Global Commitment towards Sustainable Energy

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Abstract:

Energy is crucial to economic and social development and raises the quality of life. One of the problems with conventional energy is that it produces greenhouse gases, and also can't be sustained for a long time. It is essential to tackle these problems by moving towards renewable and sustainable energy. Some countries, including the Gulf region, are still in the appraisal stage of adopting different forms of renewable energies. A case for adopting renewable energies for Oman is discussed, to see the business potential and to estimate the reduction in greenhouse gases. It is revealed that 1.9 Mega metric tons of CO_2 emission can be reduced by producing 10% of electricity requirement in Oman by any form of sustainable energy. This article further discusses the global sustainable energy commitment, the plans of some high producers of greenhouse gases countries which have set for achievement by 2030 under the United Nations (UN) convention on climate change. It is anticipated that if these plans were to be implemented, the total sustainable energy contribution could grow by nearly 11,000 TWh by 2030. These plans can provide a guideline for those countries who are still preparing to submit their plan at the UN.

Key Words: Energy, sustainability, Renewable energy.

1. Introduction:

All the 193 United Nations (UN) member countries have agreed and accepted the new Sustainable Development Goals (SDGs) in its meeting held in 2015. These SDGs consist of 17 goals, reinforced by 169 targets and further supported by 230 universal scales. Access to economical, reliable, sustainable and modern energy for all is one of the UN sustainable goals set for achievement by 2030 (UN SDGs, 2017). Umar and Wamuziri (2016) noted that currently much of the world's energy production and consumption are not sustainable. An extensive utilization of sustainable energy is necessary to address the phenomenon of global warming, not only to control the greenhouse gas (GHG) diffusions but also to raise energy security, maintain the progress of the universal economy, and to deliver energy access to the billions of human still surviving without modern energy facilities (IEA and the World Bank, 2015). With fossil fuels still contributing almost 80% of the world's basic energy requirement, energy generation and utilization is responsible for nearly two thirds of the world's GHG diffusions; energy industry directions will be a main part in determining the earth's future emissions trajectory (IEA, 2014). The total carbon emission in 1950 was 1630 million metric tons per year which rose to 9855 million metric tons per year in 2010 as shown in figure 1 (CDIAC, 2017). It is anticipated from the GHS emissions, that by the end of this century, there will be an addition of 2~6°C to the earth's temperature (NASA, 2017).

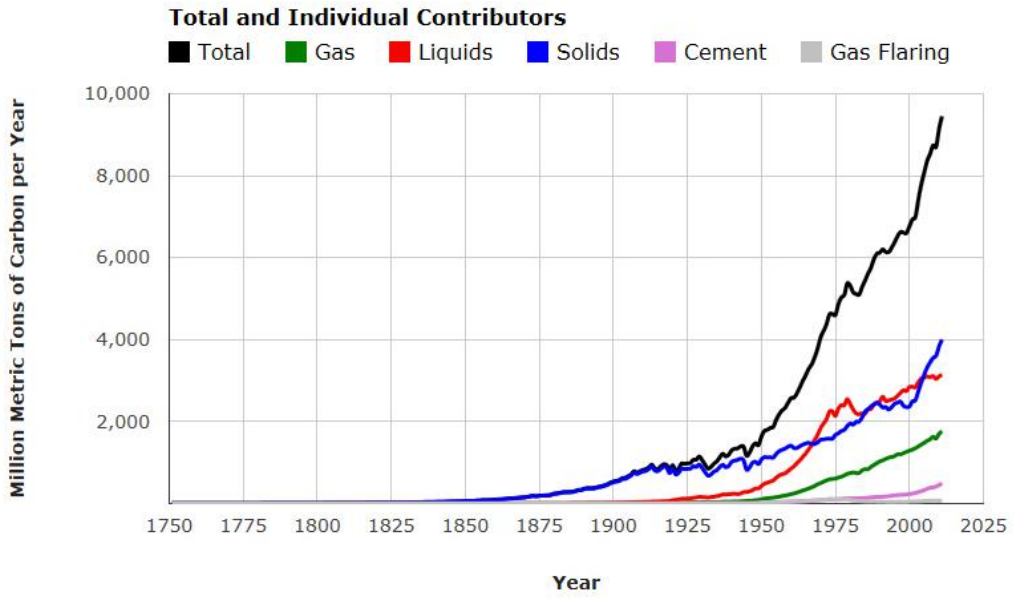


Figure 1: Annual Global Fossil-Fuel Carbon Emissions (CDIAC, 2017)

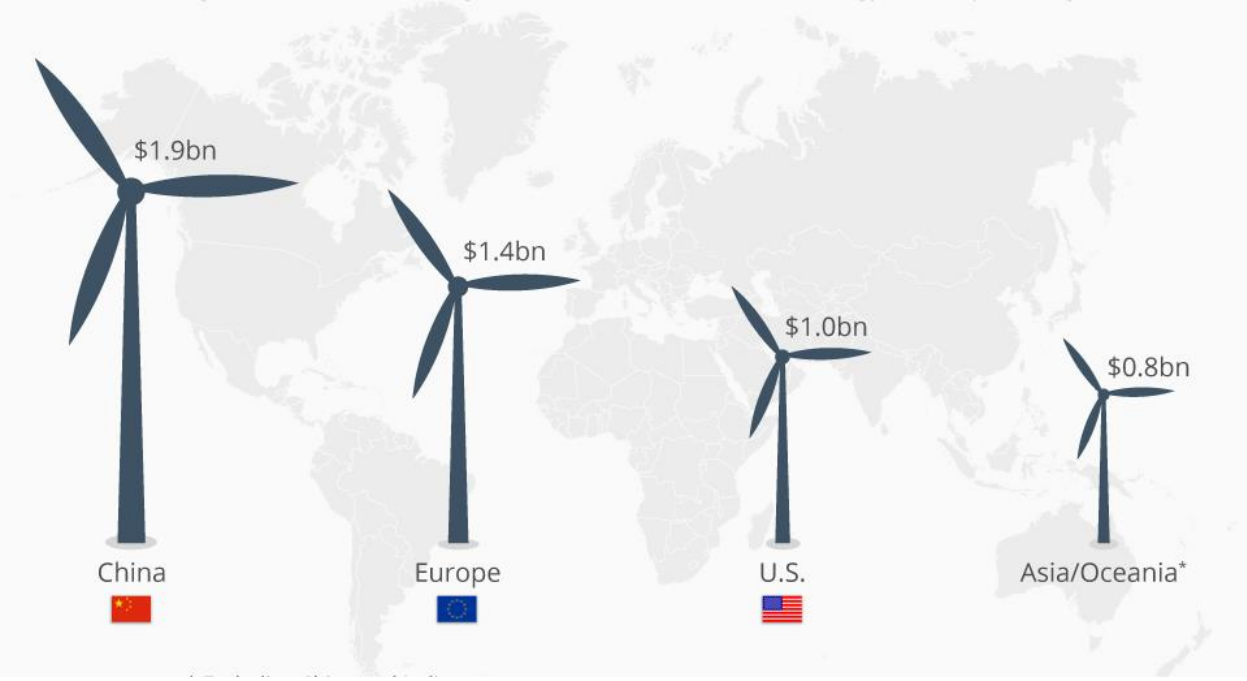
In the past few years, growth has been reflected in adopting cleaner, effective and sustainable energy technologies. Such progress has been supported by different elements which include encouraging policies and the expanding cost-competitiveness of energy from renewable sources (REN21, 2015). The statistics published by Moody's shows that the cost of solar energy has reduced by roughly 20 % since end of 2016 (Moody's, 2017). It can be clearly seen that economic development and energy-related emissions, which have been closely connected to each other in the past, are now appearing to de-couple (IEA, 2014). In 2016 only, at least an additional 75 Giga Watt (GW) of solar photovoltaic electricity was produced globally which correspond to the installation of approximately 31,000 solar panels each hour (REN21, 2017).

In year 2014 alone, approximately 100 countries publicly declared sustainable energy targets, goals, and related information (plans) to be accomplished during 10 years from 2020 to 2030. Such sustainable energy plans were publicized via countries' Intended Nationally Determined Contributions, press releases, and governmental procedures. In this article these plans are discussed first at the universal level, observing the type of plan suggested, and then examining the sustainable energy plans announced by eight of the world's top GHG emitters including China, Brazil, United States, European Union, Indonesia, India, Mexico, Japan. These countries and regions are jointly responsible for 62% of the universal emissions and more than 65% of the earth's basic energy requirement (CAIT, 2015; IEA, 2015).

This article further presents the global commitment towards sustainable energy including different types of plan to achieve the required level of sustainable energy. The sustainable energy plans of the world's highest producers of greenhouse gases are particularly discussed. These plans show the commitment of different countries and regions towards investment in sustainable energy. Now time all the countries need to expedite their sustainable energy plans with an ambition to go beyond these plans in order to achieve overall objectives of the Paris Agreement and accomplish zero GHG emissions by the agreed deadline (PA, 2015).

1.1 Opportunities for Renewable Energy:

Sustainable energy is one of the main concerns for most countries around the world. Some countries have made significant achievements in this regard. For instance, recently a totally solar powered train rides a short but pioneering drive in the New South Wales, Australia. This train travels absolutely on sustainable energy. Solar panels installed on its roof, and at pit stops, generate the whole electricity required for its 3 kilometer drive (Futurism, 2017). Such innovations in renewable energy therefore justify that solar power is no longer a form of weak or inefficient energy. Similarly, China has recently inaugurated a 1 kilometer long solar highway in Jinan, the capital of Shandong province south of Beijing. The two lane highway provides 5,875 square meters area and can produce approximately 1 million kilowatt hours (kWh) of electricity per year which is ample to power 800 houses in China (XN, 2017). China has also recently completed the world's largest floating solar power station which has a production limit of 40 Megawatts (MW), is sufficient to meet the electricity requirement of small town (WEF, 2017). Both these examples from China indicate that the availability of a large area to generate energy from solar panels, is no longer a concern. In 2016, China was spending around 1.9 billion US$ on sustainable energy which is more than European countries and almost double that of the United States as shown is figure 2. A report published by the National Energy Authority of Iceland, indicates that in 2014, nearly 85% of primary energy use in Iceland came from sustainable and renewable resources, while geothermal power facilities contributed to 25% of the country's total electricity generation (NEA, 2017).



*Excluding China and India

Figure 2: Spending on Sustainable Energy in different Regions / Countries in 2016 (Statista, 2017).

On the other hand some countries are still at the appreciation stage of adopting renewable forms of energy. Member states of Gulf Cooperation Council (GCC) are considered as the main energy producers due to their rich oil and gas reserves. However, statistics reveal that the energy consumption in these countries in the last two decades has increased rapidly due to several factors, one of which is global warming and climate change (Umar 2017-b). The average electricity consumption in the Gulf countries was 12370.91 kWh per year per capita while in China this value was 3762.07 (WB, 2017). The Gulf countries' electricity consumption is more than double – that is, 5407.29 kWh – the consumption per capita in the UK. Figure 3 shows the current electric power consumption in different gulf countries, and figure 4 shows the growth in electric power consumption since 2004. The main reason for a high consumption of electricity in the Gulf region is its hot climatic condition, and the cost of electricity which is very cheap due to subsidies provided by governments. Smart consumption of energy can help to save the energy and can contribute towards sustainability. An experimental study conducted by Escolar et al. (2014) on the use of smart street light control system that allows multiphase light sources to adjust their strength to the environmental situations, observed more than 35% saving in the energy. The results of motion sensor lighting installed on a 600 meter long pedestrian walkway in Demark, shows that these lights saved approximately 1242 kilowatt hour (kWh) electricity in a year (LON, 2015). Using the same approach, Norway has recently installed auto-dimming street lights in some parts of the country to reduce its carbon footprint. The smart LED lights installed on an 8 km highway in Oslo, dim to 20% automatically when there are no vehicles or pedestrians on the road. These smart street lights result in the saving of approximately 2,100 kWh of electricity per week. (CA, 2018; Daily mail, UK, 2018). A research conducted by Evans (2009) on 21st century climate change in the Middle East, noted that the impact on the region include a reduction of more than 170,000 km^2 in viable rain-fed agriculture land by late-century, increases in the duration of the dry season that reduces the length of time that the rangelands can be grazed, and changes in the timing of the maximum precipitation in northern Iran that will affect the growing season, forcing changes in cropping approach or even crop types. All Gulf countries still have to report their Intended Nationally Determined Contributions (INDCs) agreed under the United Nations Framework Convention on Climate Change.

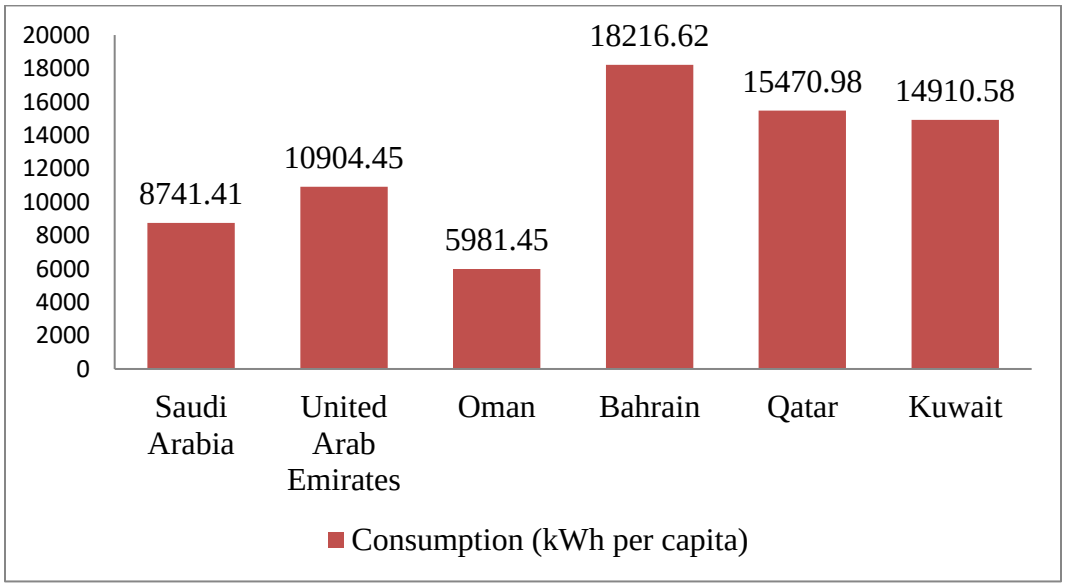


Figure 3. Electric Power Consumption in Gulf Countries (2013) - (Umar and Wamuziri, 2016; WB, 2017).

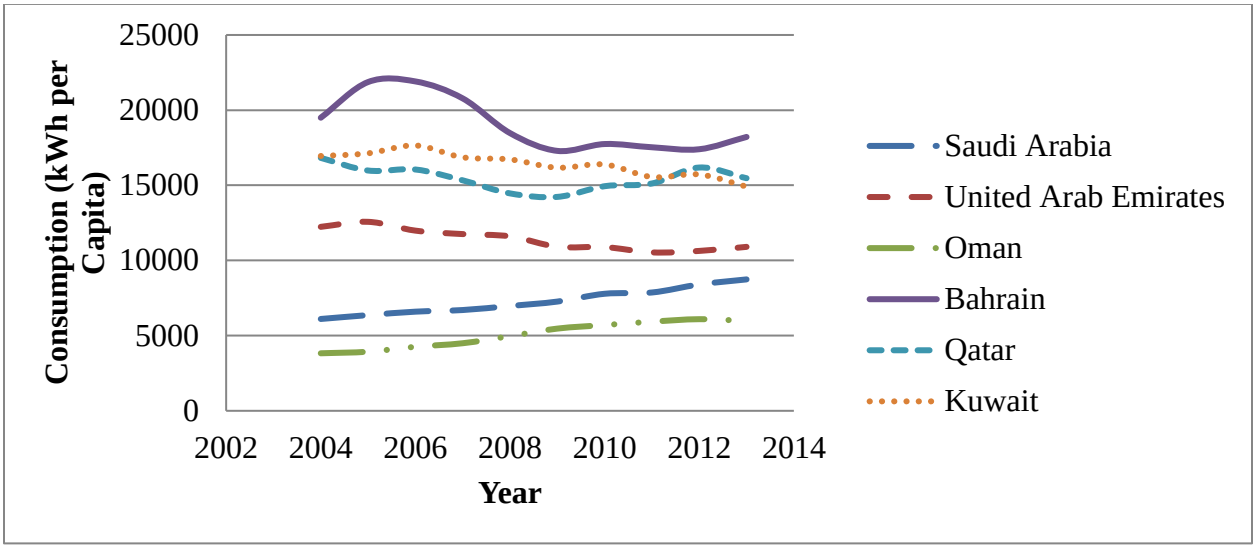


Figure 4. Electric Power Consumption (kWh per Capita) in Different Gulf Countries from 2004 - 2013, (Umar and Wamuziri, 2016; WB, 2017).

1.2 Opportunities for Business in Renewables in GCC:

Oman is one of the oil exporting countries. Its vision 2020 and vision 2040 seek to reduce the dependency on oil and gas (OV 2020, OV 2040). Other Gulf countries (Saudi Arab, United Arabia Emirates, Qatar, Kuwait and Bahrain) which are rich in oil and gas reserves have also realized that these resources are not guaranteed and have started working towards adopting other forms of renewable energy resources. Qatar, which has comparatively more oil and gas reserve than other Gulf countries, aims to generate 20% of its energy from renewable resources by 2024, including 1800 MW of green energy (Umar and Wamuziri, 2016). India, which is one of the world's highest producers of greenhouse gases, aims to achieve a solar energy capacity of 100 Gigawatt (GW), of which 40 GW will be generated from rooftop solar panels installed on residential buildings (Umar, 2017-a). While most of the countries around the world have resources of sustainable and renewable energy, the progress in adopting and exploring these resources still needs to be expedited. Different forms of sustainable energy resources can contribute to the local requirements. For instance, in Oman 10% of electricity demand can be met by producing energy from animal manure and waste from waste water treatment (Umar 2017-b).

It is important for policy makers to understand the financial benefits of sustainable energy. In order to understand the financial and environmental benefits of sustainable energy, a case of Oman is reported in table 1 and table 2 with an assumption that 10% of the electricity requirement of the country is met by any form of sustainable energy.

Items	Descriptions
Average cost of electricity in Oman for residential customers	**0.05 US $ per kWh (OET, 2017)**
Total population of Oman	**4,634,712 (NCSI, 2017)**
Electricity consumption per capita	**5981.45 kWh per year**
Total electricity consumption	4,634,712 x 5981.45 = **$2.77x10^{10}$ kWh per year**
Cost of electricity consumption	= 2.77 x 10^{10} x 0.05 = **$1.38x10^{9}$ US $ per year**
Possible Electricity production from biomass (animal manure and waste water)	$2.77x10^{10}$ x 10% = $0.277x10^{10}$ kWh per year. (10% of the total electricity consumption in Oman, (Umar 2017-b)).
Possible cost of electricity consumption produced from biomass (animal manure and waste water)	$0.277x10^{10}$ x 0.05 = **$1.38 x 10^{8}$ US $ per year**
Financial share of electricity which can be produced by biomass	$1.38x10^{9}$ - 1.38 x 10^{8} = **$1.24 x 10^{9}$ or 1242 Million US $ per year**

Table 1: Financial Share of Renewable Energy (Biomass).

Similarly, the geothermal energy resources in Oman were explored by Umar (2018) and it was concluded that underground fluid temperature at a certain depth, in the northern part of Oman is high enough (more than 100^{o} C) to produce direct electricity through a geothermal power plant. Even if only 10% of the electricity consumption can be met by any form of sustainable energy resources in a country like Oman, where almost 100% of the electricity is produced by oil and gas, then the quantity of oil which can be saved is estimated in table 2.

Items	Descriptions
Total electricity consumption in Oman	4,634,712 x 5981.45 = **$2.77x10^{10}$ kWh per year**
Oil required to produced 1 kWh electricity	**0.0016 barrels (EIA, 2017)**
Total oil required for electricity production in Oman	0.0016 x $2.77x10^{10}$ = **$44.32x10^{6}$ barrels per year**
Saving in Oil (10% of the total oil)	**$4.43 x 10^{6}$ barrels per year**

Table 2: Saving of Oil by Producing 10% of Electricity from Geothermal.

Carbon dioxide (CO_2) emissions per barrel of crude oil are determined by using equation 1.

$E = A\ x\ B\ x\ C\ x\ D$ ……Equation 1 (EPA, 2017-b).

Where,

E = CO_2 emission per barrel (normally in metric tons)

A = The average heat content of the crude oil (= 5.80 mmbtu per barrel; mmbtu = one million British Thermal Units).

B = The average carbon coefficient of crude oil (=20.31 kg carbon per mmbtu)

C = The fraction oxidized (= 100%, (IPCC, 2006))

D = The ratio of the molecular weight of carbon dioxide to the carbon (= 44 kg CO_2/12 kg C)

Based on this calculation, one barrel of oil produces 0.43 metric tons CO_2 (EPA, 2017-b). Thus the 10% saving in oil could reduce the CO_2 emission by 1.9×10^6 metric tons.

2. Global Commitments for Sustainable Energy:

The Paris Agreement is regarded as one of the major effort which has brought all the nations around the world to collectively tackle the climate change phenomenon. The main objective of the Paris Agreement is to empower the world's response to the climate change by and to ensure that additional increase to the earth temperature during this century remain below 2° C. As per Article 4 paragraph 2 of the Paris agreement, each country shall develop, announce and maintain successive nationally determined contributions (PA, 2015). A total of 162 out of 190 countries publicly communicated clean and sustainable energy plans to be accomplished during 10 years from 2020 to 2030 (UNFCCC, 2017). These plans show the greater shift to sustainable and clean energy, with both larger advanced countries and developing economies making commitments, including small island states and least developed countries.

If countries and regions such as China, United States, European Union, Indonesia, India, Mexico, Brazil and Japan which are the larger producers of GHS, accomplish their sustainable energy plans, the overall sustainable energy production may reach to 11,000 terawatt hours (TWh) by 2030 (EPA, 2017-a). This will be sufficient to meet India's entire current energy requirement (WRI, 2015). This means that the larger GHS producers may boost the earth's sustainable energy by as much as 25% by 2030, relative to 2013 levels. Table 3 shows the estimated amount of sustainable energy by 2030 in different countries/ regions (INDCs, 2017). This is subject to the achievement of post 2020 plans set by these countries / regions.

S.No.	Country / Region	Increase in Sustainable Energy by 2030 (TWh-Terawatt Hour(s))
1	United States	732
2	Mexico	128
3	Brazil	903
4	European Union	2570
5	India	620
6	Indonesia	575
7	China	5375
8	Japan	116

Table 3: Estimated amount of Sustainable Energy by 2030 in different countries/ regions (INDCs, 2017).

3. Global Sustainable Energy Plans:

In the United Nations Framework Convention on Climate Change (UNFCCC), all member countries admitted to openly announce their 2020 global warming action plans which are recognized as Intended Nationally Determined Contributions (INDCs, 2017). Many countries have decided to add information in their INDCs about plans to further advance the uptake of renewable and nuclear energy during 2020 to 2030. These sustainable energy plans may support countries with the means, among other aims, to:

- Reinforce the global GHG depletion aim.
- Prepare a comprehensive global warming action that includes mitigation and adaptation elements. Some countries sight access to energy as a crucial adaptation contribution, and act to enhancing the resilience (through fuel diversification) of current energy systems and protecting delivery of energy services under different climatic circumstances.
- Display improved levels of passion, by adding additional GHG goals.
- Support transparency, because pursuing growth of a sustainable energy plan can be accomplished by observing the key performance indicators (KPIs) such as established capacity, total energy consumption, and basic energy requirement.
- Support a focus on transformational change rather than a short term scope to achieve GHG goals.

Generally, the sustainable energy plans announced via countries' INDCs can be classified either action or outcome based which are discussed in the next section in more detail.

3.1 Action Based Sustainable Energy Plans:

Action based plans are the determinations to gadget particular methods, and refer to intercessions adopted or authorized by a government, organization, or other establishment, which may include laws, decrees and directives; standards and regulations; charges, taxes, incentives and subsidies; voluntary agreements; information instruments; application of new technologies, practices processes; and public or private sector financing and investment (GGP, 2014). Despite actions supply lucidity on countries' plans for enhancing their levels of sustainable energy production, they are difficult to measure. A total of 39 countries have action based sustainable energy plans. For instance, the Korea republic will need power generators to produce a share of electricity from renewable sources, while Kenya plans is to increase its wind, solar and geothermal energy production. Vietnam aims to promote a renewable energy technology market, which will be sustained by local industries and domestic service providers in order to support the national economy.

3.2 Outcome Based Sustainable Energy Plans:

Outcome based sustainable energy plans aim a definite quantity or share, and are commonly bordered in the context of:

- Enhancing the portion of sustainable energy in the local energy production.
- Enhancing the portion of sustainable energy in the local electricity production.
- Supporting the existing energy by providing new and additional sustainable energy installations.

From the review of Intended Nationally Determined Contribution (INDCs) plans it is revealed that 121 countries around the world have outcome based post 2020 sustainable energy plans (INDCs, 2017). For example, the United States has commitment to boost the portion of renewables in the electricity production (apart from hydropower) to 20% by 2030. The New Zealand plan is to produce 90% of its electricity requirement by renewable sources by 2025. Similarly Namibia target is to enhance the portion of renewables in its electricity production up to 70% by 2030. After reviewing 162 countries who have submitted their INDCs, 53 % of these sustainable energy plans can be classified as outcome based, and 27 % of sustainable energy plans can be as action based. 20 % of the countries did not have any plan towards sustainable energy (figure 5).

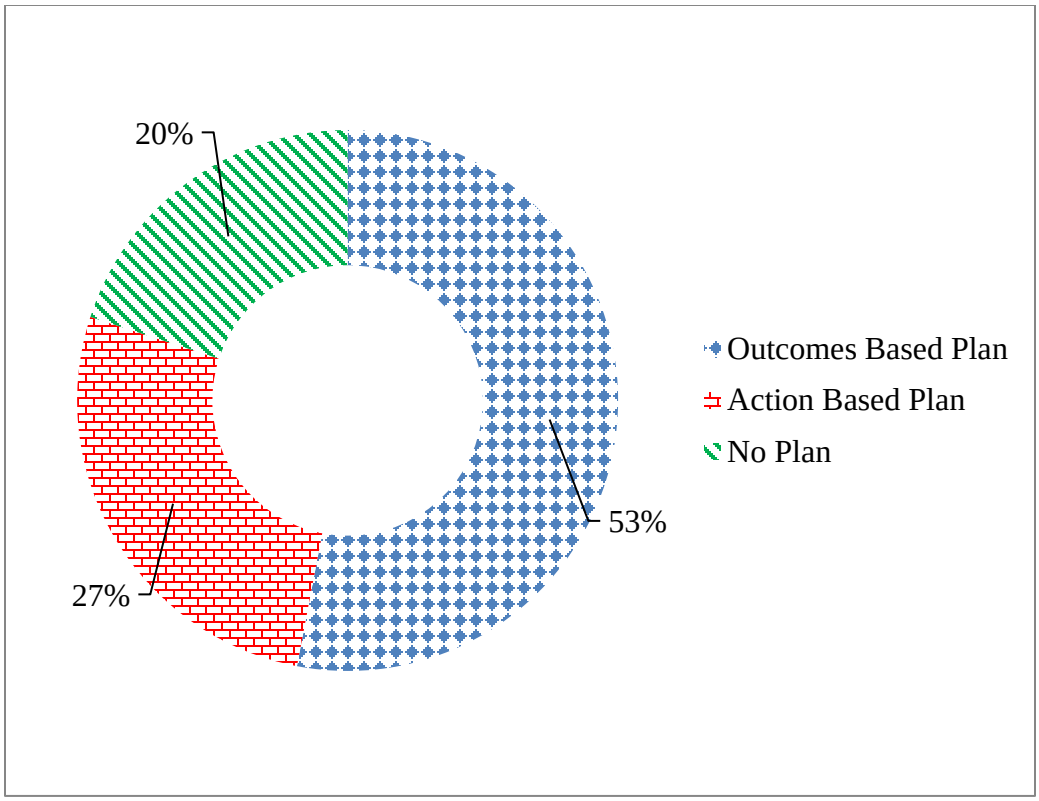


Figure 5. Ratio of Different Types of Sustainable Energy Plans.

3.3 Difference Between Action and Outcome Based Plans:

To differentiate both action and outcome based sustainable plans from each other, a detailed example is provided in table 4. The items in action based sustainable energy plans are taken from the Group 20 action plan developed in 2016 for renewable energy (G-20, 2016). Similarly, the items in outcome based sustainable energy plan are taken from a Canadian province's energy plan developed in 2016 (Oxford, 2016).

Action Based Sustainable Energy Plan	**Outcome Based Sustainable Energy Plan**
Key Actions:	**Outcome Criteria:**
1. Enhancing substantially the portion of renewable energy by 2030. 1.1. Appreciate G20 countries to deliberately gadget policies and programs to speed up the arrangement of renewable energy based on local conditions. 1.2. Promote proactive approaches and actions.	***Criterion I: Implementation status and outcomes.*** Consider the current status of 100% renewable energy target implementation in terms of consumption and production.

2. Continue the implementation of the "G20 Toolkit of voluntary options on renewable energy deployment. 2.1. Continue G20 Toolkit employment. 2.2. Continue voluntary options, as described by G20 countries. 2.3. Continue in-depth examination at the country level.	***Criterion II: 100% Renewable energy target.*** Collect the key aspects such as timescale, scope, energy sectors and political obligation for 100% renewable Energy target.
3. Enhance the structure for enabling the promotion of renewable energy investment. 3.1. Government's role to establish an enabling structure for promoting the renewable energy investment. 3.2. Private sector engagement. 3.3. sincerely work with G20 and other Working Groups.	**Criterion III: Institutionalization.** Assess the extent to which the government has helped institutionalize actions towards 100% renewable Energy by 2050. This may include human and financial resources, initialization of projects and coordination in different activities of projects.
4. Continue to support the strengthening of global cooperation. 4.1. Capacity building for developing countries on renewable energy technologies, energy planning and rural electrification as a priority. 4.2. Appreciate use of the current global cooperation platforms and mechanisms for renewable energy that are part of the established global institutions. 4.3. Voluntary contributions could be made to support the capacity building and technology transfer from the G20 to the developing countries on a bilateral and multilateral basis, with or without the help from concerned global institutions.	**Criterion IV: Renewable Energy Technologies.** Collect information on the different types of renewable energy technologies and sources used to achieve 100% of the renewable energy by 2050. **Criterion V: Buildings.** Identify and appreciate the activities within the building industry that support the overall achievement of 100% Renewable Energy by 2050.

Table 4: Difference between Action and Outcome Based Energy Plans.

Clearly, the action based plan mentioned in table 4, focuses on the main actions. However, all these action have no measurable values. For instance, the action stated in 1.1 in the G 20 action based plan states "Encourage G20 members to voluntarily implement policies and programs to

accelerate the deployment of renewable energy based on national conditions". It appears that this action is very well defined but there will be several challenges to measure it as it does not refer to any target. There is no stated outcome which will result from the encouraging of this action. These types of plan provide a certain level of flexibility and therefore they are comparatively easy to follow. In other words it may provide the opportunities for the countries and organizations to set their own targets based on each action. On the other hand, the outcome based action plan clearly indicates the target. For example, in table 4, Criterion III which is related to the Institutionalization, states a clear action with outcome as "Assessing the extent to which the government has helped institutionalized actions towards 100% renewable Energy by 2050. This may include human and financial resources, initialization of projects and coordination in different activities of projects". This criterion indicates a clear target which would be the achievement of 100% renewable Energy by 2050. Considering both action and outcome based approaches, an integrated plan for sustainable energy would be more appropriate to adopt. This would help the countries to define both their actions and set the outcomes against these actions.

Many countries and regions have developed action plans, supported by clear targets, under on their own legislations. For example each member state under European Union Renewable Energy Directive, requires an addition portion of renewable energy to 20% of total final energy consumption, and 10% renewable energy in transport by 2020 (EU, 2009). While comparing the European Union 2005 renewable electricity production with the 2020 target, Scarlat et al. (2015) observed that renewable energy sources portion in electricity production will rise from 14.9% in 2005 to 33.9% in 2020. The achieved and expected electricity production from different renewable energy sources in European Countries is shown in figure 6. While it is important for a country to have a clear action or outcome based sustainable energy plan, even it is more important to have the commitment and motivation to implement these plans and have them succeed.

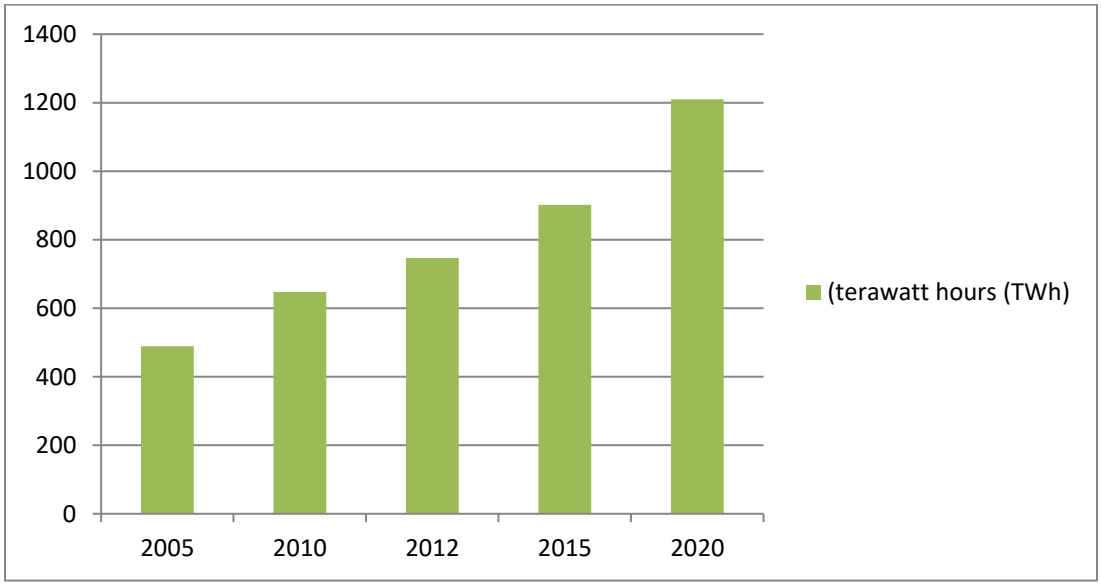


Figure 6. The achieved and expected electricity production from different renewable energy sources in European Countries.

4. Classification of Sustainable Energy Plans:

Different countries and regions publicize their sustainable energy plans in a variety of ways. These plans show that the European Union, China, Brazil, and the Indonesia aim to grow the share of sustainable energy in the national energy production, while Japan aims to increase the renewables energy production up to 24% of the total power requirement by 2030. The United States aims to accomplish an economy wide objective of decreasing its GHS emissions by 26~28% below its 2005 level in 2025 as presented in figure 7 (US, INDC, 2017). India's sustainable energy plan aims to increase electrical production from renewable sources. These nuances show valuable features that explain the scale and enthusiasm of these sustainable energy plans. Table 5 categorizes the sustainable energy plans for China, United States, European Union, India, Indonesia, Brazil, Japan, and Mexico in relations of coverage (sustainable, or sustainable and nuclear).

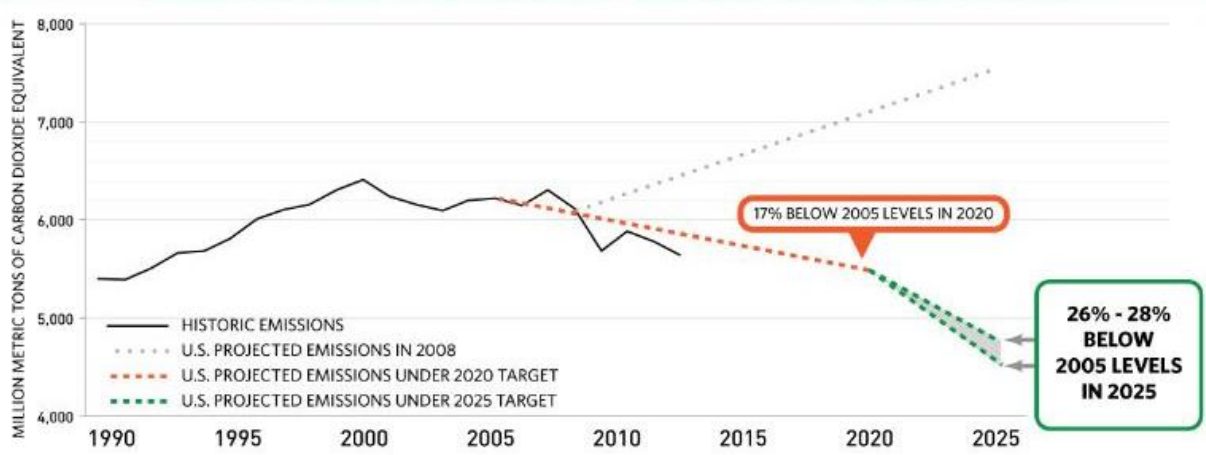


Figure 7. US emissions under 2020 and 2025 Targets (US, INDC, 2017).

Country / Region	World Ranking in GHGs, Emissions (EPA, 2017)	Coverage	Sustainable Energy Plan	Reference
Brazil	7th	Sustainable	"To adopt further measures that are consistent with the 2°C temperature goal, in particular, in the energy sector, achieving 45% of renewables in the energy mix by 2030." This includes "expanding the use of non-fossil-fuel energy sources domestically, increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar energy".	Federative Republic of Brazil Intended Nationally Determined Contribution towards accomplishing the goal of the United Nations Framework Convention on Climate Change. See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).
China	1st	Sustainable and nuclear	"Increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030".	Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions. See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).
European Union	3rd	Sustainable	Minimum 27% portion of renewable energy consumption by 2030.	The INDC of the European Union and its 28 member States. See: https://unfccc.int/files/focus/indc_portal/application/pdf/adpeu.pdf (accessed 01/10/2017).

India	4th	Sustainable and nuclear	"To achieve about 40% cumulative electric power installed capacity from non-fossil-fuel based energy resources by 2030 with the help of transfer of technology and low-cost international finance including from Green Climate Fund".	India's Intended Nationally Determined contribution: Working towards climate justice. See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).
Indonesia	6th	Sustainable	"At least 23% coming from new and renewable energy by 2025." [National Energy Policy of Indonesia's aim a 23% renewable input to primary energy in 2025 from the baseline of 4% in 2014].	Intended Nationally Determined contribution, Republic of Indonesia. See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).
Japan	8th	Sustainable	To grow renewables in electricity production to approximately 22~24% by 2030.	Submission of Japan's Intended Nationally Determined Contribution (INDC). See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).
Mexico	10th	Sustainable and nuclear	The Ministry of Energy, in cooperation with the Federal Electricity Commission and the Energy Regulatory Commission, encourages the enhancement of sustainable energy sources in the national electricity production up to 35% by 2024.	Intended Nationally Determined Contribution, Mexico. See: http://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf (accessed 01/10/2017).

United States	2nd	Sustainable	"Increase the U.S. share of sustainable and renewables, beyond hydropower, in the electricity generation mix to the level of 20% by 2030".	Intended Nationally Determined Contribution, United States. See: http://www4.unfccc.int/ndcregistry/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf (accessed 01/10/2017).

Table 5: Classification of Sustainable Energy Plans for Different Countries / Regions (INDCs, 2017).

5. Conclusion:

The United Nations sustainability goals set for achievement by 2030 stress the access to clean, efficient, sustainable and economical energy for all. Most of the countries have submitted their Intended Nationally Determined Contributions plans to the UN, showing how they intend to achieve this goal. These plans are classified in this article as either "action based plan" and as "outcome based plan". The review of 162 countries who have submitted their INDCs, show that 53% of these sustainable energy plans can be classified as outcome basis, and 27% can be classified as actions based. Major portion (53%) of these plans are outcome based plans due to the different merits as compared to action based plans. The plans of some countries which produce a high level of greenhouse gases are discussed in more detail to reflect the approaches adopted by these countries and to show that what kind of renewable forms of energies these countries are considering. There is an opportunity for countries to learn from each other's experience. The sheer magnitude of clean energy plans shows positive indications of countries' intentions to revamp their energy productions and to boost financing in the sustainable energy. Although the sustainable energy plans submitted by different countries and regions are a step ahead, however to achieve the Paris Agreement and accomplish zero emissions, there is more need to be done. These sustainable energy plans needs to be put into actions now so that the common goal could be accomplished. A greater cooperation among the countries will enable to learn from each other experience and to develop future strategies to cope effectively with the global warming issue. Although the major responsibilities with the high producers of greenhouses gases, it is also important for the countries and regions representing 20 % who have not yet prepared any sustainable energy plan, to join hands with the world and put their potential plans in action. To encourage Gulf countries to adopt different forms of renewable energies, the case of Oman is discussed in more detail showing that there is not only a great opportunity for business in renewables but also a potential to reduce the emission of greenhouse gases.

Acknowledgement: The authors acknowledge the support in proofreading and editing provided by Ms. Nicola Harris BA, PGCE, CELTA; Teaching Consultant.

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