

Impact of ICTs Diffusion on Environmental Quality in Qatar

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Introduction

Climate change, global warming and environmental degradation in general have been some of humanity's greatest challenges and there is no doubt about their threatening effects on human life quality, health, and the possible effects on future generations. Several studies have shown that if no actions are taken in the near future to deal with the problem of global warming in an effective way then it is expected that the average global temperatures will go up by more than 2°C, which is very critical for the quality of life on our planet. The consequences of this will be a rapid rise of sea levels, encroaching seas, increased heavy rainfall, increase in extremes heat waves, droughts, mass extinctions, decreased crops and fresh water and the melting of the Arctic. Climate change and global warming

heavily affect GCC countries and their effects are even more threatening since all GCC countries are characterized by dry, hot and dusty climate. Many GCC countries are among the world's top countries in terms of CO2 emissions per capita and levels of ecological footprint.

Conscious about the possible worsening situation if no action is taken, Qatari policy makers and the government of Qatar have set the improvement and preservation of the quality of the environment as one of the top priorities of the country. For instance, the fourth pillar of the Qatar National Vision 2030 is devoted to environmental development. However, the task of improving the environmental quality of the country is challenging, considering the upcoming events (hosting the world cup 2022 and QNV

2030) which require a sustainable level of economic growth. Since the energy sector remains one of the most important sectors of the country, improving the quality of the environment without reducing energy consumption makes the task more complex. In this article, we have attempted to discuss the merits of the investment, adoption and diffusion of Information and Communication Technologies (ICTs) in addressing environmental degradation.

Environmental Degradation and ICTs in Qatar

Environmental degradation in Qatar Several proxies have been used to measure the quality of the environment in a given country. Recently, the total ecological footprint has emerged as the preferred method as it accounts for six components (cropland, grazing land, forestland, fishing ground,

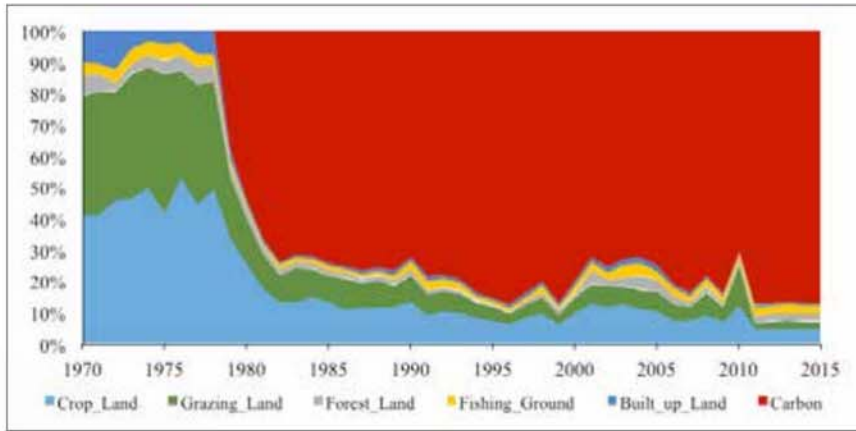


Figure 1

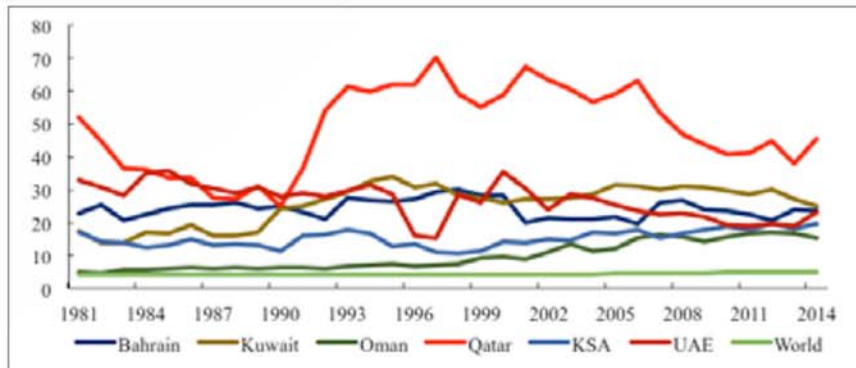


Figure 2 :

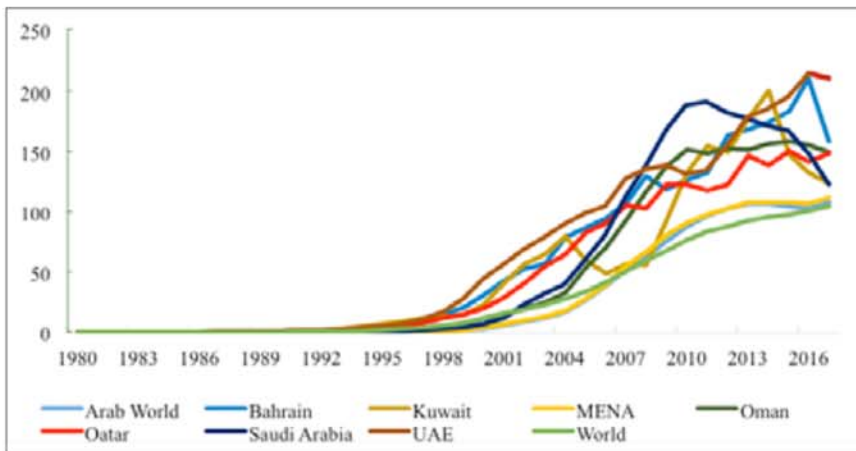


Figure 3 :

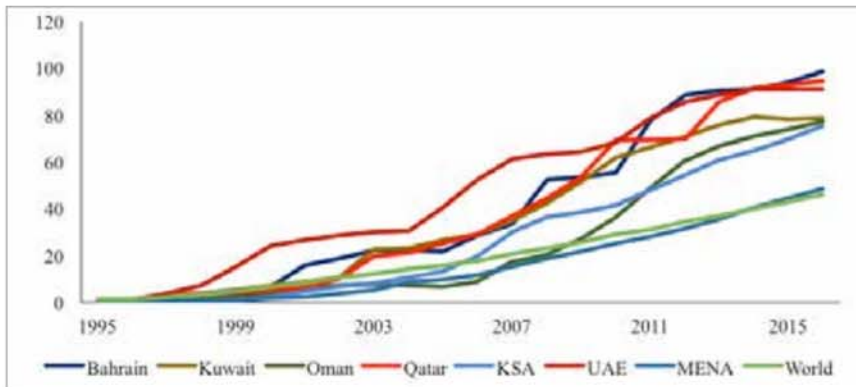


Figure 4

build land and carbon) that cover the three types of pollution namely air, land and water pollution.

Qatar is ranked among the top countries with the highest level of total ecological footprint in the world. Statistics from the global footprint ecological network show that in 2015 the total ecological footprint exceeds Qatar's biocapacity by more than 6 times.

Figure 1 below reports the contribution of each environmental degradation component to the total ecological footprint. Early on, the carbon footprint was very low and close to zero. However, since 1980, a boom in the production and consumption of energy, has allowed it to become the main contributor to Qatar's ecological footprint with a share that exceeds 88% by 2012.

CO2 emissions per capita

Figure 2 below reports the evolution of CO2 emissions per capita in all GCC countries and the average global level. It shows that before 1990, Qatar had a level of CO2 emissions per capita comparable to that of the other GCC countries. However, since 1991, Qatar shows a higher per-capita level of CO2 emissions than that of all the GCC countries and approximately 7 times higher than that of the global average.

2.2. ICTs adoption and diffusion in Qatar

2.2.1. Mobile cellular subscriptions (per 100 people)

Figure 3 below reports the evolution of mobile cellular subscriptions as an indicator for Qatar and all the other GCC countries, the average Arab, MENA and world countries for comparison.

The figure shows that the number of mobile subscriptions per 100 people in Qatar is higher than that of the average Arab, MENA and world countries and amongst the highest compared to other GCC countries.

2.2.2. Individual internet users

Figure 4 shows the evolution of

individual internet users for all the GCC countries as well as the average for the MENA and world countries. Throughout the total period of our sample, the level of individual internet users is in the top three GCC countries and a level higher than the average of the MENA and world countries.

The ICTs – ED nexus

During their process of economic development, countries show an increasing trend of ICTs adoption, use, and diffusion. As the use of ICTs is generally associated with an improvement of energy efficiency and energy intensity. However, empirical studies show evidence of different types of effects of ICTs on Environmental Decay.

The positive relationship between ICT and environmental degradation defines the worst side of ICTs' impact on environmental quality. This occurs through a direct effect, which stems from the production of ICT equipment (computers, screens, etc.) and their use. Moreover, electronic waste or e-waste has increased pollution through the toxic chemicals released in air and the ones leaking into groundwater. Lastly, the increase in ICT products and applications has also increased its consumption.

The belief that ICTs will have a high negative impact on environmental degradation comes from the belief that ICTs will facilitate the decoupling of economic growth without increasing environmental degradation. The best side of ICTs is that they enable us to reduce impact on environmental degradation by making energy use more efficient, which in turn limits the emission of greenhouse gases.

The rebound effects are known to have counter-intuitive outcomes since the effects of ICTs on environmental degradation are more profound. The rebound effect corresponds in general to an effective increase in the demand

of energy service due to the drop of prices that are caused by the increase of efficiency in production and services. It is generally observed in the transportation sector, whereby drivers respond to energy-efficient cars and subsequent fuel savings by driving more, since the effective cost per kilometer is now lower. This can reduce or outweigh any benefit in emissions reductions from the more efficient engines.

Qatar ICTs Diffusion and Initiatives

The use of ICTs in Qatar is widespread. The expanding use of these technologies has been able to play a role in improving the quality of life whether in a direct manner whereby the user accesses services instantaneously, without the need to physically visit a service center or broadly encompassing all aspects through the Internet of Things (IoT) and Smart Cities.

A smart city is the one, which utilizes ICTs to enhance the quality and efficiency of urban services including energy, transportation, and connectivity. A pioneering example of smart cities lies right here in Qatar, Lusail. In Lusail, energy conservation is achieved through the district cooling system, saving around 200,000 tons of CO₂ emissions per annum by optimizing temperatures in every building individually based on the sun's angle and time of day.

The whole city is equipped with a huge IT infrastructure to run all the city's processes. Lusail aims to set the foundations for a legacy of sustainability, showing that the country's carbon footprint can be easily minimized, without compromising with one's way of life. While in fact, making it better.

A new law drafted earlier this year mandates the establishment of a new "Media City" which aims to attract international media and technology companies as well research and training institutions in

the field of digital communication. In fact, the tech giant Microsoft is to launch a global data center for "Azure Cloud Computing" based here in Qatar, which will be the first tenant of Media City.

Another important development in Qatar is the widespread use of e-government services, through applications such as Metrash2, enabling residents to access multiple services online. Furthermore, the implementation of ICTs in the health services sector through a centralized database (Cerner) in state hospitals around the country allows for improved efficiency within the system. E-commerce, on the other hand, has been gaining growing popularity among businesses on different scales.

Conclusion and Policy Implications

In the last few decades, Qatar has heavily invested in the hydrocarbon sector to ensure a high level of economic growth. This has led to many challenges in terms of environmental quality as the increasing levels of economic activity and rapid urbanization have led to a significant negative impact on air quality.

In order to improve Qatar's environmental quality, policy makers should continue investing in ICTs and mainly those with a big potential to facilitate CO₂ emissions reduction. However, policy makers should pay attention to potential rebound effects of the ongoing ICT investments and diffusion. To avoid such effects, Qatari policy makers are expected to increase the awareness of the entire population living in Qatar through increasing awareness-oriented campaigns to stimulate an efficient use of ICTs. The empirical results show that the rebound effect should be managed, since it is likely to be greater in rapidly growing markets where there is a high demand for energy and resources.