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SESRI Policy Brief

Do Income and Consumption Growth drive CO2 Emissions in Qatar? Implications for Climate Policy

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Qatar has undergone a remarkable surge in gross domestic product (GDP) growth over the past thirty years, witnessing unprecedented levels of economic development in addition to a massive increase in the size of its population. Qatar's surge in production and consumption appears to be linked with the increase in carbon dioxide (CO2) emissions. Utilizing available sectoral and macro data, this policy brief delves into the long-term association between GDP-expenditure trends and CO2 emission patterns. Over the past three decades, there has been a consistent increase on an average in the total expenditure by 4.8%, GDP by 5.4 %, government expenditure by 4%, household consumption by 4.7% and CO2 emissions by 1.77 %. To align with UN Sustainable Development Goal #12, Qatar should continue with different policy tools in the efficient use of resources in both production and consumption to reducing CO2 emissions.

Economic growth and CO2 emissions in Qatar

Qatar's economy is one of the fastest growing in the Gulf region and its income levels are set to increase faster than the regional average over 2023-2040. The economic prosperity of Qatar continues to amplify the nation's social, economic, and political transformation including its global integration. The country is witnessing significant transition in consumption values and behavior. Studies trying to understand the determinants of CO2 emissions have recognized both income and consumption growth as major drivers of CO2 emissions[1]. The continuing income and population surge of Qatar has raised the demand for energy, water, food, leading to changing consumption pattern.

Studies show that the relationship between income, consumption and CO2 emissions seems to exist at least at the aggregate level[2]; however, at the micro level, household demand for energy varied significantly by household income levels[3] Three years after the Paris Climate Agreement[4], carbon dioxide (CO_2) emissions from fossil fuels rose by 2.7 percent in 2018[4], This increase corresponds to a surge in the CO_2 emissions gap that exceeded 19 Giga Tons of CO_2 between the current and expected value stipulated in the Paris Climate Agreement.

To reduce CO_2 emissions, the State of Qatar mapped out strategies and launched several steps such as the green building initiative, carbon capture and storage while promoting extensive research and development activities. However, the upsurge in economic activities, consumption, investment, and government expenditure in addition to the population growth, and the number of gasoline cars bustling on Qatar's streets have contributed significantly to environmental degradation. The expenditure growth in the above components implies cumulative increase in energy consumption.

In the environmental economics literature, the interaction between economic growth and CO_2 emissions is often discussed from the perspective of environmental

Kuznets curve (EKC)[5]. According to EKC, CO_2 emissions increase in the early stages of economic growth but decrease after a certain threshold of Gross Domestic Product (GDP) per capita is achieved, followed by an improvement in the environmental quality. There are four possible scenarios: (i) energy consumption induces economic growth, and a decrease in energy consumption adversely influence economic growth; (ii) economic growth in energy sectors precipitate an increase in energy consumption (the growth-led energy hypothesis); (iii) there are bidirectional causalities between economic growth and energy consumption and (iv) no causality between energy consumption and economic growth (neutrality hypothesis).

Many recent studies on economic growth and energy consumption have also addressed CO_2 emissions and environment quality. The relationship between economic growth and CO_2 emissions is generally investigated in a bivariate setting. In addition to economic growth variables, studies considered other potential determinants of CO_2 emissions, such as trade openness for testing the pollution haven hypothesis[6], and variables such as urbanization, financial development index, etc[7]. Other studies examining the validity of the standard EKC (See Figure 1) provided contradictory results, while a flourishing number of studies found an inverted U-shaped curve between economic growth and CO_2 emissions.

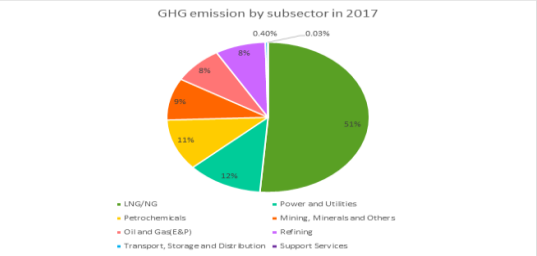
This policy brief study is aimed at contributing to the ongoing debate with a focus on the State of Qatar to answer the question: what should be done to achieve an inverted EKC's U-shape "reducing CO2e"?. Using available data, we assess how income-consumption trends tend to be associated with CO emissions in the past three decades for evaluating policy challenges.

CO2 emissions by sector in Qatar

The State of Qatar is a petroleum-based economy, with more than 83% of the government revenue originating from the energy sector through oil and natural gas. Moreover, several mega infrastructure projects were undertaken in the last decade as part of preparation for the hosting of 2022 FIFA world cup - all fully funded from oil and gas revenues. Qatar's per capita income, and energy consumption are very high compared to the rest of the world. The majority of the families in Qatar owns more than two vehicles with preference for an eight-cylinder engine. Qatar is currently the highest emitter of CO_2 per capita, approximately 36.4 tons per capita in relation to environmental degradation.

Emission from power and utilities accounts for 12% of total emissions. Simultaneously, the energy industry (natural gas (NG)/Liquefied petroleum gas LNG, petrochemicals, oil and gas, and refining) stood at 79% of Qatar's total emissions in 2017, as shown in Figure 1. Also, the substantial increase in the population size of Qatar from around half a million in 1990 to 2.7 million in 2023 may play a major role in driving up CO2 emissions[8].

Figure 1: GHG emission by subsector



Source: Computed by the authors based on available data published by the United Nations Statistics Division (UNSTAT), 2017.

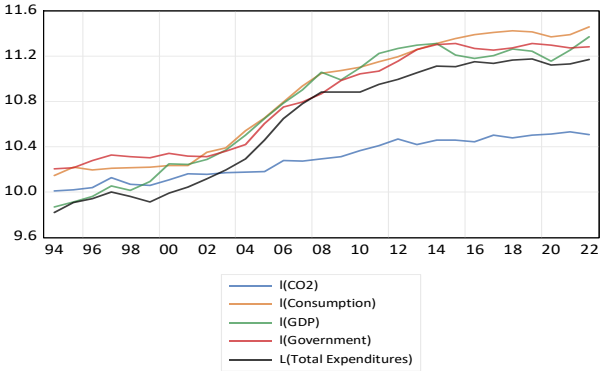
Overall, there is a long-term relationship between CO2 emissions, GDP, total expenditure, government expenditure and consumption expenditure. During the period 1994- 2004, the selected indicators move in the same direction indicating Granger causality between CO2 emissions and the selected variables. However, using the individual regression between the stationarity data "to have a consistent estimate", we found that 1% change in GDP or total expenditure, government expenditure or consumption is statistically insignificant across the selected period, which is a sign that we are close to the peak of CO2 emissions and possibly signalling a decreasing trend in CO2 emissions[9]. Appreciably, the government of Qatar undertook several measures to improve environmental quality for achieving QNV2030.

Expenditure Based CO2 Emissions in Qatar

Studies suggest that macro level CO2 emissions and the economic activities are cointegrated. For a clear understanding of this association, we present figure 2 which shows the trend between total expenditure and the CO2 emission that may exist before 2004. Within the selected period, the cointegration started to weak after 2004 (figure 2) where extensive dependence of Qatar on a cleaner fossil fuel natural gas is seen (figure 2). The CO2 of natural gas is 70% less than co2 emissions of coal and 25% less than distillate fuel oil (EIA, 2024). Qatar counts heavily on consumption Natural gas in consumption and production (see figure 1 and figure 2). During the same period, GDP rose by about 400%. Clearly, production-based CO2 emissions have been galloping faster and higher than consumption-based CO2 emissions. The rise in consumption-based CO2 emissions is observed to keep pace with GDP growth but throughout the two decades, the consumption-based CO2 emissions out-paced GDP growth.

A recent study by Afacan and Khalifa (2023) showed that CO 2 emissions increased alongside economic growth in Qatar. Another study by the Arab Monetary Fund showed that GDP growth was positively and significantly related to CO2 emissions in high-income Arab countries (Sirag and Talha, 2023). Both raising levels of income and consumption leave substantial carbon footprints. However, Qatar has the opportunity of harnessing its higher economic growth to be consistent with strict environmental policy regulations. In figure 2, the trend across the four selected variables is clear until 2004. However, the percentage change of GDP, total expenditure, government expenditure and household consumption expenditure causation declined sharply between 2004 – 2022. This might be due to the dependency of economic activities on Natural gas which is cleaner relative to oil and coal.

Figure 2 Log of GDP, Total, Government, consumption expenditure and CO2 emissions in Qatar, 1994-2022



Source: Figure generated by authors based on available data published in 2023

Expenditure Based CO2 Emissions in Qatar

In this policy brief, we highlighted the main economic factors that might cause Co2 emissions. These factors are tested using the available data from 1994-2022 and we found notable Granger causation and cointegration between CO2 emissions

and GDP, total expenditure, government expenditure and households consumption expenditure. This means that the state of Qatar is at the peak of CO2 emissions curve and there is a possibility to have a flipped U shape for Kuznets curve, i.e. decreasing CO2 emissions needs additional measures from the policy makers. From a policy prospective, we recommend several technical and market tools based on our empirical work: (1) implementing and scaling up carbon capture and storage strategy (CCS) (2) adopting a national strategy for circular economy at different levels (micro-meso-acro) (3) implanting and scaling up a carbon pricing mechanism and (4) the climate policy strategy should include complementary tools such as; command and control regulatory mechanism, an incentive-based organizational tool, pollution charges, marketable permits, removal of market barriers, elimination of energy subsidies, etc. These recommendations are approachable through building an ecosystem that include technology, institutions, behavioural change, regulations, and market tools.

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Policy Recommendations

1. To align with UN Sustainable Development Goal #12, Qatar needs to focus on sustainable consumption and production patterns.
2. Qatar should continue to progress in the efficient use of resources in both production and consumption to reducing CO2 emissions using different policy tools.
3. There is a to set up observatories to measure the level of CO2 and its causes, create dashboard for public awareness and engage with private sector in raising awareness about the methods of reducing CO2 emissions for achieving the goal of zero emissions.
4. Qatar needs to build an ecosystem that include technology, institutions, behavioural change, regulations, and market tools are crucial policy steps. These imperative steps are essential not only to mitigate climate change and environmental pollution impact but also to ensure the well-being of current and future generations.

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