

## RESEARCH ARTICLE

# The Use of Circular Economy for the Natural Resources of Power: The State of Qatar as a Case Study (Oil and Gas)

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## ABSTRACT

Climate change has been an issue since the late 18th century, and since then, humans have begun to react differently to curb global warming and play a vital role in making the planet a better and safer place for all people. However, the rapid growth of economies and technologies has a different impact when it comes to globalization and development. Nevertheless, if leading countries start working and lending a hand to solving the issue, other countries will be motivated to go with the tide. In addition, the circular economy as a solution is an ideal choice for countries like Qatar, where the oil and gas industry plays an important role in the country's economy but also increases air and water

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pollution, which ultimately worsens the climate change problem. Therefore, this paper tries to determine whether the use of circular economy for natural resources of power such as oil and gas in the case study of the State of Qatar can somehow lead to better figures and sustainable solutions, as well as less exposure to the risks associated with global changes in the oil and gas industry. Given that many countries, like Qatar, rely heavily on oil and gas for their economies, using circular economy as a model to eliminate waste and pollution, as well as recycling existing products and materials, can fully contribute to better air and water conditions. Rather than ignoring the challenges, countries should ensure compliance with the norms and standards of a circular economy and motivate their own nations to fully transition towards circular economy and sustainable solutions.

**Keywords:** circular economy, natural resources, climate change, energy, Qatar, pollution.

## 1. INTRODUCTION

### 1.1. Initial Motivation and the Real Problem

The world is struggling with a serious problem, and that problem is climate change. Ackerman et al. (2008) published a report on the estimated costs of climate change and put it at approximately US\$1.9 trillion per year. From a macroeconomic perspective, this cost (in the form of damage and lost opportunities) can represent a significant portion (around 3.6%) of a developed country's economic output in terms of GDP. Numerous models have been proposed to quantify the losses caused by climate change, not only to the economy but also in terms of other outcomes such as the human experience and loss of life (Ashraf et al., 2020; Duran et al., 2020; Preston et al., 2019). Studies published so far agree that climate change is a real problem that is becoming increasingly serious, which is why countries need to start working on solutions as quickly as possible (Christis et al., 2019; Schmid et al., 2020; Wysokinska, 2016). Given that climate change is causing human suffering and loss of life, it should come as no surprise that more and more countries are increasingly motivated to address this problem.

### 1.2. Importance of the Study

There are many possible solutions to the growing global problem of climate change. The use of renewable energy sources, for example, is one of the most commonly mentioned and researched solutions. Each alternative solution has its own advantages and disadvantages. For this reason, studies aimed at finding the most effective long-term solution to climate change must have a high level of specificity or focus on that solution (Geissdoerfer et al., 2017; Geng et al., 2019). This paper focuses on developing a circular economy as a manner by which to address the global problem of climate change. The importance of this paper lies in the fact that developing a circular economy is a less explored option for a solution to climate change (Kirchherr et al., 2017; Korhonen et al., 2018; Morsetto, 2020).

### 1.3 Importance of the Subject

The subject which the present paper focuses on is the circular economy. It is important to note that this subject is addressed in the context of the State of Qatar, a developed country in the Middle East region. A large part of the country's economic output is attributed to the oil and gas industry (Almfraji et al., 2014; Charfeddine et al., 2018; Mirzaei & Moore, 2016). The world is transitioning towards a less carbon-dependent energy production and consumption model, which is why it is important for countries like Qatar to take the necessary steps to make this global trend transition smoother for them, as the economies of Qatar and many of its neighboring states depend on the global demand for oil and gas (Kalmykova et al., 2018; Moraga, et al., 2019; Otero et al., 2018; Sandoval et al., 2018).

For this reason, this paper will address water and air pollution caused mainly by the oil and gas industry. Firstly, water pollution is the pollution of water bodies by human activity that has a negative impact on their legitimate use. Water pollution reduces a body of water's ability to provide ecosystem services. For example, this paper shows that oil can easily and highly cause water pollution from oil spills through fouling or oiling, and oil toxicity.

Fouling or oiling is a regular phenomenon in oil refineries, which is used to cool or heat oil as it passes through several stages that can harm animals, plants, and even human lives. Oil toxicity refers to the variety of harmful substances present in oil that can cause serious health issues such as heart disease, immune system problems, and ultimately death. USA has one of the highest records for oil spills per year (at the scale of thousands of oil spill incidents), causing enormous environmental damage (Denchak, 2018).

Secondly, air pollution is defined as the presence of gases in the environment that are harmful to the health of humans and other living beings, as well as to the ecosystem and other surrounding materials (Mackenzie & Turrentine, 2021). Some of these gases can cause photochemical smog, acid rain, forest dieback, and reduced atmospheric visibility.

Photochemical smog occurs when nitrogen oxides and volatile organic compounds combine with sunlight to form a brown cloud over cities. It happens more often in the summer when the cities have the most sunshine (Afework et al., 2018). Acid rain, also called acid deposition, is a general term that refers to any type of precipitation that contains acidic components such as nitric acid or sulfuric acid, and falls from the atmosphere to the ground in wet or dry form. This can include hail, fog, dust, snow, and acid rain (Environmental Protection Agency [EPA], 2021). Forest dieback is a condition in which a group of trees loses their health and dies for no apparent reason. Forest decline, forest degradation, canopy-level dieback, and stand-level dieback are terms used to describe this phenomenon. It mainly affects individual tree species, but it can also damage a group of trees all at once (Gordaliza & Turnbull, 2020). According to the Food and Agriculture Organization (FAO) of the United Nations, Nigeria has the highest rate of primary forest degradation (FAO, 2021). Finally, the most visible symptom of air pollution is undoubtedly reduced visibility. The absorption and scattering of light by particles and gases in the atmosphere before it reaches the observer causes visibility degradation. Particulate scattering reduces visibility much more quickly (Regional Haze Program, 2011).

It would be detrimental for Qatar’s economy to find itself in a situation where it still relies on revenue from its oil and gas industry after countries in the global economy have already successfully transitioned towards renewable energy sources, i.e., away from fossil fuels (Kalmykova et al., 2018; Moraga et al., 2019; Otero et al., 2018; Sandoval et al., 2018).

## 2. HISTORY, BACKGROUND

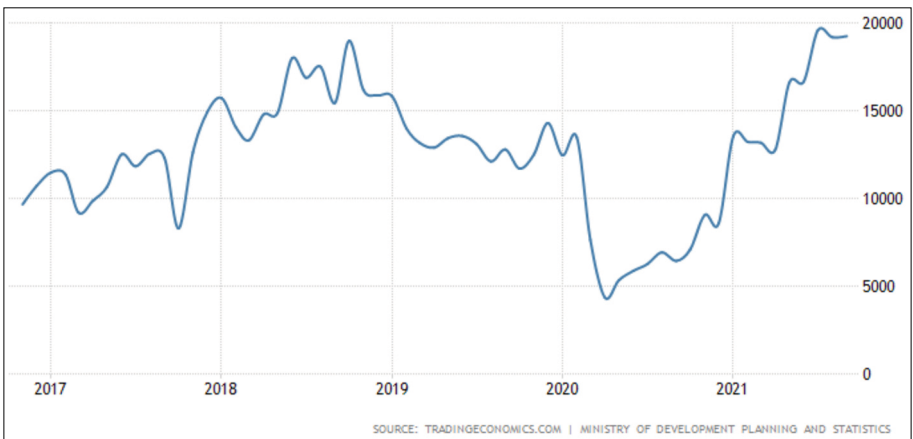
### 2.1 History, Background of Qatar’s Economy

#### 2.1.1 Pearl Extracting

Qatar is a country with humble beginnings. Before the emergence of the oil and gas industry, the country’s economic output was based primarily on the pearl extracting sector. Pearl extraction is one of the oldest industries in the Middle East and North Africa. Archeological sources show that pearl extracting began in the region around 7,000 years ago (Tsao, 2016). The profit margins and economic multiplier effects in the pearl extraction industry are low, especially compared to other high-value industries. For this reason, for much of Qatar’s history before the discovery of its oil and natural gas reserves, Qatar was considered a poor country.

#### 2.1.2 Country Trading with India and Other Countries

At the same time, Qatar’s economy was heavily dependent on trade. The country was able to export its large surpluses from oil and gas production to other countries that needed them. India is one of Qatar’s largest trading partners. Since India has the second largest population in the world, it is not surprising that the country also has one of the highest demands for energy resources such as oil and natural gas.



**Figure 1.** Trade balance between Qatar and India (Source: TradinginEconomics.com).

Figure 1 shows the trade balance between Qatar and India from Qatar's perspective (Qatar's Ministry of Development Planning and Statistics, 2021). It can be seen that Qatar has had a trade surplus with India in the last decade, which means that the value of the commodities that Qatar has exported to India is greater than the value of the commodities that the country has imported from India. This essentially means that one of the most profitable trading partners for Qatar is India, which is why the government has been keen to maintain positive relations with India over the last 50 years since the two countries began establishing mutual diplomatic relations (Cooper & Momani, 2011; Fahy, 2018; Kinninmont, 2019; Ustaoglu et al., 2017; Wright, 2013).

### **2.1.3 The Development of Qatar's Oil and Gas Industry**

The first oil and gas exploration, development, and extraction projects in Qatar began in the late 1930s. It took several decades for the country to build its oil and gas industry to the point where it could be considered a major economic factor (Kirat, 2015; Rathmell & Schulze, 2000). Depending on which sources we look at, this threshold—when Qatar's oil and gas industry became the largest contributor to its economy—was reached in the 1970s, and the same is true today (Chedid et al., 2007; Fromherz, 2017; Hashimoto et al., 2004). Qatar still relies heavily on revenue from the oil and gas industry.

### **2.1.4 The Oil- and Gas-Dependent Economy of Qatar**

Qatar's oil and natural gas industry accounts for about 51% of nominal GDP. Based on this figure, it is safe to suggest that Qatar is still an oil- and gas-dependent country. In other words, a crisis in the industry, be it a shortage of supply or a drop in price, will have a significant impact on the country's economic outcomes (Alkhateb et al., 2020; Fasano-Filho & Iqbal, 2003; Oxford Analytica, 2020; Parveen, 2019). However, His Highness Sheikh Hamad bin Khalifa Al-Thani, father of the Amir of Qatar at the time of writing, endorsed the Qatar National Vision 2030 (QNV 2030) in June 2008 during his reign, and strongly emphasized the need to diversify the economy and gradually reduce its dependence on the hydrocarbon industry by creating new economic objectives (Government Communications Office [GCO], 2019).

## **3. CIRCULAR ECONOMY MECHANISM AND FRAMEWORK**

### **3.1 Circular Economy as a Concept**

The concept of the circular economy is based directly on the idea of circularity (Bilal et al., 2020; Ferasso et al., 2020). The goal of a circular economy is to secure, and in some cases guarantee, the long-term sustainability of a process or system, or in the case of Qatar, the economy of an entire nation-state (Dantas et al., 2021; Kristoffersen et al., 2020; Pascale et al., 2021). Applying this to the case of Qatar, a successful transition to a circular economy could mean that the country would be significantly less exposed to the risks posed by global changes in the oil and gas industry.

### 3.2 Circular Economy as a Theory

The theory of the circular economy is based on three main principles: the elimination of waste and pollution, the regeneration of natural systems, and the recycling of existing products and materials. A true circular economy is one in which most, if not all, wastes and by-products of production and consumption are either reused or recycled to create another product—which is then consumed, leading to another cycle of production and consumption; hence the term ‘circular’ (Naustdalsslid, 2014; Qing et al., 2011; Velenturf & Purnell, 2021). The current theoretical framework used in the economies of many countries is far from circular. This is because the vast majority of products consumed end up as waste and are not reintroduced into the economy through recycling, upcycling, or reusing. The end result is economic, social, and environmental chaos (Gan, 2002; Joensuu et al., 2020; Real et al., 2018; Sauve et al., 2016).

### 3.3 Qatar’s Progress in the Development of a Circular Economy

In order to accurately analyze Qatar’s progress in developing a circular economy, this paper evaluates the current status of Qatar’s circular economy development based on the following criteria: (1) production of goods and services, (2) consumption of goods and services, (3) waste management—especially solid, liquid, and hazardous wastes, (4) research and development, (5) use of technology and innovation, (6) public awareness and education, and (7) government support, by examining the main players in these sectors of oil and gas—Ras Gas; Qatar Energy (QE), previously known as Qatar Petroleum (QP); Shell; Qatar Petrochemical Company (QAPCO); Oryx GTL; Nakilat; Qatar Gas; Dolphin; Qatar Fuel (WOQOD); and Muntajat (QPJSC) (Gulf Talent, 2021). Furthermore, it is shown that these main players are currently in an above-average state in all the seven indicators when it comes to developing a truly circular economy.

### 3.4 The Zero-Pollution Environment: The Case of Qatar

Looking at the aforementioned main players in the oil and gas sector, it can be observed that Qatar’s progress in developing a circular economy is rapid and that, although the country is currently in a slightly above-average state, there is still room for further improvement in the long run with regard to the seven indicators mentioned.

It is unrealistic to assume Qatar can achieve a zero level of emissions and waste, because it is an unlikely scenario in the real world (Fogarassy & Finger, 2020; Ghomi et al., 2021; Koh et al., 2020; Mugoni et al., 2020). What is more realistic is a low or almost negligible level of waste and emissions due to a fully functioning circular economy. Assuming that Qatar can keep up with its rapid pace of progress, the outcome of a near-zero level of emissions and waste can be feasible.

## 4. CHALLENGES

### 4.1 Circular Economy Mechanism Challenges

The challenges commonly associated with developing and implementing a circular economy vary widely. In one study, Hopkinson et al. (2018) examine the various challenges

of the circular economy, which include, among others, people's natural tendency to be resistant to change and fearful of the risks associated with developing a circular economy (Hopkinson et al., 2018). Other previously published studies identify additional challenges of the circular economy: (1) meeting consumers' expectations for convenience, (2) meeting consumers' expectations for price, (3) lack of government support, (4) lack of access to the required technologies, (5) lack of access to the required infrastructure, (6) lack of support from the private sector, and (7) public awareness and education about the advantages of transitioning towards a circular economy (Adams et al., 2017; Franco, 2017; Geng & Doberstein, 2008; Oliveira et al., 2018).

#### **4.2 Qatar's Challenges with Circular Economy**

While the main sector players in Qatar show how much progress is being made in improving the economy by achieving the goals and objectives of the circular economy, the country still faces some challenges in implementing this theory. These include: (1) lack of access to the required technologies, (2) lack of access to the required infrastructure, (3) lack of support from the private sector, (4) public awareness and education, (5) reducing costs to remain competitive, (6) improving the environmental footprint to meet increasingly stringent standards, and (7) improving performance to ensure asset valorization.

### **5. RECOMMENDATIONS**

At present, Qatar should maintain the pace of its progress in developing its circular economy. Over time, the country's above-average circular economic development status should develop positively and reach an excellent state. Qatar consistently scored average to above-average across all seven challenges listed in this paper: (1) meeting consumers' expectations for convenience, (2) meeting consumers' expectations for price, (3) lack of government support, (4) lack of access to the required technologies, (5) lack of access to the required infrastructure, (6) lack of support from the private sector, and (7) public awareness and education. Therefore, the government of Qatar should focus on addressing these challenges in these areas, as Qatar has all the resources it can devote to a successful transition towards a circular economy. In addition, further trends in the application and compliance with the norms and standards of the circular economy can be explored from international organizations or consultancy agents, as well as further government guidelines can be set for leading companies in the oil and gas sector in the transition towards the circular economy.

### **6. CONCLUSION**

In summary, Qatar is an oil- and gas-rich developed country in the Middle East. The country has all the resources it can devote to a successful transition to a circular economy. Based on the findings of secondary data, Qatar's current performance in the circular economy is reasonably adequate. It is important to note that there is not a single country in the world that has achieved this feat—i.e., fully transitioning towards a circular

economy. It is therefore not surprising that Qatar is considered an average state when assessed against relatively stringent circular economy standards. On the positive side, however, Qatar has made great and rapid progress in improving the performance of its circular economy in terms of (1) production of goods and services, (2) consumption of goods and services, (3) waste management—especially solid, liquid, and hazardous wastes, (4) research and development, (5) use of technology and innovation, (6) public awareness and education, and (7) government support. This means that assuming Qatar can continue to improve at its current pace, its ability to achieve a higher functioning circular economy has strong possibility in the future.

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Khawla Ahmed Al-Turki is a PhD student in Islamic Finance and Economy at the College of Islamic Studies (CIS) at Hamad Bin Khalifa University (HBKU). She is a graduate of the College of Business and Economics at Qatar University (Class of 2018) and a graduate of the Master of Public Administration (MPA) program of the Doha Institute for Graduate Studies (Class of 2020). Khawla is Head of the International Cooperation Unit at the General Tax Authority of the State of Qatar. In this role, she aims to study the relationship between Islamic finance and international taxation and examine how these two subjects correlate and impact each other.

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