**Introduction**

One of the spectacular effects of recent atmospheric warming in the Himalayan region has been the creation of meltwater lakes on the lower sections of many glaciers. Climate change is likely to exacerbate further some of these natural hazards, such as glacial lake outburst floods (GLOFs), which can cause significant social and economic damage to large populations living in the Himalayan region. Gilgit Baltistan, a province in the north of Pakistan heart of the Himalayas, is highly susceptible to disasters due to geologically active technotic plates.

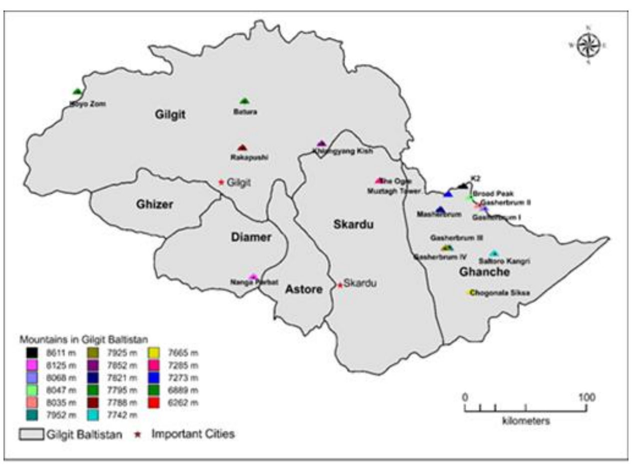
In response to climate change impacts, the Government of Gilgit Baltistan (GB) initiated a Rural Development and Climate Resilience Project (RDCRP) in Gilgit Baltistan. RDCRP aims to engage the local population in a more endogenous sustainable development path through increased participation in the development of sustainably managed services. It envisions access to water and sanitation infrastructure, energy-efficient seismic-resistant housing, electricity supply through micro-Hydel projects, sustainability through gender/climate mainstreaming, and microfinance for businesses in far-fledged areas.

To ensure compliance with environmental and social standards of project financer Agence Française de Développement (AFD), an Environmental and Social Management Framework (ESMF) was prepared in line with the national/provincial environmental laws, World Bank (WB), and AFD ecological and social safeguard requirements.

**Methodology**

At the time of project initiation, the project sites were not identified; therefore, a framework approach was adopted to foresee the adverse environmental and social impacts on the project area. To ensure development work is carried out according to the regulatory requirements, a baseline with details of sensitive receptors was prepared. Site selection criteria were outlined based on ecological and socially sensitive zones. The consultation was conducted with the major stakeholders and communities to address their concerns early. Disaster management authority was engaged for vulnerable areas with high risks of climate disasters. ESMF aimed to enable the inclusion of environmental and social considerations in the project at an early stage and accelerate sustainable development. ESMF follows the national/provincial environmental laws, World Bank (WB), and Agence Française de Développement (AFD) environmental and social safeguard requirements.

**Project Area:** The project area covers Gilgit-Baltistan spread over 72,971 square km. The province is sparsely populated, with 18 people per square kilometer and 1.8 million (2017). Approximately 79% of the population has access to a safely managed[1] and essential[2] water supply. However, less than 50% of households do not have perennial access. Wastewater collection and treatment system hardly exists in less than 2% of the population, with only five villages of piped sewerage and treatment facilities. The area encounters extreme cold in winter and vulnerability to multiple natural disasters. The existing stock of houses lacks thermal comfort, proper ventilation, adequate illumination, and seismic elements in housing structures[1]. There is limited electricity generation at the local level and the high cost of transmission lines; far-flung rural communities face a shortage or almost no electricity supply.

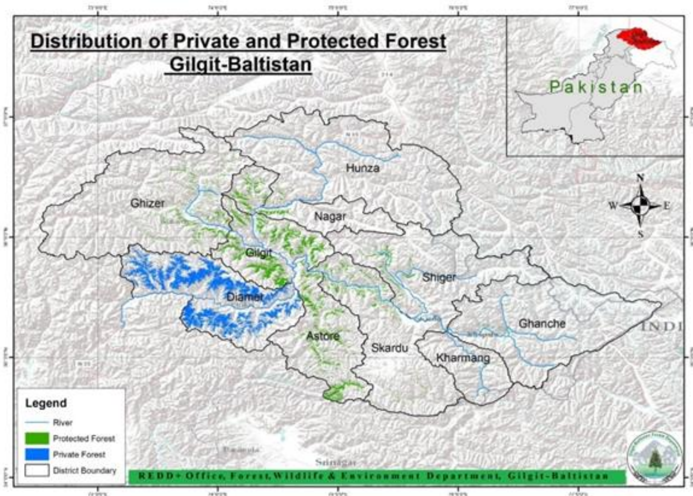



**Project:** RDCRP aims to construct 117 Drinking Water Supply Schemes (DWSS), 30 Sewerage Network and Treatment Schemes (SNTS), and 12 DWWS with SNTS. In addition, rehabilitation of 29 DWSS and 28 DWSS with SNTS is also proposed to enable the accessibility of water and sanitation in rural and urban areas. To improve the thermal efficiency, the project estimates the installation of elemental energy-efficient products in 7000 households and seismic retrofitting in 3000 homes and energy-efficient products. It will facilitate the construction of 700 seismically resistant, thermally efficient houses. To enhance access to reliable electricity, eight Micro-Hydel projects are proposed with a total generation capacity of 1200 to 1300 kW. In addition, a loan cum grant mechanism has been projected in the form of cash or in-kind contribution from the beneficiary household for the provision of services. These will be financed through existing microfinance institutions operating in the area. Each project component has planned climate and gender mainstreaming to ensure inclusive sustainability.

1 Safely managed: Drinking water from an improved water source which is located on premises, available when needed and free from faecal and priority chemical contamination

2 Basic: Drinking water from an improved source, provided collection time is not more than 30 minutes for a roundtrip including queuing

**Environmental Sensitivities:** Three major mountain ranges, including Baltistan, Brooshal, and Diamer, vary considerably in biodiversity and highly complex topography. Out of 14 peaks above 8,000 m altitude globally, five exist in GB. A vast glacial spread over 15000 square kilometers has 5000 big and small glaciers, including three of the world's longest glaciers outside the polar region (Biafo, Baltoro, and Batura) water sources for the part. Thirty-five destructive outburst floods have been recorded for the Karakoram Range in the past 200 years. Systematic application of remote sensing and geographic information systems (GIS) has revealed the formation of about 2420 glacial lakes in the Hindukush-Karakoram-Himalaya (HKH) Region of Pakistan, among which 52 lakes are characterized as potentially dangerous GLOF hazards. The Indus River emerges from the Himalayas and supplies water to all provinces that subside in the sea among numerous water streams and wetlands. Nearly 3000 big and small glacial lakes with at least 36 unsafe ones on the verge of an outburst exist. Although water bodies exhibit prevalent contamination due to anthropogenic activity, they are a major water source. The region encounters harsh weather with extremely cold/ snowy winters and mild summers influenced by high mountain systems. Air pollution is predominant in winters due to smoke from the stoves, heating of houses using firewood/waste, rock crushing in the area, and open burning of solid waste. The dispersion of pollutants in the air is quite extraordinary.




**Ecological Sensitivities:** The region is rich in biological diversity and home to several globally significant species of mammals, including some endangered species like the snow leopard, Himalayan brown bear, Marco Polo Sheep, Ladakh urial, and flare horned markhor, musk deer, and woolly flying squirrel. Several plant species of great economic and conservation value are found in the area, including wild cumin, thyme, pine nuts, and several other species of medicinal value. There are five National Parks, two wildlife sanctuaries, six-game reserves, and 48 Community Controlled Hunting Areas to preserve sensitive ecological resources of the region. Designated protected forests covering an area of 445,712 hectares are found in Astore, Skardu, Ghizer, and Gilgit Districts. GB is approximately 90 % mountainous, 4 % forested, and 4.2% cultivable land[3].

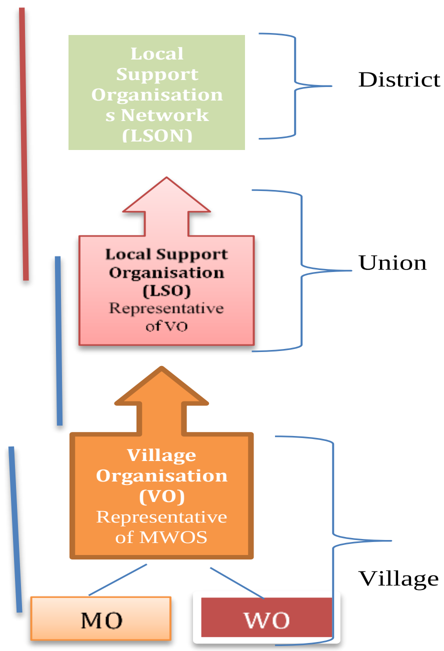
**Socioeconomic Sensitivities:** There are multiple religions, indigenous communities, and cultural discrepancies in the region that make it highly suspectable to social inequality. Although around 1.2% area is currently irrigated and harvested, there is a 90 % share of agriculture in total employment (2017-2018). With a per capita income[4] of PKR. 1319, the region encounters a literacy rate of 74% for 15-24 years[5]. The world's highest concreted road, the Karakoram Highway (KKH) connecting China with Pakistan at Khunjerab Pass (at an elevation of 4,693 meters), runs through GB for the most of its total length; the access roads density is 0.07 percent which is about one-sixth of the national average. One indigenous tribe of Kalash resides in the region. There are two notified archaeological sites and monuments in Gilgit-Baltistan.[6]

**Results and Discussion:** The key findings were to select carbon neutral technologies, sites away from the sensitive habitats and conduct further environmental checks for micro hydel and wastewater treatment installation. The concise results are captured in the adjoining table. The project may cause increased air emission, water pollution, changes in the landscape, and noise levels affecting water bodies, air quality, soil, slope stability, people, plants, animals, birds, and aquatic fauna during construction. However, these will be limited to construction duration. Project operations can increase air emission, changes in the water flow of streams, air quality, and aquatic fauna (if any). Therefore, a detailed environmental assessment will be conducted for the water and

| RDCRP Components | Environmental Impacts | Ecological Impact | Socioeconomic Impacts |
|---|---|---|---|
| **Drinking-Water Supply Sanitation and treatment** | | | |
| Construction | Moderate Negative | Low Negative | Low Negative |
| Operations | Low negative | Negligible | High Positive |
| **Energy Efficient and Seismic Resistant Housing** | | | |
| Construction | Negligible | Negligible | Negligible |
| Operations | Negligible | Negligible | High Positive |
| **Micro-hydel Power Supply** | | | |
| Construction | Moderate negative | Moderate Negative | Low Negative |
| Operations | Moderate to Low negative | Moderate | High positive |

3 IUCN. 2000
4 Gilgit-Baltistan Economic Report March 2011
5 MICS 2016-17
6 Pakistan Environmental Protection Agency "Guidelines for Critical & Sensitive Areas" (PDF) Government of Pakistan. pp. 12, 47, 48. Archived from the original (PDF) on 14 October 2013. Retrieved 6 June 2013.

sanitation and micro-hydel installation. However, the positive economic impact of RDCRP is likely to be high due to the creation of employment opportunities and access to electricity and water for marginalized communities. According to IPCCC scope 1, the carbon reduction potential of energy-efficient seismic-resistant housing's estimated carbon footprint is 50,000 $CO_2$ eq/ yr, and micro hydel is 8800 $CO_2$ eq/ yr. Water and sanitation component may emit 48-ton $CO_2$ eq/ year from wastewater treatment and 34950 tons of $CO_2$ eq/ year from water supply due to the use of electricity (which can be reduced by using a clean source of energy, i.e., solar-powered motor pumps). Considering the scale of construction, the emissions from construction and transportation are likely to be minimal.
The project also highlighted the need for land acquisition which will be entirely voluntary by the government and residents. The construction of a water tank, wastewater treatment plant, and power station for MH will require the permanent land acquisition of minor land, 0.2 to 3 canals, donated mainly by the community. However, during the construction of the water supply and sanitation network and transmission lines, temporary impacts such as loss/damage of non-land-based assets will occur; measures have been proposed to mitigate these impacts. To further avoid involuntary land acquisition in the subprojects, the first step would be to conduct screening before selecting the final site for the project. The screening exercise will be conducted jointly by the social staff of the implementing agency and the technical design team to fully orient themselves to the potential impacts of the primary and associated infrastructure. The project team will prepare social safeguards to document requirements based on the screening results, i.e., voluntary land donation documentation, abbreviated resettlement action plan, the Livelihood restoration plan, process framework, or due diligence reports. **Resettlement Policy Framework** is included as part of ESMF by the World Bank ESS 5 elaborates the preliminary screening conducted during the preparation of the ESMF using criteria provided in WB ESS5, AFD guidelines, and LAA 1894, indicating that social risks and impacts of the proposed projects are minor in both rural and urban areas.




**Stakeholder Consultation** engaged the communities and institutions early and provided them with an opportunity to express their concerns on development initiatives. The stakeholders were reached out through one-to-one meetings and focus group discussions. Eighty percent of institutional stakeholders expressed their concerns regarding the non-availability of drinking water and inaccessibility to the area. At the same time, the communities envision positive social impact through improvement in quality of life. Respondents thought that the project activities that have the potential to harm the natural environment should be managed through substantial mitigation measures. Their major concerns included disaster-prone areas and the selection of sites according to the needs of the area. The stakeholder engagement plan provided in **Exhibit 2** was proposed to involve communities and institutions during project implementation. In addition, **Grievance Redress Mechanism (GRM)** has been presented with village-level and Project level grievance redress committees to participate in the decision-making processes initiated through the village, district, and regional/project-level grievance redressal committees. The complaints of the inhabitants will be registered and resolved through the proper channel. The purpose is to facilitate the resolution of disputes without going into litigation. However, the disputant can seek a court of law if the grievance is unsettled through GRM. An extensive budget has been allocated to implement ESMF in the field and enforce the proposed mitigation measures.

**Mitigation** of adverse environmental and social impacts and screening checklists have been outlined for the project planning phase, whereas mitigation measures have been proposed for the implementation stage. The mitigation measures include slope stability measures, resource conservation, seismic resistant structures, explosives handling procedures, reduction in air emissions, effluent management, monitoring of environmental pollutants, worker health safety management, use of personal protective equipment, community health and safety management, course of action for physical culture resource, precautionary measures near archaeological sites, capacity building, training of staff and provision of non-objection certificate NoC while working in protected areas. Furthermore, environmental assessments and abbreviated resettlement action plans have been proposed for water and sanitation and micro hydel sub-projects. Deployment of an Environmental Coordinator/ Climatologist and Social/ Gender Safeguard Coordinator has been positioned at Project Support Unit for effective implementation of mitigation measures. Monitoring and Reporting (M&R) system comprising continuous collection, collation, and analysis of information to measure the progress of ESMF implementation.

**Conclusion**: Based on this project's scale and beneficial nature, the overall environmental impact is considered manageable with defined mitigation measures. The project will bring a sustainable infrastructure enabling access to essential services to the community. However, alternative technology (environment friendly) with a lower carbon footprint must be considered when purchasing equipment, machinery, construction material, vehicles, and supplies to ensure environmental sustainability. Similarly, alternative locations must be regarded in case of identified facilities in areas close to environmentally or socially sensitive receptors. To ensure accountability, Environmental and Social Safeguards documents/ commitments must exhibit full disclosure requirements of World Banks and AFD through dissemination on P&DD GB, AKF, and AFD websites and local libraries after approval.