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Evaluating the Efficiency of Circular Economies in Persian Gulf Countries in Terms of Municipal Solid Waste Management

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EXTENDED ABSTRACT

INTRODUCTION

In the last decade, concern about the environment has increased increasingly around the world. One of the serious environmental challenges is urban solid waste, the management of which has been raised as one of the main concerns of human societies. According to the World Bank, by 2025, more than 1.4 billion people will live in cities around the world, and each of them will generate an average of 1.42 kilograms of municipal waste per day. Estimates show that municipal waste worldwide triples every year. The annual generation of municipal waste worldwide has increased from 0.68 billion tons to 2.2 billion tons. Based on available data from countries up to 2012, the World Bank has published a report focusing on municipal solid waste generation. Waste is materials or objects that are discarded or thrown away. Solid waste is waste or discarded materials and objects obtained from industrial, commercial, mining, agricultural, and general daily activities (Ugwu, Ozoegwu & Ozor, 2020). Solid waste is one of the serious environmental issues in developed and developing countries. Solid waste management is a major challenge in urban areas around the world, especially in developing countries. The main reason for this challenge is the rapid population growth along with the expansion of cities, the reduction of financial resources, and the weakness of urban planning. Human activities and changes in lifestyle and consumption

patterns have led to an increase in waste production rates (Bovard & ilanloo, 2019). Controlling environmental pollution, including waste, is an important part of human duty in maintaining human health, which has a special place in new sciences and techniques according to economic health standards. Waste production is inevitable in human daily life and population increase will increase it. Municipal solid waste is defined as waste generated by human, commercial, and construction activities that are collected and treated by municipalities (Xiao, Dong, Geng, Tian, Liu, & Li, 2020). The main composition of these wastes is almost the same in different countries of the world. However, the amount of production waste, density, and share of each part of it is different from country to country and city to city. This difference is caused by economic development, geographical location, weather conditions, and cultural and social considerations (Afshar Kazemi, Eftekhar & Omrani, 2014). About, 2.01 billion tons of municipal solid waste is produced annually in the world, of which at least 33% is not environmentally managed. Worldwide, waste generated per person per day averages 0.74 kg but varies widely from 0.11 to 4.54 kg. Of course, it is predicted that by 2050, the amount of waste produced in the world will increase to 3.40 billion tons, which is equivalent to 2 times the population growth in that year. The East Asia and Pacific region produces the most waste in the world at 23%, while this number for the Middle East countries is about 6%. Of course, it is expected that the total waste production in this region will more than double by 2050. It is worth noting that in these areas, more than half of the waste is discarded without reuse. This waste growth will bring many adverse environmental, health, and welfare consequences. Therefore, it requires basic measures.

METHODOLOGY

The purpose of this study is to evaluate the efficiency of circular economies in Persian Gulf countries in terms of Municipal Solid Waste Management. This research is applied in terms of purpose and descriptive survey in terms of data collection. Its statistical population

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was formed from Persian Gulf countries. In this research, the per capita value of MSW production and the dimensions of the social progress index "basic human needs", "basics of well-being" and "opportunity" are used as input and recycling as output in the model. SPI indicators show how well society can cover the needs of its members and improve their quality of life. Data on MSW generation and recycling rates were obtained from the World Bank and data on the three SPI indicators were extracted from the Essential Social Progress website. The data of this research is for the year 2021. The DEA model was implemented in LINGO Softer.

FINDINGS

The findings show that the countries of Kuwait (1), United Arab Emirates (0.952), Saudi Arabia (0.654) and Iran (0.453) respectively have the highest circular economy performance compared to other countries in the Persian Gulf. The aim of this study is to analyze the efficiency of DMUs from the perspective of variable returns to scale (VRS).

CONCLUSION

The main purpose of this evaluation is the efficiency of circular economy in the Persian Gulf region in terms of urban solid waste management. The results show that Kuwait and the United Arab Emirates respectively have the highest circular economy performance compared to other areas of the Persian Gulf. Data analysis shows that according to the statistics of the World Bank, these three countries recycle 21% and 20% of manufactured products respectively. They have good performance compared to other input indicators. It should be noted that these results can be partially under the conditions of the Covid-19 pandemic. As, Iran will produce more solid food with more population and monitoring of health protocols. This could have caused it to fall to fourth place. Data analysis shows that production per capita in Iran is much lower than other countries. Iran has an average performance in terms of SPI indicators. But in terms of long-term performance, it has been ranked fourth. The reason for this is its very

low recycling. Policymakers should use advertising, education, etc. to increase the collection rate of recyclable products. In order to improve their performance, the system needs to produce and at the same time increase the recycling rate. Education and public investment can help in this regard. Also, it should improve its performance in terms of SPI indicators. The province also improves access to basic medical care, food, water and housing. Also, they should provide access to basic education and even advanced education for those in the country who wish to increase their knowledge and skills. According to the results, it is suggested that other Persian Gulf areas improve their performance in recycling. The country's data shows that they recycle less than 10% of their production. It is suggested to evaluate the performance of the Persian Gulf with Europe for a better explanation. It is also suggested to use other indicators of reuse in calculating circular economy performance. Since it is new for environmental management and circular economy at the study level. This means that the special indicators of recycling evaluation and SPI indicators in previous years are different from previous years and practically will not reach a comparative output. For this purpose, it is suggested that future researchers study in different years with an interval of 5 years in the same field and compare the results of different years. However, there is no validity and reliability of this research. But more thought is needed in generalizing the results.

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