Assessment of Wind Energy Potential in the Selected Sites in the Province of Marinduque

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Introduction

- The Philippines is one of the ASEAN countries which gears up towards the utilization of renewable energy.

- It is further strengthened with the implementation of Republic Act 9513: National Renewable Energy Act of 2008. Among the mandates of this law is to "***accelerate the exploration and development of RE Database***."

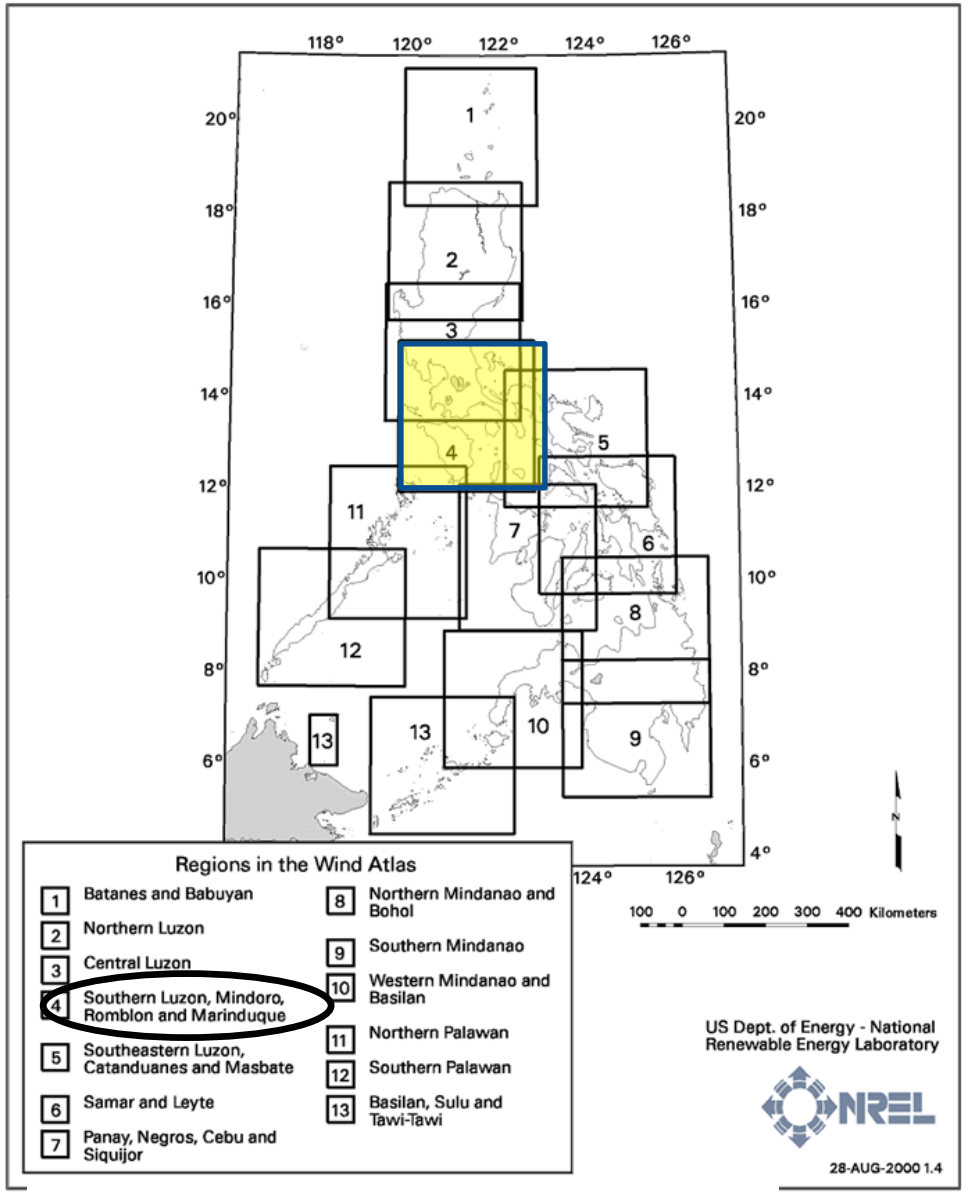

Figure 1. Wind Resource Atlas of the Philippines (NREL,2000)

Introduction

Elliot, et al.,(2000) has also provided wind power classifications shown in Table 1.

Table 1. Wind Power Classification(NREL).

CLASS	RESOURCE POTENTIAL		WIND POWER DENSITY (W/m^2)	WIND SPEED (m/s)
	UTILITY	RURAL		
1	Marginal	Moderate	<200	<5.6
2	Moderate	Good	200-300	5.6-6.4
3	Good	Excellent	300-400	6.4-7.0
4	Excellent	Excellent	400-600	7.0-8.0
5	Excellent	Excellent	600-800	8.0-8.8
6	Excellent	Excellent	>800	>8.8

Introduction

This study aimed to assess the wind resource potential of selected locations in Marinduque. These locations are being characterized as being mountainous or near the seashore. For each location, among the data to be collected are:

- average wind velocity,
- wind power density, and
- estimated power to be generated.

Introduction

This study is significant because of the following reasons:

- identify locations with high potential wind resource
- shortlist the locations for local wind measurement ;
- make a local wind map; and
- based on the measured wind speeds and estimated wind power, it is possible for developers to conduct a more thorough assessment for economic viability of wind power projects on the identified areas

Materials and Method

The data used in this study were obtained from a 10-month measurement period *(Apr 2015-Jan 2016)* at the specific sites within the province of Marinduque

Instruments used:

(1) thermo-anemometer

(2) a compass

Materials and Method

Data Collection Procedure:

- wind speed temperature , & prevailing wind direction – measured ,observed and recorded *on-site*

site elevation – retrieved from PDRRMC Office

Materials and Method

Other parameter were calculated using the following equations found in literature:

Air Density: $\rho = \left(\frac{Po}{RT}\right) e^{\left(\frac{-gz}{RT}\right)}$ **kg/m²** *Equation (1)*

Wind Power Density: $\boldsymbol{WPD = 0.5\,\rho v^3}$ **W/m²** *Equation (2)*

Theoretical Power: $\boldsymbol{Pt = WPD\ x\ A\ x\ N}$ **Watts** *Equation (3)*

Wind Power: $\boldsymbol{Pt = \eta\ Pt}$ **Watts** *Equation (4)*

1/7 Power Law: $v_2 = v_1 \left(\frac{z_2}{z_1}\right)^{\alpha}$ *where* ^{h}*=1/7* *Equation (5)*

Results and Discussion

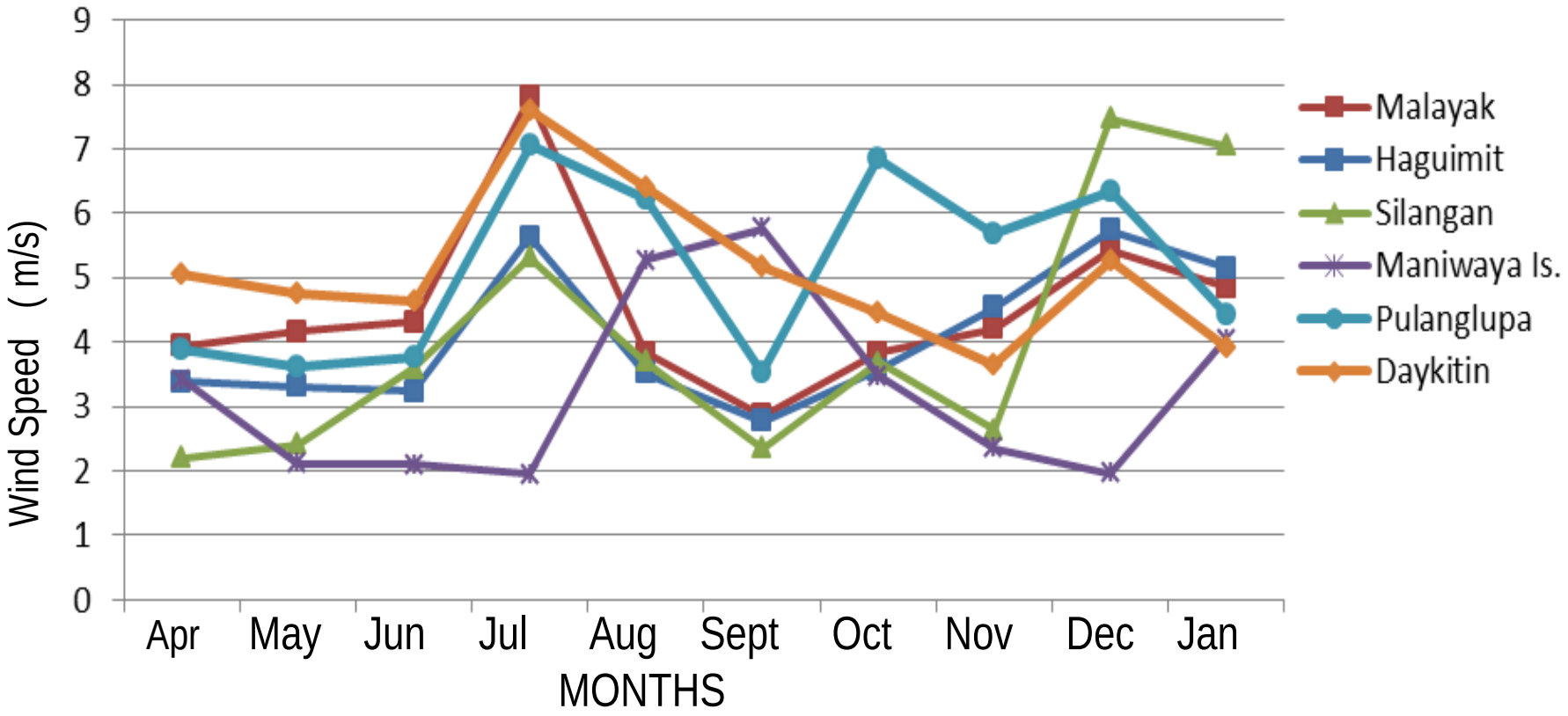

Figure 2. Mean Monthly Wind Speed in the Six Locations in Marinduque

Results and Discussion

10-month Average (Apr 15,2015-Jan 2016)	LOCATION					
	Pastilan	Malayak	San Andres Is.	Maniwaya Is.	Pulang-lupa	Daykitin
Ave. wind velocity (m/s)	4.08	4.52	4.04	3.25	5.14	5.09
Dominating Wind direction /mo	NE	NE	NE	NE	NE	SW
Ave. Temp/mo (°C)	30.58	29.53	29.54	30.52	29.05	29.80
Air Density (kg/sq. m.)	1.13	1.12	1.16	1.16	1.13	1.14
Wind Power Density (W/sq. m.)	38.56	51.84	38.39	19.92	77.00	75.43
Wind Power In Watts (r=5m, η=30%)	227.15	305.37	226.14	117.36	453.54	444.35

Results and Discussion

Based on the ***mean wind speed*** and ***wind power density*** obtained on this study, Pulanglupa and Daykitin fall under class 1 of the NREL wind classification, which is suitable for rural application. ***These two sites could be subjected to a more thorough and full wind resource assessment to assess the economic viability of wind power projects on these areas***.

References:

Elliott, D.; Schwartz, M. ; George, R. ; Haymes, S. ; Heimiller, D. and Scott, G. (2001). Wind Energy Resource Atlas of the Philippines retrieved from

http://www.nrel.gov/wind/pdfs/26129.pdf

Conover, K. (2000). Philippine Wind Farm Analysis and Site Selection Analysis. National Renewable Energy Laboratory (NREL).

Jain, A.,Fichaux,N.,and Gianvenuti, A.(2014). The Philippines: Solar, Wind and Bioenergy Resource Assessment. International Renewable Energy Agency (IRENA)

El-Wakil, M. M. (1984). Power Plant Technology. Singapore.

McGrawHill ublishing Company.

Albani,A.and Ibrahim, M.Z.(2017). Wind Energy Potential and Power Law Indexes Assessment for Selected Near-Coastal Sites in Malaysia retrieved from www.mdpi.com

THANK YOU !!!