

Environmental and Social Monitoring Report

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Quarterly Report (July-September 2018)
September 2018

Pakistan: Patrind Hydropower Project

Prepared by Star Hydro Power Limited for the Asian Development Bank.

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147 MW PATRIND HYDRO POWER PROJECT

Environmental & Social Monitoring Report July to September 2018



**STAR HYDROPOWER
LIMITED**

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Acronyms

ADB	Asian Development Bank
AJK-EPA	Azad Jammu & Kashmir Environmental Protection Agency
KPK	Khyber Pakhtunkhwa
CDP	Community Development Plan
EH&S	Environmental Health & Safety
EPCC	Engineering Procurement Contracts Contractor
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GRC	Grievance Redress Committee
IEE	Initial Environmental Examination
IDB	Islamic Development Bank
IFC	International Finance Corporation
ILO	International Labor Organization
KEXIM	Export Import Bank of Korea
NEQS	National Environmental Quality Standards
NTP	Notice to Proceed
PAPs	Project Affected Persons
PS	Performance Standard
RAP	Resettlement Action Plan
SHPL	Star Hydropower Limited

INTRODUCTION

i. Background

Patrind Hydropower Project (the “Project”) is a run-of-river project located on the boundary of Khyber-Pakhtunkhwa and Azad Jammu & Kashmir. The project is financed by multilaterals like IFC, ADB, IDB and KEXIM with total capacity of 147 MW. The Project was completed in first quarter of 2017 and was officially commissioned on November 08, 2017 and started generating electricity.

ii. Objectives:

The purpose of this Quarterly Environmental & Social Monitoring Report is to describe O&M Contractor’s compliance with the environmental and social requirements of IFC/ADB (including implementation of the Environmental and Social Management Plan) and to assess any corrective actions implemented/proposed. This includes:

- A description of all significant health, safety, environmental and social activities and events that occurred during the reporting period.
- Provision of additional information about activities (i.e., status of permits or other approvals, ongoing public consultation etc.).
- Quantitative performance monitoring data summaries in comparison to appropriate ADB and IFC policies, guidelines and national requirements.
- An explanation of any cases of non-compliance with lender’s guidelines or applicable regulatory limits that have occurred, identifying the cause and the corresponding corrective measures planned or underway to prevent future occurrences.
- Resettlement Action Plan activities and progress on the implementation of project within the Sustainable Development Strategy Framework

RELEVANT ENVIRONMENTAL PERMITS OR COMPLIANCE CERTIFICATES

a) Summary of permit conditions and media covered:

Following conditions were imposed by EPA-AJK during the operations phase of the Project.

The status of compliance with the conditions is presented in below table:

Condition	Status of compliance
Proponent shall ensure strict compliance to National Environmental Quality Standards (NEQs).	<p>Compliance with NEQs will be monitored throughout the project life.</p> <p>Services of third party are being used for the monitoring of NEQS on both sites (Powerhouse & Weir).</p> <p>Monitoring include ambient air quality, stack emission and vehicular emission tests, noise monitoring, waste water & water quality.</p> <p>Parameters include:</p> <p>Wastewater: (PH, BOD, COD, TSS, Alkalinity, Grease)</p> <p>Water parameters: (Temperature, dissolved oxygen, pH, conductivity, turbidity, total phosphorous, inorganic phosphorous, total nitrogen, ammonia nitrogen, nitrogen oxides)</p> <p>Stack Emissions:</p> <p>Sources:</p> <p>Air Emissions: (Generators & vehicles)</p> <p>Wastewater (Septic tank at sites)</p> <p>Water (River Kunhar & Jhelum upstream and downstream)</p> <p>Air Emissions will be monitored on Annual</p>
During lean period, the proponent shall ensure 2 cumecs water, as E-flow, downstream during the operational phase of the project.	<p>2.2 cumecs environmental flow is being released from weir. The data is attached as <u>Annex-1</u>.</p> <p>O&M operator is in compliance with the E-flow release. Data is missing due to some technical fault in sensor. Later on sensor was refreshed for the proper working.</p>

Condition	Status of compliance
The proponent shall in-place proper metering arrangement to ensure and verify the release of approved E-flow downstream.	Upstream and downstream gauges have been installed for monitoring of E-flows. (05) Sensors have been installed for monitoring changes in hydrology & water flows. The locations of sensors are: 1. Reservoir area, 2. Weir Upstream, 3. Talhatta 4. Kaghan, 5. Weir downstream.
Mitigation measures, as suggested in Environmental Management Plan (EMP) for operational phase, shall be strictly adhered to.	Compliance will be strictly monitored throughout the project life.
The proponent shall in place Environmental Management & Monitoring unit headed by an Environmental Monitoring Expert.	HSE team has been formulated which consists of HSE Manager having more than 17 years of experience, Environmentalist having more than 5 years of experience, HSE Officer having more than 5 years of experience and Community Liaison Officers worked with EPCC during the construction phase in the O&M team apart from Senior Manager- E&S who is monitoring the compliance from SHPL side.
The proponent shall be responsible to carry out Fish Study on annual basis through certified Fish Expert/Firm throughout the operational period of the project and undertake mitigation measures to minimize the adverse effect on fish species, if any, in consultation of Fisheries Department, Govt. of AJ&K, under intimation to EPAAJK.	The fish and vegetation studies are being conducted quarterly. The recommendations from third party are being implemented on site as per condition. Bio-engineering works has been done on site as per recommended by the expert. Plantation and soft gabion works was also done to avoid landslides and erosions. Fisheries management plan will be made in liaison with the government department of AJK & KPK.
The proponent shall carry out the Environmental Audit through 3rd party consultant after every 05 years during the Operational Phase of the Project.	The said Audit shall be conducted in 2022 as recommended.

Condition	Status of compliance
<p>The proponent shall undertake a plantation (of indigenous species) activity, in consultation with Forest Department, Govt. of AJ&K, both at the Weir & Powerhouse sites as a measures to enhance the watershed in immediate vicinities, increasing carbon sink and for the purpose of aesthetic beauty of the area.</p>	<p>Company and its EPC Contractor participated in annual tree plantation campaigns and planted several species within the project area. This will be continued during the operational phase as well.</p> <p>As part of the rehabilitation and landscaping activities, SHPL and EPC contractor carried out annual tree plantation campaigns in 2015, 2016 and 2017. In 2016, SHPL planted about 700 trees in the project area. In 2017, EPC planted approx. 3000 plant saplings on weir and powerhouse sites. In 2017, SHPL again planted approx. 800 pine trees on the slope on surge tank access road. In 2015, SHPL participated in a tree plantation campaign. This plantation will not only compensate the removal of vegetation in need for construction but will help these slopes reclaim naturally and help control of soil erosion.</p> <p>All of the plantation and landscaping activities has been done in close coordination with the forest department. Forest department and third party expert are involved during the selection of plant species.</p> <p>A detailed plantation plan is also under preparation for operational phase of the project.</p>
<p>Monitoring shall cover the entire life of the project and monitoring reports in this regard shall be submitted to AJK-EPA on quarterly basis.</p>	<p>Quarterly monitoring reports are being shared with EPA-AJK.</p>
<p>Proponent shall ensure the adequate arrangements for addressing public grievances, if any.</p>	<p>Grievance redressal procedure is in place.</p>

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Condition	Status of compliance
In case an independent Environment Specialist Companies are to be hired, as an arrangement, to undertake measurements of different parameters critically important in determining water & air quality and assessing noise emission level during the operational phase of the proposed project, the findings of monitoring shall be shared with AJK-EPA as a part of quarterly monitoring reports.	Third party monitoring was done during the construction period and the results were shared with all the stakeholders including EPAs. The same will be done during the entire operational phase of the project. The results/measurements of the reports from the third party will be shared with SHPL and lenders.
The proponent shall finalize the plan and ensure the arrangements in-place for the execution of CSR within a month of issuance of this approval.	CSR plan and procedure has been finalized and submitted. Budget information is included in the CSR plan.
The proponent shall ensure that strict and efficient Occupation Health & Safety Plan in-place and the same shall be shared with AJK-EPA accordingly.	Occupation Health & Safety Plan is in place and shared AJK-EPA.
As far as possible, the local people shall be given preference for all unskilled jobs. Preference may also be given to them for all semiskilled and skilled jobs as well.	Being complied. Please note that during the operational phase, very few vacancies are available. Hiring is being done keeping the locals on priority. Draft HR policy already shared with Lenders.
The mechanized plants and machinery and other equipment must be fitted with noise abatement devices and should have the conformity to NEQS standards.	Agreed. Noise monitoring is carried out and result will be shared via quarterly monitoring reports.
The proponent shall be liable for the correctness and validity of the information provided in EMP.	Agreed.
Proponent shall be responsible to facilitate EPA team for any visit for inspection/monitoring, etc.	Agreed. The Company has always facilitated all the stakeholders for site visits.
This approval shall stand null and void if the conditions, mentioned herein before, are not fully complied with.	Agreed.
This approval does not absolve the proponent of the duty to obtain any other approval or clearance that may be required under any law in force or by any competent forum/court of law.	Agreed.
This approval can be withdrawn at any time with any prior notice if deemed necessary in the public interest.	Agreed.

b) Relevant Government Agencies

As the Project is located on the boundary of Khyber Pakhtunkhwa and Azad Jammu & Kashmir, Star Hydro Power Limited (the “Company”) had to seek approval of Environmental Impact Assessment (EIA) from following two Environmental Protection Agencies (EPAs).

- i. EPA Azad Jammu and Kashmir
- ii. EPA Khyber Pakhtunkhwa

c) Issuance dates and duration of validity

Issuing Authority	Issuance Date	Duration of Validity
EPA-AJK	10-08-2010	Project construction phase
EPA-KPK	14-04-2011	Project construction phase
EPA-AJK	08-08-2017	Project operational phase
EPA-KPK	29-09-2017	Project Commissioning phase

INCIDENTS OF VIOLATIONS OR NON-COMPLIANCE

HSE compliance monitoring has been undertaken regularly during the reporting quarter. To ensure implementation of recommended procedures, regular liaison was maintained by the O&M operator with the Company. To prevent incident and mitigate risks, during the quarter, close supervision was carried out by O&M’s HSE team.

Waste collection is being done on daily basis on powerhouse site. Waste collectors collect the trash waste from the site and O&M accommodation buildings and dispose in the trash bins. Afterwards, the waste is segregated, non-recyclables are taken to the government approved landfill for proper disposal of waste by the government approved waste contractor. During the quarter 3.4 tons of waste has been generated out of which 2.5 tons was dry trash, 780 KG was food waste and 35 KG were oily rigs waste. Out of total waste 53 KG was recycled. No environmental incident has been reported during the quarter. Certificates from the waste contractor are attached as **Annex-2**.



Emissions monitoring was carried out by third party (**Green Crescent**) during the reporting quarter. During the monitoring vehicles smoke & ambient air quality were also tested. All monitoring results were in compliance with NEQS.



a) Warning Letters for Non-compliances

No warning letters were issued during the reporting quarter. As per policy, warning letters will be issued depending on nature and severity of violation. Verbal warning for the first time on minor violations and if any employee fails to abide by HSE policies after verbal warning a written warning letter will be issued by HSE team. On third warning person will be terminated.

INCIDENTS OF ENVIRONMENTAL AND SAFETY ACCIDENTS

a. Environmental Accidents and Mitigation

No environmental incident occurred during the reporting quarter on both the sites (weir and powerhouse).

b. Health and Safety Accidents and Mitigation

Accidents can be minimized by providing necessary health and safety information,

instruction, and supervision to employees. Employees are encouraged to take reasonable care for their own health and safety.

Summary of health and safety incidents during quarter is in the table given below.

Incident	Frequency	Description	Media or Community Reaction
Fatality	None	None	None
Medical Treatment Case	0+0+0	None	None
Near Miss	0+0+0	None	None
First Aid	0+0+0	None	None
Fire Incident	0+0+0	None	None
Property damage/environmental incident	0+0+0	None	None
Medical Checkup / Examination / Treatment	0+0+0	None	None

EXTERNAL MONITORING /INSPECTION

Sites HSE internal inspection has remained an ongoing activity. As part of external monitoring, The Lenders (IFC, ADB) Environmental & Social Monitoring team visited the site in the reporting quarter.



INTERNAL INSPECTIONS CONDUCTED DURING REPORTING PERIOD

Sites HSE inspection has remained an ongoing activity. To mitigate safety incidents, machinery, equipment and electrical appliances are being inspected by HSE staff to ensure fitness.

For the operational phase EHS risk assessments were carried out and risk register was developed. Various HSE inspections were carried out by the HSE team during the reporting period. Following

HSE inspections were undertaken during third quarter 2018;

- Site Overall Inspection
- Fire Extinguishers Inspection
- Health & Hygiene Inspection
- Hand & Power Tools Inspection etc.



Fire Extinguishers inspection during 3rd quarter, 2018

HSE Risk Register for PHPP Weir Site & Power House

S/ No	Description of aspects	Identified Impacts		Risk Level			Mitigation Measures	Residual Risk			Reference Doc/Plan & Procedures
		Hazards	Consequences	C	P	R		C	P	R	
1	Boating (Weir Site)	Incompetent operator, Adverse weather condition, Boat propeller, Waves, Rising water level, Humidity, Boating under influence (BUI), Immersed fishing net, Electricity wires, Fuel leakage, Air leakage/tubes puncture, Accumulation of huge garbage, Lack of dock line, Lack of PFD (personal floating devices), Boating alone, Overloading on boats	Collision with other boats, Sinking, Injury to persons, Cutting injuries from propeller, Trapping, Sunstroke, Dehydration, Suffocation/ asphyxiation, Damage to boat/ property, Loss of life, Fire /explosion etc.	4	B	M	Beware of weather condition, Competent operator, Check fuel and air regularly, Tool box talk (TBT), Training and capacity building of boat operators, Provision of personal floating devices (PFDs) like life jacket etc. Dock line must be provided, Community awareness about do not immerse fishing net in reservoir, avoid fishing etc. Installation of warning sign boards, Provision of communication system (Walkie talkies, cell phone, whistle etc.), Smoking not allowed inside boat, Do not boat under influence (avoid alcohol or any other drugs), Do not overload the boat, Installation of ignition safety switch (used to shut-off boat engine by operator in case of	2	A	L	OHS Plan

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							emergency), Installation of ring guard around the propeller, Boat maintenance has to be up to date, Regular inspection of personal floating devices (must be fit for use), Proper disposal of waste,				
2	Reservoir/Weir (Weir Site)	Adverse weather conditions; (Heavy rainfall, strong Winds), Snow melting, Flooding, Overtopping, Spillway gate failure, Internal erosion, River overflow, Dam leakage, Sediment deposition, Slopes instability, Land sliding, Earth quake Bypass tunnel collapse	Dam failure, Loss of human life, Loss of livestock Property damage, Distortion in ecosystem,	5	B	M	Flood warning activation system, Installation of flow sensors, Emergency response procedure (ERP), Warning sign boards, Community awareness sessions, Coordination with disaster management authorities, Sediment flushing, Continuous monitoring of slopes stability and weir by maintenance team; (leakage monitoring, pressure monitoring, temperature monitoring by geotechnical instruments) Overflow radial gates, Continuous monitoring of by-pass tunnel (Acceleratro meter to measure earth quake),	2	A	L	ERP & RMP

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3	Traffic Safety (Power house, Weir site)	Incompetent driver, Faulty vehicle, Over speed, Overtaking, Using mobile phones while driving, Driver fatigue, Driving under influence, Bumpy roads, Gravel on roads, Using shortcuts, Narrow streets, Schools, Slippery surfaces, Over trafficking, Trees & bushes, Standing water, Disturbance in communities,	Accidents, Severe injuries, Property damage, Loss of life,	4	C	M	Traffic management plan (TMP) in place, Drivers safety induction, Defensive driving training, Do not exceed speed limits, Installation of sign boards, Overtaking restrictions, Rest breaks for drivers, Pre-start vehicle check regularly, Do not drive under influence, Seat belt must be worn, Beware of weather conditions, Do not use mobile phone while driving, Drive very slow through villages, schools (beware of children's)	2	B	L	TMP
4	Community (Power house, Weir site)	Flooding, Commercial boating, Disturbance because of vehicles movement, Noise & vibration because of plant operation, (excessive noise because of using siren system for alerting community in downstream),	Drowning, Property damage, Strikes, Damage to aquatic diversity, Foul smell, Diseases outbreak, Hearing impairment, Ill health, Loss of life etc.	4	B	M	ERP; flood warning system is in place, Warning signs boards/banners installed along project area, upstream and downstream as well, Continuous monitoring of noise & vibration, Vehicles maintenance, Defensive driving training conducted for drivers,	2	A	L	Public Health & Safety Plan

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		Swimming in downstream, Roaming in downstream, Illegal fishing, Using access from the river by school children, Throwing dead animals & other garbage by the community in reservoir,					TMP is in place, Community awareness sessions regarding disposal of waste, Letter written to concerning school principal (for prohibition of using access from the river by school children), Watch guards deputed for patrolling and coordination with community for flood emergency.				
5	Electrical (Power house, Weir site)	Damaged tools & equipment, Damaged insulation, Imprope grounding, Inadequate wiring Exposed electrical parts, Overloaded circuits, Wet conditions, External cleaning of electrical equipment (e.g. Transformers	Electric shock, Electrocution, Injuries, Burns, fire/explosion, Equipment damage etc.	3	B	M	OHS Plan in place, PTW system, Double insulated electrical tools, LOTO procedures, Proper grounding of equipment's, Qualified and licensed electrician, Removal of damaged cords & defective equipment's and tagged "Out of Service" Electrical work carried out on a dry surface, Firefighting system/CO2 fire extinguishers, warning signs, trainings sessions, proper use of required personal protective equipment (PPEs) Electrical testing & inspections by electrical engineers, Use of RCDs (Residual current devices) Electrical installation by licensed electrician, Installation of GFCI	2	A	L	OHS Plan

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							(Ground fault circuit interrupter), Electrical safety trainings of workers, Regular site monitoring by HSE Team, Proper rated PPEs required especially Dielectric (DI) shoes for protection from electric shock				
6	Mechanical (Power house, Weir site)	Lack of operator competency/training, Faulty machines or defective equipment & tools, Inappropriate guarding or unguarded moving parts, loose clothing, sharp edges, chip particles, Excessive noise, Excessive vibration etc.	Amputation, entanglement/ entrapment, cutting, shearing, Severe injuries/loss of life hearing impairment due to excessive noise, HAVs (Hand arm vibration syndrome) because of exposure to instruments that produce excessive vibration (e.g. drill & chipping machines) etc.	3	B	M	OHS Plan in place, Standing operating procedures, Manufacturer manual guidelines, permit to work system, warning signs, workers trainings, avoid loose clothing, Installation of guards to maintain safe distance from danger part of machines/mechanical equipment, proper grounding, markings, Installation of emergency stop control, With all machines, Monitoring of noise and vibration on regular basis, Required personal protective equipment (PPEs), Regular on site monitoring by HSE team, Most effective is engineering control that physically change machine or work environment to prevent employee's exposure to the hazards/risks; isolation of risk	1	A	L	OHS Plan

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							from plant mechanical equipment/machines should be done by physical barriers by using fixed, interlocked, adjustable and self-adjusting guards. <ul style="list-style-type: none">➤ Especially the guards must be attached securely➤ Create no new hazards➤ Withstand operational & environmental conditions Required PPEs are compulsory like (Gloves, safety shoes, helmet, cover all, ear muff etc.)				
7	Confined Space (Power house, Weir site)	Untrained personal, Contamination, Poor access/egress, Extreme of hot or cold, Toxic atmosphere, Oxygen deficiency, Oxygen enrichment, Flammable or explosive atmosphere, Inadequate lighting, Unguarded plant and machinery inside confined space, Lack of communication system, Excessive noise, Radiations, Falling objects	Asphyxiation, Rapid breathing, Rapid heart rate, Emotional upset, Fatigue, Release of H2s or CO etc. Fire & explosion, Skin diseases in case of chemicals exposure/contact Engulfment, entrapment, Cutting, crushing, Entanglement, Slip, trip & falls, Stress & physical exhaustion, Injuries, loss of life	4	B	M	OHS plan in place, Permit to work procedure, LOTO procedures, Job safety analysis (JSA), Trained personal, Fire extinguishers, Adequate lighting, Provide emergency lighting (e.g. torches), Safety signage's, Portable ventilation system, Provide RCD protection, Isolate power supply prior to entry and tag out, Required personal protective equipment (PPEs), Proper communication b/w the worker inside and outside, Rest breaks,	2	A	L	OHS Plan

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			etc.				Job rotation, Gas monitoring through calibrated multigas detector, Noise monitoring, Elimination of ignition sources, Competency based trainings, Ensure appropriate equipment for the task Training & supervision, Gas purging and ventilation, Testing and monitoring of atmosphere, Mechanical, electrical & process isolation, In & out status record, Respiratory protective equipment, Other protective equipment's etc. Arrangements for the rescue of persons need to be suitable, sufficient and be in place for an emergency				
8	Work at Height (Power house, Weir site)	Working close to unprotected edges, Over-reaching, Fragile/ slippery surfaces, Inappropriate access; Not fully planked scaffold, No guardrails & toe boards, No handrails with ladders, Missing steps in ladder, Poor angle,	Slip, trips & fall, Personal injuries, Lost time injuries, deaths	4	B	M	OHS Plan in place, Permit to work, Proper working platform has to be provided with edges protection with guardrails; top rail, mid rail & toe boards, Ensure the EWP is operated on consolidated level ground, Outrigger pads must be sufficient to provide the needed stability for	1	A	L	OHS Plan

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		Unsecured equipment's; Harness & lanyards, Anchor points, Poor elevated work platform, Fall arrest system, Adverse weather conditions					<p>EWP, Scaffolding has to be erected on firm foundation, Safe means of access and egress to and from the scaffold, Ladder should be on firm, stable and level ground, Ladder should be secured against slipping or sliding, Do not work at height in adverse weather conditions, Required personal protective equipment (PPEs); Helmet, gloves, safety glasses and safety footwear, Full body harness with double lanyard etc. WAH risk assessment, Instructions & work at height trainings, Job rotation applied to minimize the work stresses, Fall arrest system, Barricading, Warning lines, Safety sinages, On site monitoring and inspection by HSE team</p>				
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Risk Assessment Matrix

No risk at all	Low risk	Medium Risk	High Risk

Consequence					Increasing Probability →				
Rating	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in our industry	Heard of incident in our industry	Incident has occurred in our company	Happens several time a year in our company	Happens several times a year in location
0	No injury / grievance	No damage	No effect	No impact					
1	Slight injury / grievance	Slight damage	Slight effect	Slight impact					
2	Minor Injury/ grievance	Minor damage	Minor effect	Limited impact					
3	Major injury / grievance	Localised damage	Localised effect	Considerable impact					
4	Single fatality	Major damage	Major effect	Major national					
5	Multiple fatalities	Extensive damage	Massive effect	Major international					

Mitigation measures

To ensure health and safety of both staff and labor, following were some of the prominent activities undertaken during the quarter:

1. PPEs policy has been finalized and implemented. Selected PPEs have been delivered by the vendor and HSE team distributed among the departments.
2. Regular trainings/education sessions for all employees.
3. Newly employed staff, labor and daily wagers were given HSE inductions so that they are aware of potential risks associated with the sites emergency procedures.
4. Installation of Sign boards on both sites
5. Posting of emergency contact numbers on visible locations
6. Installation of emergency lifebuoys on both sites
7. Installation of sign boards on downstream at Weir site



Selection and Procurement of PPES



Assistant commissioner visited power house to inspect fuel storage

LABOR RELATIONS AND CONDITIONS

(i) Nature of dispute or grievance

No dispute or conflict with workers or local community was observed or reported during the reporting quarter. Complaints boxes are placed on each site on prominent locations for the ease in submitting complaints.

- Three (03) complaint boxes, two (02) complainant registers and one (01) notice-board at power-house
- Two (02) complaint boxes, one (01) complainant register and one (01) notice-board at weir-site



Complaint Boxes placed on both sites

(ii) Authorities in charge of investigation/recording

In case of any incident, relevant team manager and HSE staff is responsible to record, investigate and address it appropriately.

To address any dispute or work related complaint received from staff /workers. Internal Grievance Redress Committee (GRC) comprising of Admin Manager and HSE Manager are mandated to investigate the matter in an unbiased manner and resolve it amicably so that the concerned party or individual may be satisfied and a friendly / peaceful environment is reinstated.

The local community shall be informed about project grievance handling procedures through village discussions.

All complaints and resolutions will be properly documented by the concerned Grievance Redress Committee (GRC) and be available for review for monitoring purposes. As part of the

post-evaluation and monitoring, the grievances will be available for review for all stakeholders and decision regarding grievances shall be consistent with approved policies and entitlements.

The GRCs are very important as it is expected that most cases, if not all would be resolved by the GRCs. The committee will hear complaints and facilities solutions and the process, as a whole will promote dispute settlement through mediation to reduce litigation.

(iii) Corrective actions, deadlines, identification of responsible parties.

O&M HSE department indicates corrective actions as and when required for further compliance by entire team of O&M operator.

(iv) Labor relations and living conditions for employees

Safety measures such as fire extinguishers and emergency contact numbers are placed on main locations. Following standards are implemented for adherence to local Labor standards:

- Government of Pakistan Labor Policy 2010.
- Standards for labor health and safety are executed according to O&M Contract.
- O&M has made all necessary arrangements for payment, housing & feeding.
- The living conditions are up to merit with all necessities.
- Preference to hire unskilled /skilled staff from AJ&K or KP.

(v) Compliance status based on applicable National and International laws/ regulation on labor

As per conditions stipulated in the project operations contract between Client and O&M contractor those have been made in light of National and International laws and standards, implementation during the quarter has been observed accordingly. Status of compliance with these laws are given in the table below;

Compliance Status with International and National Labor Laws/Regulations

Living Conditions	
IFC Living Standards	Status Of Compliance
Workers Accommodation Type	
Employer consider provision of family accommodation, comprising bedrooms, sanitary & cooking facilities	Single(without family) residence is provided, separate bedrooms, sanitary & combined kitchen is available for cooking
General Living Facilities	

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Residence designed to avoid flooding & others natural hazards, distance between work place and accommodation, safe & free transportation available, living facilities built using adequate materials.	Accommodation & work place are at 3min walk. Safe & free accommodation transportation is available for visiting near market
Drainage	
is the site adequately drained	Proper drainage system is available
Heating, air conditioning , ventilation & light	
Living facilities provided with adequate heating ,ventilation, air conditioning & light system including emergency lighting	Heating & cooling inverters are installed in every room, for backup lighting generator is available
Water Facilitation	
Supply of clean water in adequate quantity ,storage of drinking water constructed and covered to prevent water stored therein from becoming polluted or contaminated	Supply of water is available in every room, for drinking water mineral water is available
Drinking water monitoring	Water testing is conducted Bi-annual, Nestlé mineral water is provided for drinking
Wastewater & Solid waste	
waste material disposed of properly and their record is maintained	waste material collection and dispose of is outsourced for that proper log is maintained by HSE department
Insects Fumigation/ pest control	In process
Rooms/Dormitories Facilities	
Rooms aired & cleaned at regular interval	Rooms area aired & cleaned regularly(1 person is dedicated for this)
Mosquito screens, windows & doors area lockable	Windows & doors are lockable, Mosquito screens not installed yet
Furniture such as table, Chair Mirror Bedside light available for workers	All mentioned furniture available
Sanitary & Toilet Facilities	
Sanitary & toilet construction material are easily cleanable, cleaned frequently, separate for men & Women	Easily Cleanable material is used, women's are not living in accommodation
Cooking, laundry & canteen Facilities	
Kitchen provided with facilities to maintain adequate hygiene, canteen adequately furnished, adequately facilities for washing & drying	Well-equipped hygiene kitchen available, local market is near to the accommodation ,for laundry washing machine and sufficient space for drying is available
Medical Facilities	
First aid kits available n adequate number, adequately stocked, trained staff/worker	First aid kits are available at accommodation, For training of staff we are in coordination with civil defense authority AJ&K for trainings.

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Medical Facilities/ services available at site	we are in coordination with two nearest hospitals for the preference based ambulance service and we have two panel hospital through insurance
Leisure, Social & telecommunication Facilities	
Social collective spaces ,dedicated space for religious observation, internet access	TV room & Gym available. for religious observation a dedicated space is available inside the accommodation building. Free untimed internet service is available in accommodation
Health & safety On site	
Health & safety management plans including electrical, mechanical structural & food safety implementation	OHS plan in place
Emergency plans specially designed for Flood ,Earthquakes & other natural disasters	ERP is in place.
Security on workers accommodation	
Security plan including clear measures to protect workers against theft & attack.	Security framework in place.
Security staff checked for previous crimes or abuses, duty staff duty & responsibilities clearly defined	well trained police is deployed on security task
Workers' rights, rules & regulations on workers accommodation	
workers have freedom on their movement, religious cultural & social background respected	Employees have freedom on their movement, all employees are free to perform their religious, cultural & social activities with in the national laws
Working conditions and Management of worker Relationship	
Human Resources Policies & Procedure	
Human Resources Policies & Procedure appropriate to its size and workforce that set out its approach to manage workers consistent with requirement of their performance standard & national law	Human Resource Policies are according to the national law
Documented information that is clear and understandable ,regarding their rights under national labor & employment law and any applicable collective agreement, including their right related to hours of work, wages, overtime, compensation	written agreement is signed between company and employee at the time of employment, it includes their rights, wage, working hours, overtime , compensation
Working conditions and Terms of Employment	
Where accommodation services are provided to workers covered by the scope of this performance standard, the accommodation services will be provided in a manner consistent with the principal of non-discrimination and equal opportunity. Workers accommodation arrangement should not restrict workers freedom of movement or of association	Accommodation is provided to the migrant employees and if employees visit any other place for work than company takes the responsibility of accommodation

Workers Organizations	
Freedom of association and the effective recognition of the right to collective bargaining	No ban is imposed on the workers with regard to establishment of worker's organization or freedom to express labor concerns. However formal labor or association has yet not been established
Non-Discrimination and Equal Opportunity	
Elimination of discrimination in respect of employment and occupation	No discrimination exists as all persons have been provided equal opportunities irrespective of color, race, origin, nationality & gender. Only difference is the nature of job and relevant skills
Protecting the Work Force	
Abolition of Child labor	To ensure the abolition of child labor the Computerized National Identity Card (CNIC) has been made mandatory for induction. Which is only provided by the GOP after the age of 18 years
Elimination of all forms of forced or compulsory labor	No forced labor observed and overtime /weekends work carried out only with the consent of concerned staff/labor
Workers safety and health including those concerning safety at work	All employees are covered under health and medical insurance. safety at work is properly managed by HSE according to standards
Minimum rates of wages and working hours	All employees are getting salary above then the minimum wage defined by the GOP (i.e. 15,000PKR) and third party employees are also receiving equal or above than this. Daily standard working hours are 8.

(vi) Medical facilities provided during quarter:

Availability of first aid boxes has been ensured at both sites. During the operations a contract will be made with the local hospitals to treat on priority basis during any kind of emergency

PROJECT PROCEDURES FOR: (A) HIRING; AND (B) ACQUISITION OF GOODS AND SERVICES:

Procedures for hiring have been adopted as per O&M policy and also in compliance with O&M Contract. While, procurement of goods and services by O&M contractor is being carried out under Quality Assurance and Quality Control plan.

(i) Local Employment Status:

As per the O&M contract, O&M is bound to employ unskilled workers/lower staff from local areas/ adjacent villages and for skilled jobs preference has to be given to the qualified

locals.

The summary of employment status is presented below.

Organization	Job Type	AJK						KP				Other Areas	Total
		Alda	Patrind	Lower Chatter	Shoran	Other AJK	Sub-Total (AJK)	Sarati	Dalola	Other KP	Sub-Total (KP)		
1. K-water													
	i. Technical Staff	0	2	3	0	25	30			8	8	11	49
	ii. Non-Technical Staff	3	2	6		2	13	1	1	2	4		17
	iii. Community Liaison Officers	1					1	1			1		2
2. Third-party Staff (Private Security)						7	7	3			3		10
3. Police Personnel						18	18	13			13		31

ENVIRONMENTAL AND SOCIAL CAPACITY

i. Staff capacities in environmental and social management

The Project is being managed with a balanced team of HSE staff in O&M team comprising of HSE Manager, Environmentalist, HSE Officer along with two CLOs and being supervised by the Senior Manager Civil-E&S of the Company.

An orientation to environmental management, health and safety during operations work is part of induction for all the staff and workers hired. Furthermore, daily HSE monitoring, toolbox talks and other related activities are being conducted to raise the awareness level of all staff and workers.

ii. HSE Weekly Meetings:

Weekly internal meetings are conducted regularly. Compliance with HSE standards have always been main agenda items during these meetings.

iii. Environmental laws and regulations

Applicable laws and regulations are summarized in below table.

Laws	Relevant Clauses / Sections / Chapters
AJK Environmental Protection Act 2000	The clause 1 of section 11 of the act requires that “no proponent of a project shall commence construction or operation unless he has filed with the Agency, an Initial Environmental Examination (IEE) or where the

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	project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained from the Agency approval in respect thereof”.
AJK EPA Review of IEE and EIA Regulations 2009	Section 13(2) (b) (Conditions of approval) of IEE/EIA regulation 2009 states that “Before commencing operation of the project, obtain from Agency a written confirmation of compliance that the conditions of the approval, and the requirements given in the IEE or EIA relating to design and construction, adoption of mitigation and other measures and other relevant matters, have been duly complied with” Section 14 (Confirmation of Compliance) of IEE/EIA regulation 2009 states that “(1) The request for obtaining a written confirmation of compliance under clause (b) of sub-regulation (2) of regulation 13 shall be accompanied by an Environmental Management Plan indicating the measures and procedures proposed to be taken to manage or mitigate the environmental impacts for the life of the project, including provisions for monitoring, reporting and auditing.
National Environmental Quality Standards (NEQSS)	NEQS for Gaseous Emissions; NEQS for Vehicular Emissions; NEQS for Noise
Factories Act 1934	Chapter III – Health & safety; chapter IV – Restrictions on working hours of adults; chapter IV-A-Holidays with pay; chapter VI-Penalties and procedures
Minimum Wage Ordinance 1961	Section 4 –Minimum rates of wages for unskilled and juvenile workers; Section 5 –Minimum rates of wages for workers with respect to particular industries; Section 9 –Prohibition to pay wages at a rate below the minimum rate of wages

iv. Lenders’ Standards

Applicable lenders’ standards are summarized in below table.

Lenders Standards	Relevant Requirements / Standards / Sections
ADB Safeguard Policy Statement (Appendix 1)	Safeguard Requirements 1: Environment Safeguard Requirements 2: Involuntary Resettlement
IFC Performance Standards	Performance Standard 1: Social and Environmental Assessment and Management System; Performance Standard 2: Labor and Working Conditions; Performance Standard 3: Pollution Prevention and Abatement; Performance Standard 4: Community Health, Safety and Security; Performance Standard 5: Land Acquisition & Involuntary Resettlement
IFC EHS Approaches for Hydropower Projects	1. Industry specific impacts and management (1.1 Environment, 1.2 Occupational Health & safety, 1.3 Community Health and Safety); 2. Performance Indicators and Monitoring (2.1.1 Emissions and Effluent Guidelines, 2.1.2, Environmental Monitoring, 2.2 Occupational Health and Safety Performance)
IFC General EHS Guidelines	1. Environment; 2. Occupational Health and Safety; 3. Community Health and Safety

v. Safety Training and Campaign

Capacity building activities coupled with effective supervision is always result oriented. HSE trainings were conducted for O&M employees on different subjects. These trainings were conducted in the light of standards guidelines and procedures developed by O&M

with site specific modifications. Training matrix has been developed by HSE team for all of O&M employees.

vi. Induction Training

As part of ESMP, all staff and workers before starting their respective jobs have been given induction training.

vii. Tool Box Meetings

Daily safety message is conveyed to all staff before start of every shift.

viii. Needs assessment of environmental and social management capacity

As ongoing activity, continuous capacity building initiatives including more specific trainings on environment and social management are required for staff. Furthermore, daily HSE monitoring, toolbox meeting programs and other related activities have raised the awareness level among all employees.

STAKEHOLDER CONSULTATION/CSR ACTIVITIES

To initiate and sustain constructive external relationships with Project stakeholders particularly with adjacent /local communities, consultation is an important tool to enhance the social performance of the Project.

Details of community programs involving civil society/NGOs in implementation:

Some professional services on quarterly basis were hired by O&M from locally based individuals and organizations during the quarter. Following organizations have been engaged to undertake activities under ESMP and CSR activities.

HSE sign board preparation and printing activity requirements of the Project is being undertaken by local vender (Chaudhary Steels), resident of Muzaffarabad.

Flora and Fauna Study by local Fisheries and wildlife expert Mr. Yousaf Qureshi who is also retired Director Fisheries Government of AJK.

During the reporting quarter CLOs conducted consultations sessions with the local affected communities.



Some of the activities identified for CSR during the year 2018 are given in below table

	Procedure for Corporate Social Responsibility			
	Doc. ID.	Issue Date	Rev. #	
	K Water / HSEP-002	June 11, 2018	00	

Table 01: Annual CSR Plan 2018

Sr. No	Area	Scheme/Project	Location	Total Cost (Rs)	Beneficiaries
01	Education	Distribution of 52 sweaters / jerseys, 52 school uniforms, 52 pairs of school shoes and 08 heaters	Alda	121,165	School Students (32 girls and 20 boys) of Alda Primary Government School
02	Health	Donation of 30 rabies vaccines, 01 table, 02 doctor chairs and 06 patient chairs	Lower Chatter	48,400	Patients visiting Lower Chatter Basic Health Unit
03	Sports	Distribution of sports items (04 volleyball nets, 04 balls, 02 cricket bats, 05 tennis balls and 01 set of cricket wickets)	Lower Chatter	30,000	Youth of Alda and Lower Chatter Villages
04	Infrastructure	Donation of Rs.50,000 for repair of pedestrian walkway	Patrind	50,000	School going children and residents of Patrind Village
		Donation of Rs.80,000 for repair of electrical poles and cables	Sirati	80,000	Sirati village
05	Mosques	Donation of 12 fans and 02 water coolers	Patrind	102,400	02 Mosques at Patrind Village
		Donation of 06 fans and carpet	Tarcheela	81,200	01 Mosque at Tarcheela Village
06	Plantation	Donation of plants for plantation	Power House, Weir site	36,234	Local Communities
Total Cost (Rs / USD)			Rs. 549,402 / USD 4,445 (01 USD=Rs 123)		

COMPLIANCE AND IMPLEMENTATION ESMP

Compliance monitoring of ESMP has been an on-going activity undertaken by O&M's HSE staff and SHPL on both sites. Non compliances with recommended standards and regulations will be recorded and reported. ESMP compliance status is attached as **Annex-3**.

a. Environmental monitoring under EMP:

Internal Environmental and Inspection checklist was developed and filled on daily basis. Besides this following activities have been undertaken as part of environmental monitoring.

i. Flora Study Monitoring:

Quarterly Study/monitoring was undertaken at both (Power house & weir) sites in 3rd quarter, 2018. Detailed report is annexed as **Annex-4**.



Vegetation Monitoring for the 3rd Quarter, 2018

ii. Fish fauna Study Monitoring:

Quarterly Study/monitoring was undertaken in Kunhar River (Up & down stream of Project site) during 3rd quarter, 2018. Sampling was done on six study points. Detailed report is annexed as **Annex-5**.



Fish Monitoring for the 3rd Quarter, 2018

Table: Compliance with NEQSs

Environmental Component	Standards (NEQS)	Compliance/Mitigation measure	Remarks
Air Quality	EPA ambient air quality (EPAs standards for each Parameter)	All monitoring results are in compliance with NEQSs.	Annual air emissions and ambient air quality was conducted through third party. .
Water quality	WHO Guidelines (EPAs standards for each Parameter)	Waste water from powerhouse building, O&M building and Korean accommodation is treated prior to release into river.	Second biannual quality monitoring of waste and drinking water is in progress. Results will be shared in next quarterly report.
Noise levels /Vibration	EPA ambient noise standards and worldwide vibration standards.	Noise level is in compliance NEQSs. Vibration: More concern regarding factors of human comfort and structural damage was given and always tried to comply with allowable vibration standards.	Noise level and vibration record is maintained. No blasting is carried out during Operational phase
Soil quality	EPA quality standard (Different standards for each Parameter)	No environmental incident observed	

b. Occupational health and safety

Health and safety of staff/workers has been a prime consideration during the operation of the Project. In accordance with the safety standards, all the relevant staff are provided with the Personal Protective Equipment (PPE) comprising of hard hats, safety shoes, and jacket and dust masks depending upon the job specification to prevent injuries.

1. Waste management training sessions were held for supervisors and relevant personnel. Furthermore, waste segregation methods were practically taught to site workers and staff to adopt appropriate mechanism.
2. During quarter, coordination meetings, monitoring and inspections were undertaken by O&M's HSE staff with regard to site HSE status.
3. Waste segregation, collection, transportation and disposal mechanism has been implemented and full time waste collectors were placed on both sites. Waste management training sessions were held for supervisors and relevant personnel.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

To manage the environmental and social issue appropriately, following detailed plans developed by O&M operator have been in implementation to fulfill the environmental and social compliance requirements of the project;

- a) Plan for Waste Management
- b) Plan for Traffic Management
- c) Plan for Reservoir Management

a. Plan for Waste Management

O&M contractor have hired waste collectors on both sites to maintain housekeeping and timely segregation /collection of waste. All the waste generated at sites is being managed in accordance with ESMP & Waste Management Plan. O&M made contract with private company to collect the waste on weekly basis. The quantity of waste is being recorded on the waste consignment note.

Daily environmental Performa regarding potential environmental impacts has been prepared and monitoring at site is being done regularly by direct observation and inspection.

b. Plan for Traffic Management:

Safety precautions, warning sign boards have been placed at different locations to protect staff/workers and the general public. All the vehicles are equipped with directional control signage and are being inspected prior to use.

RESETTLEMENT PLAN IMPLEMENTATION

i. Scope of Land Acquisition and Resettlement Impacts

The land identified by the EPC Contractor on the basis of basic design of the Project measuring 872.65 Kanal (601.4 Kanal on AJK and 188.7 Kanal on KP side) was acquired by the Company in 2012 through Land Acquisition Act (LAA) 1894 applicable in both AJ&K and KPK. The land acquired in 2012 was owned by 94 land owners which was detailed in the approved resettlement plan.

In 2014, during the construction on the weir site, it was noticed that the land area of 3.7 Kanal “Additional Land” is further required on AJ&K side which is to be submerged due to the head pond of the Project. The land is owned by three (03) land owners.

Due to the change in the design and location of weir downstream in late 2014, it was confirmed through survey that the land area of 10.3 Kanal is further required on AJ&K side the slope stabilization in the stilling basin area downstream of the weir. The land is owned by six (06) land owners. The process of acquisition on AJK side completed in December 2015.

Furthermore, in 2015 on the complaint of the local Mr. Khalid who also raised the same issue during the Lenders’ E&S mission in November 2015, on the head pond area a survey was conducted to confirm whether his land is affected or otherwise. EPCC conducted the survey on November 13, 2015 and it was confirmed that his land measuring 5.45 Kanal was being affected due to submergence in the head pond. The process of acquisition started by contacting the relevant revenue department. Section-4 was issued on April 01, 2016. Initial assessed value of the land by the revenue department was deposited by the Company in November 2016. The detail of compensation is given in subsequent section.

During the reporting period, it was brought in to notice of the revenue department/district administration by one of the locals (Mr. Fareed) in Shoran village AJK that his land and house is right on the bank of river Kunhar and the area was prone to sliding in the past as well and asked the revenue department/district administration to acquire his land. The revenue started the procedure of acquisition of land in February 2017 and the land award was issued on October 31, 2017 for the land measuring 4.66 Kanal.

In addition to above, when reservoir impounding was being done, the local community of Deedal and Dalola villages (KP area) asked the district administration/revenue department to conduct a survey through revenue staff to confirm whether their land was being submerged. After the detailed survey by the revenue staff it was communicated to the Company that additional land will be submerged.

The Company along with the revenue staff again visited the site to confirm the additional land acquisition matter. It was found that land measuring 65.45 Kanal was already destroyed by the landslide well before the project started. According to revenue staff, its status in revenue record is not updated as slide area which means Company has to acquire the same. In addition to this about 17.7 Kanal land in Dalola was also being affected.

The Company approached the district administration/revenue department and apprised the situation. The revenue department started the process and issued section-4 for the areas (65.45 & 17.7 Kanal) on July 25, 2017. After the issuance of section-4, the Company was asked by the revenue department to execute an Agreement U/S-41 of LAA 1894 with GoKP. The draft agreement was shared with the office of Commissioner Hazara Division but till date there is no further development on the issue. The acquisition process will formally start after the execution of Agreement U/S-41.

SUMMARY OF THE LAND TO BE ACQUIRED ON AJK AND KPK

PERMANENT LAND						
Sr.	Project Component	Affected Land (Kanal)				
		State owned Land/ Riverbed	Farmland	Wasteland	House land	Total
1	Reservoir Impounding	87.3	282.05	231.9	9.1	610.35
2	Weir Structures	0	1.5	48.7	0	50.2
3	Powerhouse	13.6	30.1	32.85	5.25	81.8
4	Surge Tank	-	-	47.75	-	47.75
5	Additional Land-Patrand	0.3	3.75	15.4		19.45
6	Additional Land-Shoran	-	-	3.52	1.14	4.66
7	Additional Land-Deedal		1.95	63.5		65.45
8	Additional Land-Dalola			1.4		1.4
9	Additional Land-Naroka		1.65	14.65		16.3
Total Permanent Land Acquisition (Kanal)		101.2	321	459.67	15.49	897.36
TEMPORARY LAND						
	Colony of Expatriate construction staff, Switchyard, labor camp, access road, bridge, batching plant at Powerhouse Site	54.75	0	27.8	0	82.55
Total Temporary Land Acquisition (Kanal)		54.75	0	27.8	0	82.55
Total Land Acquisition (Kanal)		155.95	321	487.47	15.49	979.91

ii. Status of Land Acquisition, Progress on Compensation Payments and Assistance Delivery

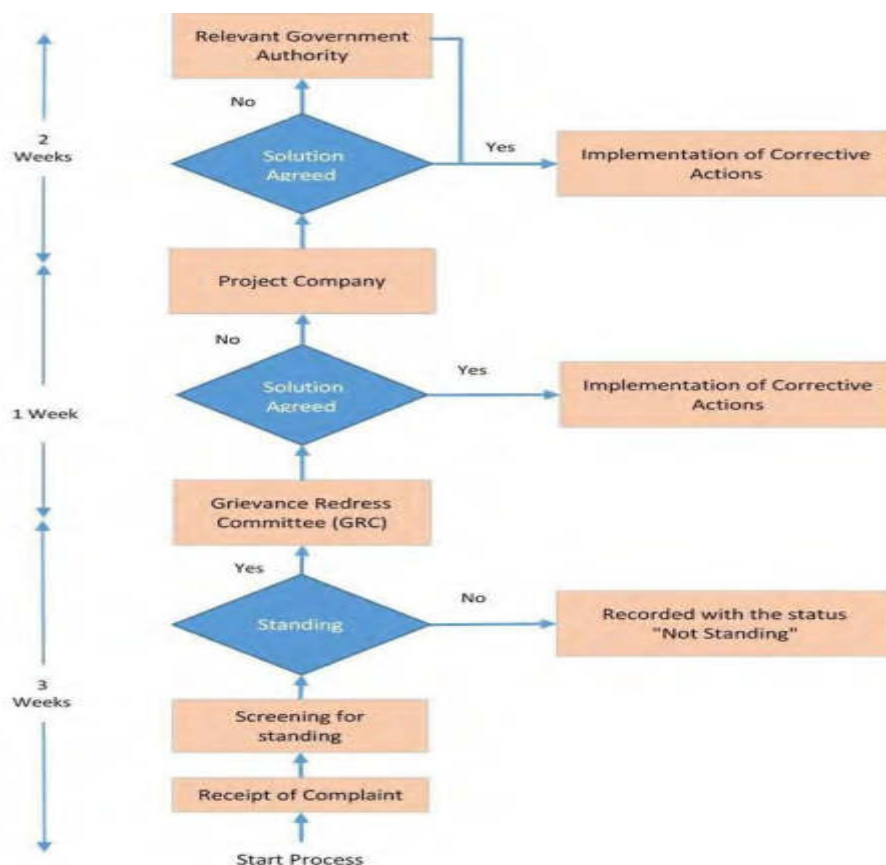
Payment for land acquisition on both sides of the project is in process. The Company has Deposited the assessed cost (100%) even for additional land whose cost has been finalized by the revenue department into Government treasuries for subsequent payment to APs. For the additional land acquired for the head pond about 97% payment has been made which is reflected in the below table. However, there is delay in the payment of compensation due to (i) unavailability of entitled land owners who are working or based in other cities or (ii) an existing shareholding dispute among the families. Status of the land acquisition is as follows;

Summary of Land Acquisition Progress and compensation payments including additional land

Village	Area (Kanal)	Award Amount (PKR)	Disbursed (PKR)	% age	No. of Persons	Persons received payment
1. AJ&K						
A. Land/Property						
Powerhouse (Alda Village AJ&K)	81.80	92,479,824	89,068,314	96.31%	196	561
Headpond (Shoran Village AJ&K)	130.75	75,181,250	74,159,019	98.64%	611	200
Weir + Headpond (Patrind Village AJ&K)	341.10	204,037,798	203,670,449	99.82%		353
Forest land for Surge Tank (Alda village)	47.75					
B. Additional Land/Property						
Weir + Headpond (Patrind Village AJ&K)	3.70	2,127,500	1,955,000	91.89%	3	19
Weir + Headpond (Patrind Village AJ&K)	10.30	6,076,540	5,562,233	91.54%	3	19
Headpond (Shoran Village AJ&K)	4.66	6,054,188	6,054,181	100.00%	3	3
C. Trees						
Alda		1,815,089	1,804,468	99.41%		19
Alda		75,546	75,546	100.00%		
Shoran		757,391	685,073	90.45%		58
Shoran		106,053	106,053	100.00%	1	1
Patrind		837,882	829,515	99.00%		32
Sub-Total	620.06	389,549,061	383,969,851	97.01%	817	1,265
2. KPK						
Land/Property/Trees						
Weir + Headpond (Sarati Village KPK)	188.70	128,557,081	114,613,320	89.15%	196	Detail Yet to receive
Headpond (Deedal Village KPK)	5.45	3,133,750	Under Acquisition Process		1	Under Acquisition Process
Headpond (Deedal Village KPK)	65.45	37,633,750			16	
Head pond (Dalola Village KPK)	1.40	805,000			1	
Head pond (Naroka Village KPK)	16.30	9,372,500			7	
Sub-Total	277.30	179,502,081	114,613,320	89.15%	221	0

GRIEVANCE PROCEDURES

GRC would be a forum for raising objections and holding discussions to resolve conflicts. Moreover, consultation with the local community and concerned public representatives and officials of the relevant line departments is an ongoing process. Relevant information to the stakeholders has always been provided in a timely manner and in a form and language that are understandable and accessible to them. A grievance mechanism has been proposed in the Environmental & Social Management Plan (ESMP) for operational phase of the project.



Complaint boxes are placed at prominent locations on both sides of the project. Furthermore, the CLOs are also engaged for community consultation and coordination and have key role in the grievance redress mechanism. The community/ APs complaints are being addressed very diligently and carefully at all levels, i.e. district and at project level.

Issues related to land acquisition and compensation requires involvement of District administration/Revenue department. For land related grievances, the land owners contact the relevant revenue department/district administration or the courts. The Company has to respond to relevant government departments since the land was acquired through LAA by the Govts.

Annexures

ANNEX-1

ENVIRONMENTAL FLOW DATA

Environmental Flow Data- 3rd Quarter-2018					
July, 2018		August, 2018		September, 2018	
Day / Sensor	1. Water Flow (m3/s)	Day / Sensor	1. Water Flow (m3/s)	Day / Sensor	1. Water Flow (m3/s)
1 Day	5.72	1 Day	3.17	1 Day	2.28
2 Day	6.58	2 Day	3.15	2 Day	2.28
3 Day	15.84	3 Day	3.14	3 Day	2.27
4 Day	2.66	4 Day	3.07	4 Day	2.23
5 Day	2.87	5 Day	15.21	5 Day	2.25
6 Day	2.87	6 Day	26.66	6 Day	2.26
7 Day	2.89	7 Day	52.56	7 Day	2.25
8 Day	2.89	8 Day	35.32	8 Day	2.23
9 Day	5.15	9 Day	11.97	9 Day	2.25
10 Day	3.1	10 Day	2.31	10 Day	2.23
11 Day	9.74	11 Day	2.39	11 Day	2.23
12 Day	109.16	12 Day	3.13	12 Day	2.36
13 Day	54.07	13 Day	3.17	13 Day	2.29
14 Day	13.47	14 Day	3.11	14 Day	2.29
15 Day	38.17	15 Day	2.33	15 Day	2.25
16 Day	2.26	16 Day	2.33	16 Day	2.29
17 Day	69.39	17 Day	2.33	17 Day	2.21
18 Day	8.8	18 Day	2.33	18 Day	2.24
19 Day	2.23	19 Day	2.33	19 Day	2.28
20 Day	8.2	20 Day	2.33	20 Day	2.25
21 Day	2.2	21 Day	2.33	21 Day	2.26
22 Day	27.47	22 Day	2.33	22 Day	2.27
23 Day	34.18	23 Day	2.33	23 Day	2.25
24 Day	91.34	24 Day	2.39	24 Day	2.21
25 Day	24.09	25 Day	2.23	25 Day	2.22
26 Day	60.56	26 Day	2.2	26 Day	2.21
27 Day	42.94	27 Day	2.21	27 Day	2.28
28 Day	2.23	28 Day	2.21	28 Day	2.27
29 Day	2.89	29 Day	2.2	29 Day	2.25
30 Day	2.6	30 Day	2.29	30 Day	2.26
31 Day	2.44	31 Day	2.29		

ANNEX-2

WASTE TRANSFER NOTES

PEST CONTROL WASTE MANAGEMENT & WATER TANK CLEANING SERVICE

PEST CONTROL WASTE MANAGEMENT & WATER TANK CLEANING SERVICE

Environmental & Social Monitoring Report (Apr-Jun 2018)

Sr. No	Environmental Management Plan (Compliance Status)		
	Feature/Issue	Parameters/monitoring	Compliance Status/Action taken by O&M
1.	Statutory Requirements	Compliance with approval conditions	<ul style="list-style-type: none"> Compliance with the conditions of approval by EPA-AJ&K, ADB's Safeguard Policy and IFC's Performance Standards is being ensured.
2.	Hydrology	River flow volume	<ul style="list-style-type: none"> Flow measuring gauges have been installed upstream and downstream of Kunhar River. The flow is being measured continuously.
3.	Head pond stability	Banks stability	<ul style="list-style-type: none"> The stability of river banks will be monitored according to the reservoir management plan throughout the project operations.
4.	Aquatic Ecology	Habitat availability and seasonal fish species and populations	<ul style="list-style-type: none"> Fish study was undertaken in 3rd Quarter, 2018. Fishing & hunting prohibited on project sites. No endanger species found.
5.	Water Quality	Wastewater treated prior to river discharge (Temperature, dissolved oxygen, pH, conductivity, turbidity, total phosphorous, inorganic phosphorous, total nitrogen, ammonia nitrogen, nitrogen oxides, biochemical oxygen demand and fecal coli forms)	<ul style="list-style-type: none"> Biannual monitoring was undertaken during the month of March, 2018 The results of analysis show that at location downstream of Jhelum river the turbidity value was on higher side. The reason for the higher turbidity is the addition of Kunhar river flow which is more turbid used for project operations and few rains in the upper reaches of Jhelum River. Kunhar River is very fast flowing river and river flow is mainly from snow melt. Kunhar River contains huge sediment load in the high flow season.
6.	Hazards/Risk	<ul style="list-style-type: none"> Monitor landslides Structural soundness 	<ul style="list-style-type: none"> Landslide monitoring shall be done on annual basis Structural soundness shall also be monitored during the operational phase.
7.	Noise	Noise levels	<ul style="list-style-type: none"> Shall be monitored according to the agreed frequencies.
8.	Solid waste disposal	Visit disposal sites	<ul style="list-style-type: none"> Waste management plan is formulated. For waste collection and its disposal, O&M operator has executed an agreement with third party contractor.
9.	Waste water discharge	Waste water quality in accordance with NEQS	<ul style="list-style-type: none"> Study/monitoring undertaken in 2018, removal undertaken as indicated in EIA.
10.	Workers' health & safety	WAPDA safety codes for powerhouse	<ul style="list-style-type: none"> HSE plan has been developed keeping in view the safety codes and is under implementation on both sides of the project i.e. powerhouse and weir

ANNEX-4 VEGETATION STUDY

Environmental & Social Monitoring Report (April-June 2013) Vegetation Study



Quarterly Study Report for July-September 2018

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1. Executive Summary

Economic, social, and environmental betterment of a state needs to have at least 25% of its land area under productive forest cover. This is very true especially for an area having hilly tract which is not suitable for growing agricultural crops. This type of area must be covered with suitable indigenous vegetative cover. Patrind Project area on both sides of the hill lies in the Himalayas subtropical zone with Chirpine as a major associate of the broad leaved trees. Forest composition, community structure, and diversity patterns are important ecological attributes significantly correlated with prevailing environmental as well as anthropogenic variables. The damming on the river system, like Patrind Hydro Power Project, has two ways impact over the vegetation; one on the Intake side and the other on the Outlet (Power house) side.

High deforestation and disturbed regeneration had been observed before the start of the project. A sharp decline in forest vegetation occurred with continuously increased levels of human and livestock interference. With the increase of the income level and decrease in land holding, the local community has decreased the number of livestock. This factor has caused a relief on vegetation but firewood and timber incidences have increased with the increase in population and households. During the last three decades, the mainstream view of deforestation in the Hindu Kush-Himalayan region attributed the phenomenon to increased local use due to population growth.

Some of the other issues relevant to low vegetative cover are common property management, including political influence, property rights, and co-management. Main tree uses are firewood consumption and timber extraction from the private and State land. The loss of vegetation is not compensated fully by reforestation and protection resulting into more forest depletion.

River damming leads to strong hydro morphological alterations of the watercourse, consequently affecting river vegetation pattern.

Major changes in riparian species pattern due to river damming takes time. More aggressive and invasive species come earlier while slow growing species take their time. There has been noticed a higher species concentration at the tail of the Patrind reservoir with pepper mulberry invasion and Phagwarr (*Ficus palmate*)

The plant landscape has significantly changed over time and along the river, particularly

as a result of the dam construction (2017). The major vegetation changes have involved riparian forests and macrophytes. Dam effect on vegetation is evident up to 13 km downstream (point of confluence with River Jhelum at Rarrah) and about 8 km behind the weir (impoundment area), and gradually decreases along an attenuation zone for about another 3 km. Woody cover on hydromorphic vegetative lands, mainly of *Ficus palmate* and pepper mulberry, increased from sparse to dense cover 2016-2017 at the tail of the lake (Shorran).

Despite the fact that the damming has caused strong local hydro morphological modification of the river ecosystem transforming it into a sub-lacustrine habitat, it has also led to the formation of wetlands of considerable naturalistic importance. Indeed, in these man-made wetlands, optimal hydrological conditions have been created by favouring both the expansion of pre-existing riparian communities and the rooting of new aquatic communities, albeit typical of lacustrine ecosystems. Some of these plant communities have become an important food resource, refuge or nesting habitats for aquatic fauna, while others fall into category of Natura 2000 habitats. Therefore, this river damming on Kunhar River seems to have indirectly had a "favourable" effect for habitat conservation and local biodiversity.

There seems to be the same positive impact on the powerhouse side because of effective protection of the site but due to short creating of the area on the hillside, it shows like a barren and deserted look.

2. Introduction

The vegetative study area is about 10 km up and downstream of river Kunhar from the weir point at Patrind (34° 20' 36" N and 73° 25' 10" E) at an elevation of 2516-3123 ft. a.m.s.l) and around the powerhouse at Alda (34° 20' 06.05" N, 73° 27' 18.6" E) in AJK. It covers both the eastern aspects on the left bank of river Kunhar and right bank of river Jhelum in AJK. Total Area is about 100 Acres.

2.1 Objectives:

- a) Immediate objective of the study is 'to assess the impact of the Patrind Hydropower Project on the vegetation of the area and to restore it by appropriate means'.
- b) To overcome the losses in shape of land erosion and green belts due to the project activities.'

2.2 Scope of the work:

The area needing attention for addressing the issue is lying at the back of the powerhouse at Alda and behind the intake on Patrind side. The interventions required to address the issues are:

- a) Cover it with suitable plant species
- b) Make the area green
- c) Stabilize the landslides by appropriate technology
- d) Protect the area from forest fire

As the area does not only cover the project site but it also needs to cover the private land on Patrind side and Government land on the Alda side. So, it is important to involve the stakeholders for the restoration of the plant cover, adopt protective measures to control forest fires and stabilize the landslides. It is not recommended to pay the stakeholders for these works but they should be taken on board while working in the area through the technical expertise provided by the project authorities.

3. Forest Types (Ecological Zonation):

The Patrind project area lies in the Sub-tropical ecological zone of the country. This zone is again classified in:

- a) Subtropical Scrub forest with broad leave tree species in the foot hills.
- b) Subtropical Chir pine Forest with a major tree species of Chir Pine.

4. Vegetation Cover

The dominant species of the area is Chirpine associated with broadleaved species and bushes. Major associates on the Patrind side are Walnut (*Juglans regia*), Drek (*Melia azedrach*), Phagwarr (*Ficus palmata*) and Amlok (*Diospyros texanum*). There are no Chirpine trees in the project area of powerhouse and itake side but outside the boundary its density is quite good with some wide gaps. This is the forest area up to the top of the hill and other side of the hill is private land. River systems around the globe are being increasingly impacted by damming, diversion, or abstraction in order to satisfy an increasing demand for electricity, water for agricultural, industrial and domestic uses. The environmental consequences of water dams are numerous and varied, depending on their size and nature and include direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments.

Another significant and obvious impact is the transformation upstream of the dam from a free-flowing river ecosystem to an artificial slack-water reservoir habitat. Changes in temperature, chemical composition, dissolved oxygen levels and the physical properties of a reservoir are often not suitable to the aquatic plants and animals that evolved with a given river system. Indeed, reservoirs often host non-native and invasive species (e.g. snails, algae, predatory fish etc.) that further undermine the river's natural communities of plants and animals.

The alteration of a river's flow and change in sediment transport downstream of a dam often causes the greatest sustained environmental impacts. Life in and around a river evolves and is conditioned on the timing and quantities of river flow. Disrupted and altered water flows can be as severe as completely de-watering river reaches and the life they contain. Yet even subtle changes in the quantity and timing of water flows impact aquatic and riparian life, which can unravel the ecological web of a river system.

A dam also holds back sediments that would naturally replenish downstream ecosystems. In aggregate, dammed rivers have also impacted processes in the broader biosphere.



View of Powerhouse Site Patrind Hydropower project- Unstable soil around the surge shaft area



View of Weir Site Patrind Hydropower Project- Slopes are well Protected and dense vegetation at powerhouse

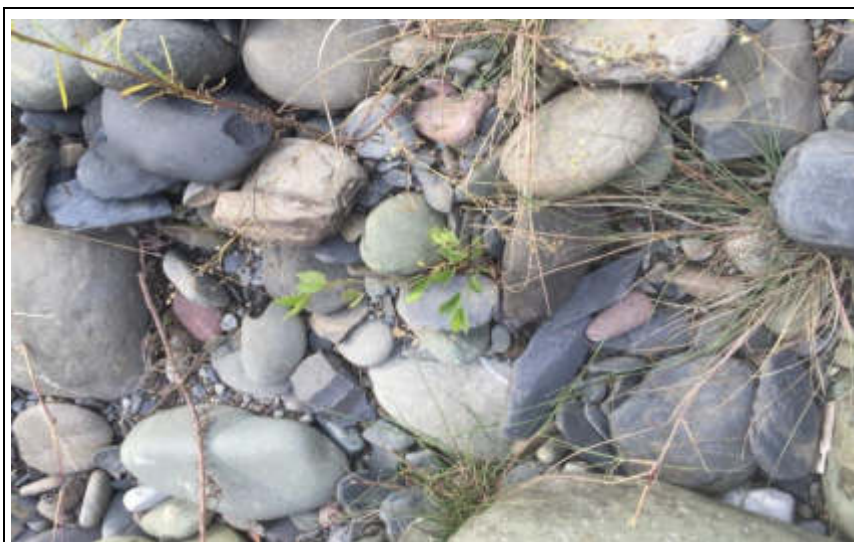
5. Methodology

Survey was conducted on both the sides of the project area. Downstream 10 km and upstream 10 km area was observed and possible impact was noted. Similarly, the area behind the powerhouse was also surveyed in detail. Gaps in the forest cover were measured, land slide details were taken, Success percentage of planted species inside the forest area and on the tunnel outlet were recorded. The species combination was also recorded and site observation was made for the selection of appropriate plant species beneficial for these types of slopes. Landslide surveyed and different techniques were spelled out to stabilize it to a maximum possibility. Biological, Bio-engineering and Engineering techniques were identified in different parts of the slide.

6. Impacts of Dam:

Dam has impacted the aquatic vegetation with the change in the quantity and quality of water. Water temperature is higher during the summer months and low during winter season. Algae and Lichen and other phytoplankton are observed in more concentration. This may impact the fish life and fish species combination. The drifted seed by the high river has got established on the soil media of the river Kunhar where it found a suitable place. The species observed are;

- a) Bakain (*Melia azedrach*)
- b) Ailanthus (*Ailanthus anus*)
- c) Wild Fig (*Ficus palmata*)
- d) Mulberry (*Morus alba*)



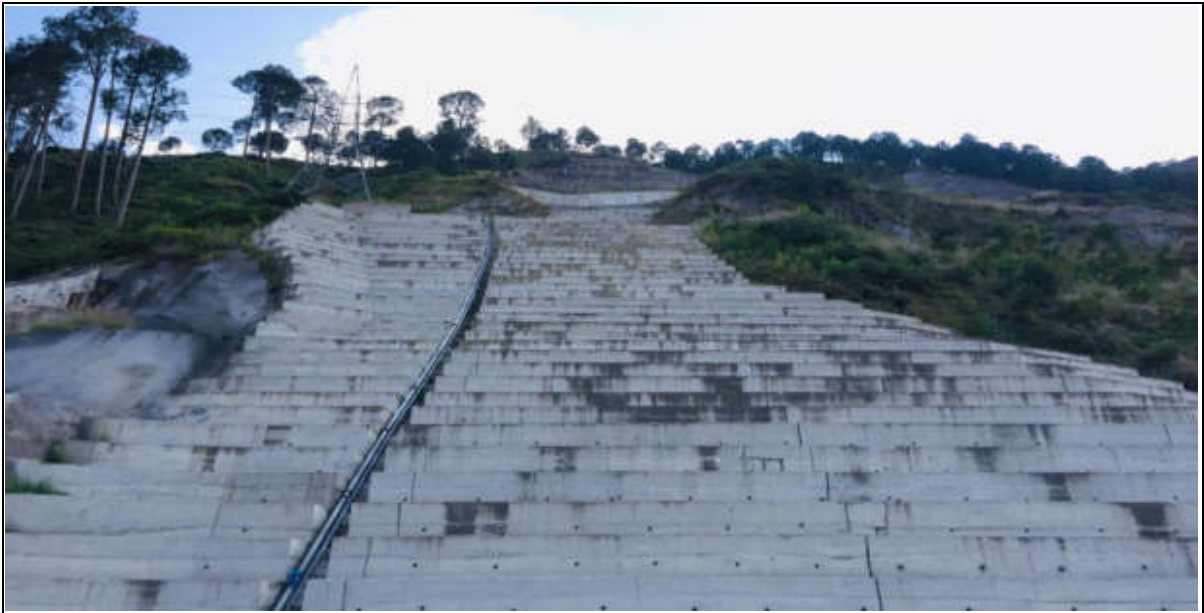
Riverside growth of (Dodonia viscosa) germinated through river drifted seed

The riparian species on the sides of the river is good in health and no dieback has been observed. So it shows that the Project has a good impact on the plant species at sides. The plant species at Boi and at the tail of the river, near Dalola village have become very dense after the dam construction as the moisture content and temperature level has suited

to these species.

7. Impact of Tunnel outlet and powerhouse

The site of the tunnel outlet has been strengthened with shotcreting but it also has lost the green belt.





Step wall at Powerhouse site to protect the soil erosion and land sliding

8. Discussion

8.1 Environmental influence on species distribution

It has been examined how reducing or changing the pattern of water flow in the main river will affect the riparian or hydromorphic vegetation. The change in water temperature will have a positive effect on the growth of lower aquatic plants like lichens and algae. Downstream low flow has an impact on the air temperature as well effecting the riparian plant species. The growth of plants in the open sun will be higher and change in the species composition also noted as more aggressive plants like Pepper Mulberry, Ailanthus and Robinea are showing the dominance over the shade and low temperature loving plants like Ficus, Salix, Adhatoda, based on their distribution in relation to elevation above at a distance from the river.

The plant canopy coming up with the changed pattern of the flow shows an excellent plant health with no dead individuals or canopy dieback. Other weeds are coming up rapidly and summer landscape looks lush green. This shows a positive impact on the vegetation on Dam side of the project.

	
Plantation cover beside powerhouse between transmission lines	Plantation cover at 4 th corner. These are planted during the construction phase

9. Findings and Observations

- i) The detail survey and observations of the area reveals that the impact of the Patrind Hydro Power Project on the riparian plant species and vegetation of far of the bank has no considerable negative impact. More green area is expected to appear with the river in low-flow as the plants will have a new space to get established in the downstream area. The species survival will depend on the degree of water flow changes. More floods will wash away the saplings but once the root system is established in the soil to sufficient strength, the temporary changes in the flow regime will not affect the well-established vegetation.



Survey during the study at powerhouse site for site identification for
Plantation

- ii) The area around the weir and the steep slopes behind the obstruction have been concreted to control the soil merger or slump. The right bank has been strengthened with wire stone gabion provision at this place.



Walls at weir site to avoid soil erosion

- iii)** Dieback of the species is no more a problem and the plant species growing on both sides of the impoundment are in a good health condition.
- iv)** The tail area of the impoundment is very rich in species population. Although the moisture loving plants are dominating here but the green patches show a good look near the bridge of Shoran village.



Green patches show a good look near the bridge of Shoran village.

- v)** The area around the power house is mostly shortcrested but some soil beds are planted with mixture of species. Dieback of Chir pine plantation under the high power transmission line and on the side slopes has been observed.



Area at powerhouse site showing step walls and plantation

- vi)** One small slide has appeared this time behind the powerhouse at Corner number 1. This needs attention. December is the ideal month to treat this slide and will give a good reputation to the project authority by stabilizing the slide and making it green. Biological, engineering, and bioengineering treatment is required to establish this land slide for making it green. December and January is the right season for these activities. The area treatment plan should become the part of the vegetation Management Plan. Portion wise detail mentioned in that plan is needed.



Area eroded due to rainfalls at powerhouse site

- vii)** A dense cover of weed (Benthium species) has been observed just behind the residence. Its existence is dangerous not only for the human health but also for more plants to come in that area as this secretes a hormone in the soil which is noxious for other plants. This should be removed mechanically as it causes skin itching if touched with bare hands.
- viii)** Fire controlling measures have to be adopted as chirpine zone is very much prone forest fires and sometimes such fires cause the stones and boulders roll down which are dangerous for the project infrastructure.

10. Plant species checklist

Following Tree species were documented in the project area both in Patrind and in Alda:

<u>Common Name</u>	<u>Botanical Name</u>	<u>Type of Tree</u>	<u>Status</u>
Akhrot (Wallnut)	<i>Juglans regia</i>	Fruit	common
Anjeer	<i>Ficus carica</i>	Fruit	rare
Batang	<i>Pyrus patia</i>	fruit	common
Batculd	<i>Celtis australis</i>	soil binder	rare
Beence	<i>salix spp</i>	Firewood	common
Ber	<i>Zizyphus mauritiana</i>	fruit	common
Chir	<i>Pinus roxburglii</i>	Timber	common
Dhaman	<i>Grewia oppositifolia</i>	Fodder	common
Drawa	<i>Ailianthus anus</i>	firewood	common
Drek	<i>Melia azadrach</i>	firewood	common
Kangarr	<i>Pistacia khunjak</i>	soil binder	rare
Kau	<i>Olea cuspidate</i>	Agri tools,	common
Kiker	<i>Acacia nilotica</i>	Firewood	common
Nim	<i>Azadirachata indica</i>	Firewood	common
Phagwarr	<i>Ficus Palmata</i>	soil binder	common
phulai	<i>Acacia modesta</i>	firewood	common
Pipal	<i>Ficus religiosa</i>	Firewood	common
Robinia	<i>Robinia pseudoacacia</i>	firewood	common
Shahtoot	<i>Morus Alba</i>	Fruit	common
Sherol	<i>Alnus nitida</i>	Firewood	common
Snatha	<i>Dodonaea viscosa</i>	soil binder	common

The main contributor grass species were *Heteropogon contortus* (Sariala), *Cenchrus ciliaris* (Dhaman), *Desmostachya bipinnata* (Dab ghaas), and *Cynodon dactylon* (Khabbal).

11. Conclusion

- There is a good impact on the health of the plants on dam side because of the humidity and temperature increase along the riverside
- Left side of the reservoir needs strengthening either with concrete or with wire stone gabions.
- Chir pine saplings of two to three-year age should be planted or replanted under the transmission line and in the rest of the gaps in the forest.
- There is need to plant selected plant species which are soil binders, protectors, and controller of soil erosion. Species which are preferably required to be planted are: Drek (*Melia azadirach*), Fig (*Ficus palmata*), Anjeer (*Ficus carica*), Mulberry (*Morus alba*), Kahu (*Olea cuspidata*), Willow (*Salix* species), Dhaman (*Grevia oppositifolia*), Silver Oak (*Grevia robusta*) Batculd (*Celtis australis*) Walnut (*Juglans regia*), Narri (*Arundo donax*), Poplars (*Populus nigra*, *P. ciliata*, *P. alba*), Robinea (*Robinea pseudoacacia*), Ailanthus (*Ailanthus altissima*), Shisham (*Dalbergia sissoo*), Snatha (*Dodonia viscosa*)
- Cuttings and root shoot cuttings can also be planted for the species which have the viability for this. All species of willow, all species of poplars, mulberry and root-shoot cuttings of Drek, Shisham, Robinea, Ailanthas
- Sowing of tree species Shisham, ailanthus, Robinea, Dodonia and Chipine sowing in the Chir pine area. Where access is not possible the sowing can be carried out by the method of Bomb or ball sowing, especially in difficult patches of the slide.
- Grass sowing and tufting is better on the loose soil of the slide. Native grasses should be selected for that and their seed can be collected in October-November.



Pic: *Stipa sabrica* (Chanja grass) good for tufting in the slide area

- ii) The land slide stabilization interventions include biological, bio-engineering and Engineering and activities can be summarized as:

Biological:

- Planting: Planting of bare rooted plants in the dormant season (December-January), Planting of tube plants, planting of cutting sand stumps, planting of root-shoot cuttings, tuft planting of grasses.
- Sowing: Sowing of local tree species seeds, sowing of local bush species seeds, sowing of native grass seeds
- Protect and encourage natural regeneration of local species

Soil Bio-Engineering Measures:

- Retaining walls: vegetated crib walls, vegetated concrete block walls, vegetated soft gabion walls, live brush wood wall
- Check dams: Single row post live brush wood check dams, double row post live, brush wood check dams, palisades
- Barriers on loose soil slopes: brush wattles, brush layering, hedge layering, brush-hedge layering, rush fence, sodding



Pic: Bio-engineering work at Kohala road

Engineering:

Wire stone gabions, RCC retaining walls, loose stone walls, Cut-off drains, perforated pipe drains, Concrete walls, pcc walls, cement sand crush stone masonry, and plumb walls.

12.Recommendations

- There is a very positive impact of the dam on the riparian species down and upstream and new watch and ward system will improve the position in the area. This watch and ward should be continued in a longer run for the sustainable establishment of natural vegetation cover along the riverside.
- It was suggested in the previous study reports to apply the biological, engineering and Bio-engineering technology to control the adjacent slide effectively which include vegetated soft gabions, vegetated loose stone walls, gabion check dams, live brush wood check dams, planting, sowing and tufting, dry seeding, hydro seeding, hay

seeding, grass sodding, sowing with geo- textile sheets, brush wattles, brush layering, hedge layering, semi-dead fences with live hedges. Patrind Hydropower agency should use this technology with a team of experts and should begin with small erosional features on small slopes before working on large slopes.

- The concreted area has provision of steps which can be used for placing earthen pots with some creepers to represent a pleasant view
- The area under the Power Poles at corner 4 should also be planted with ornamental plants for the land cover and beautification



Pic: Satellite image of landslide area with marked details

13.Acknowledgements

I am thankful to the administration of Patrind Hydropower Project to show their confidence in me to conduct this study. They not only provided me the logistic facility but their relevant staff also supported me during the field visits. My special thanks to Mr. Qamar, Mr. Sundas and Mr. Imran Yousaf for their valuable inputs during all my field work.

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ANNEX-5

FISH STUDY - PATRIND HP

Patrind Hydropower Project
Fish Study



By:

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1. Executive Summary

The K-Water Company has constructed the 147 megawatts (MW) Patrind Hydropower Project on the Kunhar River. The Project is located about 13 km upstream of the point of confluence of River Kunhar with River Jhelum, straddling the state of Azad Jammu and Kashmir (AJK) and the province of KPK. The Project will generate electricity to be fed into Pakistan's national transmission network. Main features of the Project include about 80 m high dam, and a reservoir that will extend about 8 km upstream of the dam wall. The fish and aquatic life in the Project area is under pressure from illegal fishing, use of dynamites, poison and unregulated sand and gravel mining which damage the fish habitat and breeding areas. These pressures, though limited, are projected to increase over time. Developments in similar rivers in the region indicate that if present trends continue, the damage to river ecology will be highly significant in the long run, possibly overshadowing the impact from the Project itself.

There are 12 fish species reported in Kunhar River and its tributaries upstream of confluence point of Kunhar with Jhelum River that are important breeding grounds for fish. In addition to Mahaseer and Alwan Snow Trout that are classified as Endangered and Vulnerable respectively in the IUCN Red List of Threatened species. There are fish species present that are endemic,

only found in this region of the world. In addition to Mahaseer and Alwan Snow Trout, species of food value include the Common Carp as well. The most affected fish species will be the comparatively long distance migratory Alwan Snow Trout which migrates from downstream elevations in spring to

higher upstream elevations for breeding and returns to lower elevations in the fall. The Dam has blocked its migration resulting in significant decline in its population downstream of the dam. The Endangered Mahaseer shows local movement between the main river where the larger specimens take refuge in winter, and tributaries in the summer where they breed. This species is almost extinct even before the inception of the Patrind Project. In addition, the reservoir created by the dam will not be the preferred habitat for the fish that are naturally adapted to river conditions.

The dam might be operated in the peaking mode in the winter season when the river flow drops. In this mode of operation, water is stored in the reservoir during the day, and

released through power generation turbines for three to four hours in the evening to meet the peak electricity demand. Environmental issues that are of concern with such a mode of operation include an adequate release of water through the dam when the water is being stored in it to support the aquatic life (environmental flow), and the impact of sudden changes in flow on aquatic life when the water is released from the dam for peaking purposes.

The impact on the aquatic life can be reduced to a certain level and for that mitigation measures were suggested in the study reports carried out during the construction and then operational phases of the project. Many rising issues have already been addressed during the construction phase but still there are various shortcomings which need to be resolved during this time to minimize the impact of damming on the river.

Fisheries management as applied to dams is perceived to be problematic and difficult due to the severe changes in hydrology and the impacts on fish that occur. The impact of Damming on the Kunhar River is now very conspicuous as a result of fresh impact assessment study. Some new fish species are appearing downstream with changes in the river ecology. Similarly, the aquatic vegetation is also changing hence the food chain for a particular fish will have a change. Some other aquatic animals like amphibians, arthropods and mollusks are getting established in the downstream with the changed hydrological flow, less quantity of water and change in the water quality, especially the water temperature.

2. Introduction

The construction of dam and reservoir projects plays important roles in the development of Pakistan's hydropower and the regulation of water resources. However, it also makes a profound effect on the regional ecological environment. It has become the key issue of dam and reservoir projects how to coordinate the relationship between construction and environmental protection, and to realize their harmony development. Owing to dam and reservoir projects have long construction period, big investment, broad social impact and complex social issues etc. The actual effects of the completed project prone to deviate from the predicted results of EIA. After dam and reservoir projects are completed, the actual environmental impact can be investigated by EIPA (Environmental Impact Post Assessment).

Objectives:

- a) Restore the native fish population in the affected area of the Patrind Project
- b) Aquatic Habitat protection and improvement to required minimum level.

The environmental quality needs to be repeatedly assessed for the constructed Patrind dam under the project, and thus some remedial measures should be taken to minimize the impacts.

2.1 Construction of Hatchery facility for native fish Species

Patrind Project has been completed and became operational in 2017. This study relates to the post project impacts on the aquatic fauna of River Kunhar. There is one more such project in pipeline on River Kunhar around the Town of Balakot. This intervention will change the biodiversity of the whole river system. No attention has been paid to develop hatcheries for the native cold water fish species anywhere in Pakistan. Province of Punjab has developed one Mahsheer hatchery and AJK Fisheries department is also planning to develop one Mahsheer hatchery to restock it in Poonch River and its tributaries. One new hatchery facility for native fish species is a part of the proposal under Kohala Hydropower project. Nepal has worked on producing juvenile of *Shizothorax* species in Pokhara region but there is no such hatchery in Pakistan, AJK and Gilgit Baltistan.

2.2 Legal, Regulatory Requirements and Obligations under International Treaties

The legal and institutional requirements both for AJK and KP are listed below:

These requirements relate to the policies, laws, and institutions at the national level, within both the province of KP and AJK, as well as the international conventions and obligations to which Pakistan has agreed to be a part.

Sr. No	Laws/Policy/Act	Explanation
01	National Conservation Strategy (1992)	The NCS is the principal policy document for addressing environmental issues in Pakistan. It determines the country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources. Core areas relevant for the Project include the protection of water bodies, conservation of biodiversity, development, and deployment of materials for renewable energy, pollution prevention, and control, integrating people and environmental programs and the preservation of cultural heritage.
02	National Environmental Policy (2005)	This policy aims to conserve, restore, and manage the environmental resources of the country and provides an overarching framework for addressing environmental issues in Pakistan, particularly pollution of fresh water bodies, air pollution, waste management, deforestation, loss of biodiversity, desertification, natural disasters and climate change. It also gives directions for addressing cross-sectorial issues as well as meeting international obligations.
03	National Water Policy (drafted; not adopted to date)	The National Water Policy's objectives include, amongst others, efficient management and conservation of existing water resources, optimal development of potential water resources and improved flood control and protective measures.

04	National Biodiversity Action Plan	The national BAP sets out a strategy for action under 13 main components which correspond to the Articles of the CBD: planning and policies, legislation, identification and monitoring, in-situ conservation, ex-situ conservation, sustainable use, incentive measures, research and training, public education and awareness, EIA, access issues, exchange of information and financial resources. For each component, the issues relevant to Pakistan are identified and a list of objectives and corresponding actions are recommended to deal with the identified issues. Slowing the rate of biodiversity loss in Pakistan is a key objective in the national BAP and will require policy and institutional reform as well as institutional strengthening to better understand the elements of biodiversity and the most effective means for ensuring the conservation and sustainable use of these elements. The active participation and support of local communities will be essential for in-situ conservation. The national BAP also calls for greater collaboration between government agencies, local communities, and NGOs to work together as partners in biodiversity conservation.
05	Azad Jammu and Kashmir Environmental Protection Act 2000	The Azad Jammu and Kashmir Environmental Protection Act, 2000 is the principal legislative tool used for regulating environmental protection in the state of Azad Jammu and Kashmir. The Act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, and noise pollution, as well as to the handling of hazardous wastes. The responsibility to implement the provisions of the 2000 Act lies with the Azad Jammu and Kashmir Environmental Protection Agency (the 'Agency' or 'AJK-EPA').
06	AJK Wildlife (Protection, Preservation, Conservation, and Management) Act, 2014	It aims to consolidate the laws relating to protection, preservation, conservation, and management of wildlife in Azad Jammu and Kashmir. It is aimed at promoting social, economic, cultural, and ecological well-being of local communities in conformity with the concerns of the international communities. It outlines the roles and responsibilities of government organizations and departments primarily the AJK Wildlife and Fisheries Department that has the basic responsibility to ensure enforcement of the Act. The Act recognizes that it is necessary to fulfil the obligations envisaged under the biodiversity related Multilateral Environmental Agreements ratified by the Government of Pakistan.

07	AJK Fisheries Regulation 1960 (Bikrmi)	This act aims to enforce the fisheries protection and conservation in River Jhelum, River Poonch and River Neelum and its tributaries, and Reservoir Fisheries, Cold water and warm water fisheries and their habitats.
08	KP Fisheries Act	This Act aims to enforce the overall protection of fisheries resources through issuance of permits to catch fish. Fish catching is strictly prohibited during the breeding season.

2.3 Obligations under International Treaties:

Pakistan is a party to a number of conventions in relation to biodiversity, including the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands of International Importance (Ramsar Convention) and the United Nations Convention on Biological Diversity (CBD).

Convention	Date of Treaty	Entry into Force in Pakistan
Convention on Biological Diversity (CBD)	1993	26 Jul 1994
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	1975	19 Jul 1976
Convention on Conservation of Migratory Species (CMS)	1979	01 Dec 1987
International Treaty on Plant Genetic Resources for Food and Agriculture	2004	02 Sep 2003
Convention on Wetlands of International Importance especially as Waterfowl Habitat	1971	23 Nov 1976
Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC)	1972	08 December 2011.

Table 1: International Agreements on Biodiversity and Status of Entry into Force

3. The main contents of dam and reservoir projects EIPA

EIPA (Environmental Impact Post Assessment) of dam and reservoir project mainly

focuses on water temperature, aquatic livings, terrestrial livings, hydrological regime, environmental geology, landscape and heritage, and the resettlement of migrants from reservoir.

3.1 water temperature

The Patrind dam on the Kunhar River has changed the hydrological processes and hydraulic conditions of the river, and also modified the thermodynamic state of the river, which thus changed water temperature. The typical water temperature effect of the reservoir is the vertical thermal stratification. Water temperature change is mainly due to the downstream E-flow of water and flooding, impoundment created behind the obstruction and tail of the reservoir. During summer the water temperature downstream was recorded as 19oC while upstream it was 15oC with a clear difference of 4oC. The water temperature upstream and downstream was the same during this study of October 2018.

3.2 Aquatic livings

The impact of Patrind dam and reservoir on aquatic livings focused on the effects on fishes. The dam blocking has a serious impact on migratory fishes due to destroying and disturbing their spawning, breeding and their habitats, which forces the fishes from the river water gradually transform into the lake fishes, and make some environment-sensitively fish species be endangered. Therefore, the number and types of fishes will change, especially the Cyprinids which are the bottom feeders and comparatively needing higher dissolved Oxygen (8 ppm). The impact is also seen on the planktons (phyto- and zoo planktons), as the change in water and atmospheric temperature and water quantity supports different planktonic combination, impact on habitat with effects on spawning grounds.

3.3 Hydrological regime and downstream

For storing and regulating water, the dam has changed the process of runoff and sediment downstream, and the flow rate, water level and sediment transport, and so on, which has caused the impact downstream. The dependent people on sand and gravel has stopped due to no sedimentation process. The sampling point-1 at Boi used to be the favorite place for jeeps load of this construction material but it is no more found in that area.

3.4 Water quality

Dam construction has expanded the water area of the reservoir, deepen water depth, slow water flow rate, and decreased the diffusion of pollutants, and thus the concentrations and distribution of pollutants in the waters of the reservoir has changed. Reservoir stores a lot of nutrients such as nitrogen, phosphorus, potassium, and thus promoting algae growth. This might cause the potential eutrophication of the reservoir. This concentration has been observed higher during the summer months. The environmental impact of water quality mainly focuses on the source and distribution of pollutants after storing water, changes of water quality in the reservoir, the trend of eutrophication, the status of pollutant enrichment in bottom sediments, water quality of the outflows from the reservoir and downstream.

3.5 Reservoir Bank Stability

Reservoir banks' stability is susceptible to change as it has not been strengthened at the left bank of the reservoir and bank is more likely to slump in the future.



Pic 2: TDS meter for Total Dissolved solid monitoring



Pic 3: Left side of the reservoir needs strengthening

3.6 Terrestrial and migratory livings

The reservoir at Patrind has regulated the local climate, and vegetation types are rich around the reservoir. Moreover, the larger water body has attracted the migratory birds

(water fowls) and provided the wet environment suitable for a number of waterfowl habitats. The change in other terrestrial flora and fauna will take time.

3.7 Landscape and Heritage

Some of the natural landscape and heritage has submerged, destroyed or disturbed by the dam and reservoir meanwhile, the reservoir has added the new landscape. The landscape at the disposal point has been enriched by developing a children playground by putting forward the better measures for further utilizing heritage landscape. Another very positive impact of dam has appeared as recreational and entertainment activities have started upstream in and around the lake. The recreational park developed at the disposal point has become a good place for families to visit. Before, there were two colorful water boats introduced but now the number has increased in the lake near the village Shorran and at side of the recreational park at Disposal point. According to the operator, Mr. Hamad, he has paid an amount of Rs. 600,000 for one year to KP Local Government for operating these boats but none on the AJK side.



Pic 4: Satellite Image of Park at point # 5

4. Present Status of Patrind Project

Atmospheric temperatures prevailing at Muzaffarabad are more relevant to the Project area on Patrind side. The months of May to August are the hottest months with temperature ranging between 26°C to 42°C while December to February are coldest with

temperature varying between 6°C to 11°C. Fish study was undertaken in the Kunhar River reaches of the Project area. Fish fauna survey was conducted at six selected sites to find out the kind, number and quantity of fish available. No Fish could be caught during this study. This is the time when fish migrates downstream and takes refuge under the boulders. The river water is crystal clear with a low quantity and temperature and centered flow. The Patrind project is in its operational phase. An average of 2.3 cm³/S e-flow is now observed strictly sensors have been paced to ensure the minimum e-flow of water. There is no catch of species during this study as of October 4, 2018.

5. Environmental Impacts of Dams

The environmental consequences of large dams are numerous and varied, and includes direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments.

The dam wall itself blocks fish migrations, which in some cases and with some species completely separate spawning habitats from rearing habitats. The dam also traps sediments, which are critical for maintaining physical processes and habitats downstream of the dam (include the maintenance of productive deltas, barrier islands, fertile floodplains and coastal wetlands).

Another significant and obvious impact is the transformation upstream of the dam from a free-flowing river ecosystem to an artificial slack-water reservoir habitat. Changes in temperature, chemical composition, dissolved oxygen levels and the physical properties of the reservoir are often not suitable to the aquatic plants and animals that evolved with a given river system. Indeed, reservoirs often host non-native and invasive species (e.g. snails, algae, and predatory fish) that further undermine the river's natural communities of plants and animals.

The alteration of a river's flow and sediment transport downstream of a dam often causes the greatest sustained environmental impacts. Life in and around a river evolves and is conditioned on the timing and quantities of river flow. Disrupted and altered water flows can be as severe as completely de-watering river reaches and the life they contain. Yet even subtle changes in the quantity and timing of water flows impact aquatic and riparian life, which can unravel the ecological web of a river system.

A dam also holds back sediments that would naturally replenish downstream ecosystems. Riverbed deepening (or "incising") also lowers groundwater tables along a river, lowering the water table accessible to plant roots (and to human communities drawing water from wells). Altering the riverbed also reduces habitat for fish that spawn in river bottoms, and for invertebrates. Since the area of Patrind HPP lies in the mountainous terrain, so the impact on ground water table around the river is not impacted as several perennial nallahs and creeks make a rich watershed contribution to the area.

Very prominent impact was noticed during this time of the study. Lichens and Algae production has increased and air temperature on the sides of the river is comparatively warmer impacting the side vegetation as well.

The fish presence in the lake has no evidence. Even the start point at Shorran has no fish.

6. Impact on fish Migration from River Jhelum

The fish migration from Jhelum River to Kunhar River at the point of confluence at Raaraa would have been taking place for Mahsher (*Tor putitora*), Snow Trout (*Schizothoracinae*) and other migratory species. The water level has gone downstream in River Kunhar so if any migration existed before the Patrind Project will not be taking place now. The lack of long term data on water quality, plankton concentrations and fish populations limits the conclusions that can be made about the aquatic ecology in the Project area. The scope of present study does not require covering of fish fauna present in Jhelum River along with its migration status. There is almost no possibility of upstream migration of fish fauna above Mangla Dam to the Project area as authenticated by the study results and supported by the local information recorded through the interviews. Thus, it can be safely concluded that the proposed Project will have an impact of river ecology in the stretch of 13 kilometers below the weir point due to shortage of water and 8 kilometers above due to raised water in the shape of reservoir. There will be no impact on the available fish fauna as well as the migration of fish species above Mangla dam.

7. The Fish

During the steep fall in temperature in winter schizothoracines migrate from headwaters to lower altitudes where they represent a sizeable part in fish catches in large rivers and their

tributaries. The rise in temperature in Kashmir and Kunhar streams from near-freezing level to 10-18°C during May-June induces *S. plagiostomus*, *S. labiatus* and *S. curvifrons* to spawn. During the upstream migration the fish still finds itself in waters of low temperature of 8.0-9.5°C, owing to the steady influx of snow-melt water. This induces the species to migrate to and spawn in side streams or points of warm and cold water confluence, which receive warm ground water of 17.5-21.5°C. In the same drainage *S. plagiostomus* and *S. curvifrons* migrate and spawns from September to December at 15.0 to 21°C. The eggs are large-sized (3.0-4.0 mm diameter) and sticky in nature. They are laid in shallow pools (50-70 cm depth) and remain adhered to the substratum until the hatching of fry.

The fast-swimming species of mahseer, trout and schizothoracines expend much energy in maintaining an upright position in the turbulent and fast current. The fluctuating discharge of water and drying out of streams, leaving only isolated pools or no water at all, is another important matter. A general observation during the last studies on seasonal fluctuation in river discharge in Kunhar river system indicate that the range of mean flow from October to March (winter months) represented only 8-10% of the total annual flow. There are also variations from year to year depending on the winter and monsoon precipitation. Reduction of torrential streams, especially after the construction of the dam, to stagnant pools exposes the fish to terrestrial predators and to depletion in dissolved oxygen concentrations, especially when autumn leaf fall takes place. However, due to low temperature, the level of dissolved oxygen may not fall below the optimum required by cold water fish (7.0-8.0 mg l⁻¹). As soon as the flow is restored with spring rains and snow-melt water a rapid re-colonization of the stream takes place.

Schizothorax and Schizothoracichthys spp are dominant among the cold water fish in river Kunhar in terms of catch and abundance in all seasons. The substratum was consisting of boulders, stones, gravel, and patches of aquatic vegetation in the pools but now the speed of the water flow has reduced thus breeding pools have disappeared and need to be developed artificially so that a required substratum conditions are available for the fish to breed.

As a result of this study in river Kunhar it shows that a gradual increase in water temperature corresponds to a decrease in dissolved oxygen, decline in the density of nymphs of mayflies and stoneflies, but in an increase in larval and adult aquatic beetles. The information collected during expeditions is based on spot measurements and it does not represent average values. River Kunhar has a rich potential in supporting a diversity of fish resources. Due to hydrological changes, stream flow pattern, very high and devastating

floods of 1992 and beyond that, illicit hunting of fish by the use of destructive means like explosives, poisoning, electric currents etc. Common Otter (*Lutra lutra*) used to be very common once in the area, but now this has disappeared and most probably it is no more existing in River Kunhar. No fisheries staff had ever been interacted during the study period. The departments of Fisheries of Khyber Pakhtoonkhawa and AJK have not been able to protect the river Kunhar below the town of Gharri Habibullah most probably due to the shortage of conservation staff with them.

There is need to develop coordination with the Fisheries departments of AJK and KP while developing the Fisheries Management Plan for the project area. They must be involved together with the local community in planning any commercial activity of fisheries management of the reservoir.

The main natural factors which influence fish life in the Himalayan streams are: (i) current of velocity; (ii) fluctuation in water discharge; (iii) water temperature and dissolved oxygen level; (iv) substratum; (v) shelter from the current; and (vi) food availability represented mostly by organisms clinging to and growing on rock and stone surfaces in fast current.

Snow trout, a cold water riverine and medium migratory fish, is locally known as Malli or Swati. It belongs to the family Cyprinidae and sub-family Schizothoracinae which are widely distributed in the Himalayan and sub-Himalayan region and much of the rest of Asia. Altogether 28 species of Schizoranae are reported in Himalayn river waters but only three of genus Schizothorax are recorded in the study area of river Kunhar i.e., Schizothorax curvifrons, Schizothorax labiatus and Schizothorax plagiostomus and two of them are common in river Kunhar. All the species are phytophagous fish, bottom feeder and have developed a special mouth to scrape the algae attached on stones. They spawn twice a year during September/October and March/April, but September/October is the best season for spawning. Clear water, stony bottom of creeks composed of fine pebbles and gravel, and water flow of 2.8-4 m/sec, pH 6-7 and dissolved oxygen concentrations of 8-15 mg/L form good spawning conditions in the natural environment. This study, unlike the last study of July 2018, shows that the fish has migrated from upstream to downstream from upper most reach of the outlet of the weir after spawning to lower reaches. The water colour is transparent and fish catch has become near to impossible as no fish could be caught by cast and gill nets.

A general observation during the last studies on seasonal fluctuation in river discharge in

Kunhar river system indicate that the range of mean flow from October to March (winter months) represents only 8-10% of the total annual flow. There are also variations from year to year depending on the winter and monsoon precipitation. Reduction of torrential streams to stagnant pools exposes the fish to terrestrial predators and to depletion in dissolved oxygen concentrations, especially when autumn leaf fall takes place. However, due to low temperature, the level of dissolved oxygen may not fall below the optimum requirement of Coldwater fish (7.0-8.0 mg l). As soon as the flow is restored with spring rains and snow-melt water, a rapid re-colonization of the stream takes place.

Schizothorax species are dominant among the cold-water fish in river Kunhar in terms of catch and abundance in all seasons. The substratum consists of boulders, stones, gravel, and patches of aquatic vegetation in the pools with lichens on the shallow sides of the river.

As a result of this study in river Kunhar it came out that a gradual increase in water temperature and pH corresponds to a decrease in dissolved oxygen, decline in the density of nymphs of mayflies and stoneflies, but in an increase in larval and adult aquatic beetles. The information collected during expeditions is based on spot measurements and it does not represent average values. The following parameter ranges for the Kunhar River were recorded at six sampling points during the study. Following table shows the result; transparency; pH; water temperature (°C); dissolved oxygen.

Reported Fish species of River Kunhar in the past:

Sr. No	Family	Name of species
01	Salmonidae	Oncorhynchus mykiss {Salmo gairdneri } (Rainbow Trout Salmo trutta (Brown Trout)
02	Cyprinidae	Schizothorax esomus Schizothorax plagiostomus Schizothorax micropogon Schizothorax curvifrons (Snow Trout) Schizothorax labiatus Tor putitora Tor tor Labeo spp Cyprinus carpio

03	Sisoridae	Glyptothorax kashmiriensis
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8. Methodology and Material

Six fixed sampling points were selected for conducting the study from the day 1 of this periodic study. The selection criteria was based on the ideal representation of the spots down and upstream with possible best spawning spots. A standard cast net was used at 6 sampling points with a lead weight of 6 kg and mesh size of 2 inches. Two female students, Samina Tahir Ph. D, and Rida, M.Phil. of Zoology Department of University of AJK also took part as part of their assignment along with two members of project staff, Mr. Qamar, Mr. Sundas and Mr. Imran Yousaf. One fisherman, Mohammad Haneef, was engaged for fishing in the river Kunhar at six sampling points. Two types of nets, Gill nets and Cast net, were used at the sampling points in the Kunhar River. The downstream river flow is very slow with very low water level. The gadgets used to assess the quality of water were DO meter, Conductivity Meter, pH meter, Water Thermometer, TDS meter, Digital scale, measuring tap, water sampling bottles, fish preservation Jars and 10% formalin as preservative. Observations were made at each point with recording of data collected by the team. The impact observed was discussed amongst the team at each sampling point and recorded. Water release at this time was observed to be 2.2 cubic meter/Second as reported by the accompanied project staff. Observation of water color, taste, and odor were made at the spot by the study group. The parameters collected are reflected in the table-1 below. Locals visiting the area were also interviewed for collecting the information about the status of the fish, fish markets and fishing intensity of the area. Other observations of riparian species, possibility of encroachment on the riverside, and wintering waterfowl were also observed and recorded. One boat operator, Mr. Hamad was interviewed and according to him there is no fish catch in the reservoir and even the erected gill nets by the local have not been inspected for a long time as there was no fish catch for a long time. The boat was used to inspect the old erected gill net and there was no fish in the net. The recreational activity has been started in KP side of the river by Mr. Hamad and he had paid Rs. 600,000 to the local Government of KP for a contract of one year. Notice Boards for the prohibition of fishing and warning about the sudden flooding are also placed at various place. The project authorities have implemented one recommendation of protection of fish from illegal fishing. The water level is like small crossable stream as the fishermen could cross the river

at various places and used the cast net while standing in the middle of the river. Gill net was used at the outlet of the weir alongwith the use of cast net here. Pollutants were also observed and it was found that the garbage collected last time is now released in the water flowing downstream. All possible impact causing elements and remedial possibilities were discussed amongst the team and recorded.

The following parameter ranges for the Kunhar River were recorded at six sampling points: Following table shows the result: transparency; pH; water temperature (°C); Total Dissolved Solids; dissolved oxygen.

Table-3 showing water parameters

Sample Points	Water Temp °C	pH	Total suspended particles (mg/l)	Inorganic Suspended solids (mg/l)	Organic Suspended solids (mg/l)	TDS recording	Rate of Flow (meter/sec)
1. Boi	19	6.5	88.71	59.95	23.42	330	2.2
2. Domail (nalla Boi)	19.5	6.5	90.33	66.45	26.35	330	1
3. Padri	19	6.5	86.21	58.65	22.54	330	2.9
4. Weir Outlet	19	6.5	79.32	54.56	19.21	330	pool
5. Disposal Area	19	6.5	88.52	67.41	26.41	340	0.6
6. Shorran	19	6.5	89.43	68.12	27.21	335	1.6

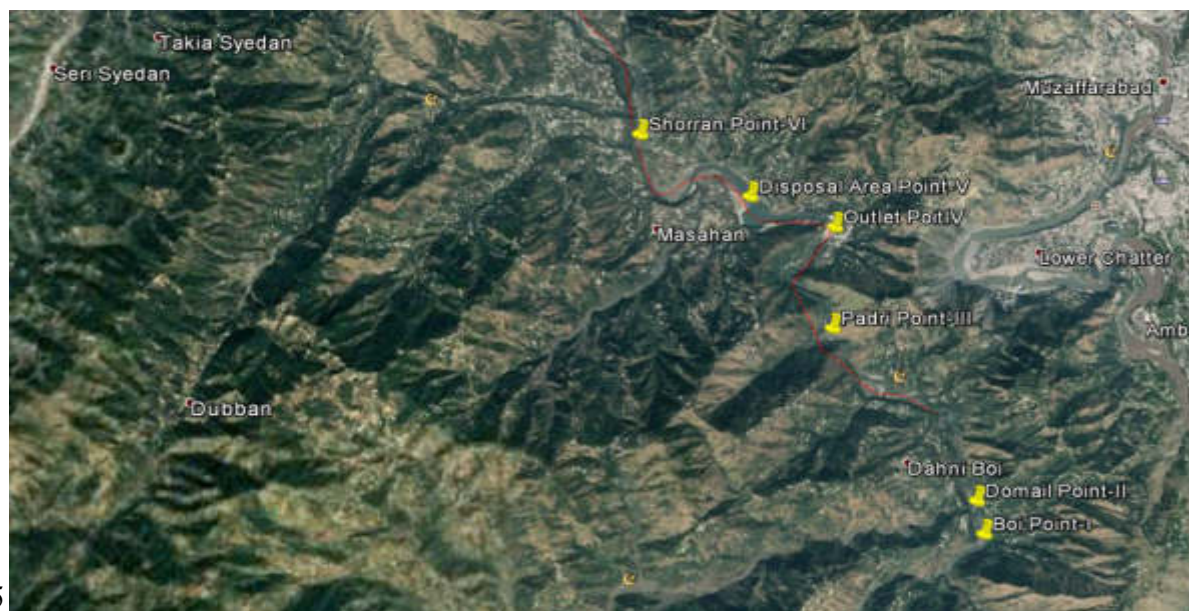


Exhibit-1 Illustration: Satellite image of project site with marked sampling points

9. Reservoir and its Better Use

9.1 Aquaculture

The reservoir doesn't allow the local endemic fish species to survive in it because of changes in the aquatic ecology, water quality and impoundment. The best use of reservoir water is to farming of rainbow Trout fish species in it. Pen and cage culture is best suited for trout culture with artificial feeding from outside. Cage Culture has been introduced in Gilgit and Baltistan area showing very encouraging results. This has to be experimented and planned very well by the expert to develop such facility. This could become a major income generation activity for the surrounding community and will be great reward from the project authority to the affected community. Introduction of Rohu (*Labeo rohita*) and Common Carp (*Syprinus carpio*) can also be tried in the reservoir as they don't have any food or ecosystem competition with native fish.

9.2 Recreational facilities

The reservoir is very much suitable for water sports. One person had made investment in the provision of sailing boats and water scooters but now one more investor, Mr. Hamad from Kanpur has come and started this water sports activity at Disposal point with marketing of the park facility as well. He pays the lease money of Rs. 600,000 per year to the Local Government of KP.

One recreational park has been developed by the project at the disposal area and tourists, very often, visit this site but it needs lot of improvement and provision of related facilities of good quality.

Migratory birds have also started coming on the lake for wintering and their protection must be ensured from hunting. Irregular and undisciplined movement of the motor boats

may disturb them. So an arrangement should be done to avoid any disturbance or any activity causing risk of life for these visiting guest birds, especially during the winter.



Pic 5: Interview with Motor Boat Contractor Mr. Hamad



Pic 6: Disposal area converted into Park after construction

10. Field Results: (Sampling Points)

Point-I (Boi)

The original selection of this sampling point was based on the speculation of possible breeding ground of the *Scizothorax* species. This first sampling point of the study is situated at $34^{\circ} 18' 19''$ N, $73^{\circ} 26' 44''$ E at an elevation of 2422 ft above sea level. The water flow is about 3 cumecs including 2.2 coumecs of weir discharge and rest of nallah Boi. Air temperature at this point is 27°C and water temperature $19.^{\circ}\text{C}$. Signs of highest water flow point during the season is visible, Debris are lying on the right bank of the river at about 15 meters from the riverside at this time. Some riparian plant saplings noticed during July 2018 on the side are seemed to be getting established here as they have grown comparatively to a larger size. Most probably the seeds have been drifted by the high water current during the January or February 2018. The plants are fig (*Ficus palmata*), Snatha (*Dodonia viscosa*), Mulberry (*Morus alba*) and Drawa (*Ailanthus anus*)



Pic 6: *Ailanthus anus*



Pic 7: *Morus alba*

This is a very positive sign of good impact on the vegetation establishment on the sides of the river providing strength to the sides from erosion. No fish could be caught because of the low quantity of crystal clear water and fish taking refuge in the middle of the river under some big boulders.



Pic 8: Water sampling at point-1.



Pic 9: fisherman Mr. M. Haneef

Point-II (Domail Boi)

This sampling point is situated at 34° 18' 36" N, 73° 26' 43" E at an elevation of 2398 ft above sea level. The nallah water and the river water both are colour-less. Air temperature 27°C and water temperature 19.5°C. The river water speed is very slow and pool has now disappeared altogether seems to be disturbed by whirling water. No fish

could be caught here with the already mentioned above. Sides are covered by the hill shades so thwith a very slow movement of water. This is the only bigger source of water contributing in the river Kunhar down the Boi to Domeshi up to the confluence of River Kunhar with River Jhelum.

Point-III: (Parri)

This is the third sampling point and is situated at $34^{\circ} 19' 47''$ N, $73^{\circ} 25' 35''$ E at an elevation of 2475 ft above sea level. The river flows through the big boulders and more centered. The shallow sides are no more fund here as before the construction of the dam. It looks like a small nallha at this time as minimum e-flow is discharged from the flow gates. The small creek joins the river here. The solid waste found accumulated down the road last time has been, disposed-off by the project authorities. This is a good sign of action taken on pointing out as this was having a very bad impact on the aquatic ecology of the area. The pool existing before the water diversion through the tunnel has disappeared and fish breeding ground is badly affected. This area is ideal for developing artificial breeding pool to minimize the bad impact on fish poulation. No fish could be caught here because of the possible reason discussed above.



Pic 10: River Water level at its lowest level at point 3.

Point IV: Outlet

This point is situated at $34^{\circ} 20' 30''$ N and $73^{\circ} 25' 43''$ E. with an elevation of 2519 ft above mean sea level. The fisherman erected a Gill net here one night before to catch the fish for assessment. There was no fish found in the Gill net nor any could be caught by cast net. Most probably the migratory fish has gone back to lower reaches and found

out their hideouts. The whirling water of the e-flow makes a larger pool and fish migration is blocked here due the dam.

The survival of the fish in the water coming out of the weir gates is impossible. This minimum E-flow water is coming out form the bottom of one gate. The pH value of the water is 6.5 and temperature 19°C.



The garbage last time seen accumulated behind the walls of the weir are released in the river downstream. There is no mechanism of accumulating and properly disposing this garbage, mostly the plastic material.



Pic 11: E-flow

Point-V: Material Disposal Area

This point lies at 34° 20' 43" N and 73° 25' 01" E with an elevation of 2471 ft above mean sea level. The water flow is almost dead here. Air temperature is 28°C and water temperature 19°C. There are many tourists enjoying the facilities of the recreational provided by the hydropower project authority here. The sailing boats are now operational here as they were only at Shorran before. There was a Gill net fixed at the right side in the reservoir. All team members went by the boat to examine the gill net but there was no fish and according to the locals, they have left erecting the nets as no fish could come in the net after December 2017. This is just because of the change in the ecology of the water body. There is no possibility of fish survival now. Mosquitos and other crustaceans are present at the top surface of the reservoir.

	
<p>Pic 12: Gill net erected on the left bank of the reservoir</p>	<p>Pic 13: Reservoir crossing on motor baot</p>

Point-VI Shoran

This sampling point is at the tail of the reservoir and is situated at 34° 21' 09" N and 73° 24' 12" E with an elevation of 2556 ft above mean sea level. Flow of water is very low with an average speed of 5 km/hr. Eutrophication can be observed here but it changes with the changing speed of water. No fish could be caught here. The sides of the river are rich in vegetation. The air temperature is 28°C and water temperature was 19°C and pH 6.5. The area has become a good ground for the mosquitos and mollusks.



	
<p>Pic 14: Water parameter testing using the gadgets with thick vegetative cover behind</p>	<p>Pic 15: Shorran Bridge</p>

Table-4: Showing Data collection at each sampling point

Point-I							
S No.	Air temp. °C	Water temp. °C	pH	DO mg/l	Fish Species	Weight (gms)	Length (cm)
1	32	19.5	6.5	8.14	No fish		
Point-II							
2	28	19.5	6.5	8.30	No fish		
Point-III							
3	32	19	6.5	8.28	No fish		
Point-IV							
4	32	19	6.5	8.61	No fish		
Point-V							
5	28	15	6.5	8.21	No fish		
Point-VI							
6	33.5	15	6.5	6.38	No fish		
Total Fish collected 0							

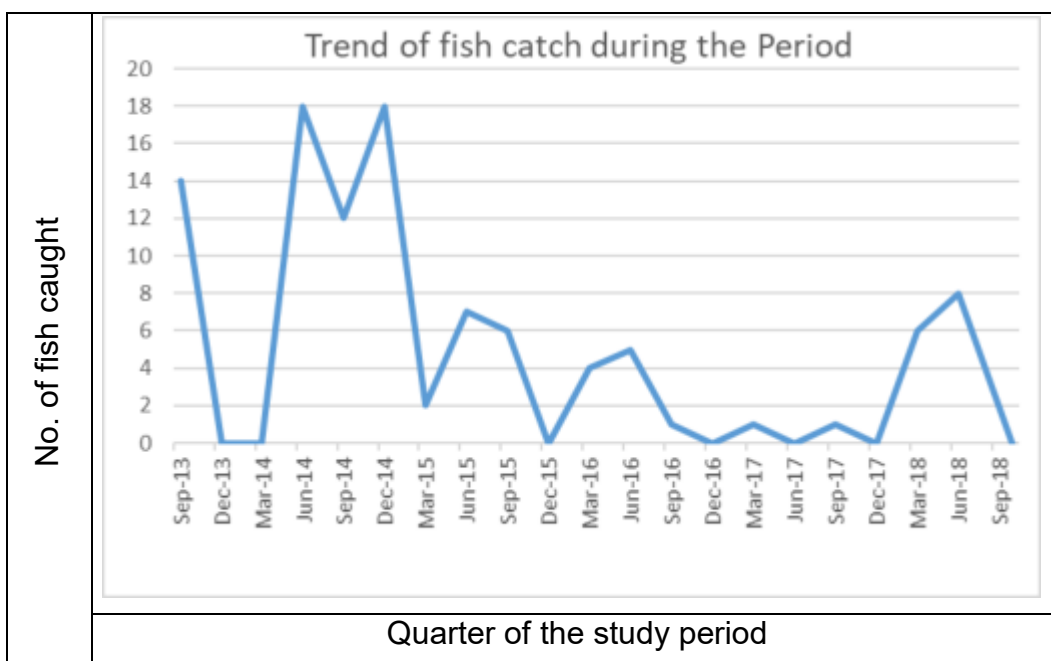
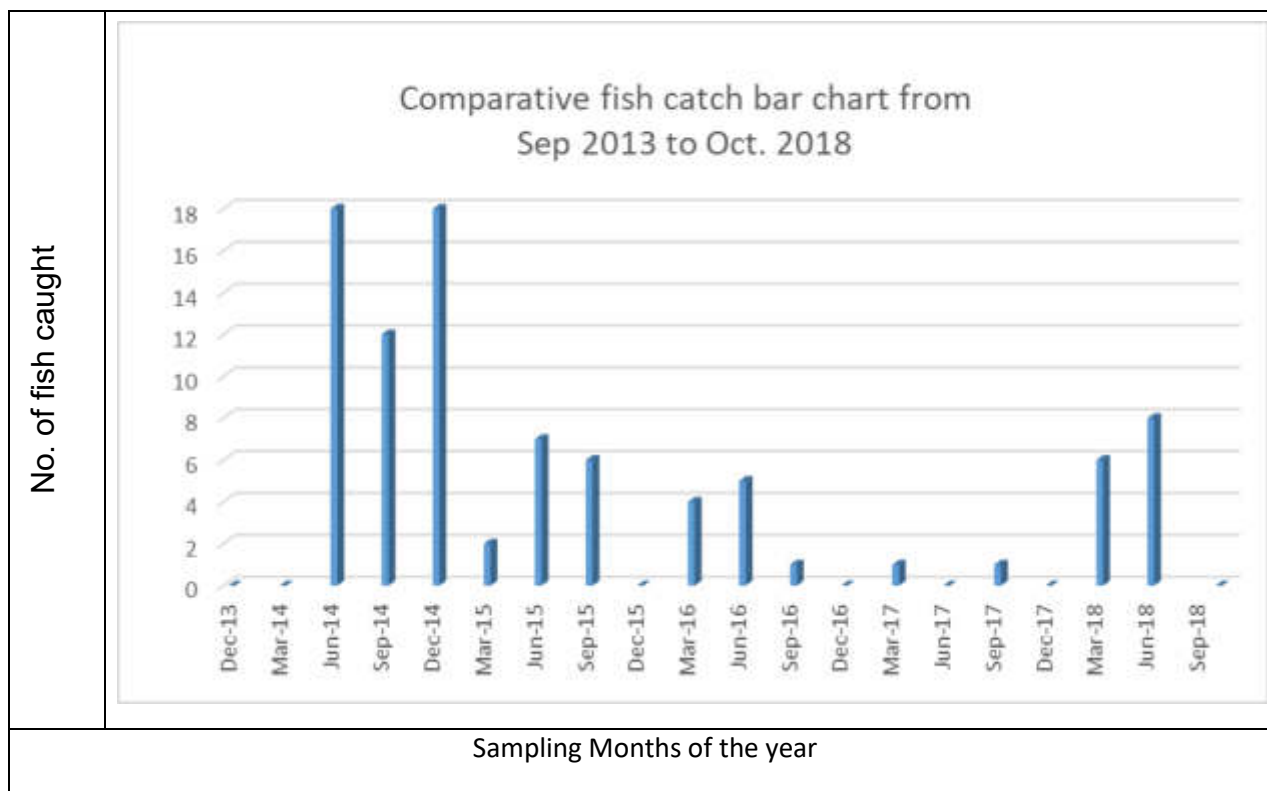


Exhibit 2: Graph showing trend of fish availability as derived from the studies of the project area

Table-5: Comparative number of fish Caught at sampling points

S.#	Study Month	Sampling Point						Total
		1	2	3	4	5	6	
1	September 2013	3	6	4	0	1	0	14
2	December 2013	0	0	0	0	0	0	0
3	March 2014	0	0	0	0	0	0	0
4	June 2014	5	7	4	0	0	2	18
5	September 2014	0	4	1	2	3	2	12
6	December 2014	6	5	0	4	0	3	18
7	March 2015	2	0	0	0	0	0	2
8	June 2015	3	1	1	0	0	2	7
9	September 2015	4	1	1	0	0	0	6
10	December 2015	0	0	0	0	0	0	0
11	March 2016	0	3	3	0	1	0	4
12	June 2016	4	0	0	0	0	1	5
13	September 2016	0	0	0	0	0	1	1
14	December 2016	0	0	0	0	0	0	0
15	March 2017	1	0	0	0	0	0	1
16	June 2017	0	0	0	0	0	0	0
17	September 2017	1	0	0	0	0	0	1
18	December 2017	0	0	0	0	0	0	0
19	March 2018	1	0	1	4	0	0	6
20	June 2018	1	0	0	6	0	1	8
21	October 2018	0	0	0	0	0	0	0
22	December 2018							

Exhibit 3: Comparative fish chart bar from September 2013 to October 2018



11. Results

- i) No fish could be caught at any sampling point here.
- ii) Watch and ward through the project is continued
- iii) Sign boards are in place
- iv) Water sports have also started at the park site on the right bank of the reservoir with colorful motor boats.
- v) No fish was found on the old erected gill nets in the reservoir.
- vi) Mosquitos were observed on the side of the reservoir and the point at Shorran.
- vii) Breeding pools are not visible as were found on pre-construction of the dam.
- viii) Water temperature upstream and downstream are same during this time
- ix) The project authorities have taken a great initiative by fixing many sign boards
- x) Algae and lichens are abundant.
- xi) New plant species are coming up at the older river beds on the sides.
- xii) Migratory water birds (mallards, Pochards, Coots, and single Common Crane) were observed on the water surface of the reservoir at sampling point V.
- xiii) Very clear water downstream with slow velocity along the right bank of the river

12. Conclusions

- i) No fish catch shows that the fish has migrated downstream and hibernated under the boulders where catch through nets has become impossible.
- ii) Proper watch and ward along the riverside has stopped the use of illegal methods of fishing like use of explosives, poisoning or electric current.
- iii) Sign boards erected are playing the role of awareness about the protection of fish in the river and enforcement of the law
- iv) Recreational facilities related to water reservoir and Side Park have started with the investment of some contractors but there is no involvement of the locals and no income share with them.
- v) There is no evidence of fish existence in the reservoir as was observed in the older erected gill nets in the reservoir. This is because of the water depth and presence of no food in the deep bottom of the reservoir. The native fish found here has a habit of bottom feeding.
- vi) Large variation in water temperature has been observed in different seasons as upstream and downstream water temperature is the same during this study of October 2018 but there was a difference of 4°C higher temperature during July 2018.
- vii) Due to water quality change, the algal and Lichen growth has increased in the reservoir and at the sides downstream.
- viii) The drifted seeds of different plant species by the current of water left at the sides of the river has germinated and some are getting established as this is the second year of their establishment.
- ix) Though, the Patrind water reservoir is not lying on the regular migratory rout of the waterfowls migrating from and to Siberia but still some flocks have found the place to roost for a night or so, and this number may increase next year if they found a suitable refuge and enough food at the sides of the reservoir through their internal communication system.
- x) Fish catch through the net is not possible at this point as the water is shallow and fish escapes by having good sights of the visitors.

- xi) Commercial aquaculture for trout in the reservoir will not impact the fish presence as it will be in the controlled cages, pens, or happas. Secondly there is no evidence of fish existence in the reservoir area.
- xii) Migratory birds have made the reservoir area as their overnight stay. They might get disturbed by haphazard boating in the reservoir.

13. Recommendations

The impact of this study is visible. To mitigate these impacts at a minimum possible level, it is recommended that:

1. The present watch and ward is a very good initiative by the project authority and it fulfilled one of the recommendations of the previous reports. This watch and ward on downstream area should be continued as this will not only provide the life security to the visitors who don't know the changing flow pattern of the river but it will protect the fish at least from the illegal fishing process.
2. The number of caution sign boards should be increased by fixing them on the road side as well, as they are also playing a good role of awareness campaign.
3. There is no existing fish hatchery for *Schizothorax* and other reported native fishes of river Kunhar but attempts could be made to catch the fingerlings from other rich sites and stocked in River Kunhar as an attempt to restore the depleted fish.
4. Improve the breeding grounds by artificial means. This should become a part of the Fisheries Management Plan to be developed in December 2018.
5. Downstream regular release of water E-flow must be ensured as it has been observed now, to avoid the casualties of the fish.
6. Downstream river fisheries management concerns focus on aeration of anoxic discharge water from the dam. The release of artificial mini-floods and the provision of adequate dry season flow are crucial to maintain a suitable environment for migratory fish species, especially endangered species.
7. Habitat improvement is an essential factor for fishery improvement. To avoid seasonal changes of water level, suitable pools should be created under the management of the local development authority. Such a practice will improve

the fish habitat quality and avoid the winter desiccation and should also be the part of the Fisheries Management Plan.

8. Continued assessment is important to compensate the immediate measures in case of emergency disaster to the aquatic life in the downstream area and in the reservoir.
9. Early planning and consultation with expert should be initiated to have aquaculture development in the reservoir on the river Kunhar at Patrind.

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ANNEX-6
THIRD PARTY
ENVIRONMENTAL
MONITORING REPORT



Monitoring Report

- Ambient Air
- Meteorological Data
- Noise Level
- Stacks Emissions
- Vehicular Emissions

PATRIND HYDRO-POWER PROJECT

7 July, 2018

Job Reference No.: GCEC-PK-182/2018

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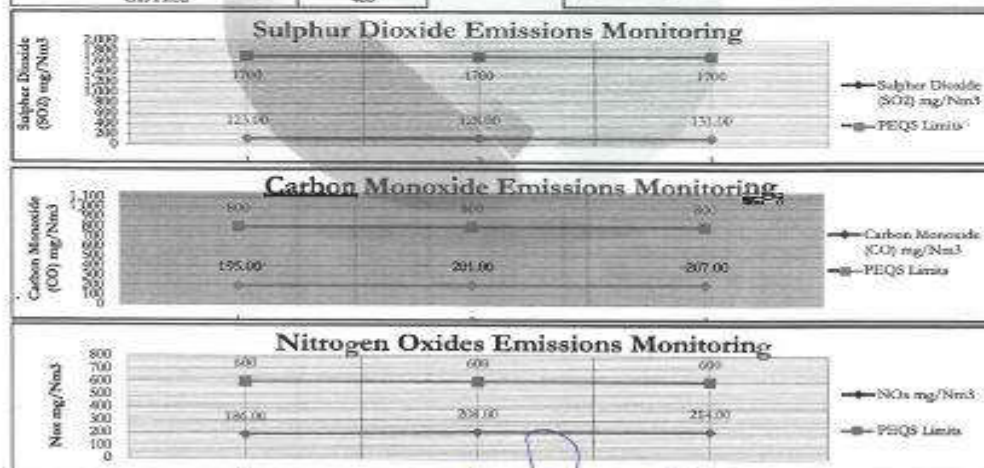
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Stack Emission Monitoring Report

Client Name:	Patind Hydro - Power Project	Reporting Date:	7-Aug-2018		
Job Number:	GCEC-PK-182/2018				
Monitoring Point Details & Monitoring Results					
Monitoring Point	Generator 2	Monitoring Time:	14:30		
Load	Off load	Monitoring Date:	27-Jul-18		
Fuel Type	HFO	Instrument Used:	Lancom-4		
Monitoring Location:	Patind - Muzaffarabad				
Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per PEQS
Carbon Dioxide (CO2)	%	7.93	7.94	7.98	-
Oxygen (O2)	%	15.23	15.19	15.14	-
Carbon Monoxide (CO)	mg/Nm ³	195.00	201.00	207.00	800
Sulphur Dioxide (SO2)	mg/Nm ³	123.00	128.00	131.00	1700
Nitrogen Dioxide (NO2)	mg/Nm ³	11.00	15.00	19.00	-
Nitrogen Oxide (NO)	mg/Nm ³	175.00	193.00	195.00	-
NOx	mg/Nm ³	186.00	208.00	214.00	600*
Particulate Matter	mg/Nm ³		57.00		300
*Limits of NOx according to Fuel type as per PEQS		Abbreviations			
Oil Fired	600	PEQS: Punjab Environmental Quality Standards			
Coal Fired	1200	mg/Nm3=Milligram/Normal meter cube			
Gas Fired	400				



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Stack Emission Monitoring Report

Client Name: Patind Hydro - Power Project
Job Number: GCEC-PK-182/2018

Reporting Date: 7-Aug-2018

Monitoring Point Details & Monitoring Results

Monitoring Point	Generator 1	Monitoring Time:			14:15
Load	Off load	Monitoring Date:			27-Jul-18
Fuel Type	HFO	Instrument Used:			Lancorn-4
Monitoring Location:	Patind - Mussaffarabad				
Parameters	Unit	Reading 01	Reading 02	Reading 03	Limits as per PEQS
Carbon Dioxide (CO2)	%	8.65	8.79	8.83	-
Oxygen (O2)	%	14.19	14.12	14.10	-
Carbon Monoxide (CO)	mg/Nm ³	214.00	219.00	227.00	800
Sulphur Dioxide (SO2)	mg/Nm ³	118.00	135.00	149.00	1700
Nitrogen Dioxide (NO2)	mg/Nm ³	8.00	5.00	13.00	-
Nitrogen Oxide (NO)	mg/Nm ³	161.00	173.00	183.00	-
NOx	mg/Nm ³	169.00	178.00	196.00	600*
Particulate Matter	mg/Nm ³		51.00		300

*Levels of NOx according to Fuel type as per PEQS

Oil Fired

600

Coal Fired

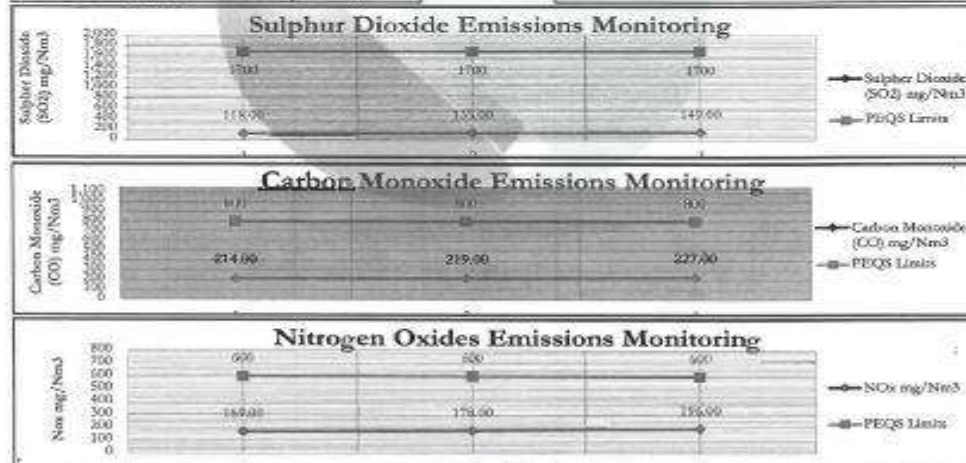
1200

Gas Fired

400

Abbreviations

PEQS= Punjab Environmental Quality Standards

mg/Nm³=Milligram/Normal meter cube

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VEHICULAR EMISSION MONITORING REPORT

Job Reference Number: GCEC-PK-182/2018

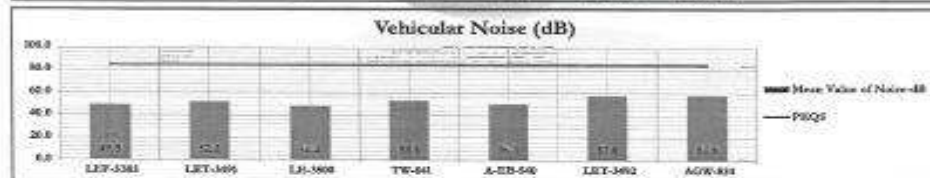
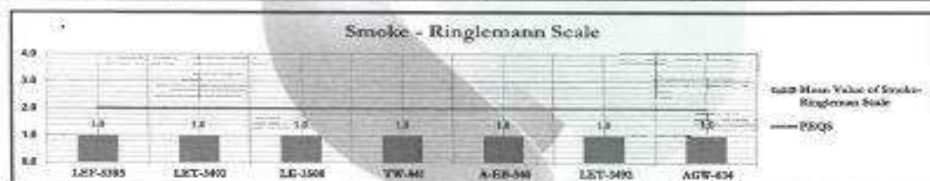
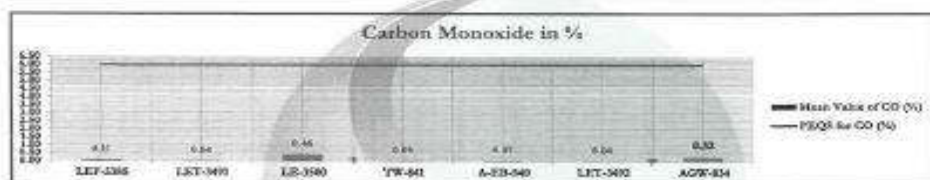
Reporting Date: 7/Aug/18

Client Name: Patind Hydro - Power Project

Monitoring Date: 27/Jul/18

Monitoring Location: Muzaffargarh

Vehicle Type	Vehicle Number	Model	Fuel	CO in %				Smoke Ringmann		Noise in dB				
				Min	Max	Mean	PEQS	Reading	PEQS	01	02	03	Mean	PEQS
Max	LEF-5385	2017	Diesel	0.19	0.12	0.11	60	1.0	2.0	50.6	48.2	49.3	49.5	85.0
Max	LST-3491	2017	Diesel	0.02	0.06	0.04		1.0		50.1	53.4	51.2	52.2	
Forster	LE-3560	2014	Petrol	0.35	0.56	0.46		1.0		48.4	49.1	47.2	48.2	
Max	TW-841	2014	Diesel	0.03	0.07	0.05		1.0		54.2	52.1	55.1	53.5	
Prodo	A-ED-540	2014	Petrol	0.05	0.09	0.07		1.0		50.1	50.9	49.4	50.1	
Max	LST-3492	2017	Diesel	0.01	0.06	0.04		1.0		57.4	57.9	58.1	57.8	
Max	AGW-834	2012	Petrol	0.25	0.38	0.32		1.0		55.4	57.2	57.0	55.9	



List of Abbreviations

CO = Carbon Monoxide

dB = Decibel

PEQS = Punjab Environmental Quality Standards

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NOISE LEVEL MONITORING REPORT

Job Reference Number	GCEC-PK-182/2018
Monitoring Point	Office Area – Patrind Power House
Date of Intervention	29-07-2018 to 30-07-2018
Sampling Coordinates	34°20'08.1" N 73°27'05.7" E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
Night Time					
1.	23:00	Noise Meter	dB	46.8	55.0
2.	00:00	Noise Meter	dB	42.7	
3.	01:00	Noise Meter	dB	40.1	
4.	02:00	Noise Meter	dB	44.6	
5.	03:00	Noise Meter	dB	51.6	
6.	04:00	Noise Meter	dB	56.7	
7.	05:00	Noise Meter	dB	50.9	
8.	06:00	Noise Meter	dB	49.3	
Night Time Average			dB	47.84	55.0
Day Time					
9.	07:00	Noise Meter	dB	48.7	65.0
10.	08:00	Noise Meter	dB	47.3	
11.	09:00	Noise Meter	dB	49.6	
12.	10:00	Noise Meter	dB	50.1	
13.	11:00	Noise Meter	dB	52.4	
14.	12:00	Noise Meter	dB	55.6	
15.	13:00	Noise Meter	dB	58.6	
16.	14:00	Noise Meter	dB	53.1	
17.	15:00	Noise Meter	dB	50.8	
18.	16:00	Noise Meter	dB	49.7	
19.	17:00	Noise Meter	dB	49.3	
20.	18:00	Noise Meter	dB	54.9	
21.	19:00	Noise Meter	dB	47.3	
22.	20:00	Noise Meter	dB	44.1	
23.	21:00	Noise Meter	dB	49.6	
24.	22:00	Noise Meter	dB	45.8	
Day Time Average			dB	50.37	65.0

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NOISE LEVEL MONITORING REPORT

Job Reference Number	GCEC-PK-182/2018
Monitoring Point	Near Residential Area – Power House Site
Date of Intervention	30-07-2018 to 31-07-2018
Sampling Coordinates	34°20'08.0" N 73°27'21.5" E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Residential)
Night Time					
25.	23:00	Noise Meter	dB	44.5	45.0
26.	00:00	Noise Meter	dB	41.1	
27.	01:00	Noise Meter	dB	39.6	
28.	02:00	Noise Meter	dB	38.7	
29.	03:00	Noise Meter	dB	36.5	
30.	04:00	Noise Meter	dB	41.8	
31.	05:00	Noise Meter	dB	44.7	
32.	06:00	Noise Meter	dB	46.9	
Night Time Average			dB	41.73	45.0
Day Time					
33.	07:00	Noise Meter	dB	49.7	55.0
34.	08:00	Noise Meter	dB	50.8	
35.	09:00	Noise Meter	dB	51.4	
36.	10:00	Noise Meter	dB	54.3	
37.	11:00	Noise Meter	dB	58.6	
38.	12:00	Noise Meter	dB	59.7	
39.	13:00	Noise Meter	dB	60.7	
40.	14:00	Noise Meter	dB	48.7	
41.	15:00	Noise Meter	dB	47.3	
42.	16:00	Noise Meter	dB	59.1	
43.	17:00	Noise Meter	dB	45.4	
44.	18:00	Noise Meter	dB	46.7	
45.	19:00	Noise Meter	dB	47.3	
46.	20:00	Noise Meter	dB	50.1	
47.	21:00	Noise Meter	dB	48.7	
48.	22:00	Noise Meter	dB	47.3	
Day Time Average			dB	51.61	55.0

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NOISE LEVEL MONITORING REPORT

Job Reference Number	GCEC-PK-182/2018
Monitoring Point	Weir-Office Area
Date of Intervention	27-07-2018 to 28-07-2018
Sampling Coordinates	34°20'26.8" N 73°25'42.7" E

Se. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Commercial)
Night Time					
1.	23:00	Noise Meter	dB	51.4	55.0
2.	00:00	Noise Meter	dB	50.3	
3.	01:00	Noise Meter	dB	49.6	
4.	02:00	Noise Meter	dB	49.7	
5.	03:00	Noise Meter	dB	48.7	
6.	04:00	Noise Meter	dB	47.3	
7.	05:00	Noise Meter	dB	51.8	
8.	06:00	Noise Meter	dB	52.4	
Night Time Average			dB	50.15	55.0
Day Time					
9.	07:00	Noise Meter	dB	40.2	65.0
10.	08:00	Noise Meter	dB	43.7	
11.	09:00	Noise Meter	dB	46.8	
12.	10:00	Noise Meter	dB	43.7	
13.	11:00	Noise Meter	dB	41.9	
14.	12:00	Noise Meter	dB	40.3	
15.	13:00	Noise Meter	dB	40.0	
16.	14:00	Noise Meter	dB	48.9	
17.	15:00	Noise Meter	dB	50.6	
18.	16:00	Noise Meter	dB	42.7	
19.	17:00	Noise Meter	dB	50.3	
20.	18:00	Noise Meter	dB	51.7	
21.	19:00	Noise Meter	dB	52.9	
22.	20:00	Noise Meter	dB	58.6	
23.	21:00	Noise Meter	dB	53.1	
24.	22:00	Noise Meter	dB	57.6	
Day Time Average			dB	47.69	65.0

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NOISE LEVEL MONITORING REPORT

Job Reference Number	GCEC-PK-182/2018
Monitoring Point	Disposal Area Park
Date of Intervention	28-07-2018 to 29-07-2018
Sampling Coordinates	34°20'45.8" N 73°24'57.2" E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Residential)
Night Time					
1.	23:00	Noise Meter	dB	41.9	45.0
2.	00:00	Noise Meter	dB	40.3	
3.	01:00	Noise Meter	dB	40.0	
4.	02:00	Noise Meter	dB	38.6	
5.	03:00	Noise Meter	dB	39.7	
6.	04:00	Noise Meter	dB	41.6	
7.	05:00	Noise Meter	dB	45.7	
8.	06:00	Noise Meter	dB	49.3	
Night Time Average			dB	42.14	45.0
Day Time					
9.	07:00	Noise Meter	dB	51.7	55.0
10.	08:00	Noise Meter	dB	50.6	
11.	09:00	Noise Meter	dB	52.1	
12.	10:00	Noise Meter	dB	45.3	
13.	11:00	Noise Meter	dB	46.7	
14.	12:00	Noise Meter	dB	44.8	
15.	13:00	Noise Meter	dB	41.5	
16.	14:00	Noise Meter	dB	49.7	
17.	15:00	Noise Meter	dB	48.7	
18.	16:00	Noise Meter	dB	47.3	
19.	17:00	Noise Meter	dB	51.8	
20.	18:00	Noise Meter	dB	52.4	
21.	19:00	Noise Meter	dB	40.2	
22.	20:00	Noise Meter	dB	43.7	
23.	21:00	Noise Meter	dB	46.8	
24.	22:00	Noise Meter	dB	43.7	
Day Time Average			dB	47.31	55.0

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