



# IMPACT OF WIND TURBINE ON ENVIRONMENT: A CASE STUDY OF GADAG DISTRICT, KARNATAKA STATE.

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## Abstract

The present paper is focused on the wind energy and its impact on environment in Gadag district of Karnataka State. Energy is one of the key factors to determine not only the economic activities but also leads the human welfare of the society. The development of any nation in the world largely depends upon the utilization of its energy. As far as the wind energy is concerned, the installation of wind turbines in different geographical space has some impact on environment. The deforestation is quite common, while installation the turbines in hilly and forest area. Wind turbines also make some noise while generating the energy which leads to noise population to the nearest residence area. The study region is located in western part of northern Karnataka. It has semi- arid characteristics. It has extended between 14° 56' to 15° 53' North latitude and 75° 17' to 76° 02' East longitudes. It has an area of 4656 Square Kilometers with a population of 10,64,570 (2011) and distributed into 346 settlements. The district is influenced by west, southwest and north-west winds. The average velocity of the wind in the district is 11.4 Knots per hour (2015). There are 750 wind turbines have been installed in study area, those have been installed in 375.00 acre of an area in different type of land such as, agriculture land (197.00 acre), barren land (05.00 acre), hilly area (66.00 acre) and forest area (107.00 acre) in various settlements. The main object of the study is focused on the wind energy and its impact on environment. The study is based on the secondary source of information and collected from various sources and the analytical method has been employed and accordingly discussed.

**Key words: Wind Turbine, Environment and Deforestation.**

## **Introduction:**

Energy is one of the most important and useful not only the human activities but also to determine the development of any nation in the world. The amazing growth of population involved in the multi activities depending upon the energy. The fast growing urbanisation, industrialisation and modernisation required more energy rather than the routine socio-economic and cultural activities. Hence, energy is an essential component. Energy is a basic requirement for the development of any nation (Nataraj, 2000). There is a strong relationship between consumption of energy and economic development. It is one of the important factors, which determines the development of the nation. It has made its place in each and every field of the life. The industrial development and improvement in the life of the human being are mostly depends upon the utilization of its energy (Sorensen, 1983).

The utilization of energy is heavily confined in the areas of transportation, industries, mining activities, infrastructural development projects and also agricultural sector in India. Due to the development of science and technology, the information technology, biotechnology, medical fields etc. are heavily depends upon the energy all the while. Besides this, there is a need energy for space travel and all scientific activities. Thus, the energy use is an indication of the degree of development as opined by Anubhav Koushik, 2006.

As far as Indian scenario, the energy situation is concerned, it has high consumption due to the population pressure resulted into the scarcity of energy paved the way for an alternative energy particularly wind energy. Therefore, the present paper is focusing on the wind energy and its impact on environment is the main consideration and accordingly discussed.

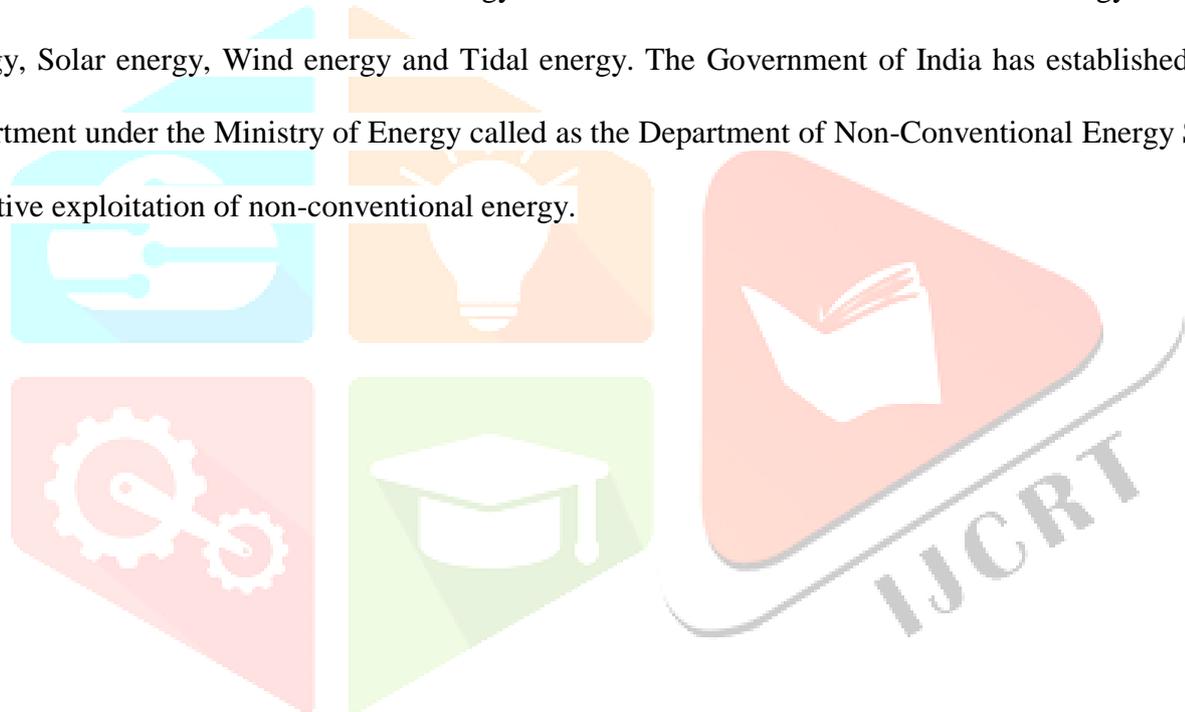
The term 'energy' is derived from the Greek language *energeia*. In Greek 'en' means in and 'ergon' means work. 'En-ergen' means in work or work contain (Bakhshi, 1995). Jadhav (1997) has defined the energy that it is the capacity to do work.

Wind is a global phenomena occurring on the earth surface with temperature variation at different places and locations. Varadarajan and Jeyakumar (1994) have states that, wind is air in motion produced by the difference of atmospheric pressure. El-Wakil (1984) has opined that, wind energy is the indirect source of solar energy. Wind is nothing but a moving mass of air. Rangarajan (1995) has studied wind power potential means the extent of power available in atmospheric wind that can be converted to electric power

using electric generators. Miller. T (1997) has mentioned the potential energy is stored energy that is potentially available for use, but the total useful energy is the available energy in the form of resources.

Wind energy is one of the major sources of energy, which does not incur fuel cost, nor it causes pollution and moreover it is a permanent source. It is helpful to reduce the global warming as it does not emit greenhouse gases. Hence, generation of power from wind has become indispensable and inevitable as it is non- exhaustible and eco-friendly. It may be bit costly at present, but in future, its generation would be very cheap, sustainable and harmless to society. Therefore, it is treated as white energy.

The sources of energy which are being produced continuously in nature and are in exhaustible are called renewable sources of energy or non-conventional energy. Besides conventional sources of energy, there are non-conventional sources of energy and also called as renewable sources of energy. Known as Bio energy, Solar energy, Wind energy and Tidal energy. The Government of India has established a separate department under the Ministry of Energy called as the Department of Non-Conventional Energy Sources for effective exploitation of non-conventional energy.



## Study Area:

The study region is located in western part of northern Karnataka. It has semi- arid characteristics. It has extended between 14° 56' to 15° 53' North latitude and 75° 17' to 76° 02' East longitudes and surrounded by six neighboring districts namely Dharwad on west, Belgaum on the north-west, Bagalkot on the north, Koppal on the east, Ballary on the south-east and Haveri on the south-west. In the northern side of the district the Malaprabha river flows for about 25 Kilometers and Tungabhadra river flows 20 Kilometers in the southern side and from the natural boundaries. It has an area of 4656 Square Kilometers with a population of 10,64,570 as per 2011 census. It measures 104 Kilometers from north to south and 84 Kilometers from east to west. There are 346 settlements and nine towns have been distributed in the five talukas of the study area (Fig No 1).

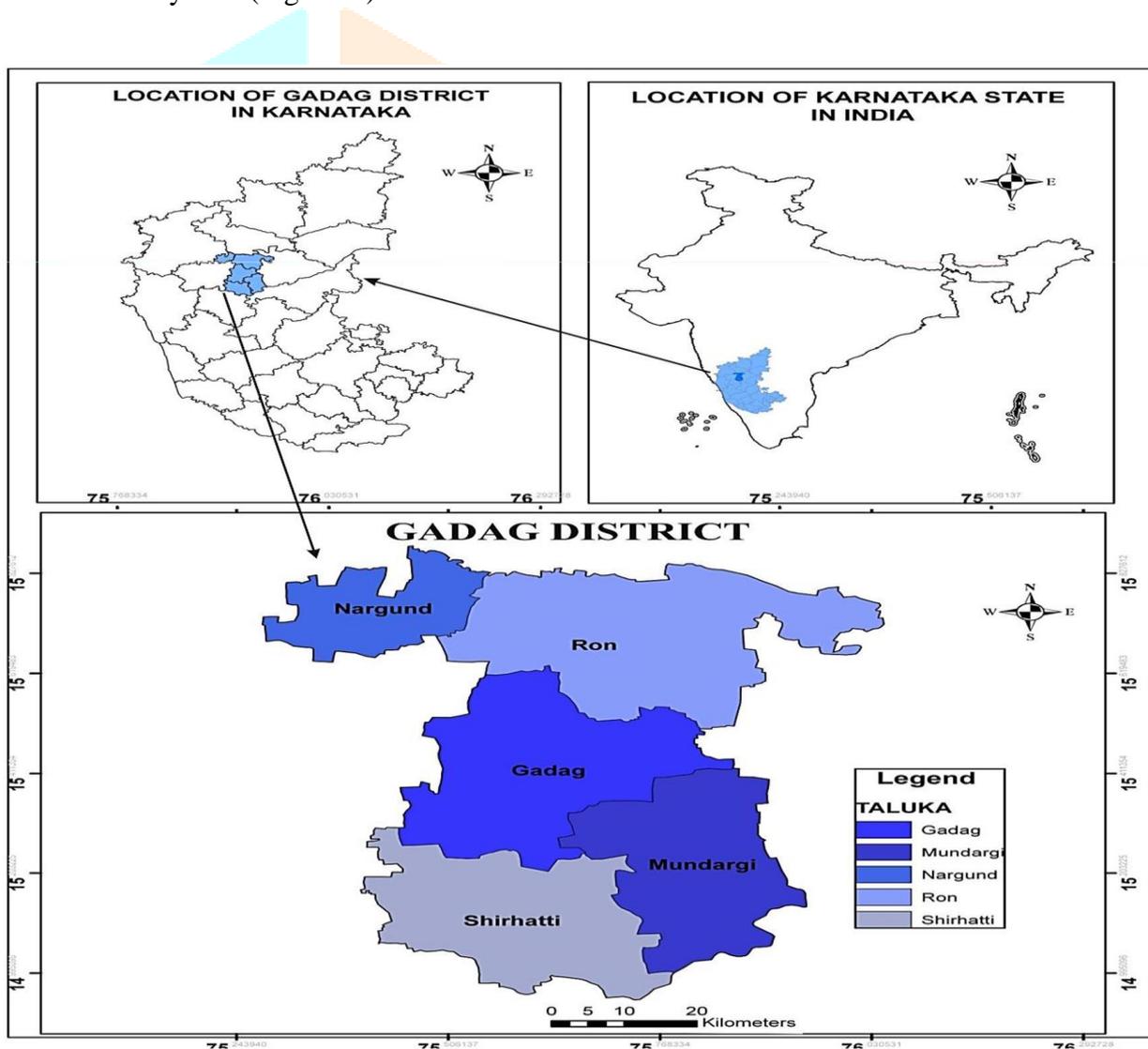


Fig No: 1

The average annual rainfall in the district is 641 mm and 16 rain gauge stations are monitor. The district has an area under forest of 32,614 hectares. The district is influenced by west, southwest and north-west winds. The average velocity of the wind in the district is 11.4 Knots per hour (2015). As far as

Karnataka State is concerned, the 16 districts have witnessed the wind energy production and Gadag District has second rank in installation of wind turbines followed by Chitradurga in the Karnataka State. In 1996, the first wind turbine was installed in the district at Kappattagudda, near Nagavi village. Now, 750 wind turbines have been installed in the study region.

### **Objective:**

The main objective of the paper is focused on to study the wind energy and its impact on environment.

### **Data Base and Methodology:**

The study is based on the secondary source of information and has collected from various sources. The collected information has been brought in the form of tables and graphs. The analytical method has been employed and accordingly discussed.

### **Analysis:**

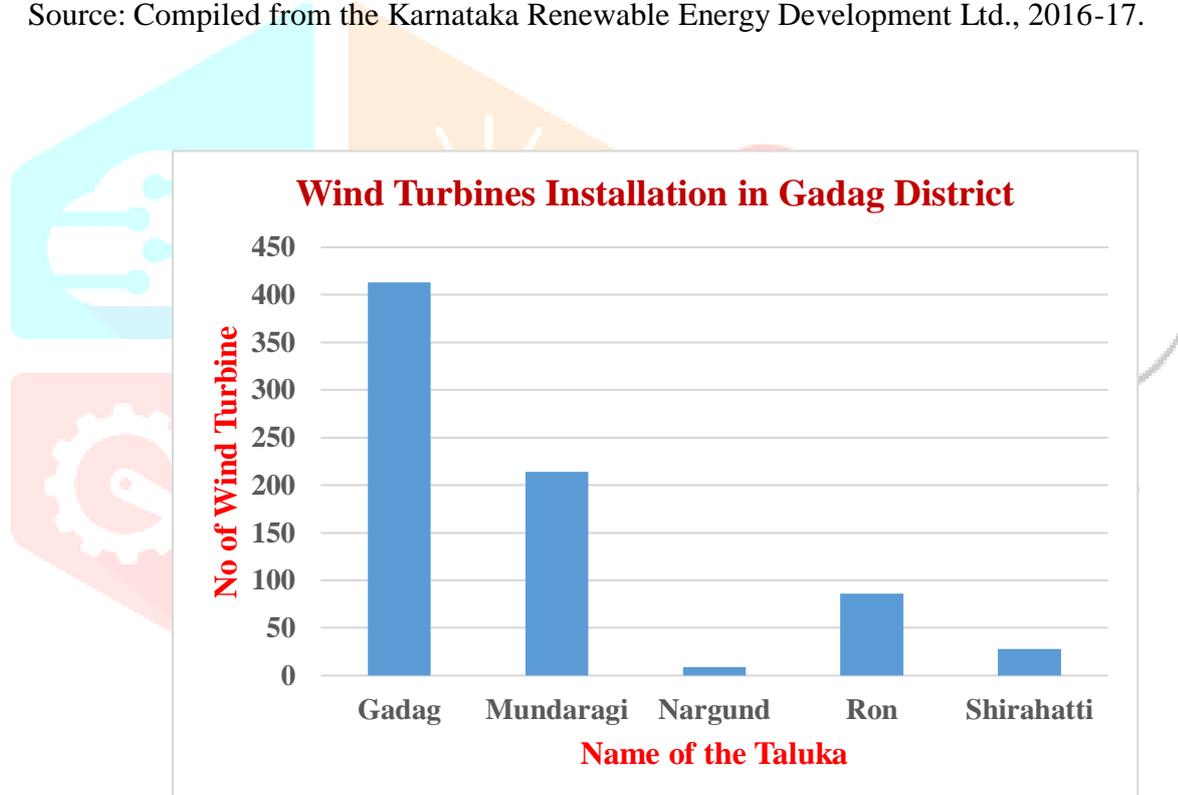
The generation of electricity by the wind turbines does not involve in the process of release of carbon dioxide, acid rain, smog or radioactive pollutants. The use of wind energy reduces dependency on conventional fossil and nuclear fuels. Wind turbines also do not require water supplies, unlike many conventional and some renewable energy sources. Any development in the countryside will have an environmental impact of some kind whereas wind energy is also not an exception (**Siraj Ahmed, 2013**).

Gadag district is being the second highest installation of wind turbines followed by Chitradurga in the Karnataka State. There are 750 wind turbines have been installed in 4656 Square Kilometers of area by the 20 companies in all five Talukas and have been functioning since, 1996 which is significant alternative energy in the study area. Among the five Talukas, Gadag Taluka is leading and rank first in installation of 413 wind turbines in 21 villages which is having half of the entire district followed by Mundaragi Taluka, 11 villages involved in the wind generation with 214 wind turbines with 28.53 percentage of the wind turbines. In Ron has 11.47 percentage of wind turbines (86) in six villages. The Shirahatti Taluka has 28 wind turbines installed in five villages and just having 03.73 percentage of wind turbines. Naragund Taluka (01.20 percentage) is the least Taluka and has nine wind turbines installed only one place at Nargund (Table No 1 and Fig No 2 and 3).

**Table No. 1: Wind Turbine Installations in Gadag District, 2016**

Sl. No.	Name of the Taluka	Geographical area (Square Kilo Meters)	Number of Settlements of Wind Turbine Installed	Number of Wind Turbines	Percentage Share of Wind Turbines
1	Gadag	1097	21	413	55.07
2	Mundaragi	884	11	214	28.53
3	Nargund	435	01	09	01.20
4	Ron	1291	06	86	11.47
5	Shirahatti	949	05	28	03.73
	<b>Total</b>	<b>4656</b>	<b>44</b>	<b>750</b>	<b>100.00</b>

Source: Compiled from the Karnataka Renewable Energy Development Ltd., 2016-17.

**Fig No: 2**

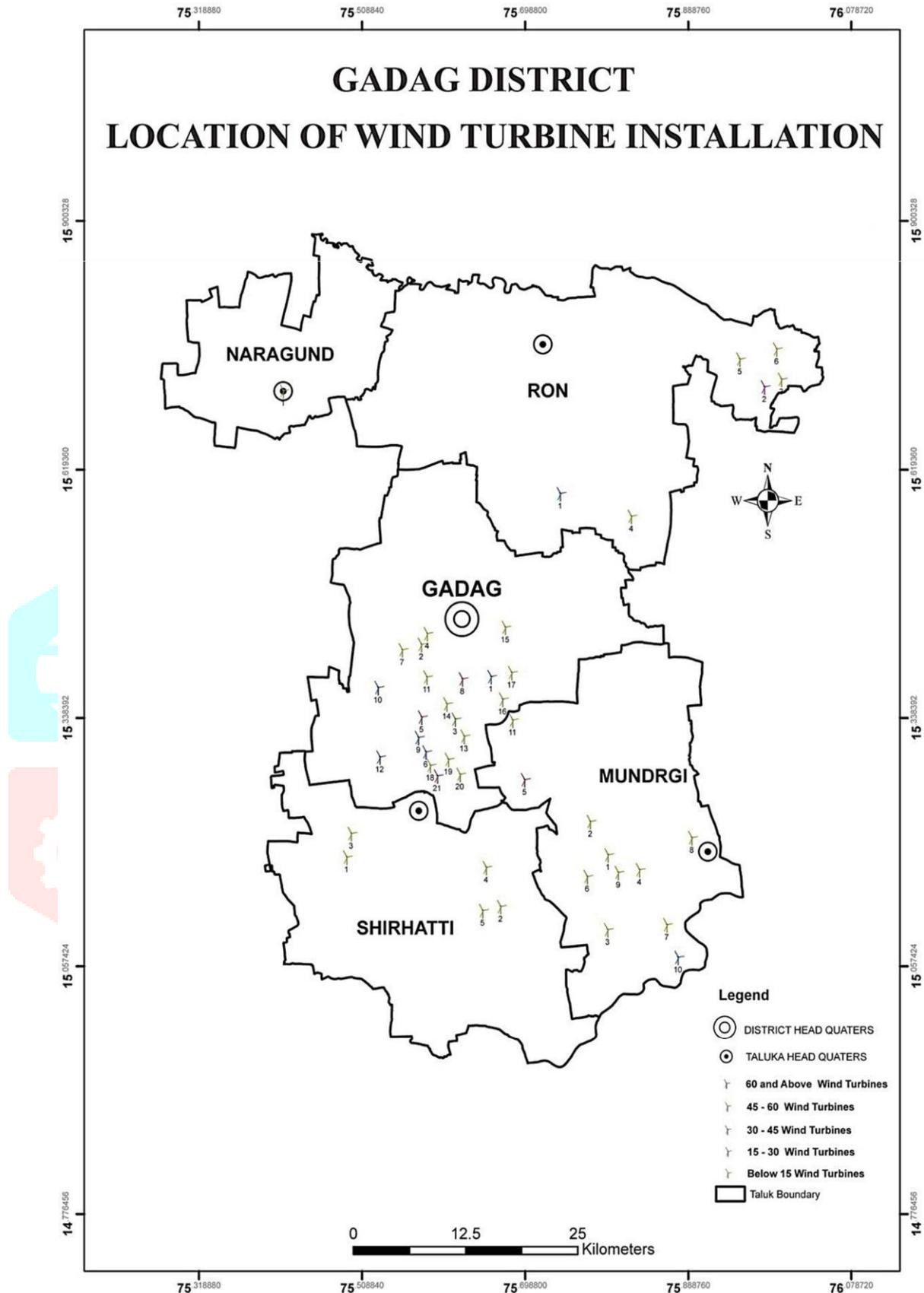


Fig No: 3

### Impact of Wind Turbine on Environment:

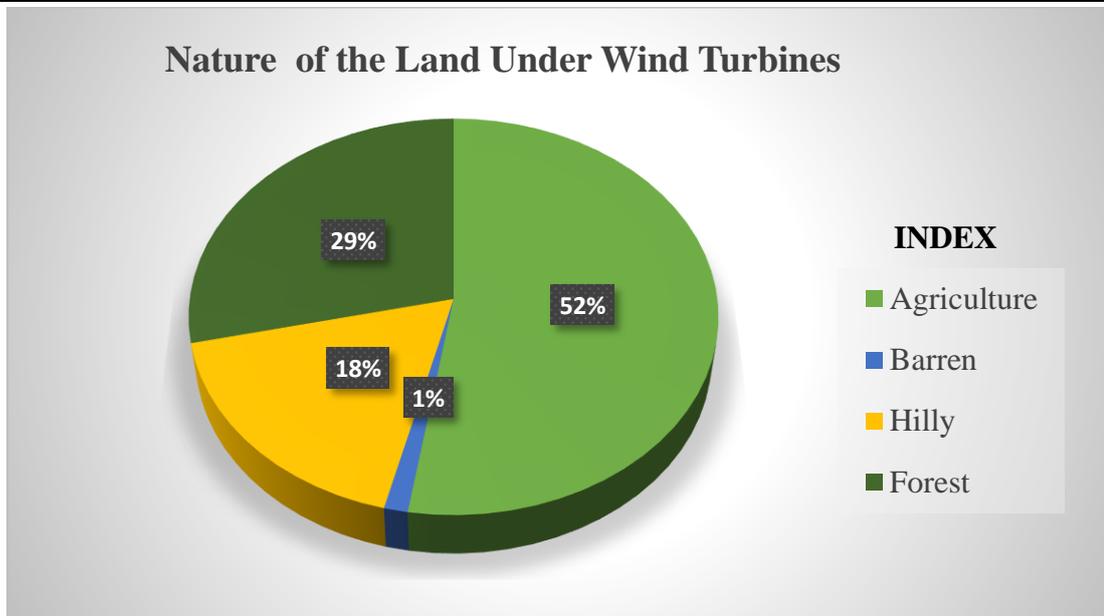
Wind Energy is the renewable energy and gaining much significance not only in India but also many countries in the world. The prosperity of the nation is largely depends upon the energy. As a result, India is also making an attempt to harness the wind energy, which is good sign for the progress of the country. As far as the wind energy is concerned, the installation of wind turbines in different geographical space has some impact on environment. The deforestation is quite common, while installation the turbines in hilly and forest area, which affects the flora and fauna due to the construction of roads to the wind turbine sites. The installation of wind turbines in agriculture land is not acceptable, which a serious issue from environmental point of view resulted into the Birds and Bat mortality scale will be reduced and ceased be the greater threat to the ecology. Wind turbines also make some noise at the time generating of electricity which leads to noise population to the nearest residence area.

**Table No 2: Nature of the Land Under Wind Turbines in Gadag District.**

Sl No	Name of the Taluka	No of Wind Turbines	Nature of the Land Under Wind Turbine (In Acre)				
			Agriculture	Barren	Hilly	Forest	Total
01	Gadag	413	179.50 (359)	04.50 (09)	22.50 (45)	--	<b>206.50 (413)</b>
02	Mundaragi	214	--	--	--	107.00 (214)	<b>107.00 (214)</b>
03	Nargund	09	--	--	04.50 (09)	--	<b>04.50 (09)</b>
04	Ron	86	15.00 (30)	00.50 (01)	27.50 (55)	--	<b>43.00 (86)</b>
05	Shirahatti	28	02.50 (05)	--	11.50 (23)	--	<b>14.00 (28)</b>
	<b>Total</b>	<b>750</b>	<b>197.00 (394)</b>	<b>05.00 (10)</b>	<b>66.00 (132)</b>	<b>107.00 (214)</b>	<b>375.00 (750)</b>

Source : Compiled from the Karnataka Renewable Energy Development Ltd., 2016-17.

Note : Bracket shows number of wind turbine.



**Fig No : 4**

As far as area under wind turbines are concerned, those have been installed in 375.00 acre of an area in different type of land such as, agriculture land (197.00 acre), barren land (05.00 acre), hilly area (66.00 acre) and forest area (107.00 acre) in various settlements in the district. In the Gadag Taluk, 413 wind turbines have been functioning in 206.50 acre of land. Whereas, 179.50 acre of agriculture land (359 wind turbines), four and half acre of barren land (09 wind turbines) and 22.50 acre of forest area (45 wind turbines). 214 wind turbines have been installed in 107.00 acre of forest area in Mundaragi Taluk. Nine wind turbines were working in four and half acre of hilly area in the Naragund Taluk. In Ron Taluk, 86 wind turbines have been installed in 43.00 acre of land. Whereas, 30 wind turbines in agriculture area (15.00 acre), a wind turbine in barren land (00.50 acre) and 55 wind turbines in hilly area (27.50 acre). 28 wind turbines were functioned in 14.00 acre of land. Whereas, five turbines have been installed in two and half acre of agriculture land and 23 turbines were installed in 11.50 acre of hilly area in Shirahatti Taluka (Table No: 2 and Fig No: 4).

Wind energy is substantially compensated in the study area to encourage the socio-economic activities and the techno-professional environment along with the convention energy prevailing in the study area. The agriculture land being utilized under the productive of wind energy by installing the 394 wind turbines. While installing 132 wind turbines in the hilly area, the tree has been cut for constructing of roads to the installation locations of the turbines and deforestation took place mainly for the installation of 214 wind turbines in the study area. The installation of wind turbines is not viable in the study region but it is hearting

to note that the conversation of agriculture land in to non-agriculture in a serious issue from the environmental point of view.

### Conclusion:

As far the above discussion, it is concluded that the wind energy is one of the most important non-conventional sources of energy. It is pollution free, eco-friendly and permanent source of energy and hardly generates waste. The agriculture land is ceased and deforestation is an environmental treat these two aspects have not taken into consideration while installing the wind turbines for generation of wind energy in the study area. The deforestation is resulted, while installation of the wind turbines in hilly area and forest area. The Birds and Bat mortality is already reduced, which has adverse affect of the ecology. Wind turbines also make noise at the time generating of electricity which affect to the nearest residence area as a noise population.

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