Exploring the GCC Progress Towards United Nations Sustainable Development Goals

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Abstract

The United Nations 17 Sustainable Development Goals were agreed in 2015 by all the members' countries to be achieved by 2030. The results of several reports reveal that some countries are making good progress to achieve these goals, the progress of others is low and most likely they will not be able to achieve these goals by the deadline if serious actions are not taken. The purpose of this article is to explore the progress of the Arabian Gulf region towards these goals and identify the Goals in which the region has major challenges. A qualitative research approach using PRISMA compliance is adopted to extract the region's progress and commitment from 91 different documents. The results show that the region has major challenges in four Goals. Specific issues associated with these goals and the GCC countries plans to overcome these issues are discussed in the paper.

Key Words: Sustainability, Environment, Fossil fuels, Renewable Energy, Sustainable Development Goals, Zero hunger, Clean water and Sanitation, Responsible consumption and production, Climate action, GCC Region.

1. Introduction:

The approach of sustainability was first truly appeared in the Brundtland Commission Report, published in 1987. This report was submitted to the United Nations 42nd General Assembly session. This report truly aimed to warn the countries about the negative environmental impact caused by economic development and globalization. The report further aimed to provide solutions to the problems arising from industrialization, urbanization and population growth (Brundtland Commission, 1987). The idea of sustainability developed in the early 1980s as reported in the International Geosphere-Biosphere Programme can be defined as "meeting fundamental human needs while preserving the earth natural environment" (IGBP, 1999). Since the earth's population is increasing, it is putting pressure on the earth's resources. According to the World Economic Forum, it is estimated that food production will need to double by 2050 to feed 10 billion people on the earth (WEF, 2018). Today, sustainability has three essential pillars including environmental protection, social development, and economic growth and sustainable development can be been defined as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Sachs, 2015). The need for sustainable development is truly recognized by all countries and thus in 2015; the United Nations was able to introduce seventeen Sustainable Development Goals (SDGs) to be achieved by 2030 (UN-SDG, 2015; Umar et al., 2020). These goals along with its target and leading

indicators that help to assess the progress of each goal are summarized in appendix 1. Most of the United Nations SDGs are closed to the engineering profession or in other words, the engineering profession and community have a wider role to achieve these goals. Many professional engineering organizations have already incorporated the requirement of sustainable development in professional engineering practices (Cruickshank and Fenner, 2007; Head, 2009). For instance, in 1994, the American Association of Engineering Societies issued a statement titled "The Role of the Engineer in Sustainable Development" which proclaimed that sustainable development requires "dramatic changes in the culture of engineering (McIsaac and Morey, 1998). Similarly, the Institution of Civil Engineers in the United Kingdom has incorporated the 'Sustainable Development' as one of the attributes which need is mandatory for Chartered Engineer registration. Under this attribute, the candidate required to demonstrate, (i) a sound knowledge of best practice in sustainable development, (ii) manage engineering activities in a way that contributes to sustainable development and (iii) lead continuous improvement in sustainable development (ICE member attributes, 2019).

There has been some significant progress on the United Nation SDGs made globally as reflected in the SDGs Report for 2018, however, some commitment towards some goals have also been dropped which may have an impact on the overall achievement by 2030 on those specific goals (TSDGR, 2018). For instance, some goals and indicators reflect good progress at a specific country level. For example, in the United States, the annual mean level of fine particulate matter (PM2.5) dropped to 9 micrograms per cubic meter, which was 15.7 micrograms per cubic meter in 2016 (EPA, 2017). On the other hand, the performance of some goals and their indicators has drooped down when compared at the global level. For instance, the progress of the goal 6, which aims to "ensure availability and sustainable management of water and sanitation for all" reflect that the funding commitments to the water sector dropped by more than 25% from 2012 to 2016. Similarly, the progress of the goal 11, which is related to sustainable cities and communities, reflect that between 2000 and 2014, the proportion of the world's urban population living in slums declined by 20% (from 28.4 to 22.8%). However, the rate of new home construction lagged far behind the rate of urban population growth, and the number of people living in slums increased from 807 million to 883 million over this period. The majority of those living in slums are located in three regions: Eastern and South-Eastern Asia (332 million), Central and Southern Asia (197 million) and sub-Saharan Africa (189 million). Similarly, Data from 214 cities or municipalities in 103 countries show that about three-quarters of municipal solid waste generated is collected. In sub-Saharan Africa, less than half of all municipal solid waste generated is collected, with adverse effects on the health of residents. Moreover, even when waste is collected, it is often not treated and disposed of in a sustainable and environmentally sound manner. Managing such waste continues to be a major challenge facing urban areas in several regions.

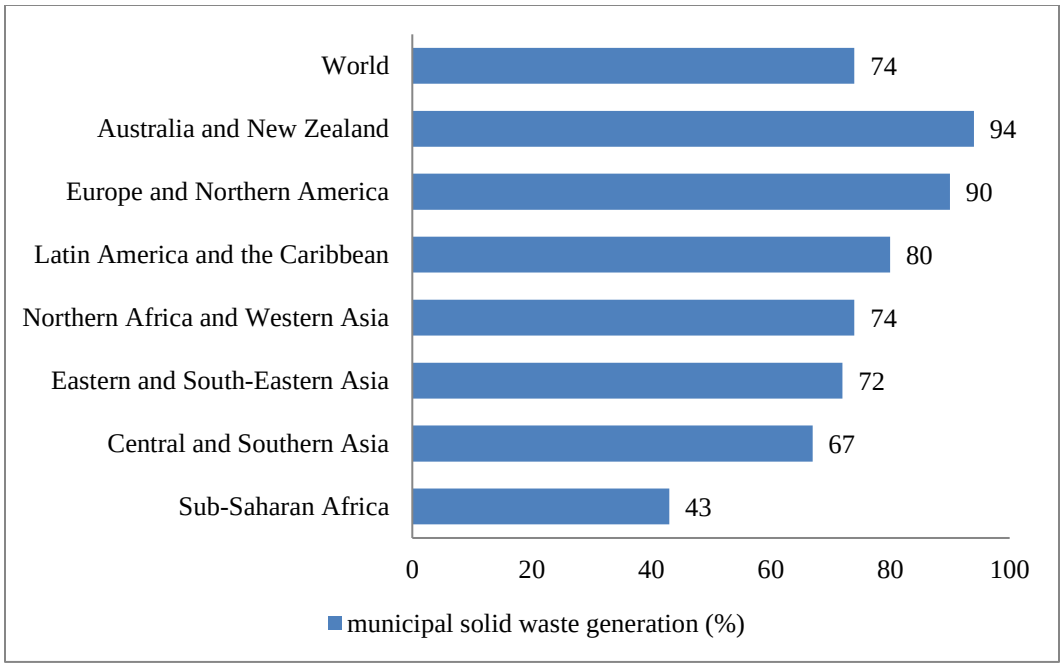

Figure 1: Proportion of the municipal solid waste generated that is collected, 2001–2015 (data from 214 cities/municipalities in 103 countries) – (TSDGR, 2018)

1.1. An Overview of the GCC Region:

According to the SDG Index and Dashboards Report, no country is on track towards achieving all the United Nations SDGs while countries with conflicts are experiencing the sharpest reversals in their progress (SDGIDR, 2018). At the outlook of the Gulf countries, they are normally recognized as high consumer of the earth resources and as the main contributor to CO_2 emission, and their low progress towards SDGs, however, some countries in gulf region have recently demonstrated their commitment towards these goals (Salahuddin and Gow, 2014; UAESDG, 2019). The GCC consist of six different countries in the Arabian Gulf including the United Arab Emirates, Saudi Arabia, Qatar, Oman, Bahrain and Kuwait (Umar et al., 2019-a). In relation to high consumption of natural resources, a study conducted by Umar and Wamuziri (2016), while exploring the wind and solar energy resources in Oman, particularly noted that energy consumption in GCC (Gulf Cooperation Council) is more than the double of the consumption in China and United Kingdom. Due to the high level of energy consumption, the average CO_2 emission per capita is GCC countries is (= 25.36 tonnes) is three times greater than the CO_2 emission per capita in China (= 7.5 tonnes) and almost four times greater than the CO_2 emission per capita in the United Kingdom (= 6.5 tonnes) – figure 2. Some research studies noted that much for the electricity in Oman are produced from oil and gas, which are neither renewable nor sustainable therefore these studies explore the geothermal and biomass resources for electricity production in Oman (Umar, 2018-a; Umar, 2018-b). On the other side, countries such as the United Kingdom have raised the percentage (%) of the total energy consumption from renewable sources to 8.6% which was only 1.3% in 2000 (ONS, 2017). The global

commitment towards sustainable energy is well demonstrated by Umar and Egbu (208-a), however, they also noted that GCC countries have not yet submitted their intended action plan required under the United Nations Framework Convention on Climate Change (UNFCC, 1992). The United Nations under goal 7, aims to reduce the adverse per capita environmental impact of cities, including paying special attention to air quality and municipal and other waste management. In relation to this goal, the overall Gulf region's progress is, however not satisfactory. The annual solid waste generation in the Gulf region has exceeded 150 million tonnes. GCC countries including Saudi Arabia, Kuwait, United Arab Emirates, Qatar, and Bahrain featuring among the world's top ten per capita waste generators (figure 3). Lack of legal and institutional frameworks has been a major stumbling block in the progress of the waste management sector (Zafar, 2018). The per capita production of municipal waste in top GCC cities, such as Riyadh, Doha, Abu Dhabi, and Dubai, is more than 1.5 kg per day which is among the highest worldwide (Zyoud et al., 2015). Across the region, the recycling sector is underdeveloped and hardly 10–15 percent of the waste is recycled (Zafar, 2015).

The above discussion clearly reveals that GCC countries' progress towards the United Nations SDGs could be comparatively slow. This article, therefore, aims to explore the current progress of the region using a qualitative research approach. The progress of the GCC countries towards United Nations SDGs is reported in this article. The next section of the article explains the research methodology adopted in this research.

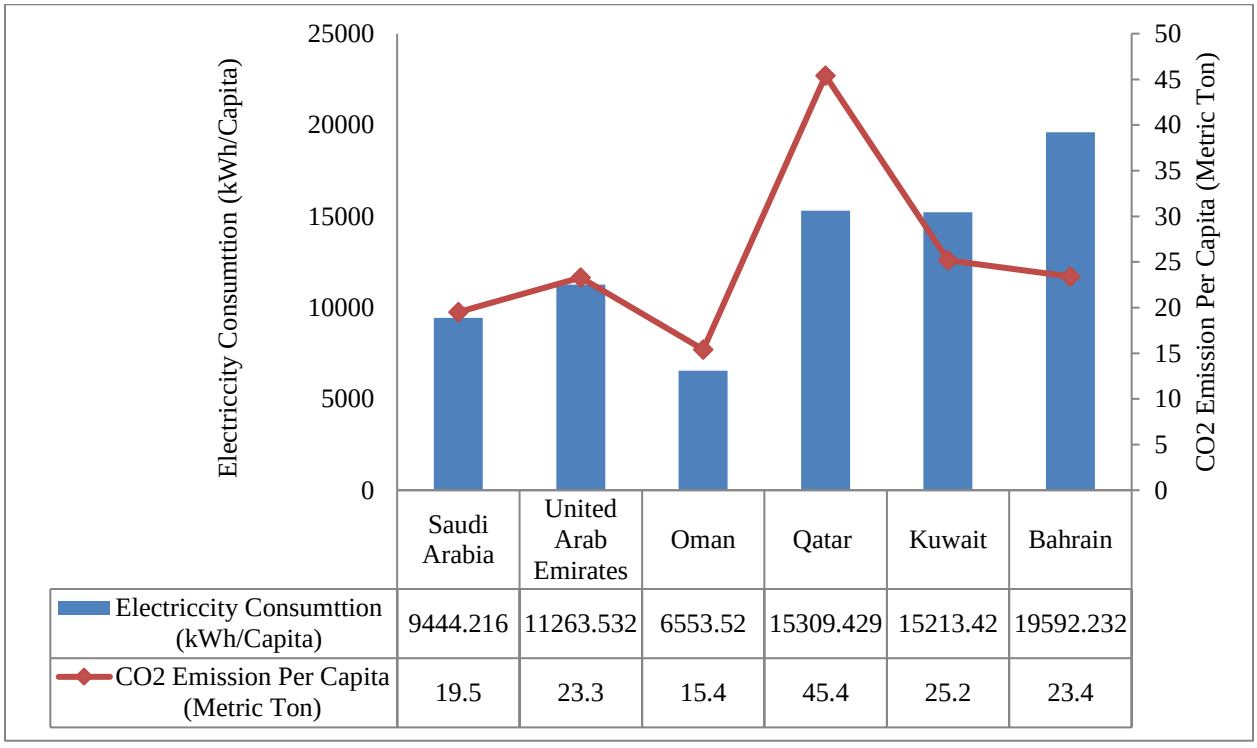

Figure 2: Electricity Consumption and CO_2 Emission Per Capita in Selected GCC Countries (WB, 2014-a, WB, 2014-b)

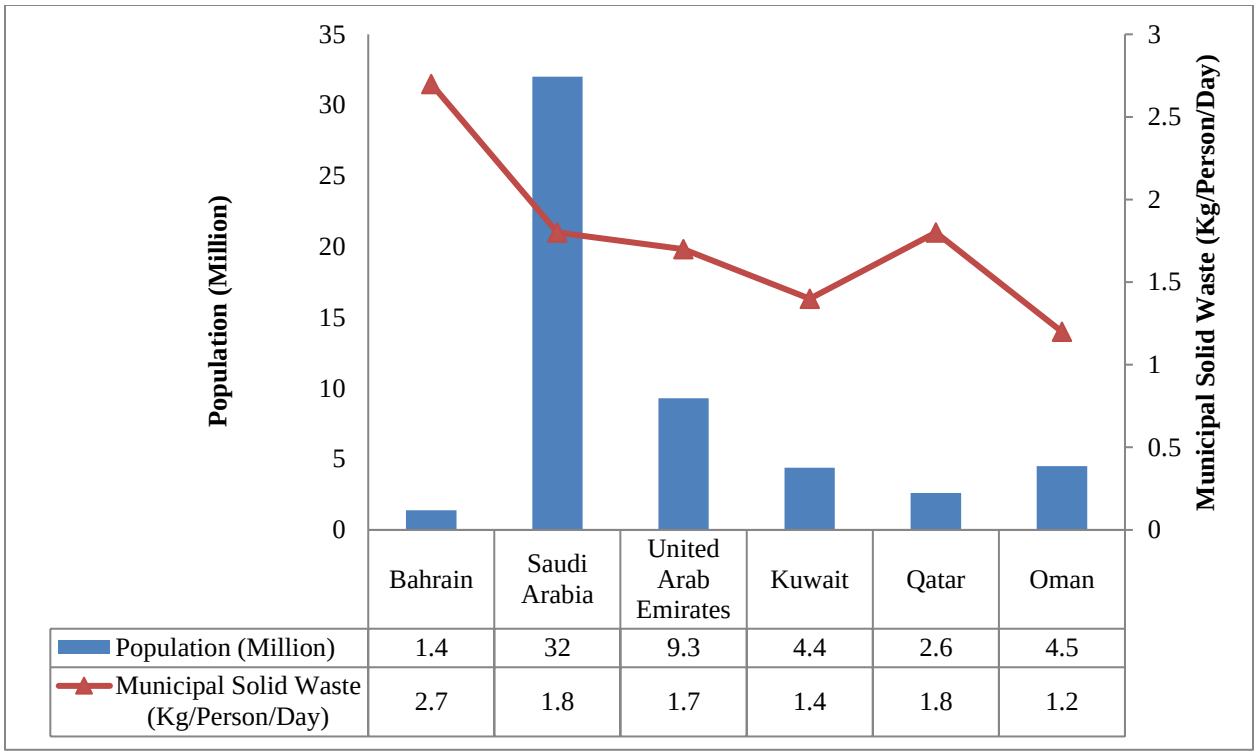

Figure 3: GCC Population VS Municipal Waste Generation (Zafar, 2018)

2. Research Methodology:

The main aim of this research was to explore the progress of the GCC region towards the achievement of the United Nations SDGs. To achieve the aim and objectives of a study, there are several methodologies open to the researcher for the collection of data. Gittins (1997), noted that choosing the appropriate research methodology is important, as it determines the research methods to be adopted in the research. When choosing an appropriate research methodology the two main factors to be considered important as noted by Remenyi et al. (1998). These factors are; (i) The specific research questions, and ii) the topic to be researched. While reviewing the research methods, Jobber (1991) argued that it is wrong to claim that one method is superior in abstract terms, as every method has its strengths and limitations. In this research, the researcher has chosen to lean qualitative methodology as the most appropriate research philosophy. This research seeks to explore the progress and commitment of the GCC countries towards United Nations SDGs.

Similarly, this research adopted an interpretive approach which is the research philosophy for this study. This is because the interpretive approach allows for an in-depth perusal of the details of the situation and an attempt to understand the reality or perhaps a reality that influenced that situation. From the interpretive view, it is important to explore the subjective meanings that motivate people's actions, for a better understanding of their actions. Furthermore, for this study, the research strategy applied is the descriptive approach since the study aims to collate first-hand information from the multiple projects and its team in different construction organizations. Although the epistemological position of this research leans towards interpretivism and deploys

the qualitative strategy, combining it with some aspects of quantitative strategy from positivism provided a richer outcome, as adopting just one paradigm may offer a limited window to the research (Mingers, 1997). This enabled the study to understand and analyze some quantifiable views, which are also important objectives of this study.

Overall the aims and objectives of this research were accomplished using a qualitative research method as averse to a quantitative method. Concisely, the difference between these two research methods is given below (Bryman, 2016). Quantitative research stresses quantification in data collection and examination. It takes a deducible way to the connection among theory and research and stress are kept on the confirmation of theories. The quantitative research method integrates the norms and practices of the natural scientific model and positivism. It views social phenomena as an outer objective truth (Cooper et al., 2006; Umar and Egbu, 2020). On the other side, a qualitative research approach stresses on words and contexts despite quantification in data collection (Opdenakker, 2006). It stresses an introductory approach in the relationship between theory and research and focus is settled on the formation of theories. The majority of the researchers prefer to incorporate both qualitative and qualitative methods, referred as a combined research method and highly appreciated in the literature due to certain advantages (Umar and Egbu, 2018-b). Since the research presented in this paper is exploratory in nature, a qualitative method was considered as the most suitable method to collect the data (figure 4).

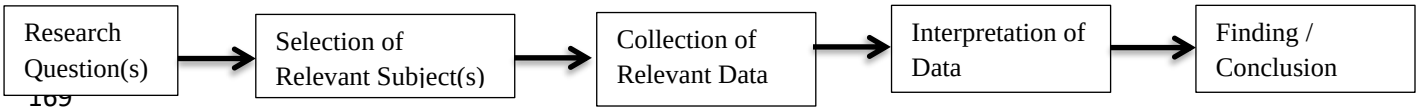

Figure 4: Process of Qualitative Research Adopted

To collect the relevant data, an internet search was employed. Since the United Nations SDGs were adopted in 2015, therefore the search period was kept from 2015 to 2019. Different terms such as "GCC (using each GCC country name) Sustainable Development Goals", "Sustainability in GCC countries (using each country name)" and "Sustainability Progress of the GCC (using each country name)" were used for the search purpose. For each item, the 200 items were considered to be further refined using the screening process. This approach was adopted due to the fact that in most cases the search engines provide a large number of the result. It is almost not possible to consider such a large number of any study. Thus, it was considered reasonable that for each item, the first 200 results will be used for further screening. The ranking and the score of the GCC countries in the United Nations SDGs in the year 2016, 2017, 2018, and 2019 were extracted from Global SDG Index and Ranking developed by a Germany based organization called Bertelsmann Stiftung. The world ranking towards United Nations SDGs developed by this organization used some of the most reliable data from the World Bank, WHO, and ILO. Similarly, goals in which most of the GCC countries are facing major challenges were identified from this database and then compared with the latest progress report presented by these countries in the United Nations.

To ensure that a systematic review process is adopted in this study, the research method for the review was guided by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The PRIMA guidelines required to follow a four steps process to include the final of

studies in the systematic review and meta-analysis (Moher et al., 2009). The data and documents found in the search were screened using the criteria that it should be published or created by a legitimate source and should be relevant to the GCC sustainability progress. All the relevant information either published as a document or a web page was considered provided that they pass the screening process. Using this criterion, all the data and publications available from the government organizations, ministries, independent government entities, independent non-government organizations and research publications relevant to the area of the study were considered. The data from research papers were only considered if the paper was published in the journal indexed in the Scopus or Web of Science. Descriptive analysis was conducted to compare the GCC progress with other countries both at the global level and regional level. The next section of the paper provides the result and discussion derived from the adopted research methodology.

3. Results and discussion:

The first term "GCC sustainable development goals" has given a total search result of 1,680,000. Similarly, the term "Sustainability in GCC" has given a total search result of 3,620,000. The last term "Sustainability Progress of the GCC region" provided a total search result of 4,830,000. Of course, all these items were not easy to be considered in the review process. Thus a criterion for selecting the top leading items was considered. The first 200 results of each item were considered for further screening process (figure 5). Thus the raw number of the result stands at 600 (N = 600). At the first screening process stage, the duplicate items/records equal to 238, were removed. Thus the eligible items/records for screening purpose was 362 (N = 362). At this stage, the screening criteria as described in the methodology section was applied, which resulted in the removal of 112 items/records (N = 214). At the eligibility stage, a total of 123 items were considered not to be eligible for further consideration. Thus the final items/records left for the qualitative and quantitative analysis were, therefore, stood at 91 (N = 91). The GCC progress towards United Nations SDGs, extracted from these items/records (N = 91) is highlighted in the next section.

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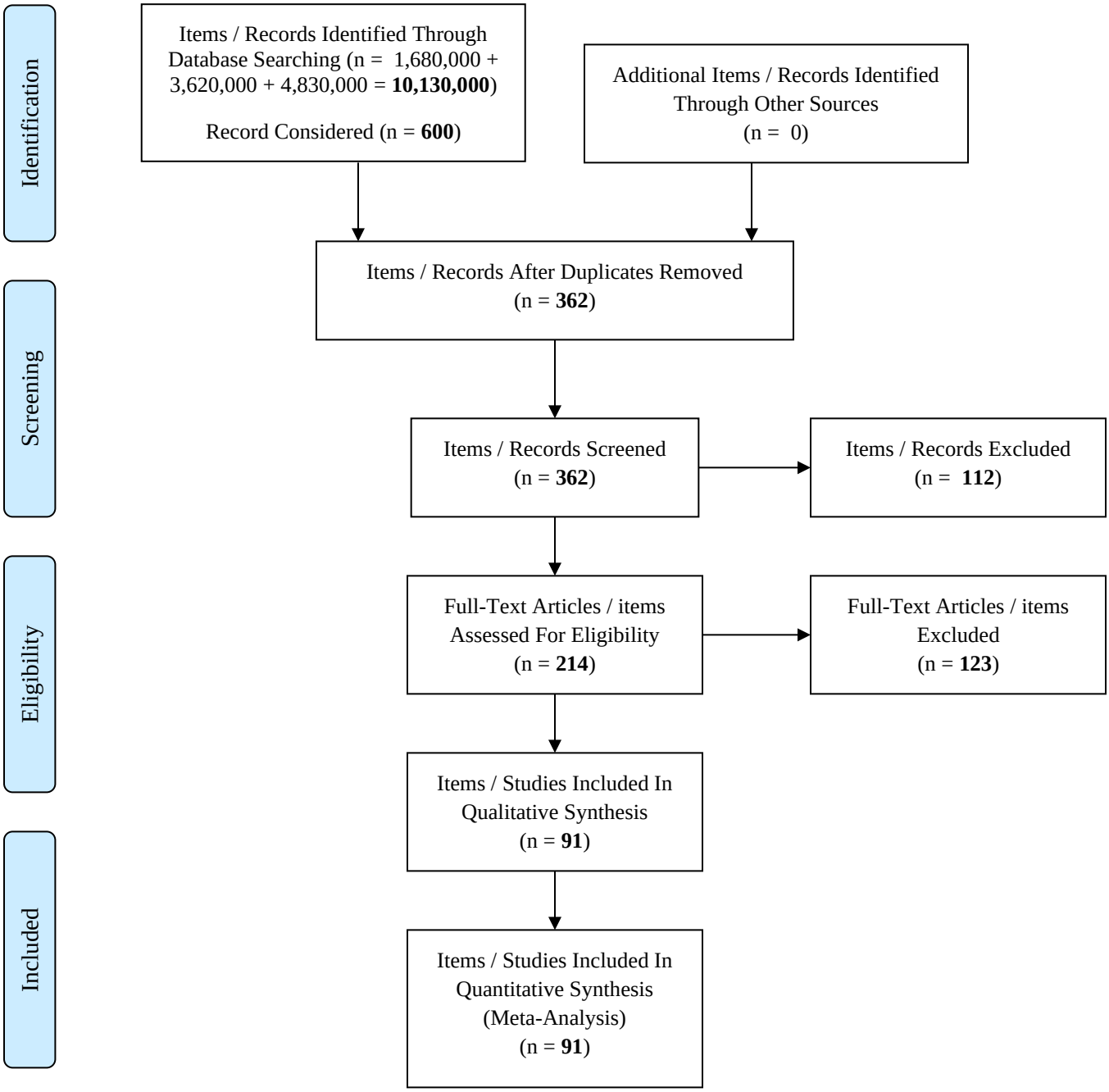

Identification
Screening
Eligibility
Included
Items / Records Identified Through Database Searching (n = 1,680,000 + 3,620,000 + 4,830,000 = **10,130,000**)
Record Considered (n = **600**)
Additional Items / Records Identified Through Other Sources (n = 0)
Items / Records After Duplicates Removed (n = **362**)
Items / Records Screened (n = **362**)
Items / Records Excluded (n = **112**)
Full-Text Articles / items Assessed For Eligibility (n = **214**)
Full-Text Articles / items Excluded (n = **123**)
Items / Studies Included In Qualitative Synthesis (n = **91**)
Items / Studies Included In Quantitative Synthesis (Meta-Analysis) (n = **91**)

Figure 5: PRISMA Process Adopted in the Research

3.1. GCC' Progress Towards UN Sustainable Development Goals:

The first progress report and ranking report on the United Nations SGDs issued in 2015, which considered the progress of 34 member countries, indicates that there was no country in the list from the GCC region. This was due to the fact that there was limited or no data from this region to be considered in the report, and secondly, this report aimed to assess the rich countries that they are ready towards United Nations SDGs (Kroll, 2015). In the second global report and raking of United Nations SDGs, five out of six GCC countries including Saudi Arabia, Oman, Kuwait, United Arab Emirates, and Qatar was included. Regionally, Qatar was leading the GCC region with its global ranking to 49 with a global index score of 65.8 (0 – 100). Qatar was followed by the United Arab Emirates with a global ranking of 55 and a global index score of 63.6 (Sachs et al., 2016). The global ranking of Kuwait was 100 with a global index score of 52.5. A total of 149 countries were considered in this ranking while a total of 44 countries were excluded from this ranking due to several reasons. Bahrain was excluded from SDG Index and Dashboards due to insufficient data. Overall, at the regional level, the United Arab Emirates was able to secure the second position in the GCC region based on its global score and ranking (figure 6). Based on the global ranking, the GCC countries were in the rage of 55 to 100. Similarly, based on the global index score these countries score was in the rage of 52.5 to 65.8.

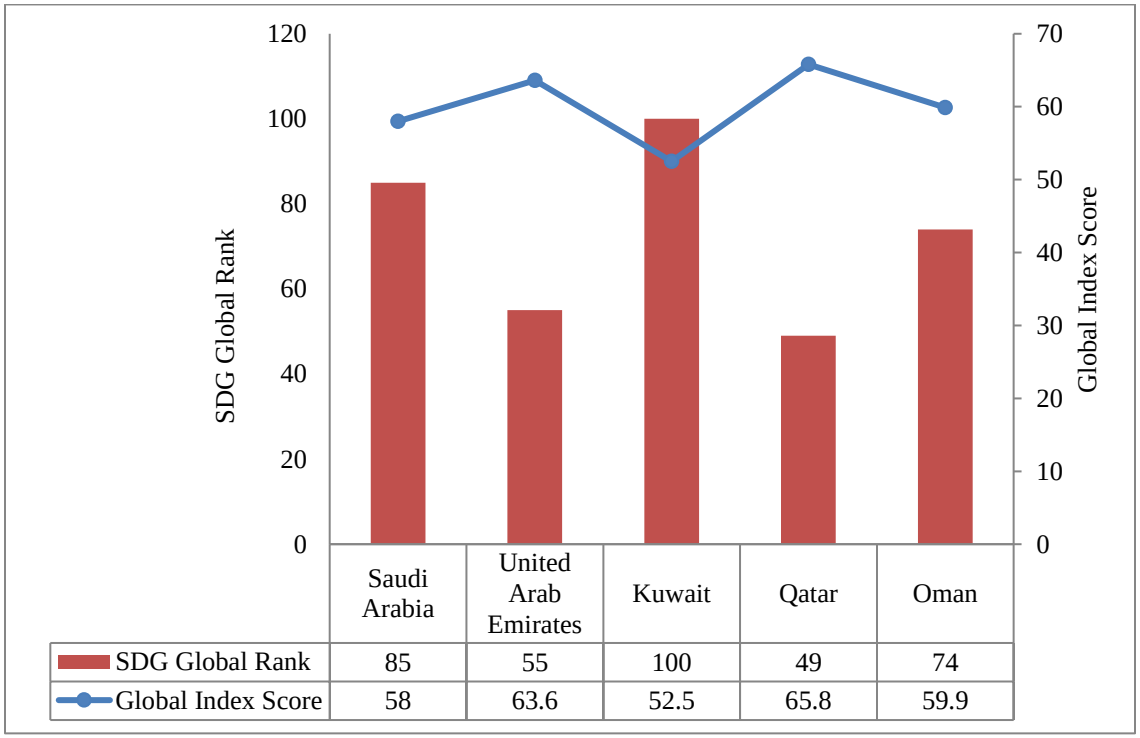
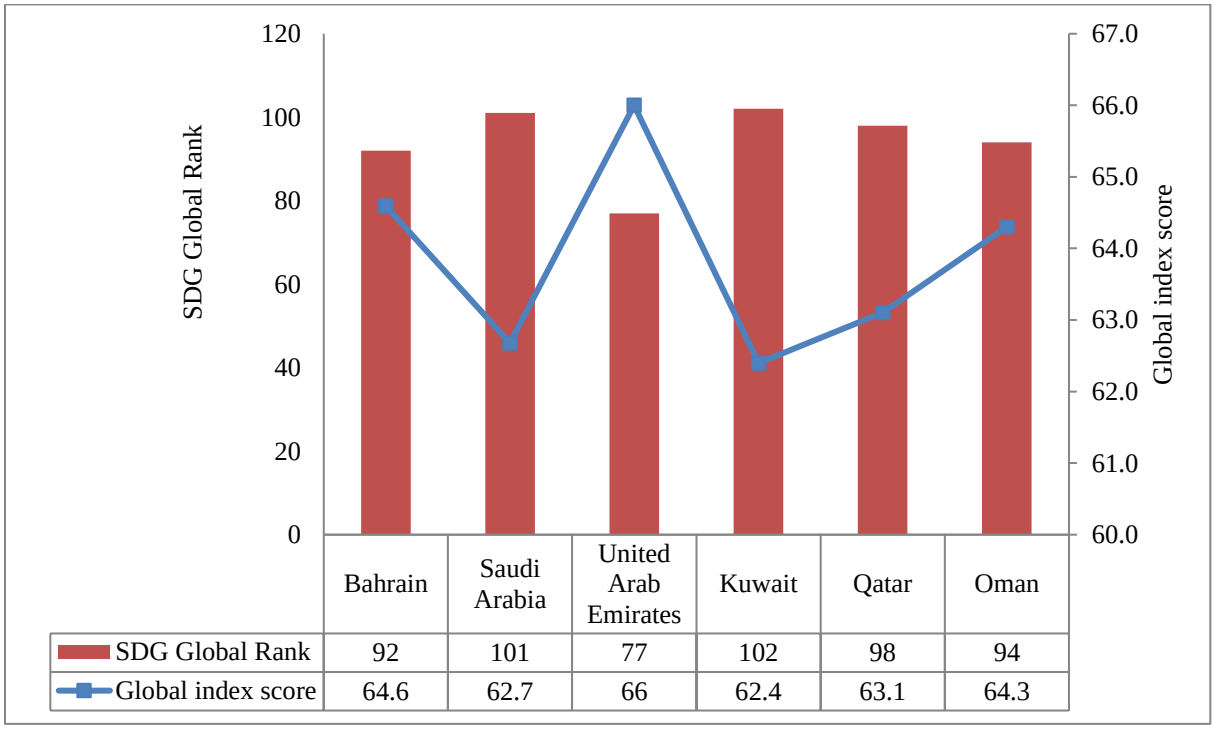


Figure 6: Global SDG Index and Ranking of GCC Countries (2016)

All the GCC countries were included in the 2017 SDGs Index and Dashboards which considered a total of 157 countries around the world. The United Arab Emirates was leading the GCC region with a global ranking of 77 and a global index score of 66.0 (0 – 100) (Sachs et al., 2017). The United Arab Emirates was followed by Bahrain with a global ranking of 92 and a global index score of 64.59. Kuwait was ranked 102 with the lowest global index score at the regional level of 62.39. Overall the raking of all the GCC countries as compared with 2016 raking has been declined, however, at the same time, the 2017 global index score of the GCC countries stands at 63.84±1.25. The same score in 2016 global index for the GCC region was 59.96±4.62. While comparing the GCC ranking and score of 2016 with 2017, it needs to be kept in mind that in 2016, the number of countries which were considered in the raking was 149, while in 2017, this number was 157. Similarly, Bahrain was not included in the 2016 raking and indexing. At the same time, this also reflects that some countries outside the GCC region have achieved good progress as compared with the GCC countries. At the GCC region level, based on its global ranking and global index score, the United Arab Emirates was able to take the first position from Qatar in 2017 as shown in figure 7.



	Bahrain	Saudi Arabia	United Arab Emirates	Kuwait	Qatar	Oman
SDG Global Rank	92	101	77	102	98	94
Global index score	64.6	62.7	66	62.4	63.1	64.3

Figure 7: Global SDG Index and Ranking of GCC Countries (2017)

Based on the 2018 global SDGs Index and Dashboards report, raking and the index score of all the GCC countries, the mean value of the global index score of the GCC region stands at 63.96±2.90. As shown in figure 8, the United Arab Emirates was leading the region with a global ranking of 60 with a global index score of 69.2 (0 – 100) (Sachs et al., 2018). The mean global index of the GCC region in 2018 is slightly improved; however, the mean global ranking of the

region is jumped by four points and reached 90 which was 94 in 2017. This was the first time when all the United Nations member countries (193) were covered in the development of global index score and ranking. Globally, Sweden was ranked first with a total index score of 85. The GCC countries' ranking was in the range of 60 to 106. Similarly, the global index score of the GCC countries was in the range of 61.10 to 69.2 (figure 8). The ranking of some of the countries in the region such as the United Arab Emirates, Saudi Arabia, and Bahrain is improved; however, the ranking of other countries including Kuwait and Qatar was reduced. Based on the 2018 global index report, Oman was ranked at 94, which is the same raking as it was given in 2017.

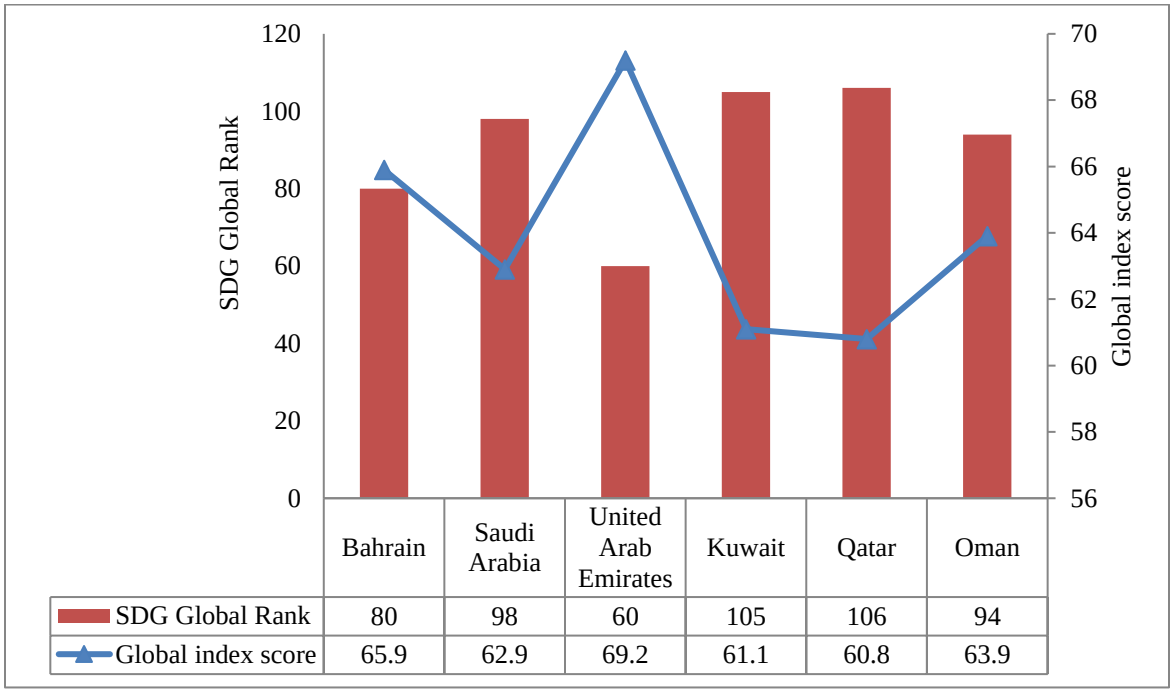


Figure 8: Global SDG Index and Ranking of GCC Countries (2018)

The 2019 sustainable development report shows that Demark was able to take up the first ranking from Sweden. The global index score for Denmark stood at 85.2, while the Sweden score was 85 (Sachs et al., 2019). The report covers all 193 member countries of the United Nations. The GCC region mean global index score was 66.76±2.23. As compared with the previous year, the mean score of the GCC region increased by approximately three points which indicates that there is some progress towards the United Nations SDGs. The United Arab Emirates was leading the region with a global index score of 69.7 and global raking of 65. The United Arab Emirates was followed by Bahrain which has a global index score of 68.7 and a global ranking of 76. Kuwait achieved the lowest score (= 63.5) and ranking (= 106) in the region as shown in figure 9.

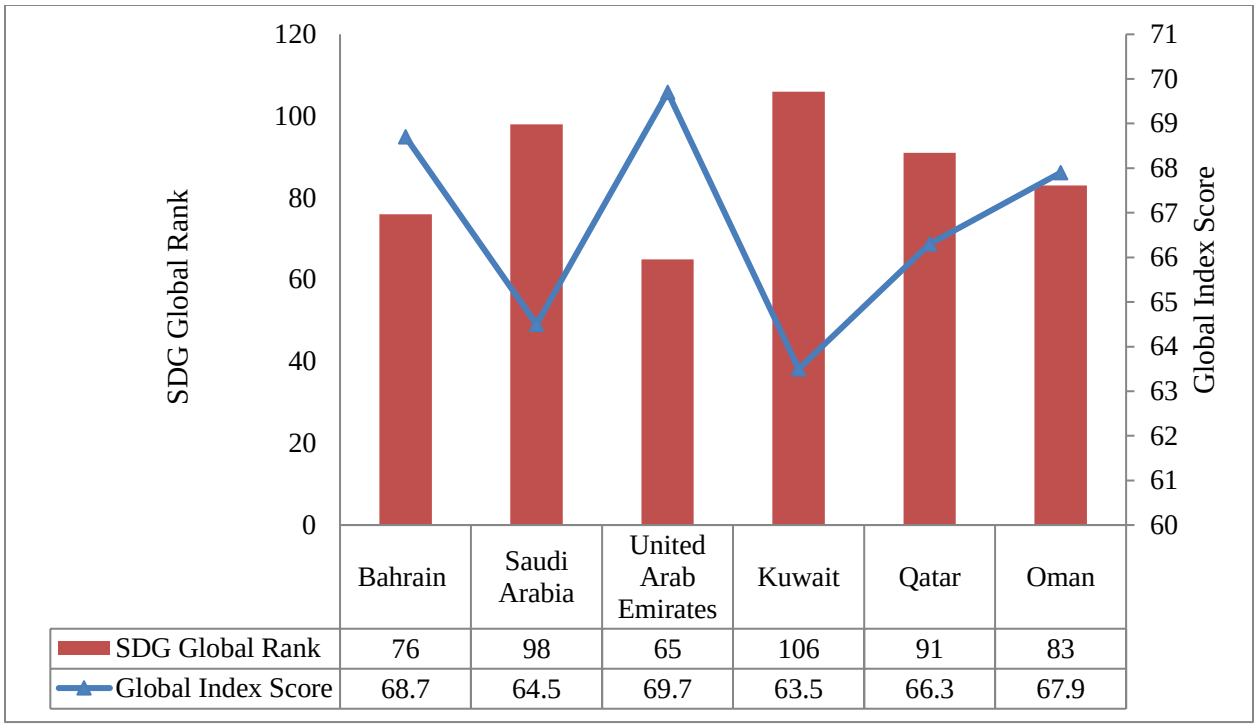


Figure 9: Global SDG Index and Ranking of GCC Countries (2019)

To effectively reflect the progress of the GCC region on each United Nations SDGs, the mean score of each seventeen goals are considered. The region achieved maximum means score (= 90.75) in Goal 4 (Quality Education). The quality education and sustainability in higher education institutions are viewed as the base for achieving the United Nations SDGs (Umar 2020). As discussed by Jose and Chacko (2017) better allocation of government funding based on quality parameters and effective deployment of resources can lead to a better return on investment from the higher education sector. The United Arab Emirates is one of the advanced country in the region but according to the Global Competitiveness Index Rankings, the overall quality of the Emirates primary and higher education has reduced in 2017-2018 as compared to 2016-2017 (PWC, 2018). Similarly, a report on the cost of education in Emirates published by Hong Kong and Shanghai Banking Corporation (HSBC) noted that the school fees in the country are second highest in the world. The total cost of education from primary to university level is US$ 99,378. Moreover, 65% of the parents in the Emirates like send their children abroad to complete their studies (HSBC, 2017).

The GCC minimum mean score (= 48.35) in Goal 5 (Gender Equality). As shown in figure 10, there is no enough data to score the Goal 1 (No Poverty). The region means score on Goal 2 (Zero Hunger) is 57.21 ± 7.26. Bahrain was able to achieve the maximum score (= 67.4) in Goal 2, while Saudi Arabia score (= 45.6) was the lowest in the region considering the same goal (Goal 2). The report indicates that there are major challenges still remain with Goal 2 in the region. The score of the goal is moderately increasing, however, insufficient to attain the goal in due course of time. The GCC mean score for Goal 3, which is related to the good health and

wellbeing, was 85.60±2.88. In the region, Bahrain achieves the maximum score of 90.4 in this goal (Goal 3), while the lowest score which is 81.6, is scored by Saudi Arabia in the same goal. There are challenges remain in the region with Goal 3, the score of the goal in different GCC countries is increasing, but it is not sufficient to achieve the goal by 2030. Similarly, the mean score of the region in Goal 4 (Quality Education) is 90.75±4.71. Saudi Arab is leading the region in quality education with a global index score of 97.6. The United Arab Emirates with a score of 85.7 is placed lowest in the region. France, which is ranked at 4th based global ranking of 2019, has a score of 97.4 in Goal 4, lower than Saudi Arabia (= 97.6). Overall, there are significant challenges remain in the region associated with Goal 4, the score is improving but at a slow rate, which puts the achievement of the goal at risk. As noted above, the region has the lowest mean score (= 48.35) in Goal 5 (Gender Equality). The maximum score in the goal is achieved by Qatar (= 57.6), while the lowest score belongs to Oman (35.8). There are some major challenges in the region associated with this goal.

The mean score of the region associated with Goal 6 that is related to clean water and sanitation, is 51.83±6.26. There are also major challenges remain in most of the GCC countries, however, the data reveals that the goal is on track in all these countries will be able to achieve the goal by 2030. The mean score of the region in Goal 7 (Affordable and Clean Energy) is 90.08±2.34. Bahrain (= 93.7) and Oman (86.7) secured the highest and lowest score based on the score of all GCC countries. Demark, which is ranked first in the 2019 ranking, has a lower score (=93.6) in Goal 7 than the score of Bahrain. Despite the fact that GCC countries have a good score in Goal 7, there are challenges remain in this goal as the score of the goal is not increasing at the required speed to achieve the goal in 2030. The GCC region is rich in oil and gas reserve and much of the energy such as electricity is heavily subsidies by the governments in the region (Umar et al., 2019-b; MEDC, 2019). Similarly, there are challenges remain Goal 8 (Decent Work and Economic Growth) in all GCC countries and only the United Arab Emirates appears to be on track to achieve the goal by 2030. The mean score of the region in Goal 8 stands at 71.15±7.68. Bahrain achieves the maximum score (82.3) in the region while the score of Kuwait was the lowest (56.3) as compared to other GCC countries. Comparatively, the region's mean score (52.05±6.70) in Goal 9 which is reacted to industry innovation and infrastructure, is lower when compared to other goals. The United Arab Emirates was leading the goal with a score of 60.8 while Bahrain achieved the lowest score (43.2) in the region. While there are challenges remain in the goal, in some of the GCC countries such as Saudi Arabia and the United Arab Emirates, the goal is on track to be achieved by 2030. While Goal 10 (Reduced Inequalities) is one of the important goals, there is a lack of data in most of the GCC countries and thus the goal is scored only for Oman and the United Arab Emirates. In most of the GCC countries there are challenges with this goal and as such if not properly focused, will be difficult to achieve in the agreed deadline.

In Goal 11, which is associated with the Sustainable Cities and Communities, the GCC region was able to achieve a mean score of 55.06±16.23. The goal was led by Oman with the highest

score of 77.5, while the Qatar score which stands at 35.5 and was the lowest in the region. Overall, significant challenges remain in the goal for all the GCC countries. The region is in the stage of developing its infrastructures and therefore the construction industry is at peak. There is, however, a great need to focus on the worker's safety and health issues as poor occupational safety and health conditions result in accidents that put a huge burden on the economy (Umar, 2017-a; Umar, 2017-b; Umar, 2020). The responsible consumption and production is the 12th Goal of United Nations SDGs in which the GCC region has major challenges. The overall mean score of the GCC countries in this goal is 53.28±17.25. Bahrain (= 72.10) and Kuwait (22.20) achieve the highest and the lowest scores in the region respectively. The Kuwait score in this goal is the lowest score of any GCC countries in a goal. Goal 13 is another important goal related to climate action. This is one of the goals in which all the GCC countries facing major challenges. In fact, some of the countries' scores are decreasing, thus they are not on the track to achieve the goal by 2030. Overall, the mean score of the GCC region in this goal is 55±12.32. Oman has the highest score (= 71.10) while the United Arab Emirates has the lowest score (= 33.4) of the goal in the region. Significant challenges remain for the GCC countries in this goal.

Goal 14 and Goal 15 of the United Nations SDGs are associated with the life below water and life on earth. There are significant challenges remain in the Goal 14 and Goal 15 in most of the GCC countries. The score of these countries in both goals are increasing; however, it is not enough to achieve the goal by 2030. The mean score of Goal 14 for the GCC region is 54.83±8.32. In Goal 14, Oman achieved the highest score (= 65.10), while the score of Kuwait is recorded as the lowest score (= 42.40) in the region. Similarly, the mean score of Goal 15 in the GCC region is 49.93±6.13. Goal 15 was led by Qatar in the region with a score of 59.50, while the score of Kuwait was the lowest (= 41) in the region. The mean score of the GCC countries in Goal 16 (Peace, Justice and Strong Institutions) is 75.05±5.63. In this goal, the United Arab Emirates achieved the highest score (= 81.50) in the region, while Bahrain achieved the lowest score (= 67.10). The last goal is Goal 17, related to the partnership for the goals. This United Arab Emirates is the only country in the region that has already achieved this goal. Remain GCC countries are facing challenges to achieve this goal by 2030.the current mean score of the GCC region in this goal is 79.55±15.18. Considering Goal 17, the United Arab Emirates achieved the highest score (= 100) in the region, while Bahrain stood at the lowest (= 60.20).

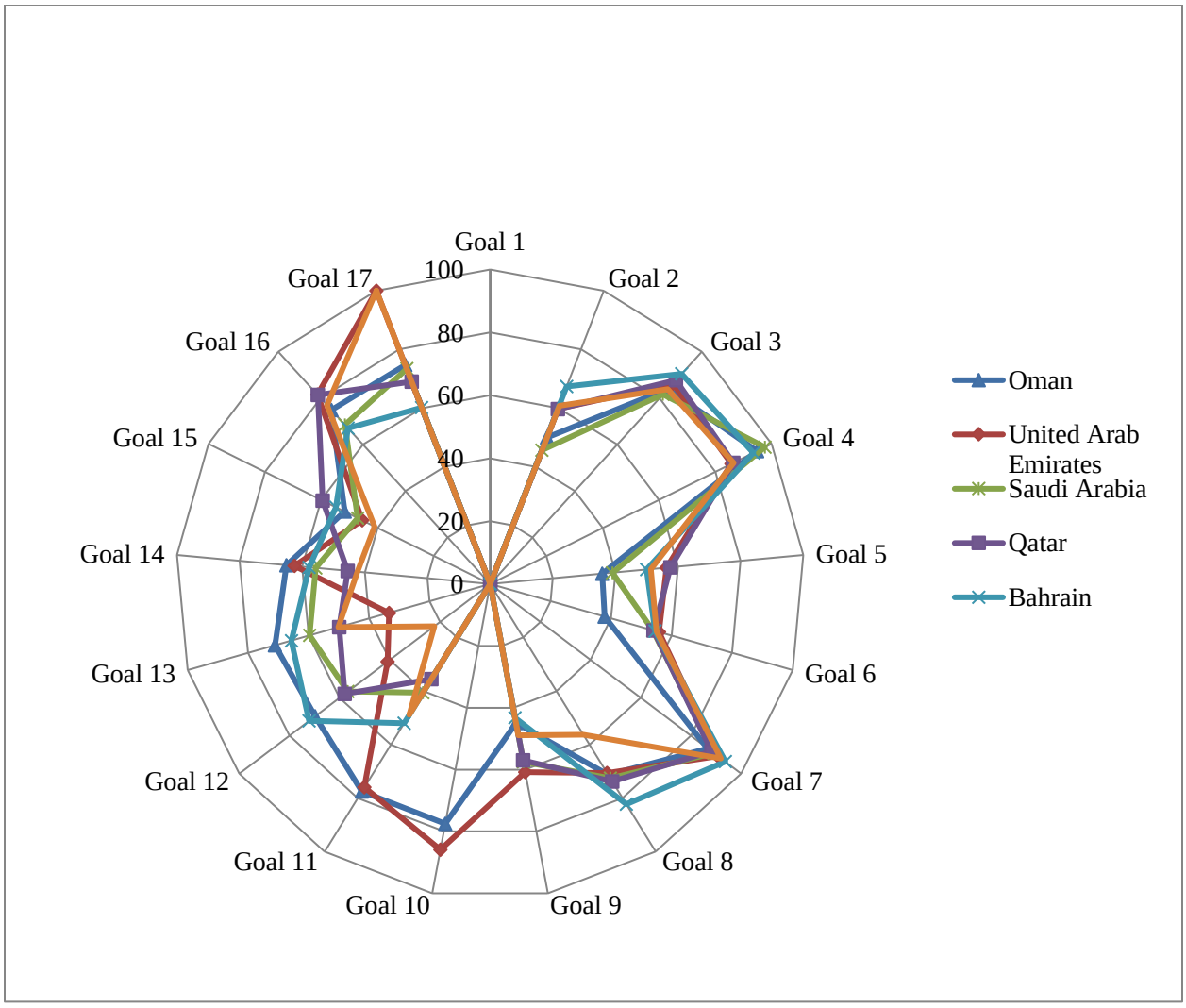


Figure 10: GCC Countries Score of Different UN Sustainable Development Goals

The next section provides an insight into GCC's commitment towards the achievement of United SDGs, especially those which are rated with major challenges. The section also describes some of the key aspects that need to be considered by the GCC countries in order to achieve the United Nations SDGs by 2030.

3.2. GCCs' Commitment Towards United Nations SDGs:

Most of the GCC countries have established an organization that looks after the progress of the SDGs in the country. For instance, Qatar's second voluntary national review was developed by the Ministry of Development, Planning, and Statistics (MDPS, 2018). Similarly, in Oman, the Supreme Council for Planning (SCP, 2019) is working on the United Nations SDGs. Oman's in their latest progress report presented in the United Nations claims that the number of targets associated with 17 goals available in the country is 72. While the number of targets set by the United Nations with all 17 goals is 169. Thus the availability of the targets in Oman stands at

43%. Similarly, a report submitted to the United Nations on Emirates 2030 agenda for sustainable development shows that the country has established a National Committee in 2017, known as "UAE's National Committee on SDGs". This committee has members from all the relevant ministries and government organizations (NCSDG, 2017). Each ministry or organization is responsible for a specific United Nations SDGs which directly or indirectly fall under that ministry or organization jurisdiction. Similarly, Bahrain has established a National Information Committee under the control of the Ministry of Cabinet Affairs which looks after the progress of SDGs in Bahrain. The Saudi Arabia first review report on the United Nations SDGs that was presented in the high-level political forum of the United Nations in 2018 was led by the Ministry of Economy and Planning of Saudi Arabia (MEP, 2018). Similarly, Kuwait has constituted a committee under the chairmanship of the Secretary General of the Supreme Council for Planning and Development (SCPD, 2019). The committee has submitted and presented their first national review of the SDGs in 2019 at the high-level political forum of the United Nations.

The latest reports presented in the high-level political forum of the United Nations by all these organizations of the GCC countries show a high level of commitment to achieve the United Nations SDGs. There are, however, still challenges in some of the goals which are faced by most of the GCC countries. The key goals in which the GCC countries have major challenges identified in section 3.1 are summarized in table 1. All the GCC countries except the United Arab Emirates and Qatar are facing major challenges in five different goals. The numbers of goals in which the United Arab Emirates and Qatar are facing major challenges are 4. There are three goals (Goal 2, Goal 6 and Goal 13) in which are the GCC countries are facing major challenges. Both of these goals are therefore further explored. Similarly, in Goal 12, five out of six GCC countries (83.33%) are facing major challenges. This goal is also therefore considered for further exploration.

Country	**Goals with Major Challenges**				
Oman	Goal 2 (Zero Hunger)	Goal 5 (Gender Equality	Goal 6 (Clean water and Sanitation)	Goal 12 (Responsible Consumption and Production)	Goal 13 (Climate Change
Saudi Arabia	Goal 2 (Zero Hunger)	Goal 5 (Gender Equality	Goal 6 (Clean water and Sanitation)	Goal 12 (Responsible Consumption and Production)	Goal 13 (Climate Change
United Arab Emirates	Goal 2 (Zero Hunger)	Goal 6 (Clean water and Sanitation)	Goal 12 (Responsible Consumption and Production)	Goal 13 (Climate Change	--
Qatar	Goal 2 (Zero Hunger)	Goal 6 (Clean water and Sanitation)	Goal 12 (Responsible Consumption	Goal 13 (Climate Change	--

			and Production)		
Bahrain	Goal 2 (Zero Hunger)	Goal 6 (Clean water and Sanitation)	Goal 13 (Climate Change	Goal 16 (Peace, Justice and Strong Institutions)	--
Kuwait	Goal 2 (Zero Hunger)	Goal 6 (Clean water and Sanitation)	Goal 8 (Decent Work and Economic Growth)	Goal 12 (Responsible Consumption and Production)	Goal 13 (Climate Change

Table 1: Goals with Major Challenges in the GCC Countries

The next sections discuss all the four goals in which the GCC countries facing major challenges.

3.2.1. Goal 2 (Zero Hunger):

One of the key indicators to measure the Goal 2 performance of a country is the bio-capacity per person (Niccolucci et al., 2012). It is important to note that bio-capacity per person in the United Arab Emirates which was 4.7 (global hectare) in 1980 has reduced to 0.6 in 2015. Similarly, in Oman, the biocapacity per person in 1984 was 4 which have reduced to 1.6 in 2016. This has affected the ecological footprint and the value is increased from 6.5 (1980) to 9 (2015) (GFN, 2019). Statistics show that Qatar has the highest ecological footprint (14.4) in the region. Qatar is therefore ranked at 114th based on the total bio-capacity per capita. Overall the mean value of the GCC region biocapacity is 8.91±2.64. Similarly, the National Food Security Strategy aims to bring the United Arab Emirates to the first position in the global food security index by 2051, which currently stood at 31st position (NFSS, 2019; GFSI, 2019). When it comes to natural resources and resilience, the United Arab Emirates is currently stood at the last (106th) in the Global Food Security Index. Qatar, based on its 2019 food security score (= 81.2) however, stood at 13th position in the global ranking. Similarly, cereal yield is measured as kilograms per hectare of harvested land, which includes wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains. In 176 countries, the United Arab Emirates and Oman secured the 2nd and the 3rd position in the ranking issued by Index Mundi in 2017 (Index Munndi, 2017). The data used by the Index Mundi is the same as the data available on the World Bank website. One of the other important indicators relevant to Goal 2 is sustainable nitrogen management. The Environmental Performance Index, based on sustainable nitrogen management raked the United Arab Emirates at the last (177th) in all 177 countries ranked in the index (EPI, 2020). Oman and Qatar stand at 136 and 133 numbers in this ranking. The progress report presented by Saudi Arabia reveals that from 2015 to 2018, the Kingdom has spent US$ 262 Million to secure food in different parts of the world. Similarly, the report of Kuwait on SDGs presented in the United Nations shows that Kuwait has achieved 65.2% of Goal 2. While all the GCC aiming to achieve Goal 2 by 2030, however, the above discussion reveals that Goal 2 (Zero Hunger) is at risk in the region and thus serious efforts are required to achieve this goal in the due course of time.

The next section shed light on Goal 6.

3.2.2. Goal 6 (Clean Water and Sanitation):

Although, according to the 2016 ARCADIS Sustainable Cities Index, Dubai (rank = 52) and Abu Dhabi (rank = 58) were the only cities from GCC, ranked among top 100 sustainable cities and were the top-ranked Middle Eastern cities in the provision of high standards of water and sanitation networks (ARCADIS, 2016). The 2018 raking, however, shows that there are no cities in the top 100 rankings of the ARCADIS Sustainable Cities Index (ARCADIS, 2018). This clearly, reflects that the region was not able to maintain its city's performance. the Emirati Government has realized this therefore recently, the government has launched the Water Security Strategy, 2036 in 2017 (WSS, 2017). The overall objectives of the strategy are to increase water productivity and reduce water scarcity. The Water Security Strategy, 2036 focuses on reducing the total demand for water, increasing the reuse of treated wastewater and increasing the national water storage capacity. The Water Security Strategy, 2036 has also adopted a number of National Key Performance Indicators (KPIs) that measure available storage, municipal consumption, sewage water collection rate, treated sewage effluent reuse rate, reduction in groundwater demand, unaccounted for water, water productivity index and water scarcity index. The Water Security Strategy has also set a target to increase the treated sewage effluent usage up to 95% by 2036 which was 64% in 2016. These KPIs are expected to significantly improve the performance of the country's water sector. Similarly, Qatar claims that all of its populations have access to safe potable water and sewage network. Their report presented in the United Nations shows that in 2017, Qatar was treating 99% of the sewage wastewater. Qatar is further working to enhance the groundwater by collecting and cleaning the surface and rainwater. This water will then be pumped into 400 meter wells to improve the groundwater. Similarly, Bahrain also reported that all of its population has access to clean water and sanitation services. To ensure availability and sustainable management of water and sanitation for all, Saudi Arabia has constructed 508 small and large dams. The current storage capacity of these dams is 2.2 billion m^3 which the Kingdom is planning to increase to 4.5 billion m^3 by 2030. This will involve the construction of new dams in the Kingdom. The current approach of providing potable water, however, may not be sustainable for a longer period due to the adverse effect of desalination. The study carried out by Bashitialshaaer et al., (2011) on the future salinity caused by desalination noted that the brine discharge in the Arabian region will further be raised by 2.24 g/l by 2050. There is also a continuous threat of algal blooms caused by global warming (Laffoley and Baxter, 2016). The harmful algal blooms are only considered as an extreme threat to the water quality but it also a threat for seawater reverse osmosis desalination (Michalak, 2016; Villacorte et al., 2015). Similarly, there is no balance between the groundwater extraction and replacement rate. For instance, in Dubai, groundwater extraction is 12 times more than the replacement rate. Although the government aims to reduce the extraction rate, the target set for this is still non-sustainable. The situation in other GCC cities is almost the same and therefore this goal required specific attention of the government entities.

The next section discusses the commitment of the GCC region towards Goal 12 (Responsible Consumption and Production) with a specific reference to key challenges.

3.2.3. Goal 12 (Responsible Consumption and Production):

Goal 12 is one of the key Goals where the GCC region has major challenges. As discussed in the introduction section, the electricity consumption per capita in all the GCC countries is quite high and most of the electricity production is based on oil, gas, and coal, which further produces a high quantity of emissions. Apart from a high municipal solid waste generation per capita (1.7 kg per day), construction and demolition waste are estimated at 5,000 tonnes per day (Zafar, 2018; Swain, 2018). Similarly, the Central Bank's latest statistics show that the United Arab Emirates petroleum exports (hydrocarbons) grew by 13.9 percent to US$ 66.2 billion in 2019 compared with US$ 58.1 billion in 2017 (ITA, 2019). This high level of consumption of resources increases the ecological footprint and thus only United Arab Emirates required at least 4.5 planets to sustain such consumptions (GFN, 2015). The main problem related to this Goal (Responsible Consumption and Production) is the consumption of natural resources, and this is something because of the consuming culture in the GCC region. Until and unless this culture is changed, reducing waste or recycling would not add any value. The Kuwait report on the SDGs progress indicates that so far the percentage on the achievement of Goal 12 is 28.9%, which is the lowest progress among all other goals. Construction waste is well recognized by Kuwait, and the statistics indicate that in 2016, Kuwait was able to recycle 12.9% of construction waste. Similarly, Saudi Arabia is aiming to process 40% of the waste by 2020. Similarly, the concept of sustainable consumption and production is underlined by the United Arab Emirates' Green Growth Strategy also known as the Green Economy initiative which was launched under the slogan of "A green economy for sustainable development" and the "UAE Green Agenda 2015-2030" (TGE, 2012; UAEGA, 2015). The Green Economy initiative includes six major fields covering a wide range of legislation, policies, programmes, and projects which are:

1. Green Energy which aims to promote the production and use of renewable energy.

2. Government Policies which aimed to encourage investments in the green economy and to facilitate the production, import, export, and re-export of green products and technologies.

3. Developing urban planning policies that preserve the environment and to raise the efficiency of housing and buildings environmentally.

4. Developing new means for dealing with the effects of climate change, promote organic agriculture, maintain biodiversity and protect the ecological balance.

5. Rationalizing the use of water resources, electricity, and natural resources and recycle waste.

6. Development and promotion of green technology.

Oman recognized the challenges associated with Goal 12 in their report on the SGDs presented in the United Nations in 2019. The report indicates that continued dependence of the Omani economy on the oil sector is one of the main challenges to the sustainability of the pattern of production and economic growth in the Sultanate. Population growth, the multiplicity of waste

and inefficiency in the management of available natural resources and the increasing urbanization are putting pressure on the levels of production and sustainable consumption in Oman, Waste management is another challenge because of its negative effects on the environment and public health. The key initiative which Oman is has taken is the waste to energy plant with a capacity of 2,200 tonnes of municipal solid waste per day. While there is a commitment from the entire GCC region towards Goal 12, it is important to keep the same pace to overcome the challenges and achieve the goal by 2030.

The next section describes the GCC commitment towards Goal 13, which is related to climate action.

3.2.4. Goal 13 (Climate Action):

Climate action is one of the other Goals in which the region is facing major challenges. One of the indicators which help to measure climate action is the CO_2 from energy. As shown in figure 2, the CO_2 in the GCC countries is quite large as compared to other countries. This is because most of the energy in the region is produced by fossil fuels. There is great potential in the renewable resources in the region; however, the progress to adopt such resources is comparatively slow. There have been several partnerships across the region between Government and private industrial sectors which reflect that there has been some progress towards achieving Goal 13 (climate action) in the GCC countries. For instance, the partnership between Emirates Global Aluminum and cement factories across the United Arab Emirates has successfully demonstrated the utilization of aluminum waste as an energy source in cement production (Zawaya, 2017). Only this partnership has resulted in a reduction of emission by 10% in each tonne of cement produced. As mentioned in figure 2 and figure 3, resource consumption and waste generation in the whole GCC region is comparatively high. This has negatively affected the environment as shown in figure 11. The amount of particulate matter in Iran, a neighboring country of the GCC region, is 35.10 ug/m^3, which is lower than all countries in the GCC region. The main reason for this is that most of the electricity (almost 100%) in GCC countries is produced from fossil fuels which results in a huge amount of emissions. Different estimates show that 0.0016 barrels of oil is required to produce one kWh of electricity and one barrel of oil produces 0.43 tonnes CO_2 (EIA, 2017; EPA, 2018).

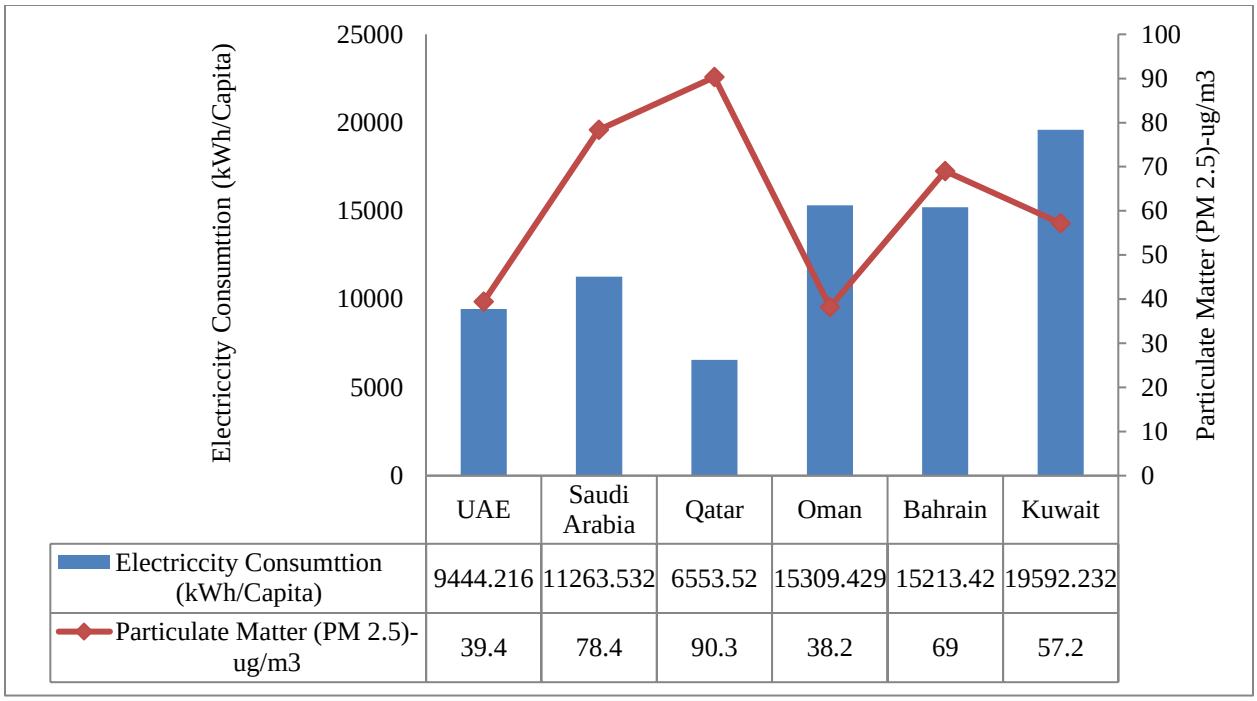


Figure 11: Electricity Consumption and Particulate Matter in GCC Countries (WB, 2014-a, WHO, 2016)

In the GCC region, the United Arab Emirates has initiated some projects related to the generation of energy renewable sources such as nuclear, solar, wind and waste. All these projects are aligned with the National Energy Strategy 2050 which was launch in January 2017. The strategy aims to achieve 50% clean energy capacity by 2050 as well as a 40% reduction in electricity and water consumption (UAEES, 2017). The strategy further aims to increase the contribution of clean energy in the total energy mix from 25% to 50% by 2050 and reduce the carbon footprint of power generation by 70%, which will result in a saving of US$ 190.57 billion by 2050. It also seeks to increase the consumption efficiency of individuals and corporates by 40%. The Government is committed to invest US$ 163.35 billion by 2050 in all renewable energy projects that ensure sustainable growth for the country's economy. The United Arab Emirates' commitment towards energy is somehow reflected from the World Energy Council database, wherein The United Arab Emirates has improved its raking from 43 in 2016, to 36 in 2018 (WEC, 2018). In the same database, the environmental sustainability ranking is however reduced from 113 to 116 in the same period. The Government, therefore, needs to keep a close eye on the overall progress and to ensure that the progress is in the right direction.

In relation to climate action, Saudi Arabia is aiming to reduce greenhouse gas emissions by 130 million tonnes (CO_2 equivalent) per year by 2030. Under the Kingdom National Environmental Strategy, Saudi Arabia is working to develop 9.9 million sqm green landscapes in the capital of Riyadh. Similarly, Bahrain has rectified the Paris Agreement in 2016 and proving climate change awareness at school levels. Oman has initiated a project which aims to use the sunlight to

generate steam. The country claims that this the world's largest project which generates 1,021 Megawatts of peak heat power and produces 6,000 tonnes of steam per day. Similarly, Kuwait is aiming to increase its share of renewable in electricity generation which is currently 1%, to 15% by 2030. There are some good actions in the region such as the promotion of electric vehicles in relation to climate action. Different clean energy strategies developed by the GCC countries are some good steps towards climate action, but at the same time, these strategies are undermined by some other action. For instance, the United Arab Emirates is constructing a coal plant that will produce a 2,400 MW. Of course, this will increase greenhouse gas emissions. The protection of mangroves and seagrass is also important in relation to climate change as they act as green lungs for most of the main cities in the GCC region. Construction is one of the main industries which provides job to locals and foreigners, however, at the same time produce a huge amount of waste and emissions. Such waste and emissions can be reduced by adopting sustainable methods of material testing and replacing cement by other suitable materials (Umar et al., 2019-c; Umar et al., 2019-d). Such small initiatives can also bring a big change and can be helpful to achieve Goals 13 by 2030.

The next section provides a conclusion of the article.

4. Conclusion:

The United Nations SDGs agreed by all nations on the earth under the umbrella of the United Nations is a great achievement of the current decade. These goals are important to improve the quality of life on earth in a sustainable way therefore efforts are underway to achieve these goals. Some countries are leading these efforts and are on the path to successfully achieve these goals by 2030; however, some countries are still in the preparatory stage. This article discussed the progress and commitment of the GCC countries towards these goals. A qualitative research method using a systematic literature review was adopted to achieve the aim and objective of this article. GCC countries are normally regarded as the main consumer of the earth's resources, and somehow it is reflected from the waste and CO_2 generation. Different plans, actions, and initiatives started from most of the GCC countries reflect good commitments towards these goals. Based on the latest global SDG Index and Ranking, United Arab Emirates is leading the region. The common goals in which most of the GCC countries are facing challenges were identified in this paper and the progress and commitment of the region towards these goals are particularly discussed. The key goals in which most of the countries in the region are facing major challenges identified in this paper were; i) Goal 2: Zero Hunger, ii) Goal 6: Clean Water and Sanitation, iii) Goal 12: Responsible Consumption and Production, and iv) Climate Action. There were other goals in which some of the countries in the GCC region were facing major challenges, however, since those goals were not common in all the GCC member countries, therefore were not covered in this article. For instance, both Saudi Arabia and Oman are facing major challenges in Goal 5 (Gender Equality). Similarly, Bahrain is also facing major challenges in Goal 16 (Peace, Justice and Strong Institutions. Kuwait was also found in facing major

challenges in Goal 8 (Decent Work and Economic Growth). In relation to Goal 2, the biocapacity of the GCC countries has a mean value of 8.91+2.64. Furthermore, since 1980, the biocapacity of the entire GCC region is decreasing. The ranking of GCC countries based on sustainable nitrogen management is also poor. In relation to Goal 6, all the GCC countries have proposed different initiatives to improve the water and sanitation indicators. For instance, Qatar is treating 99% of its sewage wastewater. The current approach of providing potable water may not be sustainable for a longer period due to the adverse effect of desalination. There is no balance between the groundwater extraction and replacement rate. For instance, in Dubai, groundwater extraction is 12 times more than the replacement rate. Although the government aims to reduce the extraction rate, the target set for this is still non-sustainable. The electricity consumption per capita in all the GCC countries is quite high and most of the electricity production is based on oil, gas, and coal, which further produces a high quantity of emissions. Apart from a high municipal solid waste generation per capita (1.7 kg per day), construction and demolition waste are estimated at 5,000 tonnes per day in the GCC region. The high level of consumption of resources increases the ecological footprint which cannot be supported by the earth. The CO_2 in the GCC countries is quite large as compared to other countries, thus affecting the progress on climate action. The average CO_2 in the GCC region currently stands at 26.36 tonnes/ per capita. Such emissions can be further increased if the region will move towards coal plants. The high level of emissions has negatively affected the GCC local environment and as such, the average value of PM 2.5 in the region is 62.08 ug/m^3, quite high than the neighboring countries of the region. The GCC countries, through their latest report of the United Nations SDGs, however, have demonstrated that how these countries are going to achieve Goal 13 by 2030. The research method adopted to achieve the aims and objectives of this research was qualitative in nature. Researchers around the world, however, prefer to use a mix research method that includes both qualitative and quantitative assessment. Using one research method was therefore considered as one of the main limitations of this study. Secondly, the search engine used to extract the data has resulted in a huge number of documents and papers. It is not practical to use all these documents and papers in this research and thus the top 200 items from each keyword were considered for further processing. This criterion may have avoided the inclusion of an important document or a paper in the review process. This appears to be another limitation of the study. Overall, the scope of the United Nations SDGs is very large, thus further and continuous research is recommended to explore the GCC performance in these Goals. A particular focus of further research needs to be the goals where the GCC region has major challenges. Future research, therefore, needs to focus on zero hunger, water and sanitation, consumption and production, and climate change. Such research should focus on the solutions that GCC countries can adopt and achieve the United Nations SDGs by 2030. The result of this paper is significantly important as this will allow the decision-makers in the GCC region to focus on the goals where they have low performance or major challenges. Currently, the world is badly affected by Corona virus (COVID-19). Apart from killing thousands of people around the world, it has affected our routine daily life. People are asked to stay at home to avoid the spread of the virus. It is therefore

anticipated that the world will be able to tackle the virus soon, however, the current situation will have a long term effect which might affect the global progress towards United Nations SDGs. The GCC Governments, therefore, need to keep a close eye on the progress of all the Goals, particularly those which have significant and major challenges ahead. At the same time, each country needs to share its experience with other GCC member countries, so that the overall progress towards the United Nations SDGs could be excel.

5. References:

ARCADIS (2016). Sustainable Cities Index 2016. The Sustainable Cities Index explores the three demands of People, Planet and Profit to develop an indicative ranking of 100 of the world's leading cities. ARCADIS, Amsterdam, Netherlands. See: https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2016/comparing-cities/?tf=tab-overall&sf=all&r=all&c=all (accessed 28/04/2019).

ARCADIS (2018). Citizen Centric Cities. The Sustainable Cities Index 2018. ARCADIS, Amsterdam, Netherlands. See: https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2018/citizen-centric-cities/ (accessed 28/04/2019).

Bashitialshaaer, R.A., Persson, K.M. and Aljaradin, M., 2011. Estimated future salinity in the Arabian Gulf, the Mediterranean Sea and the Red Sea consequences of brine discharge from desalination. International Journal of Academic Research, 3(1).

Brundtland Commission, 1987. Our Common Future. Oxford University Press: Oxford, London, United Kingdom. See: https://sswm.info/sites/default/files/reference_attachments/UN%20WCED%201987%20Brundtland%20Report.pdf (accessed 23/04/2019).

Bryman, Alan. Social research methods. 5th Edition. Oxford university press, 2016. Oxford, United Kingdom.

Cooper, D.R., Schindler, P.S. and Sun, J., 2006. Business research methods (Vol. 9). McGraw-Hill Irwin. New York, United States.

Cruickshank, H.J. and Fenner, R.A., 2007. The evolving role of engineers: towards sustainable development of the built environment. Journal of International Development: The Journal of the Development Studies Association, 19(1), pp.111-121. https://doi.org/10.1002/jid.1352.

EIA (Energy Information Administration), 2017. How much coal, natural gas, or petroleum is used to generate a kilowatt-hour of electricity. US, Energy Information Administration. Washington, USA. See: https://www.eia.gov/tools/faqs/faq.php?id=667&t=6 (accessed 05/10/2017).

EPA (Environmental Protection Agency), 2017. Air Quality - Cities and Counties, Environmental Protection Agency, Washington, D.C., United States. See: https://www.epa.gov/air-trends/air-quality-cities-and-counties (accessed 25/03/2019).

EPA (Environmental Protection Agency), 2018. Greenhouse Gases Equivalencies Calculator - Calculations and References. Washington, USA. See: https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references (accessed 04/10/2018).

GFN (Global Footprint Network), 2015. United Arab Emirates – Case Study. Global Footprint Network , Oakland, California, United States. See: https://www.footprintnetwork.org/2015/11/18/united-arab-emirates/ (accessed 24/11/2019).

GFN (Global Footprint Network), 2019. Open Data-United Arab Emirates. Global Footprint Network , Oakland, California, United States. See: http://data.footprintnetwork.org/?_ga=2.3604272.1090939346.1573990969-2026566792.1573990969#/ (accessed 17/11/2019).

GFSI (Global Food Security Index), 2019. Rankings and trends. Global Food Security Index, The Economist Intelligence Unit, London, United Kingdom. See: https://foodsecurityindex.eiu.com/Index (accessed 23/03/2020).

Gittins, R. (1997), Qualitative Research: An Investigation into Methods and Concepts in Qualitative Research. School of Informatics, University of Wales Bangor.

Head, P., 2009, May. Entering an ecological age: the engineer's role. Proceedings of the Institution of Civil Engineers-Civil Engineering (Vol. 162, No. 2, pp. 70-75). Thomas Telford Ltd. https://doi.org/10.1680/cien.2009.162.2.70.

HSBC (Hongkong and Shanghai Banking Corporation), 2017. The Value of Education Higher and higher-UAE Report. HSBC, London, United Kingdom. See: https://www.hsbc.ae/1/PA_ES_Content_Mgmt/content/uae_pws/pdf/en/voe-report.pdf (accessed 19/11/2019).

ICE member attributes, 2019. Attributes of Member and Chartered Civil Engineer (CEng MICE). Institution of Civil Engineers, London, United Kingdom. See: https://www.ice.org.uk/my-ice/membership-documents/member-attributes#attributes_of_ceng (accessed 25/04/2019).

IGBP (International Geosphere-Biosphere Programme), 1999. "Global Analysis, Integration and Modelling, "(IGBP, International Council of Scientific Unions, (ICSU), Durham, NH, 2000) http://gaim.unh.edu/; H. J. Schellnhuber, Nature 402, C19 (1999); National Research Council, Committee on Global Change Research, Global Environmental Change: Research Pathways for the Next Decade (National Academy Press, Washington, DC, 1999), p. 531, http://www.nap.edu/catalog/5992.html. (accessed 23/04/2019).

Index Mundi (2017). Cereal yield (kg per hectare) - Country Ranking. Index Mundi, online. See: https://www.indexmundi.com/facts/indicators/AG.YLD.CREL.KG/rankings (accessed 19/11/2019).

Jobber, D. (1991), Choosing A Survey Method in Management Research. In Smith N.C. And Dainty, P. (Eds.) The Management Research Handbook. London: Routledge. pp. 174-180.

Jose, S. and Chacko, J., 2017. Building a sustainable higher education sector in the UAE. International Journal of Educational Management, 31(6), pp.752-765. https://doi.org/10.1108/ijem-05-2016-0102.

Kroll, C. 2015. Sustainable Development Goals - Are the rich countries ready? Gutersloh: Bertelsmann Stiftung. Gütersloh, Germany. See: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/Studie_NW_Sustainable-Development-Goals_Are-the-rich-countries-ready_2015.pdf (accessed 27/04/2019).

Laffoley, D.D.A. and Baxter, J.M. eds., 2016. Explaining ocean warming: Causes, scale, effects and consequences. International Union for Conservation of Nature (IUCN), Gland, Switzerland. http://dx.doi.org/10.2305/IUCN.CH.2016.08.en.

McIsaac, G.F. and Morey, N.C., 1998. Engineers' role in sustainable development: Considering cultural dynamics. Journal of Professional Issues in Engineering Education and Practice, 124(4), pp.110-119. https://doi.org/10.1061/(ASCE)1052-3928(1998)124:4(110).

MDPS (Ministry of Development, Planning and Statistics), 2018. The State of Qatar Second Voluntary National Review, 2018. Ministry of Development, Planning and Statistics, Doha, Qatar. See: https://sdg-en-psaqatar.opendata.arcgis.com/datasets/a21250408814481e921c151c7cf24f3c (accessed 22/03/2020).

MEDC (Muscat Electricity Distribution Company) (2019). Oman Electricity Tariffs. Muscat Electricity Distribution Company, Muscat, Oman. See http://www.dynamic-ews.com/Tariffs/Electricity%20Tariffs/Oman.pdf (accessed 21/04/2019).

MEP (Ministry of Economy and Planning), 2018. 1st Voluntary National Review, Kingdom of Saudi Arabia, Ministry of Economy and Planning, Riyadh, Saudi Arabia. See: https://sustainabledevelopment.un.org/content/documents/20230SDGs_English_Report972018_FINAL.pdf (accessed 23/03/2020).

Michalak, A.M., 2016. Study role of climate change in extreme threats to water quality. Nature News, 535(7612), p.349. http://dx.doi.org/10.1080/19443994.2014.940649.

Mingers, J. (1997), Multi-paradigm Methodology. In Mingers, J. And Gill, A. (1997) Multimethodology: The Theory and Practice of Combining Management Science Methodologies. Wiley, Chichester. pp.1 – 20.

Moher D, Liberati A, Tetzlaff J, Altman DG, Prisma Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS medicine. 2009 Jul 21;6(7):e1000097.

NCSDG (National Committee on Sustainable Development Goals), 2017. UAE and The 2030 Agenda For Sustainable Development, 2017. UAE and The 2030 Agenda For Sustainable Development, Minister of Foreign Affairs and International Cooperation, United Arab Emirates. See: https://sustainabledevelopment.un.org/content/documents/20161UAE_SDGs_Report_Full_English.pdf (accessed 27/04/2019).

NFSS (National Food Security Strategy), 2019. National Food Security Strategy, Food Security Office, Duabi, United Arab Emirates. See: https://foodsecurity.gov.ae/ (accessed 17/11/2019).

Niccolucci, V., Tiezzi, E., Pulselli, F.M. and Capineri, C., 2012. Biocapacity vs Ecological Footprint of world regions: A geopolitical interpretation. Ecological Indicators, 16, pp.23-30.

ONS (Office for National Statistics), 2017. Energy: consumption from renewable and waste sources. Office for National Statistics, Newport, United Kingdom. See: https://www.ons.gov.uk/economy/environmentalaccounts/datasets/ukenvironmentalaccountsenergyconsumptionfromrenewableandwastesources (accessed 25/04/2019).

Opdenakker, R., 2006, September. Advantages and disadvantages of four interview techniques in qualitative research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 7, No. 4).

PwC (PricewaterhouseCoopers), 2018. Education Sector in UAE-Understanding Middle East Education. PwC, Abu Dhabi, United Arab Emirates. See: https://www.pwc.com/m1/en/industries/education/education-country-profile-united-arab-emirates.html (accessed 19/11/2019).

Remenyi, D., Williams, B., Money, A. and Swartz, E., 1998. Doing research in business and management: an introduction to process and method. Sage.

Sachs, J., Schmidt-Traub, G., Kroll, C., Durand-Delacre, D. and Teksoz, K. (2017): SDG Index and Dashboards Report 2017. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). New York, United States. See: http://sdgindex.org/assets/files/2017/2017-SDG-Index-and-Dashboards-Report--full.pdf (accessed 27/04/2019).

Sachs, J., Schmidt-Traub, G., Kroll, C., Durand-Delacre, D. and Teksoz, K. (2016): An SDG Index and Dashboards – Global Report. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). New York, United States. See: https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/SDG_Index_Dashboard_full.pdf (accessed 27/04/2019).

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G. (2019): Sustainable Development Report 2019. Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN), New York, United States. See: https://www.sdgindex.org/reports/sustainable-development-report-2019/ (accessed 22/03/2020).

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G. (2018): SDG Index and Dashboards Report 2018. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). New York, United States. See: http://sdgindex.org/assets/files/2018/01%20SDGS%20GLOBAL%20EDITION%20WEB%20V9%20180718.pdf (accessed 27/04/2019).

Sachs, J.D., 2015. The age of sustainable development. Columbia University Press, New York, United States.

Salahuddin, M. and Gow, J., 2014. Economic growth, energy consumption and CO2 emissions in Gulf Cooperation Council countries. Energy, 73, pp.44-58.

SCP (Supreme Council for Planning), 2019. First Voluntary National Review of the Sultanate of Oman 2019. Supreme Council for Planning, Muscat, Oman. See: https://www.scp.gov.om/PDF/Sustainable.pdf (accessed 23/03/2020).

SCPD (Supreme Council for Planning and Development), 2019. Kuwait Voluntary National Review 2019. Supreme Council for Planning and Development, Kuwait. See: https://sustainabledevelopment.un.org/content/documents/23384Kuwait_VNR_FINAL.PDF (accessed 23/03/2020).

SDGIDR (Sustainable Development Goal Index and Dashboards Report), 2018. Sustainable Development Goal Index and Dashboards Report, Sustainable Development Solutions Network, United Nations, New York, USA. See: http://sdgindex.org/reports/2018/. (accessed 27/04/2019).

TGE (The Green Economy), 2012. The Green Economy initiative, Green Economy for Sustainable Development. The Official Portal of the United Arab Emirates. See: https://government.ae/about-the-uae/economy/green-economy-for-sustainable-development (accessed 28/04/2019).

TSDGR (The Sustainable Development Goals Report), 2018. The Sustainable Development Goals Report, United Nations, New York, United States. See: https://unstats.un.org/sdgs/files/report/2018/TheSustainableDevelopmentGoalsReport2018-EN.pdf (accessed 25/04/2019).

UAEES (United Arab Emirates Energy Strategy 2050). UAE Energy Strategy, 2050. The Official Portal of the UAE Government, United Arab Emirates. See: https://government.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/uae-energy-strategy-2050 (accessed 29/04/2019).

UAEGA (United Arab Emirates Green Agenda: 2015-2030), 2015. United Arab Emirates Green Agenda: 2015-2030. United Arab Emirates. See: http://www.lse.ac.uk/GranthamInstitute/law/uae-green-agenda-2015-2030/ (accessed 28/04/2019).

UAESDG (United Arab Emirates Sustainable Development Goals), 2019. The UAE portal for the Sustainable Development Goals, Dubai, United Arab Emirates. See: http://uaesdgs.ae/en (accessed 24/04/2019).

Umar, T. and Egbu, C., 2018-a. Global commitment towards sustainable energy. Proceedings of the Institution of Civil Engineers-Engineering Sustainability (pp. 1-9). Thomas Telford Ltd. https://doi.org/10.1680/jensu.17.00059.

Umar, T. and Wamuziri, S., 2016. Briefing: Conventional, wind and solar energy resources in Oman. Proceedings of the Institution of Civil Engineers-Energy, 169(4), pp.143-147. https://doi.org/10.1680/jener.16.00011.

Umar, T., (2020). An Integrated Sustainability Management Approach for Universities. Proceedings of the Institution of Civil Engineers - Engineering Sustainability. Pp. 1-48. https://doi.org/10.1680/jensu.19.00014.

Umar, T., 2018-a. Geothermal energy resources in Oman. Proceedings of the Institution of Civil Engineers-Energy, 171(1), pp.37-43. https://doi.org/10.1680/jener.17.00001.

Umar, T., 2018-b. Briefing: Towards a sustainable energy: the potential of biomass for electricity generation in Oman. Proceedings of the Institution of Civil Engineers-Engineering Sustainability (Vol. 171, No. 7, pp. 329-333). Thomas Telford Ltd. https://doi.org/10.1680/jensu.17.00001.

Umar, T., Egbu, C. and Saidani, M., 2019-d. A Modified Method for Los Angeles Abrasion Test. Iranian Journal of Science and Technology, Transactions of Civil Engineering, pp.1-7. https://doi.org/10.1007/s40996-019-00268-w.

Umar, T., Egbu, C., Ofori, G., Honnurvali, M.S., Saidani, M. and Opoku, A., 2019-b. Challenges towards renewable energy: an exploratory study from the Arabian Gulf region. Proceedings of the Institution of Civil Engineers-Energy, pp.1-13. https://doi.org/10.1680/jener.19.00034.

Umar, T., Egbu, C., Ofori, G., Honnurvali, M.S., Saidani, M., Shibani, A., Opoku, A., Gupta, N. and Goh, K., 2020, February. UAE's Commitment Towards UN Sustainable Development Goals. Proceedings of the Institution of Civil Engineers-Engineering Sustainability (pp. 1-18). Thomas Telford Ltd. https://doi.org/10.1680/jensu.19.00036.

Umar, T., Egbu, C., Tahir, A., Honnurvali, M.S., Saidani, M. and Al-Bayati, A.J., 2019-c. Developing a Sustainable Concrete using Ceramic Waste Powder. In 11th International Conference on Construction in the 21st Century (CITC-11), pp 228 - 238. 9 – 11 September, 2019, RICS HQ, London, United Kingdom. ISBN: 978-1-7324416-3-7

UNFCC (United Nations Framework Convention on Climate Change), 1992. United Nations Framework Convention on Climate Change, New York, United States. See: https://unfccc.int/resource/docs/convkp/conveng.pdf (accessed 23/04/2019).

UN-SDG (United Nations Sustainable Development Goals), 2015. About the Sustainable Development Goals. United Nations, New York, United States. See: https://www.un.org/sustainabledevelopment/sustainable-development-goals/ (accessed 23/04/2019).

Villacorte, L.O., Tabatabai, S.A.A., Dhakal, N., Amy, G., Schippers, J.C. and Kennedy, M.D., 2015. Algal blooms: an emerging threat to seawater reverse osmosis desalination. Desalination and Water Treatment, 55(10), pp.2601-2611. http://dx.doi.org/10.1038/535349a.

WB (World Bank), 2014-a. Electric power consumption (kWh per capita). The World Bank, Washington, D.C., United States. See: https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?end=2014&name_desc=false&page=2&start=2014&view=map&year=2014 (accessed 18/04/2019).

WB (World Bank), 2014-b. CO2 emissions (metric tons per capita). The World Bank, Washington, D.C., United States. See: https://data.worldbank.org/indicator/en.atm.co2e.pc?year_high_desc=true (accessed 18/04/2019).

WEC (World Energy Council), 2018. Country Profile: United Arab Emirates. World Energy Council, London, United Kingdom. See: https://trilemma.worldenergy.org/#!/country-profile?country=United%20Arab%20Emirates&year=2018 (accessed 29/04/2019).

WEF (World Economic Forum), 2018. This is how to sustainably feed 10 billion people by 2050. World Economic Forum, Cologny, Switzerland. See: https://www.weforum.org/agenda/2018/12/how-to-sustainably-feed-10-billion-people-by-2050-in-21-charts/ (accessed 23/04/2019).

WHO (World Health Organization), 2016. Global Health Observatory data repository, Annual mean concentration of particulate matter of less than 2.5 microns of diameter (PM2.5) [ug/m3] in urban areas. World Health Organization, Geneva, Switzerland. See: http://apps.who.int/gho/data/node.main.152?lang=en (accessed 29/04/2019).

WSS (Water Security Strategy, 2036), 2017. The UAE Water Security Strategy 2036. The Official Portal of the UAE Government, United Arab Emirates. See: https://government.ae/en/about-the-uae/strategies-initiatives-and-awards/federal-governments-strategies-and-plans/the-uae-water-security-strategy-2036 (accessed 28/04/2019).

Zafar, S., 2015. Solid Waste Management in Saudi Arabia. EcoMENA, March 28. http://www.ecomena.org/solid-waste-management-in-saudi arabia/. (accessed 24/04/2018).

Zafar, S., 2018. Waste Management Outlook for the Middle East. In The Palgrave Handbook of Sustainability (pp. 159-181). Palgrave Macmillan, Cham, Basingstoke, United Kingdom.

Zawaya, 2017. UAE turns aluminum waste into alternative energy. Zawaya, Muscat, Oman. See: https://www.zawya.com/mena/en/business/story/UAE_turns_aluminum_waste_into_alternative_energy_minister-ZAWYA20171213102919/ (accessed 28/04/2019).

Zyoud, S.H., S.W. Al-Jabi, W.M. Sweileh, S. Al-Khalil, S.H. Zyoud, A.F. Sawalha, and R. Awang. 2015. The Arab world's Contribution to Solid Waste Literature: A Bibliometric Analysis. Journal of Occupational Medicine and Toxicology 10 (35), 1–9.

Appendix I:

Goals	Goal targets
Goal 1: No Poverty	1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day
	1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
	1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
	1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
	1.A Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in

	all its dimensions
	1.B Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions
Goal 2: Zero Hunger	2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.
	2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.
	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.
	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
	2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.
	2.A Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.
	2.B Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.
	2.C Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.
Goal 3: Good Health and Well Being	3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births.

	3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.
	3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.
	3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.
	3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.
	3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents.
	3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes.
	3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.
	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.
	3.A Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate.
	3.B Support the research and development of vaccines and medicines for the communicable and noncommunicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all.
	3.C Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States.
	3.D Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.
Goal 4: Quality Education	4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and Goal-4 effective learning outcomes
	4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and preprimary education so that they are ready for primary education

	4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
	4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
	4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations
	4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy
	4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development
	4.A Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, nonviolent, inclusive and effective learning environments for all
	4.B By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries
	4.C By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing states
Goal 5: Gender Equality	5.1 End all forms of discrimination against all women and girls everywhere
	5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation
	5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation
	5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate
	5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life
	5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences

	5.A Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
	5.B Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women
	5.C Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels
Goal 6: Clean Water and Sanitation	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
	6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
	6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
	6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
	6.B Support and strengthen the participation of local communities in improving water and sanitation management
Goal 7: Affordable and Clean Energy	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services
	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix
	7.3 By 2030, double the global rate of improvement in energy efficiency
	7.A By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
	7.B By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

Goal 8: Decent Work and Economic Growth	8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries
	8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors
	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead
	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
	8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training
	8.7 Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms
	8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment
	8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all
	8.A Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries
	8.B By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization
Goal 9: Industry, Innovation and Infrastructure	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
	9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries
	9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets

	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
	9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending
	9.A Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States 18
	9.B Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities
	9.C Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020
Goal 10: Reduced Inequalities	10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average
	10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
	10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
	10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
	10.5 Improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations
	10.6 Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions
	10.7 Facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies
	10.A Implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with World Trade Organization agreements
	10.B Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes

	10.C By 2030, reduce to less than 3 per cent the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5 per cent
Goal 11: Sustainable Cities and Communities	11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
	11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
	11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage
	11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
	11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
	11.A Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning
	11.B By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels
	11.C Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials
Goal 12: Responsible Consumption and Production	12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries
	12.2 By 2030, achieve the sustainable management and efficient use of natural resources
	12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses
	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
	12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle
	12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities
	12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
	12.A Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production
	12.B Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products
	12.C Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities
Goal 13: Climate Action	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
	13.2 Integrate climate change measures into national policies, strategies and planning
	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
	13.A Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
	13.B Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities
	*Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.
Goal 14: Life Below Water	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

	14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
	14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
	14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
	14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
	14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation
	14.7 By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism
	14.A Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
	14.B Provide access for small-scale artisanal fishers to marine resources and markets
	14.C Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want
Goal 15: Life on Land	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
	15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

	15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development
	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
	15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed
	15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products
	15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species
	15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
	15.A Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems
	15.B Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation
	15.C Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities
Goal 16: Peace, Justice and Strong Institutions	16.1 Significantly reduce all forms of violence and related death rates everywhere
	16.2 End abuse, exploitation, trafficking and all forms of violence against and torture of children
	16.3 Promote the rule of law at the national and international levels and ensure equal access to justice for all
	16.4 By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime
	16.5 Substantially reduce corruption and bribery in all their forms
	16.6 Develop effective, accountable and transparent institutions at all levels
	16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels
	16.8 Broaden and strengthen the participation of developing countries in the institutions of global governance
	16.9 By 2030, provide legal identity for all, including birth registration
	16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements
	16.A Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime

	16.B Promote and enforce non-discriminatory laws and policies for sustainable development
Goal 17: Partnership for the Goals	Finance
	17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection
	17.2 Developed countries to implement fully their official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of ODA/GNI to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries
	17.3 Mobilize additional financial resources for developing countries from multiple sources
	17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress
	17.5 Adopt and implement investment promotion regimes for least developed countries
	Technology
	17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism
	17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed
	17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology
	Capacity building
	17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation
	Trade
	17.10 Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda
	17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020

	17.12 Realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries, consistent with World Trade Organization decisions, including by ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access
	Systemic issues
	Policy and institutional coherence
	17.13 Enhance global macroeconomic stability, including through policy coordination and policy coherence
	17.14 Enhance policy coherence for sustainable development
	17.15 Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development
	Multi-stakeholder partnerships
	17.16 Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries
	17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships
	Data, monitoring and accountability
	17.18 By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts
	17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries

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