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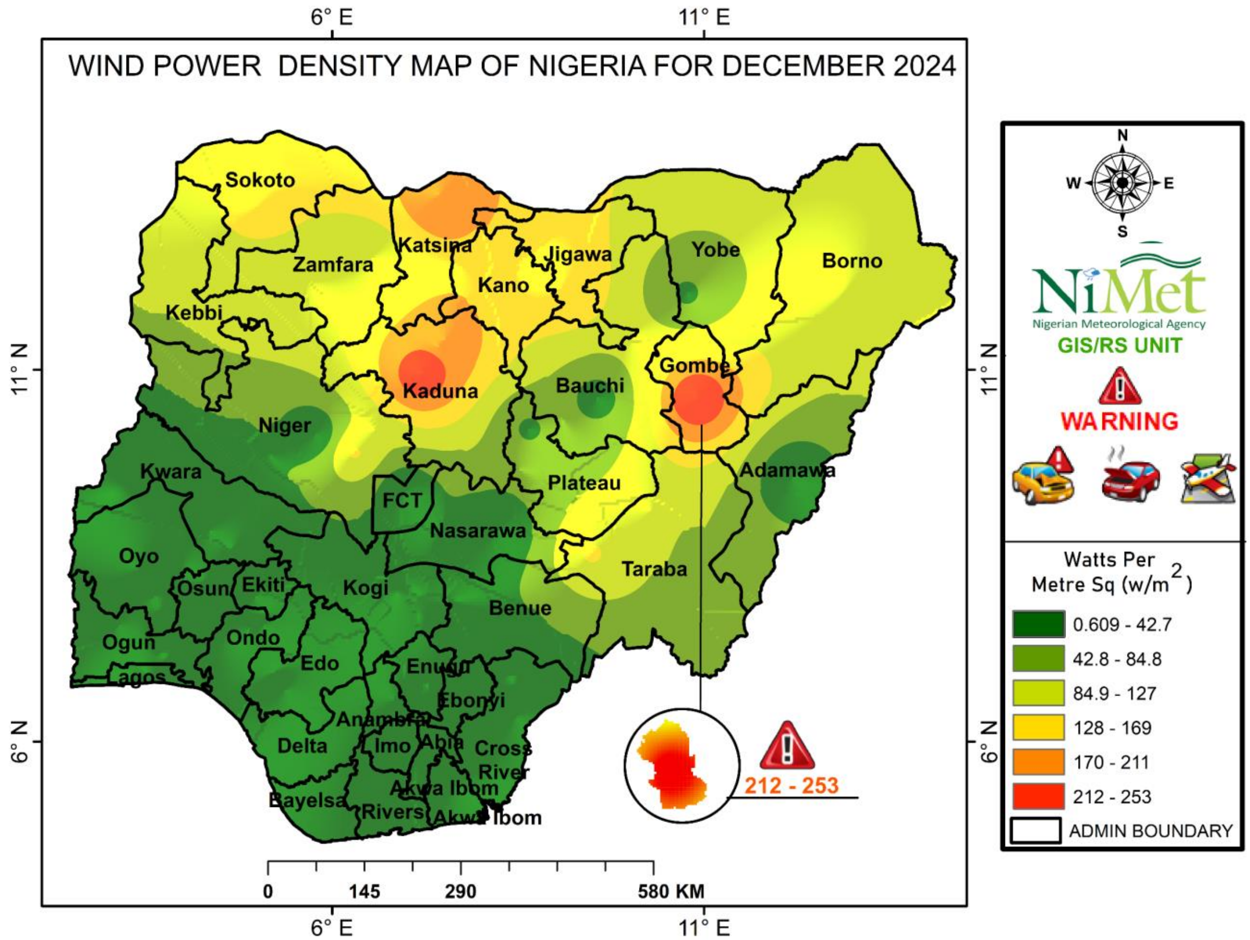

DECEMBER WIND POWER DENSITY OBSERVED FEATURES:

The Wind Power Density (WPD) measured in watts/m² ; for the month of December 2024, shows significant regional variation, with higher values in the northern regions, such as Gombe (253.13 W/m²) and Kaduna (253.25 W/m²), driven by strong winds influenced by the Sahara Desert's dry, hot air and lower humidity. These areas benefit from consistent wind speeds and open terrain, making them ideal for wind farms installations. In contrast, southern regions, like Abeokuta (2.03 W/m²) and part of Ondo (0.60 W/m²),along her coast areas exhibit lower wind power density due to stable atmospheric conditions, dense vegetation, and proximity to the equator, which reduces

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wind intensity. Northern states, including Katsina, Gombe, and Kaduna, are prime locations for wind energy development, offering the potential to significantly boost

1.3.2 RECOMMENDATION:

Nigeria's renewable energy capacity. Harnessing wind energy in these regions can add to the country's generation to the depleting hydrocarbon and hydro-power, lower greenhouse gas emissions, and create job opportunities in construction, maintenance, and energy distribution. Additionally, wind energy can generate revenue through energy exports and attract foreign investments in renewable energy infrastructure.

1.3.3 ADVISORIES:

To maximize these benefits, advisories include investing in grid infrastructure to support energy transmission, implementing policy incentives such as tax breaks and subsidies for renewable energy projects, and fostering public-private partnerships to accelerate wind farm development. Public awareness campaigns and capacity-building programs are also essential to ensure community engagement and long-term sustainability. By prioritizing wind energy in high-potential regions, Nigeria can achieve energy security, economic growth, and environmental sustainability.

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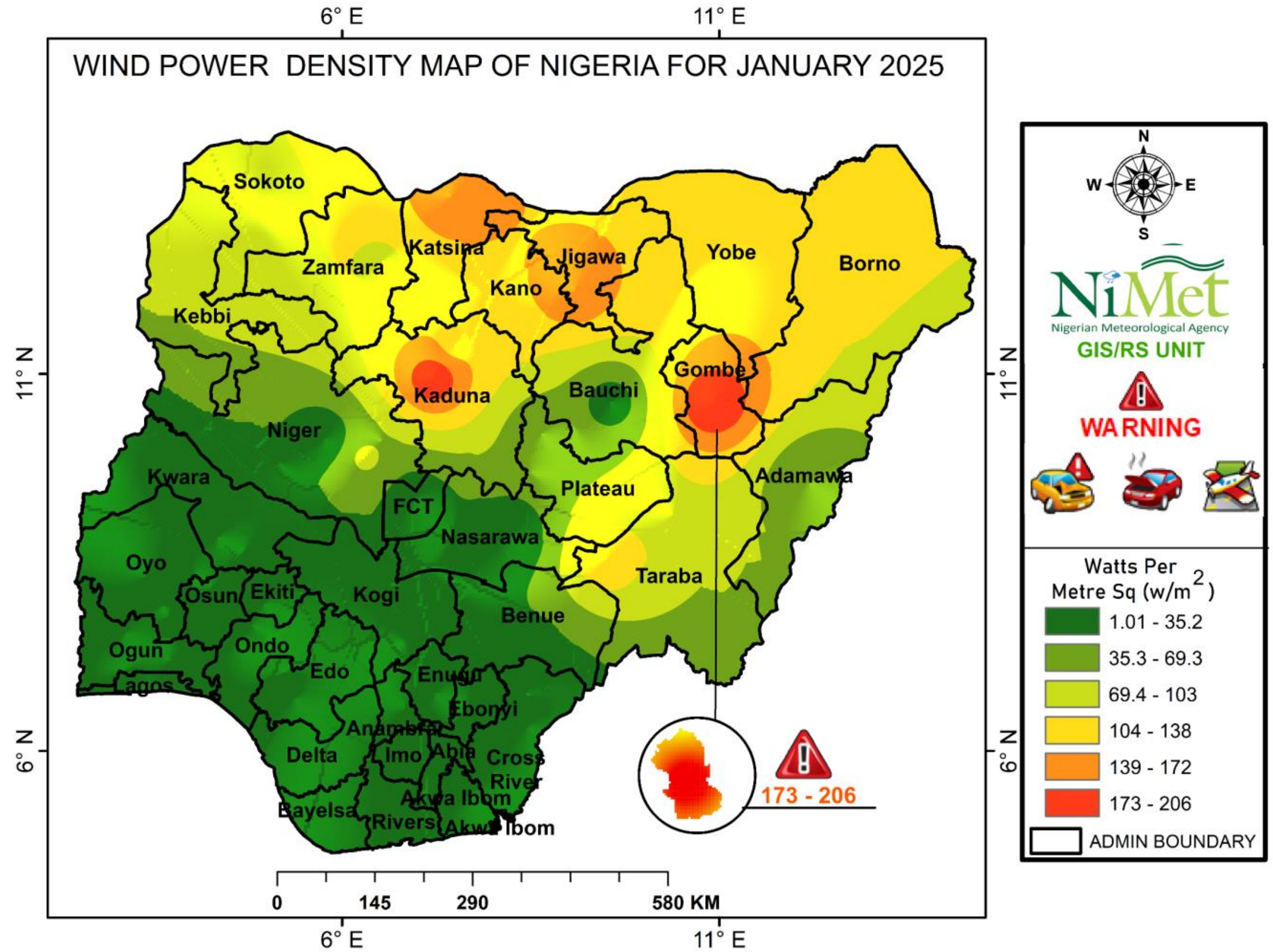

JANUARY WIND POWER DENSITY OBSERVED FEATURES:

In January 2025, the Wind Power Density (WPD) data for Nigeria continues to reflect significant regional variations, influenced by meteorological and geographic factors. Northern stations such as Gombe and Kaduna maintain high WPD values of 206 W/m², driven by the Sahara Desert's influence, which brings strong, consistent winds and low humidity. Similarly, Katsina and Dutse show high WPD values of 165 W/m², making these areas ideal for wind energy development due to their open terrain and minimal obstructions. In contrast, southern and coastal stations like Abeokuta and Ondo exhibit low WPD values of 5 W/m² and 2 W/m², respectively, due to stable

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atmospheric conditions, dense vegetation, and proximity to the equator, which reduces wind intensity.

Mid-range WPD values are observed in stations like Jos and Yola at 38 W/m², and Minna at 75 W/m², indicating moderate wind energy potential. These regions benefit from a mix of geographic features, including elevated terrains and transitional climatic zones. The high WPD in northern Nigeria aligns with the Harmattan winds, which are particularly strong during this period, while the southern regions experience calmer conditions due to the influence of the Atlantic Ocean.

To harness this potential, northern states like Gombe, Kaduna, and Katsina should be prioritized for wind farm installations, as they offer consistent wind speeds and vast open spaces. Investments in grid infrastructure, policy incentives, and public-private partnerships are crucial to support renewable energy projects. Additionally, expanding wind energy in these regions can complement Nigeria's existing hydroelectric power generation, diversifying the energy mix and enhancing grid stability. As a clean and renewable energy source, wind power reduces greenhouse gas emissions, mitigates climate change, and aligns with global sustainability goals. The development of wind farms will create jobs in construction, maintenance, and energy distribution, fostering economic growth in local communities. Public awareness campaigns and capacity-building programs are essential to educate communities about the benefits of wind energy and ensure their active participation in sustainable development initiatives. By prioritizing high-potential areas, Nigeria can harness its abundant wind resources to achieve energy security, and drive long-term economic and environmental prosperity.

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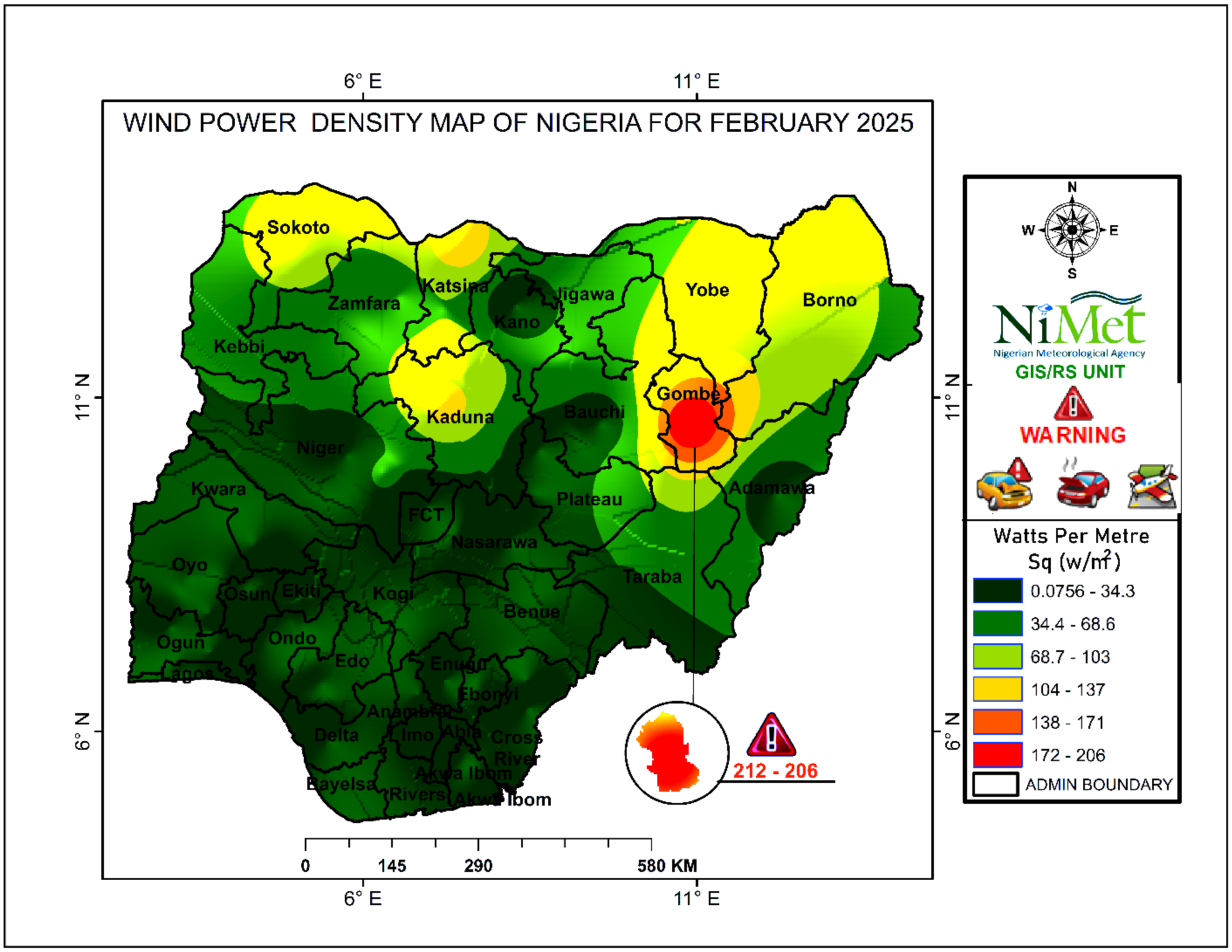

FEBUARY WIND POWER DENSITY OBSERVED FEATURES:

The Wind Power Density (WPD) data for Nigeria in February 2025 continues to reflect significant regional variations, influenced by meteorological and geographic factors.

Northern stations such as Gombe and Kano maintain high WPD values of 206 W/m², driven by the influence of the Sahara Desert, which brings strong, consistent winds and low humidity. Similarly, Katsina, Sokoto, and parts of Yobe and Bauchi show high WPD values ranging between 104 W/m² and 172 W/m², making these areas ideal for wind energy development due to their

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open terrain and minimal obstructions. The extreme WPD values recorded in Gombe (212 W/m²) highlight its strong wind energy potential, but also necessitate caution due to possible wind hazards.

In contrast, southern and coastal stations like Ibadan, Calabar, Lagos, and Uyo exhibit low WPD values between 0.0756 W/m² and 34.3 W/m². These regions experience stable atmospheric conditions, dense vegetation, and their proximity to the equator reduces wind intensity, making them less suitable for large-scale wind energy projects.

Mid-range WPD values are observed in stations like Jos and Makurdi at 38 W/m², and Minna at 75 W/m², indicating moderate wind energy potential. These regions benefit from a mix of geographic features, including elevated terrains and transitional climatic zones. The high WPD in northern Nigeria aligns with the Harmattan winds, which are particularly strong during this period, while the southern regions experience calmer conditions due to the influence of the Atlantic Ocean.

drive long-term economic and environmental prosperity while achieving energy security

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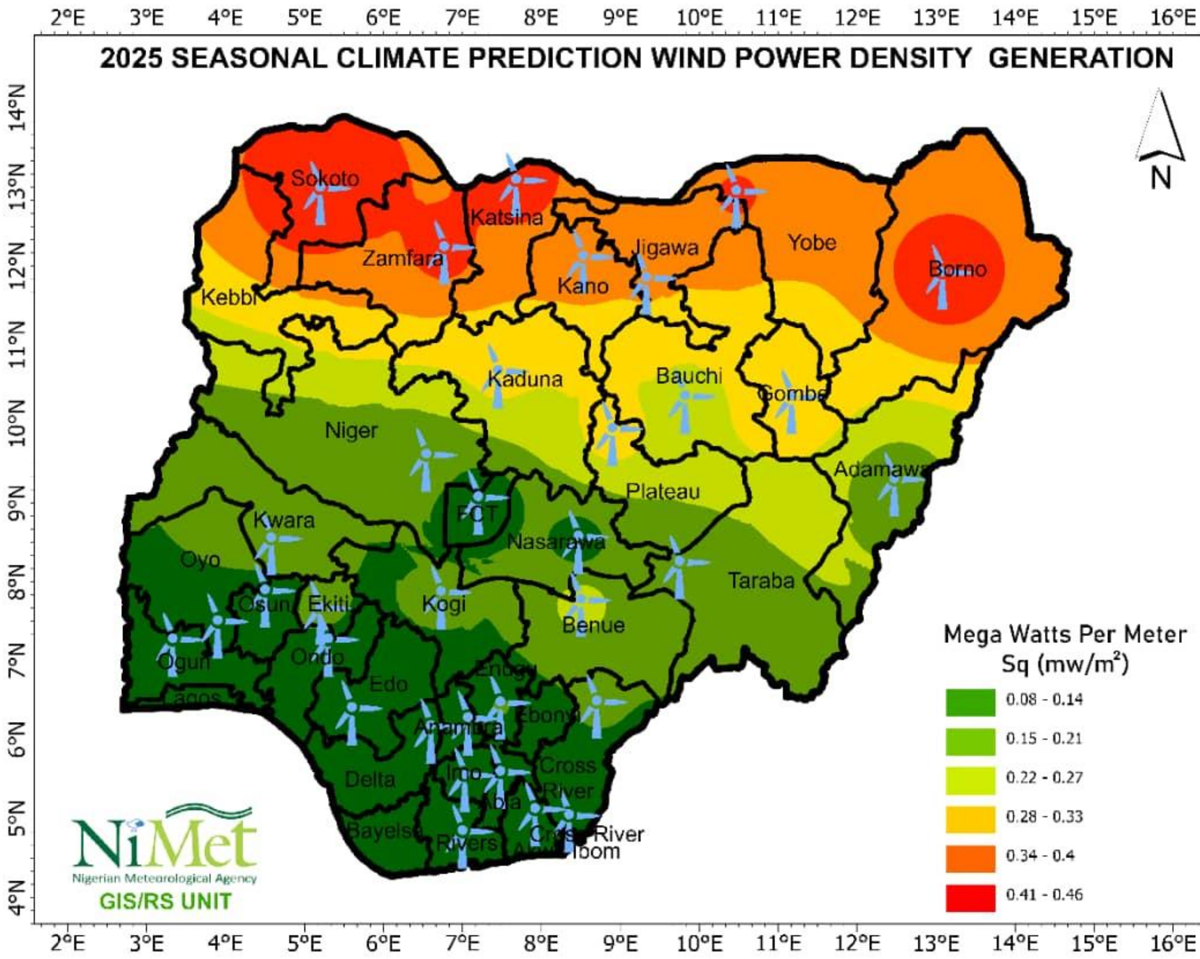
2025 SEASONAL CLIMATE PREDICTION (SCP) GEOSPATIAL OUTPUT AND PROJECTIONS.



2025 SCP wind speed and power density analysis is critical to renewable energy sector. Wind energy is one of the most attractive sustainable energy resources since it has low operation, maintenance, and production costs and a relatively low impact on the environment. Identifying the optimal sites for installing wind power plants (WPPs) is considered an important challenge of wind energy development which requires careful and combined analyses of numerous criteria. GIS helps us to identify, locate and map wind criteria all over the country to easily improve general power supply chain and to aid investment. This mappings introduces a high-resolution wind farms suitability mapping based on Fuzzy Analytical Hierarchy Process (FAHP) and Geographic Information System (GIS) approaches considering technical, environmental, social, and spatial aspects, representing a multi-criteria decision-making analysis based on the FAHP method is

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employed to assign appropriate weights for the addressed criteria with respect to their relative importance. Multi-criteria decision-making (MCDM) techniques identify suitable locations for installing wind farms. There are different techniques used for MCDM which can be combined with the Geographic Information Systems (GIS) environment such as rating method, weighted sum method (WSM), ranking method, Weighted Linear Combination (WLC), analytical hierarchy process (AHP).

The maps generated indicates Wind turbine GIS data which encompasses a comprehensive range of geographic and spatial information used to optimize the placement, maintenance, and performance of wind turbines. This data includes details on land elevation, wind speed patterns, turbine locations, and environmental constraints. Such information is crucial for maximizing energy production while minimizing environmental impact and operational costs. GIS technology facilitates the analysis of this data, enabling energy companies to make informed decisions about where to site wind turbines to harness the best wind resources. Additionally, it helps in navigating the complexities of land use and environmental regulations, ensuring that wind farms are developed in harmony with their surroundings. By integrating various data layers, wind turbine GIS data provides a multidimensional view of the operational landscape, laying the groundwork for efficient and sustainable wind energy production.

2025 SCP wind speed and wind density mapping allows Geospatial technology to revolutionize the way wind power assets are pinpointed and managed. Using sophisticated GIS applications, operators can now visualize the exact locations of their turbines in relation to geographical and man-made features. This precise mapping is crucial for planning maintenance routes, assessing potential site expansions, and monitoring environmental compliance. Moreover, it enables the detection of micro scale wind patterns that can significantly influence turbine efficiency. By employing terrain analysis tools within GIS software, wind farm planners can identify optimal turbine placements that capitalize on the highest wind speeds while avoiding areas prone to turbulence caused by nearby obstacles.

The 2025 SCP wind power density which is derived by ½ of air density multiply by wind speed raise to power 3 (½ x air density x V^3). The analysis shows that the extreme part of the North which is North west and North east has the maximum capacity of wind power density, this

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otherwise indicates the potentials of renewable energy for wind power generation and location to generate power.