

70% of installed
renewable energy



India - 5th largest installed cap.

Potential of 100+ GW in India

Target of 60 GW by 2022

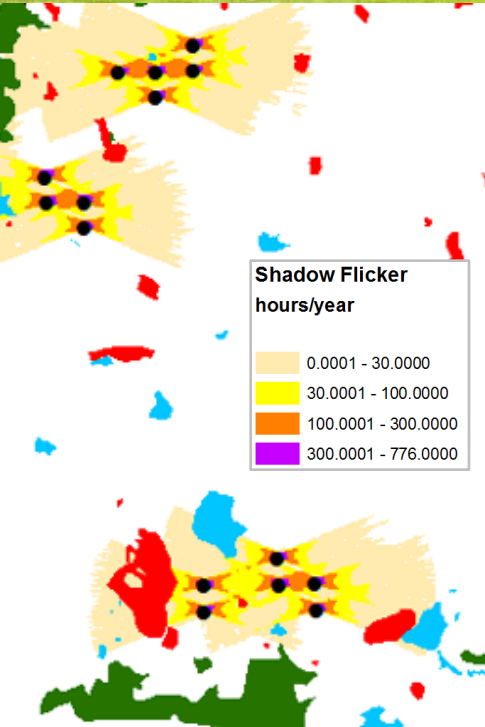
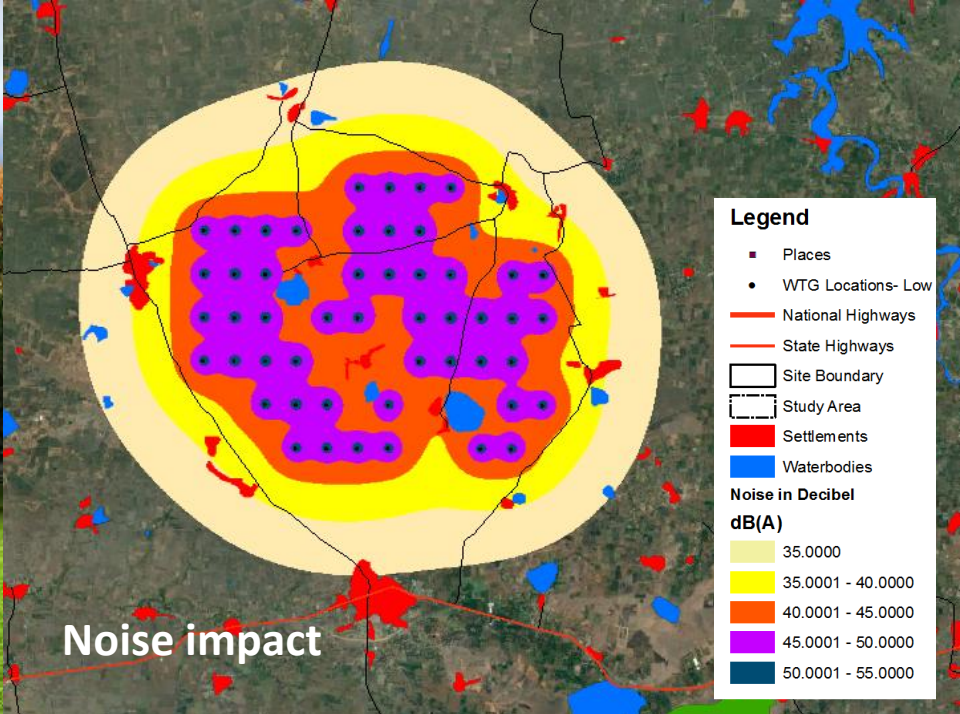
How can Wind Energy become Environmentally Benign?

Lucille Andrade

Associate Vice President



**environmental
management
centre LLP**



Wind Energy projects do not require **Environmental Clearance** by Indian law.

International Financing Institutions investing in wind energy require **Environmental Impact Assessment** studies to be conducted.

Classical EIA in India carried out **after finalizing locations** or in final stages. **Impacts are linked to location of turbine**

ESIA for wind farms should be conducted at research stage.

- Location finalized after a year long study
- WTGs once installed cannot be moved

**EMC developed a phased approach for E&S
Impact Assessment of Wind Energy projects**

Assessment based on World Bank
Groups EHS Guidelines for Wind Energy

EMC Three-stage Approach for E&S Impact Assessment of Wind Energy Projects

Early Research Stage

Screening of location (presence of priority set of E&S sensitive receptors)

Finalization of Location by Research Team

Desk-based Rapid Impact Assessment (mapping of E&S sensitive receptors; noise & shadow flicker effect modelling)



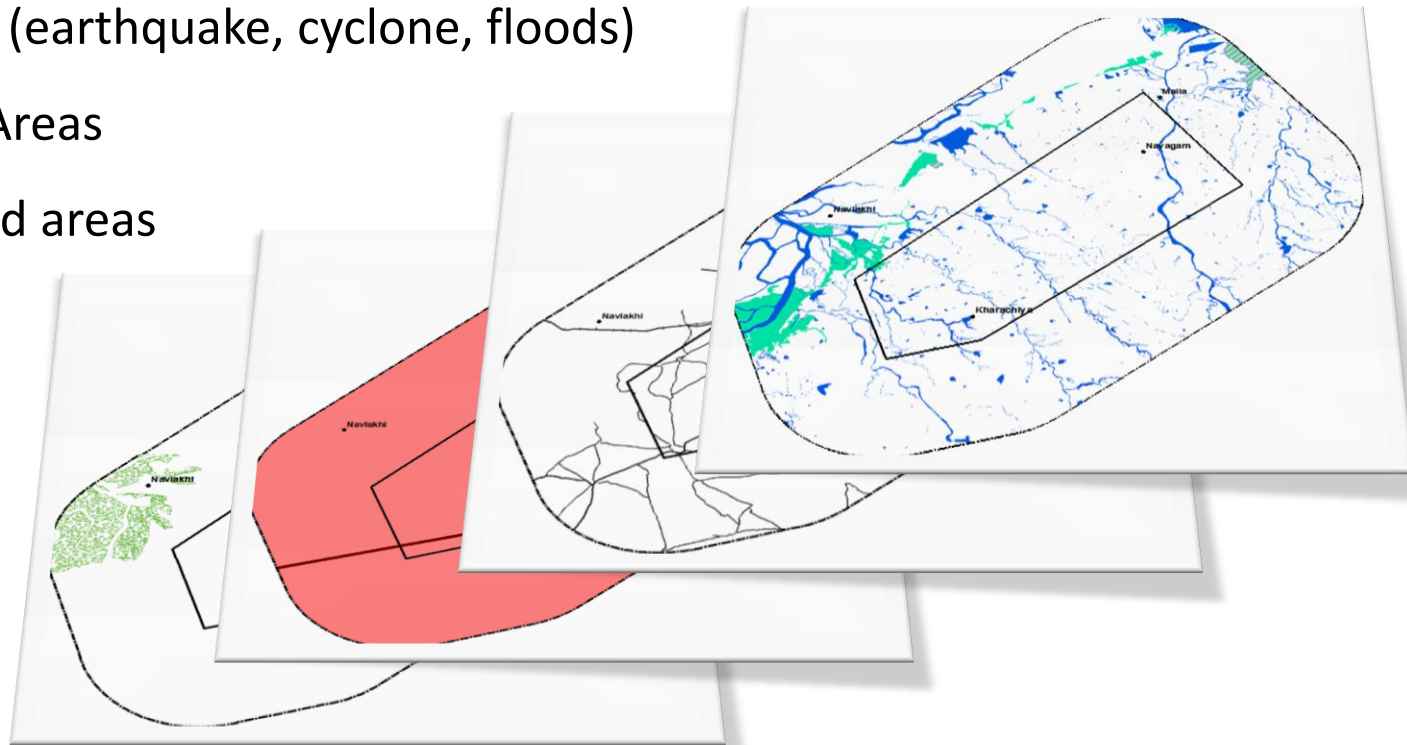
Bird and Bat Diversity Assessment (field surveys in winter for migratory birds and pre/post monsoon for bat roosts)



1- Screening

Presence/ Absence of critical E&S sensitive Receptors

- Archeological sites
- National Parks/Wildlife Sanctuaries
- Eco-sensitive zone
- Natural Hazards (earthquake, cyclone, floods)
- Important Bird Areas
- Tribal/ Scheduled areas
- Airports



2- Rapid E&S Impact Assessment (desk-based)

10 km buffer around the boundary of wind farm area

Analysis of Baseline Status

- Secondary Data Collection
- Creation of data layers for sensitive receptors in GIS (Image processing, digitization, Validation)
- Socio-Economic Analysis
- Analysis of Cropping Pattern
- Meteorological Analysis



Impact Assessment

- Defining safety buffers from E&S sensitive receptors
- Scenario generation for locating WTGs within wind farm boundary
- Noise and Shadow Flicker Effect Modelling for above scenarios
- Identification of impacted receptors based on modelling results for the above scenarios

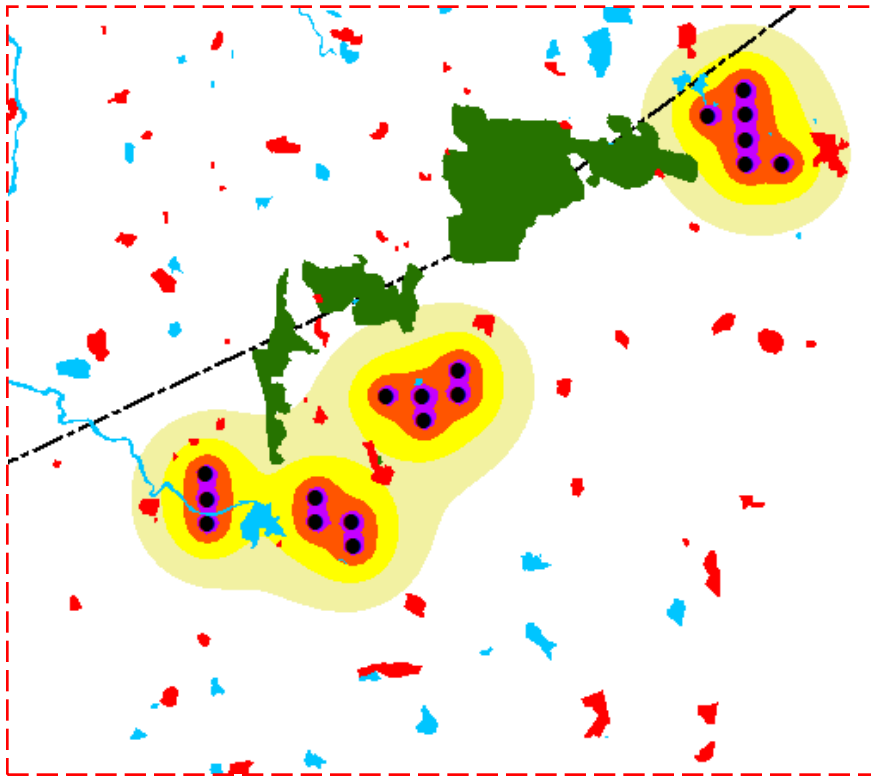


Management Plan

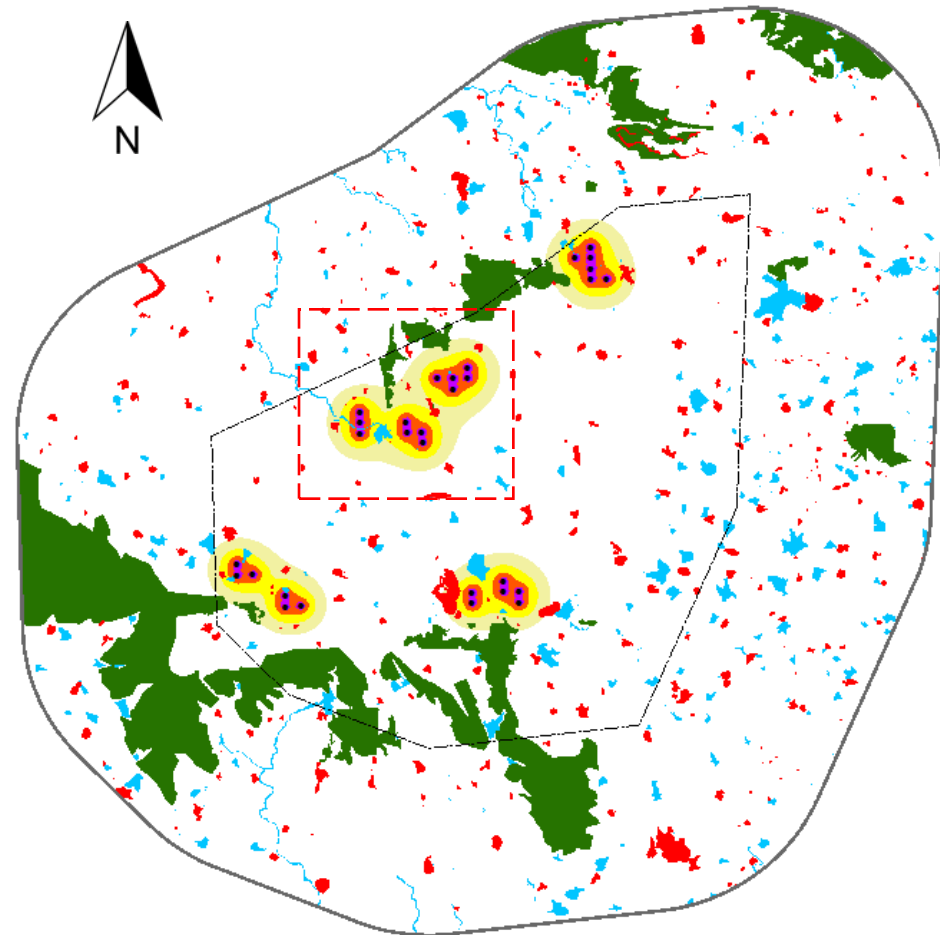
Recommendations for locating WTGs with least disturbance to E&S sensitive receptors



Impact Assessment- Noise



Using ISO 9613-2 General Model
in WindPro 3.0 software



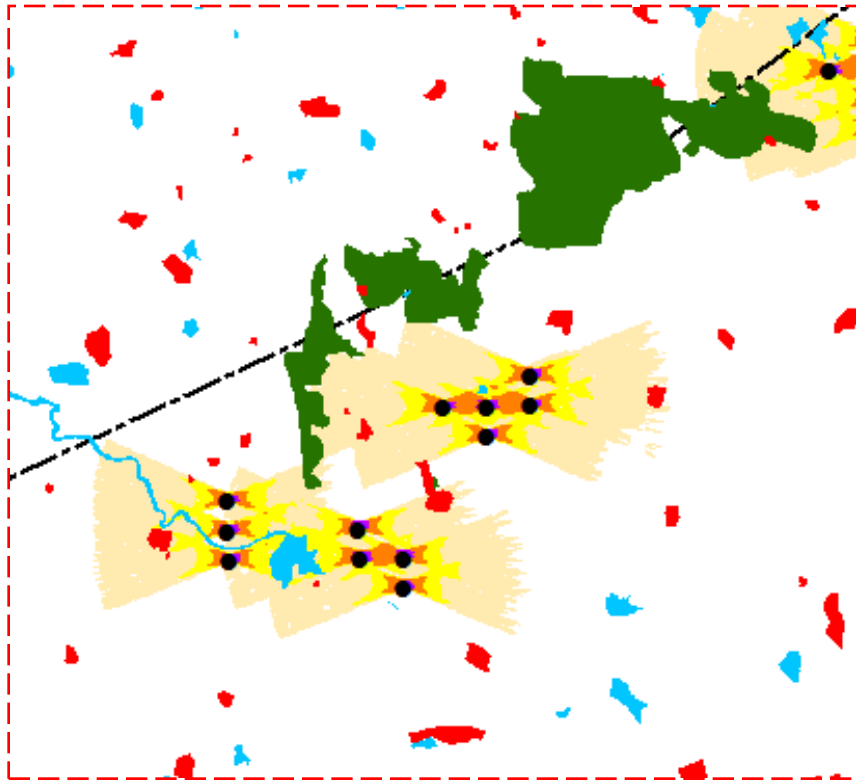
Legend

- Important Bird Areas
- Waterbodies
- Settlement
- Forests

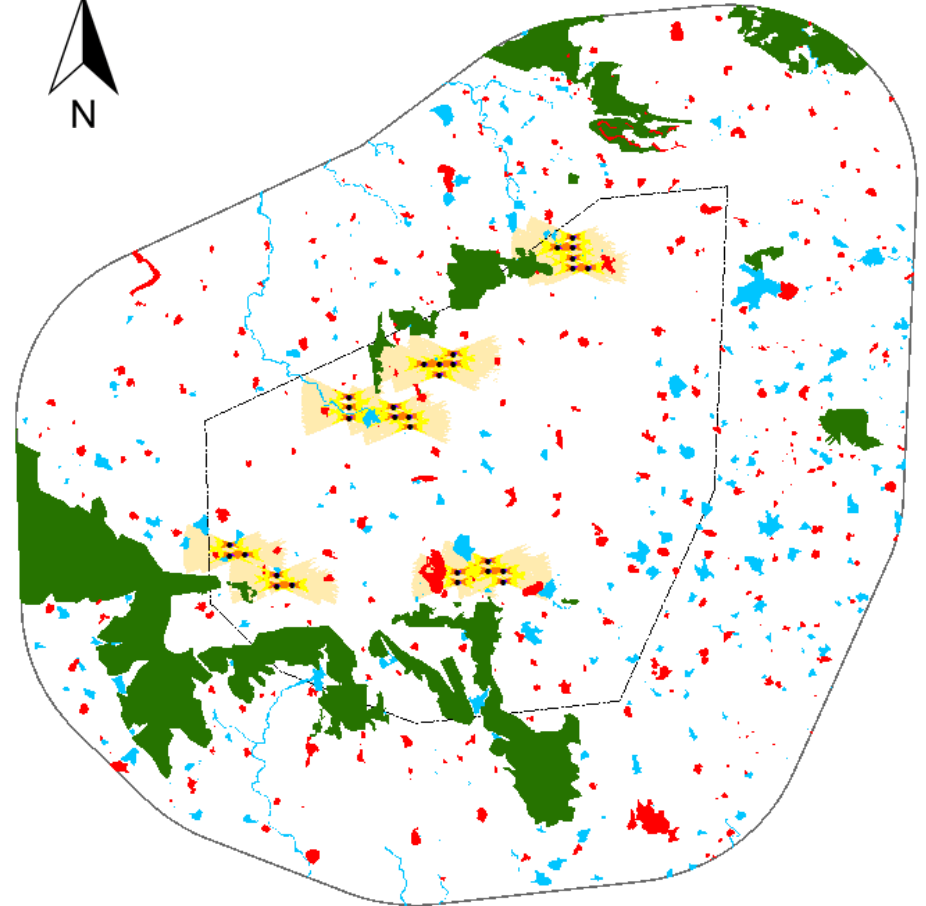
Noise in Decibels dB(A)

- 35.0000
- 35.0001 - 40.0000
- 40.0001 - 45.0000
- 45.0001 - 50.0000
- 50.0001 - 55.0000

Impact Assessment- Shadow Flicker



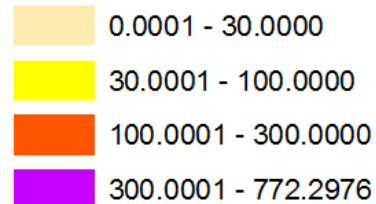
Shadow Flicker module in WindPro 3.0 & SRTM data(30m resolution)



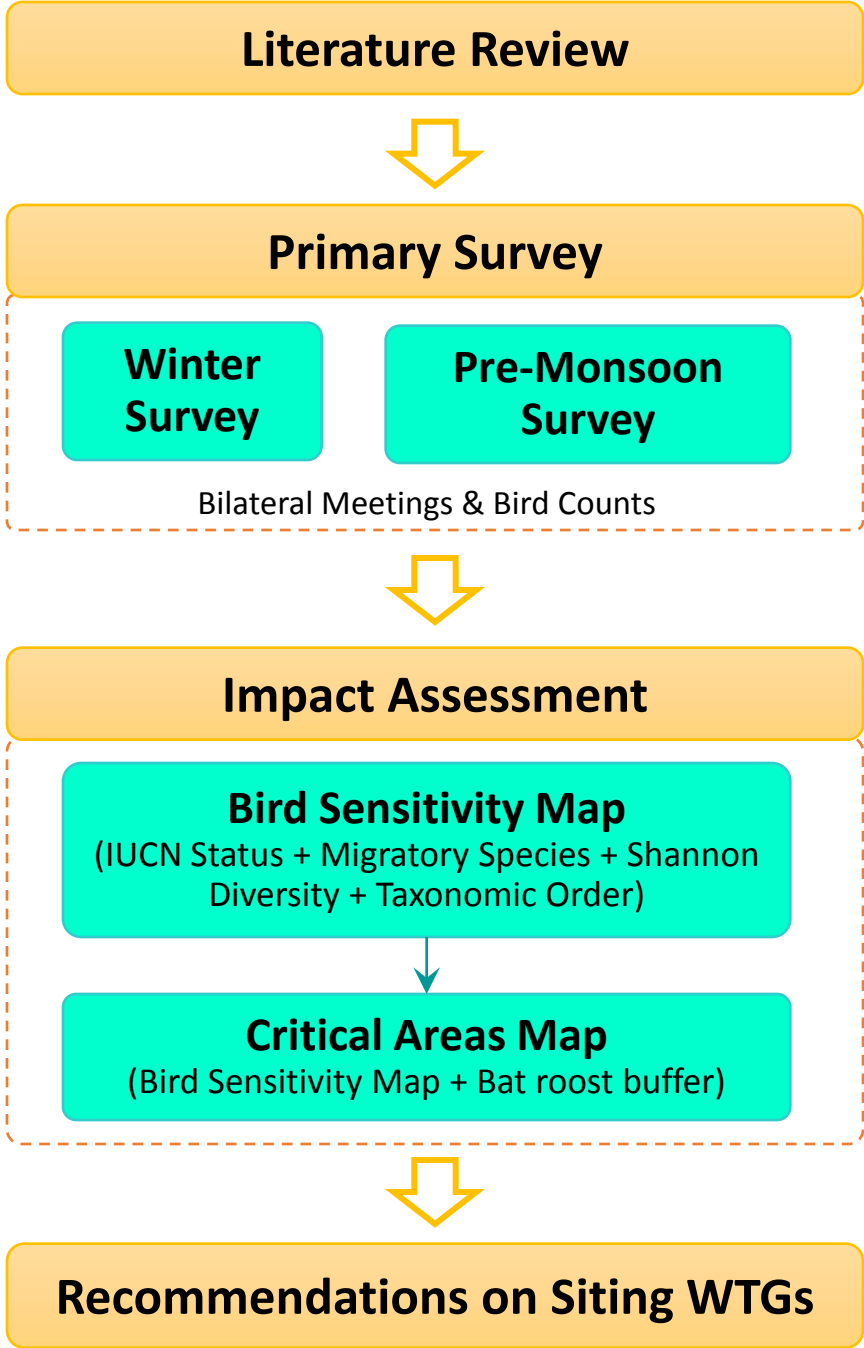
Legend



Shadow Flicker hours/year



3- Bird & Bat Diversity Assessment (on-site)



Bird & Bat Critical Areas Map



Legend

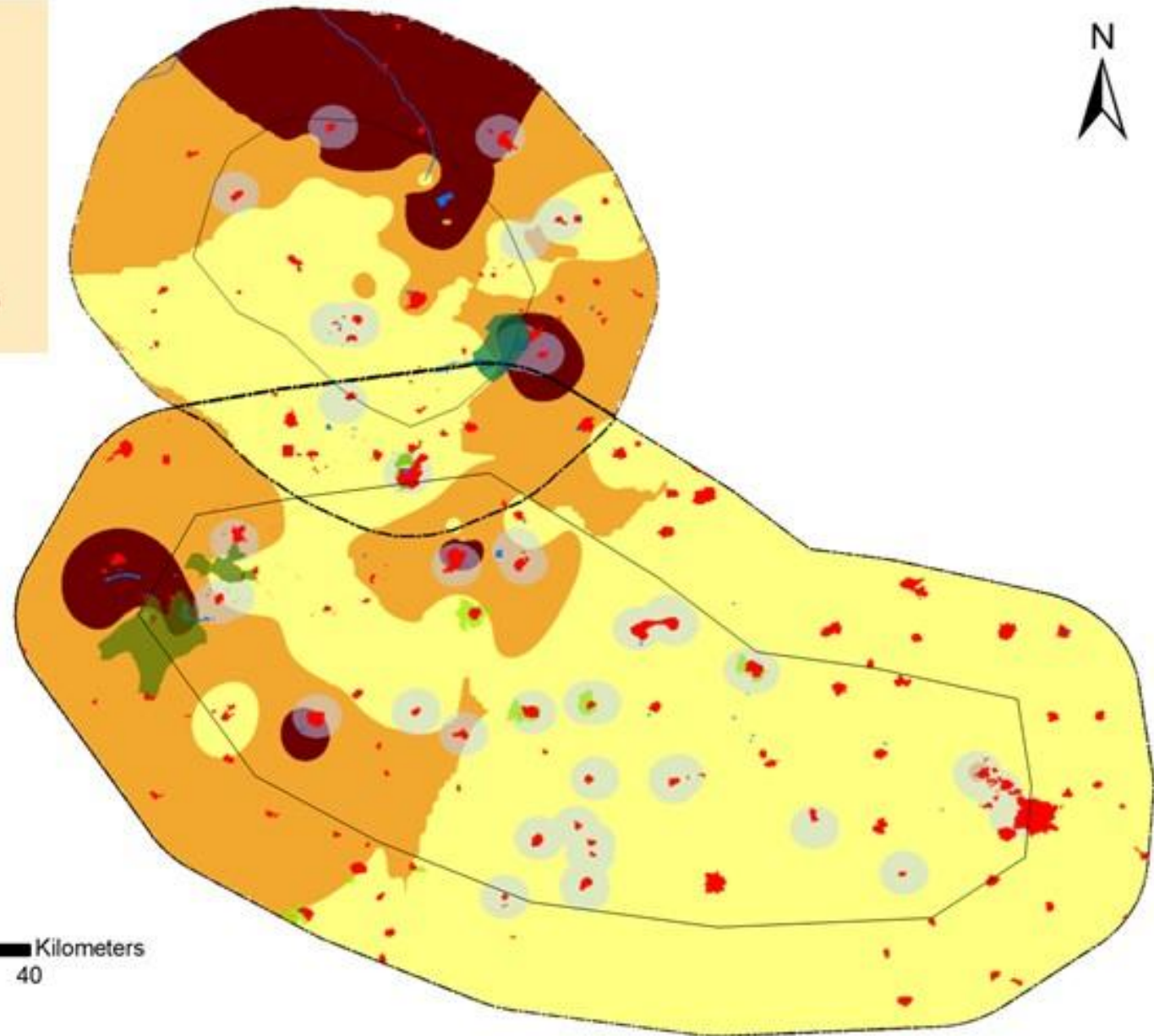
-  Study Area
-  Site Boundary
-  Protected Forests
-  Gajner Wildlife Sanctuary
-  IBA Diyatra
-  Settlements
-  Waterbodies

Bird & Bat Critical Areas

 Bat Sensitive Zone

Bird Sensitive Zone

-  Low
-  Moderate
-  High



Conclusion

Conduct of **Environmental and Social Impact Assessment** for wind farms at **research stage** is important for tapping true potential of wind energy in an environmental friendly manner.



Environmental Management Centre LLP

504/505, 5th Floor, Balarama Building,
Bandra Kurla Complex, Near MMRDA Office,
Bandra (East), Mumbai 400051 Maharashtra, INDIA
P : +91-22-62215944 / 5946
W : www.emcentre.com

E: Lucille.andrade@emcentre.com/