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Carbon dioxide prevented by Rohtak division after the installation of Solar Rooftop panels

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Abstract

The non-renewable resources are not only depleting but are also a major cause of concern because of the pollution and climate changing happening due to them. Hence, it becomes important for India to participate in the growing opportunities and necessities of the world to substitute its type of energy usage. Out of all such clean renewable energy sources, solar energy sounds the most favourable and long lasting for India. Although, it looks a lot less on the ground level, the amount of kW sanctioned to households and institutes and social sector, but together they make a huge difference. The decentralisation of electricity not only makes one more self-reliant but ensures the reduction in carbon dioxide in the atmosphere occurring because of burning of fossil fuels, particularly coal for electricity generation. This paper deals with the amount of carbon dioxide which has been prevented from release in the atmosphere because of the adoption of solar rooftop panels. The role which different sectors have played in slowing climate change, however small, will encourage authorities as well as end users to shift to solar energy for bigger and better results. The amount released in the atmosphere every year makes it even more important to control carbon dioxide emissions but it needs to be balanced with the energy needs of the concerned region which is going to rise in the coming years with development. Rohtak division of Haryana is one of the most populated, urbanised and close to Delhi, NCR region and it can show us the future potential of the solar rooftop panels in reducing carbon dioxide emissions.

Keywords: Solar energy, solar rooftop panels, renewable energy, green energy, clean energy, carbon dioxide emissions, climate change

Introduction

With the ability of humans to harness fossil fuels for producing energy came the dawn of new civilization, that of an industrial world. Industrial revolution brought the changes in lifestyle and technology which were never seen and experienced in the history of human world. But like any other new thing, innovation is scarce and expensive in the beginning and then it spreads to masses. So, the entire focus in the beginning was on spreading the technology to people and making life of people easier and more opportunistic. In the mid of 18th century or later on, zero or very minimal thought was given to the repercussions of using non-renewable resources of energy recklessly. Now the world has shifted from needs to wants, from necessity to luxuries. But in India and many other developing nations of the world, it is still a challenge to provide basic amenities like electricity to all. But side by side, the unbreathable air, undrinkable water quality and degraded lands are making people, governments and organisations to open their eyes to the world they are creating in the name of development. Hence, the world is shifting from providing energy resources at any cost to balancing it with the healthy lifestyle on planet. So, the new sources of creating power have been found out by means of renewable resources of which solar is the most promising component so far. When it comes to naming environmental benefits; saving coal, water and preventing carbon dioxide emissions are the most important ones and are also most focused upon by the international and national organisations as well as governments throughout the world. According to a report of Statista, global carbon dioxide emissions which were 4.85 billion metric tons in 1940, increased to 25.23 billion metric tons in 2000 and were 34.81 billion metric tons in the year 2020. Also, according to the World Resource Institute Report (2017),

India is responsible for nearly 6.65% of total global carbon emissions, ranked fourth next to China (26.83%), the USA (14.36%), and the EU (9.66%). Numerically, in the year 2016, India was responsible for, 2.5 billion metric tons of carbon dioxide emissions which was 1.06 billion metric tons in the year 2000. Although the per capita share of India is still less than some countries but the share is increasing nonetheless. With it comes an increase in responsibilities towards changing climate and finding alternative becomes necessary as the country is still growing and its demands for the energy would be rising in the coming years. One of those cleaner sources of producing electricity is solar energy which is a broad term in and it can be used in multitudes of ways to produce electricity. One of those ways is solar rooftop panels where solar panels are installed on the rooftop of buildings. Here, the panels process the incoming solar radiations and convert them into electricity of Direct Current (DC) form. By doing so, the electricity produced from other sources is prevented and the pollution caused by them is also diminished. Although, the entire supply is still not possible by the solar rooftop panels. It still helps in reducing the amount of coal and water used. Also, wherever, there is a use of coal via thermal power plants, millions of tons of coal can be saved. This research paper, only deals with the carbon dioxide emissions that can be prevented by using solar rooftop panels. Awareness is dependent on multiple factors which may vary from time to time and place to place. For instance, monetary factor could be a dominant factor now but it may not be so in the future when people would be fully confident about the outcomes of its use. But at the initial phase it became vital to spread awareness about the benefits that can be experienced. Many households in India are still sceptical about adopting solar rooftop panels. This is due to many reasons. But with right awareness improvements can be done. For that, it needs to be figured out where are the fissures which needs to be filled. This paper deals with one such approach of finding out the problem. Also, with high targets set by the Government of India as well as Government of Haryana for solar energy in general and solar rooftop panels in particular, it becomes necessary to spread the environmental benefits arising out of it. The current data states that Haryana is lagging far behind in achieving the target of 1.6 GW by the end of 2022. But the state has so far achieved 1 GW out of its total target of 4.2 GW. This paper deals with the data which shows that from the year 2016 to 2019 for the solar rooftop panels installed, a certain amount of carbon dioxide emission has been avoided. In a direct way, consumers have done their part for climate change, irrespective of the purpose for which they have installed the solar rooftop panels (which are mainly financial).

Study Area

The area chosen for the research paper is the administrative division of Rohtak in the state of Haryana which is the largest administrative division of the state. There are a total of 5 districts which come under this division which are following:

Bhiwani, Charkhi Dadri, Jhajjar, Rohtak and Sonipat.

All these districts have proximity to national capital, Delhi except Charkhi Dadri. Bhiwani is located west of Delhi at a distance of 124 km. Charkhi Dadri forms part of southern Haryana and do not share border with any other state or national capital. But it is only 90 km from the national capital. Jhajjar is also west of Delhi but is only 55 km away from it and forms a part of NCR. Rohtak, the city on whose name this administrative zone is named is also part of NCR and is located to the north-west of Delhi. The last city, Sonipat is only about 44 km away from the national capital and also has an education city in it.

Objectives of the Study

- To find out the carbon dioxide prevented by household, institutional and social sector in Rohtak division of Haryana.
- To find out the total carbon dioxide prevented by each district in Haryana.

Data Base

- The data for carbon dioxide emission per 100 kW of solar power creation was obtained from HAREDA.
- The data for number of solar rooftop panels installed with their capacity was obtained also obtained from HAREDA from the year 2016 to the year 2019.

Methodology

According to the data,

100 kW of thermal energy production releases 0.41 tons of carbon dioxide in the atmosphere in a single day.

So, 1kW production will amount to a release of 0.0041 tons which is 3.7 kilogram of carbon dioxide. The unit of carbon dioxide has been taken kilogram for the research work. Now, for every district the total kilogram emission of carbon dioxide avoided has been calculated by multiplying 3.7 with the total kW production in that district.

It has also been found out separately for all the sectors of every district of Rohtak division.

Results and Discussion

The following figures represent the carbon dioxide saved by every district sector-wise from 2016 to 2019.

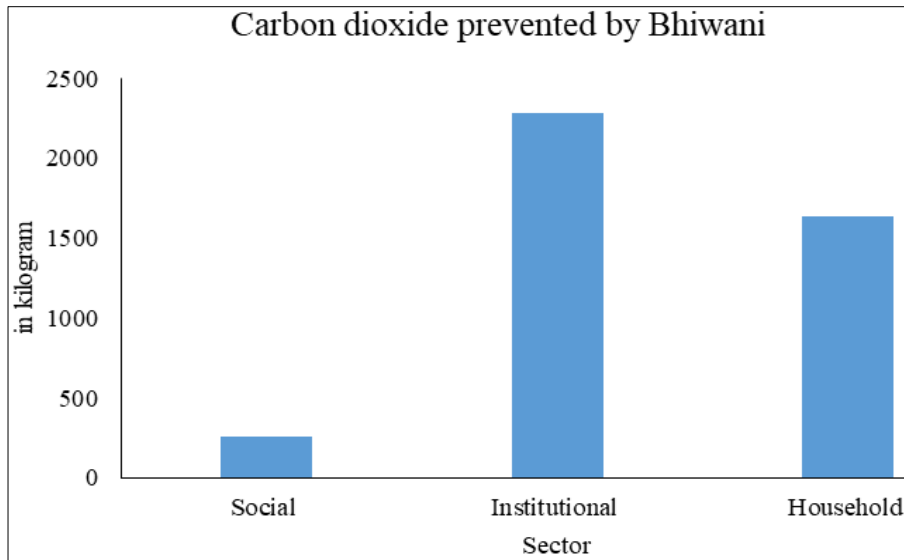


Fig 1: In Bhiwani district, 255.3 kilogram in the social sector, 2282.9 kilogram in the institutional sector and 1639.1 kilogram in the household sector carbon dioxide emissions were prevented.

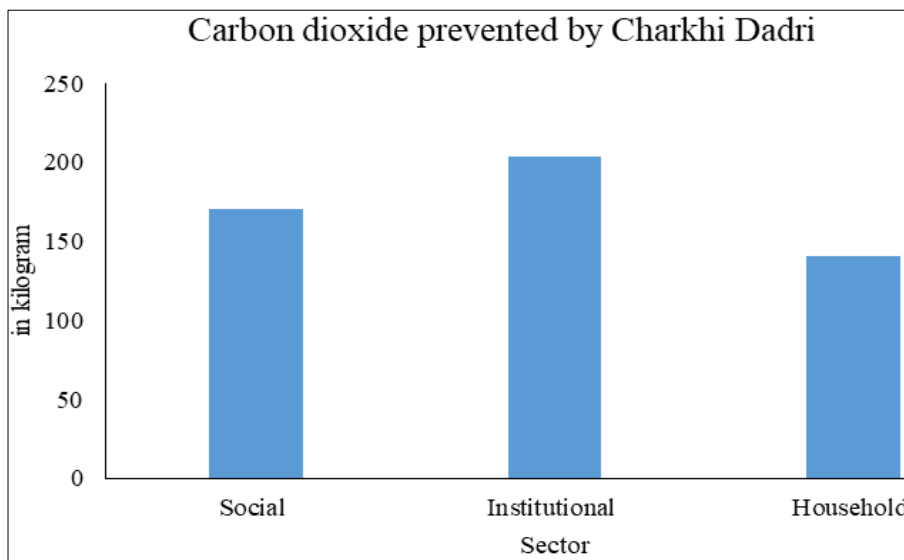


Fig 2: 170.2 kilogram in social sector, 203.5 kilogram in institutional sector and 140.6 kilogram in household sector was the amount of carbon dioxide prevented due to installation of solar rooftop panels.

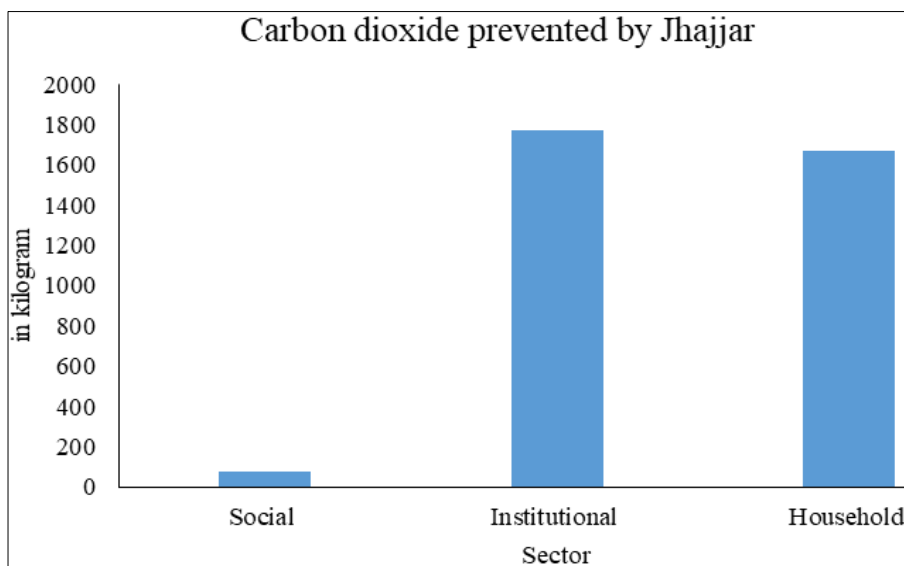


Fig 3: The above figure 3 represents that 77.7 kilogram carbon dioxide was prevented by social sector, 1768.6 kilogram by institutional sector and 1672.4 kilogram by household sector of Jhajjar.

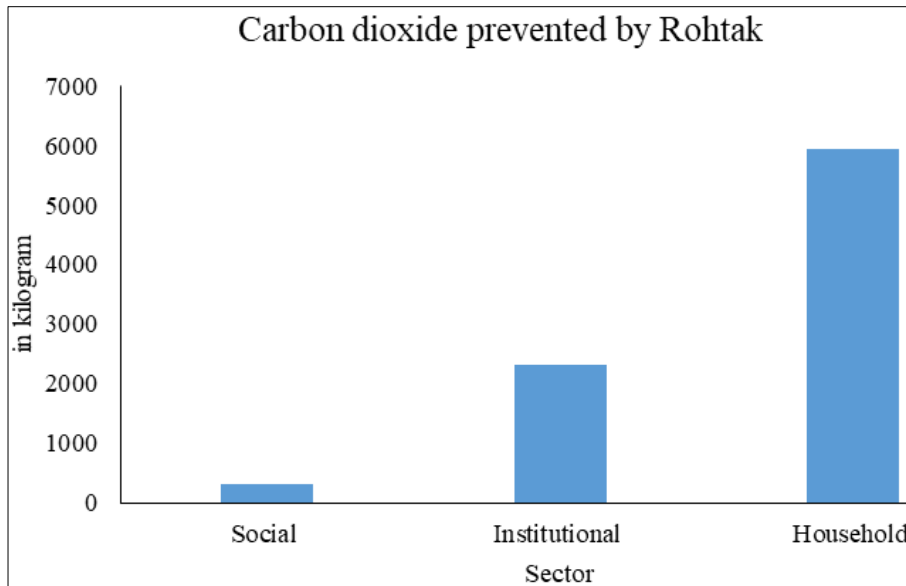


Fig 4: The above figure for Rohtak district shows that 321.9 kilogram was prevented by social sector, 2308.8 kilogram by institutional sector and 5942.2 kilogram by household sector.

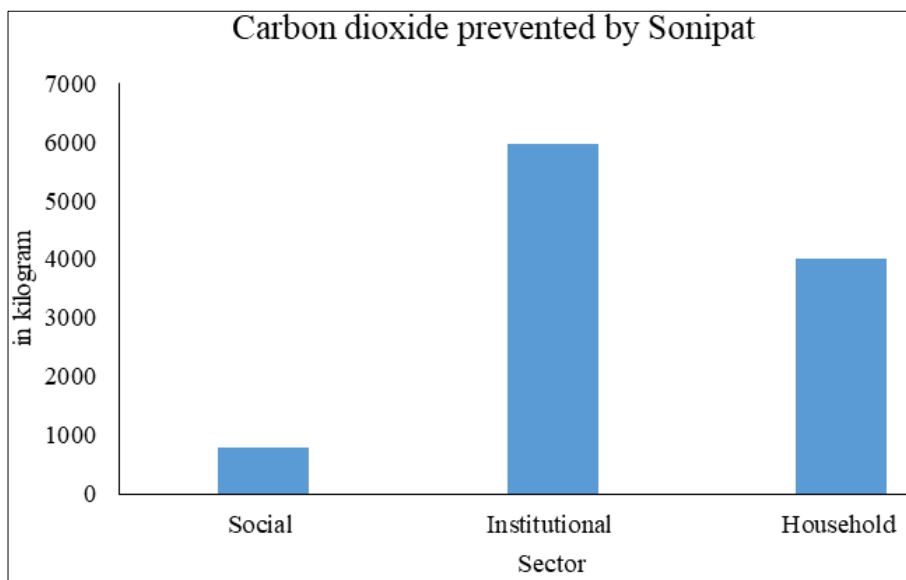


Fig 5: The above figure shows that in Sonipat, 780.7 kilogram carbon dioxide in the social sector, 5960.7 kilogram in the institutional sector and 4003.4 kilogram in the household sector was prevented.

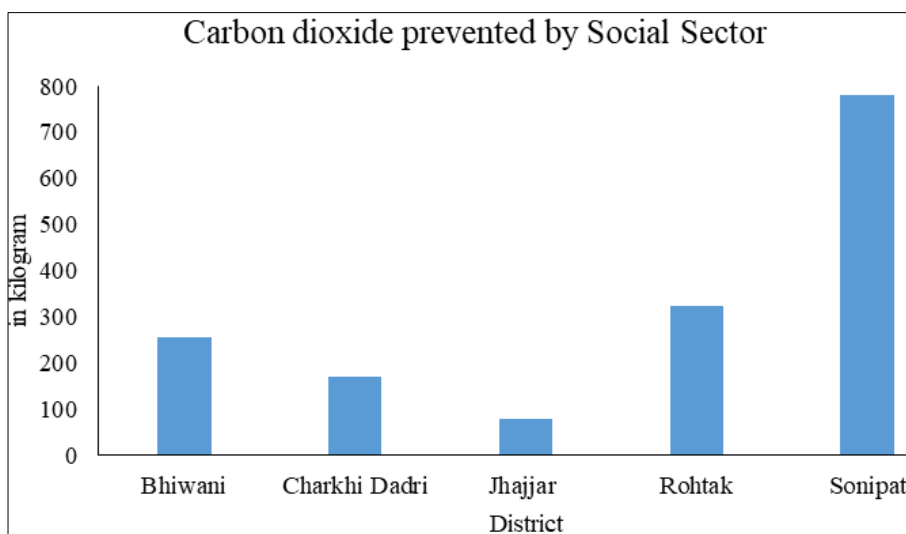


Fig 6: The highest prevention of carbon dioxide was observed in Sonipat district in social sector, followed by Rohtak, Bhiwani, Charkhi Dadri and Jhajjar.

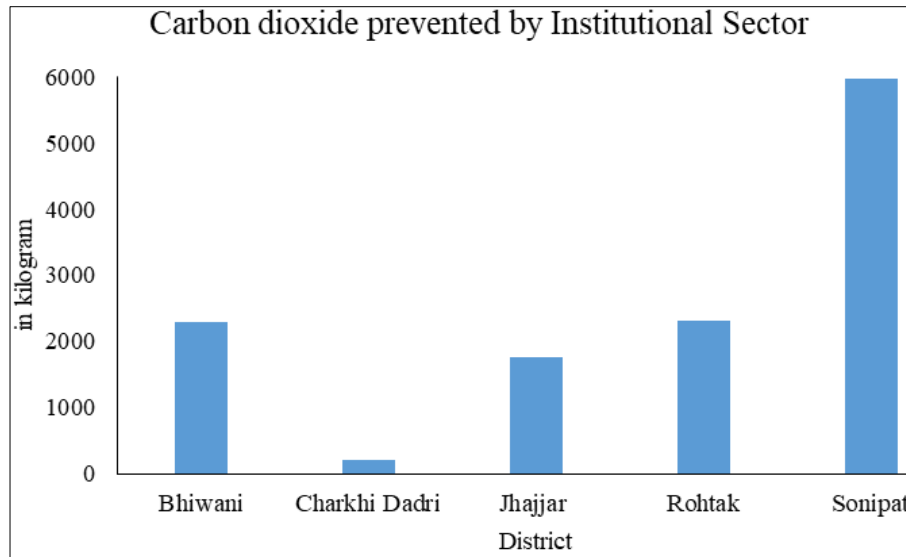


Fig 7: The above figure 7 represents the contribution in terms of emissions prevention by the institutional sector. The highest was found to be that of Sonipat, followed by Bhiwani, Rohtak, Jhajjar and Charkhi Dadri.

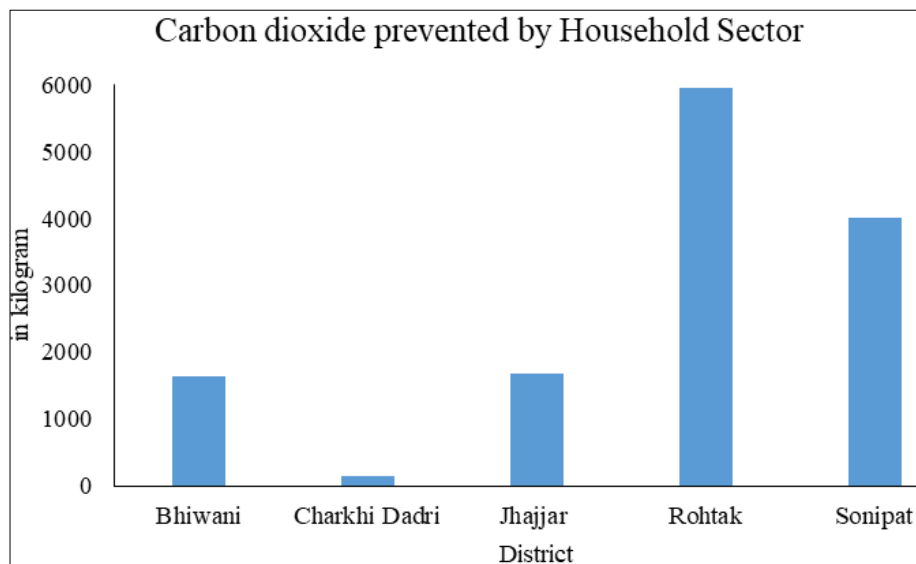


Fig 8: The maximum prevention in the household sector was done by Rohtak, followed by Sonipat, Jhajjar, Bhiwani and Charkhi Dadri as shown in the figure 8 above.

From the above discussion, it is understood that, the least carbon dioxide was prevented by Charkhi Dadri in Rohtak division and the maximum by Sonipat. The data varies from 321 kilogram to 5960 kilogram. After Sonipat, a high prevention was observed in Rohtak and Jhajjar. The prevention of carbon dioxide in Jhajjar and Bhiwani was of medium level.

The next three figures show the contribution of the three sectors throughout Rohtak division:

Conclusion

In a nutshell it can be said that every installation of solar rooftop panels looks small when seen from an individual level. But when looked from a holistic perspective, it brings changes of a considerable amount. As most of the installations of solar rooftop panels in the household sector were of 5kW mainly but when taken as a whole for the entire Rohtak division or even for a single district in the division, they brought a significant contribution to the table of preventing climate change by reducing carbon dioxide as it saved 5942.2 kilogram of it in Rohtak district alone.

Similarly in every other sector and every district, the little installations made big differences when combined together and prevented 27528 kilogram carbon dioxide emissions. The data also shows that the coverage is not even of the 5 percent buildings in the division and hence, there remains a huge potential for carbon dioxide emissions which with more installations can go into lacs of kilogram from one division only.

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