



# COMBAT THE GLOBAL WARMING BY GENERATING RENEWABLE SOURCES OF ENERGY

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## INTRODUCTION

Global warming is the increase in average temperature of the air near the earth's surface air and oceans. Most of the observed temperature increase is caused by increased concentration of greenhouse gases. Major gases are Water vapor (36-70%), Carbon dioxide (9-26%), Methane (4-9%) and Ozone (3-7%).

Electricity generation accounts for more than 50% Global Warming emission (8) with the majority generated by coal fired power plants in the world. Natural gas power plants produce more than 10% total emission on the earth. In contrast to this most renewable energy sources produce very little global warming effects.

Here in this article the author has made an attempt to bring out the status of renewable sources of energy like Hydro power, Solar and Wind energy and their contribution to combat the effects of environmental degradation. A special emphasis has been given in respect of Indian context.

Key words-Renewable, Emits, Wind, Harvesting, Warming.

## IMPORTANCE OF ENERGY

In modern day's power sector is the most important sector for the economical growth and prosperity of any country. However human activities over loading atmosphere with carbon dioxide and other global warming emission which trap heat steadily and increases the planets temperature and creates significant harmful impacts on our health, environment and climate.

Electricity production accounts for more than 50% global warming emission with the majority generated by coal fired power plants, natural gas power plants produce more than 10% total emission in the world. In contrast to this most renewable energy sources produce very little global warming emission.

## CONSUMPTION OF VARIOUS SOURCES OF ENERGY

Effects of generation of energy from various sources on the climate change and global warming, specially oil, gas, and coal which produce carbon dioxide

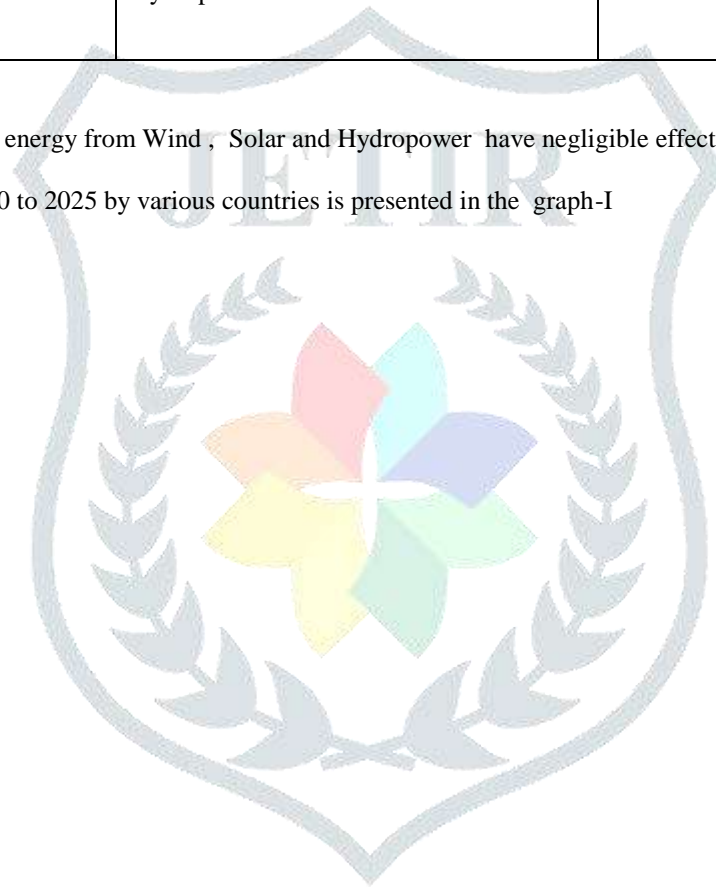
The comparison of emission of Carbon Dioxide by various sources is as under.

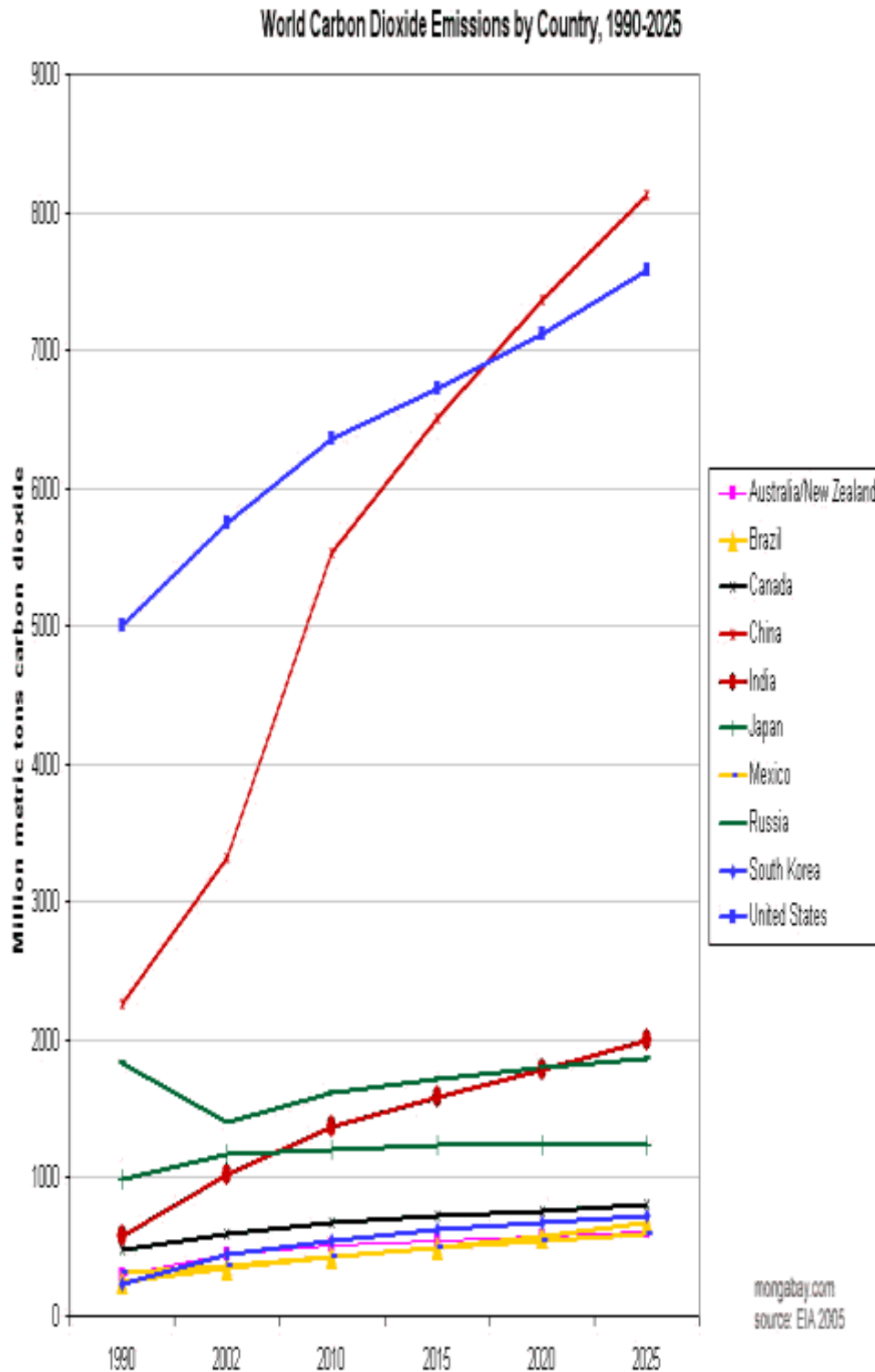
TABLE –I-COMPARISION EMISSION OF CO2 BY VARIOUS SOURCES

Sr. No.	Sources of Energy	Emission of CO2 in kg equivalent /kW
1	Natural Gas	0.272 to 0.9
2	Coal	0.635 to 1.63
3	Wind Energy	0.009 to 0.018
4	Solar	0.031 to 0.09
5	Geothermal	0.0453 to 0.09
6	Hydropower	0.0453 to 0.2268

It is clear that the generation of energy from Wind , Solar and Hydropower have negligible effects on global warming.

The carbon produced from 1990 to 2025 by various countries is presented in the graph-I





Source-Google web

Electricity generation from Biomass can have a wide range of Global Warming Emission depending on methods . Thus the supply of renewable energy would allow us to replace Carbon Intensive energy sources significantly in the world.

#### REASONS TO HARNESS RENEWABLES

##### COST COMPARISON

The cost of the renewable sources are decreasing steadily and have been projected to drop in future. The average price of solar panel has dropped almost 60 % in the last 5 years. The cost of energy from wind has dropped by 20 % in the last five years. The cost is likely to decline further by introduction of new technology. In contrast the cost of fossil fuel is increasing day by day. Fossil fuel technology has more capital intensive and renewable energy are more labour intensive.

##### SHORTAGES OF POWER

There is huge shortage of power during peak hours , morning and evening hours. For this a storage type hydro projects are required to be developed to balance the frequency in the system.

### PUBLIC HEALTH BENEFITS

Generating Electricity from renewable energy sources offers significant public health benefits. The air and water pollution emitted by coal and natural gas plant is linked to breathing problems , neurological damages ,heart attacks and cancer. Replacing fossil fuel by renewable energy has been found to reduce premature mortality and lost work days.

Wind, Solar, and Hydro system generate electricity with no associated air pollution emission.

Wind and solar energy require no water to operate and hence do not pollute water resources. As such do not interfere with agriculture ,drinking water, and other important water needs. Jobs and other economic benefits are very high in developing renewable energy as compared to Coal and Gas fired system.

The magnitude of hydro power, wind energy and solar are highlighted below.

### RENEWABLE SOURCES OF ENERGY

#### Hydro Electric Power In India.

India is the 7 th largest producer of hydro electric power .The hydro power potential of 84,000 MW at 60 % load factor is one of the largest in the world. The present installed capacity as on 31 St March 2016 is 42,783 MW which is 14.35 % of total utility electricity generation. In addition 6780 MW small hydro power installed as on 31 St March 2016 which includes mini, micro and small hydro.(less than 25 MW). India also imports surplus power from Bhutan. The hydro power plant at Darjeeling and Shivansamudra were established in 1898 and 1904 respectively. They were among the first in Asia. . Also 56 pumped storage schemes with an aggregate capacity of 94,000 MW have been identified.

National Hydroelectric power Corporation, North East Electric Power Corporation, (NEEPCO), Satluj Jal Vidyut Nigam,( SJVNL),THDC(Tehari HYdro Power Corpporation) and NTPC (Thermal Hydro power Corporation) . are a few public sector companies engaged in development of Hydro Power . Private Sector owns only 7.5 % out of the total 42,783 MW,

Bhakra Beas Management Board (BBMW) in North India has an installed capacity of 2.9 GW and generates 12000-14000 million units per year. The generation cost after 4 decades is 20 paisa per Kwh. BBMW is major source of peaking power. BBMW reservoir annually supplies water for irrigation to about 6 Million Hectares of agriculture land .

### THE HYDROELECTRIC GENERATIONS IN VARIOUS COUNTRIES

The hydroelectric generation in various countries is shown in table-II

TABLE-II-Hydro Power Generation in Various Countries.

Continents	Technical Potentials(I)	Generated in 1990(II)	(II) as % Of (I)
Africa	1344	50	3.7
Asia	4212	387	9.2
Austrilia	203	38	18.7
Europe	836	483	57.8
North America	969	573	59.1
Latin America	3486	380	10.9
USSR	2950	223	7.6
World	14000	2134	15.2

According to United Nations Estimates in1981 the total world hydropower production would have risen to 80 % by 2020.

#### Hydro Potential in India

. As per assessment made by CEA ( Central Electricity Authority ) India is endowed with economically exploitable hydro power potential to the extent of 1,487,00 MW of installed capacity. The basin wise assessed potential is as under.

TABLE-III-BASINWISE POTENTIAL

Sr. No.	Places	Potential in MW
1	Indus basin	33,832 MW
2	Ganga Basin	20,711 MW
3	Central Indian River Basin	4,152 MW
4	Western Flowing River of Southern India	9,430 MW
5	Eastern Flowing Rivers of Southern India	14,511 MW
6	Bramhaputra Basin	66,065 MW
7	Total	1,48,701

### Small Hydro Power

Small hydro projects up to the capacity of 25 MW have been classified as small hydro projects under the Ministry of Renewable and New Sources of Energy Govt of India. It has a potential of 15000 MW. They can supply energy to remote and hilly areas where extension of grid power system is either not possible or is unsuccessful. These projects are environmentally benign and have short gestation period

The account of total capacity of small hydro projects below 25 MW is given below in Table-IV

TABLE --IV- SMALL HYDRO POTENTIAL (12)

Project status	Total no of projects	Total capacity in MW
Commissioned	556	2767
Under Implementation	203	468
Total	759	3235

Of all the non-conventional sources of energy, small hydro represents the highest density source and stands first in terms of energy generation. Most of small hydro power projects are grid connected.

Investment of small hydro is affordable to private sectors enabling quick electricity and economic returns. Fiscal investment by central Govt is attracting private initiatives in this field.

In Arunachal alone there are numbers of small hydro projects such as Kamang (6 MW), Sippi (3 MW), Jugdin (1 MW) which have been commissioned and supplying power to people in remote areas. The cost of energy is ranging from 4.43 to 6.0 per unit which is quite reasonable. Their development has forbidden the use of forest wood and use of costly diesel energy protecting the environment from pollution.

### Wind Energy

Wind power is another source of energy. 1973 herald the definite breakthrough in harnessing the wind energy. In India the program was started in 1983-84 with the efforts of the Ministry of Nonconventional Sources of Energy. The estimated potential of wind power is 20,000 MW . It has been revised to 45,195 MW considering the technological advances and availability of more modern equipment. India ranked fifth in the world after Germany, USA, Denmark and Spain.

A long range program has been initiated in the direction of wind energy generation and formation of wind farm.

The global scene of wind energy is mentioned below (2006)

TABLE—VI-GLOBAL POTENTIAL OF WIND ENERGY

Sr.No.	Country	Potential in MW
1	America	1690
2	Germany	1300
3	Rest of Europe	149/84
4	India	1269.1

Out of 1269.1 MW, 736.326 MW has been connected to grid. About 24-25 manufacturers are engaged in assembly and production of wind turbines. A national wind Test Centre has been established in Tamilnadu, South India with the assistance of UNDP (United Nations Development Program) (Fig-II-Shows the wind Power Station)

The capacity factor of the wind form is in the range of 14 % only. In some cases it goes down to 10 %. Therefore very careful site selection is called for the improvement of capacity factor. The unit size of wind turbine has gone from 55 to 100 kW in the first few projects to 2.1 MW in recent projects. The capital cost of wind power ranges from Rs 4 to Rs 5 crore per MW which is very reasonable as compared to conventional sources of energy.

#### Solar Power

Solar as an idea emerged many times earlier. In our galaxy Sun is the medium size star .It is a glowing fire ball consisting of hot gaseous matter notably hydrogen and helium. The sun radiates 53 million watts of energy per square meters of its surface. The earth receives  $17 \times 10^{12}$  kW of energy (1,70 00,000 million MW).The vast amount of energy received forms the basis of all lives on the earth. The special distribution of solar radiation on the earth is greatly influenced by location, climate and atmospheric conditions. India receives about 300 clear sunny days in a year of solar radiation or about 4 to 7 kW per sq m depending on location. The solar energy is much more than the total annual requirement.

It has been estimated that a potential of 20 MW / sq km through photovoltaic route and 35 MW /sq km by solar thermal source is available .Solar power has been utilized as stand alone and grid connected power system has been under use. The stand alone application include street light ,domestic light, portal solar lanterns, water pumps etc. by using principle of conversion of solar energy directly in to electricity.

To exploit the solar energy, Govt. has launched a twin program for solar energy development. The Ministry of New and Renewable Energy has initiated the solar photovoltaic (SPV) and solar thermal power program. The SPV modes generate the DC (Direct Current) and convert it in to AC (Alternate) quality power. The solar thermal power module uses the concentrated solar power to increase the temperature of working fluid above 300 °C to run the conventional turbines to generate energy.

In order to promote use of solar energy in accelerated rate, Govt. has launched Jawaharlal Nehru National Solar Mission on January 2010. The tariff has been fixed at Rs 14.95 solar PV and Rs 12.85 for solar thermal(Water and Energy-October 2010)

It is estimated that the **1 kW** solar plant offsets about = **0.73 tons** of CO2 emissions.

So a **1 MW** solar plant will offset = **730 tons** of CO2 emissions

Now a tree can absorb as much as= **22 kg** of CO2 a year. So going solar will offset planting around  $730,000/22=33,183$  trees.(**Google search**)

Well, that's a lot of trees being offset with a 1 MW solar plant. Which is why all of us have to come together in reducing the carbon emissions we all make and take respective measures to use other renewable sources of electricity.

You have the luxury of walking down freely on the road, but a few years from now you would regret seeing your children play with a breathing mask on their face.

TABLE- VII-Total Solar Energy Potential

Project status	Total no of projects	Total capacity in MW
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Commissioned	556	2767
Under Implementation	203	468
Total	759	3235

TABLE-VIII-TOTAL POTENTIAL OF RENEWABLES AND DECREASE OF CO2

Sr.No.	Projects	Potentials	CO2 -offsets
1	Hydro Power	84000 MW	61320 tons
2	Small hydro	20000 MW	14600 tons
3	Wind Power	20000 MW	14600 tons
4	Solar Power	3235	2361.55 tons

1 MW power can off set planting of 3183 trees a year.

In India Harnessing all hydro power, wind ,and solar can reduce the carbon by 92,881.55 tons in the atmosphere.

#### CONCLUSIONS

Generation of renewable will reduce the carbon in the atmosphere and global warming effects.

The sources of renewable energy are available in plenty .However they are yet to be harnessed

They cost effectives and environmental friendly.

Reduce ,Reuse and Recycle the resources'

Reduce the use of coal based thermal power plants'

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