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The Governance of Climate Transition Pathways and their Limitations in Oil-Producing Countries

Supervised by Dr. Bastian Lange

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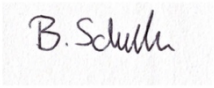

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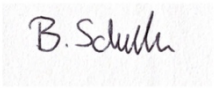

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Abstract

This Research Paper explores climate transition pathways and sustainable development strategies in oil-producing rentier-states in the Middle East and North Africa, focusing on Saudi Arabia and Algeria. Pressures from increasing domestic energy demands, economic dependence on fossil fuel exports, and global green transition efforts challenge these countries to adopt strategies for diversification and ecological modernization. The study addresses the paradox of these petrostates being pivotal yet underrepresented in global climate policy research. It examines the challenges posed by rentier-state structures to economic transformation, aiming to bridge gaps between rentier-state theory and sustainable development approaches. Key factors influencing green transition effectiveness are identified, emphasizing the necessity of comprehensive governance for climate adaptation. The findings highlight the importance of attracting investment, building economic and societal capacity, transforming rigid and corrupt autocratic political institutions, integrating into trade and knowledge networks, and nation (re)-building for a post-oil era. While Saudi Arabia focuses on economic diversification through liberalization, building up a knowledge-economy, and community empowerment, Algeria prioritizes developing a competitive renewable energy sector supported by sustainable finance tools. This comparative case study underlines the difficulty of balancing liberalization and sustainable development in the current global context.

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1. Introduction: Energy transition as a crucial global challenge of the 21st century

Assessing the climate transition pathways and sustainable development strategies of oil-producing rentier-states in the Middle East and North Africa seems to be a paradox considering these petrostates' high contribution to emissions. Saudi Arabia, the Gulf's biggest state and the region's most productive oil exporter, is ranked last in the Climate Change Performance Index, an independent and transparent assessment of countries' climate policies (CCPI, 2024). Identifying best practices of climate transition pathways in these petrostates thus admittedly seems counterintuitive.

However, climate change and environmental concerns, following decades of boundless emissions and a subordination of environmental protection under economic profit, acutely challenge global governance systems including 'bad boys' such as oil-producing countries. The global scale of environmental issues underlines the urgency of coordinated and coherent policy action, in which the energy sector particularly plays an important role. Fossil fuel export-oriented and -dependent countries are thus specifically challenged to adopt anticipatory strategies towards economic diversification, ecological modernization, and related state-structure transformation. Navigating profitable fossil fuel markets and necessities for diversification thereby constitutes a particular dilemma but also bears unexpected opportunities.

Petrostates in the Middle East and North Africa built their economic development on fossil fuel exports to high-consumption markets in Europe or East Asia and are now concerned with the expected decline of fossil fuel revenues due to European decarbonization efforts. Despite the capacity to produce oil and gas for several more decades, ecological modernization and economic diversification can be highly beneficial for many of these countries, since their geographic characteristics allow large-scale renewable energy production that could generate enough electricity for exports to high-demand markets, such as Europe. Hence, these petrostates could defend their leading positions in global energy markets, maintain important energy trade partnerships, and prepare for a post-oil era.

A major obstacle in this transformation is represented by rentier-state structures, as these states depend on oil and gas revenues not only economically, but also politically and socially. Reforms towards economic diversification thus imply profound power

restructuring processes and require integrative, comprehensive, and multidimensional strategic planning. Despite intuitively being on the periphery of climate policy frameworks, such oil-producing rentier-states are of crucial relevance in globally coordinated green transition efforts and thus require particular academic attention. This research paper therefore seeks to bring together the thematic fields of rentier-state theory and holistic approaches to sustainable development. Special focus is placed on the countries of Saudi Arabia and Algeria as archetypical cases of rentier-states with a huge potential for economic and energy diversification. The guiding research questions of this paper are therefore:

To what extent do rentier-states like Saudi Arabia and Algeria implement holistic and sustainable approaches to climate transition?

1.1 What factors impact the success and effectiveness of green transition efforts in oil-producing countries?
1.2 How do rentier-state structures represent an obstacle to economic diversification and ecological modernization and how do petrostates strategize to transform them?
1.3 To what extent are Saudi Arabia and Algeria's strategies in line with the ideals of sustainable development?

These research questions appear to be of outstanding relevance for scientific research on rentier-state transformation in line with climate policy goals and crucial for establishing an efficient global governance approach to challenges posed by climate change. A governance framework on climate transition in oil-producing countries that is based on comprehensively researched propositions is of immense importance in global climate policy, which highlights the academic, political, and social relevance of the research question.

Academically, the research question merges two research areas that have mostly been treated separately. Rentier-state theory and holistic theoretical approaches to climate transition and sustainable development appear contradictory but gaps between the research fields must be bridged to explore their intersection. Oil-producing countries are particularly marginalized in the context of climate policy and their transition potential

seems consistently underrepresented in political and academic discourses. Due to its global problem structure, climate change requires global governance frameworks and the inclusion of various world regions. Petrostates and their pathways to capacity and resilience building are in the academic periphery of climate transition governance so far. Applying holistic approaches to sustainable development in rentier-states thus appears as an important research innovation as current research lacks a coherent and comprehensive framework. The opportunities for renewable energies in many Middle Eastern and North African petrostates are equally well-researched as their structures but the link between the research fields and underlying implications is still very recent and underdeveloped. This thesis thus contributes to closing these research gaps.

The lack of coherence in research into the climate transition and sustainable development of rentier-states is also reflected in political delays in the development of comprehensive and harmonized approaches as shown exemplarily by Saudi-Arabia ranking last in the Climate Change Performance Index. Currently, governance strategies seem fragmented and fail to reflect on the interdependencies of effective climate transition. On top of that, a failure to pursue effective climate change adaptation frameworks represents an immense danger to societies and economies and is thus of exceptional political relevance. Climate transition, on the other hand, also bears the potential for the creation of new structures, which require a well-thought-out strategy and effective political management. As the energy market is the main instrument of the political, economic, and social power of these rentier-states, a comprehensive understanding of the implications of green transition efforts in these states is crucial for global governance and local politicians equally. Research on climate transition strategies can provide information on their effectiveness in the form of feedback loops and thus promote a scientifically legitimized political design of climate transition frameworks in oil-producing countries.

Lastly, the research questions are relevant simply due to the number of affected people. The interdependency of economic, political, and social dimensions in rentier-states illustrates how dependent local communities are on the state being capable of reallocating resource wealth. Research into political strategies of climate transition in rentier-states is thus highly relevant for the millions of people affected by restructuring processes in these states and globally due to the implications of climate change.

To be able to answer the research questions in a methodologically coherent approach, it is first necessary to summarize relevant concepts and research findings in the mentioned research fields in a literature review. Central sections of this review deal with the status quo of global efforts of green transition and describe the role of oil-producing countries in these frameworks. Subsequently, key research findings on conditions for a multidimensionally effective, inclusive, and sustainable transition are described, before reflecting on opportunities for renewable energy production in the MENA region and in Saudi Arabia and Algeria particularly.

In the following, rentier-state theory and holistic theorizations of sustainable development will be presented. These form the theoretical basis for the analysis and provide guiding research principles to formulate dimensions and indicators of the analysis of climate transition pathways in oil-producing countries. Furthermore, the methodological approach to case selection is theory-guided and described afterward. Central analytical steps and implications of the qualitative policy analysis are further presented to ensure transparency and include critical reflections on generalizations of the analysis. Subsequently, the developed multidimensional analytical framework forms the basis of a structure-driven analysis of the strategies of Saudi Arabia and Algeria. Finally, a critical qualitative policy analysis is carried out and a discussion summarizes the central results of the analysis as a last step and critically reflects on possible limitations along with considering the analytical generalizability of the results to other cases and contexts.

2. Literature Review: Climate transition in oil-producing countries

2.1 Climate Transition Frameworks

The climate transition is one of the most ambitious but also most urgent projects of global governance in the 21st century. Different strategies like the Paris Agreement or the European Green Deal highlight the ambitious start of large-scale transformational needs to prevent further global warming and deriving consequences for planetary health. Green transition, used synonymously with climate transition, thus mostly refers to the transition toward a low-emission or carbon-neutral economy (Ruszel et al., 2017). Definitions and strategies of climate transition have focused on the economic sphere as a main area of policy action and sustainable production and trade frameworks in particular appeared as central mechanisms to target a sustainable economy. However, economy-focused narratives underestimate the multifaceted nature of a holistic climate transition strategy that is rooted in but goes beyond pure economic figures. The concept of climate transition is hence understood as a collective, complex, and long-term process, comprising multiple actors for social changes (Sung & Park, 2018) and integrating potential context-based variation (Meadowcraft, 2009).

The necessity of a climate transition is based on observations of market (or political) failures due to the externalization of environmental costs in traditional market logic. Transformational mechanisms thus refer to reintegrating such externalities in pricing structures or changing cost-benefit calculations through political incentives for sustainable practices. Such a transition consequently targets all economic fields – trade, production, finance, and consumption – and demands new strategies for including environmental concerns in growth concepts. Green growth, as termed by the European Green Deal, thus represents a strategy focusing on the reintegration of social and environmental factors in economic figures and concepts. Hence, a climate transition inherently provides growth opportunities for new and transforming sectors and simultaneously fights pollution, climate change, resource scarcity, and environmental hazards that threaten economic growth in current systems. Consequently, green transitions do not only support planetary health but also correct market failures, and hence imply a win-win logic.

Despite these promising features, climate transition governance lacks binding agreements due to cooperation dilemmas following the nature of climate governance, which enables free-riding (Keohane & Victor, 2016). Global governance in climate policy so far resembles structures of a political regime, which relates to a set of implicit or explicit principles, norms, rules, and decision-making procedures (Krasner, 1983) and consequently suffers from non-sufficiency and related fallacies. The inadequacy of a comprehensive and effective climate policy framework is attributed to various factors in different schools of international relations. Whereas realist schools focus on systemic constraints on climate change cooperation due to relative gains as driving motivations for climate policy defections (Purdon, 2017) or impute the absence of great power responsibility (Bernstein, 2020), critical theory emphasizes how the climate regime tends to protect neoliberal ideals and global power structures over necessary transformations protecting planetary health (Paterson, 2020).

In this fragmented governance framework, the European Union positions itself as a leader in promoting transitional practices and transfers these standards to an international level. This is set in the external dimension of the European Green Deal, which aims to transfer ideals of green growth, carbon neutrality, and a connection to elements of social justice through trade policies (European Commission, 2024). A rule-based multilateral cooperation framework aims to promote green transition practices via Europe's market power (European Commission, 2022). A distinct value orientation in the EU's foreign economic policy framework combines such market power (Damro, 2012) with multilateral normative power (Manners, 2002) and thus globalizes European green transition efforts. However, the fragmentation of climate transition governance is also visible in the segmentation of respective research and governance frameworks. Exemplarily, literature as well as policy strategies on the circular economy, carbon pricing, biodiversity, the blue economy, or forest-related policies appear severely fragmented and are rarely integrated into a more holistic framework. Reuniting research, policies as well as different world regions and their diverse obstacles and opportunities of a comprehensive climate transition thus remains a key challenge. This thesis aims to contribute to closing these gaps.

2.2 Oil-producing countries in the green transition

The global problem structure of climate change highlights the necessity of global solutions. Green transition efforts thus need to be applied globally and appear of particular relevance as the transition away from fossil-fuel-powered economic mechanisms towards carbon-neutral production systems has direct consequences on global power distributions. As research has primarily focused on countries that have successfully initiated and pursued green transition efforts (Mealy & Teytelboym, 2022), countries commonly considered 'losers' of such global transformative mechanisms have been scientifically overlooked. Petroleum has been one of the most influential commodities in world politics, but climate change mitigation policies threaten the continuous importance and value of fossil fuel resources (Caldecott, 2017). Although some future scenarios of carbon neutrality build on improved carbon-capture technologies and thus leave the possibility of growing fossil fuel markets open, most research assumes a shift away from fossil fuels (Ansari et al., 2020). Latter scenarios focus on potentially declining sectors and the increased vulnerability of oil-producing countries (Zenghelis et al., 2018).

Risks for oil-producing countries mostly refer to so-called stranded assets (Zenghelis et al., 2018; Andres et al., 2023). Fossil fuel assets are expected to depreciate resulting from tightening climate policy frameworks in line with global green transition efforts (Ansari & Holz, 2020). Asset stocks generally vary with policy scenarios and environmental policy innovations thus particularly affect fossil-fuel-related assets negatively (Harnett, 2018). The implementation of international climate policy frameworks like the Paris Agreement has made evident that green transition ambitions pose a direct risk to future fossil fuel revenues, which so far have been perceived as stable cash cows for resource-rich states (Ansari & Holz, 2020). Moreover, although the Paris Agreement and the Sustainable Development Goals are legally connected (Gupta & Arts, 2018), and the crucial role of resources for many developing and emerging economies is widely analyzed (McGlade & Ekins, 2015), research has only sparsely engaged with stranded assets in the context of sustainable development (Bos & Gupta, 2019).

Estimates of losses of resource revenues due to carbon reduction ambitions are equally rare (e.g. Mercure et al., 2018) but highlight the severe risk of spiraling effects on sustainable development pathways (Campiglio et al., 2017; Dorband et al., 2019) and

even broader contexts of stability of economic structures and human security (Ansari & Holz, 2020). Such risks of stranded assets further affect the geopolitical standings of oil-producing countries, as they lose revenues and power, whereas particularly industrialized economies that import fossil fuels face advantages. Crude oil exporting countries in the MENA region are specifically estimated to be negatively affected (Ansari & Holz, 2020).

Resource dependency generally bears risk, commonly summarized under the term 'resource curse' or 'Dutch Disease' (Collier & Hoeffler, 2004; Robinson et al., 2006). Identified disadvantages of such one-dimensional dependencies include vulnerability to volatile commodity prizes (De Cavalcanti et al., 2015), lagged industrialization (van der Ploeg & Venables, 2013), or tendencies of autocratic paternalism in rentier-state structures (Beblawi, 2015). Economic diversification processes are thus a crucial strategic objective for resource-endowed countries to enhance resilience to the global green transition and prevent systemic risks stemming from stranded assets. However, many oil-producing countries could benefit from decarbonization efforts, as many countries have comparative advantages in renewable energy production (Pazheri et al., 2011). Such transitions towards green energy exports and economic diversification also promise to contribute to developments towards social egalitarianism, poverty alleviation, and new job markets (Khalili et al., 2015). Nevertheless, persistent economic, political, and social structures, based on fossil fuel revenues, represent a key obstacle in such transitions, as so-called rentier-states depend on rents from extractive industries and lack systems of effective taxation and accountability-based fiscal policies, which will be elaborated in the theory section.

2.3 Conditions for a multidimensional and sustainable transition framework

Political actors are thus challenged to implement coherent policy frameworks that allow green transitions to not only build up resilience but also stimulate inclusive and sustainable development trajectories. As emerging and developing economies particularly rely on fossil fuels in crucial industries, these states' governments are specifically challenged to connect climate transition pathways to sustainable development (Razzaq et al., 2023). Research on transition management in emerging and developing countries remains fragmented and rarely applies multidimensional or holistic

perspectives. However, there are various publications dealing with conditions for an effective green transition focusing on political, economic, or social approaches.

Policy-wise, the role of adaptive and flexible institutional structures is highlighted in the literature on preventing asset stranding (Zenghelis et al., 2018; Ansari & Holz, 2020). Due to context variety, a one-size-fits-all framework for effective green transitions does not exist. Regardless, proactive government planning and comprehensive strategy papers are commonly considered useful and effective (Kemp & Never, 2017). Strengthening institutions and systems of environmental governance through regulations, monitoring and enforcement mechanisms, transparency and accountability as well as involving crucial stakeholders in decision-making and implementation processes thus appear as crucial pillars for effective green transition frameworks (Razzaq et al., 2023). Based on the ideals of an 'embedded autonomy' (Evans, 1995), strategic cooperation and coordination between public and private sectors in partnerships facilitate the identification of vital bottlenecks and support dynamic and productive business environments (Rodrik, 2014). Such embeddedness allows reciprocal deliberations between the public and the private sector on innovation and technology needs and is commonly identified as a key condition for effective green transition strategies (Kemp & Never, 2017). However, such practices require close monitoring due to tendencies of political capture and potentially ambiguous interests of private and public sectors.

Literature on economic conditions for a successful climate transition focuses on investment attractiveness, diversification efforts, as well as technological innovation. The green transition appears as a structural challenge that targets various domains of economic systems (Krebs, 2020). Financial sectors are particularly challenged as investments do not seem inherently attractive in the early stages of a transition (Kemp & Never, 2017). Although policies could incentivize a sustainable finance sector, financial industries are challenged to navigate between wait-and-see strategies that risk crucial assets being stranded and of depreciated value and immediate-switch strategies that encompass first-mover risks in dynamic business areas (Kemfert et al., 2020). Tools such as green bonds combine environmental aspects, social responsibility, and economic growth and consequently support green transitions (Maltais & Nykvist, 2020; Wu et al., 2021). However, the simultaneity of necessities to finance innovation while maintaining economic and financial stability constitutes a crucial challenge for financial markets.

The often-observed crowding-out of productive and industrial sectors in oil-producing countries further reinforces the need for economic diversification (Zenghelis et al., 2018). Such diversification requires broad structural reforms and the development of low-carbon sectors (Razzaq et al., 2023). Countries whose exports are concentrated on a few carbon-intensive products or even on resources have limited low-cost diversification opportunities (Wittmann, 2013). Transforming production patterns or workers' skills (Saussay et al., 2022) requires less cost and complexity than building new sectors from scratch. As economic development trajectories are path-dependent (Acemoglu, Hausmann & Klinger, 2006) and follow patterns of comparative advantages (Hidalgo & Hausmann, 2009; Boschma & Gianelle, 2013), many fossil-fuel-producing countries have explored possibilities of investing in renewable energies or hydrogen (Collodi et al., 2017; Eicke & De Blasio, 2022). Economic diversification thus appears to be particularly challenging for oil-producing countries due to the high up-front costs of investments into building up new sectors. However, diversifying energy sectors seems specifically profitable. Promoting productive and dynamic environments for innovation and fostering networks for technology transfers and knowledge exchange is thus crucial (Gomes et al., 2018; Xiao et al., 2018). Proposed structural reforms focus on removing barriers to innovation and are usually implemented in a policy mix based on demand-pull, and technology-push instruments to facilitate knowledge inputs, foster research and development, protect patents legally, and provide financial incentives for innovative products or start-ups (Söderholm, 2020). Openness to international markets further supports innovation and potentially breaks with one-dimensional path dependence (Zenghelis et al., 2018). Hence, economists highlight the difficulty of economic diversification due to path dependence and identify a viable policy infrastructure that promotes innovation and technology as key pillars for an effective green transition.

From a social perspective, promoting human capital, focusing on social justice, and creating awareness for environmental issues are recurring patterns in the literature of conditions for a successful green transition. The creation of new job markets and educational platforms as well as the inclusion of local communities in transitional trajectories appear crucial to connecting green transition ambitions with sustainable and inclusive development pathways (Razzaq et al., 2023). Cooperating with affected stakeholders does not only refer to economic actors but to all members of affected

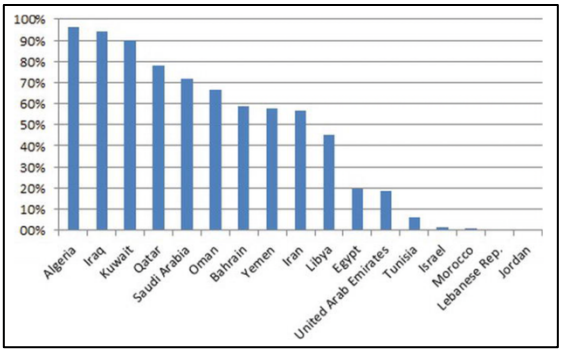
societies. Clear communication of envisioned transitional steps, their consequences for citizens' daily lives, and high degrees of interaction between policymakers, and economic and societal stakeholders promote trust and acceptance of transitional measures. Furthermore, concepts of green growth address social justice, not only related to social egalitarianism but also to intergenerational justice (Vazquez et al., 2014). Lastly, the effectiveness of green transition efforts also depends on shifts in citizens' attitudes toward responsible consumption and environmental protection (Wittmann, 2018; Zenghelis et al., 2018).

To provide a productive policy framework for an effective but also inclusive and sustainable green transition, policymakers must pursue structural transformations without compromising political, economic, social, and environmental stability (Adewuyi et al., 2020; Razzaq et al., 2023). To connect necessary green transition efforts with sustainable development frameworks, the literature proposes a flexible and heterogeneous policy mix that integrates various economic and societal stakeholders (Vazquez et al., 2013; Filipović et al., 2022). However, the specific contexts, challenges, and opportunities of climate transition pathways in oil-producing countries are rarely reflected in these papers, emphasizing the need for further research in this field.

2.4 Oil-producing countries and opportunities for renewable energy in the MENA

Many oil-producing countries are concentrated in the MENA region. The increasing regional energy demand due to emerging markets and an economic profile based on energy-intensive industries such as steel or chemicals and growing populations (Ersoy et al., 2021) creates additional incentives to explore opportunities for green transition trajectories. Many countries have thus initiated exploration processes of renewable energy and green hydrogen potential (Saudi Arabia, UAE, Qatar, Oman, Egypt, Algeria, Morocco) (Hassan et al., 2024). Saudi Arabia and Algeria have some of the largest oil and petroleum reserves in the world (Agboola et al., 2021) and currently depend heavily on fossil fuel exports (Figure 1) but publicly announced ambitions of exploring renewable energy and economic diversification potential. As units of analysis in this comparative case study, a comprehensive literature review on climate transition pathways in these two countries deserves special attention.

Figure 1: Percentage of fuel export on total merchandise export in MENA countries.

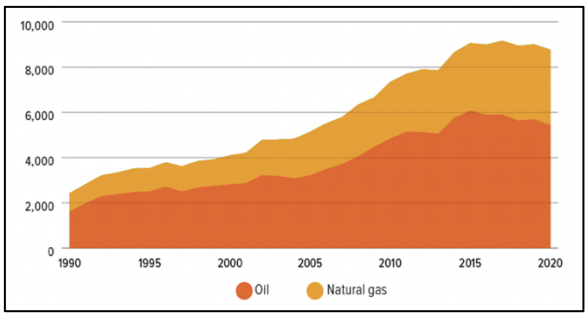


Adapted from "Beyond the Hydrocarbon Economy: The Case of Algeria,", by C. Camporeale, R. del Cielo & M. Jorizzo, 2020, Sustainable Energy Investment, 165.

Saudi Arabia has been a leading actor in fossil fuel exports since the 1930s (Nasir et al., 2019) and holds around 18% of the world's petroleum reserves. Oil and gas exports are a key component in export earnings (around 70%), government revenue (around 65%), and GDP (around 50%) (Belaid & Al-Sarihi, 2024). Petroleum industries thus represent the backbone of the Saudi economy and undisputedly appear as the foundation of economic and political power (Al-Moneef, 2006). As a result of increased demands for fossil fuel exports, the Kingdom has experienced dynamic economic growth throughout the last centuries (Belaid & Al-Sarihi, 2024) which is accompanied by increasing energy consumption (Figure 2) due to industrialization efforts, expansion of transportation sectors, rapid urbanization, and population growth (Hassan et al., 2024).

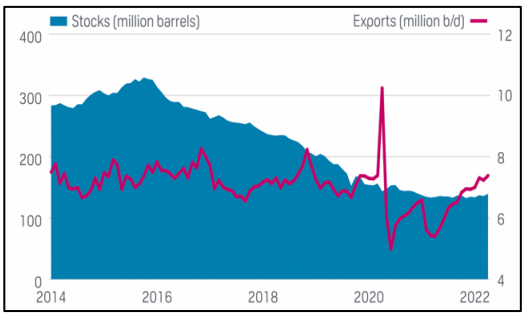
Figure 2: Fossil fuel production and export development in Saudi Arabia

Total primary energy supply in PJ



Adapted from "Saudi Arabia – Country Profile," 2022, Climate Transparency.

Crude oil exports and stocks

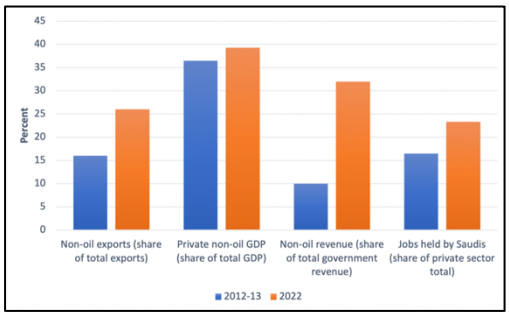


Adapted from "Saudi Data: April Crude oil exports rise to 23-month high,", by J. Gnana, 2022, S&P Global.

Saudi Arabia thus increasingly contributes to GHG emissions and is attested to perform badly in environmental policy (Chabeen et al., 2022). However, the country has inaugurated reinforced ambitions for the development of renewable energy infrastructure and economic diversification recently (Belaid & Al-Sarihi, 2024). Data highlights the decreasing role of oil exports for the economy (Figure 2) and the first diversification success (Figure 3).

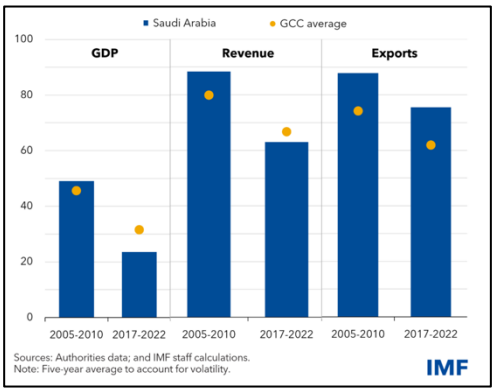
Figure 3: Saudi economic diversification efforts over time

Economic diversification indicators



Adapted from "Signs that Economic Diversification is Working in Saudi Arabia," by T. Cullen, 2023, The Arab Gulf State Institute Washington.

Hydrocarbon dependence

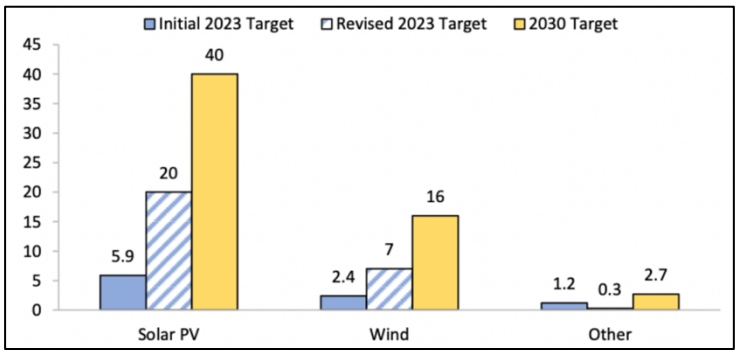


Adapted from "Saudi Arabia's Economy grows as it diversifies," by A. Mati & S. Rehman, 2023, IMF.

Literature on the case of the Saudi green transition has highlighted the importance of internal and external motivations. Internally growing domestic energy demand motivates political action, whereas externally international agreements such as the Paris Agreement create commitments to climate policy (Belaid & Al-Sarihi, 2024). Exploring opportunities for renewable energy and green hydrogen production and exports constitute a key pillar of such commitments in the Kingdom (Hassan et al., 2024), as the country has immense potential for renewable energy production due to geographic factors such as an abundance of sun, wind, and a long coastline (Waheed, 2023). The Kingdom has further adopted various approaches to circular economy that are analyzed by researchers interested in the country's green transition efforts. The Saudi circular economy framework does not only focus on reducing, reusing, and recycling carbon but specifically adds a fourth R, namely removing carbon through carbon-capture technologies (Belaid & Al-Sarihi, 2024). Recent studies underline the growing green entrepreneurial stewardship

in the Kingdom (Alwakid et al., 2021; Chabeen et al. 2022), have shown particular interest in smart city projects (Baumann, 2019) and emphasize Saudi ambitions to implement increasingly ambitious renewable energy capacity targets (Figure 4). Research on green transition efforts in Saudi Arabia is comparatively extensive and the country appears to be of growing scholarly interest. However, multi-dimensional research on the country's climate transition pathway also considering its rentier-state structure still represents a research gap.

Figure 4: Renewable energy production capacity plans in GW in Saudi Arabia



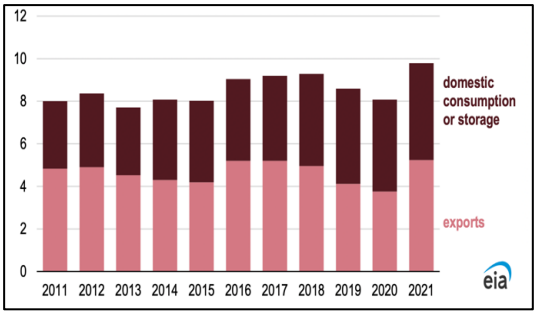
Adapted from "Strong Momentum in Saudi Arabia's Drive toward Renewables and Infrastructure,", by L. Kiyasseh, 2022, Middle East Institute.

Despite similar contexts, Algeria has experienced less interest from researchers. The North African country plays a key role in global energy markets and mostly produces and exports natural gas (Zaid et al., 2017). Historically petroleum was first discovered under French colonization and the French built crucial energy infrastructure. However, the resource only became a substantial source of government revenues and of increasing political importance after the Algerian independence in 1962. The nationalization of formerly French fossil fuel facilities and their organization in state oil companies contributed to financing the country's independence. While accounting for the country's rapid economic growth in the 1970s or in the late 2000s, the volatility of oil price fluctuations has also destabilized the North African Republic (Sandbakken, 2006). Today, Algeria remains heavily dependent on fossil fuel exports and is thus challenged to adapt to global green transition frameworks (Bergougui et al, 2024). More than 90% of the value of exports comes from fossil fuels (Bouraiou et al., 2020) and demographic change,

industrial development, and urbanization processes create a rising domestic energy demand (Ersoy et al., 2021). High post-Covid energy consumption in Europe has also re-introduced interest in increased gas imports from Algeria, leading to rising production levels after 2020 (Figure 5).

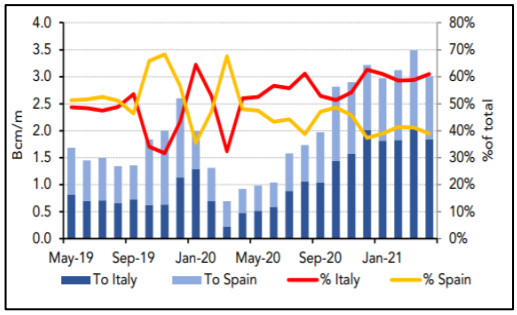
Figure 5: Algerian gas production, consumption, and exports

Annual natural gas production by disposition in billion cubic feet per day



Adapted from "In 2021, Algeria produced record amounts of natural gas," 2023, EIA.

Natural gas exports to Europe

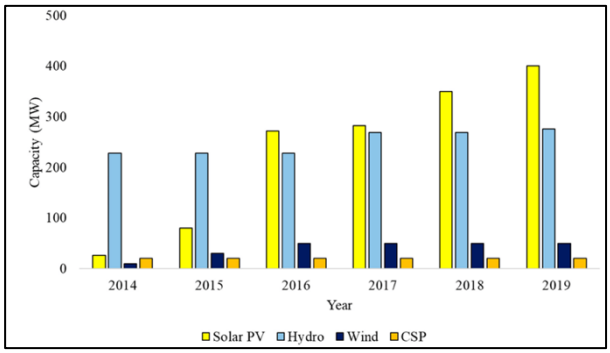


Adapted from "LNG Market Outlook," 2021, Poten & Partners.

While recent discoveries of shale gas resources solidify the country's hydrocarbon reserves as its economic backbone and fortify the resilience of Algeria's natural gas sector, a transition towards renewable energy production is a key objective for the Algerian government (Bouraiou et al., 2020; Ersoy et al., 2021). The ratification of international accords represents a commitment to global standards (Himri et al., 2021), and defending its strategic position as a key energy trade partner of the European Union presents fundamental motivations for Algeria to pursue green transition ambitions further. Algeria possesses a vast potential for renewable energies, which could address the mentioned growing domestic demands as well as pressures to defend the country's leading position in regional energy markets (Bouraiou et al., 2020). The geographic location of Algeria implies climatic conditions of abundant sunshine (Hanaa, 2021; Ahmedbelbachir, 2023), steady streams of wind (Nacer et al., 2016; Himri et al., 2021) and geothermal energy potential (Chikhi et al., 2022). Moreover, research on renewable energy potential has outlined opportunities for biomass energy production based on solid waste, date palm biomass, crop wastes, and forestry residues (Igoud et al., 2017; Hanaa,

2021). The first steps of building up infrastructure for renewable energy production have been affirmed by data and show constant, but comparatively small-scale progress (Figure, 6).

Figure 6: Renewable energy infrastructure developments in Algeria



Adapted from "Current Status Scenario, and Prospective of Renewable Energy in Algeria,", by Y. Zahraoui et al., 2021, Energies, 14(9), 2354.

Literature on Algeria's climate transition pathway generally remains more technical and focuses on renewable energy potential. More holistic perspectives appear exceptional and cover the nexus of technology transfers as part of green transition efforts (Chikhi et al., 2022; Bergougui et al., 2024) or energy transition in smart cities (El-Islem & Tahar, 2019). As for Saudi Arabia, multidimensional or comparative analyses on green transition frameworks that integrate economic, political, and social perspectives represent a research gap. Hence, this paper attempts to bridge literature gaps by combining key theoretical frameworks of rentier-state theory and sustainable development. Based on the outlined key goals, challenges, conditions, and opportunities for climate transition trajectories for oil-producing countries, the following section aims to provide a comprehensive analysis of fundamental theoretical foundations.

3. Theoretic foundation: Rentier-state-theory and sustainable climate transition

3.1 Autocratic paternalism based on fossil fuel revenues in rentier-states

A growing body of literature deals with the relationship between resource abundance and political-economic structures. Often subsumed under mentioned theories on a "resource curse", rentier-state-theory is a concept that categorizes states based on their disproportionate reliance on sources of rent, such as from extractive fossil fuel industries. The concept first emerged in the 1970s, termed by the Iranian scholar Hossein Mahdavy (Mahdavy 1970, Sandbakken, 2006), and describes how the influx of such rent directly impacts relations between governmental and societal dimensions (Beblawi, 2015; Luciani, 2015; Baumann, 2019). According to rentier-state-theory, the underlying process consists of a twofold mechanism in which fossil fuel revenues enter the economy from outside and build up state budgets before being redistributed by paternalistic state agencies to shape the domestic society, economic structures, and the political arena (Mitchell, 2011; Baumann, 2019; Kubinec & Milner, 2022).

Rentier-state-theory describing the state-society nexus in oil-producing countries mainly compromises three recurring elements. The first key feature of rentier states is their reliance on rents from extractive industries for state budgets. These states do not depend on functioning systems of taxation and the lack thereof shapes the unique social contract in rentier-state systems as there is no basis for citizens' demands on responsiveness and representation (Beblawi, 2015). On the contrary, this external source of income supplies the state with great fiscal autonomy.

A second recurring element of oil-producing rentier-states relates to the mentioned reallocation of fossil fuel revenues. This fiscal autonomy leads to the creation of political structures that are dominated by autocratic paternalism. Thus, government spending on education, health, social security, or infrastructure represents an expenditure policy that aims to acquire the legitimation and support of citizens (Sandbakken, 2006). Public spending is based on creating loyal networks of a so-called 'state class' that compromises groups of citizens that benefit disproportionately from these reallocations of resource wealth (Elsenhans, 1996). These societal, political, and economic hierarchies are reproduced constantly through nepotism and bonds of patronage and thus link rentier states closely to corruption and kleptocracy (Ouissa, 2021 Sandbakken, 2006). State-

society relationships are characterized by autocratic paternalism as regimes decide autonomously how to redistribute fossil fuel revenues. While oftentimes providing comparatively high levels of welfare services, health, or education systems and consequently accounting for increasing standards of living, intra-state power asymmetries create obstacles to inclusive and sustainable development.

Challenges to encourage dynamic growth outside of capital-intensive petroleum industries account for a third key element of rentier states. State monopolies of natural resource exports already restrict market access for private sectors. Furthermore, rent-dominated economies rarely re-invest financial surpluses productively but focus on consolidating power positions, loyalties, and clientelist bonds (Ouissa, 2021). This breaks the market-based labor-productivity-nexus and such a 'rentier mentality' prevents dynamic and innovative business environments and creates lags in economic development beyond petroleum sectors (Baumann, 2019).

This state-society relationship thus appears as a crucial foundation for analyzing the transformative potential in oil-producing countries. The interconnectedness of political, economic, and social dimensions creates challenges for holistic transition processes, which are demanded by global efforts towards a green transition and sustainable development trajectories.

3.2 Sustainable development as a holistic concept

The concept of sustainable development and its holistic nature of acknowledging the interdependence of various political, economic, social, and environmental domains further appears of crucial relevance for this research project, as climate transition strategies are usually designed and measured based on norms of sustainable development.

The theoretical framework of sustainable development was first coherently defined by the Brundtland Report in 1987 and appeals for development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987; Parris & Kates, 2003; Elliott, 2012). The report characterizes sustainable development as a holistic and multidimensional policy approach that navigates a challenging balance between ecological modernization, economic viability, social equity, political fairness, and cultural dynamism.

Sustainable development thus integrates a key environmental dimension in development trajectories and discusses the crucial importance of environmental integrity through the protection of ecosystems, the conservation and conscious use of natural resources, and mitigation and adaptation efforts to climate change (Giddings et al., 2002; Omer 2008). Maintaining planetary health is considered a key element of intergenerational justice, which was first introduced to development policies in approaches to sustainable development (Rees, 1990). The concept of sustainable development also proposes substantial reforms to traditional norms of economic, political, social, and cultural development policies. Economically, practices that contribute to environmental degradation, social inequality or disregard human rights are not supported and ideally substituted (Pearce & Warford, 1993; Filipovic et al., 2022). The economy is thus perceived as a vehicle to promote the present and future well-being of society and the environment (IUCN et al., 1980). This inherently contradicts disseminated neoliberal agendas and demands structural reforms to exploitative systems (Daly, 1990; Adelman, 2018). Social sustainability further underlines the role of a proactive approach to promoting societal well-being by pursuing policies addressing equality, social justice, and accessibility to essential services, healthcare, and education (WCED, 1987). Based on the core concept of human rights, the empowerment of marginalized communities is a key element of social sustainability. In a political dimension, sustainable development involves effective and inclusive governance based on strong and accountable institutions. Institutional structures are expected to be built on the rule of law, transparency, and inclusive decision-making mechanisms (Roy & Tisdell, 1998; Kardos, 2012, Omri & Mabrouk, 2020). Citizen participation is crucial to ensure the visibility and representation of diverse voices and models of democratic innovation are often linked to sustainable development (Holmberg et al., 1991; Smith & Stirling, 2018). Lastly, a cultural dimension underlines the importance of preserving cultural heritage and embracing cultural diversity (Nurse, 2006; De Beukelaer & Freitas, 2015). Core to the transformative innovation of sustainable development is the acknowledgment of the interconnections of these dimensions. This interconnected problem structure consequently demands a comprehensive and holistic solution (Giddings et al., 2002; Parris & Kates, 2003). Effective sustainable development strategies are thus inherently linked to climate transition pathways and are crucial for this research.

3.3 Sustainable climate transition in oil-producing countries

For oil-producing countries such multidimensional, holistic, and interconnected transition perspectives produce particular challenges. The absence of taxation and corresponding governance patterns of autocratic paternalism and repression of market freedoms in rentier-states do not represent any power sharing with the population. However, expected transformational mechanisms of a green transition following ideals of sustainable development necessarily incorporate citizens' commitment and political reforms towards accountability-based governance models. These threaten to terminate current social contracts in rentier states (Ansari & Holz, 2020). At the same time, these rigid social contracts represent an obstacle to creating economic frameworks that appear necessary to develop resilience and capacity (Reiche, 2019).

The theoretical framework of this research paper thus combines key implications of rentier-state theory and holistic considerations of sustainable development. A dual focus on building up resilience and capacity is applied which helps to ensure that green transitions are politically, economically, socially, and environmentally sustainable. Resilience thereby refers to the capacity to react to transformative forces through minimizing vulnerability to climate change effects, fossil fuel demand disruptions, and oil-price volatility, as well as by increasing levels of economic diversification, system flexibility, and responsiveness. While resilience encompasses mostly adaptive practices, building capacity involves developing the technical, institutional, financial, and social-capital-related capabilities to support green transition ambitions. This includes investment attractiveness, educational reforms, and inclusive policy innovations. Reflecting on the necessary components of effective green transition strategies, this research paper proposes five key analytical categories based on presented literature reviews.

First, attracting investment for occurring high up-front costs of complex processes of energy transition and economic diversification appears crucial. Technological development and political and financial support for innovation are identified as key elements of an effective transition environment. Access to funding mechanisms can be politically incentivized through foreign direct investment attractiveness and financial sector development. This also includes promoting economic freedom, facilitating market access for trade and foreign capital, and streamlining business regulations accordingly.

Reducing bureaucratic obstacles to business operations and further incentivizing a productive and dynamic business climate can be considered crucial in green transition and economic diversification efforts.

Second, the socioeconomic implications of such a transitional process require addressing public participation and human and social capital development. Improving educational systems leads to a more skilled workforce. Creating a green job market further provides perspectives for local participation, especially for youth and women. Incentivizing educational and professional specializations on sustainable practices represents a core idea in capacity-building. Moreover, this second category refers to addressing public awareness of environmental consciousness and sustainable consumption. Carbon-intensive economic profiles and increasingly high-carbon lifestyles in many oil-producing countries aggravate environmental degradation and global warming and thus require direct counteraction. Approaching energy efficiency, lifestyle moderation, and developing circular economy frameworks based on local needs support strengthening resilience. Lastly, ideals of cultural sustainability as represented by embracing cultural diversity as a key dimension of sustainable development need to be addressed. Persistent political, economic, social, and cultural dominance of a privileged 'state class' contradicts ideals of social justice and diverse representation and consequently calls for reforms.

A third analytical category focuses on policy frameworks and critically assesses rentier-state transformation strategies. Public sector efficiency, anti-corruption efforts, and building up functioning institutions that are based on accountability and transparency do not only appear as central elements in sustainable development theories but are also identified to be relevant for effective transitions in the literature review. However, the state-society nexus in rentier-states is inherently characterized by systems of autocratic paternalism and networks of patron-client relationships. Green transition ambitions consequently challenge rentier-state structures. To prepare such transitions effectively, rentier-states need to address the introduction of taxations, the termination of state subsidies on fuel and electricity as well as improve anti-corruption measures and public sector efficiency. Such political reforms seem particularly difficult as they concern power relations. Strategies of holistic state transformations are thus not to be expected but steps

towards accountability-based governance models appear crucial for effective green transition strategies.

In a fourth category, the inclusion into networks for sharing knowledge and technology as well as commitments to international frameworks are analyzed. Since energy markets are increasingly globalized, energy transition efforts are not isolated but emerge in cooperative efforts with trade partners. The integration into such networks and alliances thus represents an important component of green transition efforts in rentier states.

Lastly, such a multidimensional and holistic transformation of economic, political, and social power structures demands new national narratives. Many rentier-states base their self-image on the abundance of natural resources or characteristics of ruling ‘state classes’. A more diverse nation thus calls for re-narrations of national identity. Such processes of nation (re-)building can shift focal points of national identity or history. These five categories are based on previously outlined characteristics of guiding theories on rentier-states and sustainable development. Bridging the theoretical gap on how to combine these two concepts highlights the need for holistic political strategies, which target economic, political, social, cultural, and discursive dimensions simultaneously.

4. Methodological approach: Theory-guided case study and schematization

4.1 Case Selection: Saudi Arabia and Algeria as critical cases

In order to explore the extent to which deduced elements of a multidimensional, inclusive, and sustainable transition framework are reflected in strategy papers on climate transition pathways, it is necessary to select specific research objects. To reach the most meaningful and scientifically valid conclusions within an appropriate scope of research, it seems impossible to examine a random sample of political strategies on green transition in oil-producing countries due to the large volume of political strategy papers. However, a case study is not aimed at a statistical but rather an analytical generalization (Yin, 2003) and seems particularly suitable for analyzing complex and multidimensional social phenomena as they are considered within their real context. A case study is less of a method than a research strategy (Hartley, 2004) and provides a multidimensional and context-aware perspective (Patton & Appelbaum, 2003). Due to the complex interdependencies of various relevant policy domains such a context-inclusive case study allows critical in-depth analyses and further analytical generalizations that can be transferred to different cases after adjusting crucial context factors.

In order to be able to take systematic biases in a non-randomized case selection into account, an information-oriented and theory-guided case selection is crucial. Such a theory-driven case selection promises a maximized benefit from the detailed study of individual cases. One of the numerous case selection mechanisms identified in the methodological literature is the targeted research on so-called critical cases. This is intended to enable a logical derivation of potentially generalizable statements despite the lack of statistical validity in the study of individual cases (Flybjerg, 2006). Although there are no generally valid methodological principles with which critical cases can be identified with certainty, a frequently described procedure is the search for a ‘most likely’ or ‘least likely’ case – i.e. for cases that are particularly suitable for either confirming premises, propositions and hypotheses or for falsifying them almost irrefutably. Against the background of the research question, these cases are therefore political strategies which due to their contextual specifications, have high or respectively low probabilities of picking up on critical elements of effective green transition pathways in oil-producing states.

The climate transition and sustainable development strategies of Saudi Arabia and Algeria are therefore examined as 'critical cases'. The transition efforts of these two states appear to be particularly susceptible to be analyzed along deduced elements that are considered decisive over the effectiveness of a climate transition and sustainable development strategy due to numerous contextual factors. For a meaningful comparative case study, a foundation of substantial resembling structures has to be given in order to be able to elaborate on decisive key differences. Consequently, the mentioned basis of similar context factors allowing a substantial comparison is explained in the following.
Both states qualify as oil-producing countries and are part of international fossil fuel trade networks. As members of the OPEC, the countries share several characteristics and interests due to the significant dependence on fossil fuel exports as a major source of state revenues. Saudi Arabia and Algeria both possess large reserves of fossil fuels and are politically invested to stabilize oil markets and maximize economic revenues from fossil fuel production and exports. Next to that resource endowment, both states are characterized as rentier-states as state enterprises in the fossil fuel sector generate crucial revenues for the state budgets. As outlined previously in the theory section, rentier-states are constituted not only by resource dependency but also by autocratic paternalism. Both Saudi Arabia and Algeria are considered authoritarian regimes and draw the majority (both around 60%) of their state budgets from fossil fuel extraction. On top of that, both countries lie in the periphery of high energy consumption markets in Europe and are key trade partners of the EU. The similar economic and political profiles represent the first important similarity that allows substantive comparison.

A second similarity stems from resembling structures of affectedness of climate change and the necessity of a green transition. Saudi Arabia and Algeria are both located in areas that are disproportionately affected by climate change. The reliance on fossil fuel exports further creates a vulnerability to price volatility, which can have significant economic, political, and social consequences. Government budgets and social welfare programs directly depend on oil and gas extraction revenues and global green transition efforts thus threaten system functionality. Like many OPEC countries, Saudi Arabia and Algeria have acknowledged the need to pursue policies of economic diversification. They thus share an acute interest in implementing green transition strategies especially targeting economic diversification and energy transition. Considering the potential for

renewable energy due to the resource endowment of sun, wind, and hydropower, this shared necessity, interest, and potential for transforming economic profiles represents a second important context factor allowing a substantial comparison of the countries.

These opportunities and challenges associated with relying on fossil fuel exports and rentier-state structures are addressed by both states in strategy papers that are publicly accessible and comparable due to aligning time horizons. This allows a stringent comparative study on strategies to manage energy transition efforts, and economic diversification but also proposed reforms in governance. This comparability of frameworks hence constitutes the third context factor creating a foundation of substantial comparison of the two cases. Against this background, the climate transition and sustainable development strategies are analyzed as 'critical cases'.

Although generalizing findings of comparative case studies does not seem possible statistically, contextualized theory-guided case selections allow conclusions for further political strategies and thus provide a possibility to generalize analytically. This comparative case study thus aims to explore and categorize explanatory factors in the climate transition strategies of Saudi Arabia and Algeria based on this evaluation of resembling contextual factors.

4.2. Data and Methodology: Qualitative policy analysis and strategic outlooks

For this comparative case study strategy papers on climate transition and sustainable development from the two selected countries must be critically analyzed along outlined dimensions of a comprehensive transition framework for rentier-states. The specific documents that serve as units of analysis were selected based on their relevance and comparability of time horizons.

Saudi Arabia published a holistic plan for economic diversification, climate transition, and political and cultural development in 2016. The strategy paper 'Saudi Vision 2030' (2016), is a government program for a national transformation of the Kingdom until 2030 and lists various projects in three identified key pillars labeled 'vibrant society', 'thriving economy', and 'ambitious nation'. The vision is accompanied by thirteen realization programs which are used for additional information in this analysis sporadically.

Algeria's strategy on climate transition and sustainable development is documented in several strategy papers and thus appears more fragmented. In line with United Nations efforts of sustainable development, the North African country defined its contributions to achieving the sustainable development goals in an 'Agenda 2030', which was accompanied by the 'National Strategy for Environment and Sustainable Development (2017-2035)' (Ministère de l'Environnement et des Énergies Renouvelables, 2016), issued by the newly merged Ministry of the Environment and Renewable Energy in 2016. This strategy paper refers to action plans like the 'Action Plan to Develop Sustainable Modes of Consumption and Production' which provides policy goals for the time horizon of 2016 to 2030 and was developed in a co-production with 'SwitchMed', which is aimed to support Mediterranean states to transition towards circular economy models in cooperation with the UN and the EU (Ministère des Resources en Eau et de l'Environnement et al., 2016). Further action plans that specify Algeria's climate transition pathway and are included in the analysis are action plans on energy efficiency, renewable energy development (Ministère de l'Énergie et des Mines, 2024), climate change adaptation (Ministère de l'Environnement et des Énergies Renouvelables, 2023) and the national climate plan (Ministère de l'Environnement et des Énergies Renouvelables, 2019). Moreover, the 'Plan de Relance Économiques' (Services de Premier Ministre, 2020) deals with economic questions related to the green transition framework and the 'National Strategy on Hydrogen Development' (Ministère de l'Énergie et des Mines, 2023) allows insights into most recent development steps. This fragmented policy framework represents relevant documents that report on Algeria's vision for climate transition and sustainable development and build the basis of the analysis.

As both countries of this comparative case study engage in official energy partnerships with the EU, the implications of the cooperative approach in line with European Green Deal standards can be analyzed additionally. This external dimension of climate transition in collaborative efforts with key energy trade partners in Europe adds an important international dimension. The aforementioned documents thus represent the data basis of the following methodologically-guided analysis. This analysis of these strategy papers on climate transition and sustainable development is carried out in a qualitative research process that emphasizes interpretation and categorization rather than

quantification (Cassel & Symon, 1994) and aims to identify patterns of holistic climate transition pathways in the strategy papers. The case studies are thus intended to uncover patterns, interpret their implications, and allow analytically generalizing conclusions (Stake, 2000; Patton & Appelbaum, 2003).

In the following, the described policy strategies from Saudi Arabia and Algeria will be analyzed according to the systematic research framework of qualitative content analysis as developed by Mayring (2003). The method of content analysis refers to the process of coding qualitative data by classifying it as categorical schemes derived from theory (Ryan & Bernard, 2000). This theory-based consideration of patterns is a common procedure in qualitative content analyses (Neuman, 1997) and central codification schemes are usually derived from deductive categorization processes from literature – here on rentier-state theory and sustainable development as outlined previously. The central aspect of qualitative policy analysis is thus a systematic and rule-based analysis with a category system as the central instrument (Mayring, 2003; Kohlbacher, 2006). The concrete underlying procedure of such a policy analysis consists of a sequential model of providing explicative context analysis, a descriptive summary of the material, and an interpretation through the identification of patterns (Mayring, 2003). The advantages of such a qualitative contents analysis include the ability to introduce complex and context-integrating relationships and interdependencies in a methodologically controlled manner (Kohlbacher, 2006). Since climate transition pathways in rentier-states particularly address interdependent domains of politics, economy, and society simultaneously, such a context-integrating method appears pivotal. A qualitative policy analysis might allow contextualized in-depth observations that attempts of quantification would have excluded or distorted and thus seems specifically suitable as a research method. Consequently, the following research step consists of analyzing described elements of effective climate transition and sustainable development frameworks in the context of rentier-states.

5. Analysis: Saudi-Arabia and Algeria on their climate transition pathways

The described strategy papers and action plans of Saudi Arabia and Algeria will be critically analyzed below. Based on the five determined dimensions that appear crucial for effective, sustainable, and inclusive climate transition pathways in oil-producing countries, the strategic prospects of the two rentier-states will be comprehensively compared and discussed in a theory-based and context-integrating analysis.

Figure 7: List of analyzed indicators

Dimension	Indicators
Investment strategies: Funding mechanisms and business climates	- Plans for economic diversification, sector development and environmental profiles - Renewable energy development (infrastructure, technology development) - Funding and investment attractiveness (FDI, Investment Funds, development partnerships, sustainable finance, fiscal policy) - Business environment (private sector development, liberalization and deregulation, start-up incentives)
Socio-economic implications: Capacity-building and raising awareness	- Research & Development (funding of universities, quality improvements, cooperative approaches) - Education (review of university colloquiums, knowledge-sharing networks, educational sectors on environmental studies and related fields) - Job Creation (inclusiveness, support for marginalized groups, building up job agencies, transform skill sets, attract foreign talent and expertise) - Social Justice (provision of essential services, improvement of health care, poverty alleviation, women's rights, community empowerment, promoting cultural sectors) - Environmental awareness and protection frameworks (address energy efficiency, promote renewable energy production, initiate circular economy and waste management, incentivize lifestyle moderation and sustainable consumption, ESG reporting of public and private sectors)
Institutional reforms: Rentier-state transformations and governance	- Public sector efficiency (anti-corruption policies, e-government) - Accountability-based governance (transparency, reporting standards, feedback loops, monitoring) - Transformation of rent systems (introduction of taxation, removal of subsidies, building up diversified state revenues based on citizens' participation, transformation or privatization of state companies)
International Contexts: Partnerships and climate policy commitments	- Trade networks (free trade agreements, implementation of environmental standards for imports/exports, - Geopolitics (integration into regional cooperation frameworks, transport infrastructure and logistics) - Energy partnerships with the EU (green transition elements, termination of fossil fuel contracts, technology and knowledge transfer, funding)
Discursive Elements: Nation (re-)building	- Narratives on national history, identity, and unity (identity-forming characteristics, national storytelling, - Transformation of rentier-state structures as legitimizing forces for power distribution - Embracing cultural diversity

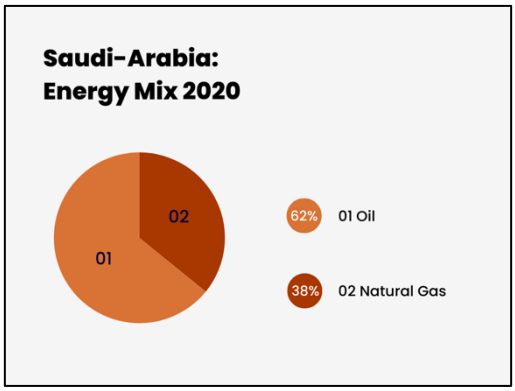
5.1 Investment strategies: Funding mechanisms and business climates

Following elaborated schematizations of relevant dimensions, Saudi Arabia and Algeria's climate transition strategy papers will be assessed along with their potential to attract investment and funding for a sustainable and inclusive climate transition pathway.

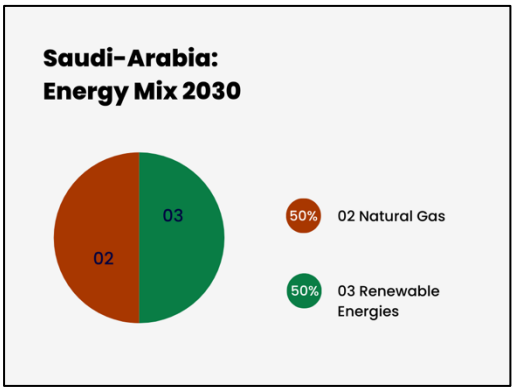
The Saudi Vision 2030 announces ambitions to stimulate dynamic growth in a diversified economy and shows a high awareness of the mounting costs of such reforms. It thus provides various policy frameworks for diversifying its oil-based economy, stimulating large-scale funding, and increasing the investment attractiveness, as well as for improving the business climate and empowering private sectors. In terms of economic diversification, the Saudi Vision 2030 lists several sectors which are identified to support non-oil revenues. While acknowledging the current crucial role of petroleum industries, Saudi Arabia has tangible plans to expand into additional sectors. The tourism and leisure sector is particularly identified as profitable and creating attractions and entertainment opportunities for locals and visitors appears a priority. Rooted in the country's Islamic heritage, the Kingdom announces plans to increase the capacities of Umrah visitors to Mecca and Medina by modernizing infrastructure and transport routes as well as by facilitating visa application procedures using digital tools. Increasing the number of visitors from 8 to 30 million yearly aims to generate revenues for public and private sectors that are requested to upgrade accommodation and service infrastructures. Pilgrimage experiences are planned to be enriched by further services and new museums such as the largest Islamic Museum in the world and an increasing effort to unlock the cultural potential of the country. For this purpose, the country aims to double the number of UNESCO heritage sites by 2030. By tapping into the nation's diverse ancient heritage and building up modern and accessible infrastructure surrounding cultural tourist destinations like Al-Ula, Saudi Arabia aims to develop a profitable tourist sector. However, the strategy does not only target foreign visitors but also aims to increase local household spending on cultural activities. Building up cultural and social infrastructure does not only follow social but also economic intentions, as the strategy specifies the goal of increasing household spending on cultural and entertainment activities from 3% to 6% until 2030. Next to the tourism and leisure sector, Saudi Arabia identifies diversification potential in investing in defense and mining sectors. As one of the world's biggest

importers of weapons and military technology, the Kingdom aims to build national expertise and industrial capacity in the manufacturing of defense equipment to increase localized military spending from 2% to 50% by 2030. In the mining sector, the Kingdom announces investment in infrastructure, an intensification of exploration, and aims to quadruple the sector's contribution to GDP. Lastly, Saudi Arabia seeks to localize a significant portion of the supply chains in the manufacturing of technology for renewable energy and hydrogen sectors. The identification of the country's immense potential in renewable energy production and competitive advantages due to existing energy infrastructure is followed by targeted investments into industrial development. As Saudi Arabia is endowed with many critical raw materials for constructing solar panels, the country aims to streamline not only production but also the export of renewable energy equipment and technology. Thus, the launch of various programs to foster renewable energy production such as the King Salman Renewable Energy Initiative does not only set goals of achieving a net zero economy by 2060, or increasing renewable energy production capacity to 130GW (making up around 50% of the country's total energy production capacity) (Figure 8), but also addresses opportunities to benefit economically from the localization of supply chains.

Figure 8: Energy diversification in Saudi Arabia



Note. Own visualization based on Saudi Vision 2030.



Note. Own visualization based on Saudi Vision 2030

These diversification efforts appear comprehensive and target various sectors. Investments into locally produced renewable energy infrastructure and potential exports of both, energy, and equipment, allow defending leading positions in regional and global

energy markets and appear particularly aligning with pathways towards carbon neutrality. However, while planning to increase renewable energy production, the Kingdom reacts to rising local demands with plans to double the national gas production. Plans to diversify energy exports while expanding fossil fuel consumption domestically, do not correspond with emission-reduction and sustainable development ideals. The other mentioned sectors for diversification promise steady revenues but do not seem to conform to sustainability standards. Concepts for tourism are not specifically designed in line with sustainability ideals but mostly focus on generating high revenues for the hospitality sector. Although sustainable tourism has potential, Saudi Arabia needs to refine these plans to not substitute one high-carbon sector with another. The same logic accounts for investments in mining and defense industries. While these sectors have a high potential to secure stable revenues, their nature contradicts sustainable development.

The Saudi strategy further acknowledges the need to stimulate multidimensional funding sources for the high up-front costs of a diversified economy. The first important aspect of the strategy is represented in the transformation and expansion of the Public Investment Fund. The Public Investment Fund Restructuring Program proposes to utilize the fund's capacities on a diverse portfolio and announces the Fund to be transformed into the largest sovereign wealth fund in the world. It is intended to support the diversification of government resources and fund various economic and social programs. Furthermore, the country aims to improve investment attractiveness by liberalizing financial sectors and capital transactions. Saudi companies and state-owned corporations are incentivized to be listed on financial markets and access to stock markets will be simplified. Consequently, the goal of increasing foreign direct investment from 3.8% to 5.7% of GDP by 2030 is based on facilitated access of foreign investors to Saudi markets and an increased fortification of pursuing PPPs (Private-Public-Partnerships). Moreover, the Saudi government proposes a Fiscal Balance Program focusing on stricter spending controls, rigorous auditing, and more effective public expenditure based on digital data-analysis tools. The recently launched 'Qawam'-Program aims to review financial regulations in government agencies and appeals for government spending with moderation.

This strategic outline for stimulating investments appears cohesive and targets various aspects. Building up investment attractiveness through increasingly liberalized

financial markets is a commonly used tool stimulating investments in public and private sectors. Increasing the national sovereign wealth fund's volume implies a strategic effort to generate additional resources for funding structural transformations. PPPs open up new possibilities of funding that break with traditional rentier-state structures but must be accompanied by accountability and transparency of governmental and corporate actors. By targeting public and private sectors simultaneously, the Saudi Vision 2030 presents a comprehensive approach but fails to target instruments linked to sustainable finance like green bonds or loans, sustainable investment funds, or blended finance. The motivation behind Saudi ambitions to stimulate funding seems to lie in economic intentions of guaranteeing stable revenues rather than in credible commitments to green transition ideals. Only when directly connected with sustainability-ensuring instruments such as governmental monitoring of sustainable and inclusive spending patterns or corporate ESG reporting, these funding mechanisms align with identified ideals of sustainable development in oil-producing countries.

In a third relevant sub-category, the pathway towards a dynamic business environment is analyzed. The Saudi Vision 2030 underlines ambitious growth targets of increasing private sector contributions to national GDP from 40% to 60%. The strategy proposes to review the current regulatory basis on contract enforcement, licensing procedures, and customs practices to incentivize smooth business operations and increase trade security. Financial institutions are requested to adapt their offers for local businesses and the strategy announces the implementation of special zones with further liberalized and simplified tax, customs, licensing, and registration procedures for logistic, industrial, financial, or tourist businesses. The gradual privatization of education and health sectors, previously provided by the public sector, should further introduce competition and market dynamics to costly sectors. Lastly, the Kingdom's strategy highlights the crucial role of small and medium-sized enterprises (SMEs) in job creation, innovation, and export growth. A newly established SME Authority should contribute to a business-friendly start-up culture and remove administrative and financial burdens to market access. These reviews of business regulations aim to increase SME contribution to GDP from 20% to 35%.

While the Saudi Vision 2030 provides several reforms contributing to a productive business environment, it lacks important details to focus on sustainable and inclusive

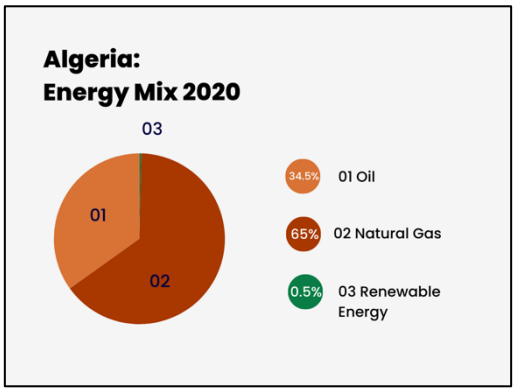
development. While streamlining regulations that simplify business operations and entrepreneurship encourages economic growth, they might prioritize profit over sustainability. Without specific environmental policies, private sector growth might diversify and stimulate the Saudi economy in a post-oil era but could potentially lead to negative environmental impacts. Only for the mentioned privatization efforts, the strategy highlights the critical role of governmental monitoring to guarantee high-quality services and egalitarian accessibility. While this aligns with identified ideals of sustainable and inclusive development, the lack of specifications on the environmental and social responsibilities of private sector actors in the strategy opposes the ideals of green and just transitions. An orientation towards liberalization, deregulation, and privatization promotes economic growth, but the Saudi strategy's alignment with neoliberal dogmas needs to integrate environmental and social responsibility.

Algeria, on the other hand, announces its ambition to transition away from a fossil-fuel-based economy in various national strategy papers. The more fragmented basis of documents reporting on the climate transition pathway of the North African country commonly refers to the necessity to implement further environmental protection frameworks and highlights the ambition to diversify the Algerian economy.

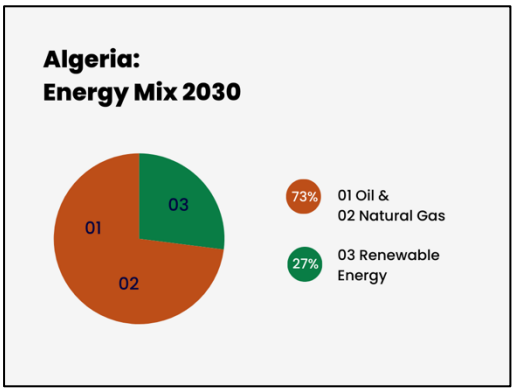
In terms of generating funding, the 'Plan Relance Économique' lists opportunities for envisioned economic diversification and strategies to attract investment and stimulate green growth. In terms of economic diversification, the Algerian government plans investments in the mining industry, as the country is well endowed with various metals and industrial minerals. Moreover, Algeria aims to improve its market position in the pharmaceutical industry and plans to particularly invest in domestic industrial production of equipment for the construction sector. Imports should be reduced and substituted with local products. Lastly, the Algerian government identified important competitive production costs and advantages in renewable energy and hydrogen production. The versatility of hydrogen is particularly described as a promising instrument to transition away from fossil-fuel dependence domestically and in exports. New industrial and technological sectors are developed to support building up the Algerian renewable energy sector and the country aims to localize large parts of the value chain of related infrastructure and technology (DH). The strategies highlight Algeria's ambitions in the

renewable energy sector by aiming for generating 22000MW (constituting around 27%) of electricity from renewable energies in 2030 (PRE) (Figure 9), and even 25GW from green and blue hydrogen by 2050 (DH). Consequently, the localization of technology and infrastructure production appears crucial to combine energy diversification with industrial development, technological innovation, and job creation.

Figure 9: Energy diversification in Algeria



Note. Own visualization based on Plan Relance Économique.



Note. Own visualization based on Plan Relance Économique.

However, these diversification strategies focus heavily on competitive advantages in regional renewable energy markets. While the development of productive and dynamic renewable energy and hydrogen sectors align with green transition ideals, their construction seems to lag behind key competitors as Morocco, Egypt, and Saudi Arabia have already started investing heavily in hydrogen partnerships (Colombo & Oei, 2023). Furthermore, these investments need to be accompanied by governance reforms and additional efforts to diversify the economy, as substituting one dependency with another contradicts the nature of diversification. Ambitions of exploring mining and pharmaceutical industries only align with green transition ideals when environmentally regulated. A more sophisticated environmental governance thus must be implemented simultaneously.

The high costs of building up new sectors and of developing a robust and competitive renewable energy and hydrogen sector without relying heavily on technology imports are acknowledged by the various Algerian strategy papers. The SNEDD calls for annual investment of public and private sectors of more than 2% of the GDP, which

implies a significant increase from currently less than 0.7% (SNEDD). Various funding mechanisms should be explored according to the 'Plan National Climat', the 'Stratégie National de Développement de l'Hydrogène' and the 'Plan Relance Économique', referring to national and international resources. Austerity in public expenditure is only hesitantly mentioned, whereas international development banks and partnerships are assigned a crucial role in financing projects (PNC, DH, PRE). The hydrogen strategy further explores innovative sustainable finance tools such as green bonds and carbon markets to attract funding (DH). The National Climate Adaptation Plan provides an example of such a corporative approach to funding green transition projects, as it was developed in collaboration with the UNDP and is funded by the Green Climate Fund (PAC). The domestic financial sector is requested to introduce banking reforms to facilitate funding and to update supervisory frameworks also based on international frameworks like Basel II and Basel III which integrate sustainable finance tools of transparency requirements and ESG risk assessments. An additional funding mechanism is identified in developing Islamic finance systems like Sukuk and Takaful (PRE), which are rooted in risk-sharing, the prohibition of gambling, and the avoidance of excessive uncertainty and due to their emphasis on ethical investments and social responsibility align with sustainable finance norms. Moreover, the hydrocarbon sector is envisioned to play a key role in funding transitional efforts. Generated revenues are used to improve yields of energy production through infrastructure modernization and to implement more energy-efficient processes of refining. The saved costs lead to a higher added value of exports which could be invested in renewable energy sectors. In order to stimulate foreign investment, the regulatory framework on capital transactions is reviewed, tax exemptions on FDIs are explored and a specialized agency will be developed to provide administrative support to foreign investors (PRE). While striving for a holistic liberalization of investment and listing various goals, the strategies fail to illustrate concrete steps on the pathway to attract foreign direct investments.

The Algerian strategies to attract funding of diverse sources are mostly focused on tapping into international funds. Integrating such efforts into broader strategies for improving investment credibility and stability seems crucial and refers, again, to reforms of governance and accountability-based structures. Algeria thus shows interest in instruments of sustainable finance internationally by tapping into sustainable funds and

project financing of development banks, as well as domestically by building up Islamic finance structures and modernizing banking sectors. At the same time, the strategies fail to address excessive public expenditure comprehensively and while targeting foreign investment attractiveness, the plans lack a detailed strategy on how to overcome administrative obstacles.

Private sector development is directly targeted in strategies for improving the business climate in the country. Administrative procedures, particularly for business creation and registration, are envisioned in the 'Plan Relance Économique' and partnerships with the private sector are extensively mentioned. Such Public-Private-Partnerships do not only promise investment but also aim to improve competitiveness and market openness of key economic sectors. The Algerian government is specifically interested in opening the market to small and medium-sized enterprises as motors of innovation (PRE). Government programs to provide financial and administrative support for SMEs are also created in international initiatives like European institutions (DH).

The Algerian strategy thus targets crucial obstacles of a productive and dynamic business climate but seems to overly rely on international cooperation for funding. Liberalization efforts need to be accompanied by environmental policies, which are rarely mentioned. However, in the renewable energy sector, Algeria seems to implement state-of-the-art policy frameworks of decentralized and inclusive sustainable development. SMEs are a key component of innovative green renewable energy markets but require comprehensive political support. Whether relying on international initiatives and public-private-partnerships is leading Algeria towards a key position in regional renewable energy markets and sustainable development heavily depends on the effective implementation of envisioned programs and remains risky, as the country concentrates most of its prospects in this field and appears to neglect to develop a productive, liberal, and sustainable private sector in a diversified economy. An orientation towards sustainable finance only seems fruitful when there are diverse sectors to invest in that align with green transition standards. As long as this is not given, the country remains dependent on the energy market, in which Algeria's position is heavily contested by various nations in a regional hydrogen race.

5.2 Socio-economic implications: Capacity-building and raising awareness

A second identified dimension of an effective and holistically designed climate transition pathway focuses on building capacity through the promotion of research & development, education, and the creation of an inclusive job market. In order to correspond with sustainable development frameworks, transformational programs should be based on improving social justice and raising awareness of the necessity of environmental consciousness. The approaches of Saudi Arabia and Algeria towards these aspects are critically analyzed in the following.

To link such large-scale transformations to capacity-building, untapping innovative potential appears crucial. The Saudi Vision 2030 does not mention innovation frequently but states that a focus on innovation and technological development is considered particularly relevant in transitional periods. Consequently, the country presents extensive strategies for promoting research and development and improving educational systems. By developing an educational environment that rewards determination, provides inclusive opportunities and increasingly focuses on social and cultural skills, the Saudi government aims to empower future generations through high-quality education. Expanded state-funded scholarships for internationally renowned universities, attracting international expertise in university teaching, and intensified cooperation with market actors to determine demanded skills through the newly launched TAQAT-program should further integrate support innovation and the integration of local youth. This target is also represented in Saudi efforts of job creation. While the potential of the comparatively young Saudi population is highlighted and actively promoted through educational programs, women's participation in the workforce is a second crucial pillar. As a majority of university graduates in the country are women, their role in key positions should be supported next to the goals of increasing their participation in the labor force from 22% to 30%. A newly developed Job Creation and Anti-Unemployment Commission supports finding employment and organizes specialized training to lower the unemployment rate from 12% to 7%. Furthermore, the strategy seeks to improve living and working conditions for expats by facilitating visa and residence permit systems and by building up international schools.

At the same time, the Saudi vision does not only target high-skilled individuals but underlines its orientation on ideals of social justice. The country commits to providing high-quality services in water, electricity, public transport, education, and health care for all citizens and aims to redirect subsidies for fuel and electricity to those in need. Moreover, the country announces investments in public sports facilities and support systems for cultural sectors. While expanding access to cultural venues, the strategy also proposes to increase the financial and public support of local artists. Lastly, the strategy introduces programs that stimulate voluntary social or cultural engagement to empower local communities.

The Saudi strategy thus provides a coherent and inclusive approach to integrating citizens into the transformation. By fostering research, innovation, education, and by improving living standards and social and cultural engagement, the strategy promises to create a proficient and resilient community with strong social bonds and a high social capital. Focusing on the inclusion of local youth, women, and people with disabilities and creating agencies to target unemployment further aligns with sustainable development ideals. However, the mentioned projects are still in the development stage and need close monitoring of their contribution to social justice, as a 'state class' currently dominates not only economically and politically, but also socially and culturally in the Saudi rentier-state. Only by overcoming these structures, the country can provide equal opportunities.

In terms of promoting environmental awareness and sustainable consumption, the strategy highlights the country's Islamic responsibility to future generations and to nature. While not directly tackling consumption patterns or incentivizing lifestyle moderation, the Saudi approach focuses on increasing energy efficiency, building up sustainable systems of waste management, and using technology and data-based monitoring of the resourcefulness of industries and households. The private sector is also increasingly obligated to contribute, and the strategy envisions the implementation of international standards of ESG reporting for businesses.

The Saudi Vision 2030 does not provide concrete details on plans to promote civic environmental awareness and does not mention consumer responsibilities. While focusing on creating effective circular economy models and utilizing technology-based solutions for building resilience, the strategy fails to streamline coherent frameworks of environmental governance that go beyond recommendations. The high-carbon lifestyles

of the Saudi elites are not targeted and environmental aspects appear to be sidelined in favor of economic productivity.

Algeria also announces investments in research and development and particularly strives to develop digital tools. So far, the public expenditure dedicated to R&D remains at less than 1% of GDP very low, but the creation of a High Council for Innovation and the initiated development of a national strategy for the knowledge economy establish regulatory frameworks and financing mechanisms for innovation, technology, and science (PRE). The government also aims to improve coordination between the universities and research centers. The Algerian strategies seek to develop human capital, particularly for the industrial development of renewable energy and hydrogen technology. Gradually building up the national hydrogen economy is set to be based on a domestic talent pool, that should be educated and trained following the highest international standards (DH, MCPD).

For this sake, the government requests university curricula to be reviewed and reformed based on the needs of the renewable energy and hydrogen value chain (DH). While the strategy papers do not go beyond these aspired reforms and lack specific recommendations or approaches to integrate local communities in these transformations, the role of social justice is emphasized. The government refers to the slogan “leave no one behind” in their definition of sustainable development and connects an aspired reduction in social inequalities directly with the green transition and environmental preservation (SNEDD). In the fight against poverty, ensuring food security is highlighted as a particularly relevant component and represents an individual axis in the SNEDD and focuses on sustainable agricultural practices, local communities, and inclusiveness of accessibility of essential services (SNEDD, MCPD).

Algeria thus pursues a more fragmented approach to building capacity and uses green transition needs to target social capital simultaneously. While promising to dedicate more funding to research and education, the strategy papers lack a coherent and detailed plan on how to achieve these goals. Requesting universities to adapt their curricula does not seem sufficient to build up a competitive renewable energy and hydrogen sector and while local communities’ interests are emphasized in considerations of food security, they do not play a crucial role in building resilience and capacity for the green transition.

Algeria thus risks missing an opportunity to develop strategies for a holistic and inclusive transformation not only of economic but also of social structures.

However, in terms of improving environmental awareness and resilience to related shocks, the strategies present coherent plans for energy efficiency, the incentivized use of renewable energies for electricity generation, and the implementation of circular economy frameworks. Planned modernizations of thermal insulations of buildings (PRE), the implementation of international standards on energy efficiency management systems and eco-efficiency certifications in industries and administrations as well as the politically incentivized introduction of alternative fuels in public transport and private vehicles, align with common best-practice approaches towards carbon-neutrality (MCDP). Developing a circular economy appears a priority in the SNEDD and policies such as generalizing selective sorting, obligating industries to collect and treat waste in line with international UN standards as well as recycling facilities are streamlined in the MCDP. This action plan also proposes the introduction of mandatory ESG reporting of Algerian businesses to ensure environmental standards and guarantee access to European markets (MCDP).
The Algerian green transition strategy thus provides a conclusive approach to developing environmental resilience by implementing energy efficiency and circular economy frameworks oriented on international standards. While these policies appear promising, the strategies only sporadically integrate efforts to build environmental stewardship of citizens. Only when described policy actions are effectively implemented and accompanied by programs to raise environmental awareness and stimulate conscious and resourceful consumption, a holistically effective climate policy regime is established.

5.3 Institutional reforms: Rentier-state transformations and governance

The third dimension of green transition frameworks in rentier-states is based on institutional reforms. Structures of autocratic paternalism and repression contradict ideals of accountability-based and decentralized governance which are emphasized in sustainable development theory. This section thus analyzes the approaches of Saudi Arabia and Algeria to improve public sector efficiency, fight corruption, introduce taxation, and transform rigid social contracts.

The Saudi Vision 2030 dedicates a whole section to public sector efficiency, emphasizes the relevance of agile and efficient government agencies, and commits to adopting transparency and accountability reforms. In order to improve the quality of public administration, the strategy proposes institutional reforms to link policy-making, implementation, and monitoring more closely and announces investments in human capital development in government agencies. The country also strives for a leading position in e-government services and aims to use digital tools increasingly for employment programs, training, passport and payment services, issuances of commercial registers and to facilitate intra-governmental cooperation and communication. Digital instruments are also envisioned to serve the openness and responsiveness of government agencies to citizen encounters as the strategy proposes online forums for interaction. Lastly, digitization efforts support the fight against corruption. After adopting international standards in anti-corruption and anti-money-laundering policy, Saudi Arabia aims to further improve digital monitoring systems of administrative and financial corruption. These reforms are part of a broader campaign to improve transparency in the public sector and increase efficiency. In line with this, the strategy aims to terminate complacent administrative routines and establish mechanisms of accountability and feedback loops on all levels.

The lack of accountability in rentier-states is usually based on non-existent systems of citizen's taxation and consequentially paternal reallocations of oil wealth in generous public expenditure. While introducing accountability-based governance frameworks for public administration, the Saudi Vision 2030 repeats commitments to not tax income, wealth, or basic goods to provide economic security for Saudi citizens. Efficient systems of taxation that break with rentier-state structures are thus not to be expected, but the strategy stipulates a gradual reduction of subsidies on fuel and electricity. Removing these subsidies is not the only instrument representing a partial termination of social contracts of autocratic paternalism. The privatization of core government agencies in the education and health sectors also represents a shift in the role of governments toward monitoring and regulating. However, state budgets are envisioned to continuously be constituted by rents. The state oil company Aramco is planned to be significantly reformed and transformed from an oil company to a global industrial conglomerate to ensure stable revenues even in a post-oil era.

Regardless of important reforms, critical power structures within Saudi Arabia remain intact, as rents from state companies are continuously envisioned to provide key funding for the state and legitimize systems of autocratic paternalism. Improvements in public sector efficiency and effective anti-corruption policies increase transparency and accountability but seem to target investor credibility and economic stability more than substantial political reform. While reviewing and redirecting subsidies, the reallocation of wealth remains the core legitimization of ruling rentier-classes.

Algeria also targets public sector efficiency and anti-corruption policies and prioritizes policy coordination. In order to implement the country's green transition strategy coherently, the Ministry of Energy Transition and Renewable Energies was established to manage competing prerogatives of such a multi-dimensional transition (SNEDD). Other examples of such coordinating bodies are the SDG Committee to monitor progress on the country's pathways to reach its sustainable development goals (SNEDD), the MCPD monitoring committee (MCDP), and two offices to fight corruption (PRE). While orienting policy frameworks on international standards, the strategies do not comprehensively describe how creating coordinative bodies overcomes problems of lethargic administrations. Furthermore, the strategies do not mention any plans to introduce large-scale systems of taxation or accountability. Rentier-state structures of low reliance on direct taxation, significant resource revenues, and autocratic paternalism are not effectively transformed. Additionally, the added value of coordinating bodies for breaking cycles of bad governance, corruption, and nepotism is not directly visible. The state budget is further anticipated to rely on rents and the government created a stand-alone state renewable energy company, preventing decentralizing tendencies of renewable energy and hydrogen systems. Although recent media reports document governmental explorations of opening the renewable energy sectors for private investors, rentier-state structures remain dominant in Algeria's institutional set-up even in a post-oil era (Chibani, 2022).

The strategies of the North African country thus represent only a limited willingness to significantly transform rigid social contracts and systems of autocratic paternalism. The establishment of coordinating and monitoring bodies might motivate the implementation of described sustainable development goals but does not target issues of

corruption, nepotism, and inefficient public sectors. The priority thus appears to be the reproduction and consolidation of existing power structures even in a changing environment of potentially decreasing revenues from fossil fuels.

5.4 International Contexts: Partnerships and climate policy commitments

In this fourth dimension, the crucial role of international contexts for the climate transition pathways of Saudi Arabia and Algeria will be critically assessed. Rentier-state structures are rooted in fossil fuel export revenues, making such petrostates dependent on global hydrocarbon markets. This represents opportunities for a simultaneous transition in a cooperative partnership with key trade partners. As both countries have official energy partnerships with the European Union, related documents also build a basis for the following analysis.

To promote its emerging economic sectors, Saudi Arabia strives to strengthen its integration in international trade networks and aims to solidify its geostrategically important position at the crossroads of Europe, Asia, and Africa. By building partnerships and modernizing transport infrastructure, the strategy aims to consolidate the country's position as a regional trade hub. Such deepened partnerships are aspired with Egypt to open up trade routes to Africa and with the Gulf Cooperation Council, with whose member states Saudi Arabia aims to implement a common market, a customs union, and coordinated economic policies. Lastly, the country is increasingly orienting its efforts towards building a strengthened energy partnership with the European Union. Whereas the partnership has primarily focused on fossil fuel trade, the European Green Deal and Saudi commitments to international agreements on climate policy have shifted the priority towards renewable energy and hydrogen markets. Technology- and knowledge-sharing forums, an increasingly connected and merged flexible energy market, and trade cooperation beyond energy sectors dominate recent developments in the partnership. The EU publicly appreciated the Saudi efforts to diversify the economy and open up to global markets and presented itself as a reliable trade partner supporting these transitional efforts (European Parliament, 2023).

While Saudi Arabia pursues a foreign economic policy of selective multilateralism with great success and maintains harmonious international relations with all world

powers, the country increasingly strives to be integrated into European markets in sectors beyond energy. The EU has shown interest in supporting the country's green transition and economic diversification, but remains a key importer of Saudi fossil fuels, particularly after sanctions against Russia.

Similarly, Algeria pursues a foreign policy strategy that aims to defend the country's position in the energy market. In a dual focus, the country aims to deepen political and economic relations with Africa and commits to the African Continental Free Trade Area (PRE) and African Union sustainable development goals (SNEDD). The Algerian government supports the AU's pan-African vision of the Agenda 2063 (SNEDD) but simultaneously seeks to strengthen Mediterranean cooperation and access to European markets. The EU-Algeria energy partnership highlights fossil fuel trade for European energy security but also establishes expert and governmental forums to discuss establishing renewable energy partnerships. Based on Algeria's commitment to international climate policy frameworks and their recurring reference to these in their green transition strategies, the EU has intensified renewable energy and hydrogen consultations recently (European Commission, 2023). However, after sanctions against Russia, the EU has demanded an increased volume of gas imports from Algeria, even leading to Algerian investments into modernizing gas infrastructure (Chibani, 2022).

While strengthening the country's integration into regional markets and exploring opportunities to establish Algeria as a key renewable energy and hydrogen trade partner, recent EU policies have pushed green transitions back following rising demands for energy security after Russia's invasion of Ukraine and related sanctions. Algeria and the EU thus have to adapt and resume ambitions to approach a sustainable climate transition pathway cooperatively.

5.5 Discursive Elements: Nation (re-)building

As such holistic transformations target constitutive elements of a nation's legitimization and narratives, frameworks on national identity need to be refined. In nation (re-)building processes, the strategies of Saudi Arabia and Algeria are thus challenged to re-narrate dominant discourses on identity, history, and unity.

Saudi Arabia's Vision 2030 partly picks up on such discursive elements by highlighting a turn away from the centrality of oil wealth in the nation's identity. While rentier-state structures remain a core legitimizing force, the strategy aims to consolidate and strengthen its position as the center of the Islamic and Arab world and describes Islamic traditions as a guiding principle in policy-making as well as in promoting national unity. Values of moderation, tolerance, and discipline are emphasized in various parts of the strategy and should be politically incentivized to empower and consolidate Islamic and Arab values. The vision further highlights the culturally rich heritage of the country, which should be made accessible for tourism and is projected to play an increasingly important role in national identity. Moreover, the domestic and international perception of Saudi Arabia should be dominated by the knowledge economy rather than by fossil fuel exploitation.

While Saudi Arabia thus appears reluctant to fully convert nation-building narratives, as autocratic paternalism and a strong state remain central in the state's identity, the strategy envisions an empowered community that is increasingly identifying with its diverse cultural heritage and is based on Islamic values. The participation of citizens in the country's new economic transformation promises increasing importance of the knowledge economy in future identity-formation processes particularly of a high-skilled younger generation. This sets the groundwork for a successful re-branding of the nation but requires consistent efforts.

Algeria's strategies are less engaged with such discursive components but emphasize the crucial role of colonial exploitation in its marginalized role in the world economy. Fossil fuel facilities were built by French colonizers and played a key role in securing post-independence economic stability. Now, the country assigns advanced economies with the responsibility to fund and support green transition ambitions. Highlighting the historic responsibilities in emissions, the Adaptation Plan refers to global climate justice and enqueues prominent narratives on the continuous reproduction of global asymmetries. The country shows an increasing awareness of such asymmetries and discursively integrates post-colonial perspectives not only in its national identity but particularly in its understanding of responsibilities in environmental governance (PAC).

Such post-colonial narratives appear crucial to processing historical legacies of exploitation and colonial dependencies and refining awareness for maintaining self-determination and independence. However, the Algerian government is challenged to reconcile post-colonial empowerment and effective environmental governance. Narratives of 'green colonialism' in the form of a continuous exploitation of resources of the Global South through Europe and an externalization of climate change-related costs are important components of a critical assessment of power asymmetries in global climate policy regimes but have to be accompanied by realist considerations on climate change as a global problem and the green transition as a global project of which individual nations could not refrain regardless of injustices.

5.6 Discussion: Diverging paths shaping climate transition outcomes

This comparative case study underlines the different approaches of rentier states to sustainable and inclusive climate transition pathways. While publicly committing to sustainable development ideals, Saudi Arabia and Algeria only partly provide concise strategic prospects. Saudi Arabia presents a coherent multidimensional strategy that focuses on building capacity in environmental, economic, political, social, and cultural domains. Empowering emerging economic sectors, formerly marginalized communities, and local youth as well as increasing the participation of citizens on the green transition project appears as a comprehensive strategy to not only tackle pressing challenges of adaptation but to create an added value for the country's citizens. Algeria, on the other hand, provides a more fragmented strategy that fails to address the interconnectedness of various policy domains and rather focuses on building resilience to climate change effects. By initiating infrastructure modernizations or implementing energy efficiency and circular economy plans, the country aims to prevent the detrimental effects of climate change and invests heavily in building up monitoring and coordinating institutions. However, the strategy lacks conclusive transformations and fails to address issues of lagging investment, research, youth prospects, or public sector efficiency.

Moreover, Saudi Arabia intends to redirect oil wealth to investments and efforts linked to community- and market-based development. Political investments into the attractiveness of the country for foreign capital by liberalizing financial markets and

opening domestic economies to globalized trade networks appear promising to independently raise necessary funds for financing high up-front costs of renewable energy development and economic diversification. Targeting investor credibility, the austerity of fiscal policy, private sector development simultaneously with local capacity-building for businesses, labor force upscaling, public sector efficiency, and community empowerment seem a comprehensive strategy to prepare for a stable post-oil era. However, liberalization, deregulation, and privatization are core neoliberal dogmas that inherently contradict sustainable development. The Saudi transformation prioritizes export orientation over developing domestic green and circular economy frameworks as the strategy incentivizes further carbon-intensive industrialization and does not address the high-carbon consumption patterns of Saudi elites. Norms of sustainable development are subordinated under dynamic economic growth aspirations. As market logic has caused climate change in the first place and is further responsible for dilemmas in negotiating effective global climate policy frameworks, the Saudi vision's focus on non-oil growth rather than on a genuine green transition appears concerning and requires refinement.

As mentioned, Algeria fails to provide a coherent strategy on how to progress efficiently in a post-oil future but focuses on its renewable energy and hydrogen potential. However, investments lag behind key competitors due to unresolved issues of private-sector repression and reliance on international funding tools from development banks or partnerships. Algeria's orientation towards domestic and international sustainable finance seems promising as these instruments are closely linked to ESG reporting. Relying on such funding remains risky in a competitive environment in the renewable energy and hydrogen market, especially since Algeria does not present a prospect for economic diversification beyond energy market transformation and fails to integrate local communities by creating educational facilities or jobs. Thus, the country risks ending up with stranded assets despite its potential. Recent EU demands for increased gas imports from Algeria further pushed green transition agendas back and incentivized investments in the outdated gas infrastructure.

Lastly, both countries do not imply structural reforms to their rentier-state system. In Saudi Arabia, rents remain the key component of state budgets, and commitments to no-taxation-promises consolidate autocratic paternalism. However, open markets provide opportunities for entrepreneurs and an emerging middle class in a knowledge economy

to gain economic and mid-term probably political influence which could challenge rigid social contracts. Data-based approaches of government frameworks towards transparency and accountability bear the risk of being instrumentalized for control and repression and thus require specific monitoring in the next years. The Saudi strategy thus represents a very performative transformation of the rentier-state reallocation of rents, as a modernized rentier-state focuses not only on subsidies or essential services but on spending on community empowerment, education, or culture. Core guiding principles of the state structure remain provisionally untouched.

Similarly, Algeria's strategy appears to prioritize the solidification of existing power structures, as the energy sector remains dominated by the state and rents continue to represent the basis of state budgets. The emerging renewable energy sector is highly centralized and substitutes or complements state oil companies. A lack of political willingness to establish taxation, remove subsidies, or introduce accountability-based governance models represents adherence to rigid and inefficient structures rather than a dynamic transformation. Lastly, attributions of colonial guilt and continuous European exploitation of national resources appear historically correct and scientifically important, but failure to independently tackle pressing issues and reliance on foreign funding only reproduce dependencies and hinder self-determined community-based progress.

The analysis thus outlines the challenges of rentier-states to navigate the green transition, as it threatens guiding principles of state legitimization. While Saudi Arabia and Algeria pursue different approaches, both countries struggle to develop sustainable climate transition pathways as they appear reluctant to terminate rigid social contracts of autocratic paternalism and prioritize solidifying existing power structures over dynamic transformations. While this research is clearly limited to the analysis of strategic prospects and does not integrate a critical assessment of how these are implemented, multidimensional challenges are already clearly visible. As such rentier-state structures are widespread in the Middle East and North Africa, this research allows analytical generalizations into how to analyze climate transition pathways along various dimensions and into related challenges. A sustainable and inclusive climate transition pathway thus appears possible only when reconciling market logic, comprehensive environmental governance and by pursuing both capacity- and resilience-building in economic, political, social, and cultural dimensions.

6. Conclusion: Climate pathways within existing power structures

The qualitative policy analysis of the climate transition pathway strategies of Saudi Arabia and Algeria as stereotypical rentier-states underlines the importance of integrating oil-producing countries in research and discourses on global green transition ambitions. The results of the critical analysis emphasize the arising challenges of rigid autocratic systems that base their legitimacy on fossil-fuel revenue and paternalistic redistribution of wealth to inclusive and genuinely sustainable climate transition. Whereas this research paper contributes to bridging research gaps on these intuitively contradicting research fields theoretically, the comparative case study shows obstacles to the realization of such ideals of a holistic, inclusive, and sustainable green transition in oil-producing countries in practice. Interestingly, both analyzed countries pursue different strategies but simultaneously lack coherent plans on how to transform fundamentally obstructive structures of domestic power asymmetries and centralizations in a ruling state class. Saudi Arabia aims to open its economy increasingly to foreign investment and trade networks and initiates steps to build up a knowledge-economy based on high-quality systems of education, research, public sector efficiency, and an empowered community with strong social bonds. While this appears efficient for securing dynamic economic growth in a post-oil era, many proposed reforms are inherently unsustainable and follow neoliberal dogmas of liberalization, deregulation, and privatization rather than green and inclusive growth. Algeria, on the other hand, relies on building up a competitive renewable energy and green hydrogen sector and thus aims to defend its position in regional energy markets. While tapping into sustainable finance systems and developing coordinating and monitoring bodies, the country fails to address pressing issues of lags in investment, private sector repression, youth unemployment, administrative inefficiency, corruption, and nepotism effectively. Thus, both examples unveil patterns of prioritizing the consolidation of existing power structures over effective climate transition pathways but show a willingness to commit to international agreements within these structures.

However, the decisive factor over future sustainable development outcomes is the pursuit of a clear political line for applying green transition ideals in the context of continuously rigid rentier-states. As the units of analysis consist of strategic prospects and action plans it further remains a research task to observe implementation patterns

critically. This research paper aims to provide a categorization scheme for illustrating and analyzing such transition strategies and emphasizes challenges, obstacles, and opportunities through the analysis of the exemplarily chosen strategies.

Appeals for the necessity of a coherent, inclusive, and sustainable global climate transition pathway appear crucial to mitigate climate change effects but their implementation in practice still lacks a consistent and efficient combination of reconciling environmental protection, economic growth, social justice, political inclusiveness, and cultural diversity.

List of Acronyms

AU	African Union
CCPI	Climate Change Performance Index
DH	Stratégie Nationale de Développement de l'Hydrogène en Algérie
EIA	US Energy Information Administration
ESG	Environmental, Social and Governance
EU	European Union
FDI	Foreign Direct Investment
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GW	Giga Watt
IMF	International Monetary Fund
IUCN	International Union for the Conservation of Nature
MCPD	Plan d'action des Modes de Consommation et de Production Durables au service
MW	Mega Watt
OPEC	Oragnization of the Petroleum Exporting Countries
PAC	Plan National d'Adaptation aux Changements Climatiques
PNC	Plan National Climat
PPP	Public Private Partnership
PRE	Plan Relance Économique
R&D	Research & Development
SDG	Sustainable Develeopment Goal
SME	Small and Medium-Sized Enterprises
SNEDD	La nouvelle Stratégie Nationale de l'Environnement et du Développement Durable
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WCED	World Commission on Environment and Development
WWF	World Wide Fund for Nature

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