भारतीय वन्यजीव संस्थान
Wildlife Institute of India

# POWER-LINE MITIGATION

## TO CONSERVE BUSTARDS

Citation: Wildlife Institute of India 2018 Power-Line Mitigation Measures. Second edition (2020)

Cover photo of dead male Great Indian Bustard due to power-line in Jaisalmer : Bipin C.M.

# HARMONIZING POWER SECTOR WITH BUSTARD CONSERVATION

*The Great Indian Bustard (GIB) is a critically endangered species of bird, with 128(± 19) individuals remaining in the world. The GIB resides in the grasslands of India with the current majority of its population in Jaisalmer district of Rajasthan. There are several threats that are inching the bustard closer to extinction, however, powerlines seem to be the most significant.*

## EVIDENCE OF IMPACT

**a) Bustards are prone to collision**

Bustards have wide sideways vision to maximize predator detection, at the cost of narrow frontal vision. Because of this, and a habit of scanning the ground while flying, they cannot detect power-lines ahead of them, from far. Being heavy fliers, they fail to manoeuvre across power lines within close distances. The combination of these traits make them vulnerable to collision with power-lines. As a result, they collide with power lines and die from the impact, injuries/trauma or electrocution (Martin and Shaw 2010).

**b) Evidence of bustard mortality due to power lines**

Worldwide, studies have shown high mortality rates of several bustard species because of power-line collision. For example, 30% of Denham's bustards (Neotis denhami) die annually from power-line collisions in South Africa (Shaw 2009, Jenkins et al. 2010). In Spain, 8.5 km stretch of power-line killed a minimum of 25 Great Bustards in one year (JC Alonso pers. obs.). A review (Mahood et al 2017/18) of nine studies covering six bustard species from different parts of the world estimated 7 detected bustard mortalities per 10 km power-line per year. This factor causes 4 - 7% mortality of Great Bustard in areas with low power line density (Martin 2008) and 13% mortality in areas with high power line density (Alonso 2007).

**c) Evidence of Great Indian Bustard collisions with power lines in India**

Surveys conducted by Wildlife Institute of India (WII) in Thar covering 80 km of power lines repeated 7 times over a year found 289 carcasses of around 40 species including the Great Indian Bustard (GIB). **The study detected 8 carcasses/10 km for high tension and 6 carcasses/10 km for low tension power-lines**. Correcting these mortalities for the proportion of carcasses that are decomposed before survey or are missed during survey, mortality rate was estimated to be ~6 bird/km/month(high-tension lines), ~3 bird/km/month low-tension lines), and ~84,000 bird per year within 4200 sqkm area in and around Desert National Park. In terms of GIB, 6 mortality were recorded from 2017-2020, all due to high tension transmission lines - some of them connected to wind turbines.

Extrapolating these mortalities to the priority bustard habitat, intersected by ~150 km high tension lines, amounts to about **16 GIB deaths per year** from a population of about 128 ± 19 individuals in Thar. **Such high mortality rate is unsustainable for the species and a sure cause of extinction.** WII also tagged ten Great Indian Bustard on pilot basis in Rajasthan, Gujarat and Maharashtra, out of which two died from power line collision, corroborating the above findings.

**d) Impact of power line collision on bustard population**

Bustards are long-lived birds where adults have high annual survival probability (Palacín *et al* 2012). However, the excessive mortality due to power-lines are unsustainable and cause population declines or even extinction (Martin 2007). Power-line mortality can also disrupt important biological processes. Palacín et al (2012) shows that in a Great Bustard population in Spain, where migratory individuals suffered significant power-line mortality, the proportion of sedentary individuals increased over years against the reduction of migratory individuals. Here, power lines have reduced the propensity of a species to migrate, and can result in the loss of such intricate behaviors.

# SOLUTIONS

**e) No Power-line zones**

Crucial breeding habitats of bustards have to be made free of overhead power-lines. Conservation of bustard is not possible in areas with power-lines which sooner or later kill the bird. Existing power-lines in such important habitats have to be moved underground or redesigned. No new power-lines should be permitted in such areas.

**f) Mitigation of threat**

Mitigation measures are available to reduce power-line mortality, such as under-grounding of cables and fitting overhead wires with bird diverters. Bird mortality and crossing rate through wires reduce, if lines are marked with diverters compared to unmitigated segments. While under-grounding of cables eliminates bird mortality, marking power line can reduce mortality by 10 % (Barrientos et al 2012) to 78 % (Barrientos et al 2011), depending on area and species, but not eliminate mortality.

# IMPORTANCE OF TELEMETRY IN POWER-LINE MITIGATION

Great Indian Bustards range over large human-dominated landscapes that are facing rapid development and expansion of power-lines. Curtailing all infrastructural development across these large areas is impracticable and calls for prioritization of areas where these infrastructure should be avoided or mitigated. Use of bio-telemetry to understand GIB habitat can aide in this process, by generating fine-scale information on the birds' movement patterns that can overlaid on existing and proposed power-line maps to identify segments for mitigation measures. Thus, telemetry supplemented with bird surveys provide a powerful tool to prioritize habitats for infrastructure mitigation in particular, and conservation management in the wake of development.

Wildlife Institute of India demonstrated the potential of this tool for GIB conservation, by tagging two juvenile birds in Kachchh, Gujarat and 5 adult birds in Thar, Rajasthan using solar powered GPS tags that weighed <1% of the bird's body weight. These tags haveprovided information on bird movements for >1 year (May 2017 onwards) and have also provided evidence of one bird mortality from collision with 33 kV power-line near Lala Bustard Sanctuary. Movement data obtained from tagged birds was overlaid on habitat and infrastructure maps to identify critical areas for mitigating power-lines (see figure 1). However, individuals vary in their movement patterns and more birds need to be tagged across bustard landscapes (Thar, Rajasthan and Kutch, Gujarat) to draw population-level inferences and achieve best conservation results with finite resources and bring about a harmony between development and conservation needs of the country.

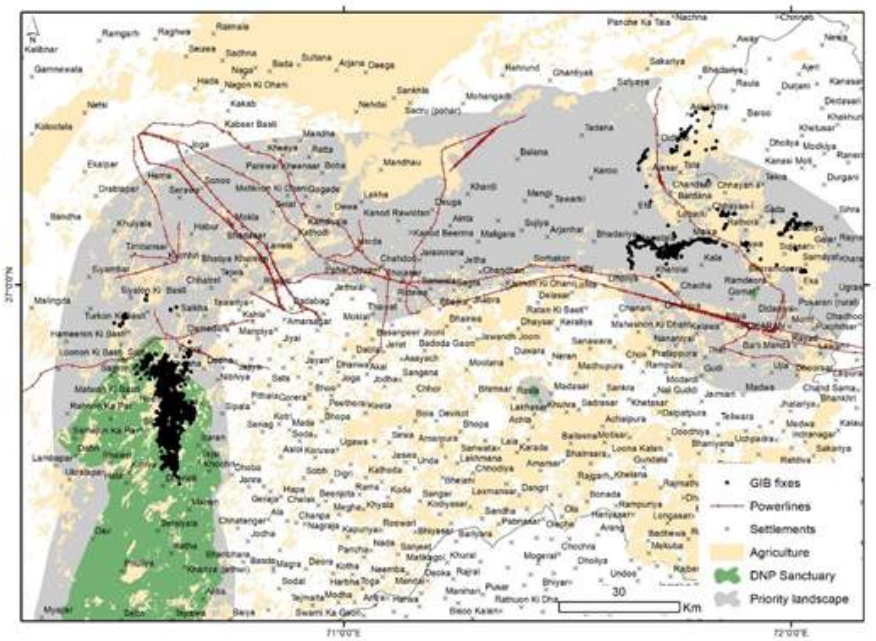
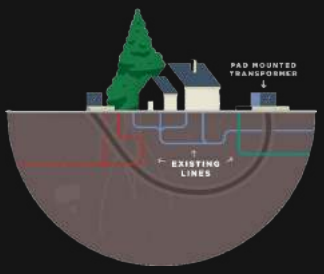



Figure 1 : Movement of tagged Great Indian Bustard overlaid on network of power lines and critical areas for mitigating power-lines (red lines).

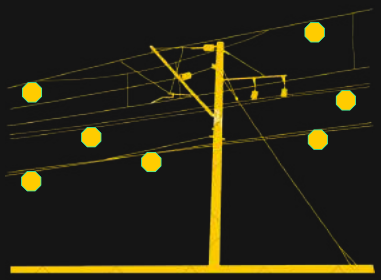
# SOLUTIONS

This crisis can be mitigated as follows:

Avoid/divert any high tension power line from priority Great Indian Bustard habitat. (Figure 2a & 2b).




Undergrounding of <66kv wires of most risky power-lines in priority GIB habitat.



Retrofitting of existing overhead wires with bird diverters (details of diverter makes and costs, and installation design in figure 3).

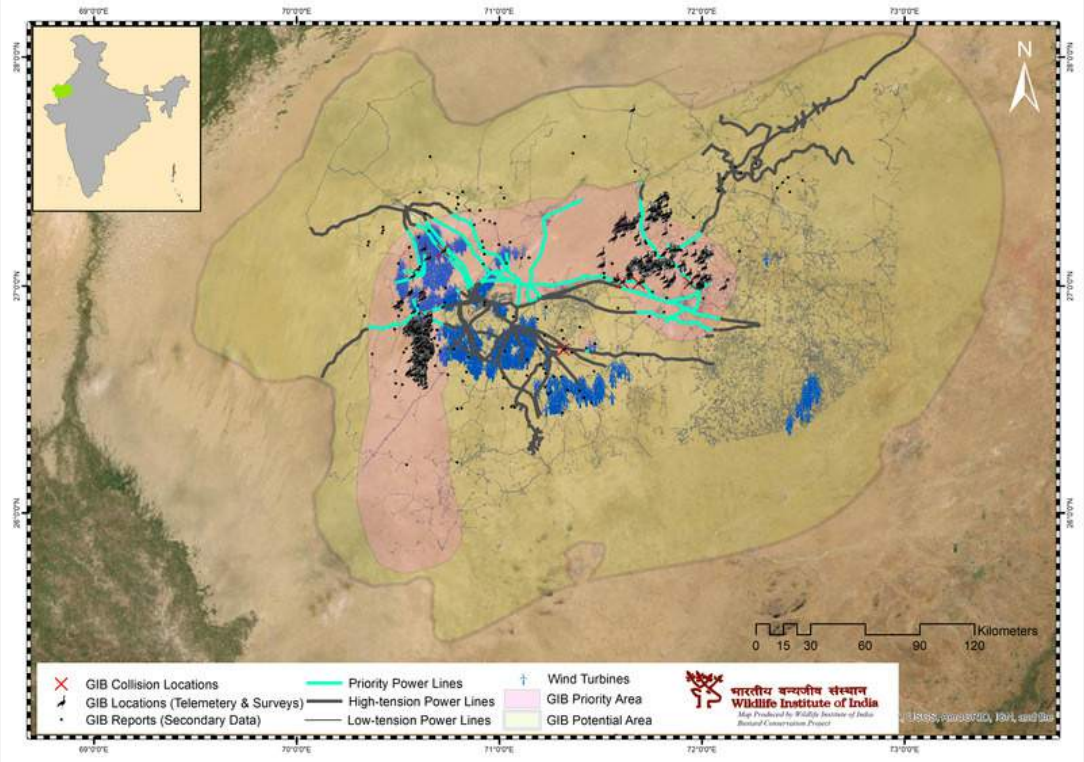



Figure 2a - Map showing Great Indian Bustard distribution, power-lines and wind turbines in Thar,Rajasthan


Figure 2b - Map showing Great Indian Bustard distribution and power-line in Abdasa, Kutch, Gujarat

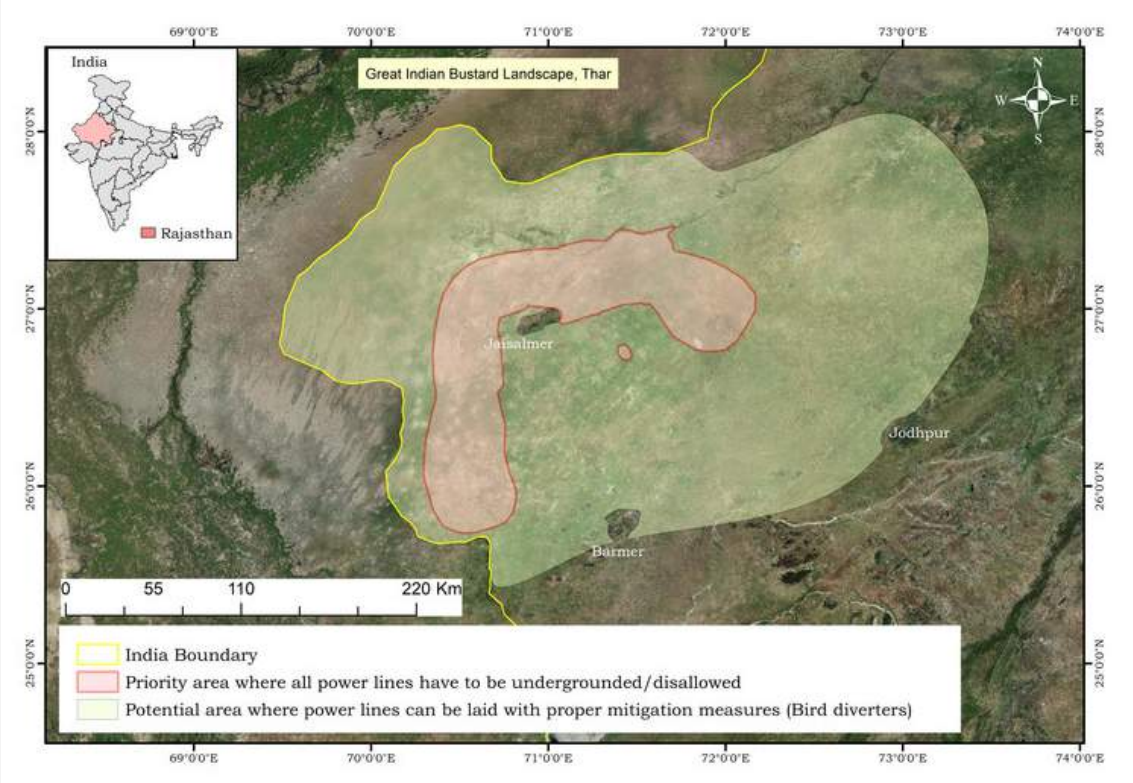



Figure 3a. Great Indian Bustard landscape in Rajasthan delineating the priority and potential areas for power-line mitigation.

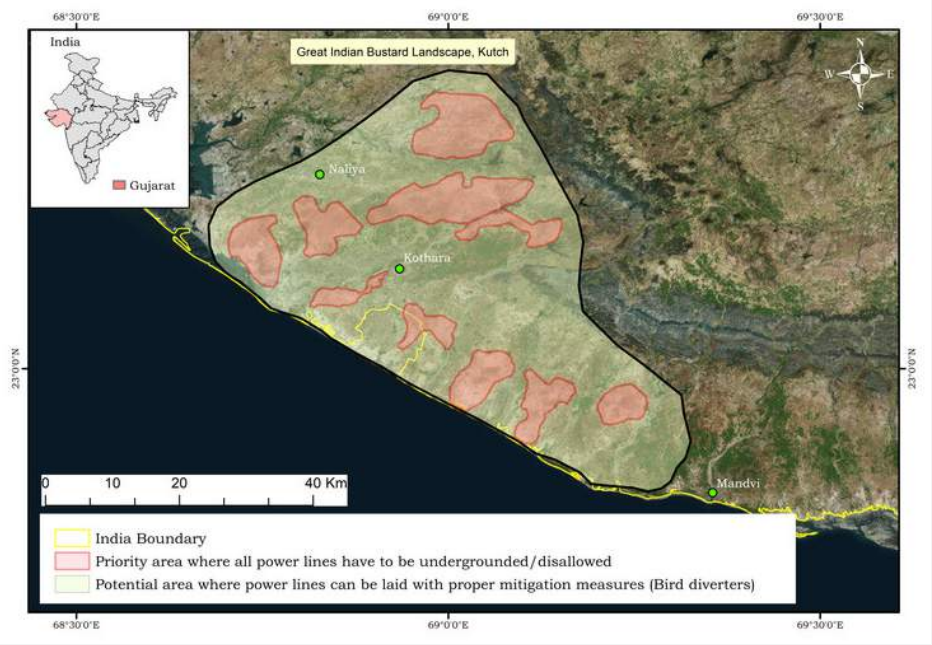
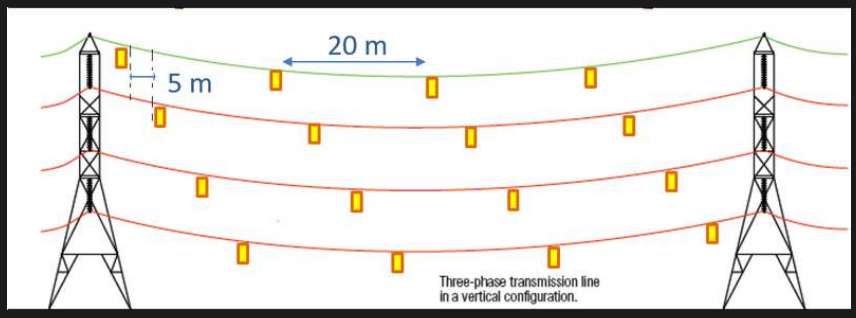
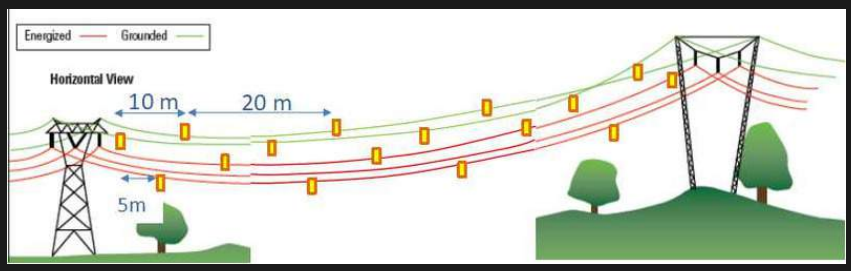



Figure 3b. Great Indian Bustard landscape in Gujarat delineating the priority and potential areas for power line mitigation.

Figure 4 : Details of diverter makes and costs, and installation design




**Cost calculations:**
Central 70% marking
~ 1 diverter/4m line
~4500 INR/unit + shipping charges (import)
~ 1000 INR /unit (local)

## Installation

Marking earth wire with 1 diverter at every 10m, and marking conductors with 1 diverter at 15 m in a staggered way, such that power-line as a whole has at least 1 diverter every 5-6 m.

**UNLESS POWER-LINES MORTALITY IS MITIGATED URGENTLY, EXTINCTION OF GIB IS CERTAIN.**

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## *Acknowledgment*

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## *Photo Credits*

Graphic image of flying GIB through power-lines - Devesh Gadhavi

Dead GIB due to electrocution in Maharashtra - Devesh Gadhavi

Network of power-line and windmill - Tanya Gupta

Tagged GIB in Gujarat - Devesh Gadhavi

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