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SPATIAL ANALYSIS OF WIND ENERGY PRODUCTION IN BELAGAVI DISTRICT: A BRIEF STUDY

Dr. Basavaraj R. Bagade[1] and Prof. Shubha Baravani[2]
[1]Assistant Professor of Geography , Rani Channamma University, Belagavi Karnataka .
[2]Assistant Professor, Dept. of EEE ,Jain College of Engineering, Belagavi , Karnataka.

ABSTRACT

The application of wind energy has increased the past 20 years, steadily throughout the world. With continuous research and development and improved manufacturing processes, wind turbine performance has enhanced. As a consequence of these developments, more utilities today are examining the wind as the option for various applications, mostly for the power generation. India is indubitably and progressively moving towards meeting the terms with its climate change commitments. India has established goals to expand its use of renewable energy and more competent technologies. The study made an attempt spatial analysis of wind energy production in Belagavi district The eminence and measure of bio resource in a expanse depends on different factors such as climate, physiographic. Hence a study on these factors is carried out for Belagavi district.

KEYWORDS: *Velocity, Decentralized production.*

INTRODUCTION

India is on the rise at a quick rate. To support a rapidly developing economy, to bring electricity to those who remain without it, and to develop the infrastructure to meet the needs of what is soon expected to be the world's most densely inhabited country, Energy is means to pull off India's development goals. India is indubitably and progressively moving towards meeting the terms with its climate change commitments under the Paris Agreement (COP21). India's undertaking at the climate summit confirmed the country's target to follow "a cleaner path than the one followed thus far by others at a subsequent level of economic development". To this end, India has established goals to expand its use of renewable energy and more competent technologies. India's intense wind power industry has the ability and understanding to help meet the country's climate and energy security goals. With total installations having crossed the 31GW, today India is the 4th largest wind market globally, marked at the end of March 2017. The industry is firmly on pathway to convene the short-term national mark of 60GW by 2022.

Till date, the expansion of the Indian wind sector has mainly been led by private sector venture. The guidelines and economic support from the government has helped the industries to take the necessary business risks to move forward in the sector and animate asset in more and more states. In 2015, when the 60GW target was proclaimed, the wind industry took on the confront to meet this goal in a timely manner. In 2016, the diligence installed over 3.6 GW of new capacity, breaking all earlier records in terms of annual installations. Following the Indian fiscal year 2016-17 reporting timeline, annual installations crossed 5.4 GW at the end of March 2017, bringing total installed capacity to over 31 GW.India is gifted with a assets of rich natural resources and sources of energy. Resources for power generation are not uniformly dispersed across the country. This can be suitably and optimally developed to make accessible consistent supply of electricity

to each and every household. Electricity is well thought-out key driver for targeted 10 to 12% economic growth of India. Electricity provided at internationally competitive rates would also make financial activity in the country competitive in the globalized environment. For securing utmost productivity of power using a given type of wind electric generator and judgment of the wind resource accessible at any potential site is crucial. Judgment of wind power potential is based on data of the wind frequency distribution at the site and need to be collected from executive meteorological data.

The power in the wind is proportional to the cube of the wind speed or velocity. It is thus important to have in depth understanding of the wind and its individuality, if the performance of wind turbines is to be predictable precisely. A variety of factors require to be considered include, the mean wind speed, directional statistics and velocity deviation from time to time and height of the anemometer. Harnessing the wind energy plays a significant role in the energy blend of a region. Wind power is renewable and environmentally gentle. Local applications in the rural and remote areas are the added advantage of harnessing the wind energy. Wind motivated electric generators could be utilized as an independent power source, and for increase in the electricity supply from the grids. Decentralized production of electricity would help local industries, particularly seasonal agro-processing industries, in densely populated areas.The coverage to which wind can be used as a source of energy depends on the probability density of incidence different speeds. To optimize the design of a wind energy tool, statistics on speed choice over which the device must function to make the most of energy extractions are requisite, which necessitate the acquaintance of frequency distribution of the wind speed.

OBJECTIVES:

1. To study the condition required to install the wind energy centres
2. To study the spatial analysis of wind energy centres in Belagavi district
3. To analyze the production of wind energy in Belagavi district

METHODS TO STUDY:

The proposed methodology evaluates wind farm performance based on technical, environmental, and Spatial analysis of wind energy production in Belagavi Production. Both qualitative and quantitative parameters were considered.

STUDY AREA:

The study area, Karnataka state, is located between 11° 40' and 18° 27' north latitude and 74° 5' and 78° 33' east longitude in the center of western peninsular India, covering an area of 19.1 Mha and accounts for 5.8% of the country's total geographic area. According to the 2001 provisional census the inhabitants of the state is 52.6 million (26.8 million males and 25.8 million females), with a rural populace of 66.02% and an urban populace of 33.98%. It has a 350 km long coastline, which forms the western boundary. The eminence and measure of bio resource in a expanse depends on different factors such as climate, geology, soil, physiographic, etc., which are discussed for Karnataka state next.

TOPOGRAPHY

Belgaum district is located in the north western part of the Karnataka state. It occupies the fifth place in terms of population of the state. It is one of the largest Districts in northern Karnataka. The total area of the district is the about 6.99% of the total geographical area of the state. The North -South extension of the district is about 160kms. and varies from 80 to 130kms. from east to west. The district as a whole forms a large plain studded with solitary peaks broken here and there and many of these peaks arc crowned with small but well built forts, thus focusing historical importance of the area. The district is surrounded by Maharashtra state in the North, Bijapur district in the East, Dharwad and Uttar- Kannada districts in the West. The Maharashtra state has a common border with Belgaum district on the West and North-West.

Vengurla-to the West, Kolhapur to the North-West and Sangali to the North of the Belgaum district. The study area has a network of roads, railway lines and airways which connect the state capital (Bangalore) and other important cities in the state and the country.The National high way (NH.4) passes through Belgaum from North-West to South-East through Nippani, Sankeshwar, Belgaum and Kittur.

WINDS:

The winds are generally light with some increase in force during the late summer and monsoon seasons. The winds blow mainly from the south-west and west during the period from April to September. In October, winds blew commonly between north and east directions, but on some days they are from South-West or west. During November and December, the winds are mostly northeasterly or easterly. South-westerlies and westerlies appear in January and from February onwards the easterlies decrease in frequency and the afternoon winds begin to flow more and more the south-west and west directions. By April, the winds blow predominantly from west and south-west directions.

WIND FARM/CLUSTER DEFINITION

Wind farms comprise number of wind turbines. These turbines are built on areas that are conductive to consistent good winds. In a “wind farm” a group of wind turbines are built in close proximity to each other to form a cluster. More turbines can be added based on the electricity demand. Basically these wind turbines convert the kinetic energy available in wind into mechanical energy and then to electricity through a generator. A modern wind turbine comprises three integral components. The rotor which is the main component includes the blades for converting wind energy to an intermediate low speed rotational energy. The generator component includes the electrical generator, the control electronics, and a gearbox for converting the low speed rotational energy to electricity. Finally the structural support component includes the tower which orientates the rotor to the wind energy source. Majority of the wind turbines installed for power generation are horizontal axis turbines as these can adjust their blades to avoid high wind storms and can collect maximum amount of wind energy. The vertical axis wind turbines are rarely used. The energy generated from these wind farms is supplied to customers through a central grid. In a large wind farm the space between the wind turbines is used for agricultural purposes. Each turbine in a wind farm is connected with another through a communication network and a voltage system. In many instances to take advantages of strong winds over an ocean or sea, wind turbines may be located offshore as well. To select ideal locations for setting up of wind farms, wind power density (WPD) is expressed in terms of the elevation above ground level over a period of time, taking into account velocity and mass

Condition required installment of wind turbines:

To get maximum yield from your wind turbine then you need to get the conditions right. There are various elements that you have to contend with when installing a wind turbine. By narrowing down and eliminating the good conditions from the bad you can make a judgmental decision on whether or not to go through with the investment.

Before you start the installation it is important to assess the wind speed and conditions before taking on a wind turbine, as this is crucial for the turbine’s efficiency. Wind turbines work best in rural areas as this reduces turbulence which is caused by obstacles, for instance, buildings and trees. For best results, an ideal wind speed would reach 5 metres per second and to measure wind speeds there are a number of different devices which are accessible to you. Inevitably with a stronger wind speed then a higher return is received. Small domestic wind systems are beneficial for those who live in remote areas, where electricity mains are unavailable, thus giving you off-grid possibilities.

Wind turbines also need to fit certain criteria before constructed, which varies depending on your choice of turbine. In some cases, turbines can be classified under Permitted Development, therefore

planning permission is not needed. A brief list of the criteria in relation to your turbine can be found below, however criteria has proven to be very complex so seeking further information is advised.

Building-Mounted Turbines

- The house must be detached
- The turbine must be at least be five metres away from the edge of the property
- The turbine blades must be 15 metres above ground and must be no more than three metres above the top of the house

Pole-Mounted Turbines

- The top of the turbine is no more than 11.1 metres above the ground
- The entire turbine is at least 1.1 times the height of the turbine away from the edge of the property

Both Types

- There are no other wind turbine and/or air source heat pump on site
- The bottom of the blades is at least five metres above ground
- The turbine's swept area is no more than 3.8 m2
- The site is not on land safeguarded for aviation or defense purposes

Ultimately, ensuring you have the right conditions is crucial to getting the maximum output of your turbine. Seeking professional advice is also a must to assess the situation fully.

Distributions of wind power projects in Belagavi district As On July 2017

Name of Developer/Investor	Manufacturer	Location/ Village	Nos of WTGs	Hub height in M	WEGs rating (KW)	Total installed capacity in MW	Date of Commissioning
Kirloskar Electric Company Ltd.	WEG(UK)	Hargapurgad	5	35	400	2	00-Jan-00
ICICI Bank Ltd.	RES-AWT-27	Girgoan	12	43	250	3	31-Mar-98
ICICI Bank Ltd.	RES-AWT-28	Bharampura	2	43	250	0.5	13-Mar-00
Magma Leasing Limited	NEG-Micon	Devanakatti	3	72	1650	4.95	30-Mar-07
Walden Properties (P) Ltd.,	NEG-Micon	Devanakatti	1	72	1650	1.65	30-Mar-07
Swarna Properties	NEG-Micon	Thimmappanagudda	1	72	1650	1.65	28-Mar-08
Doodanavar & Brothers	SINOVELL	Channenadaddi	10	70	1500	15	26-Aug-09
CLP Wind Farms (India) Pvt Ltd	ENERCON	Goravinakolla	23	56	800	18.4	4-Mar-10
CLP Wind Farms (India) Pvt Ltd	ENERCON	Goravinakolla	3	56	800	2.4	31-Mar-10
CLP Wind Farms (India) Pvt Ltd	ENERCON	Katamalli & Hooli	9	56	800	7.2	17-May-10
CLP Wind Farms (India) Pvt Ltd	ENERCON	Katamalli & Hooli	20	56	800	16	23-Jun-10
CLP Wind Farms (India) Pvt Ltd	ENERCON	Basidoni, Sirasangi	20	56	800	16	3-Aug-10
CLP Wind Farms (India) Pvt Ltd	ENERCON	Basidoni, Sirasangi	6	56	800	4.8	15-Sep-10
EN Renewable Energy	ENERCON	Kakati	15	56	800	12	11-Mar-11

Limited							
N Renewable Energy Limited	ENERCON	Kakati	18	56	800	14.4	31-Mar-11
Murugendra Rajendra Oil	Gamesa	NEJ	1	55	850	0.85	25-Aug-11
Askok Iron Works (P) Limited	Gamesa	NEJ	3	55	850	2.55	2-Jan-00
Oswal Woollen Mills Limited	Gamesa	Shorgaon	1	55	850	0.85	24-Sep-11
Bright Packaging Pvt Ltd	Gamesa	NEJ	2	55	850	1.7	24-Sep-11
The Campco Ltd	Gamesa	NEJ	2	55	850	1.7	20-Oct-11
Golden Hatcheries	Gamesa	Karoshi	4	55	850	3.4	29-Mar-12
Manjushree Technopack Limited	Gamesa	Karoshi	4	55	850	3.4	29-Mar-12
Golden Hatcheries	Gamesa	Shirgoan	1	55	850	0.85	30-Mar-01
Golden Hatcheries	Gamesa	Shirgoan	2	55	850	1.7	30-Mar-12
Golden Hatcheries	Gamesa	Shirgoan	3	55	850	2.55	30-Mar-12
Doddanavar Global Wind Private Limited	Regen	Chikkodi	10	80	1600	16	31-Mar-12
Canara PCC Poles	Gamesa	Shirogoan	1	55	850	0.85	29-Jun-12
NSB Infrastrcture and Projects Private Limited	Gamesa	Shirogoan	1	55	850	0.85	29-Jun-12
Doddanavar Global Wind Private Limited	Regen	Chikkodi	10	80	600	16	6-Jul-12
Chamundeshwari Build Tech (P) Limited	Gamesa	Shirogoan	1	55	850	0.85	17-Sep-12
Giriraj Enterprises	Suzlon	Bestur	5	80	2100	10.5	29-Sep-12
Sarayu Cleangen Private Limited	Gamesa	NEJ	4	55	850	3.4	27-Mar-13
Renew Wind Power (AP) Pvt Limited	Gamesa	Karoshi	9	78/90	2000	18	29-Jun-13
ITC Limited	SUZLON	Bambarge	7	78.3	1250	8.8	30-Sep-13
Rangineni Steel Private Limited	SUZLON	Bambarge	1	78.3	1250	1.25	30-Sep-13
Green Infra Wind Power Generation Limited	ENERCON	Ramdurga	25	800	800	20	9-Jan-14
Bhoruka Power Corporation Limited	BPCL	Savsuddi	10	79.7	1700	17	13-May-14
Bhoruka Power Corporation Limited	BPCL	Savsuddi	10	79.7	1700	13.6	4-Jun-14
Bhoruka Power Corporation Limited	BPCL	Savsuddi	11	79.7	1700	18.7	5-Nov-14
Bhoruka Power Corporation Limited	GE (Bhoruka)	Savsuddi	9	79	1700	15.3	11-Aug-16
Renew Wind Energy (Sipla) Pvt Limited	Gamesa	Batkurki	13	78/90	2000	26	21-Dec-16
Renew Wind Energy (Sipla) Pvt Limited	Gamesa	Batkurki	17	90	2000	34	21-Feb-17

Ostro Mahawind Power Private Limited	Gamesa	Sattigeri	6	90	2000	12	22-Feb-17
Ostro Mahawind Power Private Limited	Gamesa	Sattigeri	16	90	2000	32	22-Mar-17
Ostro Mahawind Power Private Limited	Gamesa	Sattigeri	8	90	2000	16	28-Mar-17

Government Sector

Name of Developer/ Investor	Manufacturer	Location/ Village	Nos of WTGs	Hub height in M	WEGs rating (KW)	Total installed capacity in MW	Date of Commissioning
Karnataka Renewable Energy Development Ltd.	VESTAS	Mavinahunda	4	50	500	2	30-Aug-03

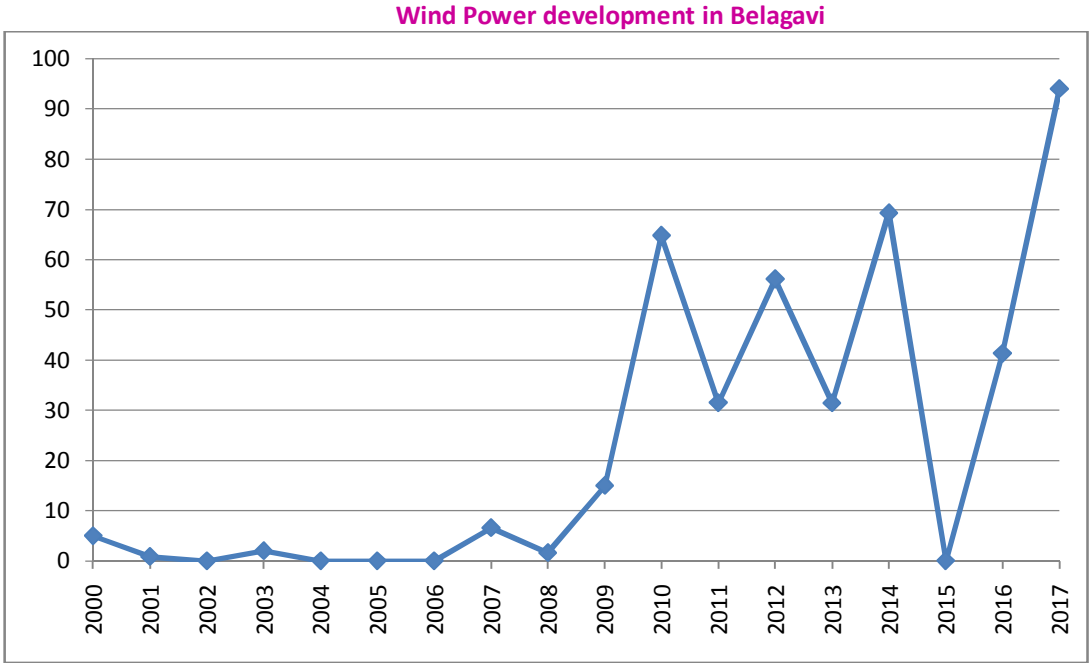

FIGURE 1. MW INSTALLATION OVER THE YEARS

CONCLUSION

Wind potential analysis across agro-climatic zone confirms the role of geographic, topographic and meteorological characteristics of a location to wind speed variability.

Total Installed capacity in MW= 420.6 from private players. Whereas 2 MW of Installed capacity from the Government sector.

However the installed capacity of the Wind turbine, or in other words the utilization of the most abundantly available renewable source have been developed at a very fast rate over the years, the maximum installations being in the year 2017.

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Dr. Basavaraj R. Bagade
Assistant Professor of Geography , Rani Channamma University, Belagavi Karnataka .