

# Sustainable development, climate change vulnerability, governance and oil rent: The case of Saudi Arabia

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## ABSTRACT

This empirical investigation has aimed at exploring the impact of climate change vulnerability, governance, and oil rent on sustainable development in Saudi Arabia, for the period 1998 to 2019. The econometric analysis uses OLS regressions, and various findings have emerged. Climate change vulnerability positively influences sustainable development, which can be attributed to the continuous adaptation and mitigation efforts to tackle the country's harrowing effects of climate change. Likewise, oil rents report a favourable impact on sustainable development, implying the Kingdom's efforts to balance the adverse consequences of fossil fuel dependency on environmental quality. In contrast, the governance score is negative; hence, the composite effect on sustainable development is nefarious, although the result is statistically not significant. Furthermore, health expenditure per capita positively influences sustainable development, but the result is statistically insignificant. Moreover, the analyses also show that growth development, proxied by GDP, has been negatively impacting sustainable development. Lastly, FDI is found to be harmful to sustainable development in the case of Saudi Arabia. The study recommends ongoing investments towards climate change policymaking and development, and triggers strident calls for economic diversification of moving assets towards "greener" sectors. Similarly, the health care sector requires a revamp in quality and delivery to contribute more effectively towards sustainable development. Most importantly, the governance structure and quality of institutions in Saudi Arabia require a profound transformation, so that good governance and efficient public administration become key players in the advancement of the Saudi Vision 2030 agenda, otherwise, the ambitions of the Kingdom might reach to a standstill.

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## 1. Introduction

### 1.1 *The SDGs: A global roadmap towards sustainable development*

Decades of excessive and uncontrolled exploitation of natural assets have been tailgated by a stratospheric rise in CO<sub>2</sub> emissions and a plethora of climatic phenomena typified by heat waves, sea level rise, health hazards, sustained droughts, flash floods, ocean acidification and wildfires to name a few. Against such a backdrop of existential threats to fauna, flora and humans, coupled with rising climatic disturbances, the United Nations have promulgated the Sustainable Development Goals (SDGs), which are set of 17 goals and 169 targets which aim at driving national and international programs towards greener policymaking, spearheaded by a key credo, which is sustainable development. Meant to “free humanity from poverty, secure a healthy planet for future generations, and build peaceful, inclusive societies as a foundation for ensuring lives of dignity for all” (UN 2017, p. 4), the SDGs present an ambitious agenda to the world country leaders, as came into force back in 2015, following the phasing out of the Millennium Development Goals (MDGs). The primary focus of the SDGs is to reach a common global vision towards better management of dwindling natural resources and promote a more durable production and consumption pattern to synchronise current and future global needs responsibly. Those SDGs are listed as follows: Poverty eradication, Hunger eradication, Well-being and Health for all, Inclusive and Quality education for all, Gender equality and women empowerment, Water and sanitation for all, Provision of modern and sustainable energy for all, Employment and decent livelihood, Build resilient infrastructure, Reduce inequality within and among countries, Promote safe and sustainable human settlement, Combatting climate change, Protect marine resources, Protect terrestrial ecosystems and Promote peaceful societies with well-functioning state institutions. The literature presents various sustainability concepts, and one of the most prominent ones is the troika model, which includes the three pillars of sustainable development: economic, social and environmental. Hence, sustainable development enjoins countries to complement the pursuit of their socio-economic objectives with environmental conservation endeavours in alleviating the ecological impacts of economic development. Ciegis and Zeleniute, (2008) explain those three interrelated nodes, where firstly, from the economic viewpoint, sustainable development requires that the per capita income of forthcoming generations is not lower than the previous one. Secondly, from a social perspective, sustainable development, refers to development that nurtures social bonding and community togetherness. Finally, from an ecological standpoint, sustainable development advocates the preservation and conservation of ecosystems, biodiversity and natural environments. The three spheres of sustainable development are illustrated below:

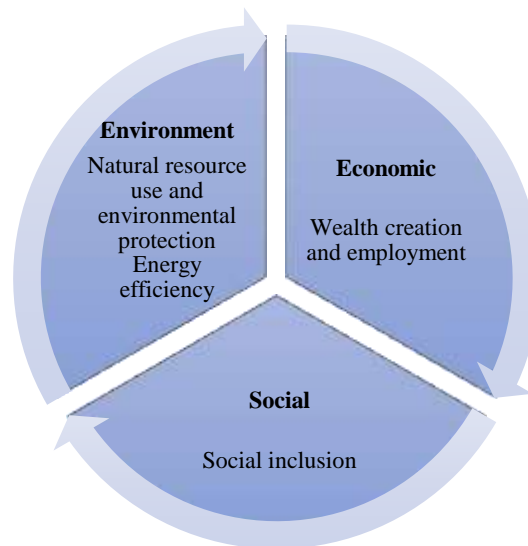


Figure 1. The three pillars of sustainable development. Source: (Fauzel & Tandrayen-Ragoobur, 2021).

Whilst the concept of sustainable development is traditionally grounded in the three dimensions, as shown above, a fourth aspect is attracting much attention: the governance or institutional quality dimension. Indeed, it is widely recognised that governance structures and the effectiveness of state institutions and civil bodies are key ingredients nationwide sustainable development [Bochańczyk-Kupka & Pęciak, (2015); Mombeuil & Diunugala, (2021)]. Undoubtedly, countries with a weaker institutional background and framework tend to face significant hurdles in formulating and implementing sustainability goals, because the governance impediments act as solid barriers to inclusive, pro-poor and pro-environment growth. Institutional capture, in fact, restricts institutional autonomy, thereby increasing the level of opacity in the management of funds, which might end up benefiting a more minor group at the expense of national welfare. Fundamentally speaking, effective, independent, accountable and sound institutions are the bearers of social change, and are the actors of economic transformation, which generate enough trust and confidence in private and public stakeholders to also embark on the sustainability bandwagon. The heterogeneous scale at which the SDGs have progressed primarily explained by the differences in effectiveness and public administration efficiency (European Commission, 2021). One creative way to visualise the interconnectedness of the SDGs and the spearheading role of governance in the SDG agenda advancement is through the “wedding cake” model. The figure below illustrates the synergistic capacity of governance and institutions to bolster the entire SDG program at different levels and vehicle the individual SDGs across a common axis.

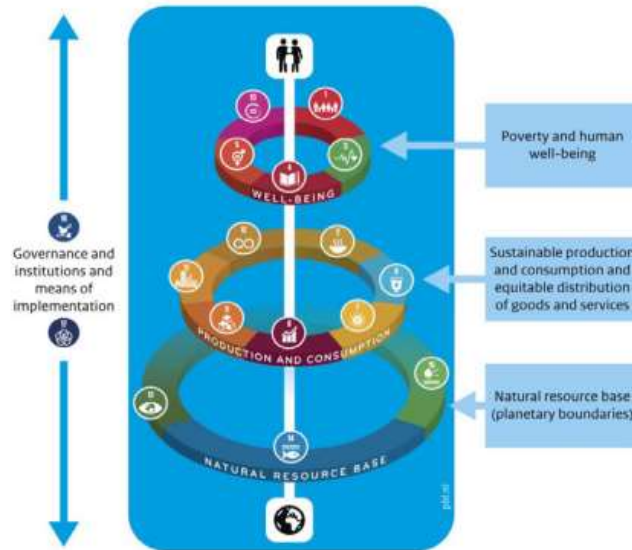


Figure 2. Wedding cake SDG model. Source: (PBL, 2018)

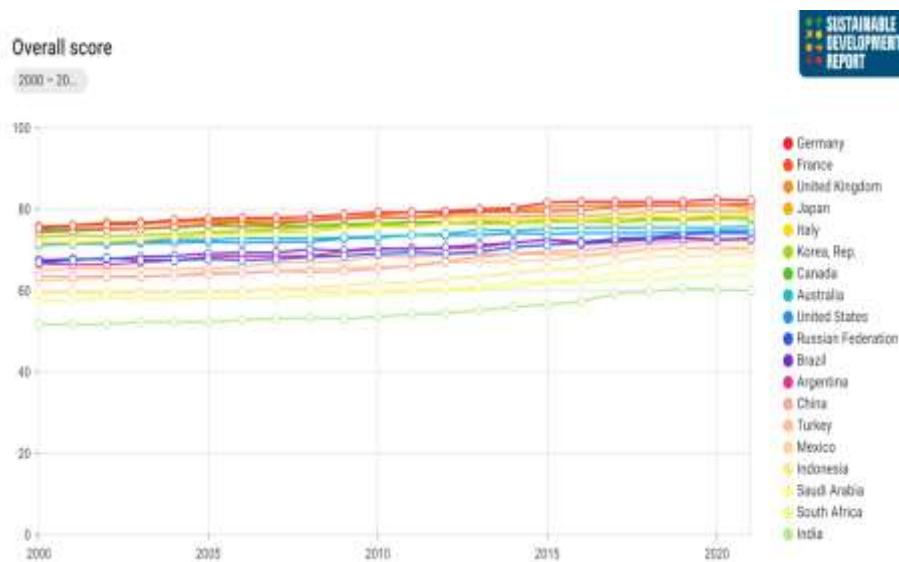


Figure 3. Progress in SDG achievement. Source: (Sustainable Development Report, 2022).

The graph above illustrates the overall SDG score, which measures the progress in the achievement of the 17 SDGs, where a score of 100 denotes a complete accomplishment of all the SDGs. The graph pertains to a group of selected countries for the 2000 to 2020 period. While the general trend might denote continuous progress towards attaining the SDGs, many countries, notably those in the developing world, including the Small Island Developing States (SIDS) and those affected by war, face multiple hurdles in achieving their sustainability targets. On the one hand, those SDG impediments are country-specific (internal factors), such as lack of finance, capacity constraints in terms of infrastructure and human capital, over-dependence on natural resource exploitation, climate change adversities, and defaulted state

institutions (corruption, lack of the rule of law, instability), and on, the other hand they are exogenous as well, such as international conflicts (war in Ukraine) and global-scale imbalances (COVID 19 pandemic) which restrain the movement of funding towards the financing of the SDGs and shift policy-making towards other priorities [for further reading see Sustainable Development Report, (2022)]. As mentioned by Sachs et al., (2022) in the Sustainable Development Report 2022, the average SDG score index saw a slight fall in 2021, owing to the slow or no recovery in the poor and vulnerable parts of the world, in the aftermath of health and security crises. Simultaneously, the authors, deplore that performance in SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic growth) have experienced a severe blow, which brought the scores back to pre-pandemic levels, especially in many low-income and middle-income countries.

## 1.2 *Research motivations and objectives*

Described as “The heart of the Arab and Islamic worlds, the investment powerhouse and the hub connecting three continents” (Saudi Vision 2030, p.9), Saudi Arabia has set foot since 2016 on a socio-economic transformative journey which is fueled by to shift in the country’s long past reliance on its oil resources, towards a more sustainable future for the years to come. Such endeavour rests on three central pillars, namely: a vibrant society, a thriving economy and an ambitious nation, breaking down further into 96 goals, which include major sustainability targets driven by the preservation of environment and natural resources. Kosárová (2020) explain that the overarching reasons for embarking on the Saudi Vision 2030 are diminishing oil prices and demographic shifts. As the world embraces a paradigm evolution towards renewable energies, oil prices remain highly volatile. At the same time, a more youthful population means more jobs to match the younger generation’s aspirations. Over Vision 2030 has been touted as a “mega project” and “monumental experimentation” (Kosárová, 2020), and is promoted as a masterplan for the Kingdom’s historic steer towards economic diversification and sustainable progress. However, a key concern which sheds skepticism is the rentier system which is deeply rooted in a monarchy and absolute authority. The country’s authoritarian regime is based on rentier machinations where the state injects massive investments from its natural resources towards public welfare, while the citizens, on their side, showcase loyalty and fidelity. With the novelty of Saudi Vision 2030, this social contract between the monarchy and the public, is expected to be fractured, since large-scale economic liberalisation might signal the end of subsidised public goods and services, with more input from the private sector. This is an intensely tricky conjecture, since on the one hand, Saudi Arabia is called upon to liberalise its economy (which might lead to the imposition of taxes, and reduction of subsidies and privileges). On the other hand, the citizens might desire another form of government if, in exchange for their loyalty they can no more benefit from certain privileges. Overall, the way the governance structure will evolve under Vision 2030, and how it will adapt to the country’s cultural ethos, remains a serious question.

At the same time, climate change vulnerability is seen as a significant stress exacerbator in many regions worldwide, particularly the Middle East, known for its arid climate. Saudi Arabia, similar to its middle eastern counterparts, faces severe climate threats, which harbinger dramatic ramifications on sectors dependent on water, and many other SDGs are in jeopardy, causing their relegation. For instance, Mousavi et al., (2020) revealed that climate change could cause respiratory diseases, skin cancer, vector-borne diseases, cholera, and diarrhoea (SDG 3: Health and Well-being). Likewise, a severe water crisis can impede SDG 6: Water and Sanitation and the adverse effects are more rampant when the agriculture sector consumes a large chunk of water resources, such as in Saudi Arabia, where 87% of total water use is intended for irrigation purposes (Ghanim, 2019). Equally, global warming poses a significant danger to wildlife and endemic species in Saudi Arabia, such as Arabian Oryx, Arabian spiny-tailed lizard, vultures and Hoopoe Larks (Williams et al., 2012), thereby, negatively impacting SDG 15: Ecosystems and Biodiversity. Similarly, severe weathers such as storms, cyclones, sandstorms, hurricanes and precipitation can damage road infrastructures through soil erosions and rockslides, amongst others (Zaid et al., 2021), thus harming SDG 9: Infrastructure. In general, climate vulnerability is a severe impediment to SDG attainment, and Saudi Arabia is much concerned about it.

As observed, climate change vulnerability, governance (institutional quality), and oil rents represent significant areas of concern for sustainable development. Hence, the present study aims to uncover the relationship between sustainable development, climate change vulnerability, governance and oil rents for Saudi Arabia during the 1998 to 2019 period. For this research, Saudi Arabia, sets an interesting case study for the following reasons: It is experiencing a critical transition towards sustainable development, it is a climate change hotspot, it is at a major turning point in governance and institutional transformation and. 4. ilts oil rent can be either a boon or a bane in achieving sustainable development. The current study contributes to the empirical literature by exploring the interconnectedness between climate change vulnerability, governance and oil rent against a transformative journey towards sustainable development. In this context, Saudi Arabia lends itself to the objectives of this study, and the implications for policies are meant to be highly relevant, especially under the Vision 2030 program.

In this context, Saudi Arabia lends itself to the objectives of this study, and the implications for policies are meant to be highly relevant, especially under the Vision 2030 program. According to the author's best knowledge, there is a paucity of research which focuses on the triple effects of climate change vulnerability, governance and oil rent on sustainable development in a context such as Saudi Arabia in a single study, especially in the aftermath of the announcement of the Saudi Vision 2030 masterplan. Together, this paper reunites several aspects that make it a valuable contribution to the present scholarly literature on sustainable development, set against a backdrop of a unique case as Saudi Arabia.

The conceptual framework is shown below, where the independent variables are climate change vulnerability, governance and oil rent, while the dependent variable is sustainable development:

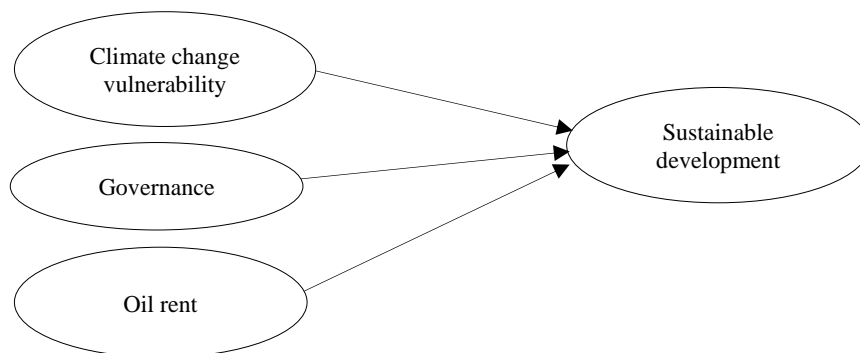


Figure 3. Conceptual framework. Source: (The Author).

## 2. Literature review

### 2.1 Climate change vulnerability and conflicts: Twin conundrums for the SDGs

The dramatic effects of climate change and global warming on humans and surrounding environments continue to acquire undisputed recognition as serious issues of concern within the global political and academic spheres. The harrowing consequences of climate change hit countries differently at varying degrees of intensity. For instance, SIDS, developing, least developing countries, and conflict-affected states are those bearing the most significant burden of the looming climate crisis, notably in terms of prolonged drought, loss of natural habitats, rising food insecurity, decrease in crop yields and many other social and economic woes amidst political tensions [Islam & Winkel, (2017); Mustun, (2022) and Tandrayen-Ragoobur, & Fauzel, (2021)]. The disproportionate exposure of certain countries and groups vis-a-vis climate hazards compared to other nations or communities can be explained through four channels of vulnerabilities. Thomas et al., (2019) explicate that vulnerability is a function of four main aspects: resource accessibility, governance, culture and knowledge, and these influence to a great extent, the success of

countries or communities in addressing the adverse effects of climate change. In other words, inadequate resource accessibility (financial means, transport systems, access to healthcare and shelters in the face of floods, hurricanes, etc.), poor governance (government ineffectiveness, weak institutions and political instability), culture (high degree of social inequality and perception of risks) and insufficient know-how on climate hazard preparedness and adaptation - all constrict the progress in formulating policies to tackle climate change challenges, thereby causing some communities to remain bare to the alarming climate events.

Climate-induced repercussions are multifarious, including migration, loss of lives, loss of livelihoods, pressure on food stocks, political instability and conflict, amongst many others. When these events correlate and experience inter-causality, the ramifications tend to be more persistent and dramatic, especially climate-related disasters and conflicts, which are known to be closely inter-linked [see Report on the Impact of Climate Change on Migration, 2021 and Koubi, (2019)]. According to the Internal Displacement Monitoring Centre (IDMC), internal displacements for the 2008 to 2021 period caused by disasters and climate hazards have amounted to 305.6 million across 202 countries and territories. The weather hazards include extreme temperature, wet mass movement (toppling of rock and sediment/landslides), stormstorms, drought, wildfire, severe winter conditions, and flood. Similarly, the IDMC also computed displacements from conflict and violence for the same time frame, is tantamount to 111.3 million for a panel of 83 countries and territories. The respective graphs are shown in Figure 2 and Figure 3 below. Both graphs tend to insinuate an upswing pattern in the rise of internal displacements, both natural hazard and conflict-induced over recent years.

Climate hazards hit the hardest the most impoverished societies and communities, notably those that depend heavily on agriculture, husbandry, and fishing as subsistence activities. In these contexts, conflicts and turmoils are exacerbated due to pre-existing conditions such as political tensions, rural underdevelopment, high population density, poor sanitation and government ineffectiveness (Mustun, 2022). For these reasons, climate hazards and turmoils are often viewed as correlated phenomena, leading to internal displacements and migration across borders.

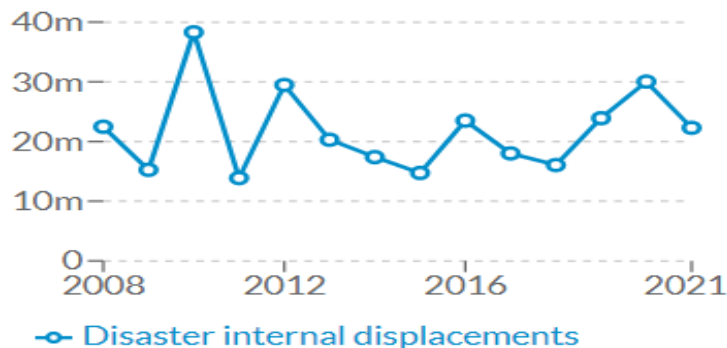


Figure 3. Internal displacements due to climatic disasters. Source: (Global Internal Displacement Database Data, 2022)

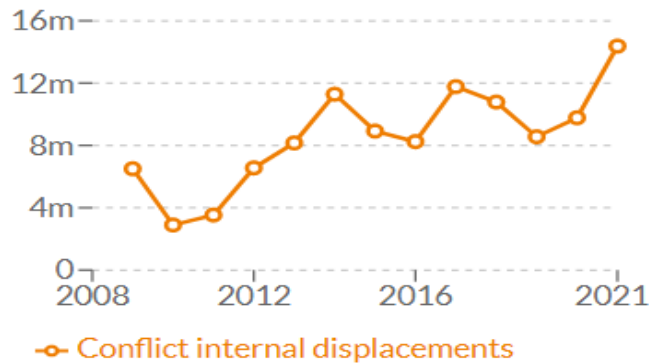


Figure 4. Internal displacement due to conflict. Source: (Global Internal Displacement Database Data, 2022)

Climate change vulnerability in and of itself represents a serious threat to the SDG agenda since it retards the progress of countries, either rich or poor, in advancing faster in policy formulation and implementation, given that extreme climate hazards are known to aggravate inequality, poverty levels, famines, engender severe damage to human settlements through flash floods, increase school dropouts and equally jeopardise fragile marine and terrestrial ecosystems [for further reading see Mustun, (2022)]. Similarly, political and social unrest undermine the SDGs in the sense that they deepen food insecurity and destabilise economic well-being while heightening the number of war migrants, poverty levels and other forms of suffering. Such consequences are even more amplified in countries already crippled by extreme weather hazards. By contrast, well-performing state institutions and good governance in a stable socio-economic setting, are considered prerequisites in the SDG agenda advancement, since strong, high-quality state bodies and government effectiveness are the backbones of sound and impactful policy mechanisms.

The protagonist's importance of institutional quality is more felt in countries with weak and unstable civil bodies, where corrupt institutions champion political shenanigans instead of concrete climate action and environmental governance. That is why, amongst the 17 SDGs, SDG 16, "Peace, Justice and Strong institutions", is given a cornerstone role in the enforcement of policies, enactments of rules, regulations and reforms to gear public and private partnerships towards sustainable development. Within the institutional quality literature, several studies confirm high-performing institutions' positive effect on goal attainment of sustainability goals. For instance, Azam et al., (2021), denote in their empirical findings for a panel of developing countries that institutional quality matters for sustainable development. Likewise, Huynh and Ho, (2020) demonstrate that pollution level, proxied by CO<sub>2</sub> emissions is high in the shadow economies of a selected group of 43 developing countries. However, the institutional quality effectively abates those harmful effects through adequate policy enforcement. In general, environmental sustainability is improved under good institutions; in particular, the rule of law, government effectiveness, control of corruption, and regulatory quality (Nguyen., 2021).

## 2.2 Setting the context in oil-rich and resource-abundant countries.

Whilst global recognition of the urgency to counteract the effects of fossil fuel consumption and adopt climate mitigation plans has primarily been reached, as testified by the Paris Agreement in 2016, which aims at limiting global warming well below 2o C and limiting the temperature increase to 1.5o C, the path towards the realisation of those targets and accords remain a daunting feat for those countries whose economic models are extensively based on sub-soil wealth extraction. Among those countries, the ones located in the Middle East and North African (MENA) region are well-known since they are amongst the largest extractors and exporters of natural gas and oil. Consequently, these economies derive substantial portions of rents as a percentage of their GDP from natural gas and oil. The figures below show the



percentage of oil rents as a percentage of GDP for a selected group of MENA countries for the year 2018, and as can be seen, oil rents can reach almost 45% of the GDP for Iraq, Kuwait and Libya.



Figure 5. Source: (World Development Indicators, 2022)

In the same way, high dependence on fuel extraction and usage for consumption and exports can generate high levels of CO<sub>2</sub> emissions, which are often used as a proxy for climate change [see Nawaz et al., (2020) and Povitkina, (2018)]. The graphs below illustrate trends in fossil fuel energy consumption, fuel exports and CO<sub>2</sub> emissions for the MENA region from 2007 to 2015.

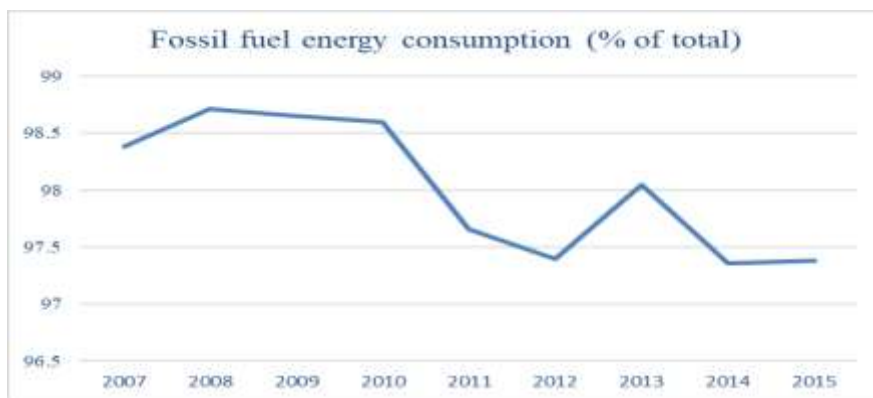


Figure 6. Source: (World Development Indicators, 2022).

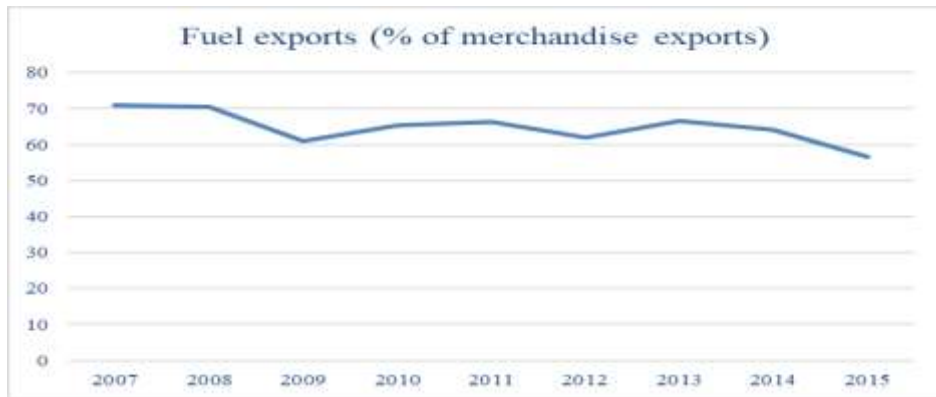


Figure 7. Source: (World Development Indicators, 2022).

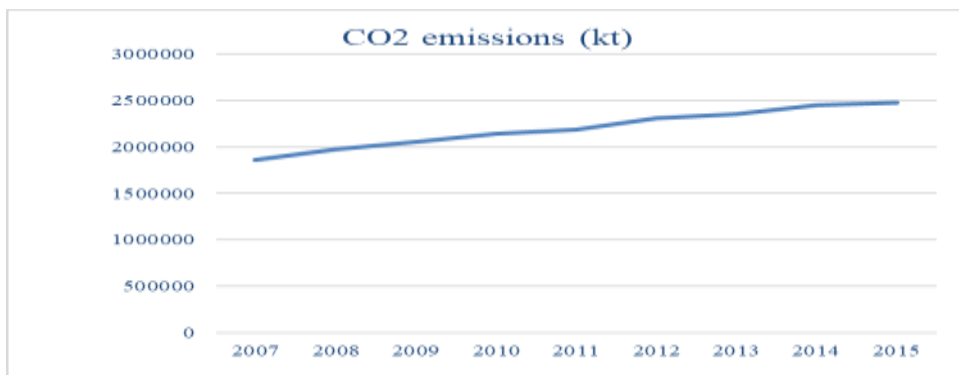


Figure 8. Source: (World Development Indicators, 2022).

As observed, fossil fuel is a major source of energy (above 97% of all energy sources) for the entire period. Similarly, fuel exports have remained above 50% of merchandise exports for the same time frame. Consequently, CO<sub>2</sub> emissions have experienced a continuous increase during the 2007-2015 period, which altogether denotes the extent to which oil-rich and resource-abundant countries hinged on their natural assets to meet their trade and domestic energy demands. Nonetheless, the oil and gas sectors are often considered positive contributors to the SDGs, in terms of the massive government revenues they generate, which aid in societal policy financing, the numerous direct and indirect jobs they create, which improve the living standards of poorer communities, the consequential amounts of fuel trade which spur economic growth amongst many other channels leading towards sustainability goals attainment [See the full report: *Mapping the oil and gas industry to the Sustainable Development Goals: An Atlas* (2017)].

However, natural resource endowments do not automatically mean that resource-rich countries are those which are most successful in meeting the SDGs. Paradoxically, many such resource-abundant countries are amongst the worst-performing economies across a series of macroeconomic and social welfare indicators. For example, despite deriving almost 48% of its GDP from natural resource rents, the Republic of Congo, has only 45% of its population who have access to safely managed drinking water services, and an infant mortality rate of 34.7 % per 1000 live births [figures for 2018] (World Development indicators, 2022). Similarly, in 2018, Iran's natural resource rents as a percentage of GDP amounted to 24%, yet 32% of its youth population are neither in education, employment, nor training and 40% of its total population face moderate or severe food insecurity. By contrast, with a natural resource rent of 45% of GDP in 2018, 100% of Kuwait's population has access to safely managed drinking water and sanitation services. Another interesting example is Bahrain, with only 4.4% of its GDP coming from natural resource rents; the country

has a much higher percentage of its population who have access to safe drinking water and sanitation, coupled with a much lower infant mortality (6.1%) rate than the Republic of Congo (34.%). This stark contrast is what is known in conventional economics as the “resource curse” or the “paradox of plenty”, which hypothesises that despite some economies being bountiful in natural resources, they are ironically plagued by low levels of socioeconomic development, which with compounded effects hamper sustainable development.

One point of view to explain this phenomenon is through the lenses of corruption, governance and institutional quality. From what is observed within the literature, resource-abundant countries have an embedded culture of rent-seeking, which is channelled towards the ruling elites, at the expense of the general population’s betterment and social progress. In other words, substantial proceeds from resource exploitation are monopolised in the hands of a few, thereby leading to corrupt behaviours which cascade down into state institutions, where policies are diverted towards breeding a diseased oligarch. For instance, Salari and Noghani-behambari, (2021) show for a panel of 141 countries from 1997 to 2018 that natural resource rent will increase corruption. Arezki and Brückner (2011) equally bring evidence that oil rents significantly increase corruption, while political rights weaken as oil rents rise, for a sample of 30-oil exporting countries for the 1992 to 2005 period. Meanwhile, Chygryn et al. (2020) demonstrate in their results for a group of 15 countries during the 2000 to 2008 period, that oil rents were linked to corruption, and corruption equally increased oil rents, but that occurred only when institutional quality was a below a certain threshold. This confirms the role of institutions in moderating the adverse effects of oil rents and keeping the level of corruption.

As seen, governance and institutional quality are essential ingredients in facilitating sustainable development achievement, and resource-rich countries are usually poor achievers in this regard. Therefore, it becomes interesting to investigate the scenario in Saudi Arabia and see how the country has fared so far, given that it remains one of the largest exporters of oil in the world. In other words, this very oil could be either a blessing or curse, and it beseeches interest to know what it is in the case of Saudi Arabia. Secondly, Saudi Arabia is no exception to climate change. It too suffers from hazards of extreme weather, and the challenge is even more potent when there is such a dependency on sub-soil wealth. Climate change makes the non-oil sectors significantly vulnerable, including fisheries, agriculture and tourism, and the same can be evoked across the GCC (Gulf Cooperation Council) countries (see report: Prospects for climate change integration into the GCC economic diversification strategies).

Secondly, the oil sectors are equally affected by the mitigation plans adopted by other countries, which herald dwindling revenues for these oil exporters. The report also mentions that “*climate change action plans are yet to be established across the GCC states*” (Aisha Al-Sarihi 2018, 18). Therefore, this paper is timely and is a humble attempt to capture a glimpse of how Saudi Arabia has been performing in terms of sustainable development and how its climate change vulnerability has been influencing its progress towards greater sustainability levels. At the same time, important questions like how the governance and oil rent have affected the sustainability agenda in the country either positively or negatively undergo investigation.

### 3. Data, variables and methodology

This study aims at ascertaining the relationship between climate change vulnerability, governance and oil rents on sustainable development for Saudi Arabia, by exploiting data related to the 1998 to 2019 period. The availability of data has dictated the time period. The prime research objective is to assess the impact of climate change vulnerability, governance and oil rents on sustainable development. Subsequently, the primary econometric model takes the following functional form:

$$ANS = f(CV, GOV, OIL) \quad (1)$$

and OIL represents oil rents (% GDP). The dependent variable is sustainable development, proxied by adjusted net national savings (current US\$). The use of ANS as an indicator for sustainable development

has been previously used in studies such as Güney (2017) and Azam et al. (2021). To amplify the model, control variables are added based on the literature review.

The final econometric model is as follows:

$$ANS = f(CV, GOV, OIL, GDP, HEALTH, FDI) \quad (2)$$

Where, GDP is the per capita annual growth rate, HEALTH refers to the government spending on healthcare per capita in current US dollars, and FDI is a foreign direct investment as net inflows (% of GDP). Once the functional model is specified, the econometric equation is set as follows:

$$ANS_{it} = \beta_0 + \beta_1 CV + \beta_2 GOV + \beta_3 OIL + \beta_4 GDP + \beta_5 HEALTH + \beta_6 FDI + \varepsilon_{it} \quad (3)$$

Where  $i$  = the country under study;  $t$  = time;  $\beta_0 \dots \beta_9$  = parameter estimates, and  $\varepsilon$  = error term.

The equation above explains the a priori expected results and the linkages between the dependent and the independent variables. First and foremost, climate change vulnerability (CV) as viewed as a major setback to the SDGs. For instance, communities highly susceptible and exposed to extreme weather hazards face tremendous challenges in escaping the pits of poverty (SDG1), also food shortage becomes rampant (SDG 2), health, wellbeing and access to water and sanitation facilities (SDG 3 and SDG 6) are undermined and lesser opportunities are available for education, employment and economic growth (SDG 4 and SDG 8) (Mustun, 2022). The climate change vulnerability index ranges between 0 and 1, where the lesser the value, the better it is. Hence, high climate change vulnerability is expected to negatively affect ANS.

Furthermore, institutional quality or governance (GOV) represents the effectiveness and efficiency of governmental bodies to perform independently while handling the affairs of the state. The values for the governance scores vary between -2.5 to +2.5, and higher order values indicate good governance practices, high institutional quality and generally an ability of governments to operate in stable environments. In fact, highly competent, robust and ethical institutions are less prone to corrupt and hence address critical issues such as climate change and environmental policy making while formulating strategies to improve the socio-economic status of the citizens. Thus, high quality institutions drive the sustainability agenda of the government.

This has been evidenced by Azam et al., (2021) whose empirical results confirm the positive effect of institutional quality on sustainable development, thereby reinforcing the need to improve governance structures in order to uphold the SDG agenda. Similar confirmations are also found in Güney, (2017), where governance is reported to positively influence sustainable development, thus, supporting the institutional school of thought which avers that institutional quality is critical to environmental quality. Therefore, it is anticipated that governance (GOV) positively impacts ANS. Saudi Arabia is one of the largest exporters of crude oil in the world, and to this effect oil contributes around 90% to government coffers (Sultan & Haque, 2018). Undoubtedly, the vast amount of oil reserves in Saudi Arabia and their trade, has catapulted the latter as one of the premier economies in the Middle East and led it to achieve impressive economic development since the discovery of oil. However, the environmental impacts of such dependency on natural resources have took the centre stage in recent years, and is a strong motive behind the Saudi Vision 2030. In fact, Alkhatlan and Javid, (2015) contend that during the 1971 to 2013 period, oil consumption and CO<sub>2</sub> have been rising continuously in Saudi Arabia, which alternatively depict a progressive trend in environmental degradation. Likewise, Mahmood et al., (2019) found that economic growth, energy consumption and CO<sub>2</sub> have a short run and long run relationship in Saudi Arabia for the 1968 to 2014 period. Both economic growth and energy consumption contributes positively to higher CO<sub>2</sub> emissions. Therefore, leaning on previous empirical works, this study posits that oil rent (% of GDP) negatively harms sustainable development.

GDP per capita growth rate measures the level of economic development on a yearly basis, and as a country expands its sectoral and economic activities, its natural resources are expected to deplete (Güney, 2017). Hence, it is expected that GDP reports a negative relationship with ANS. Moreover, human

development (social capital) is one of the three traditional pillars of sustainable development which are economic, social and environmental. Indeed, the “people” dimension of sustainable development lies at the heart the overarching theme of sustainability achievement, since without a healthy, prosperous and dignified human capital, national welfare, wellbeing and progress would remain constricted. For this reason, government expenditure on health have been included in the econometric estimation, since it is recognized as a strong leverage to achieve a superior quality of human resources, and subsequently, act as an enabler to sustainable development. Hence, the health proxy is expected to have a positive coefficient vi-a-vis ANS. Lastly, the effect of FDI on sustainable development has been considered, since foreign direct investments are perceived as prime catalyses to economic growth, higher incomes, more employments and act as pathways for technology transfers towards less developed economies (Kardos, 2014). Thus, in multifarious ways FDI contributes to the achievement of the SDGs, such as poverty reduction, food insecurity alleviation, job creation, economic development, improved education and healthcare standards, amongst others. The table below summarizes the variable descriptions and sources.

Table 1. Variable descriptions and sources.

Variable	Variable definition	Sources
Adjusted Net Saving (ANS)	Net national savings are equal to gross national savings less the value of consumption of fixed capital	World Development Indicators
Climate change vulnerability	Measures a country's exposure, sensitivity and capacity to be resilient in the face of the negative effects of climate change	Notre Dame Global Adaptation Initiative
Governance	Measures the quality of institutions, the ability of the government to enforce sound policies and the overall political stability in a country	Worldwide Governance Indicators
Oil rent (% GDP)	The contribution of oil revenues as a percentage of GDP	World Development Indicators
GDP per capita growth rate (annual %)	Annual percentage growth rate of GDP per capita	World Development Indicators
Health expenditure per capita (current US\$)	Current government spendings on healthcare per capita in current US dollars	World Development Indicators
FDI	Foreign direct investment, net inflows (% of GDP)	World Development Indicators

The governance index (GOV) is a composite score of six individual indices, which are illustrated in the following table. The use of the World Bank governance scores is widely present in the institutional quality literature namely; Dwumfour and Ntow-Gyamfi, (2018), Abdulahi et al., (2019), Boateng et al., (2021) and Yameogo et al., (2021) amongst others.

Table 2. World Bank Governance Indicators

World Governance indicators	Description
Control of corruption	Measures the extent corruption is perceived to be present amongst public officials
Government effectiveness	Measures the perceptions on the effectiveness of the government to undertake reforms/policy formulation
Political Stability and Absence of Violence/Terrorism	Measures the perceptions on the level of stability the public enjoy in the country
Regulatory Quality	Measures the perceptions on the government in enforcing regulations/ keeping in check the private sector
Rule of Law	Measures the perceptions on the level of law abidance and presence of law in the country
Voice and Accountability	Measures the perceptions on the extent the citizens are free to choose their political representatives and degree of freedom of expression, association and free media

## 4. Results and discussion

### 4.1 Descriptive analysis

Table 3. Descriptive statistics

Variable	Mean	Median	S.D.	Min	Max
ANS	1.39e+011	1.34e+011	9.01e+010	5.40e+009	3.06e+011
CV	0.400	0.398	0.0102	0.389	0.417
OIL	37.1	37.9	11.1	19.6	54.4
GOV	-0.335	-0.336	0.0645	-0.483	-0.214
GDP	0.499	0.719	3.64	-5.72	8.02
HEALTH	560.	505.	247.	267.	943.
FDI	2.1254	1.17	2.73	-0.99257	8.4964
CC	-0.00551	-0.0125	0.197	-0.305	0.366
GE	-0.0441	-0.0665	0.226	-0.375	0.321
PS	-0.354	-0.448	0.263	-0.655	0.227
RQ	0.0225	0.0238	0.0993	-0.268	0.161
RL	0.0892	0.0892	0.0920	-0.151	0.338
VA	-1.72	-1.72	0.132	-1.91	-1.32

Source: (Author's compilation). [CC: Control of corruption; GE: Government effectiveness; PS: Political Stability and Absence of Violence/Terrorism; RQ: Regulatory Quality; RL: Rule of Law and VA: Voice and Accountability]

Since sustainable development (ANS), climate change vulnerability (CV), governance (GOV) and oil rent (OIL) are the crux of this study, the focus is laid on these descriptive statistics only. It is also useful to graph the values in order to gauge the trend over time.

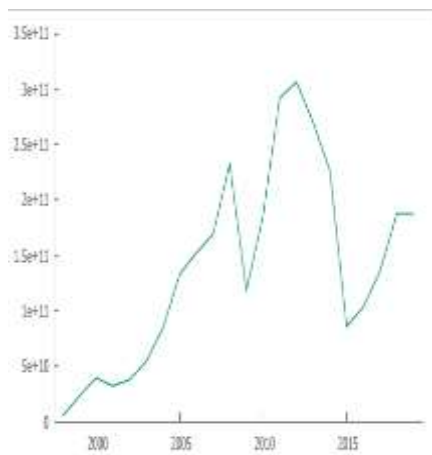


Figure 10. Sustainable development. Source: (The Author).

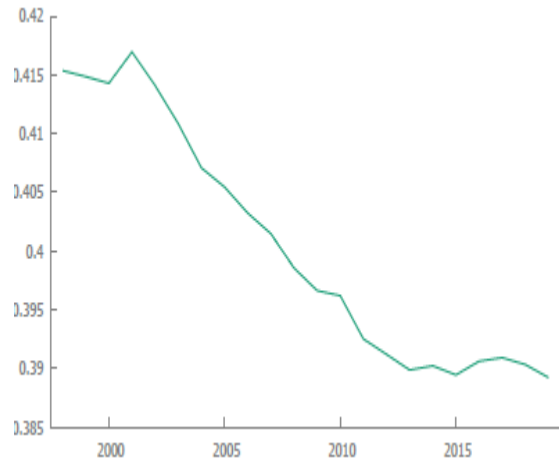


Figure 11. Climate change vulnerability. Source: (The Author).

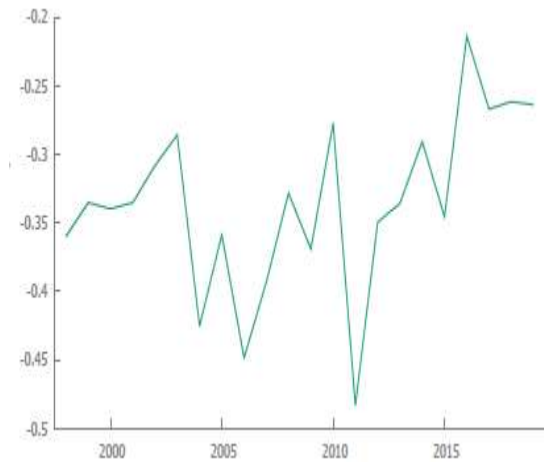


Figure 12. Governance. Source: (The Author).

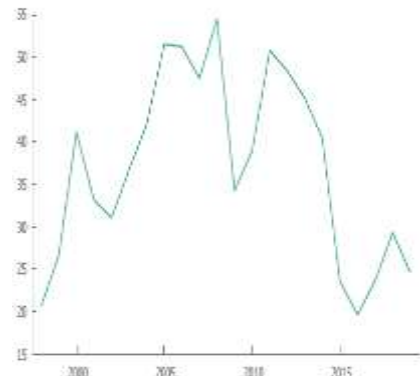


Figure 13. Oil rent (% GDP). Source: (The Author).

In the first instance, it can be observed that the ANS mean value is positive, which might indicate that Saudi Arabia has been progressing towards sustainable development – an outstanding effort, given its extensive reliance on oil extraction. Besides, the ANS value depicts an upward trend over the 1998 to 2019 period, reflecting the continuous improvement to spur economic diversification with the help of at least ten development plans since the 1970s. However, success in shifting the economy away from oil to novel development paths has been insufficient. Perusing the climate change vulnerability index, its mean value (0.400) is closer to 0 than 1, thereby lending to a possible insinuation that vulnerability and sensitivity to climate hazards, have been generally stable over the years. In fact, in view to tackling the adverse consequences of water scarcity and drought, Saudi Arabia has been experimenting with desalination as early as the 1970s, and today is a paragon in the region in terms of desalination technologies, which substitutes for groundwater used for drinking (DeNicola et al., 2015). In the same bandwidth, Maghrabi et al., (2021) report that Green Spaces (GS) in Jeddah, are instrumental in mitigating the harmful effects of climate change, through heat stress abatement, an increase in air quality while elevating the outdoor thermal comfort.

These offer an explanation for the downward trend in the climate change vulnerability index (see Figure 11) over the years, thereby insinuating progress in the adaptation to and mitigation of climate change impacts, coupled with lower vulnerability and sensitivity to extreme weather hazards.

Concerning the composite governance score, noticeably sharp fluctuations have been the norm over the years. Despite the improvement in the overall index from 1998 to 2019, the score has remained negative for the entire study period. The same can be said for the individual institutional quality indices, as shown in table 3, except for “Regulatory Quality” (RQ) and “Rule of Law” (RL). Inspecting the governance scores separately, “Control of corruption” and “Government Effectiveness” (GE) have negative means. This, in fact, corroborates a line of argument which profess that in resource-rich countries, political perversion tends to flourish [Robinson et al., (2006); Mehlum et al., (2006)], thereby breeding corruption which then dampen the institutional and governance structures. Caselli and Tesei, (2016) point out in their empirical study that when experiencing windfalls, autocratic regimes tend to adopt harsher forms of autocracy, which might give way to more elitism, cronyism and corruption. Besides, Saudi Arabia is an absolute monarchy, and consonant with its longstanding past of supreme control by the House of Saud over the vast territorial sub-soil wealth, it is evident how the oil trade has benefitted the Royal family, and this ultimately leads to speculation on corruption and non-meritorious privileges.

As for the “Political Stability and Absence of Violence/Terrorism” (PS) index, it is also negative, which can be explained through different lenses, either economic, political, religious and social, [for further reading see Hegghammer, (2008)], especially given the strategic importance of Saudi Arabia in the Muslim world, its powerhouse status in the Middle East and the Sunni (Saudi Arabia)-Shia (Iran) hostility. Nonetheless, the Kingdom has remarkably managed to nurture long-term stability over the years (Stenslie, 2018), despite a Middle East engulfed in tumultuous episodes for decades. Concerning the negative score for “Voice and Accountability” (VA), it mirrors the reality that since Saudi Arabia is a monarchy, freedoms associated with expression and association are generally restricted, which otherwise might challenge the monarch’s authority. Essentially, this has been amongst the foremost reasons behind the maintenance of stability in the country, since aided by the clerical community (*ulamah*), the House of Saud leans on the governance precepts of Islam (*Ahkaam al haakimiyyah*), which promotes support, adherence, affiliation and loyalty to the ruler in charge of the *ummah* [Al-Atawneh, (2009) and Stenslie, (2018)]. It is a direct command which emanates both from the *Quran* and the prophetic *Sunnah* (traditions), as evidenced below:

*“O you who have believed, obey Allāh and obey the Messenger and those in authority among you. And if you disagree over anything, refer it to Allāh and the Messenger, if you should believe in Allāh and the Last Day. That is the best [way] and best in result.” (Chapter 4, verse 59)*

The prophet Muhammad *s.a.w* (Peace be upon him) said:

*“It is obligatory upon you to listen and obey the orders of the ruler in prosperity and adversity, whether you are willing or unwilling, or when someone is given undue preference to you.” (Riyad as-Salihin 666 - The Book of Miscellany)*

Hence, rebellion, insurrection and insurgency are profoundly condemned in Islam since these perturb the socio-economic life of the Muslim community, and directly impact the five *Maqasid us Shari’ah* (Objectives of Islamic Law) which are: Protection of life, Protection of faith, Protection of intellect, Protection of progeny and Protection of wealth (Shabbir, 2020). Therefore, obedience to rulers and those at the head of state affairs results in safeguarding prosperity, peace and national stability. In fact, under *Salafism*<sup>1</sup> revolting against the ruler will generate more harm than what was initially present. For these reasons, many *Ulamahs*, especially the *Salafists*, have notoriously condemned the revolts across the Arab world years back, known as the Arab spring, which was meant to oust the corrupted system, but instead resulted in a greater catastrophe. Adherence to these principles has contributed extensively to regulating the socio-political life in Saudi Arabia, and in various ways, led to the stability of a kingdom rooted in oil wealth.



Lastly, the oil rent graph illustrates the volatile nature of the oil market, and the declines and upsurges in the oil rents reflect the success or failure of economic diversification at several points in time and the peaks and lows of world oil prices.

Before proceeding to the regression analysis, the stationarity of variables needs to be checked. Non-stationarity of data in time series is a major issue in empirical analysis, which, if not corrected, can lead to spurious regressions. To be noted, the variables have not undergone a logarithmic transformation, since, for most of them, the values are negative. In order to check the stationarity properties of the variables, the Phillips-Perron (PP) test is used. The null hypothesis for the stationarity test infers that the series is non-stationary (has a unit root). The results of the PP test are tabulated in the table below. The significance level chosen is 5%.

Table 4. Phillips-Perron (PP) test (Main variables).

Variables	Model specification	PP test p-values		
		I(0)	I(1)	I(2)
ANS	With constant	0.3457	0.0068	
	With constant and trend	0.6011	0.0300	
CV	With constant	0.7298	0.0285	0.0000
	With constant and trend	0.9215	0.0834	0.0001
GOV	With constant	0.0163		
	With constant and trend	0.0253		
OIL	With constant	0.2437	0.0031	
	With constant and trend	0.4622	0.0082	
GDP	With constant	0.0016		
	With constant and trend	0.0094		
HEALTH	With constant	0.9014	0.0072	
	With constant and trend	0.1162	0.0133	
FUEL	With constant	0.8076	0.0083	
	With constant and trend	0.1997	0.0375	
FDI	With constant	0.4476	0.0261	0.0007
	With constant and trend	0.7590	0.0796	0.0051

Source: (Author's compilation).

Table 5. Phillips-Perron (PP) test (Governance variables).

Governance variables	Model specification	PP test p-values	
		I(0)	I(1)
CC	With constant	0.2331	0.0000
	With constant and trend	0.1609	0.0001
GE	With constant	0.7463	0.0000
	With constant and trend	0.2718	0.0000
PS	With constant	0.0049	
	With constant and trend	0.0001	

RQ	With constant	0.0016	
	With constant and trend	0.0173	
RL	With constant	0.0107	
	With constant and trend	0.0000	
VA	With constant	0.1914	0.0005
	With constant and trend	0.4396	0.0033

Source: (Author's compilation).

Table 6. OLS results

	Coefficient	Std. Error	z	p-value
Constant	7.67002e+09	1.87021e+010	0.4101	0.6817
CV	3.68521e+012	1.67976e+012	2.194	0.0282**
GOV	-8.98389e+09	5.50167e+010	-0.1633	0.8703
OIL	6.93752e+09	7.02110e+08	9.881	<0.0001***
GDP	-2.70605e+09	1.53202e+09	-1.766	0.0773*
HEALTH	9.55286e+07	7.85267e+07	1.217	0.2238
FDI	-6.89437e+09	1.56264e+09	-4.412	<0.0001***
Adjusted R <sup>2</sup>	0.753815			
P-value (F)	7.89e-08			

[p-value < 0.05 \*, p-value < 0.01 \*\*, p-value < 0.001 \*\*\*]

Source: (Author's compilation).

The table above yields quite interesting findings. It can be observed that climate change vulnerability (CV) in fact has a statistically significant and positive influence on sustainable development. This confronts the *a priori* expectation of a negative relationship, since as explained earlier, climate change exposure has wide-ranging effects on human health, settlements, food security, biodiversity and water resources (Mustun, 2022), just to name a few. However, in the case of Saudi Arabia, its adaption and responsiveness efforts have largely contributed in counteracting the effects of climate change, especially in terms of water resource management and desalinization. Worth pointing out, is the role of financial capacity in upholding climate change adaptation and mitigation plans, which is clearly playing a substantive role in Saudi Arabia's achievements, given its massive inflow of oil wealth. Clearly, the same cannot be said about many other countries in the Middle East, and this reinstates the role of financial capacity building in addressing climate change-induced hazards. As for the role of governance in upholding sustainable development, a statistically not significant result is obtained. Besides, the coefficient is negative, which is understandable, since the governance score is negative (see Table 3), and thus the institutions are too weak to exercise a positive and impactful effect on sustainable development. In fact, the quality of institutions is below the minimum threshold, a scenario in which state bodies are unable to perform effectively and efficiently in attaining the sustainability goals. The threshold effect has been confirmed in studies such as Abdulahi et al., (2019) and Apergis et al., (2014).

Furthermore, oil rents report a statistically significant and positive impact on sustainable development. From an economic stand point, the results are in accordance to that of Haque and Khan, (2019) who confirm a positive impact of oil production and government expenditure on human development in Saudi Arabia during the 1990 to 2016 period. Eventually, with rippling effects, sustainable development is enhanced in multiple ways. Also, the finding is corroborative to a strand of empirical works, which argues that countries heavily reliant on natural resource extraction, in this case Saudi Arabia, are expected to utilize their very

ephemeral resources parsimoniously and sustainably in order to prolong their use (Sarkodie & Strezov, 2019). It can be further argued that despite it is recognized that energy consumption from fossil fuels, notably oil, gas and coal are detrimental to the environment [Alkathlan and Javid, (2015) and Mahmood et al., (2019)], it is evident that Saudi Arabia has been using its oil wealth to outweigh the environmental costs, by pursuing the economic objectives of sustainable development. Overall, the finding reaffirms the energy sector's potential to advance sustainability targets, but simultaneously, the environmental outcomes need to be addressed. For example, according to Xiaoman et al., (2021), resource-abundant and oil-rich countries often utilise green technologies and less polluting apparatuses in their extraction processes, which minimise their environmental impact

Additionally, economic development, proxied by GDP, has been negatively affecting sustainable development which meets the *a priori* expectation. The result is congruent with previous studies including Güney, (2017) and Azam et al., (2021), since growth propels an economy towards more trade openness and globalization, which then accentuates environmental deterioration, solid waste generation, pollution levels and increase harms to human health (Saleem & Shabbir, 2020). Although the HEALTH coefficient is not statistically significant, yet the positive value signifies the conducive role played by government expenditure in healthcare services in improving human development (Razmi et al., 2012). As for FDI, it depicts a statistically significant and unfavourable effect on sustainable development, and therefore it is in agreement to the FDI-environmental degradation hypothesis, as shown in Hakimi and Hamdi, (2016) and Bukhari et al., (2014). The results equally corroborate the pollution-haven hypothesis which argues that laxer economies with less stringent environmental control or institutional backup, are attractive to environmentally unfriendly FDI.

Table 7. OLS results for segregated governance analysis

	Coefficient	Std. Error	z	p-value
Constant	-1.43545e+010	6.38739e+09	-2.247	0.0246**
CC	2.29436e+09	3.77285e+010	0.06081	0.9515
GE	2.16692e+010	3.67023e+010	0.5904	0.5549
PS	-3.27633e+010	1.15362e+010	-2.840	0.0045***
RQ	8.97025e+010	6.19723e+010	1.447	0.1478
RL	1.21822e+011	3.25401e+010	3.744	0.0002***
VA	-4.45861e+010	3.58105e+010	-1.245	0.2131
Adjusted R <sup>2</sup>	0.729333			
P-vale (F)	9.28e-08			

[p-value < 0.05 \*, p-value < 0.01 \*\*, p-value < 0.001 \*\*\*]

To acquire a more complete understanding of the impact of institutional quality on sustainable development, a decomposed governance analysis has been conducted, as reported above. Although some values are not statistically significant, it is worthwhile to peruse each one of them. It is reported that "Control of Corruption" (CC) and "Government Effectiveness" (GE) have positive influences on sustainable development. In other words, poor corruption control and government effectiveness (see Table 3), in fact, favour the march towards the achievement of sustainability goals. This can be understood from the perspective of the "greasing-the-wheel" hypothesis which claims that loopholes in institutional structures and performance, can be beneficial in accelerating personal gains and socio-economic perks. Altogether, they improve the standards of living of people, especially in poorer communities, and thus, in multiple ways can promote SDGs [Méon & Sekkat, (2005); Hoinaru et al., (2020)].

Meanwhile, the coefficient for "Political Stability and Absence of Violence/Terrorism" (PS) is negative and statistically significant, which illustrates the extent insurgencies and politically motivated violence including terrorism (see Table 3), can be detrimental to the sustainability agenda. In fact, political stability

has been recognised in previous empirical works (Radu, 2015), as a valid condition for sustainable economic development, promoting an economically durable system. Khan and Farooq, (2019) also confirm that political instability in the form of coups, ethnic tensions, revolts and conflicts can disrupt economic activity, through the destruction of physical capital and displacement of human capital, which then constricts the level of sustainable development, since investments, productivity and long term economic policies all suffer a massive blow.

As for “Regulatory Quality” (RQ) and “Rule of Law” (RL), they showcase a favourable effect on sustainable development, since their individual scores are positive (see Table 3), which means that a well-performing institutional system tailgated by justice, legislative robustness and a strong hold on rules is pivotal in sustainable development for many reasons. For instance, environmental legislations are useful in abating the level of CO<sub>2</sub> emissions in the informal sector (Huynh and Ho, 2020). For Bouzahzah, (2022) high-quality institutions favour environmental protectionism, and, therefore, encourage FDI towards sectors with a lower carbon footprint. Lastly, “Voice and Accountability” (VA) reports a negative effect on sustainable development, which the negative “Voice and Accountability explain” (VA) score (see Table 3), which reinstates the argument that suppression of environmental demands by the citizenry, in fact, makes governments less accountable about the way resources are being harnessed and hence participate minimally in international green ventures with the aim to protect the environment (De Soysa et al., 2012).

## 5. Conclusion

This paper has investigated the relationship between sustainable development, climate change vulnerability, governance and oil rent in Saudi Arabia, by exploiting time series data for the period ranging from 1998 to 2019. The latter represents a case study of particular interest since it is essentially an oil-based economy, with a significant dependence on oil wealth. At the same time, the country has set its gear since 2016 towards a visionary target, aimed at profoundly revolutionising the Saudi economy, to achieve sustainable economic prosperity. Simultaneously, Saudi Arabia lies in the face of two daunting challenges. On the one hand, its governance structure is almost a unique one in the world, which is framed in a background of monarchical hegemony, coupled with a distinctive culture, ethos, and identity. On the other hand, similar to many countries in the Middle East, the Kingdom finds itself amidst one of the most exposed geographies to climate change. Therefore, the findings have noteworthy points of consideration, especially given the implications of the Saudi Vision 2030 master plan.

First and foremost, in reference to the results, it is seen that climate change vulnerability in fact contributes positively to sustainable development, which implicates that Saudi Arabia has been directing multifarious strategies over time to counteract the adverse effects of climate change exposure. Moreover, governance reports a negative but statistically insignificant influence on sustainable development, thereby inferring that the institutions and governance structure in Saudi Arabia is still quite low in terms of quality, and thus is slowing the progress towards the SDGs instead. Alternatively, oil rents exercise a positive and statistically significant impact on sustainable development and is observed to be contributing the most to the attainment of sustainability goals. This shows that oil wealth in Saudi Arabia have been put to fruitful ends, and in a way counterbalances the adverse impacts of fossil fuel extraction on the environment. As for GDP, its effect on sustainable development is statistically significant and negative, hence denoting the harms caused by economic development in Saudi Arabia during the time period under study. Furthermore, health expenditure per capita (current US\$) has a positive, yet statistically not significant coefficient *vis a vis* sustainable development. Consequently, it can be said that investment in health care is necessary for sustainable development, but in Saudi Arabia’s case, the impact is not visible enough.

Finally, FDI is reported to negatively affect sustainable development, which is concomitant to numerous previous empirical studies, and insinuates that FDI has been unfavourable to some extent in Saudi Arabia’s quest to sustainable development during the 1998 to 2019 period. Additionally, this study has sought to focus on the individual effects of the different governance indicators on sustainable development. Looking at the descriptive statistics, the overall governance score and all the individual scores are negative, except “Regulatory Quality” (RQ) and “Rule of Law”. This means that although the governance system in its

ensemble lacks robustness, regulatory control, monitoring, and respect for legislations and abidance of law are standards which are generally maintained in Saudi institutions. This is analogous to the stringent and rigorous application of *Shari'ah* laws embedded in the Saudi justice system, which obviously serves as an important deterrent to committing offences such as theft, perjury, forgery, defamation and bribery amongst others. Political instability and the presence of violence in the country is reported to negatively affect sustainable development, which confirms both common wisdom and past studies, since instability foretells higher market volatility, uncertainty and unpredictability, hence impacting a host of investments and jeopardizing continuity of economic growth. Meanwhile, rule of law positively impacts sustainable development, which highlights the quality of the judicial system in Saudi Arabia and its contributive role in engineering sustainable development. As for the other governance indicators, the results are not statistically significant.

### 5.1 Recommendations

Saudi Arabia is encouraged to further maximize efforts in promoting more climate change mitigation and adaptation strategies, since results show that they are a direct pathway to sustainable development. Secondly, the governance system in Saudi Arabia is in need of a deep restructuring, fundamental changes and vast improvements, especially in terms of control of corruption and government effectiveness. In the same vein, more efforts are required to reinforce the level of political stability. While many are skeptic over the role of the clerical community under the Saudi Vision 2030, the latter remains a protagonist player in keeping the wider Saudi population connected and bound to their rulers. The *ulamahs* shoulder the responsibility of upholding fundamental Islamic principles such as allegiance to rulers which eventually discourage revolts and insurgencies. "*The principles of Islam will be the driving force for us to realize our Vision*" (Saudi Vision 2030, p. 16), makes it evident that the scholastic community will remain a cornerstone in the new Saudi epopee. This is because, as the Kingdom navigates into a novel era, it is critical that population support, comprehension and collective effort are captured along the way. With compounded effects, the political stability and reduction in violence or terrorism are expected to improve. Also, it is equally necessary to increase awareness on environmental protectionism, through education, campaigns, dissemination of knowledge amongst the citizenry so that they can raise their ecological concerns, be less passive and as a result make the government more accountable and transparent in its policies.

Additionally, although oil rents represent a valuable contributor to sustainable development, it is well-known that fossil fuel extraction is a stress exacerbator to the environment. Thus, windfalls are further encouraged to support environmental purposes, and should be diverted to other "greener" sectors for a higher degree of sustainable economic development and minimizing the trade-off between economic development and environmental quality. Similarly, more effort is required to overcome the shortcomings in the healthcare sector, so that the effect on sustainable development is more impactful. Lastly, as FDI has been negatively affecting sustainable development, it is clear that economic diversification is necessary so as to encourage investments in less environmentally polluting sectors. At the same time, better performing institutions are expected to regulate and control the harms of FDI on the environment. Without a serious governance and institutional overhaul, the Saudi Vision 2030 might be heavily compromised.

The current study contributes to shedding some light on the interlinkage between sustainable development, climate change vulnerability, governance and oil rent, in Saudi Arabia, and thus presents implications for the Saudi Vision 2030. Future research is encouraged to use other measurements for sustainable development, since adjusted net saving as used in this paper, capture only economic sustainability. Likewise, forthcoming studies should equally focus on dual causality between sustainable development and institutional quality, to assess whether there are any improvements in governance when treading on the sustainability path. This study has been constraint by lack of data for more years, hence future studies can look for alternative variables spanning over longer period of time. Also, forthcoming studies need to delve into more comparative analysis while taking examples of different countries in the Middle East, for better cross-country comparison, because this is beyond the scope of the present study.

### A. Note and further reading.

1. Salafism is described as the branch or collection of the Muslim community which follows the rulings from the Quran and prophetic Sunnah, based on the understanding of the Salaf al Swalih (pious predecessors/early generations of Muslims). Therefore, it endorses an orthodox (not extremist, contrary to popular belief), puritan and literal interpretation of Islamic teachings (Hasan, 2012). It is the leading doctrine practiced in Saudi Arabia. On the hand, Wahhabism is a pejorative and derogative term (Armanios, 2003) often used interchangeably with Salafism, which tend to portray the latter as extremist, archaic, promoting violence, terrorism and intolerance. The term Wahhabism is coined after the 18<sup>th</sup> century Muslim scholar, Muhammad ibn Abd al-Wahhab ibn Sulayman al-Tamimi, who is credited to be the foremost revivalist of Islamic law in Saudi Arabia. He strived for a “return” to fundamental teachings of Islam, and firmly fought paganism, saint/tomb/shrine worshipping, celebration of prophet Muhammad *swal lal laahu alaihi wassallam*’s birthday and other innovated beliefs/practices, while establishing the rulings of Islam as per the *Quran* and the prophetic *Sunnah* (traditions).

2. [https://www.vision2030.gov.sa/media/rc0b5oy1/saudi\\_vision203.pdf](https://www.vision2030.gov.sa/media/rc0b5oy1/saudi_vision203.pdf)

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### Conflict of interest statement

The author declares no conflict of interest, and no financial or commercial motives which might have compromised this research.

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**Authors' contributions**

Zuhayr Khan Mustun is responsible for writing the whole paper from conception to final reporting.



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