE) is the governing body in India .

- It's aim is to strengthen the market for energy efficiency by creating a conducive regulatory and policy regime.
- The programmes under this mission have resulted in an avoided generation capacity addition of about 10,000 MW between 2005 and 2012 government target to save 10% of current energy consumption by the year 2018-19. The government has launched the policy such as Standards and Labelling Programme, Energy Conservation Building Code (ECBC).

Carbon Capture and Management Initiatives

SAUDI ARABIA

Saudi Arabia was one of four countries signed up to the "Four Kingdoms" initiatives which aim to explore the environmental viability of carbon capture and storage (CCS) technology.

- Saudi Arabia is going to build the world's largest plant for capturing and using carbon dioxide.
- According to the plan, the plant will capture around 1,500 tons a day of carbon dioxide from ethylene plants and purify it for use in petrochemical plants in the industrial city of Jubail.

INDIA

India has recently launched many programmes and schemes to address the problem of pollution such as

- Continuous Emission Monitoring System (CEMS)
- Common Effluent Treatment Plants (CETPs)
- National Air Quality Index (AQI)
- Fly Ash Utilisation Policy.

Critics of Saudi Arabia NDC

According to NDC report, Saudi Arabia has initiated many policies to minimize carbon emission, but the majority of power plants in Saudi Arabia have lower efficiencies.

- The energy penalty for CO_2 capture is higher.
- CO_2 emissions, mainly produced by combustion of oil and natural gas, are growing very fast in Saudi Arabia.

In the renewable energy sector, there are multiple barriers to the spread of renewables in the country.

- As seen in the system which depends on the oil-based energy system and locks out renewable energy.
- Missing legal and regulatory framework, investors and funding.

- A weak innovation culture and lack of a skilled workforce and knowledge base hinder a successful development, manufacturing and implementation process.

Saudi Arabia has yet to make major investments in energy efficiency projects. Despite many projects offering 2–3 year payback periods, committing capital to investments in new energy technologies is still considered an adverse risk.

- Saudi Arabia has a unique position as a major oil and gas producer and its resultant low domestic energy prices.
- Saudi Arabia lags behind many other developing nations in implementing energy efficiency strategies.
- As a consequence, there is no central institution responsible for energy efficiency at a national level and no explicit end-user policies.

Current Position in terms of NDC

- The projects and programs added in the NDC of the country are action-based and not the result-based with the target of 130 million tonnes equivalent of CO_2 till 2030.
- There is a high amount of economic reliance on oil. This constitutes the major export and significant part in the total energy mix. This is also contributed by a lack of manufacturing industry in the country.[Appx. 1.2]
- As the Kingdom is heavily dependent on the exports of crude oil, it is highly vulnerable to climate change. This, KSA has always taken steps and will continue to do so, to diversify its economy.
- It must also be taken into account that the economic diversification needs a huge capital cost. Thus, the Kingdom needs some assistance in terms of funding and technology & development to achieve the goals of NDC.
- The NDC of KSA is designed to ensure the optimum usage of all the available resources of the Kingdom such as oil, gas, minerals, sands and sun, along with other options such as tourism and services.
- The success of KSA's NDC is dependent extensively on the experience and expertise of other countries, including success and failure. Taking that into account Saudi Arabia has set some broad collaboration networks with other governments and international organizations.
- Saudi Arabia's 25% oil and gas production goes directly for the water desalination process. Taking that into account, KSA is making all its desalination plants to be solar powered which will help to reduce the GHG emissions and will also increase the export revenue by saving oil and gas resources.
- The Kingdom seeks to achieve the NDC goal by economic diversification and adaptation. Its effect on the economy of the Kingdom is uncertain. Taking that into account, actions and plans are contingent to availability and accessibility of required technologies and its economy continuing to grow.
- Saudi Arabia exhibit vulnerability in all physical, economic and social factors. Climatic conditions vary from semi-arid to the hyper-arid region with extremely low rainfall (<150mm/year).

- Kingdom's NDC is also dependent on the facts that the social and economic consequences of the policies implemented by the international bodies to tackle climate change do not have any abnormal or disproportionate burden on the economy of the Kingdom.
- The NDC of KSA seems to be more ambitious when it is compared to other countries. Also, the plans and actions mentioned in the Kingdom's NDC is clear and has a proper mechanism at the national level and has a quantitative goal to achieve.

National Development Priorities - Current Standing

- Average 5.26 % of annual per capita growth from 1990-2013
- 11th in countries with the fastest progress in human development
- 57 in global human index
- Ranked 26th among 189 countries with respect to ease of doing business

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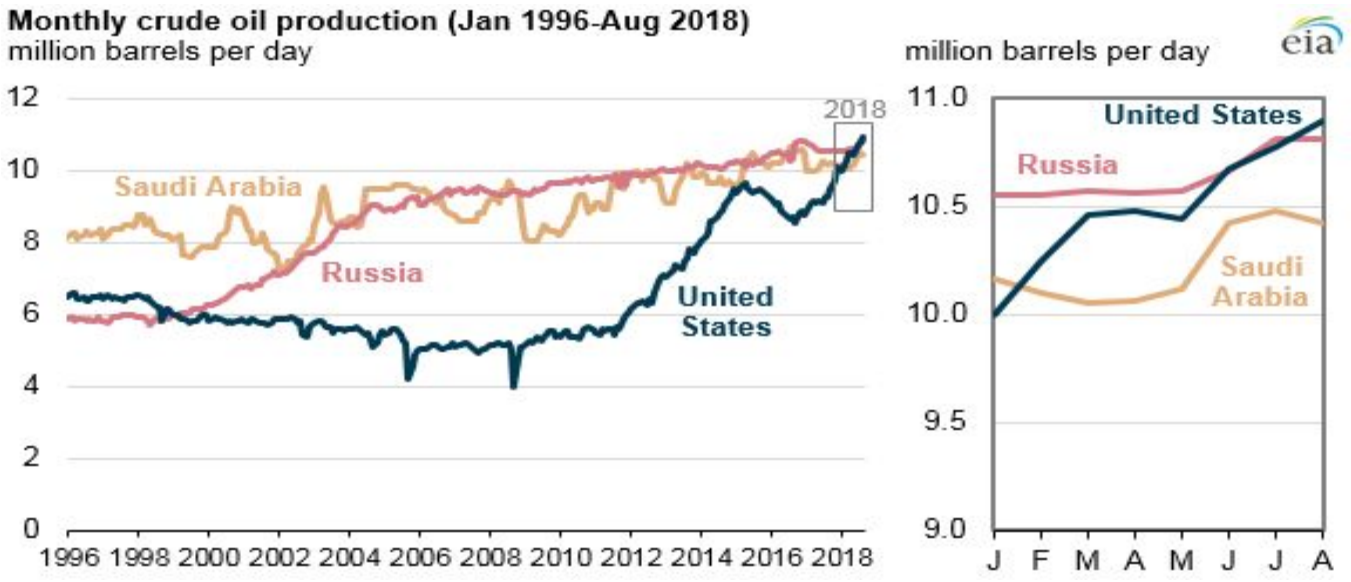
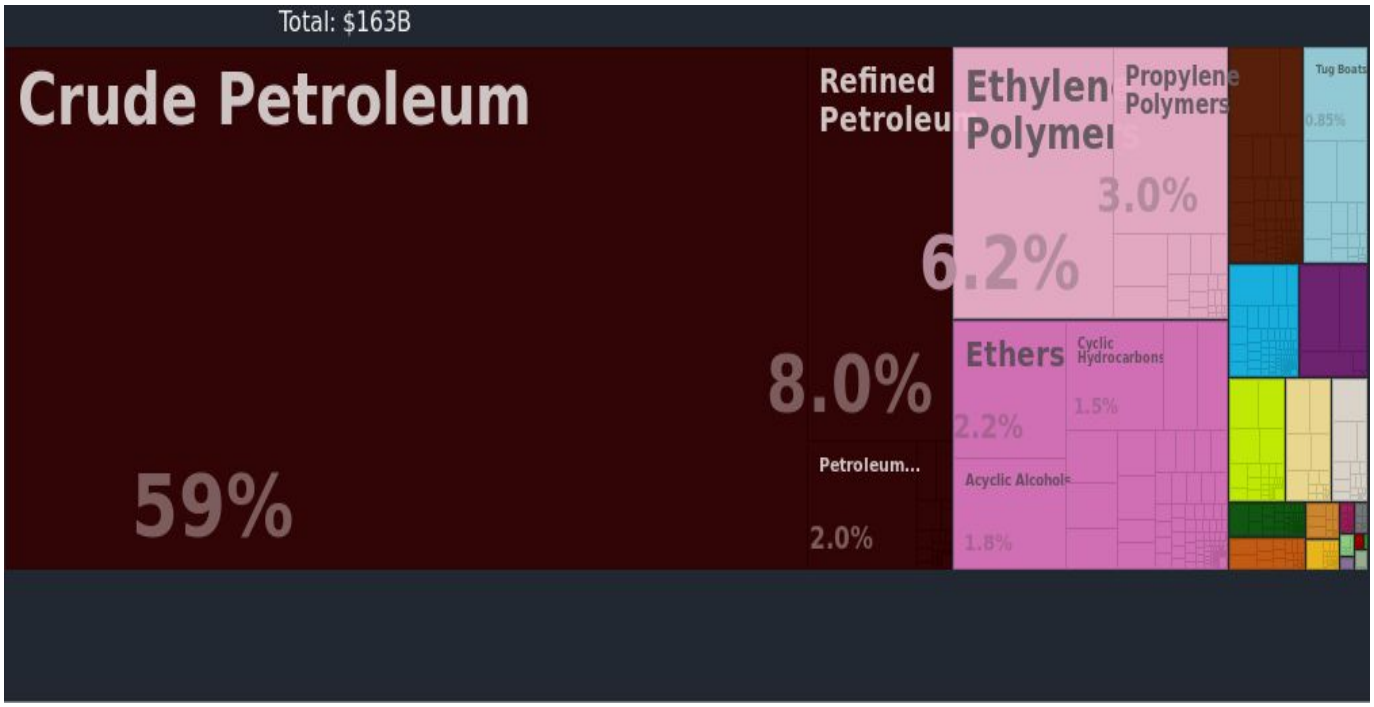
Appendix 1

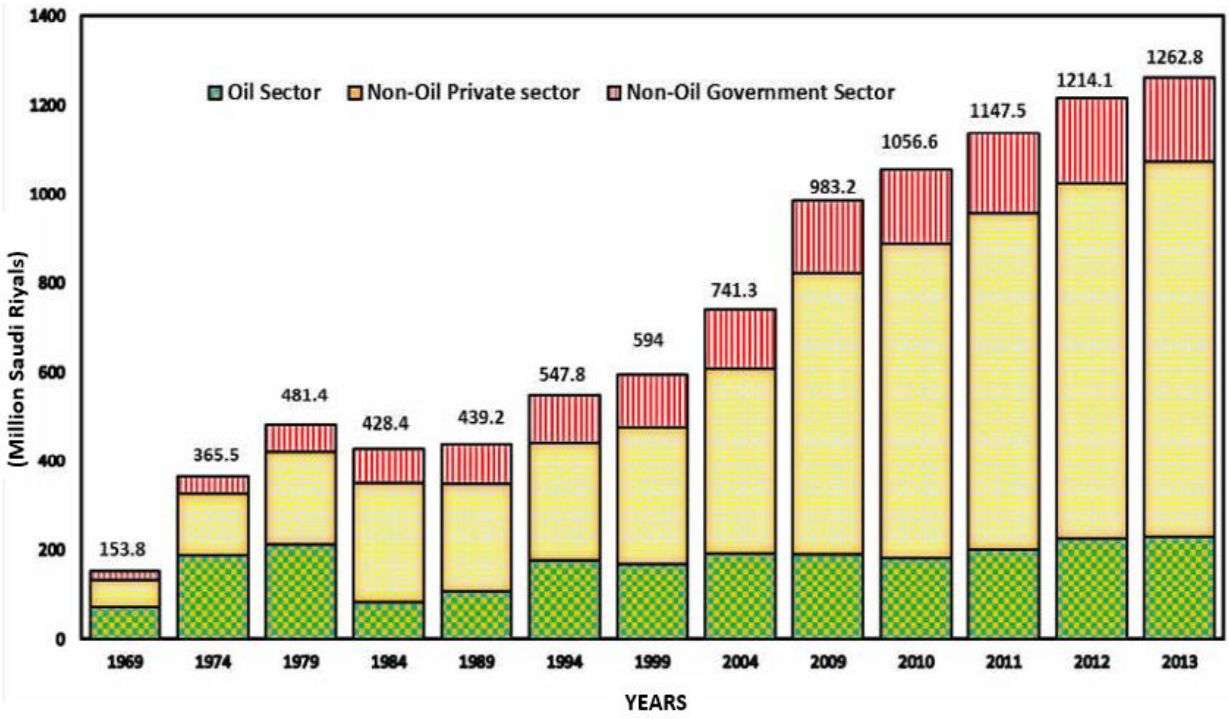
1. [USA took over Saudi Arabia and Russia to become the largest producer of crude oil]



2. [https://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/sau/all/show/2016/]



3. Development of GDP by Oil and Non-Oil sector at 1999 constant price



4. CO_2 emissions saved by solar initiatives:

Sr. No.	Project	Saved CO_2 emissions (Tons/yr)
1	Solar Thermal plant of 25 MWh, Riyadh (Established by Princess Nourah Bint Abdulrahman University in 2012)	16.35
2	Ground mounted solar thermal plant of 9.3 GWh/yr (Established by GACA in 2013)	6,028
3	Ground mounted a solar array of 864 MWh/yr, Faisal Island, Jazan (Commissioned by SEC and Showa Shell Sekiyu in 2011)	565.1
4	Solar rooftop mounted an array of 330 MWh/yr, KAFDP, Riyadh (COmmissioned by KAUST in 2012)	180
5	Utility-scale solar plant of 385 GWH/yr, Makkah	2,51,000

5. Plans and developments towards the knowledge enhancement of the Kingdom:
    - "Expanded Five Year Plan for the National Science and Technology Policy" initiation and implementation.
    - Starting implementation of the "Strategy for Supporting Talent, Creativity and Innovation"
    - Approval of the "National ICT Plan"
    - National Industry Strategy"
    - Inauguration of King Abdullah University of Science and Technology (KAUST)
    - Initiation of construction of economic knowledge city in Medina
    - Approval of the Future University Education Plan of the Kingdom (AFAQ)
    - Approval to construct the Dammam Technology Zone