From Resource Curse to Resource Wealth: Energy and Economic Transformation for Sustainable Development

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Abstract. This study examines the complex relationship between the energy sector and economic development that poses challenges to sustainable development in resource-producing countries. We investigate the hypothesis that resource-rich developing and underdeveloped nations struggle to maximize the advantages of their crude oil reserves, ultimately experiencing the phenomenon known as the "resource curse". The paper examines the need for developed countries to formulate new strategies to meet their domestic energy needs. The authors argue that industrialised countries can tap into resources from developing nations, but it is important to ensure that these nations benefit fairly. The research is based on the analysis of data on oil production, human development index (HDI) ranking, and GDP to debt ratio. We call for further research to develop effective policies that can address the relationship between energy and economic issues and propose future research directions to ensure that developing countries can benefit from their energy economies.

Key words: Energy-economy nexus; Resource curse; Debt trap.

1 Introduction

This paper examines the complex relationship between energy and the economy, often referred to as the economy-energy nexus [31]. Our reliance on non-renewable resources like oil and gas creates intricate geopolitical dynamics, as evidenced by OPEC's influence on global oil prices and subsequent conflicts [23, 29]. This overdependence raises energy security concerns for nations heavily reliant on fossil fuel imports [28]. Furthermore, resource extraction in developing nations can be linked to environmental degradation, corruption, and

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conflict due to the management and exploitation of energy resources [28]. Energy prices, technological advancements, and government policies significantly influence this interplay between energy and the economy [28]. The complex geopolitical implications of non-renewable energy sources include intricate relationships between producer and consumer nations, disputes over resource ownership, and population displacements triggered by global climate change [5, 49].

The projected rise in carbon dioxide emissions to 35 gigatonnes by 2023 due to higher global energy utilization [36, 56, 70] necessitates a paradigm shift towards green energy. The transition to renewable energy sources is widely recognized as a critical solution offering minimization of greenhouse gas emissions, enhanced energy security, and improved environmental health [12, 60]. Prioritizing this transition requires significant investments and innovative initiatives to establish a more sustainable and robust energy system that underpins both economic growth and development [12].

This research serves as a call to action for developed nations to adopt a more thoughtful approach to the energy transition. This intricate web of connections demands a focus on energy prices, technological advancements, and government regulations [31]. It emphasizes the need to avoid repeating past mistakes of resource dependency in energy production. To prevent developing nations from lagging behind, developed nations must also embrace a paradigm shift in the energy-economy nexus. Mitigating the "resource curse" as the world transitions to a new energy era is crucial [34].

The economy-energy nexus represents a critical issue for policymakers and stakeholders seeking to ensure long-term economic stability and environmental preservation [72]. Some policymakers underestimate the profound impact of energy production and consumption on the economy, environment, and overall well-being, focusing solely on economic growth [72]. This is particularly concerning for resource-reliant countries, as the "resource curse" demonstrates how excessive dependence on such resources can hinder development and foster instability [34].

Existing disparities in energy resource distribution create power imbalances between nations. Developed countries often exploit resource-rich nations for economic gain, raising ethical concerns and fuelling political instability and conflict [35]. Despite renouncing such exploitative practices, governments sometimes resort to sanctions or even warfare to control resources, perpetuating tensions and conflicts [35]. This underscores the need for alternative energy sources to promote stability and cooperation.

As highlighted in the Sustainable Development Goals, the economy-energy nexus is an indispensable topic for policymakers and businesses to ensure universal access to affordable, reliable, and sustainable energy. Understanding the multifaceted relationship between energy production and economic stability is pivotal for balancing the energy-economy nexus and achieving global harmony [43].

The purpose of this study is to identify and analyze the relationship between the exploitation of energy resources and the economic development of countries, especially taking into account the phenomenon of the “resource curse”, and to develop recommendations for energy resource management policies that will enable countries to make the most efficient use of their natural resources to achieve sustainable economic growth and social well-being.

Research objectives:

1. Analyze data on oil production, Human Development Index (HDI) and GDP-to-debt ratio to identify countries that, despite being rich in natural resources, face socio-economic difficulties.
2. To study the mechanisms and causes of the “resource curse” in resource-producing countries, as well as the impact of this phenomenon on their long-term economic development.

3. Develop a conceptual framework for policies to overcome natural resource dependence and propose ways to integrate renewable energy sources to reduce environmental and economic risks.

2 Methodology

This study investigates the correlation between oil production and vulnerability in developing nations. We analysed data from the International Energy Agency [17] on countries responsible for 99% of global oil output. From this group, we identified nations exceeding average oil production levels between 2010 and 2020 [17]. Next, we examined GDP per capita data from the National Academies of Sciences [47] for the same period, focusing on countries within this group that fell below the mean value.

To assess a nation's development status and track progress over time, we incorporated the Human Development Index (HDI) Ranking [77]. The HDI, provided by the United Nations Development Programme [69], evaluates fundamental aspects of human development across different regions.

The analysis revealed a specific group of countries - Nigeria, Angola, Iraq, Venezuela, Libya, Algeria, Mexico, and Brazil - that consistently engage in primary oil-related sectors without substantial benefits translating to their populace. Through the proposed conceptual framework, this study establishes a potential link between energy resource exploitation and economic instability in developing countries [6, 43]. This finding aligns with previous research highlighting the "resource curse" phenomenon (refer to [34] for a recent discussion).

Data collection was conducted through a comprehensive document analysis to investigate the hypothesis. This analysis involved a systematic review of research papers published between 2010 and 2020 and publicly accessible data from United Nations agencies. The primary data collection efforts centred on three key variables: global crude oil production, United Nations HDI rankings, and GDP per capita for the respective countries. In our research, we employed Pareto analysis to discern the global distribution of crude oil production among diverse nations. The findings of this analysis underscore that a select group of nations accounts for approximately 90% of the world's oil production. Those contributing over 90% of the world's total crude oil production were initially identified to ascertain relevant nations. Subsequently, analyses were performed to compute the mean values for the three selected parameters. This enabled us to identify the countries meeting the following criteria: crude oil production exceeding the global mean, UN HDI ranking surpassing the global mean, and GDP per Capita falling below the global mean.

2.1 The conceptual framework

This study investigated the hypothesis that developing countries with huge natural resources are unable leverage complete potential for their public when working with developed nations leading to social underdevelopment, political instability, and economic inactivity [24, 32, 50]. A framework was used to validate this hypothesis, as shown in Fig. 1.

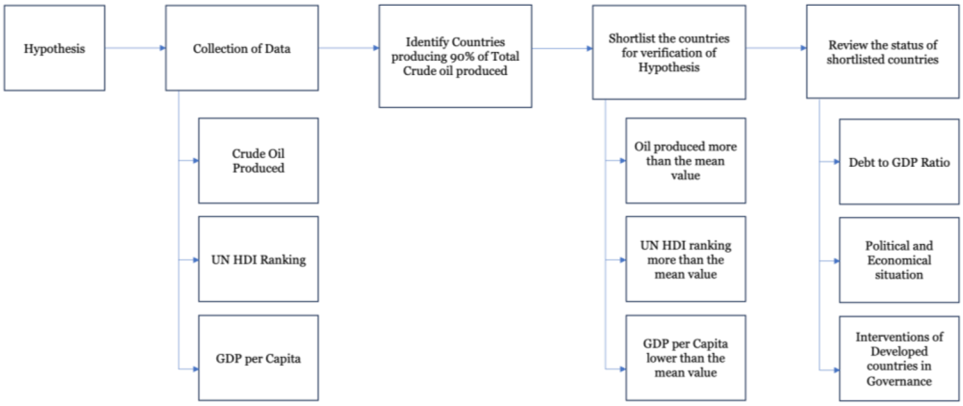

Fig. 1. The conceptual framework.

2.2 Pareto analysis

Data collection was conducted through a comprehensive document analysis to investigate the hypothesis. This analysis involved a systematic review of research papers published between 2010 and 2020 and publicly accessible data from United Nations agencies. The primary data collection efforts centred on three key variables: global crude oil production, United Nations HDI rankings, and GDP per capita for the respective countries. In our research, we employed Pareto analysis to discern the global distribution of crude oil production among diverse nations. The findings of this analysis underscore that a select group of nations accounts for the lion's share, approximately 90%, of the world's oil production. This statistical methodology, known as Pareto analysis, serves as a valuable tool for pinpointing and ranking the most influential factors or contributors within a dataset, thereby emphasizing the pivotal elements among the multitude of variables under examination. Those contributing over 90% of the world's total crude oil production were initially identified to ascertain relevant nations. Subsequently, advanced statistical analyses were performed to compute the mean values for the three selected parameters. This enabled us to identify the countries meeting the following criteria: crude oil production exceeding the global mean, UN HDI ranking surpassing the global mean, and GDP per Capita falling below the global mean.

3 Results and Discussion

3.1 Pareto analysis

Document analysis was done for data collecting to test the hypothesis. A thoroughly review of the publicly available data from United Nations organisations as well as research works published between 2010 and 2020 was done for this analysis. Three main factors that were the focus of the data collection activities were GDP per capita for each country, United Nations HDI rankings, and world crude oil output. To analyse the findings, the Pareto analysis was used that highlighted that the majority of the world's oil output approx. 90% is produced by a selected group of countries.

The Pareto analysis a statistical methodology that serves as an important tool for finding and ranking the most important factors within a dataset that emphasizes on the critical elements among the mass of variables under examination. Initially, countries that contribute over 90% of the world's total crude oil production were identified to discover suitable nations.

Furthermore, to derive the mean values for the three selected parameters statistical analyses were conducted. This enabled the researchers to identify the countries meeting the criteria i.e., crude oil production exceeding the global mean, UN HDI ranking striking the global mean, and GDP per capita falling below the global mean (Fig. 2).

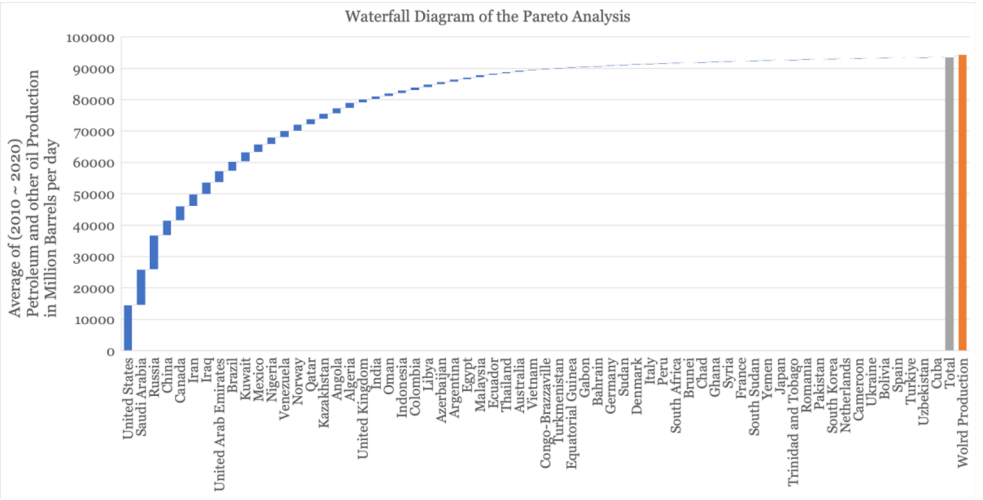

Fig. 2. Waterfall diagram of the Pareto analysis petroleum and other oil production (Average data 2010-2020).

Source: Adapted from [17].

Table 1. Countries producing 90% of total petroleum and other oil production in million barrels per day.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Production in million BPD	87317	88482	90769	91306	93899	96629	97116	97798	10049	10023	93866
Total of 63	86415	87580	89841	90412	92992	95771	96283	97067	99770	99502	93167
%out of total	98.97%	98.98%	98.98%	99.02%	99.03%	99.11%	99.14%	99.25%	99.28%	99.27%	99.26%

Source: Adapted from [17].

Table 1 complements the Pareto chart and provides detailed quantitative data about global oil production, specifically focusing on the cumulative oil production over eleven years, from 2010 to 2020. The table demonstrates that these 63 countries collectively account for most of the global oil production, ranging from 98.97% to 99.28% of the total production over the examined years. This data reinforces the insights derived from the Pareto chart, serving as a quantitative representation of the distribution of oil production among the identified 63 countries. It consistently demonstrates the concentration of oil production within this group of nations, which aligns with the Pareto principle.

Table 2 provides the fundamental parameters for assessing the performance of oil-producing nations in comparison to the Human Economic Factor mean. This analysis aids in uncovering evolving trends among countries involved in oil production. The table presents the annual averages and standard deviations of oil production in million barrels per day, along with the mean of per capita GDP.

To validate the findings of the Pareto analysis, we conducted precise calculations to provide a quantitative depiction of the distribution of oil production across 63 countries. The

analysis reveals a stark reality about the relationship between oil production and the prosperity of nations. The plotted values depict vast discrepancies in human living standards and the wealth generated from oil production. It is evident that in some countries, the populace is engaged in oil extraction without receiving the full benefits of their land's rich oil reserves. Strikingly, this situation is akin to modern-day slavery, where the citizens are deprived of the economic opportunities and prosperity that can come from natural resources.

Table 2. Annual mean and standard deviation values for Oil Production and GDP per Capita in countries engaged in oil production.

Petroleum and other liquids production (Mb/d)												
	HDI Rank 2020	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mean	81	1372	1390	1426	1435	1476	1520	1528	1541	1584	1579	1479
Std Dev	52.63	2224	2355	2462	2547	2702	2831	2860	2910	3122	3225	3055
Per Capita GDP at current prices in USD												
Mean	81	17448	19735	19976	19997	19643	16565	16091	16988	18047	17593	16335
Std Dev	52.63	20076	23015	23079	22998	22368	18339	18003	18832	20211	19525	18533

Source: Adapted from [14, 47, 69].

Supplementary Table 2, comprehensively adapted from United Nations Statistics Division, UNDP, IEA overviews the mean and standard deviation values for petroleum and other liquids production, HDI, and GDP per Capita across the selected countries, for the years spanning from 2010 to 2020. This data serves as crucial metrics for understanding the disparities and challenges associated with oil production in these nations and provide a foundation for further investigation and analysis. Total production in a million BPD reflects the total quantity of crude oil extracted globally each year and total oil produced by 63 countries represents the data on cumulative oil production in a million BPD. These countries are singled out for examination due to their dominant roles in global oil production. % of the total denotes the percentage of global oil production by these countries annually, serving as a representation of their share in the total oil production for that respective year.

The mean values demonstrate the average levels of petroleum and other liquids production in a million BPD, HDI rank, and per capita GDP at current prices in USD across the selected countries. The variation in the data signifies that many nations cannot fully benefit from oil production within their borders. By mapping the year-on-year values against the mean values, we aimed to identify commonalities among these countries and investigate how they are impacted by phenomena such as the resource curse and debt traps [15, 36]. It is evident from the analysis that there are considerable disparities in these indicators, emphasizing the differences in economic development and resource utilization. Furthermore, the standard deviation values shed light on the extent of variation and volatility within these indicators. The higher standard deviations suggest significant fluctuations in oil production, HDI, and GDP per Capita among the countries under study. The findings of this analysis indicate that underlying patterns and factors affect these countries' ability to effectively harness the benefits of oil production. By examining the common thread among these nations, we can gain insights into the phenomenon of resource curse and the challenges posed by debt traps [15, 36].

Notably, as the significant share of oil production lies within the limited subset of 63 nations, the significance of their roles in shaping global energy dynamics warrants further exploration and analysis. The findings contribute to a comprehensive understanding of the dynamics and implications of the concentration of oil production within a select number of nations. This combined information forms the basis for our research paper's analysis of the behavioural patterns, economic consequences, and international relations involving these key

players in the global energy arena. Through comprehensive analysis, the research identifies nations such as Nigeria, Angola, Iraq, Venezuela, Libya, Algeria, Mexico, and Brazil as particularly susceptible to oil slavery.

A brief layout of the salient features noted for the particular nations are detailed:

3.2 Nigeria

Nigeria's economy heavily relies on oil exports, contributing to over 90% of its export earnings in 2019 and around 60% of government revenue [48]. Among the top oil producers worldwide from 2010 to 2020, with an average daily production of 1.9 million barrels [42]. Nigeria still faces substantial economic difficulties, political instability, and widespread poverty [30]. Political unrest, corruption, and concerns about China's influence further exacerbate the country's economic instability [9].

Nigeria has accumulated substantial debt from foreign entities, including the Export-Import Bank of China (Exim Bank) [11], to tackle the prevailing issues. In 2006, Exim Bank granted Nigeria a 2.5 billion USD loan for infrastructure projects like expanding the Lagos-Kano railway line and constructing new power plants. In 2009, Nigeria secured an additional 6 billion USD loan from Exim Bank for oil and gas sector development, including the construction of refineries and pipelines [71]. However, these loan amounts have contributed to Nigeria's growing debt burden, with external debt rising from 5.7 billion USD in 2010 to 27.8 billion USD in 2020.

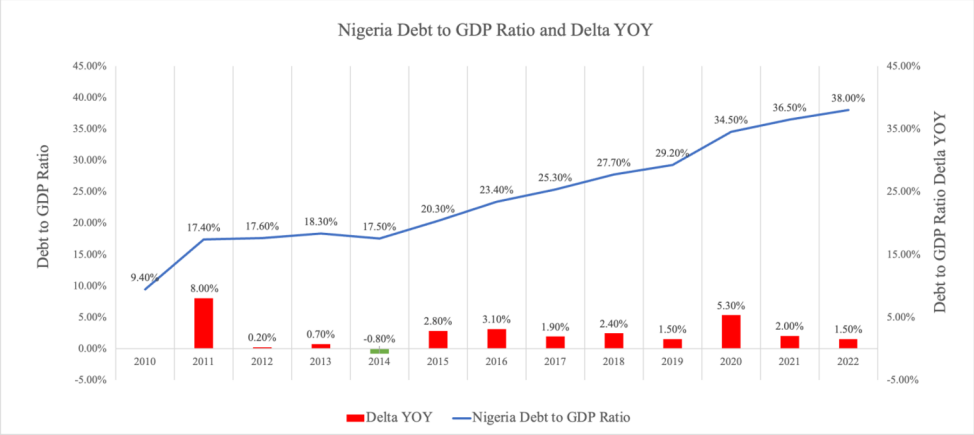

Fig. 3. The ratio of Nigerian GDP to its debt.
Source: Adapted from [62].

Fig. 3 illustrates the increasing trend of Nigerian GDP to its Debt. While Nigeria received substantial loans from China for infrastructure and energy development, they have faced criticism due to their terms, which are deemed overly favourable to China and potentially lead to debt traps [37]. Nigeria's debt-to-GDP ratio has increased from 17.5% in 2016 to 29.1% in 2019, surpassing the permissible limit set by the Fiscal Responsibility Act, which mandates a maximum of 25%. As Nigeria grapples with its mounting debt burden and economic challenges, concerns surrounding China's influence remain significant [40]. Consciously, despite being an oil reservoir, Nigeria ranks among the poorest countries globally, with a HDI ranking of 163 out of 189 countries in 2020 [69]. The country's heavy reliance on oil exports exposes it to fluctuations in oil prices and market demand, further amplifying its vulnerability.

3.3 Angola

Angola is one of Africa's largest oil producers, with an average daily production of 1.4 million barrels of crude oil between 2010 and 2020 [19]. Despite its oil wealth, Angola has struggled with economic inequality and poverty, with a significant portion of its population living below the poverty line. While the country has made some progress in recent years, particularly in education and healthcare, it still faces significant economic and social challenges. Foreign oil-producing companies, such as Chevron, Total, and ExxonMobil, have played a substantial role in Angola's oil production, often operating joint ventures with the state-owned oil company Sonangol [39]. While these companies bring in billions of dollars in revenue each year, critics have pointed out that little of this revenue goes toward improving the lives of Angolan citizens [22].

It is worth mentioning that in 2004, China provided Angola with a 2 billion USD loan to help fund reconstruction efforts following the end of the country's civil war. Since then, China has provided Angola with additional loans, including a 14.5 billion USD loan in 2015 to fund infrastructure projects such as railways, ports, and dams [4]. While these loans assisted in the development of much-needed infrastructure, it simultaneously contributed to Angola's significant debt burden. Despite being an oil-producing country, Angola, at 149th position on the HDI ranking, continuously struggles with economic instability and is burdened with considerable debt [69].

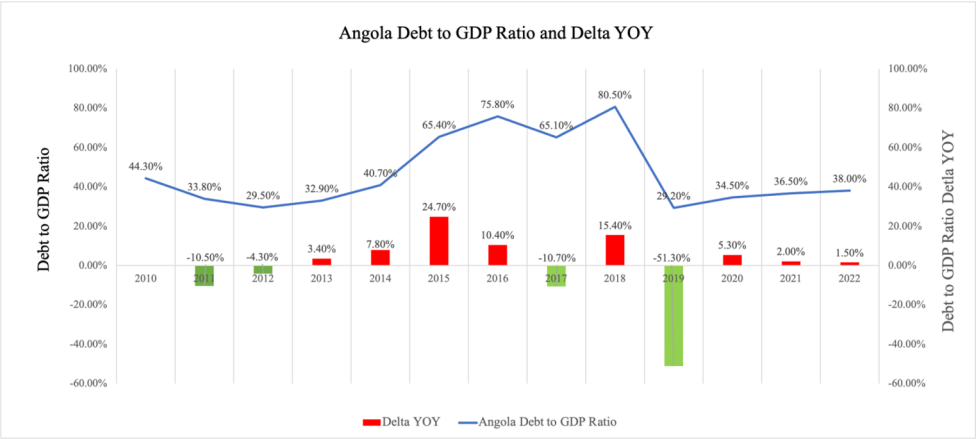

Fig. 4. The ratio of Angola's GDP to its debt.
Source: Adapted from [63].

Fig. 4 illustrates the increasing trend of GDP to its Debt. As of 2020, Angola's external debt was estimated to be around 63 billion USD, with China being one of its largest creditors. Critics have raised concerns about the terms of these loans, which some have described as being too favourable to China and potentially leading to a debt trap [1, 79]. A bird's-eye model of China's Loan Agreement Financial Structure is shown in Fig. 5. The blue arrows represent the governmental orders, the red arrows symbolize natural resource flows, and the green arrows indicate debt flows. It is worth mentioning that the top two countries employ the Chinese financial model, which has been consistently questioned by scholars for its ethical implications.

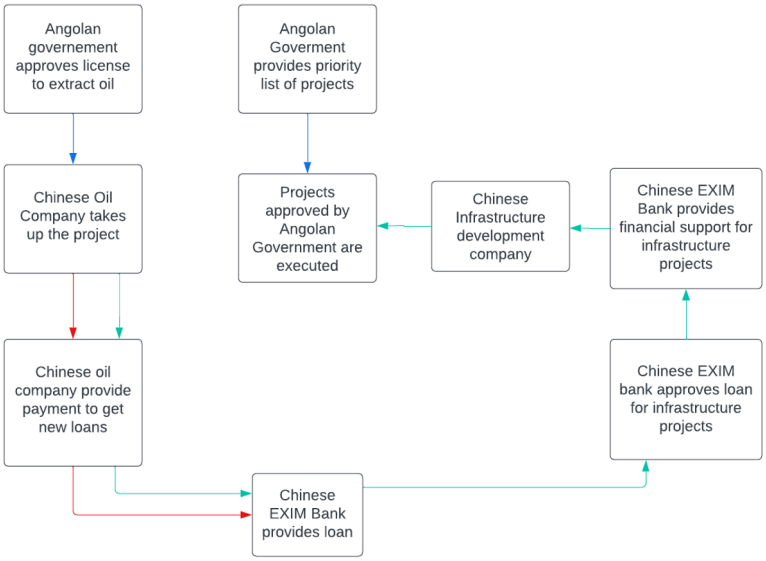

Fig. 5. Schematic representation of China's loan arrangements' financial structure.

3.4 Iraq

Between 2010 and 2020, Iraq emerged as a prominent player in the global oil industry, consistently producing an average of 4.4 million BPD. This substantial oil production positioned Iraq as one of the leading oil producers in the world. However, despite its vast oil reserves and impressive output, Iraq faced numerous challenges, such as political instability, economic sanctions, and foreign intervention [76].

One of Iraq's most significant foreign interventions during this period was the United States-led invasion of 2003. This invasion drew widespread criticism, with many suggesting it was motivated by a desire to gain control over Iraq's valuable oil reserves. Following the invasion, the United States-led Coalition Provisional Authority (CPA) assumed control over Iraq's oil sector and initiated a program aimed at privatizing and deregulating the industry, as highlighted in the research of Muttitt [44] and Yasiry [75]. Although oil sector control was transferred to the Iraqi Government in 2009, foreign oil companies continued to exert significant influence over Iraq's oil industry. In 2009 and 2010, Iraq entered contracts with major international oil companies such as ExxonMobil, BP, and Royal Dutch Shell to develop some of its most substantial oil fields. These contracts were criticized for allegedly favouring foreign companies and granting them extensive control over Iraq's oil reserves, as Vivoda [73] documented.

In terms of revenue, Iraq heavily relied on oil exports. In 2019, these exports generated an estimated 81.5 billion USD, constituting the country's primary source of income, as Habib [26] reported. However, despite this substantial oil revenue, Iraq confronted various economic challenges, including high unemployment rates, widespread poverty, and a significant external debt burden. As of 2021, Iraq's external debt amounted to approximately 113 billion USD, with a debt-to-GDP ratio exceeding 70%, as Mahmood et al. [38] outlined. These economic challenges underscored the need for Iraq to address structural issues and diversify its economy beyond oil to ensure long-term stability and prosperity.

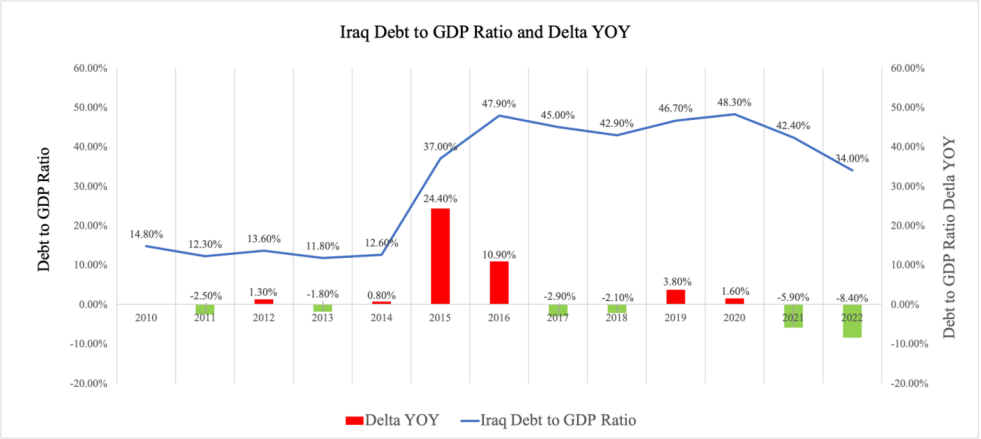

Fig. 6. The ratio of Iraq's GDP to its debt.
Source: Adapted from [65].

Fig. 6 indicates the impact of war on Iraq's GDP to its Debt. Given the history of foreign intervention in Iraq's oil sector and the continued dominance of foreign oil companies, there are concerns that Iraq may be caught in a similar trap as Angola and Nigeria. The potential for debt traps, as exemplified by situations in Angola and Nigeria, is a cause for concern, particularly considering China's growing investments in Iraq's oil sector. How Iraq chooses to navigate its economic challenges and harness its oil reserves for the betterment of its citizens is a matter yet to unfold.

3.5 Venezuela

Venezuela is a country with vast oil reserves, but it has been facing a severe economic crisis due to a debt trap. The country's oil production has declined significantly, and it relies heavily on loans from China to keep its economy afloat [53, 74]. Venezuela's oil industry is dominated by the state-owned company Petróleos de Venezuela, SA which accounts for about 95% of the country's total oil production.

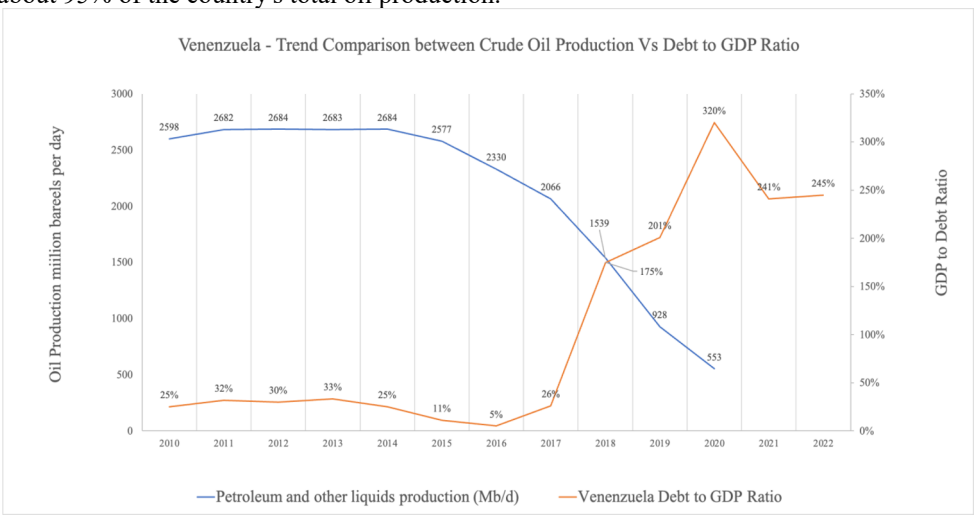

Fig. 7. The trends of Venezuela's Crude Oil Production and GDP to its debt.

Source: Adapted from [67, 68].

Fig. 7 demonstrates the drastic GDP-to-debt ratio increase due to decreased oil production. As seen from the figure, in 2019, Venezuela produced approximately 749,000 BPD, which has taken a considerable downfall from 2.5 million BPD in 2015. The revenue generated from oil exports is crucial for Venezuela's economy, accounting for ~98% of the country's total export earnings. However, Venezuela's oil revenue has decreased significantly in recent years due to declining oil production and prices. Notably, in 2019, the country's oil exports generated approximately 18 billion USD in revenue, down from 73 billion USD in 2012.

The United States has been involved in the crisis in Venezuela, imposing sanctions on Petróleos de Venezuela, SA, other individuals, and entities to pressurize the Government to step down. The sanctions have further restricted Venezuela's access to international markets, making it more reliant on loans from China [59]. Despite the constraints, Venezuela continues exporting oil to several countries, including India, the United States, and China. Notably, in 2019, China was the largest buyer of Venezuelan crude oil, accounting for approximately 60% of the country's oil exports [17, 41]. In recent years, China has provided significant loans to Venezuela, intending to secure its oil supply. From 2007 to 2017, China provided Venezuela with approximately 62 billion USD in loans, with most loans backed by oil exports. In 2019, Venezuela owed China roughly 19 billion USD, with most of the debt backed by oil shipments. The loans from China have helped Venezuela to maintain its oil production, but they have also left the country heavily indebted. Venezuela's total external debt was estimated at 110 billion USD in 2019, with China being the largest creditor. The HDI ranking of Venezuela has also declined significantly due to the economic crisis. In 2020, Venezuela ranked at 179th position out of 189 countries [69].

3.6 Libya

Libya, located in North Africa, has vast oil reserves, accounting for a significant portion of its revenue. However, the country has been facing challenges in its oil industry due to political instability and conflict, resulting in a decline in oil production and a decrease in its HDI ranking [3, 14, 61]. The state-owned National Oil Corporation (NOC) dominates Libya's oil production and works with foreign companies to extract and export crude oil. In 2019, the country produced an average of 1.1 million barrels daily, with most of the oil shipped to Europe and Asia. Libya has been grappling with significant debt issues, with a large portion of the debt owed to China. As of 2019, the country's total external debt was estimated to be around 7.7 billion USD, with more than 70% owed to China. This has raised concerns about a potential debt trap, with China using its debt to gain access to Libya's oil reserves.

US-based companies' involvement in Libya's oil industry has been limited due to political instability and U.S. government sanctions [13]. However, some US-based oil companies, including Marathon Oil and Hess Corporation, have been granted contracts to explore and extract oil in some regions of the country. Apart from US, several countries have attempted to enter Libya and gain control of its oil reserves due to the conflict in the country. Turkey, which supports the UN-recognized Government of National Accord (GNA), has signed a maritime deal with the GNA to expand its territorial waters in the Mediterranean and gain access to Libya's oil and gas resources [13]. Russia has also been involved in the conflict, supporting the Libyan National Army led by General Khalifa Haftar, who controls most of the oil-rich eastern region of the country [55].

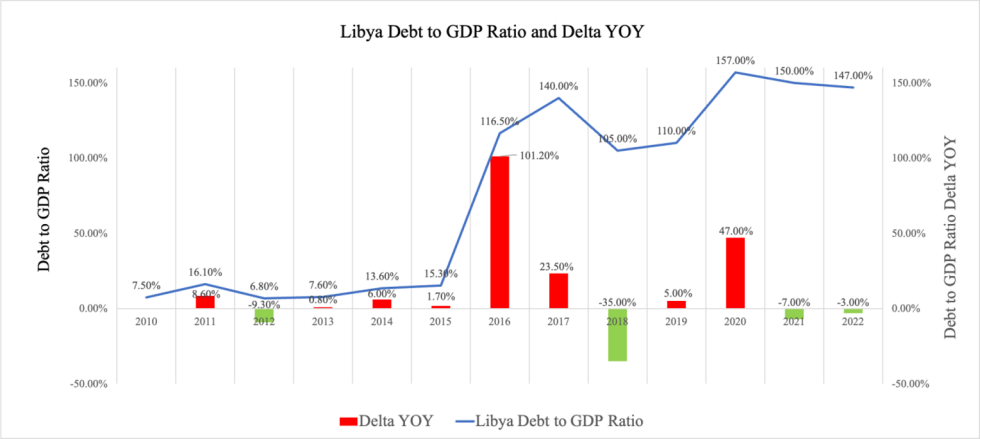

Fig. 8. The ratio of Libya's GDP to its debt.
Source: Adapted from [66].

Fig. 8 shows the Libya's critical trend of GDP to Debt Ratio. Notably, Libya's oil reserves have made it a significant player in the global oil market, with foreign countries vying to access its resources. However, the country's debt issues and political instability have raised concerns about a possible debt trap and foreign exploitation of its resources.

3.7 Algeria

Algeria, located in North Africa, is the largest country on the African continent and is known for its significant oil and gas reserves. The country's economy heavily relies on its energy sector, which accounts for approximately 60% of its total GDP and 95% of its export revenue [20, 21]. The state-owned company Sonatrach dominates Algeria's oil production and partners with foreign companies to extract and export crude oil. In 2019, the country produced an average of 1.2 million BPD, with most of the oil shipped to Europe. Despite its significant oil and gas reserves, Algeria has been facing economic challenges due to declining oil prices, production, and political instability. The country has struggled with high unemployment rates, inflation, and a significant trade deficit. In 2020, Algeria's GDP was estimated to have contracted by 5.2%, mainly due to the impact of the COVID-19 pandemic on oil prices.

Algeria has also faced significant debt issues, with a large portion of its external debt owed to China. In 2020, the country's total external debt was estimated to be around 6.8 billion USD, with more than 35% of the debt owed to China. This has led to concerns about a possible debt trap, with China leveraging its debt to gain access to Algeria's energy resources [8]. The involvement of US-based companies in Algeria's energy sector has been limited, with some companies such as ExxonMobil and Anadarko Petroleum having previously operated in the country. However, in recent years, the US government has imposed sanctions on the country due to its alleged support for terrorist groups, limiting US-based companies' involvement in the energy sector [54].

Noteworthily, Algeria's significant energy reserves have made it a crucial player in the global energy market, with its oil and gas exports accounting for a substantial portion of the country's GDP and export revenue. However, the Government has been facing significant economic and debt challenges, with concerns about a possible debt trap by China. The involvement of US-based companies in the energy sector has been limited due to political factors, including sanctions imposed by the US government [17].

3.8 Mexico

In Mexico, the Government essentially owns the revenue generated from oil production through its state-owned oil company, Petroleos Mexicanos (Pemex). In recent years, Pemex has struggled with declining oil production and mounting debt, leading to concerns about the country's economic stability. According to data from the Mexican Government, Pemex contributed around 7.8% of the country's gross domestic product (GDP) in 2020, down from nearly 20% in the early 2000s. The company's revenue in 2020 was around 31.4 billion USD, a significant decrease from its peak revenue of 124.6 billion USD in 2013. The Mexican Government has made efforts to increase revenue from oil production by allowing private companies to participate in the industry, but Pemex remains the dominant player. The Government also relies heavily on revenue from taxes on oil production, which accounted for around 16% of the Government's total revenue in 2020 [33]. Despite the significant revenue generated from oil production, Mexico's HDI ranking remains relatively low, at 76 out of 189 countries, indicating significant inequality and poverty. This is mainly due to a concentration of wealth among a small percentage of the population and corruption and inadequate public services [25].

Mexico has also struggled with debt issues recently, with total external debt estimated at around 485 billion USD in 2020. While most of the debt is denominated in Mexican pesos, the country has also borrowed heavily in foreign currencies, leading to concerns about a potential debt crisis.

In conclusion, while Mexico's oil production generates significant revenue for the Government, the country has struggled with declining production, mounting debt, and a relatively low HDI ranking. Efforts to increase private sector participation in the industry have been made, but the Government continues to rely heavily on revenue from oil production taxes [2].

3.9 Brazil

Brazil is the largest country in South America, known for its vast natural resources, including oil reserves. The country's oil industry is dominated by the state-owned company Petroleo Brasileiro S.A. (Petrobras), which accounts for more than 90% of the country's oil production [78]. In 2020, Brazil produced an average of 2.6 million barrels of oil per day, making it the world's ninth-largest oil producer. Most of Brazil's oil exports are sent to China, the United States, and India. The oil industry is a significant contributor to Brazil's economy, accounting for more than 10% of its GDP and generating over 15 billion USD in revenue for the Government in 2020.

The involvement of US-based companies in Brazil's oil industry has been limited, with Petrobras being the dominant player. However, in recent years, some US-based companies, such as Chevron and ExxonMobil, have been granted licenses to explore and extract oil in some regions of the country. Brazil has also faced significant debt issues, with a large portion of its external debt owed to China. As of 2020, Brazil's total external debt was estimated to be around 314 billion USD, with more than 9% of the debt owed to China [46]. This has led to concerns about a possible debt trap, with China leveraging its debt to gain access to Brazil's natural resources, including its oil reserves [10].

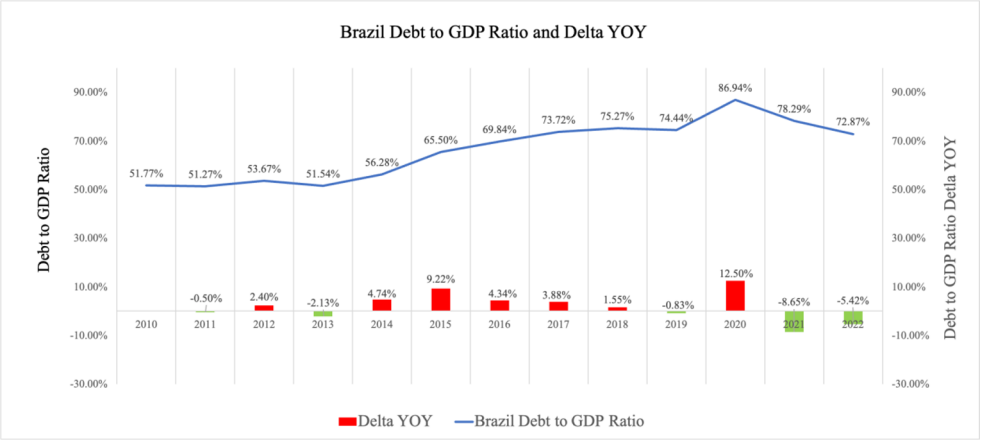

Fig. 9. The ratio of Brazil's GDP to its debt.
Source: Adapted from [64].

Brazil's oil industry plays a significant role in the country's economy, generating substantial revenue for the Government and contributing to its GDP. While the involvement of US-based companies in the industry is limited, the country's debt issues as shown in Fig. 9 and China's participation in its natural resources, including oil, have raised concerns about a possible debt trap.

Before the discovery of oil reserves, the primary economic drivers of oil-producing countries were agricultural products. However, upon the revelation of oil resources, the economies of these countries underwent a dramatic transformation towards oil extraction and refinement by international corporations predominantly from developed countries. This shift in economic focus was characterized by high volatility levels and neglected the populace's comprehensive development. Despite high GDP, these nations have been adversely affected by recurring oil price crises and burgeoning debts from international financial institutions. Consequently, their literacy rates remain low, and their global significance is negligible.

Conspicuously, a detailed analysis of oil production across the globe led us to conclude that numerous future strategies can be pursued to overcome the predicaments confronted by oil-producing nations that have been adversely affected by the actions of international corporations. The diversification of the economy can be a vital step in reducing the dependency on oil as the primary source of income and economic growth. This can be achieved by promoting the development of other sectors, such as agriculture, tourism, and manufacturing. For instance, Nigeria, which heavily relies on its oil industry, has recently promoted the agricultural sector through various policies and programs, such as the Agricultural Transformation Agenda, to decrease its dependence on oil revenues [18].

Authors recommend the listed multifaceted approaches that can suitably assist in offering a comprehensive framework for oil-producing nations to achieve long-term stability and prosperity:

(1) Increasing local participation can help ensure that oil production benefits are equitably distributed among the local populace. This can be achieved through policies that promote local employment, local procurement, and increased involvement of local firms in the oil sector. For example, Ghana's local content policy requires international oil companies operating in the country to procure a significant portion of goods and services from local companies [7].

(2) Promoting transparency and accountability is imperative for effective management of natural resources. Governments can implement regulations requiring companies to disclose their activities and payments to host countries, thereby promoting transparency in the sector.

For instance, the Extractive Industries Transparency Initiative (EITI) is a global standard that requires companies in the extractive industries to disclose their payments and revenues to host governments and promote transparency [51].

(3) Strengthening institutions and regulatory frameworks can also help ensure that the oil sector operates responsibly and sustainably. This includes creating robust legal and regulatory systems to manage environmental impacts, health and safety risks, and social issues. For example, Norway's regulatory framework for the oil industry is widely considered one of the most comprehensive and robust in the world, ensuring environmental protection and the industry's sustainable development [27].

(4) Furthermore, promoting responsible investment by international companies can significantly ensure that the host countries benefit from the oil industry. International companies should adopt responsible business practices that respect human rights, protect the environment, and contribute to the socio-economic development of the host countries. Creating incentives for responsible investment and implementing international standards for corporate social responsibility can encourage companies to adopt these practices. For instance, Shell has invested in social development programs in Nigeria, such as the Shell Live WIRE program, which supports young entrepreneurs in the country [52].

(5) To break the cycle of wars and exploitation of nations with abundant natural resources, adopting an alternative energy source such as Hydrogen could motivate developed countries to focus on technological advancements rather than resorting to political tactics destabilizing these vulnerable nations. Hydrogen offers a clean and sustainable energy source that could help promote cooperation and stability, reducing the incentive for conflicts and tensions surrounding the control of natural resources [57, 58].

4 Future Research Prospects

For global powers to navigate the paradigm shift in the energy sector in a humane manner, it is crucial for academia to equip them with tools and guidance. This support is essential to empower developing countries in leading the way toward energy security and sustainable growth. To craft a comprehensive roadmap for the global adoption of Hydrogen as the future of energy, it is imperative to carefully consider suitable theoretical frameworks and analytical methodologies that can illuminate the intricate interplay between the economy and the energy sector [45]. The insights derived from this study will furnish a structured foundation for researchers, guiding their exploration of future research questions and objectives. Future investigators should give due regard to the following theoretical and methodological approaches to steer their research endeavours and augment their knowledge base:

Game Theory Integration: By incorporating Game Theory into their analyses, researchers can gain valuable insights into the strategic behaviours of developed nations. This framework can also help identify strategies for mitigating economic vulnerabilities in developing countries [16].

By harnessing these theoretical frameworks and analytical methods, a deeper comprehension of the multifaceted relationship between the economy and energy can be attained. These frameworks are not only essential for comprehending the potential of Hydrogen but also for envisioning a future marked by sustainable and equitable partnerships between developed and developing nations.

5 Conclusion

The article conducts a critical examination of the geopolitical histories of nations plagued by the resource curse, debt traps, and conflicts, shedding light on the prevailing dominance of

developed countries in their affairs. While innovative strategies have enabled simultaneous development and resource exploitation, the root causes persist. Nevertheless, the root causes of these challenges can potentially be eradicated by replacing crude oil, the primary energy source, with Hydrogen—a promising avenue towards a carbon-free world. The transition to Hydrogen, necessitates a harmonious alliance of policymakers, scientists, and industry leaders committed to fostering sustainable and equitable energy policies. By forging ahead together, we can collectively shape a brighter future, leaving behind the era of resource exploitation and geopolitical tensions. Henceforth, this article is an attempt to envision a world where the exploitation of natural resources and the tensions it engenders belong to the annals of history. Through such concerted efforts, we have the potential to usher in a brighter future, transcending the era of resource exploitation and geopolitical conflicts.

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