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Management of Key Economic Resources in Saudi Arabia and their Contribution to Environmental Sustainability in a Historical Context

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Abstract **-Historical models of economic resource management were examined to clarify how environmental sustainability policies in Saudi Arabia have been shaped over the past five decades. The qualitative research method was followed, which included reviewing documents, conducting an interpretive analysis, and using semi-structured questionnaires for the policymakers and environmental professionals and tracing the patterns of governance from the 1970s up to modern times. The key results were that the early dependence on the oil revenues was connected with the institutional structures that still focused on fast growth, whereas the environmental protection also was considered as a secondary matter. The long-term effects were recognized in the form of the degradation of the ecosystem, the frequent shortage of water, and the increased pressure caused by climate. Despite demonstrations that Vision 2030 reforms have boosted sustainability on the national agenda by placing renewable energy on the agenda and introducing balanced water management, it was observed that there have been limitations in implementation due to institutional inertia, disparate integration of technology, and poor community participation. Incorporation of policies was thus seen to be improving at a quicker rate than the operational implementation, and coordination across the sectors was seen to be a continual bottleneck. The main implication is that historical path dependence will still impair the adaptive capacity, and thus the effectiveness of reforms will still be underbalanced unless there is an increase in the ability to govern. With that in mind, more compatibility between the reform design and sociocultural context was stressed, a more focused focus on institutional capabilities of monitoring and enforcement and digital platforms was suggested to promote transparency, accountability, and evidence-based decision-making towards the achievement of the goals of sustainability.**

Keywords: **Historical Governance Trajectories, Policy Reform, Ecological Degradation, Diversification Strategy, Institutional Legacy**

I. INTRODUCTION

The introduction of the study presents the historical background of economic resource management in Saudi Arabia and its effects on the environmental sustainability. It emphasizes how petroleum discoveries in the early-20 th century have stimulated the process of industrialization and urbanization, resulting in a tremendous economic growth, but also environmental problems like desertification, water shortage, and emissions. This economic prosperity, however, was accompanied by environmental problems taking the back seat in policy considerations, because of a history of centralized governance and frequent oil booms. This is a legacy of government that is still in play in modern environmental sustainability in the country. The article highlights this research gap on the historical determinants of environmental sustainability frameworks in Saudi Arabia; i.e. how past economic policies and patterns of governance have informed the sustainability reforms in the country. The most critical research question is how cycles of restructuring the economy throughout history have either promoted or slowed the process of incorporating environmental sustainability into the development strategies in the country. This paper will add to the current theoretical debate on sustainability transitions by exploring the sustainability consequences of governance legacies in resource-dependent economies such as Saudi Arabia (Abbas et al., 2024).The study through its historical examination of the relationship between economic resource management and environmental sustainability offers context into the issues and achievements of current policies on sustainability, in a way that can give a complete picture of the effects of the past governance models on the present environmental policies. The study is placed in such a way that it aids in shaping future policy in such situations.

Key Contribution

- Diversification of Economic Resources: Saudi Arabia is no longer an economy that is petroleum based but an economy that has changed to be based on economic diversification with renewable energy, minerals and water resources being the key areas of interest. The shift helps the nation to achieve its objective of decreasing its dependence on oil and cultivate sustainable growth as per Vision 2030.
- Sustainable Water and Energy Management: Saudi Arabia has put in place highly sensitive technologies of water conservation and renewable energy sources such as desalination, highly efficient irrigation systems, solar and wind power projects. Such activities are crucial in

solving environmental issues and in the sustainability of resources in the long run.

- Institutional Governance and Policy Integration: The presence of regulatory frameworks and institutions, including MEWA and NCEC, has been the key to the integration of sustainable practices in every sector of the economy. These authorities are concerned with the management of the resources of the country, environmental protection, decreasing emissions and implementation of the principles of a circular economy.

This research is covered in the following sections: Section I introduces the topic; Section II contains the literature review, problem statement, and research objective. Section III explained the theoretical framework, including a conceptual framework, a comprehensive overview, thematic analysis, comparative analysis, and advanced integration. Section IV explained the research approach, data sampling, and semi-structured interviews. Section V explained the results, analysis, discussions, and recommendations. Section VI explained the conclusion of the main research.

II. Literature Review

The economies that are dependent on the resources, especially that of hydrocarbons, have great environmental impacts, as seen in the literature. Problems like greenhouse gas emissions, deforestation, and environmental damage are part of economic growth in these environments. The Vision 2030 in Saudi Arabia was developed to promote diversity and sustainable growth, and the studies focused on governmental framework and institutional ability to implement sustainability in the policymaking process (Abubakar et al., 2020). Yet, there is a gap in the exploration of system developments of the past, and the analysis is mostly based on the existing indicators. Certain researchers have indicated that technological innovation and institutional investment have played a key role in ecological reforms. There is a longstanding gap in research on the academic discussion of the historical determinants of the sustainability framework in Saudi Arabia. Even though several studies have examined the ecological effects of the resource curse and institutional inertia, there are limited studies that have been done systematically to monitor the change in governance over time. This difference makes it harder to evaluate the current sustainability policies and incorporate them into the national development policies. The study is also an exploration of the impacts that economic policy and resource management have had on the capacity to instill sustainability principles in development initiatives. The issue of whether phases of modernization have facilitated or slowed down the institutional adjustment to challenges of the environment has not been given enough attention. The primary objective of the study is to examine how historical models of economic management affect Saudi environmental policy. The study can shed light on the sustainable development potential of Saudi Arabia by looking at the institutional legacies and their influence on the existing reforms. The historical contextualization of policies is done to explain the path taken by the nation towards sustainability. Based on past evaluations, the research also shows the legacy of governance pathways on the structure of policies. The findings are meant to enhance the knowledge on sustainability transitions and provide a wider discussion on the balance between economic progress and environmental care. Environmental sustainability is currently at the center of economic development and has been the focus of economic research, policy, and development research. It can be defined as the preservation of prized environmental resources, and it is a major challenge in growth, especially depleting resources and pollution, in extractive economies. The imbalance between development and conservation has made institutions think of incorporating ecological goals without affecting the developments. Whereas the traditional economic theory placed utility and preservation, the modern theory emphasizes institutional adaptation. Policymaking experiments and deliberations have identified that sustainable development is a product of such experimentation over decades (Addas, 2025).

Statement of the Problem

The research problem is about the fact that the incorporation of the legacies of historical governance into the sustainability plans of Saudi Arabia is poorly incorporated. Despite the fact that Vision 2030 is an environmental protection agenda, it still leaves the big question of how the institutional structure and the old policies have contributed to the possibility of the country to adopt a sustainable planning strategy. Environmental sustainability, continuity of resource management and governance are some of the constructs that are critical in this study. The relations demonstrate how the fixed models suppress adaptive response. Interventions can be inefficient unless the role of history in the development of present-day practices is analyzed. This gap also has implications on scholarship, planning and development systems in resource-based economies. This paper thus attempts to establish historical influences that restrain the sustainability endeavors in Saudi Arabia. The study will evaluate the role of policy continuity as far as environmental strategies are concerned by following the policy evolution. The key question that will be used to direct this research is: How have the historical governance systems and resource management practices impact on the functionality of current sustainability policies in Saudi Arabia.

Natural Resource Management (NRM): Natural Resource Management (NRM) is the utilization of institution-based mechanisms to sustainably manage resources like water, energy, soil, and biodiversity. Saudi Arabia needs to strike a balance between extraction and conservation using NRM programs, which involve regulations, technology, and governance. The concept of participatory decision-making incorporates socioeconomic and ecological priorities. Decarbonization, circular development, and water-energy -food systems are encouraged under Vision 2030. The management of the fossil fuels needs to be done cross-sector to be sustainable.

Environmental Sustainability: Environmental sustainability provides limits in which the ecosystems would be able to sustain human activities. It is a combination of conservation of biodiversity, environmental protection, and equitable use of resources. Innovation in technology is further extended to modern debates on planning. Carbon emissions, land degradation, and water shortages exist in Saudi Arabia. Vision 2030 focuses on the reduction of emissions and renewable energy as well as sustainable infrastructure (Alfehaid et al., 2024).

Sustainable Development: Sustainable development secures the future generation with the help of their resources so that the present generation can be satisfied. It combines economic development, social goodwill, and care of the environment. Saudi Arabia is looking forward to substituting oil dependency with knowledge-based industries. The policies of Cambridge in relation to renewability contribute to resilience and stability. The nation should have structures to deal with dependency and institutional inequities (Al-Adeem & Brearey, 2024).

Circular Economy (CE): The circular economy decreases the waste through recycling and prolonging the lifespan of items. CE is the opposite of linear models, which accentuate regeneration and reuse. The Circular Carbon Economy is the application of CE in energy and water by Saudi Arabia. CE associates' expansion with environmental care. Efficiency and carbon capture are national projects.

Resource Rent and Economic Diversification: Resource rent is profit, which is over and above the cost of production of fossil fuels. These rents have been financed by Saudi Arabia to fund services and subsidies. This dependency led to weak points and damaged innovation. Diversification is created to create industries to eliminate dependency on raw materials. The strategies are aimed at tourism, technology, and renewables (Al-Gahtani, 2024).

TABLE I SUMMARY OF KEY CONCEPTS IN ECONOMIC RESOURCE MANAGEMENT AND ENVIRONMENTAL SUSTAINABILITY

Concept	Definition	Core Elements	Application in Vision 2030
Natural Resource Management (NRM)	Sustainable management of water, energy, soil, and biodiversity through institutional strategies.	Rules, technology, administration, and involvement in decision-making.	Decarbonization, circular development, water-energy-food nexus (Alharbi et al., 2025)
Environmental Sustainability	Ability of ecosystems to sustain human activities on ecological levels	Biodiversity conservation, environmental protection, and fair resource use	Emissions reduction, renewable energy expansion, and sustainable infrastructure (Ali, 2023).
Sustainable Development (Alhamad et al., 2024)	Serving present-day needs without jeopardizing the future generation's resources.	Economic growth, social welfare, and environmental care	Diversification (oil-to-knowledge)
Circular Economy (CE)	Serving present-day needs without jeopardizing the future generation's resources.	Regeneration, reuse, resource efficiency	Carbon capture, efficiency projects, and circular carbon economy (Almulhim & Al-Saidi, 2023).
Resource Rent and Economic Diversification	Profit beyond production costs; development of alternative sectors	Revenue management, sectoral diversification	Development of tourism, technology, and renewable energy (Alodah, 2023).

Table I shows about concepts outlined in relation to Vision 2030 emphasize sustainable practices across various sectors. The practice of Natural Resource Management (NRM) is centered on a sustainable approach to managing natural resources, i.e. water, energy, soil and biodiversity, in a way that supports decarbonization and the water-energy-food nexus. Environmental Sustainability is a goal that seeks to guarantee ecosystems function sustainably to sustain human activities by preserving biodiversity and lowering emissions using renewable energy and sustainable infrastructure. Sustainable Development emphasizes current needs fulfilled without undermining the future resources and with economic growth and social welfare but with balanced environmental issues. The Circular Economy (CE) also helps this by encouraging the regeneration and reuse of resources, minimizing waste, and helping in carbon capture. Finally, Resource Rent and Economic Diversification emphasize that alternative sectors like tourism, technology, and renewable energy should be developed so that the economy is resilient and sustainable in revenue management. The ideas are part and parcel of the realization of the objectives of Vision 2030, especially in developing a balanced, diversified and sustainable future.

Research Objectives

This study aims to learn how economic resource management in the Kingdom of Saudi Arabia has evolved from the 1970s to the present, to evaluate the efficiency of current approaches that support environmental sustainability within the framework of Saudi Vision 2030, and to examine the environmental effects of managing key resources such as oil products, minerals, and natural waters across the Saudi geographic landscape. In addition, it attempts to identify the incorporation of sustainability into the resources governance in the country regarding institutional, regulatory, and

structural aspects and suggest the necessary strategic policies that facilitate sustainable management of resources by evaluating the past trends as well as the present needs.

Research Gap and the Current Study Objectives

One major gap is left in the discussions on how the historical patterns of management that were petroleum-based overlap with the modern sustainability initiatives. Most research does not include long-term studies of institutional inertia, cultural norms, and economic drivers. There is a paucity of research concerning the transfer of national priorities to local actions in the area, such as Hail. Solving these problems will reinforce the argument of good policies. The paper uses a path-dependent methodology to trace the policy development and its impact on the environment. It provides scientific understanding in order to guide interventions by combining economic, legal, and technological analysis. This contribution contributes to the knowledge that is required on how the rich countries can attain sustainable development. The literature reviewed indicates that sustainability in Saudi Arabia has been influenced by policy, finance and technology in diverse frameworks. Research indicates policy alignment and impact assessment issues have been made. The study addresses gaps because it follows a historical course of governance and its impact on sustainability. The analysis makes the review support the general research objectives.

III. Theoretical Framework

The growing need for resources necessitates the thorough theoretical research of the resource-dependent economies in order to learn about their implications in the long run. Saudi Arabia has the twin challenge of implementing sustainable business and staying reliant on petroleum earnings and needs conceptual understanding on how to manage the resources in line with Vision 2030. Research frameworks are considered the fundamental instruments used in explaining economical systems, institutional transformations, behavior adjustments, and policy formulation. These paradigms direct the analytical procedures and come up with causal relationships that enhance research findings fit to be used more generally. The application of sociocultural, behavioral, and cognitive models has been used to analyze the past resource management systems in Saudi Arabia and how they affect environmental sustainability. Combined, these frameworks explain why previous practices continue to influence current policies and strategies.

The sociocultural approach describes Vygotsky's view of how behavior is learned through historical experiences and cultural influences on development and group decision-making. The norms of resource use and the practices of governance by Saudi Arabia have been developed through long-standing traditions that have been in contact with the centralized power of the state. Environmental policies are shaped by social constructs, whereas cultural discourses about economic modernity shape public perceptions of conservation policies. The sociocultural theory postulates that institutions conform to memory practices and social behaviors, particularly when policies utilize cultural and religious aspects. This view advocates local-based environmental policies applied to local social-historical contexts. A cognitive framework, grounded in schema theory, can be used to explain the concepts and perceptions of sustainability and climate risk. The mental structures influence the manner in which people perceive and react to challenges in the environment, the attitudes and the behaviors exhibited. The schema theory depicts the psychological impediments to switching to renewable sources of energy because of an addiction to oil income. Cognitive theories explain the attitude towards policy reforms and environmental sensitivity measures aimed at bringing about a change in the behavior of populations. The theory of digital transformation has been of greater relevance in the case of Saudi Arabia since the country is opening its digital infrastructure in the quest to modernize its resource management systems. This theory is seen as the redesign of the decision-making process, use of resources, and involvement in civic affairs supported by technological means digital platforms, big data analytics, and monitoring activities. The tools offer transparency, efficiencies, and instant vital environmental intelligence in terms of sustainable development in dry land. The Innovation Diffusion Theory (IDT) brings the process of diffusion of the sustainable practice and technology inside institutions into focus and shows that its implementation depends on the perception of benefits, the compatibility of the process, the evaluation methods, and the complexity of the system (Alomari & Heffron, 2023).

Fig. 1 gives us a conceptual basis of Vision 2030, which revolves around the interaction of different historical, economic, and governance factors to enable environmental sustainability. It begins by the historical background of a petroleum-based economy and institutional legacies, which form the present government and economic resources such as energy, minerals, and water. The institutional and governance framework highlights the major structures like regulatory bodies, organizational capacity, policy integration, and digital transformation, which will be imperative in the process of restructuring to Vision 2030. The economic diversification, renewable energy, sustainable development, circular economy practices, and water management reform are some of the goals in this vision. This diagram is followed by the environmental sustainability outcomes, which seek to reduce emissions, conserve resources, and ensure resilience of the ecosystem through adaptive governance and a feedback loop to constantly improve the situation. This system is indicative of a wholesome approach to sustainable development and reform as far as the Vision 2030 of Saudi Arabia is concerned.

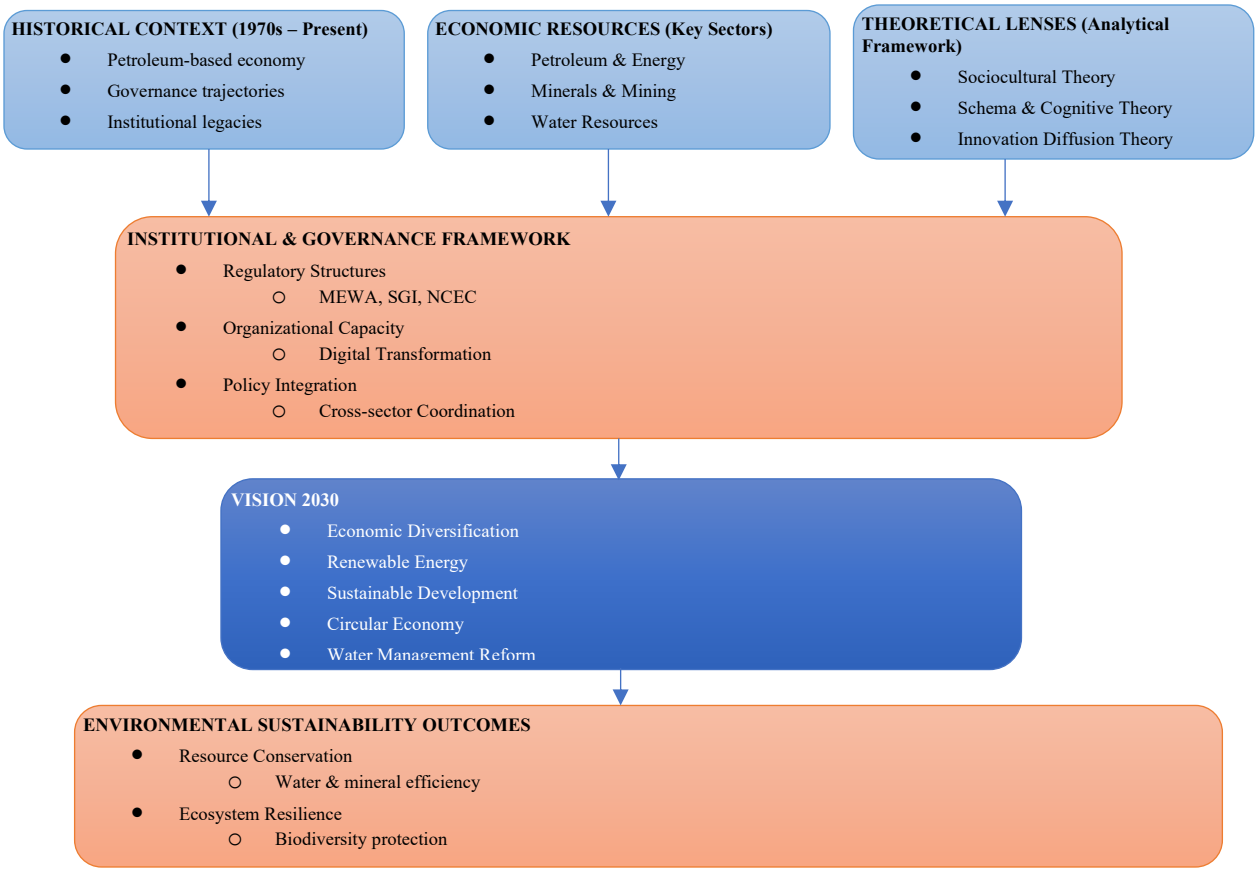

Fig. 1 Conceptual Framework: Economic Resource Management and Environmental Sustainability in Saudi Arabia

Comprehensive Overview

The examined works research the development of the management of the economic resources in Saudi Arabia to achieve the goals of Vision 2030. They discuss sustainability in the economic planning, where they underline the links between the circular economy programs, governance reforms, technology, and finance. Researchers put forward issues of policy effectiveness, institutional impact, and corporate preparedness for green practices. The theories are sociocultural theory, innovation diffusion, and environmental governance, which have been used in national strategies and local adaptation. The approaches include econometric frameworks and surveys as well as case studies and historical policy analysis. The target groups include big companies, manufacturing SMEs, and governmental agencies and provide different views on sustainability (Islam & Ali, 2024).

Thematic Analysis

Literature is divided into five themes, namely policy integration, corporate governance and finance, technological innovation, sociocultural adaptation, and research methodologies. The research of policy integration is used to analyze national and local policy alignment. Within the corporate governance studies, the emphasis is put on the effects of finance and green investment. Digital transformation and data tools are studied in terms of sustainability. Sociocultural studies examine cultural expectations and views on conservation. Mixed methods and longitudinal research to describe changing processes of sustainability are emphasized in methodological contributions. Collectively these themes show the complicated environmental change in Saudi Arabia (Braun & Clarke, 2022).

Comparative Analysis

The majority of studies concur that Vision 2030 helped to draw more attention to sustainability, yet they disagree about the results of implementation. These differences are further enhanced by differences in methodology, which spans to econometrics to case studies. This kind of variation helps justify the harmonization of research strategies in the resolution of conflicting findings.

Advanced Integration

In summary of the research, sustainability transition of Saudi Arabia depends on interdependent factors of financial, technological and institutional factors. Conceptual mapping brings out the importance of the interaction between the activities of the circular economy and the governance reforms that are like components of a dynamic system that shape the outcomes. Meta-synthesis focuses on adaptive governance and coordination as being essential in ensuring that adjustment in growth is in line with environmental aims. Among them, this paper continues by synthesizing historical study, economic analysis as well as sociopolitical analysis to

create a more composite picture of the same. The integration of the above studies boosts the level of analysis and conditions of relevance that pits this study in the most appropriate stance to overcome the problems of policy fragmentation and lack of information on scale.

IV. Methodology

Research Approach

The qualitative historical approach was used to determine the development of the economic resource management strategies and their impact on the environment of Saudi Arabia. The previous studies helped to identify the most important sustainability practices, institutional developments, and significant landmarks in policy-making alternatives that characterized the governance systems. The study was conducted on the basis of the historical-descriptive design which integrates both document-analytical and interpretive method to qualitative research with the aim of capturing the changing economic thought and practice.

Data Sampling and Documentary Sources

The documentary sampling frame comprised of the sources of files and archival records that were related to the economic resources management and eco-sustainability in Saudi Arabia since the 1970s. The documents were selected voluntarily provided that they were on oil, mineral, or water management; regulatory and institutional arrangements; or explicit sustainability goals. Only those materials that were officially published by Saudi authorities, or official regulators, or by other internationally respected sources, which could be provenanced, were to be included, and undated, duplicative or irrelevant materials were to be excluded. It was published with a restricted number of documents (55) that were chronologically ordered to follow the evolution of the concept and practice of resource management.

Semi-Structured Interviews

Semi-structured interviews were used to complement the analysis of the documentary by focusing on experts who are actively involved in Saudi economic planning, environmental policy, or history of governance. Participants The sample, consisting of 12 participants, including historians, policymakers and environmental scholars, was selected because of their expertise. The exclusion criteria were excludable inclusion, incompleteness of the inclusion, or failure to agree with the historical and institutional focus of the study. The sample size was taken because it was necessary to corroborate and have the thematic sufficiency during the period of time identified.

Triangulation, Time Frame, and Spatial Scope

Triangulation between documents and experts were used to contribute to credibility and depth of analysis. The chronological context of the research was from 1970 to the present in order to follow the long-term trends of governance and its effects on the environment. The analytical emphasis on the relationship between the central authorities and the regional institutions was focused to determine the extent to which the national priorities were turned into the outcomes of sustainability and how the historical trends were represented on the contemporary strategies.

V. Results

The discussion of the findings is provided here, following the historical development of the management of economic resources in Saudi Arabia since the period of the 1970s to date and how past decisions influenced the contemporary institutional processes. It is a critical evaluation of the effectiveness of the existing policies in the development of environmental sustainability under vision 2030 which also takes into consideration their historical underpinnings, consistency, enforcement and results. Ecological costs of such resources as oil, water, and minerals are considered, and some degradation patterns and ecosystem resilience with time are observed. The analysis also portrays how gradually the principles of sustainability have been embedded into resource governance institutionally and structurally on a historical basis of development. Analyzing these histories and the present policies and demands, the paper proposes a strategy towards acquiring the adoption of practices whereby the objective of saving the environment becomes parallel to developing the nation. The analysis of the products was done under various dimensions, which are mentioned below.

Development of Economic Resource Management Methods in the Kingdom of Saudi Arabia from the 1970s to the Present

The history of Saudi Arabia has been completely changed in the last 50 years, as it progresses from the state of rentier based on oil exportation into the economy that aims at getting more diversification, development of institutional modernization, and sustainability. This paper follows such an evolutionary path, and it follows the establishment of economic planning as an institution in the 1970s, the wave of oil, and eventual reforms under Vision 2030, which transformed the way resources, are managed. This was first pillared with the introduction of the First and Second Five-Year Development Plans (1970–1980) that, in a coherent manner, ensured that the oil revenues were channeled towards infrastructure, human capital and economic diversification, (Presley & Westaway, 1993). The Central Planning Organization streamlined planning activities, which have allowed the country to make strategic investments outside of hydrocarbons, including education and health. After the oil crisis of 1973, rising revenues dramatically increased the potential of the fiscal resources, and the reliance on oil rents intensified, and early industrial projects were initiated, such as the Saudi Basic Industries Corporation (SABIC) in 1976 to build petrochemicals and other downstream industries (Albassam, 2021). These early years provided the foundational basis of the way Saudi Arabia planned its resources.

In the past, the late 1970s and early 1980s were the time of unprecedented financial development due to the increase in oil prices when SAMA became a leading institution in monetary policy and regulation. Nevertheless, in the mid-1980s the oil price crash revealed weaknesses of this dependence, leading to austerity policies and new efforts to diversify by increasing both the growth of the private sector and foreign investment. During the 1990s and early 2000s, the planning of diversification became faster, prioritizing the elements of privatization, development of the SME sector, and regulatory enhancement. Special economic zones like Jubail and Yanbu were created to make investments and create modern industrial zones. Changes of historical importance happened when the Public Investment Fund (PIF) that was established in 1971 evolved into a key diversification tool, investing more in technology, green energy, and tourism since 2015. All these reforms were a reflection of a transition towards active and globally connected economic management. The most grandiose historical agenda of reforms is Vision 2030, which was launched in 2016 and aims to boost the contribution of non-oil GDP, expand the involvement of the private sector, and enhance fiscal sustainability. The institutional reforms of the vision that have been empirically investigated are the restructuring of subsidies, changes in tax policy, the establishment of competitive regulatory frameworks, and renewable energy projects. Under the National Transformation Program, performance benchmarks have been created to ensure that fiscal deficits are mitigated and that the level of revenue diversification is achieved (Issaoui et al., 2023). Regardless of the great efforts, the historical factors, such as the susceptibility to the oil price shock, institutional challenges, and labor market inflexibilities, continue to exist. The resource curse, which is here to stay, and the slowness of diversification are some of the issues that have to be considered in future strategies. The further evolution will require the incorporation of human capital, the establishment of innovative ecosystems, and the advancement of digital transformation to develop on top of this historical evolution (Hashinaga et al., 2023).

Evaluating Current Resource Management Methods in Saudi Arabia: Effectiveness in Promoting Environmental Sustainability According to Vision 2030

The strategic plan called Vision 2030 is riveted by the ability to sustain the environment with the main idea of diversifying the Saudi Arabian economy and reducing the oil reliance. The program promotes integrated water, energy and land management as one of the options to mitigate environmental degradation in order to promote economic development. This vision aligns with the national priorities and the United Nations Sustainable Development Goals, as it promotes efficient use of resources, using renewable energy and the necessity to maintain the ecosystem (Al-Sulayman, 2021). This change in policy will constitute a transformation of historical extractive governance to sustainability-oriented governance (Alruweili, 2025). Renewable energy incentives and regulations by the government underscore a distinct move to reform the energy policy in order to make it sustainable in the long term. The water resource management is also restructured under the vision 2030 and this is the National Water Strategy 2030. The availability of natural water sources is low and therefore Saudi Arabia relies on groundwater pumping and desalination. The gap between states which declare their intentions, and those which put these intentions into practice in the real world, still remains, especially in the treatment of industrial wastes and biodiversity protection. The key to the actualization of the objectives of Vision 2030 that are still in practice is more institutional reforms, capacity building, and involvement of the people. The experience in the areas of renewable energy, water conservation and strategic planning shows that Saudi Arabia is determined to the reform. Continuous governance changes, cooperation across sectors, and efficient monitoring facilities will be the elements in the achievement of sustainability (Alotaibi et al., 2023).

Environmental Impacts of Managing Essential Economic Resources in Saudi Arabia

The economy of Saudi Arabia is largely based on the rich natural resources such as petroleum, minerals and water. These resources are growth drivers, but when extracted and used, they cause a lot of environmental problems. This paper evaluates the ecological impacts of petroleum extraction, metallurgical progress, and water management through the government publications and scientific literature. The results provide details of how these effects undermine sustainability goals and policies to deal with them. The main source of income in Saudi Arabia is petroleum, as the country possesses 17% of the world's crude oil reserves (Keynoush, 2021). Nevertheless, oil production interferes with the sensitive ecosystems, specifically in the Arabian Gulf, where pollution threatens the marine biodiversity.

Oil spills, leaks, and emissions pollute land, air, and water and enhance the greenhouse gases and negatively impact the health of the people. The emissions of fossil fuels contribute to climate change and increase the problem of weather instability and the lack of water in the region. Extraction infrastructure, land degradation, and acid rain associated with combustion also worsen the soils and vegetation. Gold, phosphates, and bauxite are also among the mineral resources available in Saudi Arabia and drive the diversification process. Mining changes the landscape, erodes the soil, and destroys natural habitat that is important to indigenous species. The mining runoff water polluted by heavy metals is a threat to agriculture and groundwater (Khoirunnisa & Nurhaliza, 2024).

The mining process also consumes a lot of energy, contributing to the emission unless the environmentally clean technologies are implemented. The issue of water scarcity is still critical because the overexploitation of the groundwater reserves leads to the depletion of groundwater and increases salinity. Most of the municipal water is supplied by desalination plants but releases the brine disruption of marine ecosystems. The use of fossil fuels in the process of

desalination increases carbon emissions. The use of treated wastewater in agriculture needs proper control so that the soil cannot salinize or be polluted. The renewable energy, comprehensive water management, and tougher regulations are encouraged by Vision 2030 and the National Environmental Strategy (Madkhali et al., 2023). The mitigation of impacts is provided by projects that will decrease the flaring of gases, enhance wastewater treatment, and increase renewables. According to the National Renewable Energy Program, the country plans to have 58.7% renewable capacity by 2030. The mining reforms are focused on environmental considerations, waste disposal, and restoration of the land. The policies on water revolve around efficiency, surveillance, and sensitization. Although there are improvement, pollution, degradation, and depletion are some pressing issues. Vision 2030 provides the system of sustainable resource management, which implies a constant commitment and implementation in order to preserve the ecosystems and the health of the population (Mir & Ashraf, 2023).

Evolution of Sustainability Integration of Resources Management in Saudi Arabia: Institutional, Organizational, and Structural Visions

Traditionally, the Kingdom of Saudi Arabia has been dependent on massive natural resources such as oil, minerals, and water to spearhead economic development. Over the recent decades, it has become more and more significant to administer such resources in a sustainable manner, both in terms of international environmental obligations and national requirements. This change has entailed institutional reforms, capacity building, and policy. Research and government documents indicate the way sustainability has been considered in governance systems. The environmentally conscious and the necessity of diversifying the economy were the main factors that triggered the institutional changes. These reforms have rearranged the way of managing the natural resources as one whole sustainability agenda (Benlaria et al., 2024).

In the past, resource management was concentrated on the oil and water ministries that lacked effective environmental protection. In 2016, the establishment of the Ministry of Environment, Water, and Agriculture combined the supervision and enhanced the regulations. Sustainability was engrained in Vision 2030, which advocated renewable energy, reduction of emissions, and conservation (Council of Economic and Development Affairs, 2016). New organizations such as the National Center of Environmental Compliance and the Saudi Green Initiative institutionalized the environmental objectives. Researchers observe that these reforms transformed the requirements and enhanced implementation in industries. The integration has played a critical role in sustainable governance.

At the organizational level, it has enhanced the ability to undertake sustainable practices through investments. Colleges and institutions of higher learning have increased environmental management training. It became a trend among water agencies to use integrated management, which incorporated measures of demand, reuse, and desalination. The digital monitoring tools have enhanced accountability and transparency. However, national oil corporations have also used the standards of ISO 14001 to incorporate sustainability. Renewable energy and investments in the circular economy have been one of the priorities of the Public Investment Fund (Mohammed N et al., 2021).

Sustainability objectives in the sectors have also been promoted through policy reforms. The Environmental Protection Law has provided a legal framework on the regulation and enforcement. Vision 2030 established the goals regarding renewable energy and reduction of emissions (Council of Economic and Development Affairs, 2016). Development of clean energy is encouraged by such programs as the National Renewable Energy Program (Kingdom of Saudi Arabia, 2019). The reforms on water governance presented the Water Law and corporatization of service delivery (MEWA, 2021). Environmental assessment and land restoration is now an environmental condition of mining (MIMR, 2023). The domestic policies are also affected by the international agreements like the Paris Agreement (United Nations Framework Convention on Climate Change [UNFCCC], 2016).

Even though some improvement can be observed, there are still gaps in enforcement, lack of data, and the issue of stakeholder engagement. Reformations and international cooperation will be important in the process of making the move towards diversified and sustainability-focused government. The case of Saudi Arabia indicates how, through innovation and reform of policies, development and environmental protection can be integrated. Vision 2030 continues to be an initiator of a combination of growth and sustainability. Capacity and compliance should be enhanced in the future to ensure there is the ability to achieve long-term environmental objectives (Mohammed et al., 2024).

Analysis of Resource Usage in Saudi Arabia (1970-2020)

Fig. 2 shows the dynamics of the resource utilization in Saudi Arabia in the period of 1970-2020, which indicate the tendency to the constant increase in the oil production, water consumption, and mining production. The oil production began in 1970 with the production being 3 million barrels per day, which gradually rose to an average of 9.5 million barrels per day in 2020. This is a pointer of increasing reliance of Saudi Arabia on petroleum as its significant economic operation. The increasing pace of urbanization, industrialization, and population growth that began to manifest in the constantly rising water consumption, which began in 1970 reaching 2 billion cubic meters and reached 4.5 billion cubic meters by 2020, also demonstrated the increased strain on water resources. In the same manner, mining production grew by 0.5 million tons in 1970 to 3 million tons in 2020, which is an indication of an attempt to diversify the economy beyond petroleum.

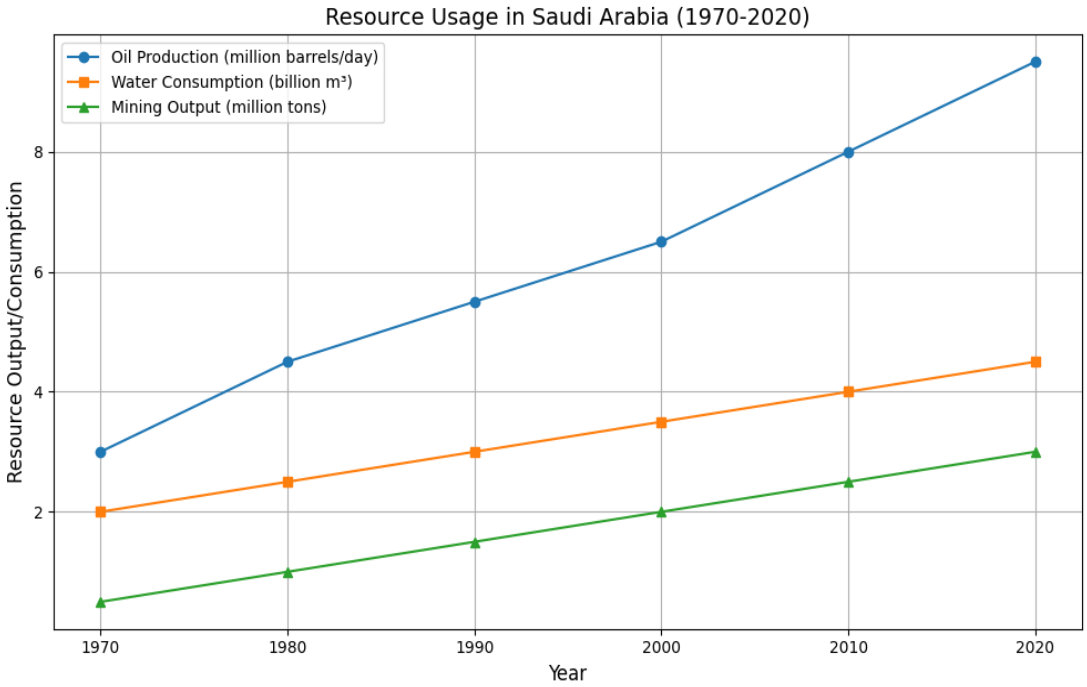

Fig. 2 Resource Usage in Saudi Arabia

The fact that these increases are a good sign of a rising economy in this country but it also shows how challenging it is to sustain such levels of resource demands in the long term. The growing exploitation of resources is the reflection of the fact that economic development and environmental sustainability are two phenomena, which should be harmonized, and Saudi Arabia should accelerate its efforts to diversify resources and establish the policies that support the goals of Vision 2030 such as using more renewable energy and improving water conservation strategies.

Recommendation of Strategic Plans on Sustainable Resource Management in Saudi: An Analysis of Past Trends and Current Demands

Sustainability and Strategic Resource Management in Saudi Arabia

In Saudi Arabia, resource management sustainability is very important as the petroleum, mineral and water resources are little already and they are piling up in the form of environmental and climatic challenges. In the past, economic trends improved, favoring economic growth by exploiting the environment, which led to the depletion of aquifers, the contamination of water, and a loss of the environment. The Vision 2030 needs to be reformed strategically to be in balance with development and sustainability goals. The following proposal proposes some of the main policies that follow historical analysis and incorporate new sustainability priorities based on research and official reports. During the previous decades, resource governance was characterized by a desire to maximize oil revenues, and regulatory provisions on the environmental effects were rather weak. The groundwater abstraction, which is not followed by sustainable recharge mechanisms, was used to manage water (El-Rawy et al., 2023).

There were also no environmental protection and all-encompassing regulations on the exploitation of minerals. The institutions were fragmented, meaning that there was no easy coordination of sustainability. Climate change, environmental destruction, and water shortage today require a transition into resource governance, which is more integrated and flexible. To reduce emissions by investing in renewable energy, decarbonization and diversification of the energy are necessities. Sustainable water management implies larger wastewater reuse, desalination systems that have the least environmental impact, and combined water management. Strong environmental standards and regular monitoring of the compliance will be crucial to conserve the ecosystem and minimize pollution (Erdoğan et al., 2021). Strategic policy suggestions comprise institutional harmonization in order to enhance inter-ministerial planning and coherence in policies. Integrated governance should be led by the Minister of Environment, Water, and Agriculture, as well as supportive of cross-sector councils. The implementation of environmental impact assessments of any resource exploitation projects should be compulsory and backed by regular performance assessments and solid enforcement. It is recommended that a circular economy strategy will encourage the reuse of industrial by-products, water-saving technologies, renewably powered mining and desalinating. Investment in research, online surveillance, and education will develop the national capacity. It is also important to conduct community outreach and educational programs that would promote the engagement and implication of the populace in regard to the idea of sustainability (Hegazy, 2024). The development of

sustainable resource management in Saudi Arabia demands policies that would consider both economic arguments and environmental management. The recommended policies are based on institutional reforms, regulation enforcement, innovation, and inclusivity to ensure less reliance on traditional exploitation. These strategies are in line with the goals of Vision 2030 and a targeted achievement of long-term prosperity and ecological resilience.

Discussion

In the post-1970s period in Saudi Arabia, the model of resource management was changing significantly by turning into a more diversified model rather than a model that was oil-dependent. The quantitative analyses indicate that Vision 2030 facilitated the development of renewable energy and enhanced the water conservation aspect, which demonstrates coherent reforms and regulations that are in line with sustainability. The strategic interventions integrated development and environmental goals, which directly met the objectives of the research. These findings confirm the idea that properly coordinated reforms can be effective to balance economic growth and environmental protection. The research adds to the resource governance theory to show that rentier states have a chance to change their way. The practical use also brings implications to policymakers in the developing world economies because Vision 2030 has provided a model of harmonization between growth and preservation. When compared to the rest of the literature, the diversification path of Saudi Arabia is typical of the region but with specific sustainability strategies. Diversification is still dependent on reforms, and the current level of sustainability integration is even better than some other instances. The utilized methodology in a systematic way was able to capture the development of resource management by triangulation of sources over a 50-year period and thus improve validity. Although the methodology took a broad range of institutional dimensions, the possible biases and temporal imprecisions were seen as drawbacks. The results also prove that local practices have been refined by global alignment and integrated management, particularly due to the adoption of Vision 2030. The difference in implementation is dictated by unique cultural, demographic, and geographic backgrounds, requiring specific planning of the water and energy resources. The argument is informed by the academic literature on the history of governance of rentier states and the necessity of sustainable development. The adaptation governance and holistic policy approaches are considered the key to the attainment of the targets of sustainability based on the Saudi experience. On the whole, findings are relevant in highlighting how long-term reforms and strategic decisions can help Saudi Arabia to move beyond oil reliance towards more sustainability-focused models that can balance economic development with environmental management as provided in Vision 2030.To enhance the discussion of implementation limitations, it would indeed be valuable to highlight specific case studies where these gaps have been most prominent. This would provide a more tangible understanding of how historical, institutional, and systemic issues have hindered the effective execution of sustainability reforms in Saudi Arabia. As an illustration, a single case study may be devoted to National Renewable Energy Program. Although the government had a set target of 50 percent of renewable energy by 2030, its realisation has been marred with a number of challenges that include institutional inertia, non-co-ordination among different sectors and the challenge of integrating technology. As an example, initiatives such as the Sakaka PV plant -that facilitates the creation of partnerships between the government and the private sector have been faced with delays because of complications in regulatory systems, funding, and linkage to the current infrastructure. Other case studies may focus on the water management reforms where the National Water Strategy 2030 is an initiative aimed at solving the water crisis faced by the country by ensuring water reuse and efficiency. Nevertheless, lack of proper stakeholder involvement and socio-cultural resistance have slowed the use of water saving technologies and practices particularly in agricultural sectors. Regardless of these plans, there are still some problems with groundwater depletion and emitted brine desalination plants, and these issues complicate achieving the water sustainability goals of Vision 2030.Moreover, emphasizing institutional coordination failure in other areas like waste management may also help to further underline how implementation gaps have affected the overall sustainability efforts. Although policies have been put in place to minimize industrial waste and encourage recycling, the inter-sector collaboration, as well as public-corporate collaboration, have been sluggish due to the absence of these partnerships. Indicatively, limited participation of communities in recycling programs continues to be a stumbling block towards establishing an effective waste management system in cities. Incorporating these case studies would not just base the discussion on real life contexts but also give real life examples of the problems encountered and the gaps in the institution and governance systems that must be closed to achieve the sustainability targets of the Vision 2030.

Recommendations

The whole unbroken and concise form of the policy recommendations, of the recounting of the policy and implementation mechanism suggestions together in a single and the same coherent paragraph is as follows: To make the high-performance task instructions as coherent and clear as possible, it is proposed that government agencies use a standard form of step-by-step structuring of instructions, which would force all their instructions to be broken down into sequentially definite procedures, with Additionally, the stakeholders will be to insist on the infusion of the modularity of the task breakdown into the operational manuals where the component tasks would be assigned separately with corresponding measures of performance which would enable them to monitor, train and continuously improve better. Another recommendation is that the working process should be designed to allow a reasonable amount of model thinking time to prescribe regular breaks in the performance philosophy and to ensure that the staff has some time to

review their progress, audit the errors and correct plans before the next steps, which is most essential to the lack of procedural drift and accuracy. Lastly, it is recommendable to introduce the use of techniques of assigning personas during training whereby thematic personas are assigned to employees as part and parcel of training employees in the given prescribed roles of a relatively realistic situation to instill situational awareness and the ability to transfer training skills to the operational environment via experiential learning techniques.

VI. Conclusion

As shown in the historical analysis, the management of the economic resources in Saudi Arabia has long been focused on economic growth rather than on the environment, which has led to the degradation of the ecosystem, water shortage, and carbon emission. Although the institutional reforms of integrated renewable energy and water management in the name of Vision 2030 have been introduced, the sustainability front is still crippled by the lack of institutional change and involvement of the stakeholders. The paper highlights that historical patterns of governance are crucial in the successful policy formulation in resource-dependent economies, and this relationship between the regulatory framework, cultural factors, and environmental forces is complicated. Combining the past with the present institutional evaluation will present a large-scale framework that will assist policymakers in working out context-sensitive and practical strategies. Finally, the results note the need to develop institutional capacity, develop technological innovation, and promote participatory governance to realize sustainable environmental conditions in the long term.

Study Implications and Future Directions

The paper demonstrates the paramount significance of historicizing understandings of governance in the design of sustainable resource management strategies and reveals that the interdependence of the institutional memory and modernized policy frameworks can educate procedural coherence and responsive versatility. The findings present a viable option to construct teaching systems and integrate sequential organization, module division of jobs, and model thinking time to promote implementation fidelity in any industry. Based on such an integrative framework, the architecture of digital monitoring platforms and the participative model of governance may be constructed according to which it is possible to integrate the environmental goals with the functioning processes. The following research should be designed to conduct a longitudinal assessment of reform effects, that is, the nature of the effects of applying standardized and persona-based training tasks to behavior change and policy adherence, as well as the nature or manner in which it varies with time. It can be further argued that the strategies can be transferred, as the comparative research is necessary in other economies that are resource-based in order that the culture-specific parameters that dictate the outcome of sustainable development can be identified.

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