NATURAL GAS CONSUMPTION, STRUCTURAL EFFICIENCY AND LOW-CARBON TRANSITION IN THE MIDDLE EAST: VISION TOWARDS 2050

Muhammad Yousaf Raza[a]
[a]Department of Energy Economics, Shandong Technology and Business University, Yantai, Shandong, 255000, China
Phone# +86-15659817179
Email: yousaf.raza@ymail.com; yousaf.raza@sdtbu.edu.cn
Muhammad Nadeem Javaid[b,*]
[b]Department of Finance for Energy Solutions, Al Babtain Leblanc Telecommunication Systems, Riyadh-14275, Kingdom of Saudi Arabia
Phone# +966-54-8013595
Email: Muhammad.Nadeem@abltel.com;Mn.Javaid@yahoo.com

Overview

Green and low-carbon transition has become an imperative driving force for worldwide development. Natural gas is a significant energy source extensively consumed in various industries and the electricity sector [1]. Natural gas combustion results in low-emissions compared to oil, coal and petroleum products. It is a basic contributor to economic growth in several consuming and producing countries, especially in the Middle Eastern Countries (MECs). In the MECs, natural gas consumption demand grew by 0.84-20.80 exajoules from 1978-2023, in which industrial and residential sectors are the most consuming sectors. Like several industrialized and developing countries, MECs are third-rich natural gas producers and contribute 17.8% of the world, which is considered a huge input for its socio-economic development [2]. Recently, MECs have fulfilled their energy demands through oil, coal, natural gas, nuclear, and renewables, in which natural gas is the most widely consumed as a primary fuel by 51.41% during 2023. In addition, background, natural gas production and consumption growth are taken as low-carbon, domestic reserves and cheap energy sources, which have a significant impact on production, income, environment, energy security, and the economy. Thus, it could substitute for traditional sources, such as oil and coal, for energy supply and become a low-carbon energy source to challenge energy poverty and security. On this basis, the research sightsees the contributions of several socio-economic and energy-related factors (i.e., natural gas energy structure, fossil energy structure, energy intensity under technical development, GDP per capita, and population) in MECs, which are important due to their demand, supply, income, and market sustainability. Regarding economic growth perspectives, the study factors are decomposed, deocoupled, and then the best decoupling status is chosen under three BAU, best and weak scenarios until 2050 to achieve the organization of the rapid growth of the MECs productivity under major factors and to achieve the strong decoupling in all countries, which are not studied before. This will give a wide range of possibilities for long-run planning of maximum energy capacity and substitution, highlighting demand for a complete sustainability valuation framework and guaranteeing economic development.

Methods

The implications of energy and socio-economic trends are led by five major structural factors beyond energy efficiency, which show a deep impact on the aggregated use of natural gas, notwithstanding the effect of energy efficiency measures and policies. Several countries are reliant on their energy efficiency goals as a way of challenging unusual challenges associated with huge pollution, imports, and lack of energy resources. To estimate these factors, decomposition, decoupling and scenario analysis are adopted for the years 1978-2050. When exploring the driving factors of decoupling statuses, we considered the impacts of eight MECs under eight decoupling status using the best and weakest scenarios of productivity. These methods are imperative and the most adaptable methods to investigate the factor's statuses, which combine the deocomposition and Tapio's methods [3-4]. The study mechanism of variation included in factors is described in Fig. 1. (Further discussion will be provided in the complete manuscript).

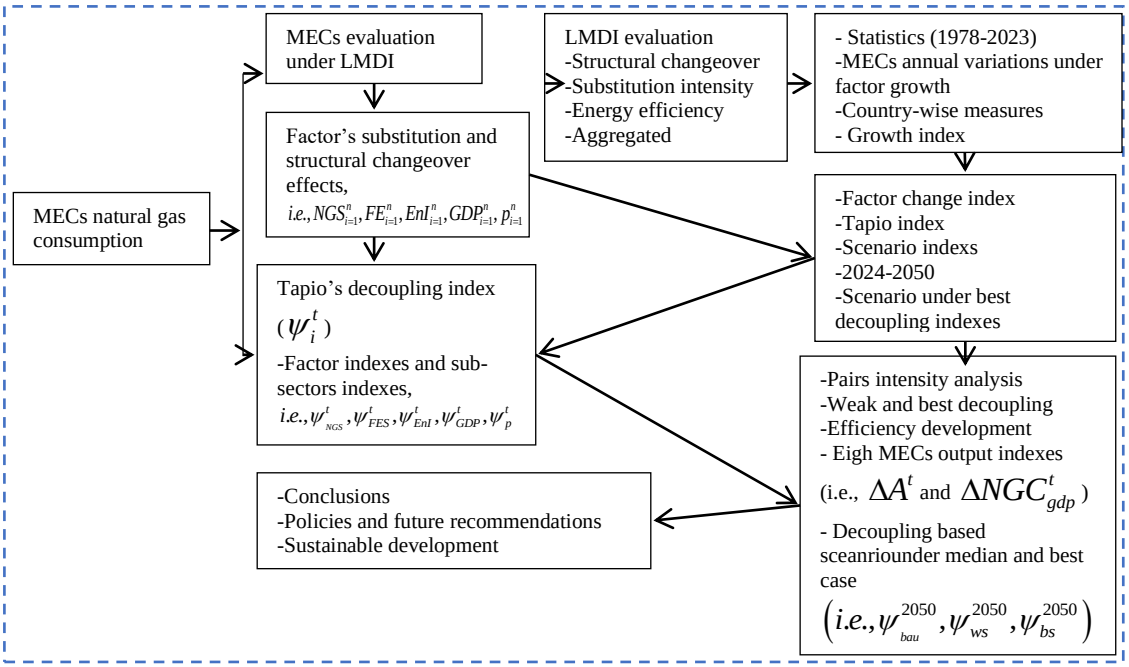

Fig. 1. Study's research mechanism.

Results

The novel factors provide interesting results that are advantageous for policy-makers and provide a new-way for researchers and government. Aggregatively, during 1978-2023, the GDP per capita and population are the most important factors in growing natural gas consumption in MECs, while fossil fuel structure and energy intensity effects provide declining results. This shows a most significant motive towards energy security, especially in terms of natural gas consumption. Regarding factors decoupling, weak decoupling, strong negative decoupling and expansive, and strong decoupling were the main indexes during the aggregated period. The strong, weak and expansive decoupling-based scenarios show that sustainability and energy-security could be ensured by regulating environmental policies and technical progress.

Conclusions

To the best of our knowledge, this is the first study analyzing the MEC's major driving factors under the low-carbon transition. The major findings present that there is a substantial growth in natural gas consumption due to a rise in per capita GDP and population. Concentrating on the low-carbon energy policies in Pakistan, it is predicted that the natural gas consumption growth index will grow, which will develop air quality and economic sustainability and reduce imports, costs, and society. Thus, the government should concentrate on feasible prices and fuel substitution possibilities, and policymakers should design a framework for MECs and most natural gas-producing countries such as Iran, Qatar and Saudi Arabia.

References

[1] International Gas Union (2023). Global Gas Report 2022. file:///C:/Users/Administrator/Downloads/GLOBAL-GAS-REPORT-2023.pdf.

[2] Raza, M. Y., & Lin, B. (2022). Natural gas consumption, energy efficiency and low carbon transition in Pakistan. *Energy*, *240*, 122497.

[3] Jiang, J., Zhao, T., & Wang, J. (2021). Decoupling analysis and scenario prediction of agricultural CO2 emissions: An empirical analysis of 30 provinces in China. *Journal of Cleaner Production*, *320*, 128798.

[4] Raza, M. Y., & Lin, B. (2024). Energy transition, carbon trade and sustainable electricity generation in Pakistan. *Applied Energy*, *372*, 123782.