Wind Energy Expansion and Biodiversity Conservation

India's rapid expansion of wind energy, reaching 51.3 GW by mid-2025, has raised concerns about its environmental impact, particularly on bird populations. A study by the Wildlife Institute of India (WII) highlighted high bird mortality at wind farms in the Thar Desert, home to critically endangered species. Additionally, as India expands offshore wind energy, concerns grow over impacts on marine biodiversity and inadequate environmental assessments.

1. Wind Turbines and Avian Populations

1. High Bird Mortality Rates Documented

A study conducted by the Wildlife Institute of India (WII) in the Thar Desert recorded 124 bird carcasses near 90 wind turbines, estimating that 4,464 birds die per 1,000 sq. km annually in the area. This makes wind turbines a significant cause of avian mortality in sensitive ecosystems.

2. Severe Impact on Endangered and Large Birds

The Great Indian Bustard (GIB), one of the most critically endangered birds in the world, along with raptors (birds of prey), is disproportionately affected. These birds have soaring flight patterns and very low reproductive rates, making recovery from population losses extremely slow.

3. Threat from Migratory Pathways

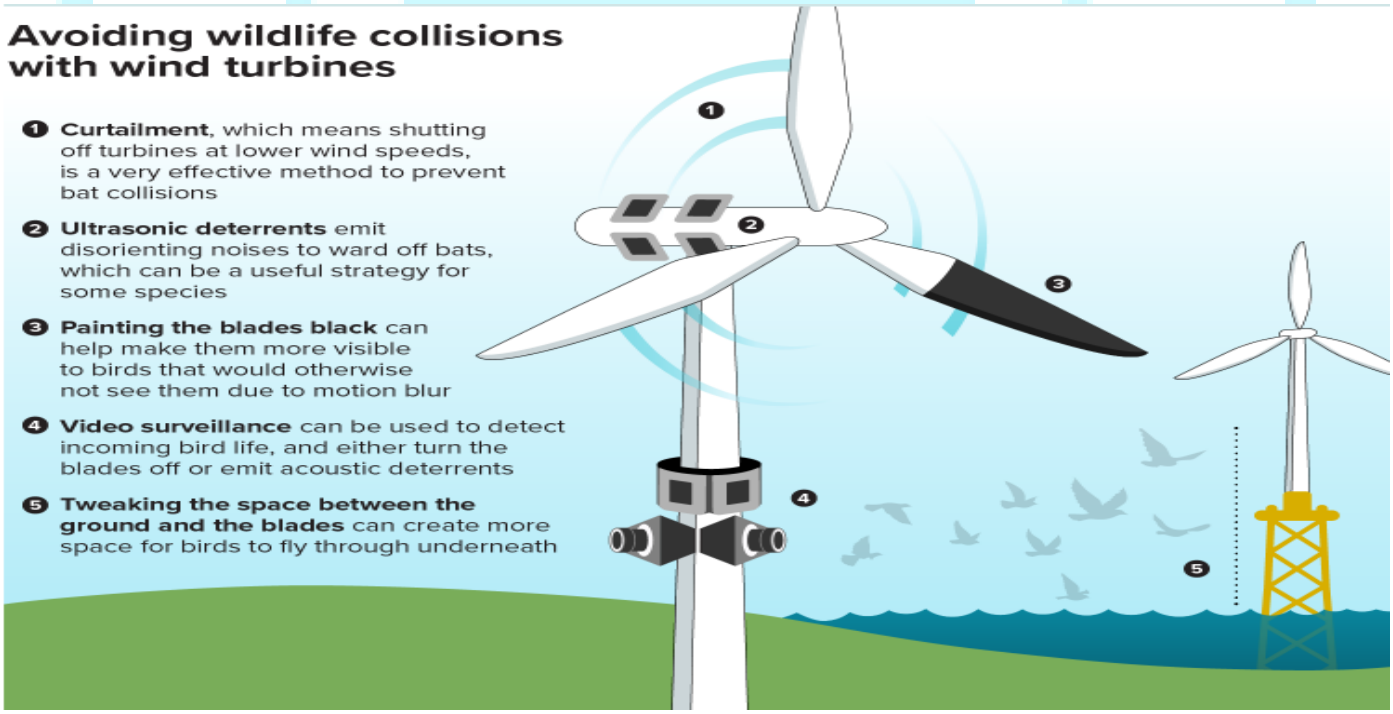
The Thar Desert lies along the Central Asian Flyway, a major migratory route for birds traveling between breeding and wintering grounds. Wind farms in such zones increase the risk of fatal collisions during migration seasons.

4. Additional Hazard from Power Lines

Apart from the turbines themselves, birds often collide with high-tension power lines associated with wind farms. The WII study noted that this compounded mortality was often ignored in earlier assessments, leading to underestimation of the real impact.

5. Lack of Environmental Oversight for Onshore Projects

In India, onshore wind farms are not required to conduct Environmental Impact Assessments (EIAs). As a result, projects can be set up in ecologically sensitive habitats without adequate study of their impact on biodiversity.



2. Offshore Wind Energy Exploration

1. Potential Threat to Marine Biodiversity

Offshore wind farms can disturb marine habitats, including breeding grounds for fish, turtles, and marine mammals. The construction phase often overlaps with sensitive reproductive seasons of marine species.

2. Impact of Underwater Noise Pollution

Installation activities such as piling, dredging, and anchoring produce intense underwater noise, which can interfere with echolocation, communication, and navigation in species such as dolphins, whales, and certain fish.

3. Risk of Marine Pollution from Operations

Maintenance activities and supporting vessels can result in oil, fuel, and lubricant spills, which may contaminate surrounding waters and negatively affect marine life health and food chains.

4. Inadequate Ecological Studies

While offshore projects require EIAs, these assessments are often rapid and superficial, missing key ecological concerns. For example, the rapid EIA for the Gulf of Khambhat offshore wind farm acknowledged the presence of dolphins, sharks, and reptiles but downplayed potential long-term operational impacts.

5.Technological and Logistical Barriers

India currently has limited domestic expertise and tested technology for deep-water offshore wind installations. Harsh marine conditions—such as strong currents, salt corrosion, and storm activity—pose durability and maintenance challenges for turbines.

3. Balancing Wind Energy Development with Biodiversity Conservation

1. Strategic Site Selection

Tools like the Avian Sensitivity Tool for Energy Planning (AVISTEP), developed by BirdLife International, can guide project placement to minimize bird impacts. AVISTEP classifies areas into low, moderate, high, and very high sensitivity zones, but must be supported by ground-level ecological studies before installation.

2. Zoning and Spatial Planning for Renewables

Renewable energy infrastructure should avoid critical habitats by establishing "no-go" biodiversity zones using long-term research, satellite data, and species tracking. Power infrastructure in Great Indian Bustard habitats should be consolidated into designated corridors to reduce habitat fragmentation.

3. Conservation Breeding and Revival Programs

For critically endangered species like the GIB, the "jump-start" method—where late-stage eggs are artificially incubated, and chicks are raised in safe zones—can help restore populations in the wild.

4. Technological Mitigation Measures

Painting one turbine blade a contrasting color can improve visibility for birds, reducing collision risk. Similarly, shutdown protocols during peak migration seasons can prevent large-scale bird mortality.

5. Mandatory EIAs for Onshore Projects

Extending EIA requirements to onshore wind farms would ensure that ecological risks are properly assessed before project approval.

6. Integration of Wind, Solar, and Storage

Combining wind power with solar energy and battery energy storage systems (BESS) can ensure round-the-clock renewable energy while allowing certain wind farms to operate less intensively during sensitive wildlife periods.

7. Monitoring and Long-Term Research

Continuous post-installation monitoring is necessary to understand wind energy's impact on both avian and marine wildlife, with special focus on ecologically sensitive regions like the Thar Desert.

4. Wind Power in India – Current Status

As of June 2025, wind energy contributed 21.78% to India's total renewable energy generation. According to the International Renewable Energy Agency (IRENA) Renewable Energy Statistics 2025, India ranks 4th globally in total installed wind power capacity. India's wind capacity has grown from ~21 GW in 2014 to 51.3 GW by June 2025, more than doubling in just a decade. The National Institute of Wind Energy estimates that India has a total wind potential of 1,164 GW at 150 meters hub height, indicating vast untapped opportunities for expansion—provided ecological safeguards are integrated.

Source: https://www.thehindu.com/sci-tech/energy-and-environment/worlds-highest-bird-death-rates-at-thar-desert-wind-farms/article69868496.ece