GEOGRAPHICAL INFORMATION SYSTEM
FOR
IDENTIFYING WIND POTENTIAL SITES

Joint Pilot Study
by

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&

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The study is aimed at carrying out a pilot study for identifying wind potential locations to establish wind farms using the space technology and advanced computerised systems such as Remote Sensing (RS) and Geographical Information System (GIS). An area of about 450 sq. kms around Muppandal wind monitoring station covering Tirunelveli and Kanyakumari Districts in Tamilnadu is selected to carry out the pilot study. It is situated on the western side of the western ghat mountain. The wind monitoring station is located on the exit of Aralvaimozhi gap in the mountain. This area is chosen for the reasons that C-WET has already conducted a micro-survey study of wind resources in Muppandal area using the wind data collected by the Wind Monitoring Station installed over there and the complex nature of the terrain. The terrain conditions in terms of natural settings such as current land use/cover, geology/geomorphology, soils, slope, drainage etc are mapped using the Indian Remote Sensing satellite multispectral false colour composites and also consulting Survey of India topomaps.

The five major Land Use/Land Cover categories present are Agriculture (64%), Forest (18%), Wastelands (11%), Built-up land (5%) and Water bodies (2%). These categories are grouped in to different roughness lengths classes which have bearing on the wind speeds/power.

Geomorphologically most of the wind gaps / pediment gaps are in the central part of the study area especially in the denudational hill zones. These gaps are formed due to severe denudation along the major regional structural trends and highly jointed charnockite rocks. As the gaps are oriented perpendicular to the wind direction, they form potential zones for harnessing the wind energy.

The properties of soils with reference to their type, nature and distribution in terms of their physico-chemical, morphological and engineering aspects such as liquid limit and plastic limit are studied. The entire area is divided into zones of high, medium and low suitability classes with respect to establishing wind mills.

The slope map shows that nearly 70 percent of the study area is relatively flat and suitable for locating wind mills. Nearly 24 percent of the study area is not suitable for locating wind mills from the point of view of slope which is more than 15 percent.

The drainage and surface water bodies are the other spatial elements mapped. They have to be avoided while carrying out the site suitability analysis for locating the wind potential areas.

A mathematical function named Weibull density function is widely accepted for the prediction of wind characteristics since it is a good match with the experimental data. Weibull distribution shows its usefulness when the wind data of one reference station (along with terrain data) are being used to predict the wind regime in the surroundings of that station. The WAsP model and wind atlas methodology are used for analyzing and assessing wind resource in Muppandal area. The assessed wind resource is then plotted as the isopleths of wind power densities at an interval of 50 W/m^2.

Digital databases are created and organized for all the terrain parameters and wind power density information as per the requirement for analysis. The multi-source data thus created is analysed using advanced data integration techniques available in ArcGIS software package.

The digital databases so generated are analysed to derive the spatial distribution of potential wind farmable sites in the study area. This task is accomplished using a set of decision rules (reasoning) which are formulated taking the knowledge of experts in relevant fields, ground observations and terrain conditions into consideration.

The results of the analysis show that nearly 40 percent of the study area is good for establishing wind mills. Rest of the 60 percent area is mainly covered with features such as structural hills, good forest and intense cultivation. The intensely cultivated area in the intermountain valley which is in the western part of he study area is not favorable for establishing wind mills. Area in the east of the Mahendragiri hills is very good for establishing the wind mills and almost all the potential sites lie east of Mahendragiri hills.

The potential wind farmable areas map generated from the analysis of information on natural resources and wind power density in the study area is validated in the field jointly by the scientists from C-WET and NRSA.

The results of study have amply proved that the GIS technology in combination with remote sensing can play a major role in identifying areas suitable for establishing the wind farms.
This pilot study demonstrates the importance of terrain parameters and the need for their integration with wind derived information for scientifically locating the suitable sites for wind farms development.

SOME IMPORTANT MAPS

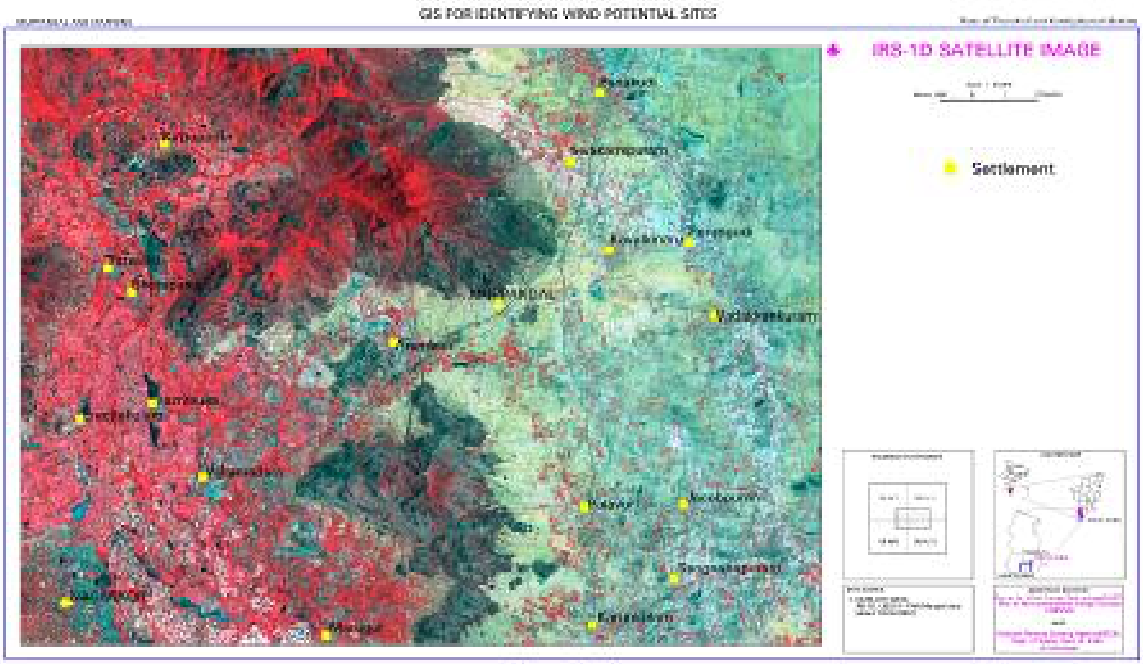
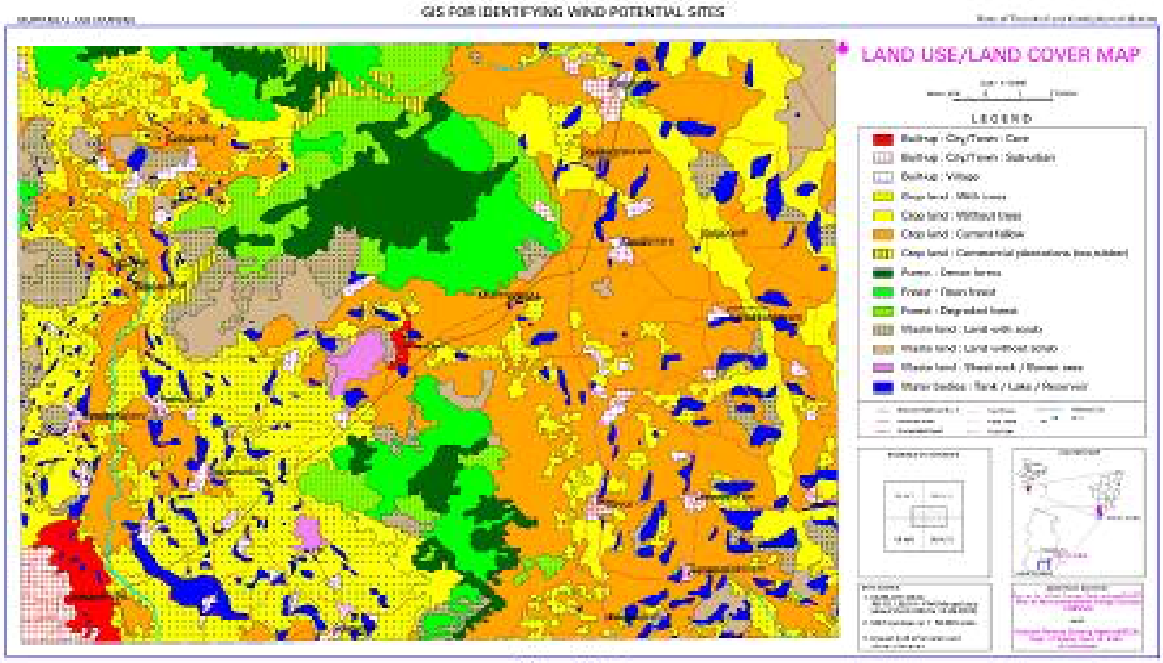


Figure No. 1b



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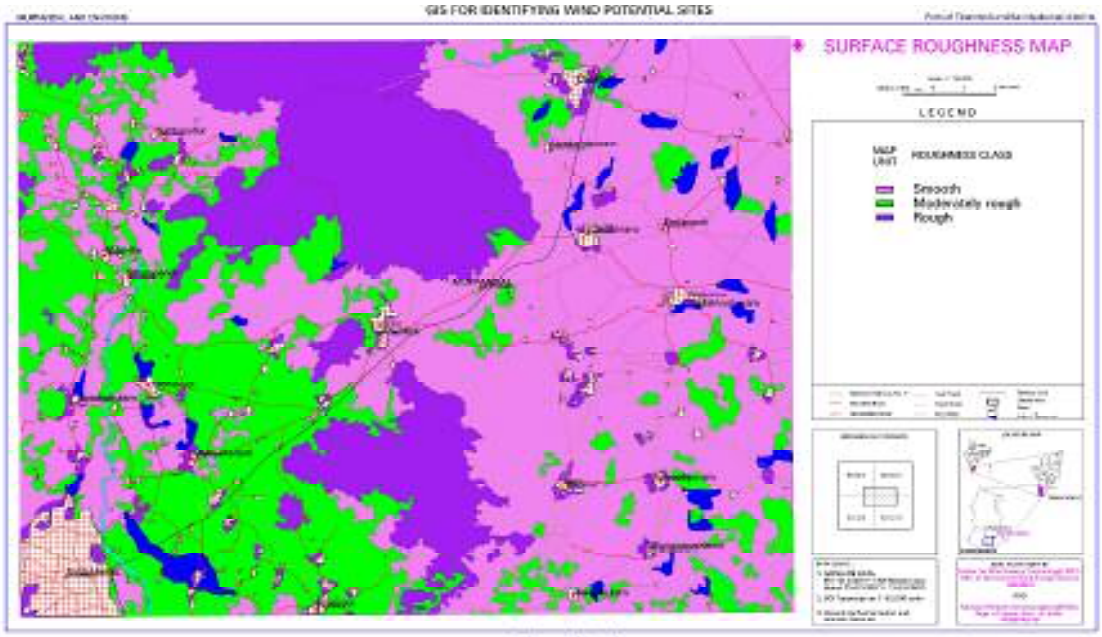

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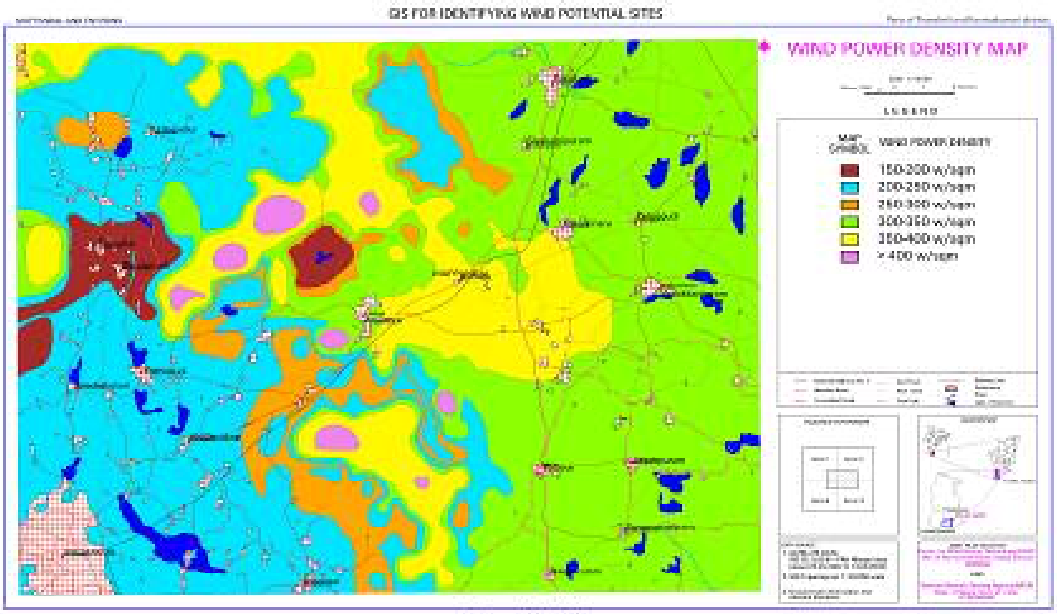

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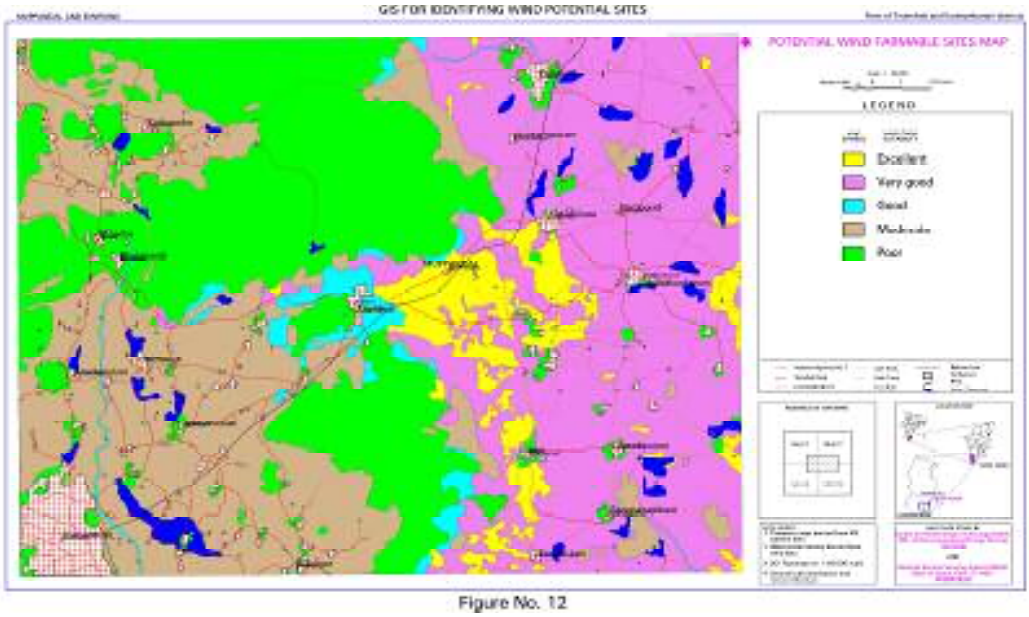

Figure No. 12

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