

Invitation for Prequalification

Country: Islamic Republic of Pakistan
Name of Project: Khyber Pakhtunkhwa Hydropower and Renewable Energy Development Project
Contract Title: **PK-PEDO-339715-CW-RFB** (Madyan Hydropower Project -Civil Works)
Sector: Hydropower
Loan. / Cr. No.: Loan No. IBRD-91640, Credit No. IDA-67790
Prequalification Reference No. **PK-PEDO-339715-CW-RFB** (Civil Works – All Civil Structures including Weir, Intake, Headrace Tunnel, Tail Race, Powerhouse (Cavern) with related Structures, Colony, Roads, Bridges, Water Treatment Plant and Hydraulic Steel Structures)

1. The Government of Pakistan (GoP) has received financing from the World Bank toward the cost of Khyber Pakhtunkhwa Hydropower and Renewable Energy Development Project and intends to apply part of the proceeds toward payments under the contract for **PK-PEDO-339715-CW-RFB** (Madyan Hydropower Project – Civil Works).
2. The Pakhtunkhwa Energy Development Organization (PEDO) intends to prequalify contractors for Contract No. **PK-PEDO-339715-CW-RFB**. Brief description of the type(s) of works to be provided are narrated hereunder:

A. Construction of Civil Works:

- River Diversion and Cofferdams
- Weir
- Desander Chambers
- Power Intake
- Tunnels (Headrace, Tailrace, Adits, Access, Vertical Pressure Shaft etc.)
- Surge Tank
- Underground Powerhouse Cavern and Associated Structure
- Temporary and Permanent Bridges
- Temporary and Permanent Access Roads
- Colony and Control Buildings
- Utilities Services (Water Supply, Water Treatment, Electricity etc.)

B. Design, Supply, Installation and Testing of Hydraulic Steel Structure:

Gates, Stop log, Trash racks, Steel liner/Vertical Shaft, Manifold etc.

Quantities, locations and other information are described under Section VII “Scope of Works” of this Prequalification Documents.

It is expected that Invitation to Bid will be issued in July, 2023.

Construction Duration shall be 48 months.

3. Prequalification will be conducted through the procedures as specified in the World Bank's "Procurement Regulations for IPF Borrowers- Procurement in Investment Projects Financing" Fourth Edition, November 2020 ("Procurement Regulations"), and is open to all eligible Applicants as defined in the Procurement Regulations.
4. Interested eligible Applicants may obtain further information from the PEDO at the address below during office hours. A complete set of prequalification documents in English language may be purchased by interested Applicants on the submission of a written application to the address below and upon payment of a nonrefundable fee of Pakistan Rupee 30,000/-. The method of payment will be through Pay Order or Bank Draft drawn on a scheduled bank of Pakistan in favor of the *Head PMO Construction of 157 MW Madyan*. The document will be sent by courier for local delivery.
5. Applications for prequalification should be submitted in clearly marked envelopes and delivered to the address below by 1400 hours (local time) on May 11, 2023. Late applications may be rejected.

The address referred to above is:

Name of office: Office of the Head PMO-PEDO, World Bank Projects

Name of officer and title: Mr. Mustafa Kammal Khan, Director Project (Madyan Hydropower Project)

Postal Address: Ground Floor, NESPAK Building (PMO KHRE, PEDO),
Plot# 24, Sect B/2, Phase-5 Hayatabad, Peshawar
Khyber Pakhtunkhwa Province
Islamic Republic of Pakistan

ZIP Code: 25000

Telephone No.: +92 91 921 9616-7

Email: proc.wbprojects@pedo.pk

(Note: The Qualification Criteria & Scope of Works is attached as Annex to this SPN for info of the potential Applicants and can be viewed on-line on PEDO website(www.pedo.pk).

Section II - Prequalification Data Sheet (PDS)

A. General	
ITA 1.1	<p>The identification of the Invitation for Prequalification is: PK-PEDO-339715-CW-RFB</p> <p>The Employer is: Pakhtunkhwa Energy Development Organization (PEDO), Government of Khyber Pakhtunkhwa (GoKP)</p> <p>The list of contracts is: Madyan Hydropower Project – Civil Works</p> <p>RFB name and number are: Madyan HPP- Civil Works: All Civil Structures including Weir, Intake, Headrace Tunnel, Tail Race, Powerhouse Cavern with related Structures, Colony, Roads, Bridges, Water Treatment Plant and Hydraulic Steel Structures: RFB No. PK-PEDO-339715-CW-RFB</p> <p>Under this Project, the following two main contracts for civil works are in procurement processes:</p> <p>Contract I: Gabral Kalam Hydropower Package-1: Civil Works – Water Conveyance Structure (weir, diversion structure, tunnel etc.), Access Roads and Bridges (RFB No. PK-PEDO-344261-CW-RFB); and</p> <p>Contract II: Madyan Hydropower - Civil Works - All Civil Structures including Weir, Intake, Headrace Tunnel, Tail Race, Powerhouse Cavern with related Structures, Colony, Roads, Bridges, Water Treatment Plant and Hydraulic Steel Structures (RFB No. PK-PEDO-339715-CW-RFB)</p> <p>The current prequalification is for Contract II only. The bidding and implementation for Contract I will be conducted simultaneously with Contract II. The Applicants, who also participate in the bidding process for Contract I, should meet the Financial Qualification Requirements (average annual turnover and financial resources) on an aggregate basis for both contracts. Specifically,</p> <p>If Contract I is awarded before the completion of the prequalification process for Contract II, and the successful bidder for Contract I also participates in the prequalification for Contract II, then only this bidder/applicant should meet the Financial Qualification Requirements on an aggregate basis.</p> <p>If Contract I is not awarded before the completion of prequalification process for Contract II, the Applicants, who also participate in the bidding process for Contract I, will be conditionally pre-qualified for Contract II in case the Applicants can meet the Financial Qualification Requirements for Contract</p>

	<p>II only but not both Contract I and Contract II on aggregate basis, until Contract I is awarded.</p>
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In addition, the winning bidder for both contracts must also demonstrate availability of resources such as key personnel and equipment as may be required under the RFBs.

Section III - Qualification Criteria and Requirements

This section contains all the methods, criteria, and requirements that the Employer shall use to evaluate Applications. The information to be provided in relation to each requirement and the definitions of the corresponding terms are included in the respective Application Forms.

Contents

- 1. Eligibility4**
- 2. Historical Contract Non-Performance5**
- 3. Financial Situation and Performance6**
- 4. Experience7**

Eligibility and Qualification Criteria			Compliance Requirements				Document/ Form
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
1. Eligibility							
1.1	Nationality	Nationality in accordance with ITA 4.5	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	Conflict of Interest	No conflicts of interest in accordance with ITA 4.6	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
1.3	Bank Eligibility	Not having been declared ineligible by the Bank, as described in ITA 4.7 and 5.1	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
1.4	State-owned Entity of the Borrower Country	Applicant required to meet conditions of ITA 4.8	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Forms ELI -1.1 and 1.2, with attachments
1.5	United Nations resolution or Borrower's country law	Not having been excluded as a result of prohibition in the Borrower's country laws or official regulations against commercial relations with the Applicant's country, or by an act of compliance with UN Security Council resolution, both in accordance with ITA 5.1 and 5.2 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments

Eligibility and Qualification Criteria			Compliance Requirements			Document/ Form	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
2. Historical Contract Non-Performance							
2.1	History of Non-Performing Contracts	Non-performance of a contract ¹ did not occur as a result of the contractor's default since 1 st January 2018	Must meet requirement ¹	Must meet requirements	Must meet requirement ²	N/A	Form CON-2
2.2	Suspension Based on Execution of Bid/Proposal Securing Declaration by the Employer	Not under suspension based on execution of a Bid/Proposal Securing Declaration pursuant to ITA 4.9.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Application Submission Letter
2.3	Pending Litigation	Applicant's financial position and prospective long-term profitability are still sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Applicant	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2
2.4	Litigation History	No consistent history of court/arbitral award decisions against the Applicant ³ since 1 st January 2018	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2
2.5	Declaration: Environmental, and	Declare any civil work contracts that have been suspended or terminated and/or performance	Must make the	N/A	Each must make the	N/A	Form CON-3 ES

¹ Nonperformance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the applicant have been exhausted.

² This requirement also applies to contracts executed by the Applicant as JV member.

³ The Applicant shall provide accurate information on the related Application Form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of awards against the Applicant or any member of a joint venture may result in rejection of the Application.

Eligibility and Qualification Criteria			Compliance Requirements			Document/ Form	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
	Social (ES) past performance	security called by an employer for reasons related to the non-compliance of any environmental, or social (including Sexual Exploitation and Abuse) contractual obligations in the past five years ⁴ .	declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration		declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration.		Performance Declaration
2.6	Bank's SEA and/or SH Disqualification	(a) At the time of Contract Award, not subject to disqualification by the Bank for non-compliance with SEA/ SH obligations (b) If the Applicant had been subject to disqualification by the Bank for non-compliance with SEA/ SH obligations, the Applicant shall either (i) provide evidence of an arbitral award on the disqualification made in its favour; or (ii) demonstrate that it has adequate capacity and commitment to comply with SEA/SH prevention and response obligations; or (iii) provide evidence that it has already demonstrated such capacity and commitment for another Bank financed works contract	Must meet the requirement (Including each sub-contractor proposed by the Applicant)	N/A	Must meet the requirement (Including each sub-contractor proposed by the Applicant)	N/A	Application Submission Letter, Form CON-4
3. Financial Situation and Performance							
3.1	Financial Capabilities	(i) The Applicant shall demonstrate that it has access to, or has available, liquid assets,	Must meet requirement	Must meet requirement	N/A	N/A	Form FIN – 3.1, with

⁴The Employer may use this information to seek further information or clarifications during the bidding stage and the associated due diligence.

Eligibility and Qualification Criteria			Compliance Requirements				Document/ Form
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
		<p>unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as USD \$ Twenty five (25) million for the subject contract(s) net of the Applicants other commitments</p> <p>(ii) The Applicant shall also demonstrate, to the satisfaction of the Employer, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.</p> <p>(iii) The audited balance sheets or, if not required by the laws of the Applicant's country, other financial statements acceptable to the Employer, for the last Five (5) years shall be submitted and must demonstrate the current soundness of the Applicant's financial position and indicate its prospective long-term profitability.</p>	<p>Must meet requirement</p> <p>Must meet requirement</p>	<p>Must meet requirement</p> <p>N/A</p>	<p>N/A</p> <p>Must meet requirement</p>	<p>N/A</p> <p>N/A</p>	attachments
3.2	Average Annual Construction Turnover	Minimum average annual construction turnover of USD \$ One Hundred (100) million calculated as total certified payments received for contracts in progress and/or completed within the last 5 years , divided by five years.	Must meet requirement	Must meet requirement	Must meet 25 %, <i>[twenty five percent]</i> of the requirement	Must meet 40 %, <i>[forty percent]</i> of the requirement	Form FIN – 3.2
4. Experience							
4.1 (a)	General Construction Experience	Experience under construction contracts in the role of prime contractor, or JV member, subcontractor, or management contractor for at least the last ten (10) years. starting 1 st January 2013	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1

Eligibility and Qualification Criteria			Compliance Requirements			Document/ Form	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
4.2 (a)	Specific Construction & Contract Management Experience	<p>A minimum number of similar contracts specified below that have been satisfactorily and substantially⁵ completed as a prime contractor, or joint venture member⁶, management contractor or subcontractor between 1st January 2008 and Application submission deadline:</p> <p>(i) At least Two (02) Hydropower (100 MW each or higher) contracts of minimum value of US\$ 120 Million each for Civil works component;</p> <p>OR</p> <p>(ii) At least One Hydropower (200 MW or higher) contract of minimum value of US\$ 240 Million for Civil works component</p>	Must meet requirement	Must meet requirement ⁷	N/A	N/A	Form EXP 4.2(a)
4.2 (b)		For the above and any other contracts [substantially completed and under implementation] as prime contractor, or joint venture member, or sub-contractor between 1st January 2008 and Application submission deadline, a minimum construction experience in the following key activities successfully	Must meet requirements	Must meet requirements	N/A	Must meet the following requirements for key activities listed below N/A	Form EXP – 4.2 (b)

⁵ Substantial completion shall be based on 80% or more works completed under the contract.

⁶ For contracts under which the Applicant participated as a joint venture member or sub-contractor, only the Applicant's share, by value, and role and responsibilities shall be considered to meet this requirement.

⁷ In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

Eligibility and Qualification Criteria			Compliance Requirements			Document/ Form	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
		<p>completed⁸:</p> <p><u>Civil Works:</u></p> <p>i. Open Excavation 40,000 m3 in a month</p> <p>ii. Shaft/Tunnel/Cavern Structure excavation of 20,000 m3 in a month</p> <p>iii. Concrete work 10,000 m3 in a month</p> <p>iv. Fabrication & Installation of Hydraulic Steel Structures</p> <p>v. Constructed at least two number of Bridges (with cumulative length of minimum 150 m for both)</p>	<p>‘ii. Shaft/Tunnel Excavation’ and/or ‘iv. Fabrication & Installation of Hydraulic Steel Structures’ and/or ‘v. Bridges’ may be met through a Specialized Subcontractor in accordance with ITA 25.2</p>	<p>‘ii. Shaft/Tunnel Excavation’ and/or ‘iv. Fabrication & Installation of Hydraulic Steel Structures’ and/or ‘v. Bridges’ may be met through a Specialized Subcontractor in accordance with ITA 25.2</p>			
4.2 (c)	Specific Experience in managing ES aspects	<p>For the contracts in 4.2 (a) above and/or any other contracts [substantially completed and under implementation] as prime contractor, or joint venture member, or Subcontractor between 1st January 2008 and Application submission deadline, experience in managing ES risks and impacts in the following aspects:</p> <p>(i) Environmental and social management</p> <p>(ii) managing labor and working conditions, and Sexual Exploitation and Assault (SEA) risks and impacts,</p>	Must meet requirements	Must meet requirement	Must meet the following requirements: N/A	Must meet the following requirements: N/A	Form EXP – 4.2 (c)

⁸ Volume, number or rate of production of any key activity can be demonstrated in one or more contracts combined if executed during same time period.

Eligibility and Qualification Criteria			Compliance Requirements			Document/ Form	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirement
				All Members Combined	Each Member	One Member	
		(iii) Protection of the environment, resource efficiency and pollution prevention and management (iv) Security of the site, community health and safety, (v) Biodiversity conservation and sustainable management of living natural resources etc. Refer to Chapter 4 of Section VII of this document for further details.					

Section VII - Scope of Works

Contents

1.	Description of the Works.....	12
2.	Construction Period	14
3.	Site and Other Data.....	15

1. Description of the Works

1.1 Background

Several potential hydropower sites have been identified to support the development of the Khyber Pakhtunkhwa Hydropower and Renewable Energy Development Program (KHRE). The Madyan Hydropower Project (Madyan HPP) is one of the potential sites located at the Swat River, 60 km north of the town of Mingora.

The project will be developed by Pakhtunkhwa Energy Development Organization (PEDO) through approved financial assistance from the World Bank (WB).

In 2021, PEDO appointed a Project Implementation Consultant (PIC), a joint venture of SMEC (Australia) and Temelsu (Turkey), to undertake an independent review of the feasibility study and to conduct the project's detailed design (DD) and preparation of tender documents (TD).

1.2 Security Plan for the Project during Construction Phase:

The Government of Khyber Pakhtunkhwa (GoKP) recognizes the security requirements of the contractors and its obligation and commitment to meet them. GoKP undertakes to structure, implement and monitor a multi-layer security plan, specific to each contract. For this contract, PEDO has engaged Special Security Unit (SSU) to assess the security risks and, based on the assessment, will prepare a detailed Security Plan which will be included into the Bidding Document.

The Security Plan will consist of detailed arrangement for safeguarding the construction process including needed manpower, equipment and logistics required for the security measures, along with standard operating procedures (SOPs) for various protection/ security measures to be adopted at site and camps to ensure the safety of personnel including foreigners, material & equipment and installations.

It is expected that the security plan will cover the following major aspects of the project:

- Threat analysis and risk assessment to be conducted by professional security expert
- Provision of security to personnel & equipment, working at different sites, offices and Camps
- Security to all installations
- Security of routes leading to work
- Provide inner and outer cordon security
- Route protection including security during movement / travelling within project area /camps and Provision of Security for moving materials, equipment and personnel in/out of the project area etc.

Additionally, PEDO will work with the security team of the Contractor to customize the Security Plan based on the work program and methods of construction of the contractor when the contract is awarded. For this purpose, a provisional sum will be included in the bidding document in case additional costs will be involved from the contractor for the final

Security Plan.

The Security Plan is in addition to the responsibilities of the Contractor for the security of the Site as specified in the Contract.

1.3 The Scope of work

PEDO will execute the Madyan Hydropower Project in two main work packages:

- Package 1 (This Package): Civil Works
- Package 2: Electrical and Mechanical Works (E&M) for Equipment Design, Supply, Installation, Commissioning and Testing.

The Madyan Hydropower Project is being undertaken through international Competitive Bidding Contract. The Prequalification of Applicants is for the Construction of Civil Works including construction of including Weir, Intake, Headrace Tunnel, Tail Race, Powerhouse Cavern with related Structures, Colony, Roads, Bridges, Water Treatment Plant and Hydraulic Steel Structures.

2. Construction Period

All works shall be completed within four (4) years followed by one year Defects Liability Period.

Construction Period	Four (4) Years
Defect Liability Period	One (1) Year
Total Implementation Time	Five (5) Years

At the bidding stage, the contractor will be expected to produce detailed programmes in Primavera or MS Project format presenting construction schedule and interface between different construction components. Construction scheduling and coordination between construction packages will be managed by the Project Manager/Engineer and site supervision team.

3. Site and Other Data

3.1 Location & Accessibility

The project area is located in the Swat District, north of Madyan Town. Madyan Town is located at a distance of approximately 200 km from Peshawar, the capital of Khyber Pakhtunkhwa and 60 km from Mingora, the district headquarters of Swat Valley.

The project area is accessible from Peshawar and Islamabad via Motorway (M1) and National Highway (N-95). Swat Motorway is also under-construction which will significantly reduce the travel time from Peshawar to Chakdara whereas further same route of N-95 will be followed. At the moment Swat Motorway is operational only for light traffic vehicle.

The proposed weir site of the Madyan HPP is located on the Swat River approximately 14 km north of Madyan Town and the powerhouse approximately 1.2 km upstream of Madyan Town.

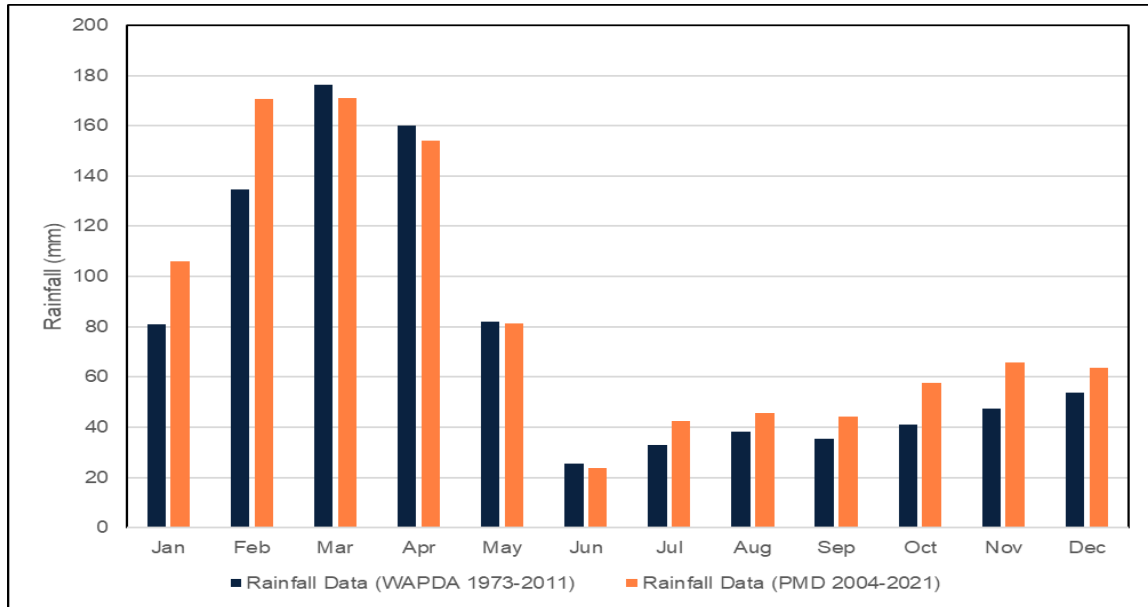
Location Coordinates are;

- Latitude: 35° 09' 25" N
- Longitude: 72° 32' 02" E

3.2 Climate

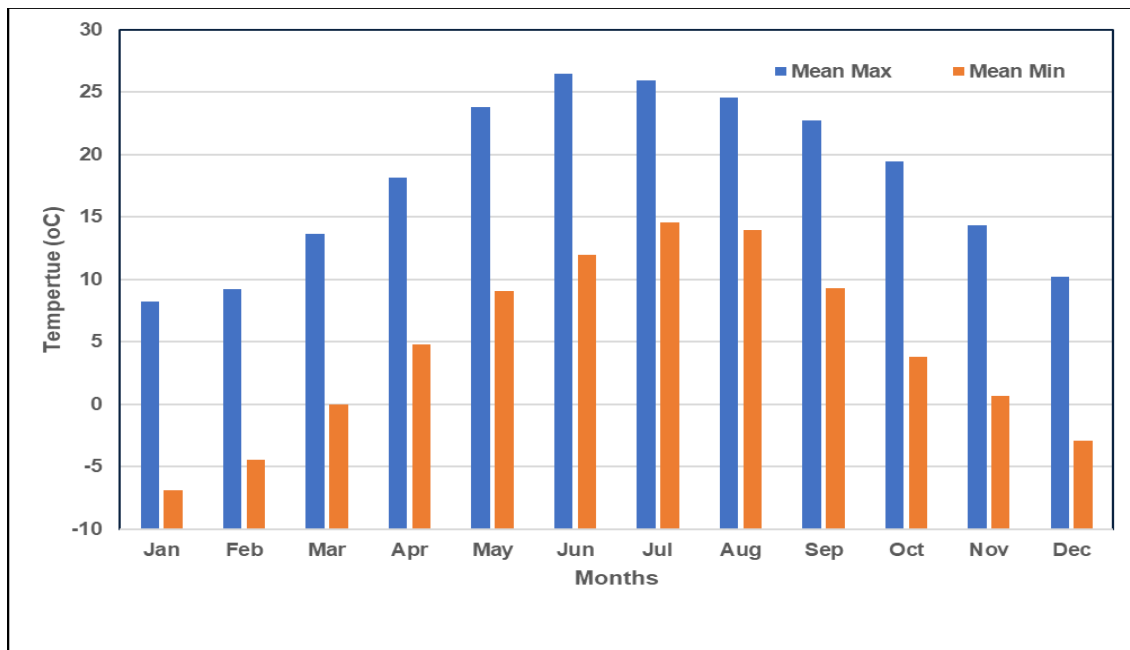
The weather of the area can be characterized as very cold winter and pleasant summer.

The precipitation regime in the Swat Valley is dominated by the occurrence of eastward moving extra tropical zones of low pressure, also known locally as Western Disturbances. The Western Disturbances bring humidity to the region of the Swat River from the Atlantic Ocean and the Mediterranean Sea. The Western Disturbances are more frequently and intense, during the Winter Season and they provoke the largest amount of precipitation over the Swat catchment. During the summer season the frequency and intensity of the Western Disturbances normally decrease, and the precipitation on the region also decreases. The monthly precipitation is given in Figure below.



Monthly Precipitation at Kalam Station (1973-2021)

The temperature regime follows the temperature pattern in the northern hemisphere. Figure below shows the variation of the mean temperature during the year. When the temperature is at its maximum in July, flows are mostly snowmelt generated. It can be expected that largest flows occur during this month. High temperatures in addition to high precipitation during the previous winter result in high base flows. Available record indicated that the monthly temperature ranges between -8.4 °C i.e. extreme cold in winter to 26 °C i.e. pleasant in summer.



Temperature Regime at Kalam Hydrometeorological Station

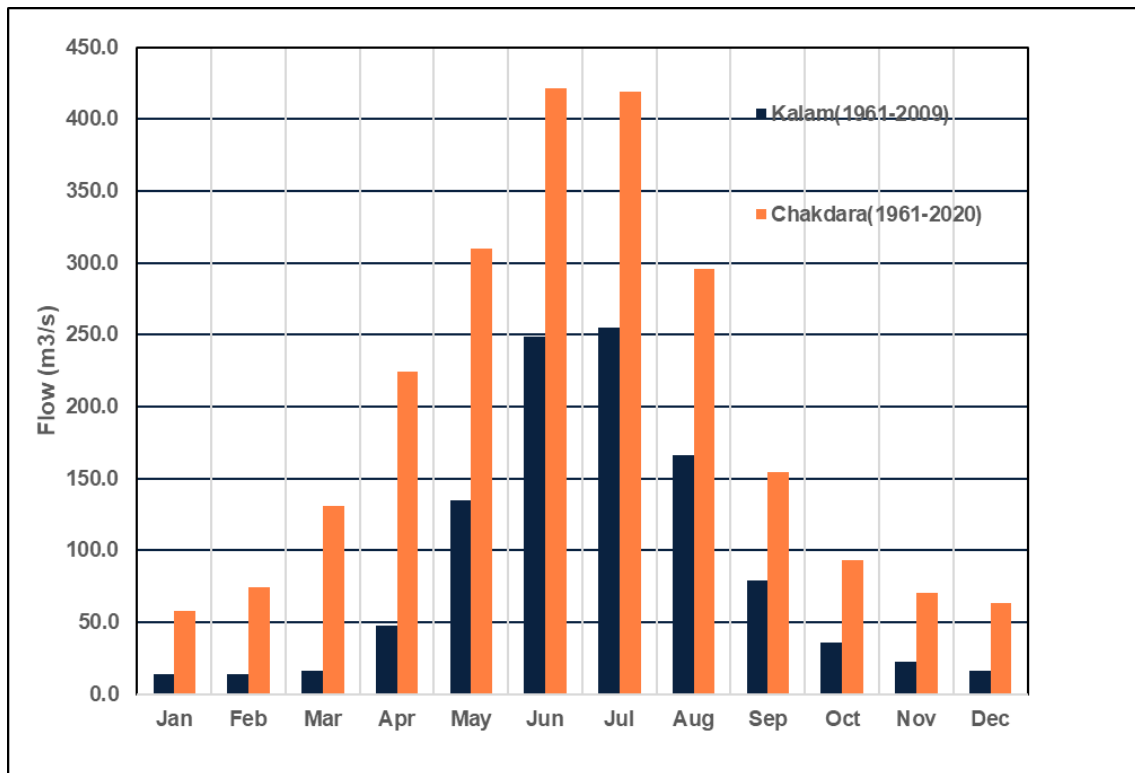
3.3 Hydrological Conditions

Swat River originates in the form of Ushu and Gabral streams in the northern mountains of Khyber Pakhtunkhwa and takes the name of Swat River at Kalam at the confluence of these two rivers.

The catchment of the Swat River in the upper region can be classified as a “high mountain catchment” in which there are several glaciers. Glaciers are visible above altitude of 4,000 m asl. The highest mountain peak of the river reaches above 5500 m asl.

Long term daily flow data is available at Swat River at Kalam (upstream of weir site with catchment area of 2,020 Km²). The length of the data is 1961 to 2006. Historic record of Swat River at Chakdara located at downstream of project area is available for period of 1961-2020 (catchment area 5,776 Km²). The catchment area at weir is about 2472 Km² and 2,961 Km² at powerhouse.

Estimated monthly inflow using the available records from Kalam and Chadara staions at weir site is presented in the Figure below.



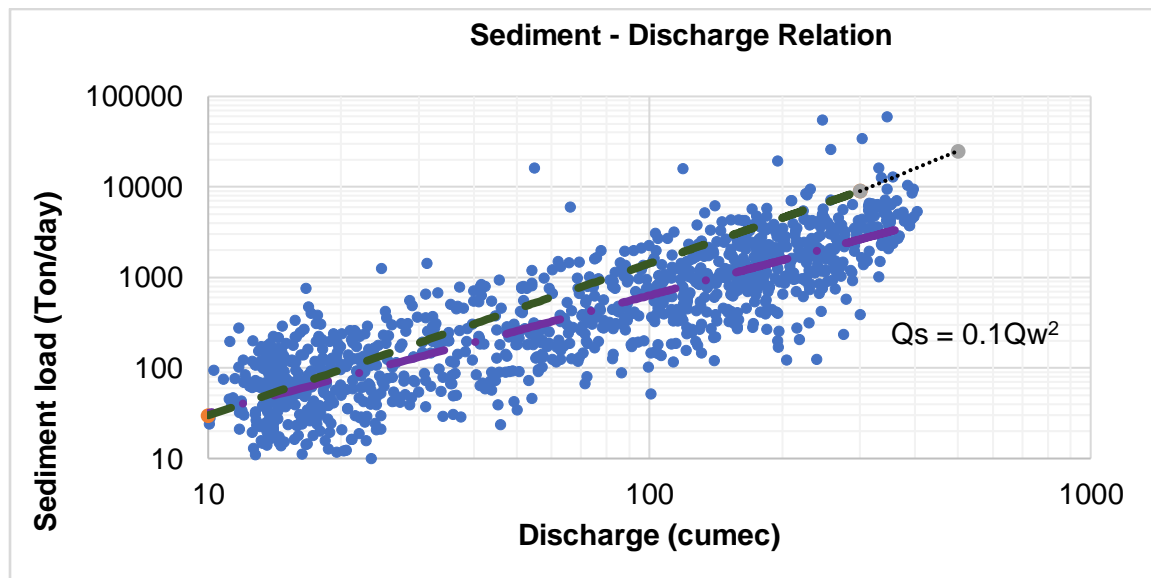
Estimated Flow at Weir Site

The estimated design flood for various return periods is given in the Table below:

Estimated Design Flood for different Return Periods

Return Period (Year)	Computed Flow (m ³ /s) at Weir	Computed Flow (m ³ /s) at PH
10,000	7,387	8,460
1,000	4,972	5,695
100	2,734	3,131
20	1,396	1,599
5	592	678

For estimation of suspended sediments, series of data on sediment concentrations are available from the sites at Kalam, Kedam and Ramet. The relation between river flow and sediment transport for the gauging stations at Kalam and Kedam is shown in Figure below. The solid curve in Figure below represents the mean rate of suspended sediment transport, while the dashed line represents a high estimate relevant for the required capacity of the desanding facilities.



Sediment Rating Curve

Estimated sediment concentration at the weir site is 96 ppm with total suspended sediment of about 925,000 ton. The sedimentation rate will be 373 tons/Km² at the upstream catchment of the weir site.

3.4 Geotechnical and Geological Assessment

Regional Geological Setting

The entire project area including the weirs, intake, desander cavern, headrace tunnel and powerhouse complex lies in a section of the Swat River between Kedam and Madyan on and under the eastern slopes of the Swat River. The geology of the study area in Kohistan in northern Pakistan is dominated by continental collision tectonics, where three of the world's most important and active mountain ranges converge: the Himalayas, the Karakorum and the Hindu Kush. As the Indian Plate moves northward, a complex pattern of thrusting and wrench faults has evolved. The neo-tectonic regime is associated with frequent seismic activity.

Quaternary Geology

The Swat River valley was shaped by glaciers during the Pleistocene ice age and by rivers during the Holocene interglacial. The project area is dominated by a V-shaped valley, which indicates that the valley was more recently shaped by river erosion. The Quaternary sediments that cover a significant portion of the valley slopes and river bed are made up of glacial deposits (moraines) and colluvial deposits including boulders, slope wash, and landslide debris. Alluvial deposits are also present in the riverbed and on its banks.

Bedrock

The main rock type found in the project area is Gabbonorite. Gabbonorite (description following the European Standard EN ISO 14689-1:2003) is light greyish grey, medium to coarse-grained, strong to very strong, slightly weathered, spacing of discontinuities medium to wide. Dimensions of rock blocks are medium with very few instances of large blocks. Block shapes are polyhedral and equidimensional. Joints are generally planar rough with few cases of undulating rough, large-scale roughness is straight, occasionally curved.

Joint aperture varies from wide to partly open with of clay, silty clay, chlorite, feldspar infilling. The gabbonorite is of Cretaceous age. The slopes are stable at 45 - 65 degrees of inclination angles. The visual observations indicate that the bedrock class at the weir sites is generally good to very good and fair to good at the powerhouse site.

Weir

Weir is having coordinates E: 028 11 87.0; and N: 390 40 69.0. Bedrock gabbonorite is exposed at the right bank below the existing road, which is light grey, hard, medium to coarse-grained, fresh to slightly weathered and jointed. The rock is competent. It is within the range of good to very good rock mass classes.

On the left bank, terraces of alluvial deposits extend immediately adjacent to the riverbank. Massive bedrock is exposed at high elevation at this location. The bedrock is gabbonorite, light to dark grey, hard, medium to coarse, fresh to slightly weathered

Desander Cavern Site

The desander chambers are located on the left bank of the river at about 800 m downstream the weir site. The desander cavern is situated within strong gabbonorite of good rock class.

Headrace Tunnel Site

Along the headrace tunnel alignment, the bedrock is expected to be generally of fair to good quality. However, at places where sheared/fractured zones are anticipated, the rock quality would be poor.

Powerhouse / Surge Tank Sites

At the powerhouse site, the slopes in the western and southern directions are largely covered with terraces to maximise the cultivable area. The retaining walls of the terraces are 1.2 to 2.0 m high and made of crushed rock and boulders. Sandy silt and organic material is filled behind for farming purposes.

Gobbronorite is exposed along the riverbed at the left bank in the shape of a small strip and accessible from a walking track. At the powerhouse site, the rock is light grey to dark grey, hard to very hard, medium to coarse grained, slightly to moderately weathered, and jointed. The joints are open filled with material presumed to be feldspar and joint planes are generally rough. At the surge tank location, some 200 m above the riverbed, bedrock was found to be light grey with brown shades due to the presence of iron oxide. The rock is medium-hard to hard, moderately to distinctly weathered, closely to moderately fragmented and closely jointed.

3.5 Project Salient Features

Following are the project major salient features.

Project Salient Features

S/No	DESCRIPTION	VALUE
1	LOCATION	
	Country	Islamic Republic of Pakistan
	Province	Khyber Pakhtunkhwa
	District	Swat
	Project Site	The proposed weir site of the Madyan HPP is located on the Swat River some 14 km north of Madyan town
2	ORGANIZATIONS	
	Client	Pakhtunkhwa Energy Development Organization (PEDO) Power and Energy Department, Government of Khyber Pakhtunkhwa

Description	Unit	Updated Feasibility Study 2023
Catchment Area	km ²	2,471
Mean Annual Flow	m ³ /s	107
Design Discharge	m ³ /s	153
Normal Reservoir Operation Level	m asl	1,507.4
Max. Operation Level	m asl	1,507.9
Crest Level of Weir	m asl	1514.1
Max. Weir Height	m above river bed	16.2
Length of Weir Crest	m	107
Number of Gates	Nos	6
Width of Gate	m	13
Height of Gate	m	10.5
Design Discharge	m ³ /s	153
Design Particle Diameter	mm	0.2
Number of settling chambers	Nos	02 chamber (04 Basin)
Effective length of chamber	m w/o transition	204
Width of chamber	m	26.47
Average depth of chamber	m	22.74
Length	km	11.17
Net Diameter	m	8
Max. Flow velocity	m/s	3.0
Diameter:	m	20.50
Height:	m	65.87
Total length (shaft & tunnel)	m	340
Length of vertical shaft	m	110
Diameter	concrete lined	5.75
Flow velocity	m/s	6
Diameter	steel lined	5.7
Flow velocity	m/s	6
Steel lining	mm	25
No. of units	Vertical Francis	3
Capacity each unit	MW	74.85
Installed Capacity	MW	207MW (2 x 86.6) & (1 x 33.8)
Cavern Width	m	18
Cavern Length	m	95.5
Turbine Setting	m asl	1,343
No of Transformers	Nos	03
Type of GIS Switchyard		SF6
Voltage	KV	220

4. Environmental and Social (ES) Requirement

This section provides a summary of key ES risks and impacts associated with the development of the Madyan Kalam Hydropower Project. It also sets out the expectations on contractors to manage the risks and impacts. The text is structured according to the 2018 World Bank Group Environmental and social framework¹ which contractors will be expected to conform with.

4.1 Environmental and Social Management

Key project ES risks and impacts

The key risks associated with this topic is ineffective management of the project's E&S risks. Specific risks are set out in the subsequent topics.

Key expectations from contractors

Demonstrate experience:

- Working to international lenders E&S requirements including requirements of the Environmental Health and Safety Guidelines (EHSGs)
- Implementing corporate level ESMS which will be applied at the project level, ideally certified to ISO14001
- Implementing Construction Environmental and Social Management Plan (CESMP). Please share examples.
- Monitoring and reporting on environmental and social risks and impacts.
- Implementing an E&S policy and employment of staff with suitable E&S capacity. Please outline the ESHS management team structure that you would expect to implement and to include example CVs of key ESHS staff you would deploy.
- Declaration of ESHS past performance: Record of past ESHS performance for similar projects.
- Qualification Criteria/ESHS experience: Details of relevant experience in managing ESHS aspects for similar projects.

4.2 Managing labour and working conditions, and Sexual Exploitation and Assault (SEA) risks and impacts,

Key project ES risks and impacts

Site preparation, construction activities and the use of temporary workers' accommodation pose potential risks to the health, safety, security and therefore wellbeing of construction workers. Potential issues with the use of temporary accommodation include sanitation, disease, fire, cultural alienation, sleeping space, quality and quantity of food, personal safety and security, temperature control and recreation, amongst others.

¹<https://www.worldbank.org/en/projects-operations/environmental-and-social-framework>

Occupational Health and Safety (OHS) risks likely to arise during construction include exposure to physical hazards, trip and fall hazards, exposure to dust, noise and vibrations, falling objects, exposure to hazardous materials, exposure to electrical hazards, exposure to extreme heat, working around large water bodies, working at height, electro-magnetic fields, live power equipment and lines.

Key expectations from contractors

Demonstrate:

- HR policies
- Codes of conduct
- Grievance mechanisms and controls,
- Means to address harassment and other forms of Gender Based Violence (GBV) and Sexual Exploitation and Abuse (SEA),
- Means to address child and forced labour
- Existing occupational health and safety procedures and controls.
- OHS statistics from previous projects
- Experience engaging with community workers
- Evidence of developing and operating worker's accommodation in line with international standards
- Experience managing ES aspects through multiple sub-contractors and complex supply chains
- OHSAS 18001 certification (preferred but not essential)

4.3 Protection of the environment, resource efficiency and pollution prevention and management

Key project ES risks and impacts

i. Water

Surface water quality

Surface water quality could be affected by a number of construction works taking place within or in close proximity to water bodies. Deterioration in water quality could arise as a result of increased sedimentation (for example from run off from exposed ground), sanitary effluents from worker camps and work sites as well as vehicle and plant washings and any spillages of oil or chemicals. The deposition of inert and hazardous substances into surface waters would have the potential to harm fish and aquatic life as well as any downstream uses including irrigation. Mitigation measures to avoid or minimise the risks of surface water pollution are well known to the construction industry and include for example:

- Careful selection of work sites and access roads so that the risk of surface runoff entering the river is minimised. Use of measures such as rip rap and slope protection where appropriate.

- Pre-treatment of sewage prior to discharge and / or use of a sewage collection system to meet national and international standards for discharge water quality
- Installation and use of oil and water separators and settling ponds to minimise the risk of contaminated construction water entering the river or groundwater
- Stabilising and re-vegetating of disturbed areas upon completion of construction
- Development and implementation of an Oil and Chemical Spill Response Plan, to include measures to be taken in the event of accidental spillages and leaks as well as outlining proper handling and storage requirements
- Development and implementation of a sediment and erosion control plan
- Surface water and groundwater quality will need to be monitored regularly during construction.

Groundwater quality

Although project execution will not affect the existing drinking water infrastructure however, ground water quality of small villages falling in the project reach need to be monitored.

ii. Air

There are few sources of air pollution in the Project area and air quality in general is considered to be good. It is expected that emissions of gaseous pollutants from traffic and plant associated with construction will result in a notable deterioration in local air quality. Dust could be problematic for local receptors if not properly managed. Dust will also affect the contractor's camp located within 500 meter of construction site. Sources of dust could include earthmoving, excavation and spoil disposal activities as well as aggregate crushing and cement batching.

iii. Noise

There are no significant sources of man-made noise in the vicinity of the Project other than traffic which is irregular and relatively light. Activities that will result in elevated noise levels during construction include blasting, excavation, drilling, rock crushing, concrete batching and traffic. However, the level of impact depends on a number of factors including the level of generated noise, the length of the activity and the distance from local properties. During the night time, significant impacts were found to be possible should earthmoving works be carried out in close proximity to the potential worker accommodation camps.

iv. Waste

The National Conservation Strategy (NCS, 1992) outlines Pakistan's intention to drive improvements in waste management and the Pakistan National Environmental Policy (NEP, 2005) provides an overarching framework but despite this, progress towards an effective national waste management programme has been limited. Very few landfills are in operation in Pakistan and no landfills are present in Kalam where the project is located. The likely waste types generated during construction and operation include solid, liquid,

hazardous, non-hazardous and inert wastes. The selection of appropriate disposal sites or methods has been identified in the ESIA and it will also be possible to sell/recycle much of the waste generated. Volumes of waste generated during operation are expected to be significantly less than that generated during the construction phase.

Key expectations from contractors

Demonstrate experience:

- Reducing energy, water and raw material consumption on projects
- Controlling release of pollutants to air, water and land due to routine, non-routine, and accidental circumstances
- Managing hazardous waste, including storage, transportation and disposal
- Controlling erosion and sedimentation on project sites
- Managing large infrastructure development in a river, maintaining water quality and hydrological regime.
- Rehabilitating project sites with native vegetation

4.4 Environmental and Social Impacts/Risks and Mitigation Measures:

Environmental and social impacts and risks are evaluated based on World Bank's OP4.01/BP4.01. The following impacts are anticipated, causing moderate and few substantial risks during the construction stage of the Project. The risks and some of their mitigation measures are listed below:

- As Madyan HPP has a run-of-river design with a long headrace tunnel, a lot of material will be excavated. Disposal of such a huge amount of excavated material is a big challenge of the Project. Disposal of this material has impacts on many issues such as air quality, noise aspects, traffic, landscape, flora and fauna, tourist activities etc. To mitigate this impact, some of the material will be reused as concrete aggregates, for gabions and slope protection. Before commencing the construction activities, the contractor will be required to prepare a Spoil Management Plan and submit it to the PMO for their review and approval.
- Overall, more than 1.05 million m³ of excavated material will have to be transported, and this is equivalent to about 170,000 truckloads. Main focus was given to reduce the transport of excavation material along the Madyan-Kalam Road (N-95) as far as possible, which would also positively affect aspects as noise and air quality, especially in town/villages like Bahrein and Madyan. As a mitigation measure, disposal sites are selected close to the adits on the left river bank helping to reduce transportation routes. Transport of excavated material through the City of Bahrein will be avoided.
- Air quality of the Project area will be impacted by dust from drilling and blasting activities, especially in open excavation for road and tunnel portal constructions, and gaseous emissions from construction-related traffic and equipment. As a mitigation

measure, water shall be sprayed continuously to reduce dust emissions of construction activities. Possibility of excessive dust generation may be reduced by adopting the best construction practices, and precautions.

- The sources of noise during construction will be excavators, generators, concrete batching plant, and other construction machinery and vehicles. Blasting for tunnel will be major source of vibration. Increased noise and vibration levels during construction activities can be a source of nuisance for locals and a source of disturbance to wildlife. To mitigate it, the contractor will monitor the noise levels regularly at the nearby villages and other sensitive receptors to ensure that these do not exceed NEQS and WHO standards. The Community Liaison Officer shall notify affected people and communities prior to undertaking especially noisy work activities
- Construction activities may create problems for resident wildlife species especially those which cannot move or migrate from one place to other to avoid the disturbances. Construction work destroys natural habitats but also creates ruderal habitats. In such ruderal habitats, a succession process starts and the species love to occupy newly developed habitats where they do not face any kind of competition with any other species.
- Around 400 workers in peak periods will generate significant amounts of liquid and solid wastes. The liquid sanitation waste water will be treated at workers' camp site; proper disposal of solid waste will be the responsibility of the Contractor.
- Around 400 workers (skilled and unskilled) will find employment during the construction period in peak times. In addition, related services (hotels, shops selling articles for the daily life etc.) will benefit from the Project. Because of the very conservative social structures of population committed to principles of Islamic Shariah, HIV/AIDS does not play any role and the adverse effects on the local community will be very limited.
- The inadequate implementation of E&S instruments expected due to poor management or lack of capacity to follow the Bank's guidelines. Mitigation measures include suggestions to prepare Construction Environmental and Social Management Plan (C-ESMP), Occupational and Community Health and Safety (OCHS) Plan, and Community Health and Safety (CHS) Plan based on the Environmental and Social Management Plan (ESMP), and to recruit qualified staffs to implement the C-ESMP and OCHS Plans.