SOCIO-ECONOMIC ASSESSMENT

BALOCHISTAN CARBON OFFSET PROJECT

A Community and Livelihoods Assessment of Six Mangrove Sites in Gwadar and Lasbela Districts

FY 2025-26

BALOCHISTAN PUBLIC-PRIVATE PARTNERSHIP AUTHORITY

GREEN GROWTH CONSULTANTS

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EXECUTIVE SUMMARY

Balochistan is Pakistan's largest province, covering more than 347,000 square kilometers of desert, semi-arid rangeland, and ecologically vital coastal wetlands. Along its Lasbela and Gwadar coastlines, extensive mangrove forests provide shoreline protection, fish nursery habitat, and carbon storage, and these ecosystems are becoming increasingly important both environmentally and for the communities who depend on them. Nevertheless, unsustainable resource use, weak institutional oversight, and the accelerating effects of climate change continue to erode these mangrove systems, even as the province's fragile socio-economic conditions push coastal communities to rely on marine resources more heavily than ever.

In response, the Balochistan Public-Private Partnership Authority (BPPA) launched the Balochistan Carbon Offset Project, an Afforestation, Reforestation, and Revegetation (ARR) initiative centred on mangrove restoration. This report presents the socio-economic and community landscape assessment that underpins the project, complementing a separate High Conservation Value and Biodiversity Assessment. Its purpose is to help the Government of Balochistan design a carbon market intervention that reflects the lived realities of coastal communities and that advances in a genuinely collaborative and inclusive manner.

The assessment covers six coastal sites, namely Sonmiani Hor, Kalmat Khor, Jiwani, Shabi and Ankara Creeks, Shahidi Khor, and Sawar Khor, examining livelihoods, environmental pressures, gender roles, and infrastructure gaps at each location. Across these sites, fishing emerged as the dominant source of employment, while schools, clinics, clean water, and electricity remain scarce or entirely absent in many villages. Literacy, particularly among women, is critically low, though women continue to contribute economically through livestock rearing, fuelwood collection, and traditional crafts such as embroidery and Rilhi making.

Environmental degradation was observed at every site, driven by unsustainable and illegal fishing practices, destructive trawling, and climate-related hazards including coastal erosion, flooding, and drought. Despite these pressures, the assessment found a strong and consistent willingness among local residents to participate in the proposed project and to share in the benefits it could generate. Building on this finding, the report identifies the principal challenges communities face and proposes mitigation measures that can be woven into the project's benefit-sharing mechanism.

To situate the proposed intervention within a proven model, the report also examines the Delta Blue Carbon project in Sindh, drawing lessons on how community upliftment and inclusion have been mainstreamed there. It further compares scenarios with and without the proposed project, evaluates potential risks to communities, and sets out a Free, Prior and Informed Consent (FPIC) procedure aligned with the requirements of international carbon-market standard-setters such as Verra and Gold

Standard. The report closes with a set of practical recommendations to guide implementation.

Taken together, the assessment builds a compelling case for a carbon offset intervention that is community-driven, environmentally sound, and socially inclusive. It underscores the centrality of local participation, gender inclusion, and institutional support to building durable climate resilience and secure livelihoods. With focused investment and genuine multi-stakeholder collaboration, the project can position Balochistan as a model for equitable, sustainable, and ecologically sound carbon offset development.

Figure 1. Balochistan and the six-site mangrove assessment at a glance

1. INTRODUCTION

Balochistan's scale and ecological diversity, spanning arid deserts, semi-arid rangelands, and sensitive coastal wetlands, make it Pakistan's most varied province. Its mangrove forests, concentrated along the coasts of Lasbela and Gwadar districts, rank among its most valuable natural assets, yet they face mounting pressure from climate change, unsustainable resource extraction, and inadequate institutional management, even as the province's fragile socio-economic base drives coastal communities to lean on these ecosystems ever more heavily for their livelihoods.

The mangroves under study are dominated by Avicennia marina, Rhizophora mucronata, and Ceriops tagal. As carbon sinks, mangroves sequester roughly four times more carbon than tropical rainforests (Sanderman, 2018) of equivalent area, while also supporting marine biodiversity and buffering coastlines against erosion. Recognising this value, the proposed Balochistan Carbon Offset Project aims to reforest and regenerate mangrove ecosystems across six sites in Gwadar and Lasbela: Sonmiani Khor, Jiwani Khor, Kalmat Khor, Shabi and Ankara Creeks, Sahidi Khor, and Sawar Khor. Afforestation, Reforestation, and Revegetation activities of this kind offer a dual opportunity, enhancing carbon sequestration while delivering tangible socio-economic co-benefits; nature-based solutions of this type accounted for close to two-thirds of all carbon credits issued globally in 2023 (Climate Focus, 2023).

This report, read alongside its companion High Conservation Value and Biodiversity supplement, sets out to understand the communities living across the six sites, their socio-economic circumstances, their livelihoods, and how they might participate in and benefit from the ARR project. It draws on extensive community consultations, site visits, and secondary desk review, conducted in alignment with the Balochistan Public-Private Partnership Authority and the Balochistan Forest Department.

1.1 Objectives

- Establish a standardized framework for community engagement across all project sites, consistent with the Government of Balochistan's Community-Led Local Governance Policy and with the standards of bodies such as Verra and Gold Standard.
- Assess the local socio-economic landscape at each site, including how communities earn a living, their access to basic services, and their relationship with the surrounding mangrove forests.
- Identify community challenges, priorities, and aspirations, including gender-specific perspectives, so that project planning, implementation, and benefit-sharing are genuinely inclusive.

- Evaluate the case for socio-economic upliftment through a with-and-without-project comparison, and gauge community willingness to participate.
- Propose a benefit-sharing mechanism aligned with community needs as identified through the assessment.
- Review the Delta Blue Carbon project as a reference model for community-centred carbon market development in Pakistan.
- Identify potential risks to communities arising from the project and corresponding mitigation strategies.
- Outline a Free, Prior and Informed Consent procedure that satisfies global requirements for high-quality, community-inclusive carbon credits.
- Align the project with the Core Carbon Principles of the Integrity Council for Voluntary Carbon Markets, Verra's Climate, Community and Biodiversity Standards, and the Gold Standard for Sustainable Development Goals, reinforced by the Government of Balochistan's own Community-Led Local Governance Policy.

2. PROJECT OVERVIEW

The Balochistan Carbon Offset Project spans six mangrove sites along the coasts of Gwadar and Lasbela districts, together covering approximately 147,958.5 hectares. Sonmiani Khor, in Lasbela district, is by far the largest at 82,503 hectares, followed by Kalmat Khor in Gwadar at 55,869 hectares. Jiwani accounts for 8,062 hectares, while Shabi and Ankara Creeks, Sahidi Khor, and Sawar Khor form smaller but ecologically significant patches of 707, 617, and 200.5 hectares respectively. These coastal ecosystems are now being evaluated for their suitability for large-scale ARR interventions under the voluntary carbon market.

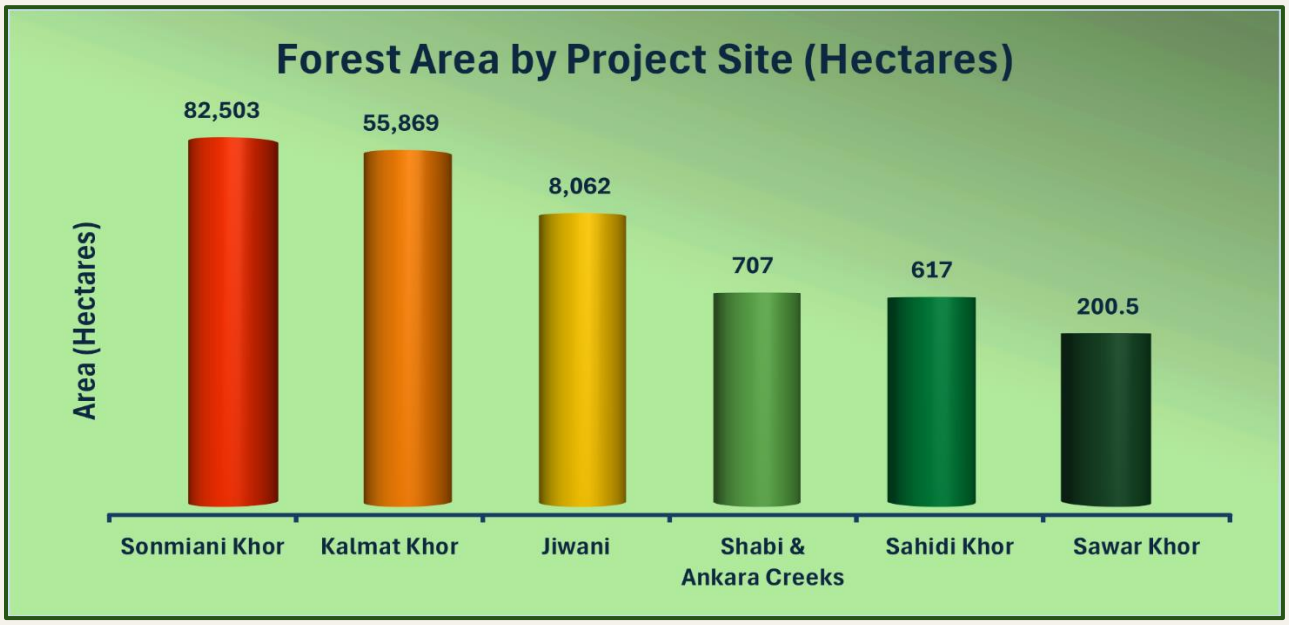
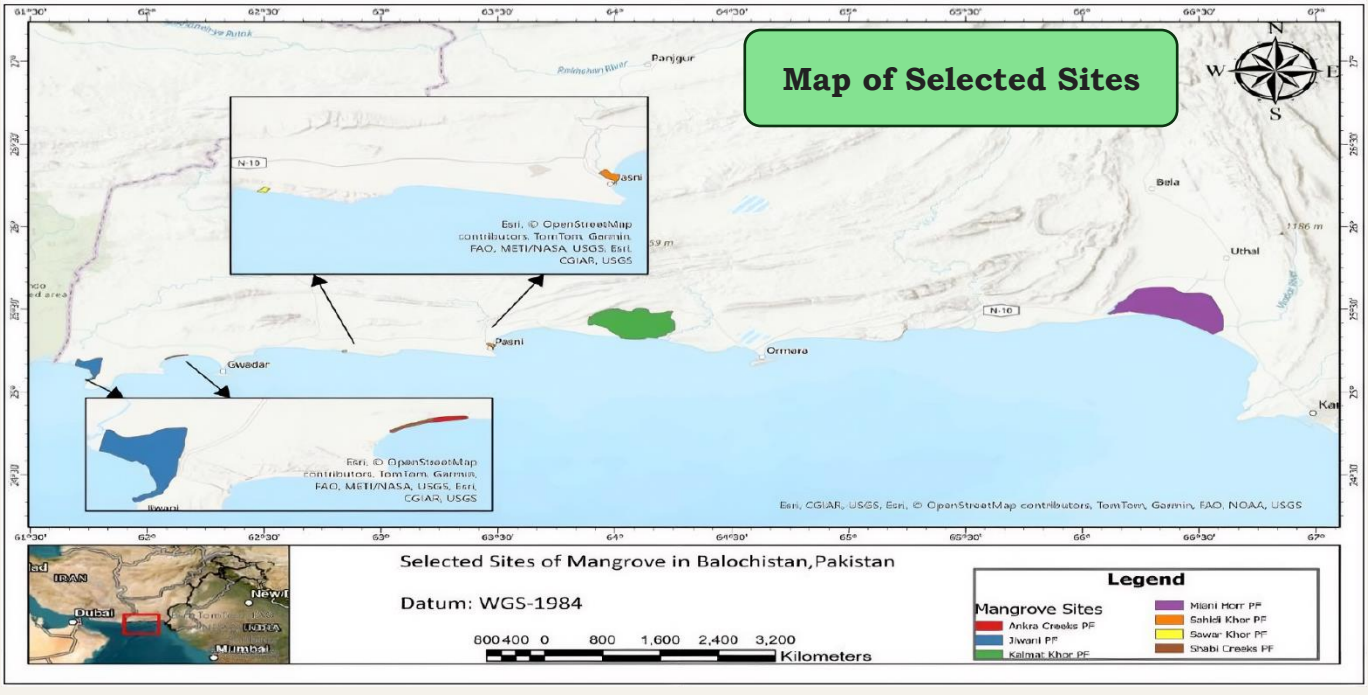


Figure 2. Forest area (hectares) across the six project sites



3. METHODOLOGY

The assessment followed a multi-tiered methodology that combined desk research, site visits and surveys, and structured stakeholder engagement. Work began with an extensive review of government and Balochistan Forest Department publications to understand the socio-economic and environmental context of Gwadar and Lasbela, alongside an analysis of existing livelihoods, land use, biodiversity, and climate vulnerability, and a review of relevant policy including the Community-Led Local Governance Policy. Case studies of successful community-based projects elsewhere were also examined for practical lessons.

A Standard Operating Procedure (SOP) was then developed (see Annex A) to guide site visits and surveys, drawing on global best practice and tailored to Balochistan's socio-economic context (see Annex B), with the specific aim of gauging communities' willingness to engage with the proposed project. Stakeholder engagement with the Balochistan Public-Private Partnership Authority, the Balochistan Forest Department, and the Sindh Forest Department supplemented this fieldwork, offering direct insight into the Delta Blue Carbon project and ensuring a collaborative, locally informed approach throughout.

Because the global carbon market is governed by frameworks that place a premium on social engagement and inclusion, the assessment team paid close attention to conclusions that would help project proponents meet these requirements, including the Free, Prior and Informed Consent procedure that Verra and Gold Standard require as a condition of project registration.

4.SOCIO-ECONOMIC BASELINE & SITE PROFILES

The six coastal and near-coastal mangrove sites under review, Sonmiani Hor, Kalmat Khor, Jiwani, Shabi and Ankara Creeks, Shahidi Khor, and Sawar Khor, sit within Lasbela and Gwadar districts. Lasbela district spans 15,153 square kilometers and, according to the 2023 Population Census, is home to approximately 680,977 people (PBS, 2023) whose economy rests on agriculture, forestry, fishing, and related services; it also contains significant forested areas, including the mangroves of Sonmiani Khor. Gwadar district covers 12,637 square kilometers and has a population of 305,160 (PBS, 2023), with an economy built around fishing, agriculture, and livestock, and it hosts the mangrove sites of Kalmat Khor (9.33 square kilometers), Jiwani (2.33 square kilometers), and the smaller patches at Shabi, Ankara, Shahidi, and Sawar Khor.

The following profiles draw on desk review and field observation to describe each site's ethnic composition, livelihood patterns, environmental characteristics, and other defining features, identifying the challenges and opportunities that should inform sustainable development and conservation strategies across the region.

4.1 Sonmiani Hor

Site Overview

Sonmiani lies in Lasbela district on Balochistan's southern coast, bordered by Khuzdar district to the north, Dadu, Malir and Karachi districts of Sindh to the east, the Arabian Sea to the south, and Gwadar and Awaran districts to the west.

The village is predominantly Baloch, home to the Kalmati Baloch, Rajput, and Soomra tribes, and is organised into eight caste-based localities known locally as Para (Wandani, Tipaee, Rajput, Raeesani, Soomra, Saman, Mahairi, and Channa/Wadda), each with its own leader. Social interaction between Paras is limited by cultural norms and a strict Pardah system, though residents unite readily on collective concerns. Most people in and around Sonmiani speak Sindhi, and although the area was predominantly Hindu before the 1947 partition, the community subsequently migrated and was replaced by settlers from nearby regions who maintain close ties to both coastal and inland ecosystems.

Environmentally, Sonmiani Hor hosts substantial mangrove cover dominated by Avicennia marina, Rhizophora mucronata, and Ceriops tagal, providing shoreline stabilization, fish nursery habitat, and carbon sequestration (WWF, 2005). The site is also home to the Humpback Dolphin and migratory birds such as flamingos and herons, and it was designated a Ramsar Site in 2001 (Ramsar, n.d.). While open grazing and

fishing have historically dominated land use, ongoing mangrove expansion and afforestation are gradually converting degraded mudflats into productive green buffers.

Community Socio-Economic Baseline

Sonmiani comprises around 1,110 households and a total population of roughly 19,500, with household sizes reaching up to seventeen individuals and a relatively balanced gender distribution across livelihood activities.

Healthcare remains limited to a single basic healthcare unit, and services generally depend on government or NGO support. Drinking and irrigation water is sourced from hand pumps and groundwater wells, with forty percent of surveyed households purchasing water by tanker, while electricity is available through thermal sources.

Male literacy stands at 45.58 percent and female literacy at 25.89 percent, an improvement that has emerged largely among younger residents; education facilities exist within a five-kilometer radius and extend to the twelfth grade (PBS, 2023). Sixty percent of respondents reported completing higher education, while twenty percent reported no formal education, mostly among those aged 40 to 50, underscoring a generational shift towards greater educational attainment. The village maintains separate middle schools for boys and girls, with the girls' school, established in 1982, now serving 190 students taught by nine teachers. Housing standards are comparatively strong: about ninety percent of homes are built of cemented block, and all surveyed households live in pucca structures, with sixty percent occupying plots below ten marla and the remainder below five marla.

Fishing sustains ninety percent of households, with average monthly earnings of about PKR 30,000 (roughly USD 107) for men and PKR 10,000 to 15,000 (USD 35 to 53.5) for women, alongside daily wage rates of PKR 1,200 for men and PKR 1,000 for women. Few households have more than five income earners, and only a small number work in government departments such as fisheries, electricity, or education, or engage in trade. Just over twenty percent of Sonmiani's households are classified as poor, sixty percent as middle class, and twenty percent as relatively well-off. Community members are frequently engaged, and paid, for afforestation work such as planting and maintaining mangrove stands, typically earning PKR 1,000 to 3,000 per day depending on site accessibility and available project funding; this work fosters both income and a stronger sense of environmental stewardship. Additional economic potential lies in value-added seafood processing, particularly jellyfish and crab exports to China, where market links already exist, alongside smaller enterprises such as mangrove honey production and seaweed harvesting.

Land in the area remains government-owned, and while communities have resided there for centuries and retain the right to build homes, formal leases have historically not been granted; the recent survey found that some respondents own residential or

agricultural property while others hold none. Traditional gillnets and hand lines remain the principal fishing gear, and forest products such as mangrove wood, honey, mushrooms, and fodder from inland Prosopis trees supplement household resources; residents display strong awareness of local biodiversity, readily identifying species such as the Humpback Dolphin, flamingos, and mangrove-associated fish.

Gender Dynamics

Gender roles in Sonmiani were traditionally restrictive, with men holding social and economic authority while women faced limited access to education, healthcare, and property rights; female literacy once stood at barely three percent, and women often relied on traditional healers owing to inadequate medical facilities. Early marriage and son preference persist, although a growing number of families now value daughters equally, and Purdah, while still common, has relaxed enough to allow women greater mobility for essential needs such as treatment and shopping.

The rise in female literacy to 25.89 percent reflects this shift. Women, traditionally engaged mainly as housewives, increasingly contribute economically through sewing, embroidery, Rilhi making, and fuelwood collection, and every surveyed male respondent reported allowing women's participation in economic life. Twenty percent of women now hold additional roles as health workers supporting polio eradication and vaccination campaigns, and all respondents recognized the importance of women's education and their right to vote.

Capacity, Awareness and Community Institutions

Awareness of modern fishing gear is growing, though many households still rely on hooks, with twenty percent also using encircling nets; forty percent of respondents own livestock and maintain cattle sheds, with few other assets reported. Communities demonstrate clear awareness of mangrove-related ecosystem services and of climate threats such as flooding and erosion, and they are eager for livelihood diversification linked to conservation.

Sonmiani hosts one community-based organization, the Sonmiani Development Organization, active in both social work and natural resource protection, alongside long-standing support from WWF for conservation activities.

Land-Use Change and Community Dependence

Local dependence on the forest includes fuelwood extraction, fodder collection, and traditional grazing within mangrove areas, with Prosopis cineraria serving as a vital inland source of fodder and fuel. Some community members harvest small quantities of timber for boat-building, though this is neither large-scale nor encouraged by the Balochistan Forest and Wildlife Department, and no commercial timber extraction occurs. Camels occasionally browse mangroves close to inhabited land, and residents

harvest mangrove leaves and succulent branches to feed camels and goats; fishing remains a defining activity, with Damb and Sonmiani well known locally for this purpose.

Communities report visible coastal erosion, reduced freshwater availability, and increased flooding during high tides, and view mangrove afforestation as an important buffer against these impacts. Overgrazing, untreated wastewater discharge, and fuelwood clearing remain key drivers of degradation. Encouragingly, mangrove cover expanded by 665 hectares between 2010 and 2020, a rate of 66.5 hectares per year, and updated estimates place carbon sequestration at Sonmiani Hor at 3,457 tonnes of CO2 equivalent annually, with the potential to rise by fifty percent through REDD+ interventions.

Benefit-Sharing and Community Willingness

Site visits found strong willingness among both men and women to participate in project activities, particularly where livelihood or training opportunities are attached. Cash payments, job creation, and skills training were the preferred forms of compensation, and every respondent viewed the proposed activities as beneficial, with none anticipating negative consequences; women, in particular, indicated they would welcome the chance to participate.

The Pictorial View of Sonmiani Site Visit

4.2 Kalmat Khor

Site Overview

Kalmat Khor forms a coastal plain within Tehsil Pasni, some 55 kilometers long and 19 kilometers wide, consisting of mud and salt flats and tidal channels. Its tidal lagoon supports mangroves dominated by Avicennia marina, and the area has held protected status under Balochistan's conservation framework since 2022.

The villages here are home to Baloch families from two clans, the Sanghoor and the Jaurak, both with strong maritime traditions and a heavy reliance on fishing for income and subsistence. Environmentally, Kalmat Khor's estuarine and mangrove habitats are moderately degraded by siltation, pollution, and illegal cutting, yet they continue to support fish breeding, coastal stabilization, and migratory bird populations (WWF, 2005).

Community Socio-Economic Baseline

The single village of Kalmat Khor comprises about 130 households and a population of roughly 1,130, made up of 630 men and 500 women, with average household sizes of about ten, similar to Sonmiani. Every household engages in indigenous fishing, and while Muslims and Hindus once lived there together, no Hindu families remain today.

Basic healthcare is limited to a single government civil dispensary in Gur Sant village, established in 1961, staffed by one resident MBBS doctor and one dispenser who together see between ten and thirty patients daily, drawn from Gur Sant and neighboring settlements; no lady doctor is available. Households rely on hand pumps or distant water sources, and energy access is minimal or dependent on biomass. Fishing infrastructure is essentially absent, with no cold storage, drying platforms, or jetty to protect post-harvest quality and incomes. Electricity remains a persistent problem: although a grid station with two oil-run generators can supply power for twelve hours a day, it has not been activated because residents cannot afford WAPDA's meter installation costs, a burden made heavier by the extreme poverty that already limits access to basic needs such as drinking water.

Nine schools serve the wider Miani Hor area, including both boys' and girls' institutions in all three villages. In Gur Sant, male literacy stands at just five percent, with only three matriculates, while female literacy is nearly zero, although girls have begun attending the government boys' primary school over the past two years. In Chandi village, literacy remains below six percent with no literate females, though a handful of girls have recently enrolled; only four residents have completed matriculation and around fifty have studied to grade five. The primary school there, established in 1983 and taught in Urdu, currently serves 41 students. About ninety percent of homes in Gur Sant are pucca, with the remaining ten percent semi-concrete.

Fishing engages around ninety-five percent of the population in Gur Sant and Chandi, with about one percent involved in fish trading through locally run Chhapras (fish trading units), and others working as drivers or boat repairers. Livestock rearing has declined sharply owing to drought, water scarcity, and the loss of grazing land, leaving only a few camels, goats, and hens, some of which feed directly on mangroves. Women contribute to the fishing economy by cleaning fish, peeling shrimp, mending nets, and producing embroidery as a supplementary income source. In Gur Sant, about twenty households are considered wealthy, ten are poor, and the remainder occupy a middle-income band, with boat ownership and access to alternative income determining status; laborers working on others' boats are the most economically disadvantaged. Around half of households' own motorcycles and many live in pucca housing, though sanitation remains inadequate. In Chandi, roughly eighty percent of households are classified as poor, with only a small minority in the middle-income or wealthy bands.

Natural Resource Use

Kalmat Khor's fisheries include Paplet, Mushk, and Sunheri fish alongside Tiger, Jairo, and Kiddi shrimp varieties, though overfishing by local and external trawlers using destructive gear has sharply reduced stocks, with some species now scarce or locally extinct. Mangrove forests covering about 2,160 hectares, dominated by Avicennia marina, remain degraded yet continue to serve as fish nurseries and sources of fuelwood, fodder, and honey. Persistent drought has diminished grazing land and rendered agriculture nearly impossible, deepening reliance on already stressed marine resources.

Gender Dynamics

Gender dynamics in Gur Sant and Chandi remain traditional and patriarchal, with men dominating decision-making, property ownership, and fishing livelihoods. Women's ownership is generally restricted to hens, goats, ornaments, and embroidery materials, and their mobility depends on male accompaniment, largely for social or spiritual purposes. While men manage income-generating assets such as boats and motorcycles, women contribute through household labour, embroidery, and the collection of fuelwood and fodder, yet they retain minimal say over resource control or financial decisions and bear a disproportionate share of the burden from resource degradation and poverty.

Capacity, Awareness and Community Institutions

Traditional knowledge remains the principal basis for fishing and resource use, with little exposure to modern gear, techniques, or marketing, and awareness of the ecological services mangroves provide, such as coastal protection and fish nursery habitat, remains limited, although recent community engagement has begun to improve understanding. Awareness of climate change persists mainly through lived experience

of shifting weather, declining catches, and prolonged drought rather than formal education. Beyond a primary school in Chandi and a school and dispensary in Gur Sant, no government institution operates in the area, no local community-based organization exists, and national NGOs have yet to undertake substantial work there, though WWF remains active in natural resource conservation.

Land-Use Change and Community Dependence

Communities make some use of mangrove wood for fuel and occasionally cultivate salt-tolerant crops on adjacent land, though residents have not been deeply engaged in afforestation activities to date, notwithstanding an expressed interest where livelihoods and training are involved.

Frequent cyclones, storm surges, and mangrove loss have heightened Kalmat Khor's exposure to climate risk. Mangrove cover fell from 3.78 square kilometers in 1990 to 2.77 square kilometers by 1995, reflecting habitat loss and hydrological change, and communities report growing shoreline retreat and sedimentation in fishing zones. Deforestation, unsustainable fishing, and weak land-use planning remain the principal drivers of degradation, with afforestation, improved fisheries regulation, and protective embankments identified as priority interventions.

Benefit-Sharing and Community Willingness

There is strong willingness among residents to engage in restoration or conservation activities, provided tangible livelihood benefits accompany participation, with training and employment identified as the preferred forms of compensation.

4.3 Jiwani

Site Overview

Jiwani, on Gwadar Bay in Gwadar district, covers a geographical area of 80 square kilometers and lies near the Iranian border as part of the Daran-Jiwani coastal zone, some 515 kilometers from Karachi. More than 85 percent of this zone remains in its natural state, with most residents settled in fishing communities scattered across the landscape.

The population is predominantly Baloch, engaged chiefly in traditional fishing livelihoods. Jiwani's coast, designated a Ramsar Site in 2001 (Ramsar, n.d.), features two ecologically critical habitats: mangrove swamps dominated by Avicennia marina and sandy beaches that support endangered Olive Ridley and green turtles across four known nesting beaches. The Dasht River and seasonal streams sustain the mangrove forests, though reduced freshwater flow following construction of the Mirani Dam has contributed to habitat degradation, compounding the threat posed by coastal erosion and sea-level rise.

Community Socio-Economic Baseline

Jiwani has a population of 26,991, predominantly Baloch, with households organised chiefly around fishing and limited internal migration, though external development pressure is raising concern about future demographic change.

Infrastructure remains underdeveloped: a desalination plant exists but is not operational, there are no major hospitals, so residents must travel to Karachi for serious medical care, fishery workshops are in poor condition, and the local fisher association is inactive. A few fish processing units offer some economic engagement, but broader industrial activity is absent. Educational attainment is low, particularly among fisherfolk, limiting access to alternative or skilled employment, and housing in fishing villages is basic and vulnerable to extreme weather, with no technical institutions available to support skills development.

Fishing is the primary income source, supplemented modestly by fish processing or small trade. Most fishermen use speedboats alongside traditional gear such as gill nets, cast nets, and hand lines, with trips ranging from a few hours to a full day; income is seasonal, volatile, and largely without insurance or safety nets. Land tenure data for the area remains limited.

Natural Resource Use

Fishing and mangrove wood collection represent the community's key uses of natural resources, though overexploitation and weak regulation are degrading the ecosystem; bottom trawling, while officially banned, still occurs illegally on occasion.

This dependence on fragile ecosystems underscores the need for stronger conservation and management measures.

Gender Dynamics

Women play a limited role in the fisheries sector, engaging mainly in post-harvest handling within the household, and their access to education, employment, and decision-making remains constrained by traditional roles and a lack of supporting services.

Capacity and Awareness

Community awareness of conservation is growing, largely as a legacy of past NGO interventions, but institutional support remains weak: the fishermen's association is largely inactive, training facilities are lacking, and the local Fisheries Department has limited resources and trained staff.

Land-Use Change and Community Dependence

Mangroves remain vital to the community, supplying fishing grounds and domestic resources such as wood, though unsustainable extraction and reduced freshwater inflow continue to degrade the ecosystem. Conservation initiatives, including WWF-led mangrove and turtle conservation programmes, have sought to raise awareness and encourage sustainable resource use.

Jiwani faces considerable climate vulnerability, having experienced typhoons, including one in 2007, alongside flash floods and heavy rains that have damaged infrastructure and fishing vessels; it ranks as high priority for flood and earthquake risk and medium priority for drought. Coastal erosion and seawater intrusion threaten local settlements, while development and increasing human encroachment place further pressure on natural habitats.

Benefit-Sharing and Community Willingness

The community expressed strong willingness to engage in conservation and alternative livelihoods, with particular enthusiasm for coastal tourism, and welcomed the prospect of receiving benefits through training and capacity-building.

4.4 Shabi & Ankara Creeks, Sahidi Khor and Sawar Khor

Shabi Creek draws saline water from Gwadar's west bay and freshwater from the Ankara River and its watershed, and it hosts only Avicennia marina among the three mangrove species reported in Pakistan. Together with Sahidi Khor, it has seen substantial mangrove expansion driven largely by natural regeneration and minimal human interference; the newly planted Ankara Creek site, which receives inflow from the Chatti Lake reservoir, provides coastal protection and habitat across sand, mixed vegetation, mudflats, and algae-covered terrain, with cover rising from 35.4 hectares in 2016 to 40.53 hectares in 2024. Both sites have held protected status since 2022.

Shahidi Khor, a newly planted region near Pasni city fed by freshwater from the Shadi Kor catchment, similarly supports Avicennia marina across sand, mudflat, and mixed-vegetation terrain, with mangrove cover expanding markedly from 7.29 hectares in 2016 to 83.38 hectares in 2024; it too has been protected since 2022.

Sawar Khor consists of a narrower mangrove patch, small enough that it is difficult to detect using ten-meter satellite resolution, yet it has likewise held protected status since 2022.

Very limited dedicated research currently exists for Shabi and Ankara Creeks, Shahidi Khor, and Sawar Khor, indicating a need for more targeted socio-economic study. Given their shared protected status and geographic proximity to the other sites, however, it is reasonable to expect broadly similar community dynamics to those documented at Sonmiani, Kalmat Khor, and Jiwani.

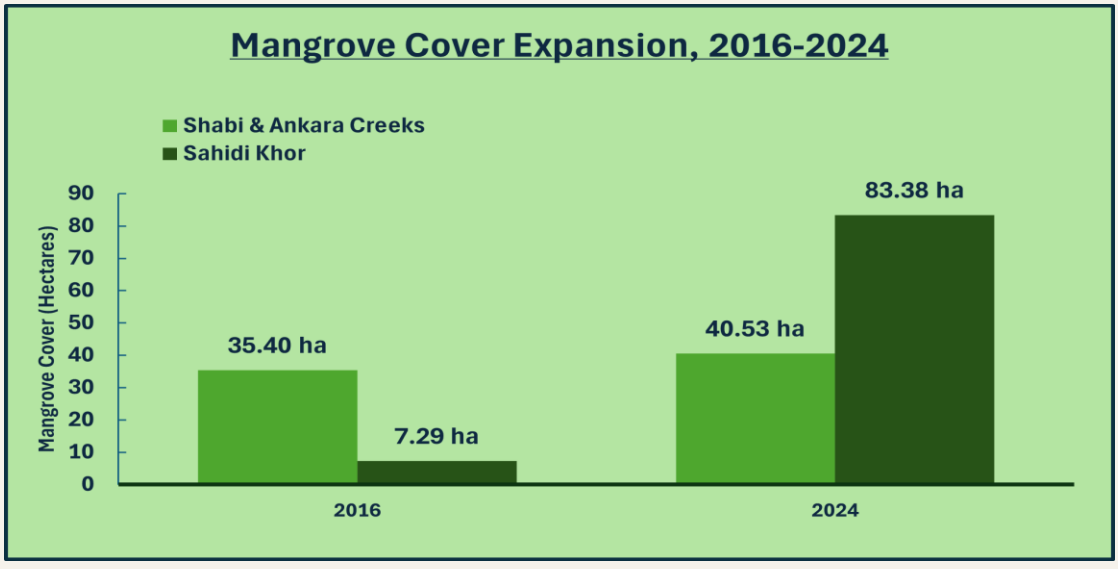


Figure 3. Mangrove cover expansion at Shabi & Ankara Creeks and Sahidi Khor, 2016-2024

4.5 Key Takeaways

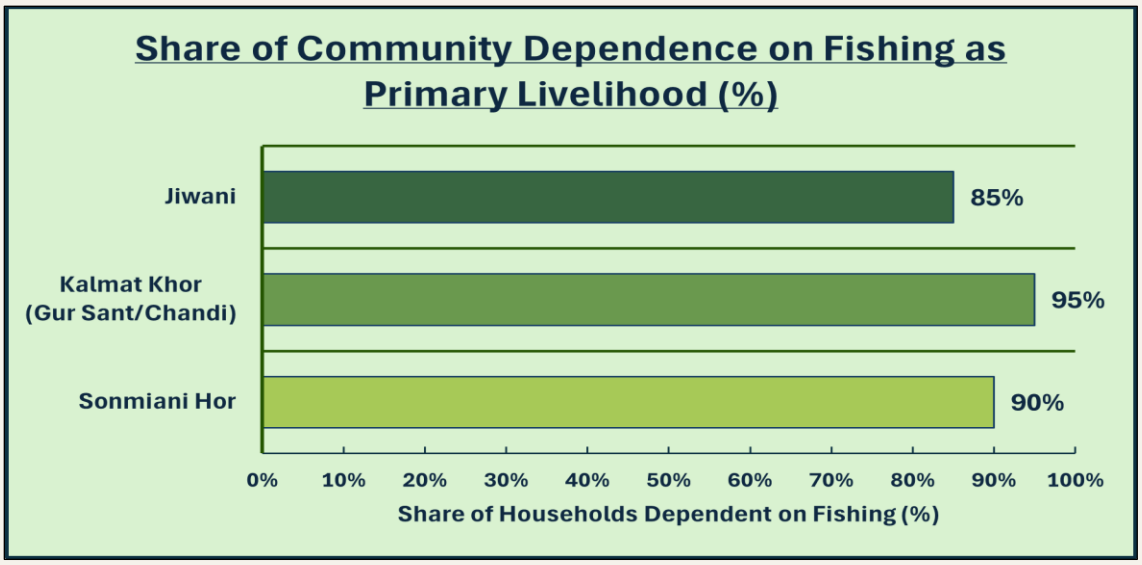


Figure 4. Share of households dependent on fishing as primary livelihood

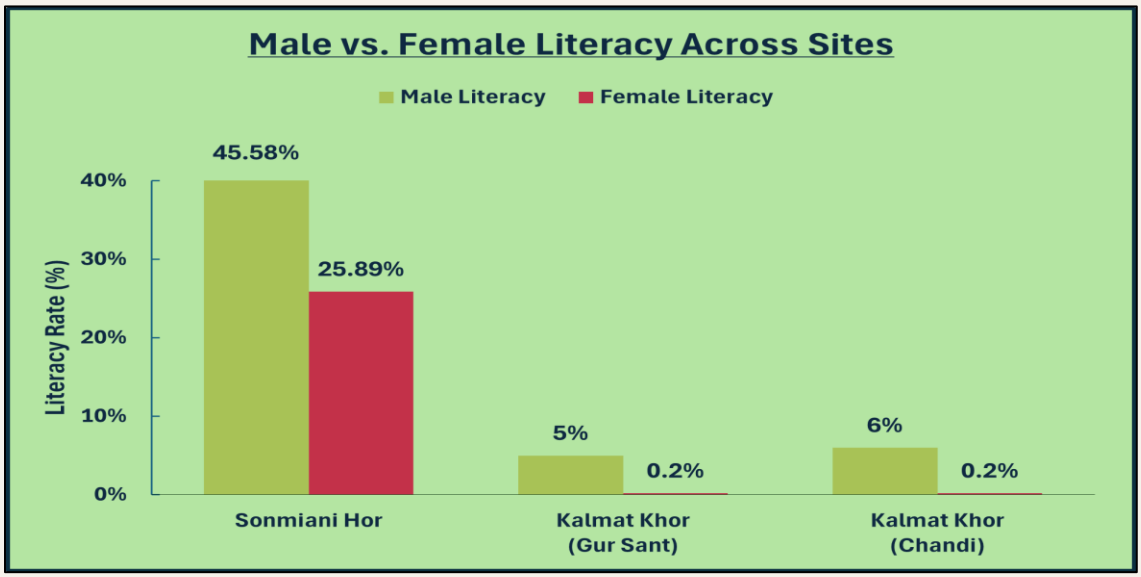


Figure 5. Male versus female literacy rates across sites

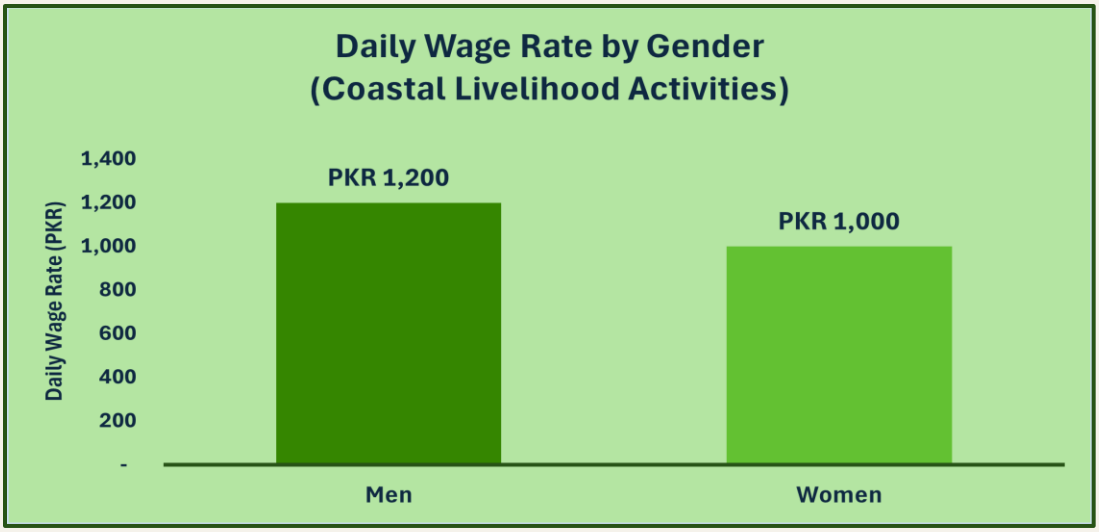


Figure 6. Gender wage disparity in daily livelihood activities

Livelihood and Revenue

Fishing remains the primary source of employment across all six sites, underscoring communities' dependence on coastal and marine resources. Overfishing, resource exploitation, unsustainable practice, and illegal trawling have depleted marine stocks and directly reduced household earnings, a problem most acute in Kalmat Khor and Jiwani, where market access is already limited. Communities also rely on mangroves for fuelwood, honey collection, seaweed farming, and grazing, a dependence that grows as marine resources decline, pointing to the need to diversify income streams through mangrove honey, seaweed cultivation, and value-added fisheries.

Education and Literacy

Literacy varies considerably across sites: Sonmiani shows moderate progress, while Kalmat Khor and Jiwani suffer from extremely low literacy, particularly among women, limiting opportunities for skill development and empowerment. Expanding access to education, especially for girls, alongside vocational training, would strengthen community capacity and support long-term sustainable development.

Gender Dynamics

Patriarchal and male-led decision-making dominate across all communities, and women's agency remains limited, though women are permitted to participate in select revenue-generating activities such as crafting Rilhi textiles, collecting fuelwood, rearing livestock, and working as polio health workers or vaccinators. Female literacy consistently trails male literacy, and the gender wage gap, PKR 1,200 per day for men against PKR 1,000 for women, remains a visible marker of these disparities. Addressing them through inclusive policies that promote female education, leadership, and entrepreneurship is essential to equitable community development and poverty reduction.

Infrastructure and Basic Services

Schools, health units, water, and electricity remain inadequate across the community areas, a shortfall that is especially severe in Kalmat Khor and Jiwani and that directly hampers quality of life and development prospects. Expanding potable water access,

healthcare facilities, and electricity supply is necessary to support healthy, productive communities alongside conservation efforts.

Climate Change and Environmental Degradation

Mangrove degradation, driven by both human activity and natural hazards, is evident at every project site. Resource exploitation, economic dependence on fuelwood and grazing, and unsustainable fishing compound the effects of coastal erosion, rising sea levels, and increasingly frequent natural disasters, which in turn threaten the marine life dependent on healthy mangrove cover. As communities lean further on mangroves to sustain their livelihoods, community-led restoration and climate adaptation strategies become essential to safeguarding both the ecosystem and the people who rely on it.

Community Dependence on Mangroves

Communities depend on mangroves both directly, through fuelwood collection, honey farming, leaf harvesting, and grazing, with Prosopis cineraria providing a vital inland source of fodder and fuel, and indirectly, since fishing, the main source of employment, relies on healthy mangrove ecosystems to sustain high-quality catches. Given that these communities have resided nearby for generations, any plans affecting the area must give full weight to their historical presence and their dependence on the land for their livelihoods.

Community Capacity and Willingness to Participate

Communities across all sites expressed strong willingness to participate in the proposed project, showing clear awareness of the environmental degradation already affecting their localities and support for greater female participation in project activities. Many also welcomed the offer of training and capacity-building to diversify their income and reduce pressure on mangrove ecosystems, building on experience gained through earlier conservation initiatives such as WWF's mangrove and turtle conservation programmes.

Potential Sources of Revenue

Diversifying economic livelihoods while advancing sustainable mangrove management offers considerable promise across all sites. Mangrove honey collection and seaweed farming stand out as viable interventions, alongside the development of craft-based micro-enterprises for women, and there remains meaningful potential for value-added seafood processing, particularly jellyfish and crabs destined for China's established export market.

5. KEY CHALLENGES & AVENUES FOR SOCIO-ECONOMIC UPLIFTMENT

The socio-economic and environmental assessment of Lasbela's Sonmiani Hor and Gwadar's Kalmat Khor, Jiwani, Shabi and Ankara Creeks, Sahidi Khor, and Sawar Khor points to several interlinked challenges that continue to hinder inclusive, sustainable development. These challenges span livelihood insecurity, infrastructure deficits, environmental degradation, gender inequality, and weak governance, drawn from site visits, surveys, and secondary sources. Rather than treating these constraints as obstacles alone, the project can turn them into opportunities by embedding measures for socio-economic resilience directly into its design, shifting the trajectory of the current landscape toward transformational, sustainable change.

Avenues for Socio-Economic Upliftment

Economic Upliftment and Livelihood Security

Reducing economic vulnerability calls for diversified, nature-based livelihoods that complement existing fishing practice. Community-led honey production, eco-tourism, and seaweed farming offer viable alternatives, while small-scale fish processing units and improved market linkages, including for underused products such as jellyfish in Sonmiani, can stabilize incomes. Vocational training in boat repair, handicrafts, and sustainable enterprise would equip local youth and women with employable skills beyond fisheries.

Infrastructure and Service Improvements

Solar-powered water pumps and microgrid systems could bring reliable electricity to remote communities such as Kalmat Khor, while mobile clinics and the deployment of female health professionals would expand healthcare access. Flexible community schooling, adult literacy programmes, and scholarships would raise female enrolment, and upgraded fishing infrastructure, including jetties, cold storage, and drying platforms, would reduce post-harvest losses and strengthen value chains.

Women's Empowerment and Inclusive Development

Gender-sensitive programmes that train women in mangrove restoration, handicraft production, and micro-enterprise development, supported by awareness campaigns and institutional reform, would actively promote women's participation in natural resource management and local governance.

Strengthened Governance and Community Engagement

Restructuring and supporting local fishermen's associations as agents of mangrove protection, alongside a participatory approach to development planning, would ensure communities are meaningfully engaged in decision-making. Solutions for enhancing community involvement and ownership will be designed in line with the Government of Balochistan's Community-Led Local Governance Policy, reinforcing empowered community institutions and transparent decision-making.

Regeneration and Conservation of Forests

Sustainable forest management plans, developed collaboratively, would prioritise environmental resilience and biodiversity. Community-based natural resource management should address unsustainable practices such as mangrove logging, overgrazing, and illegal fishing through affordable fuel alternatives, regulated livestock access, strict enforcement against destructive fishing methods, and incentivized restoration programmes such as paid afforestation, strengthening community stewardship and easing pressure on the ecosystem.

Awareness and Capacity-Building

Guidance and training on alternative revenue streams identified through the assessment, including honey farming, seaweed farming, and traditional crafts for women, alongside broader awareness of sustainable fishing practice, would enhance community capacity across all sites.

Addressing the many challenges facing mangrove ecosystems calls for a holistic, inclusive strategy. Integrating livelihood diversification, ecosystem restoration, gender equality, and participatory governance is essential to fostering climate-resilient, community-driven development across Balochistan's coastal regions; strengthening local ownership and aligning development efforts with ecological sustainability will help safeguard the future of both the environment and the people who depend on it.

6. POTENTIAL PROJECT IMPACTS

Focus Area	Without the Project	With the Project	Positive Impacts	Negative Impacts
Mangrove Ecosystems	Without intervention, mangrove ecosystems will remain under continued pressure from climate change, unsustainable fishing, and resource exploitation.	With the project, mangrove afforestation and conservation will build environmental resilience, reverse land degradation caused by both human and natural factors, and support ecosystem regeneration and improved marine resources, while promoting sustainable livelihoods for communities who depend on the forest.	Environmental resilience to climate change through improved mangrove cover, improved ecosystem services, reversal of land degradation, and new employment for locals.	Reduced community access to forest-based sustenance, such as fuelwood collection from mangrove areas.
Socio-Economic Challenges	At present, communities report economic insecurity linked to declining fishing yields, compounded by the effects of climate change, and continue to rely on livestock, agriculture, and mangrove-based products such as fuelwood, honey, and seaweed.	The project will regenerate mangrove ecosystems to enhance marine resources, provide direct employment through project activities, and deliver training and capacity-building so that communities can diversify their income and reduce reliance on marine resources.	New avenues for employment and alternative livelihoods, more equitable female participation and empowerment, and improved access to health, water, sanitation, and education services.	Potential disparities among communities in the extent of their involvement in the project.

Focus Area	Without the Project	With the Project	Positive Impacts	Negative Impacts
Fiscal Challenges	Despite institutional and government ambition, fiscal constraints continue to limit environmental resilience and socio-economic upliftment through mangrove regeneration.	Through afforestation and regeneration, sequestered carbon will generate carbon credits, creating a revenue stream for the province to sustain further action and direct funds toward similar interventions and community upliftment.	An improved socio-economic landscape, alongside the regeneration, afforestation, and protection of mangrove ecosystems.	The risk of potential misuse of funds.

Overall, the project holds considerable potential to generate benefits that would not otherwise materialize. It is innovative in leveraging the opportunities offered by global carbon markets, unlocking a stream of climate finance and co-benefits critical to sustainable development and environmental regeneration across Balochistan.

7. THE DELTA BLUE CARBON MODEL

The Delta Blue Carbon project, led by the Sindh government, is a sixty-year initiative launched in 2015 and running until 2075, aimed at restoring 350,000 hectares of mangroves and sequestering an estimated 142 million tonnes of CO2 equivalent over its lifetime. Across two phases, the project will restore degraded mangroves over 600,000 hectares of the Indus River Delta, ultimately sequestering more than 250 million tonnes of CO2, and it has already restored 73,000 hectares of degraded mangrove forest and tidal wetland. The project is registered under Verra's Verified Carbon Standard and its Climate, Community and Biodiversity Standards.

Delta Blue Carbon places broad, extensive stakeholder collaboration at its center, building on more than thirty years of engagement between the Sindh Forest Department and local communities. Its approach spans improved social services, capacity building and training, economic upliftment, and better quality of life, underpinned by a robust benefit-sharing mechanism that blends cash and non-cash benefits.

The project's first tranche of carbon credits was issued in late 2022 to strong buyer interest, including from Microsoft, Carbon Growth Partners, and Respira. In 2023, Delta Blue Carbon credits were auctioned at USD 29.72 per tonne (Reuters, 2023); more than sixty percent of successful bid volumes were priced above USD 30, with some bids reaching as high as USD 50, though all credits ultimately sold at the USD 29.72 clearing price. Demand for carbon-removal credits at the auction exceeded available supply by more than fifty percent, a clear signal of the momentum behind nature-based solutions and an encouraging indicator for Balochistan's own ambitions in this space.

Figure 7. Delta Blue Carbon project at a glance

7.1 Benefit-Sharing Mechanism

Delta Blue Carbon operates on government land, yet the socio-economic upliftment of Indus Delta communities remains a central priority, pursued through long-term, sustainable development underpinned by the regeneration of natural capital. Its benefit-sharing mechanism combines direct payments to community members employed in restoration or conservation activities with indirect payments channeled into community development and livelihood improvement.

This approach rests on four mutually reinforcing pillars: participation and inclusive decision-making, equity, effectiveness and efficiency, and accountability and transparency. Direct employment of local community members in project implementation and monitoring generates revenue that, in turn, funds community programmes and interventions, while a share of revenue supports the Government of Sindh and a climate resilience trust fund, and the project's biodiversity and fisheries impact directly strengthen community livelihoods.

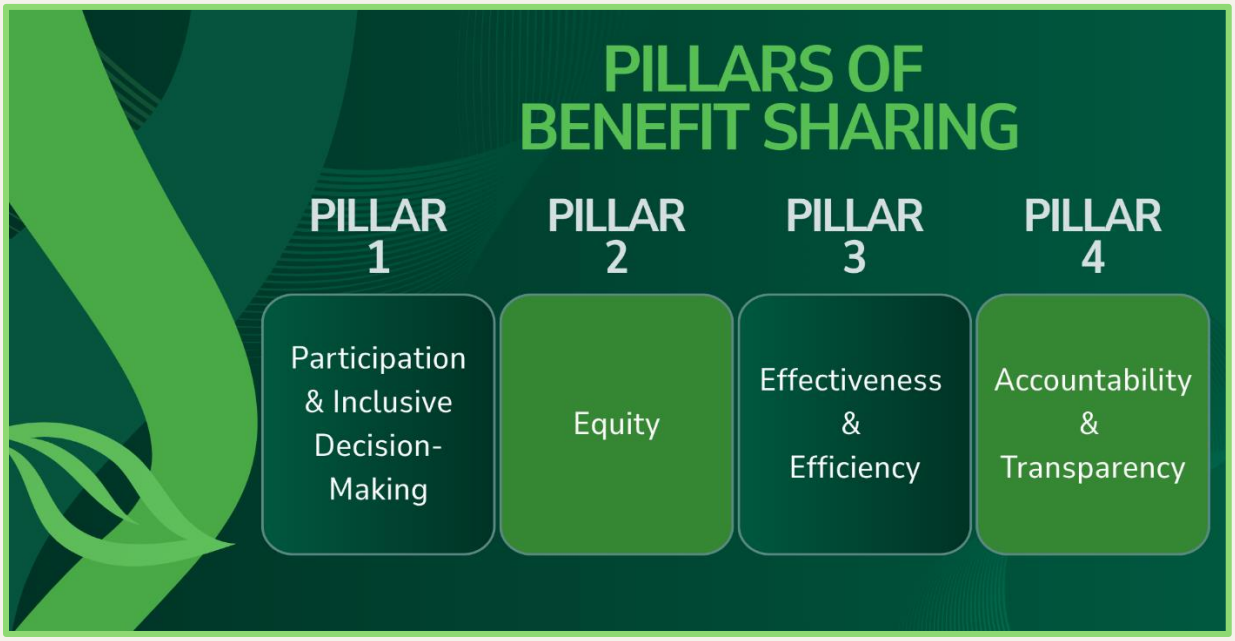


Figure 8. Four pillars underpinning Delta Blue Carbon's benefit-sharing model

7.2 Community Engagement Strategies

Participatory Rural Appraisals and Community Consultations

Village development committees and women's organizations have been established to determine the fair distribution of project benefits. These socially inclusive, village-level bodies give voice to marginal and vulnerable groups traditionally excluded from decision-making, allowing all stakeholders to advocate for benefits aligned with community priorities; stakeholder identification for the project was conducted through participatory rural appraisals.

Partnership with Local Communities

Restoration is implemented in partnership with local communities using ecological practices that draw on the natural regeneration processes of mangrove ecosystems. Mangrove Stewardship Agreements, Biodiversity Stewardship Agreements, and Fish and Sustainable Fishing Stewardship Agreements empower communities as custodians of mangroves and biodiversity, formalized through a ward-and-watch system that also provides additional income and strengthens community ownership of restored and existing forest resources. Fishing Stewardship communities, meanwhile, ensure that fishermen are compensated fairly, gain market access, and adopt sustainable fishing practices.

Capacity Building and Skills

The project prioritizes capacity-building in small business development, alternative livelihoods, and sustainable production and harvesting across fisheries, forestry, agriculture, and livestock, together with value-chain promotion. It has trained 24,000 community members in natural resource management, including crab farming and fisheries processing, and is now expanding in collaboration with Pollination to assess social and biodiversity impacts across the delta, an initiative that has surfaced persistent challenges such as inadequate transport infrastructure, electricity, and education. New fishing nets with wider casts and ice boxes have also been distributed to encourage younger fishermen to carry forward the tradition sustainably.

Gender Inclusion

Training sessions with a strong focus on gender inclusion have equipped 6,000 women with skills in natural resource management, and job creation under the project has likewise been inclusive of women, who held fifty percent participation in land-use planning and awareness programmes and gained improved access to healthcare. A further initiative, Empowering Coastal Zone Women in Sindh Province, developed with Karachi University's Women's Studies Department, engaged around 200 households through mixed-method research aimed at strengthening women's role in socio-economic activity and reducing their reliance on low-income, climate-vulnerable sources of revenue.

7.3 Community Development and Improvement Outcomes

Safety from Natural Disasters and Biodiversity Conservation

The project supports improved coastal and marine biodiversity conservation through the establishment and adaptive management of Marine Protected Areas, employing nature-based solutions such as green infrastructure to build a mangrove ecosystem better adapted to salinity, rising temperatures, and extreme weather. According to Earthly ratings, the project has protected 24,099 people from storm surges and coastal hazards, including an emergency relief operation that evacuated 15,700 people ahead of a cyclone threat in Keti Bandar, Shah Bandar, and Kharochan, with the Government of Sindh providing water, food, and mosquito nets. The 2022 floods, despite improving soil fertility and freshwater influx for mangrove growth, caused considerable hardship, prompting the project to provide healthcare, flood-disease response, and building materials, along with livestock vaccination and alternative fodder support.

Water, Sanitation and Hygiene

Indus Delta Capital has focused on improving water and sanitation across 60 villages serving 49,000 people, including locations such as Ahmed Dablo, Haji Pandhi Jatt Goth, Haji Wario Jatt, Keti Bander, Muhammad Khan Jatt Goth, and Peerabad. Five reverse osmosis plants now treat brackish water at a combined capacity serving 50,000 people daily, with the project also managing their ongoing operation and planning further expansion.

Job Opportunities

Conservation of mangroves and their biodiversity sustains the livelihoods of farmers across the 60 villages served by the project, which has created 21,000 local jobs through its resource management, conservation, and carbon sequestration activities.

Basic Healthcare

All seven Basic Health Units in the region now have improved access through ambulances and mobile healthcare facilities, addressing communicable and non-communicable disease alongside malnutrition. Community Health Workers serve villages including Muhammad Moosa Jatt, Keti Bandar, and Ahmed Khan Memon, and a renovated healthcare center in Keti Bandar, donated by Indus Delta Capital, now includes an ambulance, hospital linen, medical equipment, and a solar power system; free medical camps addressing common skin conditions have also been held in Shah Bandar.

Energy

The project promotes access to affordable, sustainable energy, encouraging the planting of alternative tree species for fuelwood outside the project area to meet local energy needs while also promoting solar power and broader energy conservation.

Education

Programmes to raise primary and secondary enrolment and improve learning environments are expected to significantly benefit villages such as Arab Jatt, Karam Ali Jatt, and Gul Hassan Samoon, where literacy has ranged from zero to four percent and access to schools has been limited to zero or two schools; separately, 31 villages within

the project zone report literacy below 0.1 percent, with only ten villages reaching as high as 0.6 percent.

7.4 Project Payment Mechanism

Delta Blue Carbon operates a comprehensive mechanism for disseminating cash benefits to communities. Previously, a forest officer received payment by cheque and distributed it onward, an arrangement that raised accountability concerns, notably in cases such as the Hyderabad-Sukkur highway issue in Sindh where cash was handed over using national identity cards. The method has since been revised: payments are now issued by cheque to a pre-qualified, taxpaying Labour Headman recognized as an expert in the process, who then distributes funds to workers.

Payments are made through bank accounts or EasyPaisa mobile transfers as third-party disbursements. Cash payments remain permissible only for amounts below PKR 25,000 (USD 88); amounts above this threshold must be paid into a bank account. This evolution illustrates how the project has drawn on its own experience to adopt best practice for equitable, transparent, and accountable payment to local communities.

7.5 Key Takeaways

- Community engagement is critical to the sustainability and success of nature-based projects. By building on the efforts of local people, who possess deep expertise and long-standing relationships with the land, and treating them as agents of change rather than passive beneficiaries, Delta Blue Carbon has fostered genuinely sustainable collaboration across every segment of society, including women.
- Delta Blue Carbon demonstrates that a project's success depends not only on improved mangrove management but also on tangible outcomes for local people in education, health, and other services, an approach that additionally strengthens the quality and market performance of the credits it generates.
- Interventions that foster ownership and interaction between the project and local communities, such as the Mangrove Stewardship Programme, enable residents to become custodians of the species and land that sustain their livelihoods, giving them a genuine stake in the intervention's success.
- During the feasibility stage, engaging with local communities to identify potential sources of additional revenue is essential; Delta Blue Carbon, for instance, trained women in detergent and candle making, among other initiatives, broadening the diversification and sustainability of local income.

- Training and education are indispensable to any benefit-sharing mechanism, as community visits confirmed that local people are willing not only to work for the project but also to learn and improve their own socio-economic conditions, equipping them to protect the environment while developing alternative revenue sources.
- All cash and payment transfers to communities should occur through an electronic payment system to ensure efficiency, transparency, and accountability, a practice increasingly prioritized by projects in developing countries that rely on bank accounts and digital payment rails.
- The benefit-sharing mechanism should direct the maximum possible share of revenue toward the needs of local communities; across the six project sites, improved water, sanitation, education, and health facilities emerged as the most pressing needs, and Delta Blue Carbon's installation of a reverse osmosis plant illustrates how such reinvestment can transform daily life.
- Alternative forms of revenue, such as honey and mushroom collection, textile products made by female artisans, and traditional medicinal products derived from forests, should be actively developed, with constant communication between project proponents and communities helping to identify and close any gaps that could allow benefits to leak away from intended recipients.

8. PROPOSED BENEFIT-SHARING MECHANISM

The proposed mangrove regeneration and afforestation intervention, developed as a carbon market project, offers considerable scope for improving local livelihoods. To structure this fairly, the following benefit-sharing mechanism is proposed, grounded in findings from the socio-economic assessment across all six target sites and designed to ensure communities actively participate in, and benefit from, the project.

The mechanism rests on two primary streams. Direct benefits comprise local employment opportunities in nursery management, plantation activities, monitoring, and ecosystem protection, with inclusion and community mobilization as key priorities that build local capacity and foster a lasting sense of ownership. Indirect benefits consist of a defined share of carbon credit revenue, channeled through project proponents and reinvested into community-driven development priorities such as clean water, renewable energy, health services, education, and livelihood diversification, determined through participatory planning consistent with the Community-Led Local Governance Policy and international best practice for carbon market projects.

This structure reinforces accountability and supports a just transition toward climate-resilient, community-centred development across Balochistan's fragile coastal ecosystems.

9. POTENTIAL PROJECT RISKS

Community engagement and inclusion are central to the sustainability and success of any carbon market project, yet potential risks must be identified and addressed to ensure successful delivery. Because no dedicated risk-rating criteria currently exist under Verra beyond its internal Results-Based Risk Assessment, this section applies a general framework: a high rating signals that immediate action is needed and that impact would be severe; a medium rating calls for frequent observation and measures to address moderate, noticeable disruption; and a low rating requires only annual observation, reflecting minor impact of limited consequence.

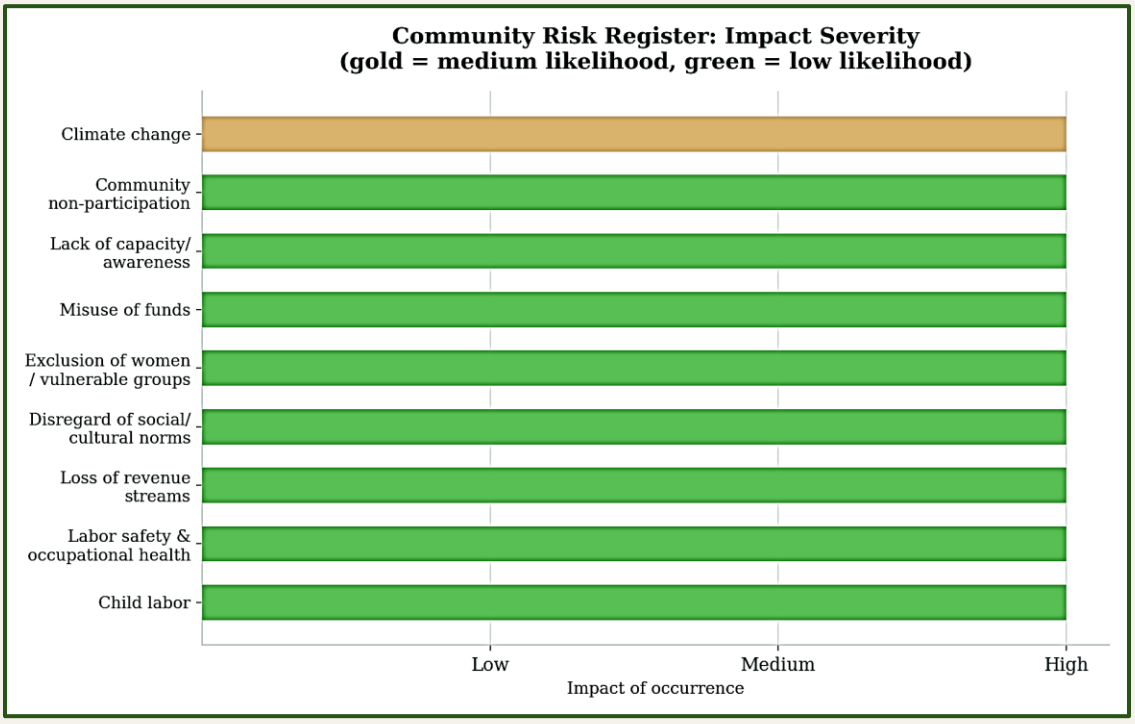


Figure 9. Community risk register — impact severity by risk type

Type	Risk	Likelihood	Impact	Mitigation Measure
Environmental	Climate change Climate-induced disasters such as flooding or drought may delay project activities.	**Medium**	**High**	Develop an Emergency Response Plan; consult with communities and conduct regular evacuation drills.
Technical	Lack of community participation, or refusal to participate Communities may be reluctant to engage, or may decline to participate if they judge the project would not benefit them.	**Low**	**High**	Engage the Balochistan Forest Department given its established community relationships; follow and periodically revisit the FPIC process; involve communities in setting and achieving project goals; establish a Grievance Redressal Mechanism.
Technical	Lack of capacity or awareness among locals Limited awareness of project activities could hinder effective participation, though prior involvement in mangrove restoration suggests existing capacity.	**Low**	**High**	Provide training and capacity-building; maintain constant communication with communities; establish a Grievance Redressal Mechanism.
Technical	Misuse of funds could be mismanaged at the administrative level, undermining transparency in cash transfers to communities.	**Low**	**High**	Implement an electronic payment system and ledger for all community cash benefits; establish a Grievance Redressal Mechanism.
Social	Exclusion of women and	**Low**	**High**	Develop a Gender and Social Inclusion Plan

Type	Risk	Likelihood	Impact	Mitigation Measure
	vulnerable groups Regressive norms and limited education may exclude women from participation, though existing engagement in fuelwood collection, livestock, agriculture, and craft work offers a foundation to build on.			with specific monitoring indicators; establish a grievance mechanism; provide training and awareness for community participation, including nursery work for women; conduct community sensitization.
Social	Disregard for social or cultural norms A project design that overlooks local social and cultural context risks community refusal to participate.	**Low**	**High**	Secure Free, Prior and Informed Consent through genuine community engagement; tailor the project to local social and traditional context; establish a Grievance Redressal Mechanism.
Social	Loss of revenue streams Restricting fuelwood collection and other mangrove uses to allow regeneration could remove an existing source of household income.	**Low**	**High**	Provide green jobs such as forest guardian and laborer roles; develop alternative livelihoods; provide training and capacity-building; establish a Grievance Redressal Mechanism.
Social	Threats to labour safety and occupational health Ongoing project activities may expose workers to safety	**Low**	**High**	Develop a Community Health and Safety Plan; establish a Grievance Redressal Mechanism.

Type	Risk	Likelihood	Impact	Mitigation Measure
	risks, including those linked to climate-induced disasters.			
Social	Child labour Community consultations observed children collecting firewood, indicating a risk that children could become involved in project operations.	**Low**	**High**	Enforce a complete ban on child labour; establish a Grievance Redressal Mechanism.

Lessons from the Global Carbon Market

Globally, carbon market projects have encountered serious risks where community engagement and consent were treated as secondary considerations. In the Democratic Republic of Congo, a company (Mongabay, 2024) with little apparent experience in carbon markets or REDD+ began soliciting local communities for the rights to market their forest carbon in late 2021, with representatives spending as little as 35 minutes discussing the project with residents before gathering signatures. In Indonesia, a project spanning half a million (Human Rights Watch, 2024) hectares of land long inhabited by the indigenous Chong people operated for two years without community consultation or a benefit-sharing agreement, ultimately leading to the project being halted.

Inadequate transparency in monitoring, reporting and verification, carbon accounting, credit sales, and benefit-sharing can similarly leave local communities overlooked. A review of 47 project design documents found that only fifteen mentioned benefit-sharing arrangements at all, and of those, only four showed evidences of benefits actually reaching local communities or Indigenous Peoples. Weak benefit-sharing has led to project delays, cancellations, and community opposition, particularly where Indigenous rights are strong, and credits from such projects often trade at discounts of fifteen to thirty percent as buyers increasingly demand verified social co-benefits; poor benefit-sharing also carries reputational risk, as verifiers and rating agencies now scrutinize social impacts closely.

The absence of conflict resolution mechanisms compounds these risks, since disputes can arise if communities are excluded from decision-making, just as developers

and funders may in turn perceive mismanagement of funds or unmet targets on the community side. Anticipating such conflicts and establishing a fair resolution process from the outset is therefore essential. These risks bear directly on both project delivery and the integrity of the resulting carbon credits, reinforcing why community consideration, inclusion, and engagement remain central to a viable carbon market project.

10. FREE, PRIOR AND INFORMED CONSENT

Free, Prior and Informed Consent offers a structured, collaborative tool for community engagement that respects community rights and priorities, and it is used widely in projects worldwide, including carbon markets. Adopted by the United Nations General Assembly in 2007 as part of the Declaration on the Rights of Indigenous Peoples, the principal centres on securing consent from Indigenous Peoples for any activity undertaken on their land, and it mandates that governments cannot implement a policy or project affecting Indigenous Peoples' land without prior consultation and consent. FPIC is grounded in the international human rights principle that all peoples have the right to self-determination and to freely pursue their economic, social, and cultural development, making it a vital mechanism for recognizing the historical presence of Balochistan's coastal communities and their dependence on the land for their livelihoods.

10.1 FPIC in the Global Carbon Market Landscape

FPIC is a core requirement of leading standard-setting bodies. Gold Standard's Safeguarding Principles (Gold Standard, 2023) and Requirements state that projects affecting Indigenous Peoples and local farmers must be designed in partnership with them, with their full and effective participation, aiming to secure their free, prior and informed consent wherever their rights, lands, resources, territories, or traditional livelihoods may be affected. Verra's Nature Framework (Verra, 2024) similarly recognizes the essential role Indigenous Peoples and local communities play in stewarding global biodiversity, requiring projects to secure FPIC, establish mutually agreed benefit-sharing mechanisms, and ensure genuine stakeholder participation throughout design and implementation. The Integrity Council for Voluntary Carbon Markets (ICVCM, 2021), meanwhile, sets out FPIC as a core requirement under its Core Carbon Principles and Assessment Framework.

FPIC is also increasingly tied to market performance: buyers are willing to pay more for credits from lower-risk projects, and between 2021 and 2024, credits from projects contributing to the Sustainable Development Goals commanded prices averaging 31 percent higher (BeZero Carbon, 2024) than those without such claims. With current supply of high-integrity credits falling roughly 40 percent short (Sylvera, 2025) of buyer demand, a robust FPIC process represents a meaningful opportunity to secure both community inclusion and a stronger market position for Balochistan's mangrove credits.

10.2 Implementing FPIC

The first three elements of FPIC, free, prior, and informed, define the conditions under which consent is sought: consent must be obtained before any project or action

begins, must be independently decided, and must rest on accurate, timely information delivered in a culturally appropriate way. FPIC must be secured at project inception and then maintained throughout the project's duration. In Pakistan, WWF operationalizes these principles through its Complaint Resolution Mechanism, keeping community voices central to natural resource management, and Delta Blue Carbon has likewise maintained FPIC throughout its own project life. Applied here, FPIC recognizes the rights of local communities and stakeholders to inform and help implement the project, particularly in decision-making and benefit-sharing.

Implementation follows a structured, three-phase process. During project development and inception, the team scopes and identifies local communities and their needs, documents key community information, and drafts a procedure for securing and maintaining FPIC before engaging stakeholders to secure it. During project implementation, the project disseminates information, adheres to the FPIC agreement, conducts monitoring and evaluation, and maintains FPIC at intervals throughout delivery. At project closure, lessons learned and information about the FPIC procedure are documented and disclosed.

Within this structure, six concrete steps guide the process. First, a qualified social safeguards consultant, agreed by project proponents, leads scoping and identification, defining the project's scope and each community's role. Second, the FPIC process is planned in detail, including timelines, communication strategies, and consent procedures, with provision for a community representative to consent on behalf of a group where individual consent would be impractical. Third, baseline research assesses the social, cultural, and economic context, including customary land rights, governance structures, and traditional knowledge. Fourth, communities are informed, consulted, and given the opportunity to negotiate through accessible, culturally appropriate sessions covering safeguards, benefit-sharing, and grievance redress. Consent is then formally sought and documented through community assemblies, voting, or signed declarations, according to local custom.

Experience elsewhere illustrates both the risks and the rewards of this process. Projects in Indonesia and Vietnam show that poor communication, misinformation, and a lack of cultural sensitivity can undermine FPIC and erode trust even where initial consent was obtained, whereas successful examples such as Delta Blue Carbon in Pakistan, the Mangrove Action Project's work in Mozambique, and Yagasu's coastal greenbelt initiative in Indonesia demonstrate that meaningful engagement, clear communication, and tangible benefits, from livelihood opportunities to healthcare, education, and empowerment, build trust and secure lasting community participation. FPIC, in short, must go beyond formal procedure to become a dynamic, inclusive process rooted in transparency and shared value.

11. RECOMMENDATIONS

1. Inclusive and Adaptive Engagement Models

Ensure inclusion and engagement for all project stakeholders, particularly local communities, to build a project design that reflects the capacities and ambitions of every partner, with deliberate outreach to women, youth, and children to foster environmental regeneration and shared progress.

2. Enhancing Co-Benefits and Socio-Economic Upliftment

Promote environmental solutions such as mangrove restoration and sustainable aquaculture that generate multiple benefits, including carbon sequestration, while developing livelihood diversification opportunities such as mangrove honey and seaweed farming identified through the assessment, integrated value chains linking fisheries, eco-tourism, and artisanal products, and coordinated investment across health, education, and environment.

3. Gender Inclusion and Social Equity

Tailor project design to expand female participation through gender-responsive programming that supports women's education, health, economic empowerment, and leadership, with culturally sensitive engagement processes that create safe spaces for marginalized groups and scope to upscale women's existing craft enterprises.

4. Equitable Benefit-Sharing

Develop an inclusive, equitable benefit-sharing mechanism that prioritizes the needs and challenges of local communities as key project beneficiaries.

5. Risk Mitigation and Resilience Building

Identify potential risks to local communities and pursue viable mitigation strategies to ensure a sustainable, inclusive process.

6. Capacity-Building and Knowledge Empowerment

Prioritise tailored training aligned with local livelihoods and governance, alongside sustained awareness campaigns on environment, climate, health, and social rights, to promote diverse livelihood opportunities and reduce reliance on marine resources.

7. Community-Led Governance

Adhere to the Government of Balochistan's Community-Led Local Governance Policy to foster robust community participation, and maintain alignment with standard-setting frameworks such as the Climate, Community and Biodiversity Standards to preserve global credibility and support participation in the voluntary carbon market.

8. Mainstream Local Knowledge into Planning

Involve traditional knowledge holders in planning and monitoring so that restoration activities align with seasonal, cultural, and ecological realities.

9. FPIC Processes

Design and lead an inclusive FPIC process that engages local communities and contributes to a high-quality project, offering a global example of community engagement and collaboration for sustainable mangrove management.

12. CONCLUSION

This assessment provides a socio-economic evaluation of the six identified project sites, examining the community landscape, socio-economic realities, and communities' dependence on the surrounding forests. It has also considered the key challenges facing local communities and the strategies that could integrate socio-economic upliftment into the design of the proposed carbon market project for mangrove afforestation and regeneration, including livelihood diversification, gender empowerment, infrastructure investment, and community-led ecosystem restoration.

Fishing stands out as the primary source of employment for communities across the sites, while educational and health infrastructure remain inadequate and access to water and electricity is often unreliable. Education levels are critically low, especially among women, and gender inequality persists, even as women maintain a foothold in the economic sphere through livestock rearing, fuelwood collection, and traditional crafts.

Environmental degradation, driven by both human and natural factors, is evident across every site: unsustainable and rampant fishing, illegal trawling, and climate-related hazards such as coastal erosion, floods, and droughts all take their toll on the mangrove ecosystem. Yet the assessment also found a strong and consistent willingness among local residents to participate in the project and to share in its benefits, a foundation on which the report builds to identify mitigation options for integration into the project's benefit-sharing mechanism. The review of the Delta Blue Carbon project further deepens this understanding, illustrating how community upliftment and integration can be mainstreamed successfully within a comparable carbon market intervention.

By comparing with-and-without-project scenarios, assessing potential community risks, and outlining a Free, Prior and Informed Consent procedure aligned with the requirements of Verra and Gold Standard, this report positions the proposed intervention to meet global best practice while remaining firmly rooted in Balochistan's local context. The recommendations that follow chart a practical way forward.

In sum, the assessment builds a strong case for a carbon offset intervention that is community-driven, environmentally sound, and socially inclusive, underscoring the importance of local participation, gender inclusion, and institutional support in building lasting climate resilience and livelihood security. With targeted investment and genuine multi-stakeholder collaboration, the project can help position Balochistan as a model for carbon offset development rooted in equity, sustainability, and ecological integrity, linking ARR-based carbon offset activity to the region's socio-economic and ecological needs and channeling the revenue generated through carbon credits into meaningful, lasting change.

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ANNEX-A: STANDARD OPERATING PROCEDURE FOR SOCIO-ECONOMIC DATA COLLECTION

Across the identified sites (Sonmiani Khor (Miani Horr), Kalmat Khor (Kalmat Horr), Shabi and Ankara Creeks, Sawar Khor, Sahidi Khor, Jiwani (Gwater Bay)), mangroves are a critical natural fortress providing a multitude of services ranging from the provision of livelihood opportunities, necessities such as fisheries, and disaster risk resilience, among others. For coastal communities, mangrove species play an important role in providing fuel, house construction, firewood, timber and fodder for livestock. The socio-economic issues of coastal regions of Balochistan include water scarcity, inadequate healthcare facilities and infrastructure, while issues specific to the coastal region include coastal erosion, siltation and illegal trawling.

Among coastal communities, poverty is widespread and literacy levels are low, while health issues are rampant. The coastal communities' predominant source of livelihood is from fishing and fishing associated businesses such as boat building/repair and net manufacturing, grazers, and agriculturalists. Women also participate in tasks like cleaning fish, peeling shrimp, and repairing fishing nets. Community members in the identified sites primarily depend on fishing for their livelihoods, which is increasingly under threat due to over-fishing and unsustainable methods, mangrove deforestation and climate change. Through this socio-economic assessment we aim to collect further data on the socio-economic landscape in the project sites. Our key goal is to understand community willingness to participate in the forestry project, potential benefits and livelihood opportunities that may be developed through this project, and how it can benefit them.

1. References for Annex A

- Hanif, S., & Shah, M. H. (2020). Coastal communities of Balochistan vis-a-vis CPEC.
- MFF Pakistan. (2014). Pakistan National Strategy and Action Plan.
- Nassir, M. B., et al. (2019). Efficacy of Melia Azedarach for Gastrointestinal Nematodes Control in Sheep.
- Saifullah, S. M., Rasool, F., & Kamal, A. (2003). Mangrove conservation along the coast of Sonmiani.
- WWF. (2005). Study on Knowledge, Attitudes and Practices of Fisherfolk Communities.
- WWF-Pakistan. (2005). KAP survey in Kalmat Khor, Balochistan.

2. Objective

To collect socio-economic data from the identified sites and resident communities in Balochistan to assess the feasibility for the Balochistan Carbon Offset project.

3. Scope

This SOP covers the procedures for conducting socio-economic surveys, including household interviews, focus group discussions, and key informant interviews of the target communities residing in project areas.

4. Equipment and Tools

- Survey questionnaires
- GPS device
- Notebooks and pens
- Camera (optional)
- Mobile device with data entry software (optional)

5. Procedures

5.1 Survey Design

1. Sampling Strategy:
    - Cluster sampling will be conducted as villages and areas are geographically dispersed, hence, geographic areas will be clustered to reduce complexity
    - Stratified random sampling will be conducted to select respondents for interviews as the population will be diverse, geographical location and gender will be utilized as a subgroup
    - Out of this subgroup, participants will be selected at random and engaged in Focus Group Discussions (FGDs)
    - FGDs will include a group of 7-8 people
    - Given the local traditions and cultural norms, we will keep the option open for meeting community representatives where appropriate. In such cases, a representative sample will be collected that ensures that those consulted (representatives or selected individuals) reflect key characteristics of the larger population (e.g., land ownership, or forest usage patterns)

2. Questionnaire Development:
    - Develop a structured questionnaire covering key socio-economic indicators
    - The questionnaire will gauge information on socio-economic indicators such as age, gender, household size, assets, employment, education
    - The questionnaire will also assess other aspects such as land use, income sources, forest dependency, and willingness to participate in the potential project

5.2 Data Collection

1. Household Interviews:
    - Conduct face-to-face interviews with selected households
    - Record responses in the survey questionnaire
2. Focus Group Discussions (FGDs):

- Organize FGDs with community leaders, women, and youth groups
- Discuss community perceptions of forest resources and forestry projects

3. Key Informant Interviews (KIIs):
   - Interview key stakeholders such as forest department officials, local NGOs, and community elders
   - Gather insights on historical land use changes and potential forestry sites

5.3 Data Recording

1. Field Notes:
   - Take detailed notes during interviews and discussions
   - Record GPS coordinates of each household or community visited
2. Photographs:
   - Take photographs of community activities, land use, and forest areas (with consent)

5.4 Data Analysis

1. Data Entry:
   - Enter survey data into a digital database (e.g., Excel or SPSS)
   - Perform data cleaning to remove inconsistencies
2. Data Analysis:
   - Analyze data to identify trends in forest dependency, income sources, and community willingness to participate in forestry projects
   - Use statistical tools to generate descriptive statistics and cross-tabulations

5.5 Reporting

1. Report Preparation:
   - Prepare a detailed report summarizing the socio-economic findings
   - Include recommendations for forestry project feasibility based on community feedback

5.6 Ethical Considerations

1. Informed Consent:
   - Verbal consent will be acquired from participants prior to engagement
   - Participants will be informed of the nature and goal of the engagement
2. Cultural Sensitivity:
   - It will be ensured that the engagement remains respectful of local customs

5.7 Quality Assurance

1. Quality Assurance Review:
   - For quality assurance, the questionnaire developed for socio-economic community assessment will be shared with all stakeholders prior to activation

- Once the final report is prepared, it will be shared with stakeholders such as the Balochistan Forest and Wildlife Department to gather any feedback on data quality

ANNEX-B — SOCIO ECONOMIC BASELINE SURVEY

Note: In the original source document, this annex consists entirely of scanned/image-based survey form pages with no extractable text. It's the physical questionnaire layout, not typed content. I can't reproduce it here as text. You'll need to pull those pages directly from your original file (or source PDF) and insert them as images into your design file.

ANNEX-C — DRAFT FPIC PROCEDURE

Purpose

This document outlines the Free, Prior, and Informed Consent (FPIC) agreement procedure and plan for the Balochistan Carbon Offset Project. The project proponents recognize the rights of local communities and stakeholders in implementing and informing the project, especially in decision-making, and aim to ensure a collaborative and process to undertake the project.

Scope

The procedure covers activities relating to the design, implementation and operation of the Project across the identified project sites in Balochistan, Pakistan: Sonmiani Khor, Jiwani Khor, Sawar Khor, Sahidi Khor, Shabi & Ankara Creeks, and Kalmat Khor. The FPIC procedure will be used for community inclusion and engagement during the project design and operation phases.

i. Project Development Phase

- Project proponents will engage and develop an agreement to develop and secure FPIC, outlining their role in developing and securing FPIC, and mandating responsibility for coordination and alignment with project proponents to facilitate access to the site and communities, and other relevant matters.
- Project proponents will then hire and appoint an officer/consultant as per the agreement to coordinate, finalize and oversee the acquisition and maintenance of FPIC throughout the project.
- The official/consultant should be familiar with the identified locations and proficient in the local language of the region.
- The FPIC will remain cognizant of the fact that dependent communities are native to the region and have resided across forest sites historically, acknowledging their

dependance on the forest for their livelihoods and engaging their consent and participation.

- The appointed consultant will develop an FPIC workplan and guidelines along with a stakeholder engagement plan detailing the frequency and types of engagement, and a monitoring plan to oversee maintenance of FPIC.
- A portal and/or website will be developed to ensure access to data.
- A data collection and publication plan will be developed, ensuring translation of data in English, Urdu and Balochi languages.
- Set up a line of communication with local communities to ensure coordination and timely delivery of project related information and events.
- A FPIC document will be drafted in English, Balochi and Urdu languages to be shared with the community.
- Community consent will be recorded and published for public access.
- FPIC official, in accordance with project proponents, will develop guidelines and agenda for FPIC meetings with community members.
- FPIC Meetings will be set up with the community to acquire FPIC through forms which will require signatures of community members to record consent.
- A grievance redressal mechanism will be developed ensuring community concerns and grievances are noted and addressed.
- Community members will be informed of this process and familiarized to it.

ii. Project Implementation Phase

- The FPIC official will develop agendas for every event and/or meeting and share them with community members at least 05 days prior.
- The FPIC official will ensure public availability of project documents with translations in English, Urdu and Balochi languages.
- The FPIC official will maintain an attendance log to track participation of community members.
- The FPIC official will maintain and monitor the grievance redressal mechanism, keeping a log of concerns and grievances that may arise.

Monitoring and Evaluation

- The FPIC official will develop a Monitoring and Evaluation (M&E) plan to track FPIC and oversee maintenance.
- The M&E Plan and guidelines will be published for public access.
- The grievance redress mechanism will be operationalized by project proponents, ensuring community concerns are addressed.
- Monitoring of the grievance redress mechanism will be ensured by project proponents and third-party bodies to ensure community concerns are addressed, maintaining inclusion.