

# THE INVESTMENT VALUE OF NATURE THE CASE OF ZEPHYR POWER LIMITED



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**Earth Security** guides investment decision-makers to align global capital with the value of the Earth's assets.

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# 1 THE CASE OF ZEPHYR WIND POWER

**Earth Security worked with CDC Group and Zephyr Power Limited to assess the value that mangroves provide to the investment project as a nature-based climate solution.**

We estimate that the investment in the restoration of mangroves by the wind power project in Pakistan could return 20 times the value in the protection of physical assets against coastal erosion, saving the project developer and its investors up to USD 7 million over the project's 25-year timeframe, while doubling the income of local communities.<sup>1</sup>

This report provides the evidence to guide investment decision-makers to embed the value of nature-based solutions in their investments to increase their impact and resilience.

## The Project

**In 2017 Zephyr Power Limited (ZPL) began the construction of a 50 MW wind power project, located near Bhambore, Ghoro approximately 60km from Karachi, Pakistan. The project is built on the Indus River Delta – the 5th largest delta system in the world and the 7th largest mangrove ecosystem.**

The project, which became operational in 2019, has 25 wind turbines. CDC Group invested USD 41 million for the construction of the project making it the largest shareholder in ZPL.

The project site is predominantly barren inter-tidal mudflats and mangrove. It had become degraded due to the cutting of mangroves for firewood, fishing, crabbing and camel grazing by the local communities, who depend on them for their livelihood.

This over-harvesting increases the long-term risk of the project due to coastal erosion, climate change and the rise in sea level.

Early on, CDC Group and ZPL recognised the importance of improving the site's ecological value, and the role that mangroves could play in increasing the project's climate resilience and bringing broader benefits to local communities.

At the start of construction, ZPL, in partnership with the Government of Sindh's Forestry Department, implemented guidelines to protect what remained of the ecosystem, and to plant new mangroves strategically around the site. These successfully seeded to create a site rich in mangroves.

The site's ecological value was incorporated into the design, engineering and construction of the civil infrastructure (i.e. road network, creek crossings, etc.). A proactive mangrove protection and rehabilitation programme, coupled with a community involvement plan, were central to the project's plan to mitigate its social and environmental impact. This has helped the project to evolve from an impact mitigation plan into a proactive build-up of ecological assets.

The collaboration with the local government helped to raise awareness among local communities of the value of mangrove protection. Today, ZPL's CEO Kumayl Khaleeli sees that the site is flourishing: "Our partners see that these are decisions we make every day. The plan has been moulded as the project has grown and as we see the site settle over time."

**"We know that nature-based solutions have a tangible value in helping project assets to become more resilient to climate change. Our partnership with Earth Security is looking at these economic values more systematically and showing other global investors how they can benefit from integrating nature-based approaches in their projects."**

**Nik Stone, ESG manager, CDC Group**

## 2 THE INVESTMENT VALUE OF MANGROVES



### 1 Asset protection

Pakistan is one of the world's five most vulnerable countries to climate change. Rising sea levels increase the risks to ZPL's infrastructure.<sup>2</sup> The site is located in a tidal delta, meaning that water levels rise and fall across the site over the course of a day and vary in height due to the seasonality of high tides. This can wear down the civil infrastructure, such as roads and wind turbine platforms, so that they require frequent maintenance.

Mangroves act as a natural physical barrier protecting the infrastructure by strengthening the soil conditions and acting as a buffer against the water flow. In turn, this reduces damage to the infrastructure, which cuts maintenance costs for the business. The flood protection value provided by mangroves in the Sindh delta region ranges from USD 3,500/ha for areas near Port Qasim, to USD 11,900/ha close to Karachi.<sup>3</sup>

The project's assets are situated in a tidal area that is regularly inundated during high tides and highly exposed to the impacts of climate change, including sea level rise, increased flooding and erosion.

The stone pitching in the internal road network (large inter-locked stones that are set in mortar), which protects civil infrastructure such as roads, wind turbine platforms and submarine cabling, is exposed to erosion and damage during high tide season. In a strong high tide season, the worst-case outcome is the loss of the internal road and wind turbine platforms, requiring frequent maintenance.

Increased mangrove coverage has improved site stability and reduced soil erosion, providing asset protection from regular tidal erosion, as well as from extreme storms and sea-level rise. The mangroves are estimated to save USD 35,000 – USD 40,000 a year in maintenance costs (USD 1 million over the 25-year asset lifetime).

The physical assets that are protected by mangroves would cost USD 6 million to replace (USD 3 million to replace road infrastructure; USD 3 million for complete replacement of submarine cable).



### 2 Local economy

The project is close to more than half a dozen small coastal communities that depend on subsistence artisan fishing, selling their catch to local market intermediaries. The catch has dwindled over recent years due to worsening ecological conditions. As a result of the project's conservation and regeneration efforts, local fishermen have begun to see a substantial increase in fish, shrimp and crab populations, creating direct economic value for local communities. The regeneration programme has generated some limited local employment, but following its success, ZPL plans to cultivate its own mangrove seedlings by setting up a nursery, which would provide additional livelihoods.

Around 60 local community members access site tidal creeks daily to catch fish, crabs, and shrimp. The company's access roads have improved access to fishing grounds. Community outreach activities are increasing community awareness of the value of sustainably using mangroves for fuelwood and fishing.

Figure 1  
**Key Facts: ZPL**

Project company	<b>Zephyr Power (Pvt.) Limited (ZPL)</b>
Capacity	<b>50 MW wind power project</b>
Location	<b>Deh Kalar Sarkari (Bhambore, Gharo), Taluka Mirpur Sakro, District Thatta, Sindh Province, Pakistan</b>
Site	<b>1,028 hectares</b>
Habitat types	<b>Intertidal mud flat (predominant) and degraded mangrove forest</b>
Operations	<b>Commenced on March 28, 2019</b>
Sponsors	<b>CDC Group and 3 local investors</b>
Lenders	<b>CDC Group, FMO and United Bank Limited</b>



### 3 Regulatory requirements

As a result of mangrove restoration and improved management, local fishermen have reported a doubling of the catch for higher value shrimps, from 5kg to 10kg a day. The communities sell this shrimp species to an intermediary for USD 2.5/kg. The increased yield is almost doubling the annual income of 60 fishermen from USD 4,500 to USD 9,000/year (giving the community an additional USD 270,000/year on aggregate).

In addition, ZPL will employ 10 local people full-time (at a salary of USD 105/month) to help manage and secure the replanted areas, in a region where employment opportunities are limited. This will create income for the community of around USD 12,600/year — a total of USD 315,000 over 25 years.

The mangrove protection and restoration programme has enabled ZPL to meet the environmental requirements of international investors, in line with the IFC Performance Standards. It has also established a deeper co-operation between the project developer and CDC Group on the integration of nature-based climate solutions into the latter's investment strategy.

ZPL's CEO recognised early the value that improved ecological health and mangrove restoration could provide to the project. He worked in close collaboration with CDC Group and IUCN Pakistan to develop the project's Habitat Monitoring and Management Report (HMMR) to address the biodiversity impacts of the construction of 25 turbines, one control building and 13 km of access roads.

The HMMR covers 918.7 hectares, which are home to eight local communities. The HMMR ensured that construction minimised any further damage, and where possible improved natural drainage. It also offset the unavoidable impact of the project to 1.2 hectares of mangroves on site by planting 14 hectares of mangroves, and protecting and monitoring a range of wildlife and community impacts.<sup>4</sup>



Mangroves regenerating  
on the Zephyr Power site.  
Haider Mukhi

Figure 2  
**The return on investment of mangrove restoration for ZPL**

<b>Item</b>	<b>Description</b>	<b>Regeneration Investment</b> USD, 25 years	<b>Cost Savings</b> USD, 25 years	<b>Additional Value</b> USD, 25 years
Initial costs for the mangrove programme	Baseline studies and stakeholder engagement	50,000		
Staff costs for the mangrove nursery and monitoring	2 full-time employees (USD 105/month/employee)	63,000		
Projected direct costs for regenerating 14 hectares on site	USD 17,100/ha for 25 years *	239,400		
Asset replacement costs without protection of mangroves	Road (USD 3 million) Submarine cable (USD 3 million) **		6,000,000	
Additional maintenance cost estimated without factoring the protection of mangroves	USD 35,000 – 40,000/year **		1,000,000	
Additional economic value generated for local communities over 25 years	Additional income of USD 270,000/year for 60 fisherfolk from increased yields of export shrimp is USD 6.75 million, plus USD 315,000 in direct employment over 25 years **			7,065,000
<b>Total</b>		<b>352,400</b>	<b>7,000,000</b>	<b>7,065,000</b>
<b>Net value to the project's investment</b>			<b>6,647,600</b>	
<b>Net value to the project's investment plus the local community</b>				<b>13,712,600</b>

\* The estimated restoration costs per hectare are based on Earth Security's analysis of 120 restoration projects worldwide. Average mangrove restoration costs are calculated to be USD 9,500/ha for the first five years, and additional USD

1,900/ha (20%) every five years. The figure covers plot assessment, pre-planting, preparing seedlings, planting, costs and monitoring, sampling methods, replanting dead trees, and monitoring planted mangroves. This reflects the vast majority

of projects reviewed. In practice, restoration costs are context- and project-specific. For example, very high staffing costs can lead projects to have costs of more than USD 100,000 per hectare, although these have been found to be outliers.

\*\* Based on interviews with CDC Group and Zephyr Power Limited combining project materials and the gathering of anecdotal evidence, and projected over the 25-year lifespan of the asset.



### 3 TIMELINE

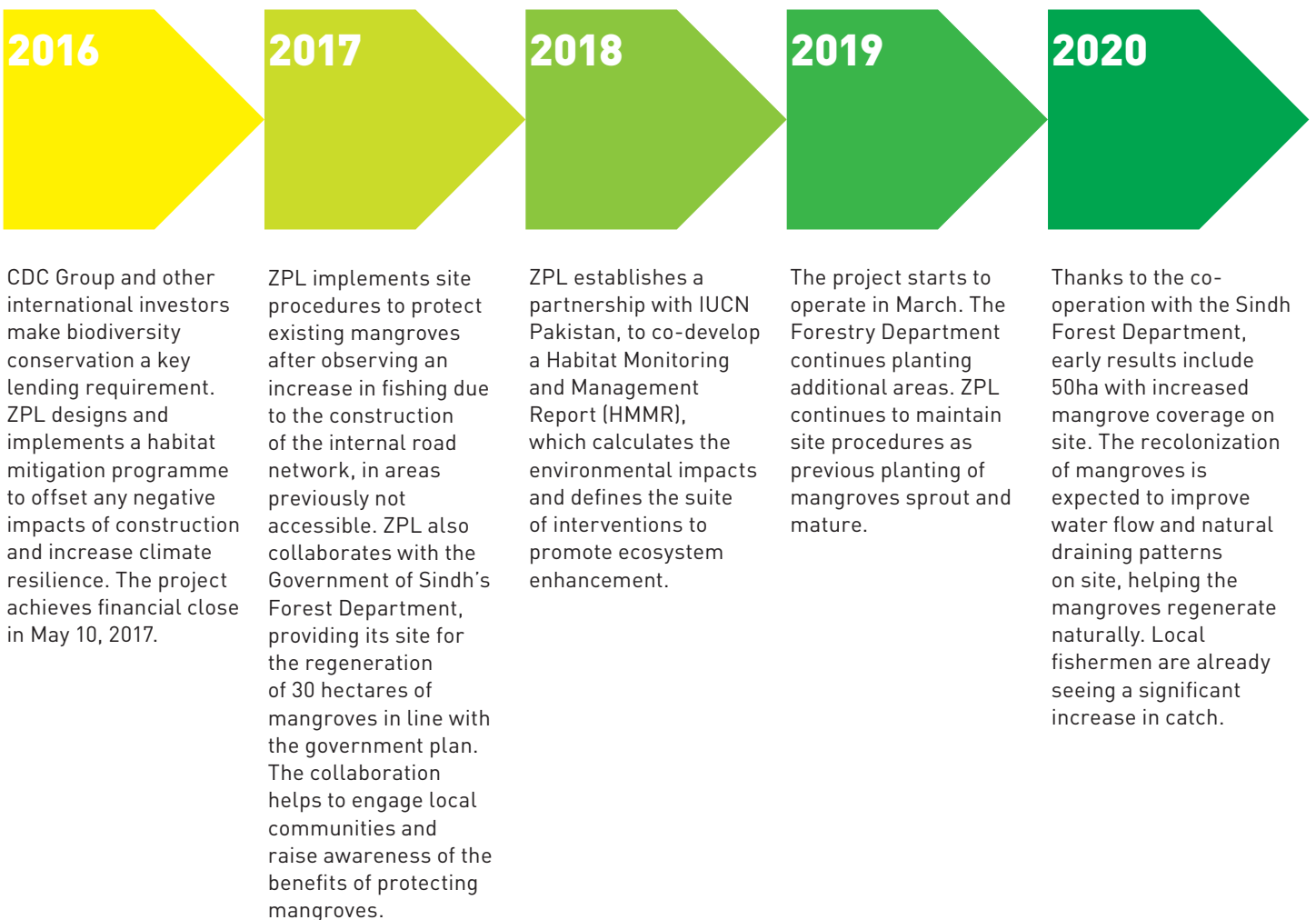
#### From biodiversity offsets to 'natural asset'

**What started for ZPL as biodiversity management has evolved into a strategic investment in a natural asset, which could increase the area of mangrove regeneration by five times the original plan.**

A mangrove nursery is to be established on site to support ZPL's re-planting of 14 hectares of mangroves over the next two years, which would take the total regenerated mangrove coverage to 64 hectares — almost five times the amount originally planned.

ZPL will also review local fishing practices and nets used by fishermen to prevent immature catches that would slow environmental rehabilitation.

Figure 3  
The project timeline



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## Acknowledgements

### Report title

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### Partners

This case study has been developed by Earth Security in collaboration with CDC Group.

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### Cover Photography

Wind turbines on the Zephyr Power site, Sindh Province, Pakistan.  
Hasan Halai

## References

- 1 The estimations are based on review of project materials and interviews with CDC Group and Zephyr Power Ltd. They rely on anecdotal evidence and assume that these values are maintained over 25-year lifespan of the assets.
- 2 'Global Climate Risk Index 2020: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2018 and 1999 to 2018', Eckstein, D., Kunzel, V., Schafer, L., and Winges, M., Germanwatch, 2019.
- 3 'The Global Flood Protection Benefits of Mangroves', Menendez, P., Losada, I.J., Torres-Ortega, S., Narayan, S. and Beck, M.W., Scientific Reports, 2020.
- 4 Documents provided by CDC Group and ZPL: Environmental and Social Impact Assessment (ESIA) Phase II, April 2017; Habitat Mitigation Plan, February 2018; Habitat Monitoring and Management Report, IUCN, March 2020; Community Development Plan, March 2020





