Wind Mapping

of Bangladesh

Website: wind.sreda.gov.bd

User Manual – version 1.0

SREDA
Sustainable and Renewable Energy Development Authority

IWM
Water Environment & Climate

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1 Introduction

The Wind Information System (WIS) is a GIS-based web application developed by Institute of Water Modelling (IWM) for SREDA, providing comprehensive wind resource data and supplementary layers for optimal wind site selection in Bangladesh, promoting sustainable energy solutions and environmental stewardship.

This guide will take the user through the many useful features and functions of Wind Information System and help user to get the most out of website navigation experience.

2 Web Interface

User can get more information by browsing the website of WIS. First of all, user can view an interface that is landing page where a map is represented by many layers and feature include in the map. There are some feature menus in the landing page:

a. Home
b. Map
c. About
d. Contact
e. Admin Portal

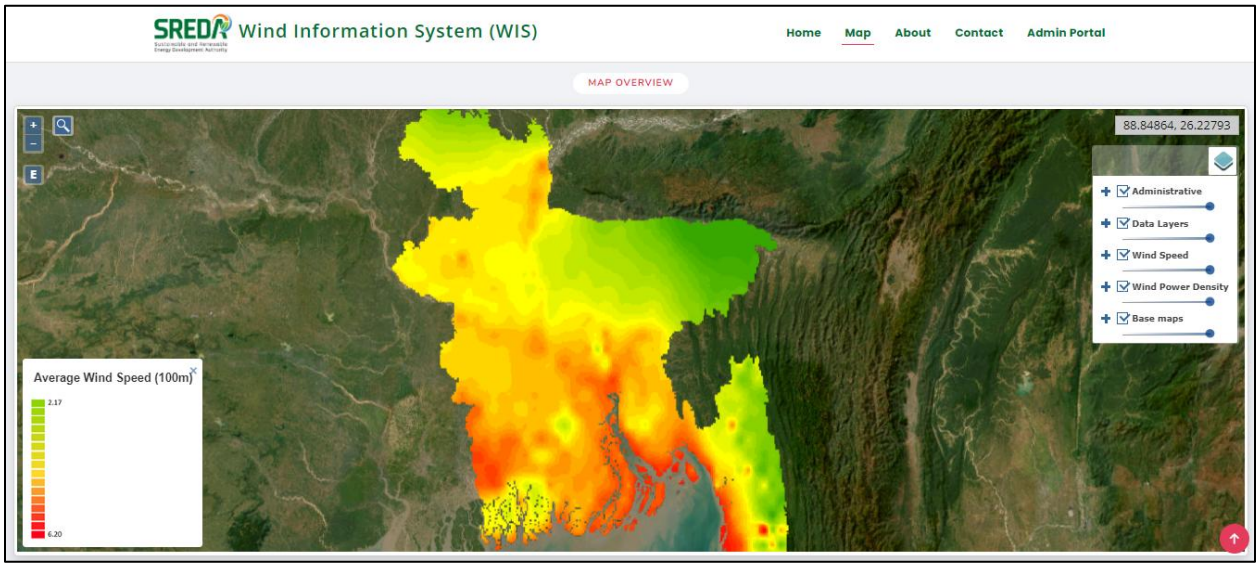

Figure 2-1: Web Interface

3 GIS Features

General Instructions

a. To identify on click information of a particular layer, it is recommended to turn all other layers off.
b. Legend box will demonstrate the legend of the latest selected layer.

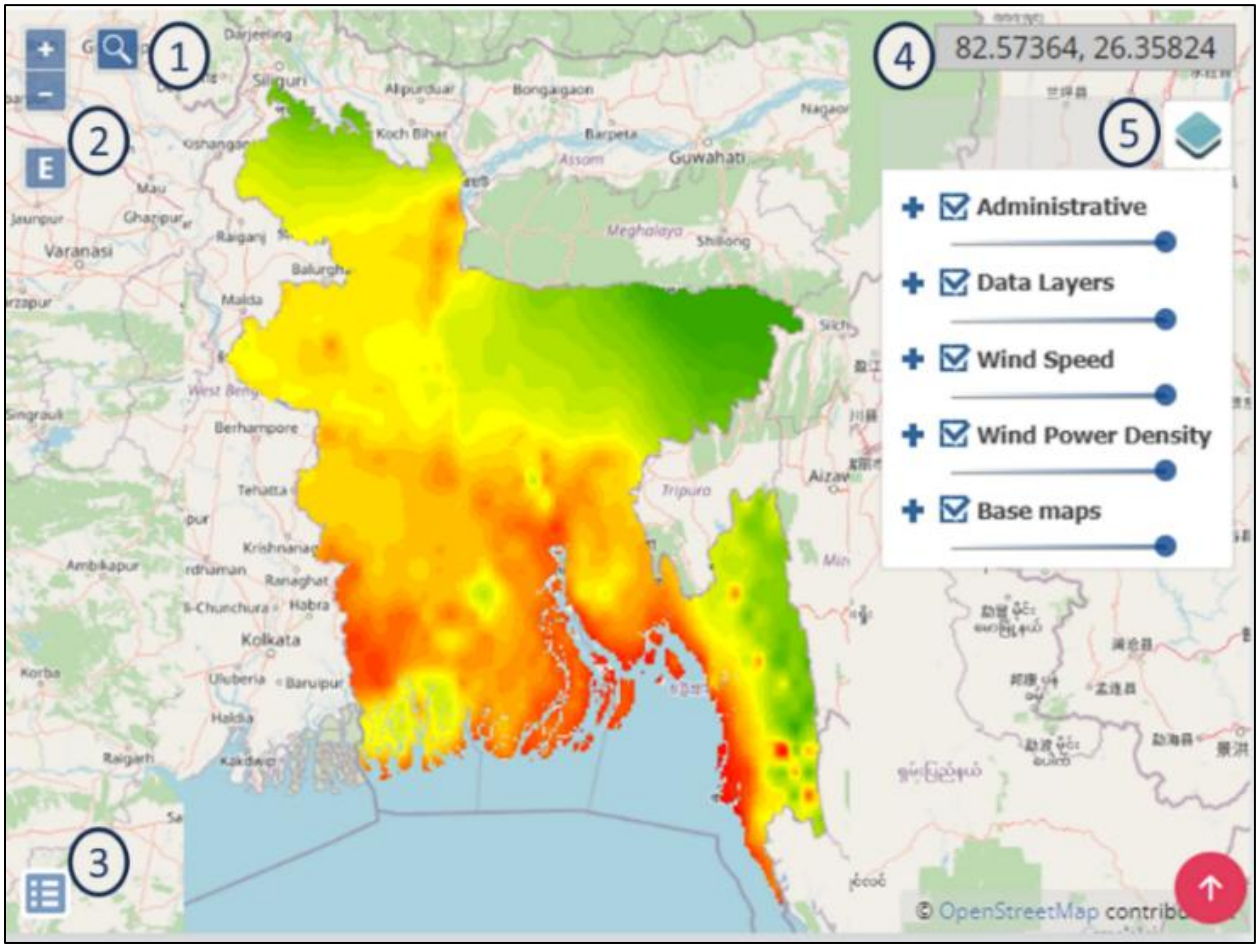

Figure 3-1: Extended GIS Map Interface

3.1 Search Option

User can search an area by selecting the magnifying glass icon located at the top left corner of the web-map (1). [Figure 2-1]

3.2 Zoom in/out

Click the zoom in button, and zoom out button to go inside and out of the map. This can also be achieved by scrolling mouse wheel.

3.3 Zoom to extend

A useful way of examining a study area is to zoom to a layer's extent in the display. The tool denoted as E located at the top left of corner the web-map. (2) [Figure 2-1] For layer, there is another extend button is available also.

3.4 Legends

User can view legends from data layer, color bar from wind speed & wind power density layer. (3) [Figure 2-1] Legends located at the bottom left corner of the web-map.

3.5 Longitude and Latitude

Latitude and Longitude are parameters or coordinates that help determine the location of any place on Earth. The Longitude and Latitude information is represented from WGS84 coordinates system. (4) [Figure 2-1] Latitude and Longitude at the top right corner of the web-map.

3.6 Layer Box

Clicking on the layer box will show different types of layers. (5) [Figure 2-1]

3.7 Pan Option

Pan tool is activated by left cursor of mouse pointer. The Pan tool enables user to move the view vertically or horizontally, which is pretty handy when user zoomed in. With the Pan tool active, click and drag the Pan cursor in any direction to move the map around.

3.8 Opacity Tool

Transparency control is available with each layer. This tool is provided to control transparency of the layers when one layer is overlapped by another. A user can control opacity by moving cursor left and right.

3.9 Layer Group

button indicates a layer group. Five-layer groups are available in WIS, they are Administrative, Data Layer, Wind Speed, Wind Power Density, Base Map. Upon clicking on the sign, the layer group expands and the layers under the group will be visible.

3.10 Metadata Information

Button indicates the metadata information of a layer. The metadata information includes Feature Title, Data Source, Update Year, Description.

3.11 Base Map

The base map provides the foundational geographic context for all other spatial layers. It includes essential reference features such as landforms, water bodies, administrative boundaries, transportation networks, and settlements. By serving as the background layer, the base map helps users orient themselves and interpret thematic data more effectively.

There are two types of base maps that were used, such as: ESRI Map and OSM Map.

3.12 ESRI Map

The ESRI Map provides interactive satellite imagery that allows users to zoom, pan, and explore spatial data in detail. Beyond simple navigation, the imagery can be used for advanced analyses such as image classification, vegetation assessment, and land cover mapping, enabling deeper insights into environmental and geographic conditions.

Figure 3-2: ESRI Map

3.13 Open Street Map (OSM)

OpenStreetMap (OSM) is a free, collaborative geographic database created and maintained by a global community of volunteers. It provides detailed street-level mapping, including roads, buildings, landmarks, and points of interest, making it a valuable resource for navigation, planning, and spatial analysis.

Figure 3-3: Open Street Map (OSM)

4 Average Wind Speed

Average wind speed represents the annual mean wind velocity over multiple years, expressed in meters per second (m/s). The wind map visualizes this data using both colors and symbols: red areas indicate higher wind speeds, green areas show lower speeds, and yellow or orange denote moderate levels. A wind rose symbol further illustrates wind direction and distribution at specific points. By panning or zooming across the map, users can examine variations in wind intensity and orientation across different regions.

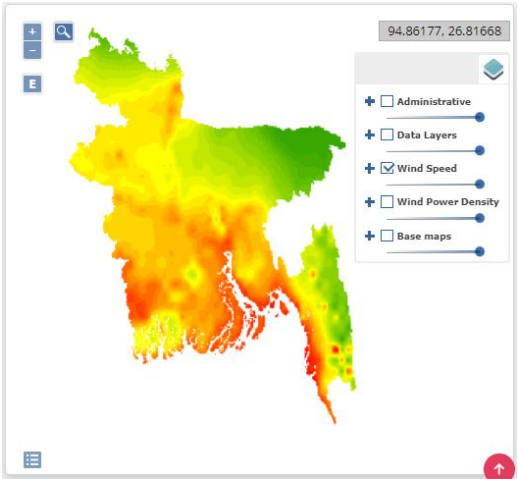

Figure 4-1: Avg. Wind Speed Layer

When the wind speed layer is selected, clicking on a specific location on the map displays a wind rose diagram. The diagram shows the frequency distribution of wind speeds at the selected location for the chosen time period and layer height.

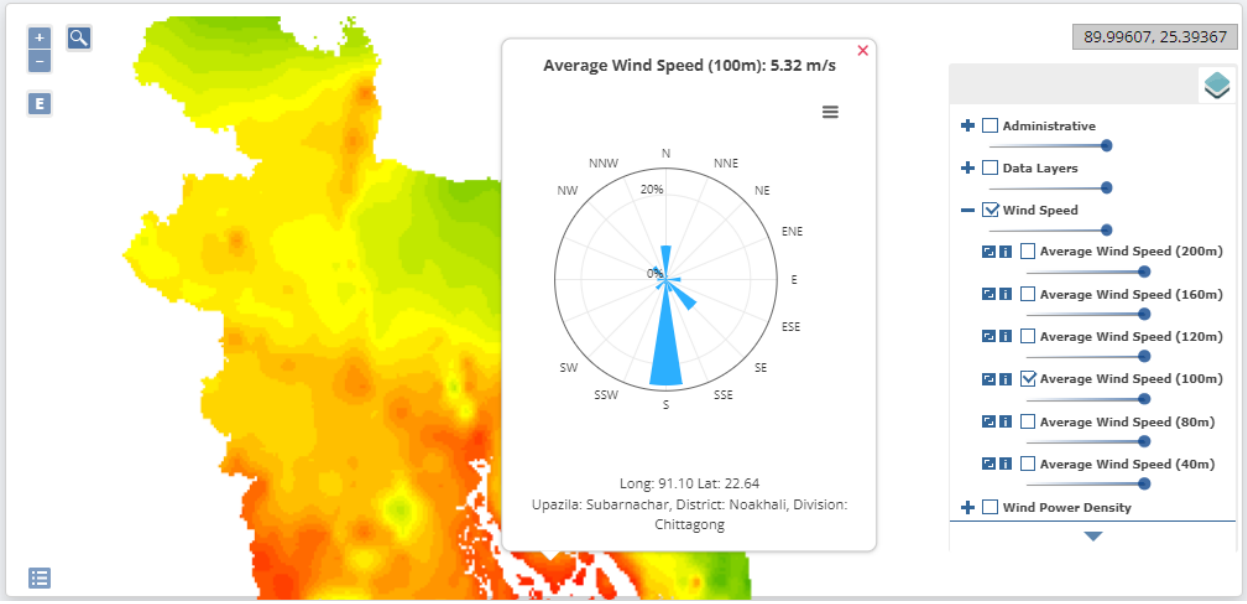

Figure 4-2: Wind Rose Diagram

Figure 4-2 shows a wind rose diagram for the selected location. It illustrates the distribution of wind direction and speed, indicating an average wind speed of 5.32 m/s at a height of 100 m, with winds predominantly flowing from south to north.

4.1 Wind Direction, presented by Wind Rose

The wind rose diagram illustrates how wind direction and speed vary at a given location over time. Each bar shows the proportion of time the wind blows from a specific direction, with its length representing the percentage. Bars are further divided into color segments that indicate different wind speed ranges.

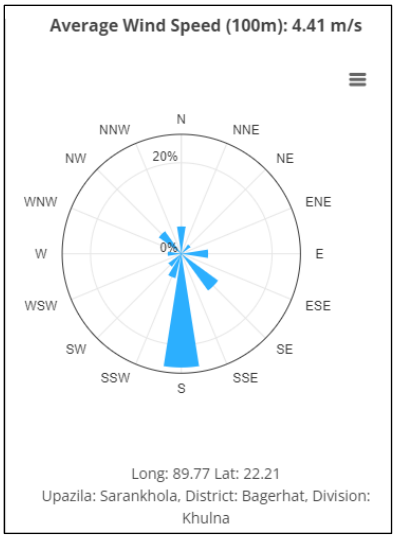

Figure 4-3: Wind Direction

For data access, users can download the observations in multiple formats—including JPEG, PNG, CSV, and XLS—or view the data table directly. These options are available through the menu located at the top right corner of the wind rose window ☰.

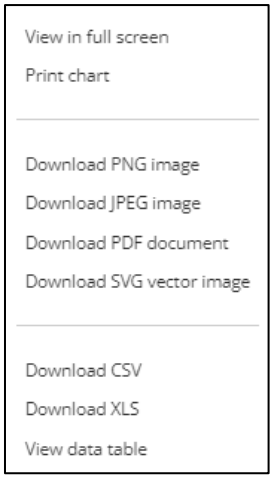

Figure 4-4: Data Export Options

4.2 Average Wind Speed (200 m)

By clicking the "AVERRAGE WIND SPEED (200m)" then the output map below describes here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button. Also, map can be zoom in or out by using the scroll wheel. when upper layer of data selected if others data also selected then it will be visible only the upper data layer.

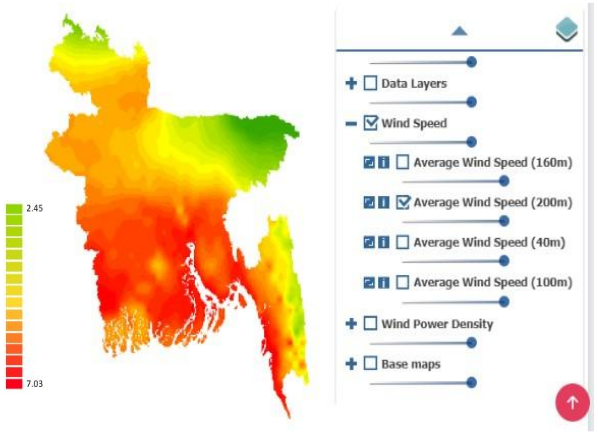

Figure 4-5: Wind Speed at 200m

4.3 Average Wind Speed (160 m)

By clicking the "AVERRAGE WIND SPEED (160m)" then the output map shown here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button. Also, map can be zoomed in or out by using the scroll wheel.

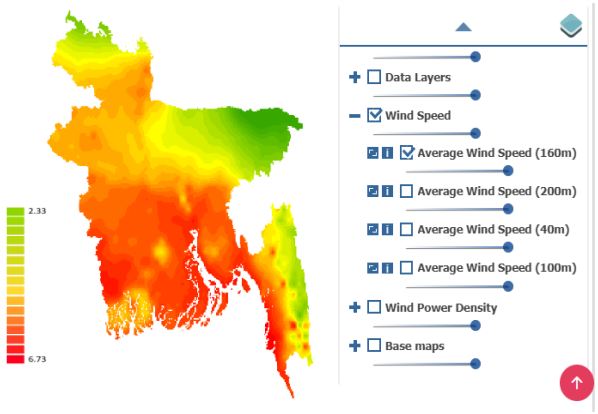

Figure 4-6: Wind Speed at 160m

4.4 Average Wind Speed (120 m)

By clicking the "AVERRAGE WIND SPEED (120m)" then the output map shown here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button.

Also, map can be zoomed in or out by using the scroll wheel.

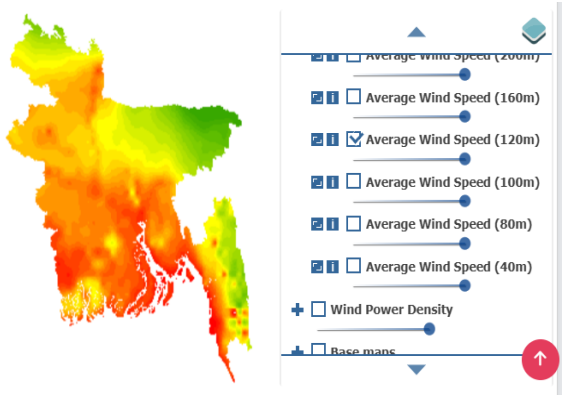

Figure 4-7: Wind Speed at 120m

4.5 Average Wind Speed (100 m)

By clicking the "AVERRAGE WIND SPEED (100m)" then the output map shown here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button. Also, map can be zoomed in or out by using the scroll wheel.

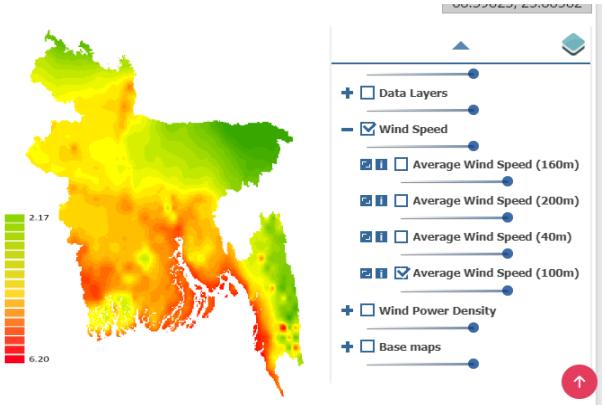

Figure 4-8: Wind Speed at 100m

4.6 Average Wind Speed (80 m)

By clicking the "AVERRAGE WIND SPEED (80m)" then the output map shown here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button. Also, map can be zoomed in or out by using the scroll wheel.

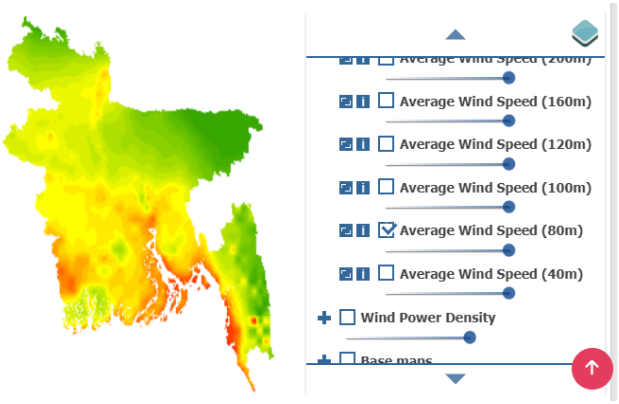

Figure 4-9: Wind Speed at 80m

4.7 Average Wind Speed (40 m)

By clicking the "AVERRAGE WIND SPEED (40m)" then the output map shown here. In the left corner legend showed the range of the wind speed (m/s). The map can be moved using the left mouse button. Also, map can be zoomed in or out by using the scroll wheel.

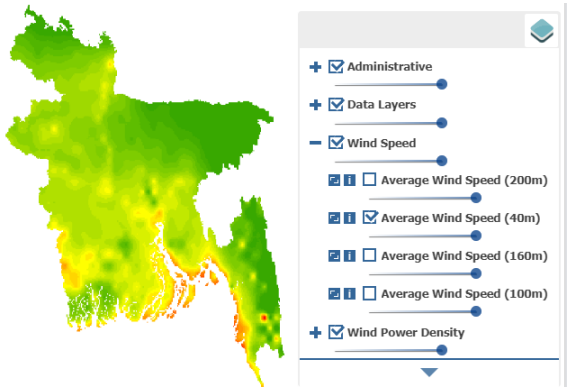

Figure 4-10: Wind Speed at 40m

5 WIND POWER DENSITY

Wind Power Density (WPD) is a quantitative measure of wind energy available at any location. Formula for WPD is: (1/2) X (air density) X (wind speed) 3

It is represented as raster layer. The unit of WPD is Watts per meter square (Wm-2).

5.1 Wind Power Density (40 m)

Wind power Density (40m) layer provide information wind energy potential available at a location for 40meter height.

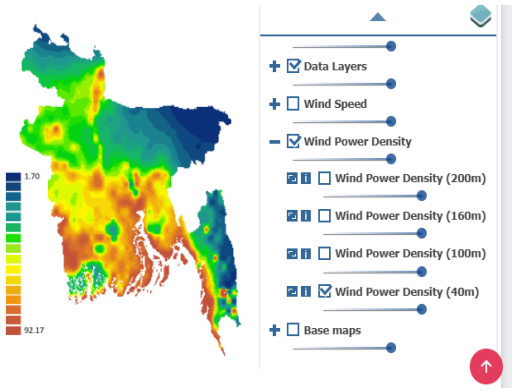

Figure 5-1: Wind Power Density at 40m

5.2 Wind Power Density (80 m)

Wind power Density (80m) layer provide information wind energy potential available at a location for 80meter height.

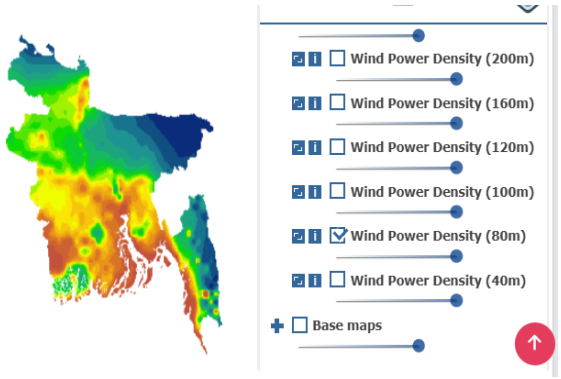

Figure 5-2: Wind Power Density at 80m

5.3 Wind Power Density (100 m)

Wind power Density (100m) layer provide information wind energy potential available at a location for 100meter height.

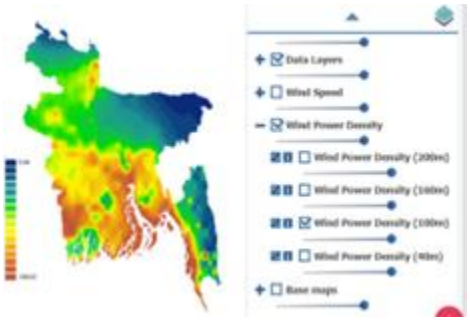

Figure 5-3: Wind Power Density at 100m

5.4 Wind Power Density (120 m)

Wind power Density (120m) layer provide information wind energy potential available at a location for 120meter height.

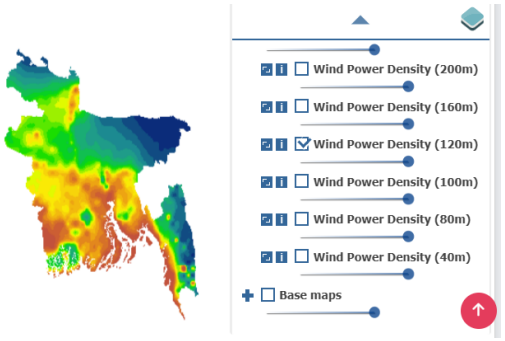

Figure 5-4: Wind Power Density at 120m

5.5 Wind Power Density (160 m)

Wind power Density (160m) layer provide information wind energy potential available at a location for 160meter height.

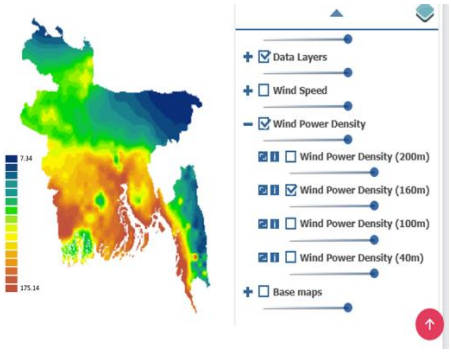

Figure 5-5: Wind Power Density at 160m

5.6 Wind Power Density (200 m)

Wind power Density (200m) layer provide information wind energy potential available at a location for 200meter height.

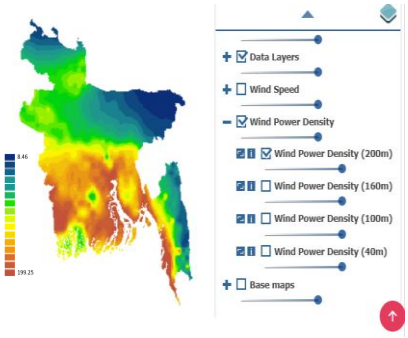

Figure 5-6: Wind Power Density at 200m

6 Supplementary Data Layers

The data layer exhibits distinctive features, consisting of a total of 12 layers, accessible through navigation on the WIS website by clicking specific points on the map below, with a brief description provided for each layer.

6.1 BMD Stations

BMD refers to Bangladesh Meteorological Department stations. All station locations can be viewed on the map by clicking and selecting the corresponding layer. Data can be downloaded in various formats through the menu located at the top right corner of the window ≡.

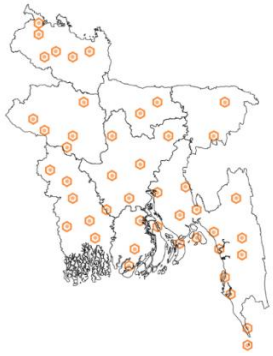

Figure 6-1: BMD Stations Layer

6.2 SREADA Stations

Locations of Wind information monitoring stations are presented in this layer. A user can see stations by checking in the box menu. Data can be downloaded in various formats through the menu located at the top right corner of the window ≡.

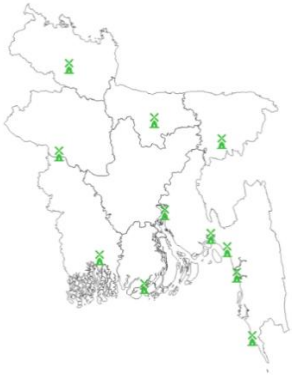

Figure 6-2:SREDA Stations Layer

6.3 Topography of Bangladesh

This map highlights the land elevation across Bangladesh and presents the country's overall topography. Elevation is represented through a color gradient, with red indicating higher terrain and green showing lower elevations. The data is sourced from the Survey of Bangladesh (SoB).

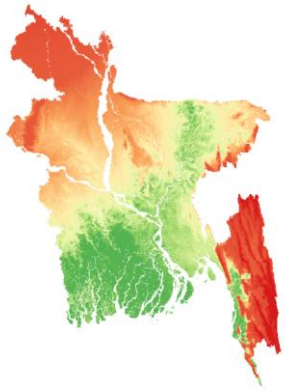

Figure 6-3: Topography Layer of Bangladesh

6.4 Ports of Bangladesh

The map displays the locations of Bangladesh's land, river, and seaports, represented using three distinct symbols for easy identification. The data is sourced from the Port Authorities of Bangladesh.

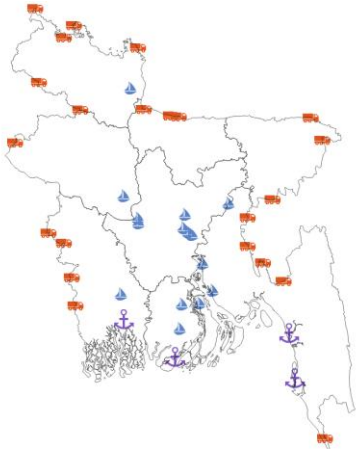

Figure 6-4: Ports Layer of Bangladesh

6.5 Airports of Bangladesh

The map presents airports across Bangladesh as a dedicated layer, with data sourced from the Civil Aviation Authority of Bangladesh. Airports are categorized by type—International, Domestic, and Others—and displayed using distinct symbols for clear identification.

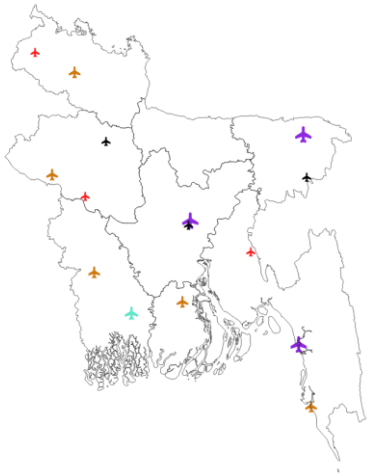

Figure 6-5: Airports Layer of Bangladesh

6.6 Rivers of Bangladesh

This spatial data layer represents the major rivers of Bangladesh as polygon features, providing a clear visualization of their extent and distribution. The dataset has been collected from the Water Resources Planning Organization (WARPO).

Figure 6-6: Rivers Layer of Bangladesh

6.7 Protected Forest Area

The protected area layer includes sanctuaries, national parks, community conservation zones, safari parks, eco-parks, and botanical gardens. The dataset has been collected from the Bangladesh Forest Department.

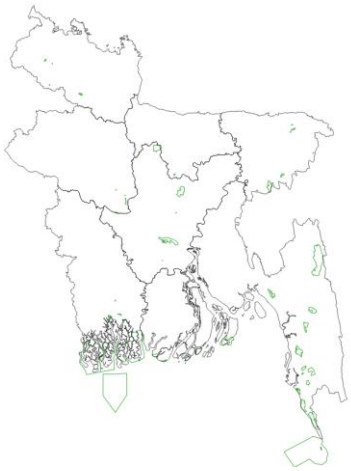

Figure 6-7: Layer of Protected Forest Area

6.8 Power Plant

The power station icon is represented in the map as a power plant in Bangladesh. This data was collected from Bangladesh Power Development Board.

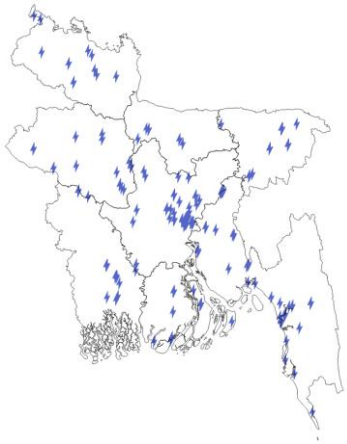

Figure 6-8: Powerplant Layer

6.9 Earthquake Risk Zone

Typically, a high seismic hazard zone is nearest a seismic zone where there are more earthquakes, and a lower seismic hazard zone is farther away from a seismic zone marking color indicates risk factor. high, medium, low. This data was provided by the Department of Disaster Management (DDM).

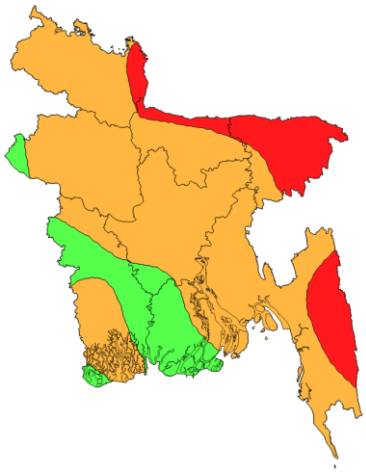

Figure 6-9: Earthquake Risk Zone Layer

6.10 Cyclone Risk Zone

The cyclone risk zone layer identifies geographical regions vulnerable to cyclones—severe tropical storms marked by strong winds, storm surges, and heavy rainfall. The southern coastal region of Bangladesh is particularly highlighted, as it faces the highest exposure to cyclone hazards. This dataset has been collected from the Department of Disaster Management (DDM) and shows areas where cyclone risks are most significant.

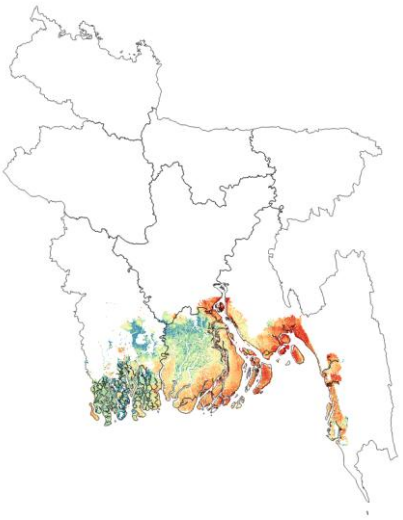

Figure 6-10: Cyclone Risk Zone Layer

6.11 Economic Zone

BEZA is endeavoring to establish Economic Zones in potential areas of the country with a view to encouraging rapid economic development through diversification of industries and augmentation of employment, production and export. With that target, BEZA has till now got approval to establish 97 economic zones countrywide comprising 68 Government and 29 Private EZs has been presented as point feature.

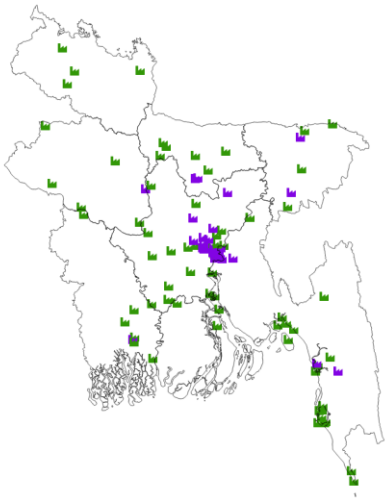

Figure 6-11: Economic Zone Layer

6.12 Major Road

This map illustrates the major road network of Bangladesh, with data collected from the Roads and Highways Department (RHD). The roads are categorized into three types: National Roads, Regional Roads, and Zila Roads, each represented distinctly for clear identification.

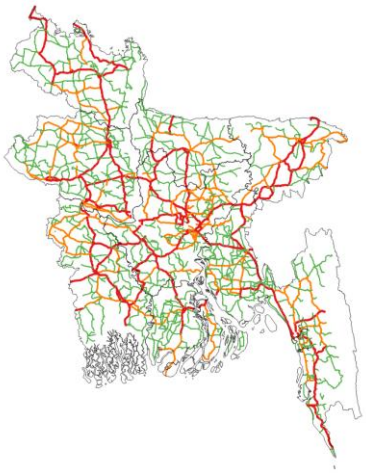

Figure 6-12: Major Roads Layer

7 Administrative Layers

The administrative layer of Bangladesh is organized into three levels of boundaries: Division, District, and Upazila. Each boundary layer provides detailed spatial information, allowing users to view and analyze the country's administrative structure at different scales.

7.1 Division Boundary

This spatial data layer displays the administrative boundaries of Bangladesh's 8 divisions, with attribute information provided by the Bangladesh Bureau of Statistics (BBS). Division details become visible when zooming to the appropriate map scale.

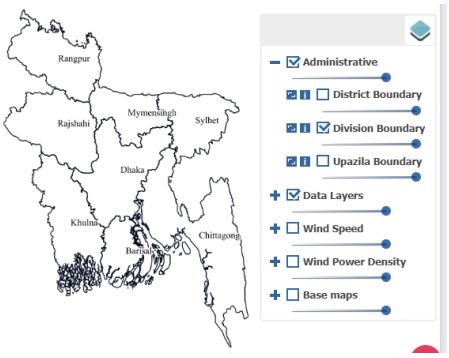

Figure 7-1: Division Boundary Layer

7.2 District Boundary

This spatial data layer displays the administrative boundaries of Bangladesh's 64 districts, with attribute information provided by the Bangladesh Bureau of Statistics (BBS). District details become visible when zooming to the appropriate map scale.

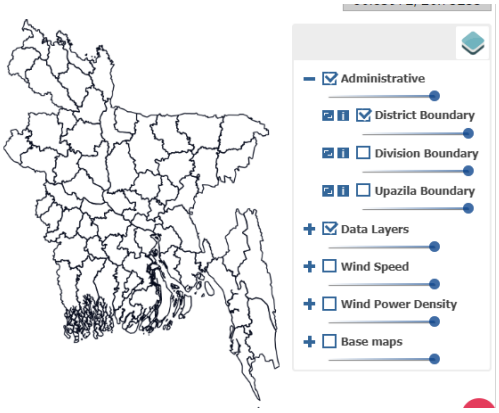

Figure 7-2: District Boundary Layer

7.3 Upazilas Boundary

This spatial data layer presents the administrative boundaries of Bangladesh's 492 upazilas, with attribute information sourced from the Bangladesh Bureau of Statistics (BBS). Upazila details are shown when zooming to the appropriate map scale.

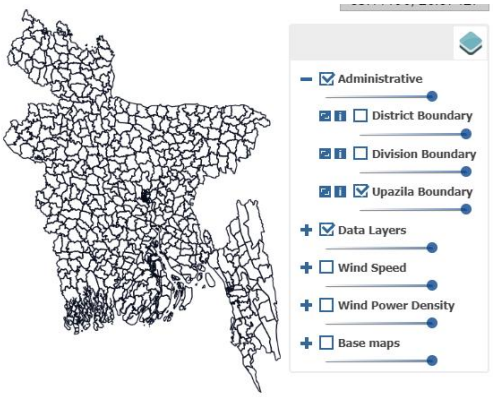

Figure 7-3: Upazila Boundary Layer

Thank You

Support & Contact

For any inconvenience, please contact: ad.wind@sreda.gov.bd