

Environmental and Social Monitoring Report

Project Number: 44914-014
Quarterly Report (January-March 2019)
March 2019

Pakistan: Patrind Hydropower Project

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

This environmental and social monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

147 MW PATRIND HYDRO POWER PROJECT

2019

Environmental & Social Monitoring Report January 2019 to March 2019



**Star Hydro Power
Limited**

3/31/2019

TABLE OF CONTENTS

1. Health, Safety and Environmental (HSE) Performance Indicators	2
2. Compliance with EPA AJK NOC Conditions / Requirements	3
3. Compliance with Environmental and Social Management Plan (ESMP)	5
4. Compliance with Operational Requirements of EIA.....	7
5. Stakeholder Engagement and Corporate Social Responsibility (CSR).....	7
6. Health, Safety and Environment (HSE).....	8
7. Livelihood Restoration Program	9
8. Next Reporting Period Tentative Plan (April, 2019 to June, 2019).....	11
9. Photographs.....	11
Annexures	16
Annexure-1 Environmental Flow Data	17
Annexure-2 Fish Monitoring Study.....	25
Annexure-3 Plantation Campaign, 2019	47
Annexure-4 Tentative CSR Plan	51
Annexure-5 Vegetation Monitoring Study	53
Annexure-6 Noise Monitoring Report.....	68
Annexure-7 Waste Transfer Notes	72
Annexure-8 Fire Fighting, First Aid Trainings & Emergency Evacuation Drill Report	79

List of Abbreviations

AJK	Azad Jammu & Kashmir
KPK	Khyber Pakhtunkhwa
HSE	Health safety & environment
LTI	Lost time injury
PTW	Permit to work
NEQs	National environmental quality standards
ESMP	Environmental & social management plan
CSR	Corporate Social Responsibility
OHSP	Occupational health & safety plan
ERP	Emergency Response Plan
E-flow	Environmental flow
PHSP	Public health and safety plan
SMP	Security management plan
PLSP	Plantation, landscaping and slope protection plan
TMP	Traffic Management Plan
CLO	Community liaison officer

1. Health, Safety and Environmental (HSE) Performance Indicators

Table 1: HSE Performance Indicators

Indicators	Data (Reporting Period)	Data (From November 08, 2017 to March 31, 2019)
Plant Safe Man-Hours Plant Safe-Days	39, 840 (0.03984) 90	209,808 (0.209808) 514
Lost Time Injury (LTI)	0	00
HSE / Environmental Accidents	0	00
Fire	0	00
Spills	0	00
HSE Audits / Inspections	03	17
HSE Training Sessions	05	10
Emergency Drills (Evacuation, Firefighting & First Aid)	02	04
PTW Issued	10	146
Community Consultations	08	28

2. Compliance with EPA AJK NOC Conditions / Requirements

Table 2: Compliance Status of NOC Conditions

EPA Condition No	EPA NOC Conditions	Compliance Status	Compliance Action/Notes
I.	Compliance to National Environmental Quality Standards (NEQs)	Yes	Compliance with NEQs is being monitored internally and through third-party.
II.	2 cumecs water as E-flow, downstream during the operational phase	Yes	2.2 cumecs environmental flow is being released from weir. Please refer to Annex-1 for E-flow data. Data shows compliance with the NOC condition.
III.	Metering arrangement to ensure and verify the release of approved E-flow downstream	Yes	Metering arrangement is in place. Data is being shared regularly.
IV.	Strictly adhered to mitigation measures, as suggested in Operational Environmental Management Plan (OEMP)	Yes	Quarterly compliance reports verify adherence to the mitigation measures.
V.	Environmental Management & Monitoring unit headed by an Environmental Monitoring Expert	Yes	Qualified and competent HSE team has been formulated which consists of HSE Manager, Environmentalist, HSE Officer and two Community Liaison Officers in the O&M team. Qualified and competent Senior Manager-E&S from SHPL is also monitoring the compliance from SHPL side.
VI.	Carry out Fish Study through certified Fish Expert/Firm throughout the operational period of the project	Yes	The fish studies are being conducted on quarterly basis. During the reporting period one (01) fish study was conducted. Study discusses the impacts on fish & aquatic fauna in reservoir & downstream and recommends measures including development of breeding grounds etc to minimize impacts. Please refer to Annex-2 for the study report.
VII.	Environmental Audit through 3rd party consultant after every 05 years during the Operational Phase of the Project	Yes	Will be complied when required. Still operation is in its second year.
VIII.	Plantation (of indigenous species) activity, in consultation with Forest Department, Govt. of AJ&K, both at the Weir & Powerhouse	Yes	During the reporting period tree plantation campaign was conducted on both sites of the project. On powerhouse site 2,410 plants and at weir site 1,790 plants were

			<p>planted. All the plants planted were indigenous and native. Campaign was conducted under the supervision of third-party fish and vegetation expert.</p> <p>Please refer to Annex-3 for details.</p>
IX.	Continuous monitoring & submission of quarterly compliance report	Yes	Quarterly compliance reports are being prepared and submitted.
X.	Adequate arrangements for addressing public grievances	Yes	<p>Grievance redressal procedure is in place. Grievance redressal committee (GRC) has been formulated and functional. Three (03) complaint boxes have been installed at powerhouse area and two (02) complaint boxes have been installed at weir site area. Further two (02) complaint registers have been placed at powerhouse area and one (01) complaint register has been placed at weir site area. Community Liaison Officers (CLOs) have also been deputed on powerhouse and weir site areas.</p> <p>No complaint was received in the reporting period.</p>
XI.	Findings of third-party monitoring shall be shared with AJK- EPA	Yes	The results/measurements of the reports from the third party are being shared with AJK-EPA and lenders.
XII.	Arrangements in-place for the execution of CSR plan	Yes	<p>CSR procedure is in place. Based on the CSR procedure, annual CSR plan is developed and implemented. Annual CSR plan is developed and finalized in consultation with local communities and based on the needs of local communities. General areas of focus are education, health, livelihood, living conditions, water, and cultural etc.</p> <p>Please refer to Annex-4 for CSR Plan 2019.</p>
XIII.	Efficient Occupation Health & Safety Plan	Yes	Occupation health and safety plan is in place. The plan has been developed based on the findings of risk assessment. The plan has been proved effective as the operations are smooth and safe.

			As the plan is live document it will be updated when required.
XIV.	Local Employment	Yes	Hiring is being done keeping the locals on priority. Currently total staff is 70, out of which 66% from AJK, 17% from KPK and 17% from other parts of Pakistan. In addition, 5 unskilled and 14 security staff are also working, all of them are locals.
XV.	Liability for the correctness and validity of the information provided in EMP	Yes	Agreed.
XVI.	Facilitate EPA team for any visit for inspection/monitoring, etc.	Yes	The Company will always facilitate all the stakeholders including EPA for site visits.

3. Compliance with Environmental and Social Management Plan (ESMP)

Table 3: Compliance Status of ESMP

ESMP Reference #	ESMP Requirement	Compliance Status	Compliance Action/Notes
Section 6.1	Quarterly Fish and Fauna assessment (Kunhar River)	Yes	Please refer to Row VI of Table 2, Section 2.
	Bi-Annual drinking & waste Water Quality	Yes	Bi-Annual drinking and waste water analysis will be conducted in next reporting period.
	Quarterly Flora / vegetation monitoring	Yes	During the reporting period one (01) Flora / vegetation monitoring study was conducted. Study reports that impact reported on the weir side is low and in some aspects it is positive. Please refer to Annex-5 for the report.
	Annual Landslides monitoring	Yes	Annual landslide and catchment study will be conducted by the end of this year.
	Quarterly noise monitoring and noise impact management	Yes	Noise monitoring is being done regularly and data is being maintained. All the noise readings are in compliance with NEQS. Please refer to Annex-6 for the noise monitoring reports. Further company has signed contract with audiologist for hearing test of staff. Hearing

			tests of staff will be conducted in next reporting period.
	Environmental friendly disposal of solid waste	Yes	Waste generated on both sites is being disposed of in environmentally friendly manner through third-party waste contractor. Please refer to Annex-7 waste transfer notes.
	Development and implementation of CSR Plan and procedure /Community Development Programs	Yes	Please refer to Row XII of Table 2, Section 2.
	Labors / Employees management as per applicable regulations and standards.	Yes	Labors / Employees are being managed as per applicable regulations and standards.
	Workers/Staff Health & Safety as per applicable regulations and standards	Yes	Please refer to Row XIII of Table 2, Section 2.
	Grievances from communities and any affected people Grievances from civil society organizations Grievances from labor / employees	Yes	For external grievance redressal mechanism, please refer to Row X of Table 2, Section 2. Internal grievance redressal mechanism is also in place. Internal GRC has been formed and complaint box has been installed. No complaint received in the reporting period.

4. Compliance with Operational Requirements of EIA (Environmental Monitoring and Management Plan during Operations Phase)

Table 4: Compliance Status of EMP of EIA Addendum

EIA Addendum Reference #	Impacts	EMP Requirement	Monitoring Frequency	Compliance Status	Compliance Action/Notes
Table: 6.4	Water Impoundment	Water Elevation Level Incoming/outgoing flow	Monthly	Yes	Water impoundment is being monitored via sensors. Every three second data is being uploaded on the system.
	Environmental Flow	Water flowing downstream in Kunhar river	Monthly	Yes	Please refer to Row II of Table 2, Section 2.
	Aquatic Fauna	Fish, upstream-downstream and in the pond	Quarterly	Yes	Please refer to Row VI of Table 2, Section 2.
	De-sanding	Accumulation of silt and de-siltation process	—	Yes	Monthly bathymetric surveys are being conducted to check the level of silt / sand in the reservoir. As per the survey results, de-sanding is not required currently. However, the de-sanding will be conducted annually during the peaking season.

5. Stakeholder Engagement and Corporate Social Responsibility (CSR)

- Community Liaison Officer (CLO) of weir site conducted four (04) awareness sessions in weir upstream communities (Sarati, Tarchella, Shoran and Ghari Habibullah) about proper waste disposal and protection of Kunhar River from waste disposal. In addition, he also conducted two (02) general consultation sessions in which he discussed with local communities about CSR activities, flood safety etc.
- CLO of powerhouse conducted two (02) awareness sessions in local communities (Alra and Lower Chattar) about proper waste disposal and protection of Jhelum River & tail-race from waste disposal.

- Two (02) power megaphones and two (02) torches were procured & handed over to watch guards deputed at weir downstream.
- No grievance from the local communities were recorded (both at powerhouse and weir site areas) in the reporting period.
- HSE and Communication & Instrumentation teams surveyed weir downstream area for the identification of locations for installation of public addressing system to alert the weir downstream communities in case of high flow release / flood emergency. Proposal was developed for the system and shared with Star Hydro Power Limited (SHPL). As per the instructions of SHPL, EPCC contractor Daewoo ENC will install the system in weir downstream.
- Tentative CSR plan 2019 has been prepared and submitted to head office for approval. After the approval, the CSR activities will be executed accordingly. Please refer to **Annex-4** for details.

6. Health, Safety and Environment (HSE)

- Tree plantation campaign was conducted on both sites of the project. On powerhouse site 2,410 plants were planted and at Weir site 1,790 plants were planted on selected locations. Please refer to **Annex-3** for details.
- Third meeting held at Fisheries Department, Mansehra (KPK) office regarding development of fisheries management plan. Meeting was attended by team of fisheries department, Fish consultant Mr. Yousaf Qureshi, Mr. Syed Atif Ali Shah (from SHPL) and Mr. Imran Yusuf (from O&M contractor). It was decided in the meeting that next way-forward will be the identification of locations for developing of breeding grounds for local indigenous /native fish species. Once the locations are finalized, plan will be developed accordingly.
- Firefighting and first aid trainings were given to all staff of Patrind Hydro Power Plant by Civil Defense.
- Emergency evacuation drill (general for all staff), firefighting and first aid drill (Specific for site emergency response team) were conducted by HSE team through third party Civil Defense. Please refer to **Annex-8** for details.
- All the fire extinguishers of powerhouse were inspected. Discharged cylinders were replaced with new fire extinguishers.
- Three (03) HSE inspections of operation conducted. Overall HSE compliance was satisfactory and no major HSE issues were recorded.
- Three (03) monthly safety star events were organized to enhance HSE culture of the company. In each monthly event two of company staff were awarded as “Safety Stars of the Month”.
- Three (03) monthly noise monitoring surveys were conducted by HSE in power complex and nearby community. The result findings were in compliance with NEQS.
- Chief Secretary AJK visited Patrind Hydro Power Plant and Manager HSE & CSR gave presentation about SHPL and K-water CSR activities on both project sites. Chief Secretary showed satisfaction over the CSR activities.
- HSE department supported the Refuge team regarding Environmental & social audit. All the required documents were shared with Refuge team and all the questions were answered. Refuge team were also taken to CSR activities sites.
- The defensive driving training was given to all drivers of K-water by HSE team and also awareness session was conducted about traffic management plan to improve drivers’ traffic safety awareness.
- Safety induction and Work at Height (WAH) training were given to National Transmission & Dispatch Center (NTDC) workers prior to start stringing work in powerhouse slopes.

- Waste generated during operations at sites is being managed in accordance with environmental and waste management plan. Different color waste bins are placed for segregation of waste. Waste collection and transfer by the waste contractor is in accordance with environmental standards.
- Meeting was conducted with audiologist and contract details were finalized and agreed for hearing test of employees.

7. Livelihood Restoration Program

Apart from the employment to male members of Aps, the Company started an initiative to enhance the skills of female members of APs as part of the livelihood restoration strategy.

SHPL implemented programs related to stitching, hand and machine embroidery for females of not only the APS but for the entire villages of neighborhood. To start with, 6-months program in Alda village-AJK (powerhouse area) and 6-months program in Sarati village-KP (weir site) were completed in 2018.

This initiative has shown very positive results as the female members of the area are very much satisfied with the programs and suggested to continue the same in future as through this they not only earn some money but they are now capable to stitch for their families which is a cost saving side of the program.

During the reporting period, the programs were conducted at two new locations i.e. Patrind Village (AJK) and Deedal Village (KP). These programs will continue in other neighboring villages of the Project area in future as well.

Pictures of Vocational Training/Livelihood Restoration Program



8. Next Reporting Period Tentative Plan (April, 2019 to June, 2019)

- To conduct hearing tests of all company employees
- To conduct 2nd quarter third-party fish monitoring study
- To conduct 2nd quarter third-party vegetation monitoring study
- To conduct 1st biannual third-party water and wastewater monitoring study
- To conduct community consultations at powerhouse and weir site areas
- To arrange meetings for General Manager (GM) with key stakeholders
- To finalize emergency medical treatment contract through Support Services Department
- To install HSE signages at power-house and weir site
- To identify locations for breeding grounds in weir downstream and coordinate with Fisheries Department, KKP regarding fisheries management plan
- To start HSE markings / tagging at power-house and weir site
- To conducted community awareness sessions at weir downstream regarding flood safety
- To Install awareness signages in communities
- To Conduct three awareness sessions (Flood / safety / environment / CSR) at schools at weir site area
- To conduct trainings of watch guards deployed at weir downstream.
- To manage the process of HSE staff external HSE trainings depending upon approval and trainer's availability

9. Photographs



Emergency Evacuation Drill



Fire Extinguisher Inspection



Noise Monitoring



Powerhouse Inspection



Waste Management



Meeting with Fisheries Department KPK



Tree Plantation Campaign, 2018



Meeting with Audiologist Dr. Musawir



Meeting with Refugee Environment & Social Team



Chief Secretary AJK visited Patrind Hydro Power Plant



Awareness sessions were conducted by weir site CLO



Defensive Driving Training for K-water Drivers



Weir Site Downstream Survey for the installation of public addressing system



Monthly HSE Star Award Ceremony



Induction & Training to NTDC Workers

Annexures

Annexure-1

Environmental Flow Data

	January, 2019	February 2019	March 2019
Day / Sensor	Water Flow (m3/s)	Water Flow (m3/s)	Water Flow (m3/s)
1 Day	23.58	2.58	2.45
2 Day	24.91	2.56	2.56
3 Day	23.61	2.57	2.54
4 Day	23.54	2.56	2.54
5 Day	26.29	2.57	2.5
6 Day	24.29	2.62	2.48
7 Day	23.2	2.67	2.45
8 Day	25.07	2.69	2.43
9 Day	23.8	2.67	2.42
10 Day	23.81	2.58	2.4
11 Day	24.25	2.59	2.55
12 Day	25.93	2.58	2.68
13 Day	24.26	2.64	2.56
14 Day	24.86	2.79	2.55
15 Day	25.69	2.63	2.52
16 Day	25.79	2.4	2.5
17 Day	26	2.38	2.49
18 Day	24.76	2.45	2.49
19 Day	26.26	2.39	2.57
20 Day	26.92	2.46	2.52
21 Day	18.43	2.68	2.5
22 Day	6.12	2.7	2.49
23 Day	12.42	2.58	2.48
24 Day	2.79	2.52	2.48
25 Day	2.75	2.53	2.48
26 Day	4.78	2.54	2.47
27 Day	28.37	2.51	2.47
28 Day	26.43	2.52	2.49
29 Day	26.74		6.22
30 Day	14.68		2.49
31 Day	2.57		2.44

Monthly Discharge Measurement at Bella (Boi)

Sr. No	Month	Flow Reading (Cumec)	EPA Requirement (Cumec)
1.	January, 2019	4.81	3.7
2.	February, 2019	4.57	3.7
3.	March, 2019	5.02	3.7

Note: Please refer below for the flow measurement methodology.

Methodology of Discharge Measurement at Bella (Boi)

Weir Downstream

Pakistan Patrind Hydropower Plant



Pakistan Office

Korea Water Resources Corporation



1. General

Measuring flow using digital current meter involves wading across a stream and taking velocity measurements at multiple places. Both velocity and water depth measurements are taken at the same time and place in multiple locations across the stream.

There are many types of current meters. The cup or propeller types determine flow velocity by the number of revolutions of the cups (or propeller) over a given period of time.

2. Purpose

The main purpose of discharge measurement at Bella (Boi) downstream of weir structure is to verify that enough environmental flow is being released by Patrind hydropower project.

3. Site selection



After visiting to several locations, one site i.e. Bella (Boi) has been selected for discharge measurement at weir downstream considering the following aspects.

- The site should be safely accessible and should be in a section of the stream that is free flowing.
- Stream should be straight enough to have uniform form.
- The flow should not be affected by tributaries or tides.
- There should not be any side channels so that all the water flows through the main channel.

- Areas where there are large boulders, logs, or thick brush which can create eddies, slack water, turbulence or disturbed flow should be avoided.



4. Equipment

- Measuring tape
- Digital Current Meter
- Top-setting rod (if available) or measuring stick
- Paper and pencil for record keeping
- Waders (waterproof garment)



5. Procedure

- 1) Tighten a measuring tape across the stream at right angles to the flow. It should be snug and not sag in the middle.
- 2) Measure the total stream width and record this measurement.
- 3) Divide the total stream width into equal segments. If the stream is less than 10 feet wide, use $\frac{1}{2}$ foot intervals. For streams greater than 10 feet, use 1 foot or greater intervals. (Note:

The standard method is to divide the width by 20, however $\frac{1}{2}$ foot or 1-foot intervals are sufficient for the purposes of this guide.)

- 4) Step out to the first measuring point and position the rod. Stand downstream from the measuring tape with the rod next to the tape. The rod should be held vertically, the meter should face upstream and you should be standing off to the side or behind the meter.
- 5) Record the distance to the bank. Measure total stream depth and record this depth. Multiply the total depth by 0.6 and set the propeller at this depth. (Note: 0.6 times the total depth is considered the point of average discharge in a spot that is less than 2 feet deep. If the depth is greater than 2 feet, two different velocity measurements are required one at 0.2 times the depth and one at 0.8 times the depth.) Read and record the velocity at this depth. (Note: If your meter is attached to a “top setting rod” the propeller can be easily set at this 0.6 depth without calculation by you. Directions on using a top setting rod should be provided by the manufacturer.)
- 6) Move to the next measuring point and repeat the process. (Note: The standard method is to obtain three velocity measurements at each point and average them.) Make sure to record the distance to the bank, the total stream depth and the velocity at the 0.6 depth for each point across the stream.

6. Calculation & Conclusion

For more accurate results, discharge measurement will be carried out for three times. Following steps will be taken to calculate the discharge at Bella (Boi) downstream of weir structure.

- Calculate area for each section = width of section x depth of section
- Calculate flow for each section = area of section x velocity of section
- Determine total stream flow = Sum of flow of each section

Annexure-2

Fish Monitoring Study

Impact of Patrind Hydropower on the Fish Resources of Kunhar River



January-March 2019

Mohammad Yousaf Qureshi

Country Director

Edinburgh Direct Aid (EDA)

Table of Contents

1. Abstract	3
2. Introduction	3
3. The objectives of fisheries management in relation to dams	6
4. Impact Assessment of the Project	7
4.1 Materials and Methods	7
4.2 Local knowledge of fish in river Kunhar	10
5. Field Results: (Sampling Points)	11
5.1 Point-I (Batangi)	11
5.2 Point-II (Boi)	12
5.3 Point-III (Domail Boi)	14
5.4 Point IV: Outlet	15
5.5 Point-V: Material Disposal Area	16
5.6 Point-VI Shorran	17
6. Results and Discussions	18
7. Impacts of dams on fish resources	21
8. Recommended Mitigation Measures	24
8.1 Maintenance of flow level	24
8.2 Screens and fish exclusion devices	24
8.3 Artificial desertification	24
8.4 Trapping and hauling	25
8.5 Maintenance of spawning grounds	25
8.6 Fish hatchery	25
8.7 Reservoir fishery	26
9. Recommendations	26
10. References	27

Tables Maps and Graphs

Table: Comparative number of fishes Caught at sampling points	19
Exhibit: Graph of Fish Sampling during Sep. 2013 to Dec. 2019	20
Exhibit: graph of the fish caught during the period of March	20
Map of study area Covering Point-I to Point-III	9
Map of study area Covering Point –IV to Poit VI	9

1. Abstract

River Kunhar flows down through the Kaghan Valley and joins River Jhelum at Domeshi. It has a length of about 250 km originating from the snow glaciers and several perennial and rain fed streams join it at various places. Those of lowlands are fed by rain and intermittent streams and dry up during the low flow period. The rivers support a large variety of aquatic flora, insects and about 12 fish species. The fish are classified as long-distance migrants, mid and short distance migrants, or resident fish. Rivers of Pakistan are renowned for hydropower potential. Two methods, i.e. runoff river type and high dam reservoir type, have been adopted for hydropower development in Pakistan. Weir type is adopted in the steep part of river kunhar where low and average flow of water show less variation. In the reservoir, some resident and game fish may decline, whereas, resident non-game fish species and hardy fish such as catfish may find reservoir conditions favorable. Minimum downstream discharges recommended in the EIA study of Kunhar River is 2.2 m³/s to maintain an aquatic environment suitable for riverine fish.

Water resources of Pakistan are utilized for power generation, irrigation, domestic uses, aquaculture and recreational fisheries. Of all the above, hydropower development has become the most attractive as a reliable, cheap and safe energy source. Patrind Hydropower project is placed on river Kunhar to produce 147 MW of electric power with its full capacity. It is estimated that under the hilly conditions of Pakistan a high dam storage reservoir can generate electricity for about 50 years. Weak geology, frequent earthquakes, high sediment load, and fragile environment are the challenges for a high dam reservoir together with the problems of submergence, stratification, fast sedimentation and erosion of downstream areas.

Cold-water fishes of Pakistan are facing problems due to an increasing number of hydropower projects. Once abundant indigenous fish stocks have been declining due to overfishing, harmful fishing practices (electrofishing, dynamiting, use of chemicals), pollution and developmental works. Developmental works such as river damming have a major impact on river ecology, aquatic flora and fauna, including fish.

2. Introduction

Patrind Hydropower Project authorities have developed a coordination with the stakeholder of the Kunhar River System, i.e., local communities and Department of Fisheries, Government of KPK. Several meetings have been conducted to have consensus on the management practices

for the improvement of riverine fisheries in the project area. Consultant from Edinburgh Direct Aid (EDA) also assisted this talk and the departmental authorities have fully endorsed the plan framework of the project presented by the consultant.

Dam planning, construction and operation is one of the most information-intensive of all civil engineering projects, and typically employs a wide range of specialist skills. Because of the complexity of operation and diversity of impacts of dams, responsible and well-behaved projects generate an information and professional capacity demand which extends far beyond purely engineering, hydraulic and hydrological skills to embrace sociological, environmental and economic disciplines. Of concern at this stage of the project is the information base that is required to effectively manage the fisheries sector throughout the various phases of a dam project cycle. Rational decision-making about matters related to management of fisheries affected by dams should be based on comprehensive and high-quality information. A poor-quality information base will not likely lead to outcomes favorable to the fisheries sector. Fisheries Management Plan requires the careful study of (i) downstream area from weir point to the point of confluence of river Kunhar with river Jhelum, (ii) upstream from Shorran to Gharri Hubibullah and (iii) Reservoir.

The purpose of this Fisheries Management Plan (FMP) is to review what type of information related to fisheries management is required of the dam project, and what fisheries management capacities are required to ensure that effective mitigation measures are implemented at dam projects- that new fisheries development opportunities are realized- that fisheries achieve sustainability, and that fish biodiversity is protected throughout the project cycle.

There is a large amount of diversity in dam designs, dam operations, impacted environments and climatic zones worldwide. It is nonetheless possible to specify sets of fisheries management objectives that will apply to most dams. Objectives in relation to dams fall into two categories. There are conventional or normative management objectives, which are not unique to dam-impacted fisheries but apply to most fisheries throughout the world. These objectives must be considered during the development of Fisheries Management Plant for the project area of Patrind hydropower Project. These generally include some or all of the following:

1. To maintain stock abundance at high levels.
2. To reduce the risk of overexploitation and stock collapse.

3. To achieve sustainability of production of commercially important species.
4. To prevent the loss of fish biodiversity.
5. To maintain levels of employment and enhance incomes within the fisheries sector.
6. To supply domestic consumers with good quality fish at affordable prices.
7. To produce fish products for export.

3. The objectives of fisheries management in relation to dams

Dams impose very specialized and rigorous conditions on fisheries and aquatic environments. Therefore, a further set of dam-specific objectives may be formulated to support and elucidate the above general objectives. These include:

- A. To develop the new fisheries potentials created in the reservoir of the dam.
- B. To maintain fish biodiversity and production in affluent streams entering the reservoir.
- C. To maintain fish biodiversity and production in the riverine environments downstream from the dam.

Proposed framework for developing Fisheries Management Plan was discussed with the Deputy Director of Fisheries Department of KPK Government, Mr. Faheem Ahmed in detail along with Mr. Atif of Starhydro Pvt Ltd and Mr. Imran Yousaf in his office at Mansehra on 28-3-2019. He fully endorsed the framework and ensured his assistance during the preparation and implementation of the Fisheries Management Plan at the Patrind Hydropower project area.



Meeting with Fisheries Department regarding Fisheries Management Plan

4. Impact Assessment of the Project

4.1 Materials and Methods

The study area has been divided into six sampling points for comparative impact assessment at a stretch of about 12 km down and upstream, the points selected were based on the potential of existence of the fish on the basis of their breeding ground, abundance of food ingredients, confluence of side streams and migration possibility of the fish. The points were selected during the pre-construction phase of the dam and sampled during the construction and now during the operational phase. There are two points where sampling has now become impossible; one at Parri (Point-III) where water flow has become centralized and large boulders have made it impossible for casting or erecting any type of net there and second is Point-V at disposal area where casing of net in the reservoir is of no use because of the absence of the fish catch and depth of the reservoir water. During this study, an alternate sampling point has been selected downstream at Batangi Village where a small stream joins the river Kunhar. Another sampling point will be selected upstream beyond Shorran on the next sampling time after June 2019.

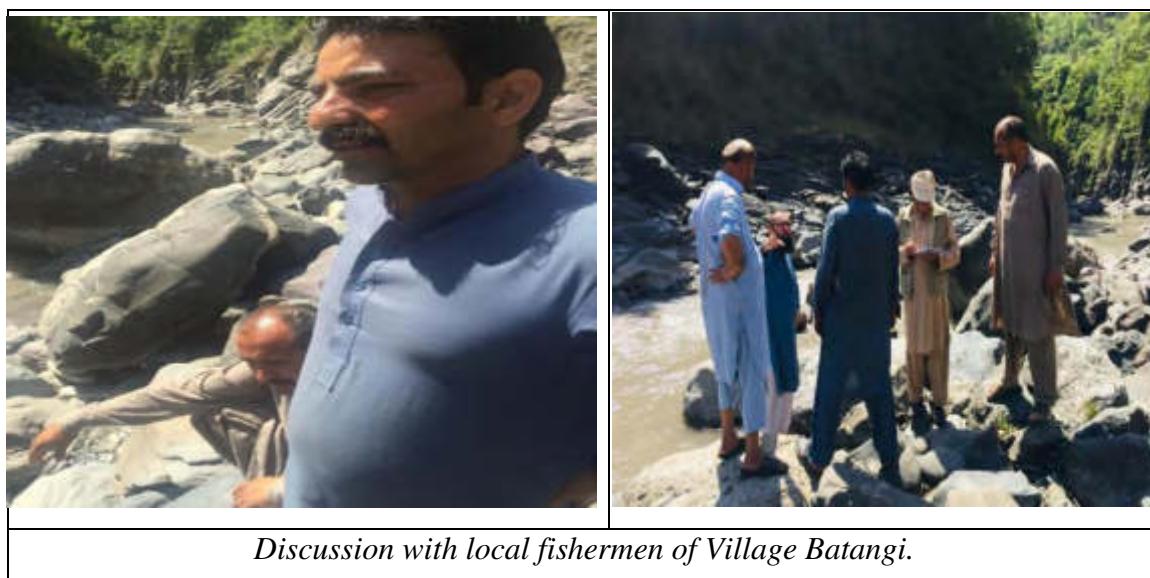
Cast net of 2x2 inch mesh size with a weight of 6 kg has been used and gill net of 1.5x1.5-inch mesh size was used at Point-IV (Weir) to catch fish. A professional fisherman, Mr. Sajid Mehmood was engaged for catching the fish at the sample points of the river Kunhar. Electronic balance was used to weigh the caught fish and normal tap to measure the length. PH paper was used to measure the hardness and TDS meter was used to measure the total dissolved solid and DO meter for the dissolved oxygen in the stream water. Water samples were collected for other parameters of the river water.



Study Area showing location of points

4.2 Local knowledge of fish in river Kunhar

Village Batangi is the new first sampling point of the study. During the study few locals, Mr. Mohammad Altaf, Mr. Ejaz Hussain Shah of Batangi village and Mr. Azhar Shah of Tori village were interacted. All these three locals catch the fish for their domestic use. They were of the opinion that after one year of the dam construction the fish catch has gradually come down. Before they were catching fish weighing half to two kg each but now, they could find hardly any half kg fish. The number of fishes is also limited now and due to this shortage, regular fishing has not been done. The use of cross and gill net is common as it has become easier due to low water flow in the river.



5. Field Results: (Sampling Points)

5.1 Sampling Point I- Batangi

This is a new selected point for sampling as the point 3 at Parri is no more suitable for the fishing because large boulders and centered river water. The selection of this new point at Batangi was based on a small creek joining river Kunhar and it has the possibility of potential of fish concentration on the basis of food availability coming in the creek. This is situated at 34°18' 8.12" N 73°26' 32.79" E with an altitude from sea level is 2371 feet. The creek has brought some gravels and sand and making the bed suitable for possible breeding of the fish. Water flow is slow and river water is greyish muddy while the stream water is clear. Water temperature is 16°C and pH is 6.5. One fish of 125 grams and 15 cm long has been caught here.



Fishing at Point-1 Batangi

5.2 (Boi) Point-II


This second 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 mean sea level. The water flow is slow, air temperature at this point is 32°C , water temperature 16°C and pH 6.5. River guards are placed by the project authorities here to control the pedestrian movement along the riverside to take care of any sudden flooding in the river. The river water was flodded by opening the gates on 7th of April and sign of inundation is visible at the sides. One fish (*shizothorax plagiostomus*) could be caught here with a weight of 211 grams with 26 cm length.



Fish caught at point-2

5.3 Point-III (Domail Boi)

The third point of sampling is Domail at the junction of Nallah Boi with River Kunhar. This point is situated at $34^{\circ} 18' 36''$ N, $73^{\circ} 26' 43''$ E at an elevation of 2398 ft above sea level. The river water is muddy and very slow but nallah water is clear. Air temperature 32°C and water temperature 16°C . The water quantity is low and nallah water has pushed the river more towards the left bank. 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. No fish could be caught here. One angler was erecting the line with bat on the left bank of the river and there was no body from the Fisheries department to check him. River Guard of the Hydropower project accessed him to forbid him from coming close to the river but he did not seem to listen to him. During the study for management plan development, the department of Fisheries, KPK Government should be asked to place at least one Fisheries watcher on this area to control illegal fishing and avoid any incident of life danger because of sudden river flooding or they should authorize the project guard to exercise the law on their behalf.

	
<p>An angler fixing the line for catching fish</p>	<p>Nallah Boi joining River Kunhar</p>

5.4 Point IV: Outlet

Fourth point of sampling 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 placed a Gill net, of 60 ft by 4 ft size,

here one night before to catch the fish for assessment. There were two fish caught here this time as compared to no fish last time. The months of April and September-October are the migratory months of the Schizothorax species. The migration is blocked here because of the weir constructed at this point. There is only 2.25 cumecs of water released. The pH value of the water is 6.5 and temperature 16.5°C.

Two fish were caught, one with a weight of 536 grams and length 36 cm while the other with a weight of 256 grams and length 20 cm.



Water flow from the gate





Fish caught here



Gill net placed at Point IV

5.5 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 30°C and water temperature 16°C. The water temperature indicates that the winter and summer both impact the reservoir. Only hardy fish, *Gyptothrax* or loaches can survive in this reservoir. Mosquitos and other crustaceans are present at the top surface of the reservoir. No fish could be caught. There is no possibility of fish catch here so it is decided to have another sampling point upstream during the next study for establishing baseline for Fisheries Management Plan. A building is under construction of the park but no proper site selection has been carried out. The Government of KPK has allowed the contractor to construct this building without observing the loss of aesthetic value.

	
Building construction at Park	Park beside the lake

5.6 Point-VI Shorran

This sampling point is at the tail of the reservoir and is situated at 34° 21' 09" N and 73° 24' 1" E with an elevation of 2556 ft above mean sea level. Flow of water is faster as



compared to last time very low with an average speed of 5 km/hr most probably the reservoir

water was low because of the release of water during 7th of April 2019. The sides of the

river are rich in vegetation. The air temperature is 31°C and water temperature was 14°C with pH 6.5. The area has become a good ground for the mosquitos and mollusks. Ono fish of 90 grams and length 20cm could be caught here.

River at Shorran

6. Results and discussions

The trend of fisheries catch has decreased over the time. The fish catch was high during the first pre dam construction phase. As the dam construction progressed and obstruction came into being, the fish catch has decreased. The table given below reflects the catch of fish of periodic study at six sampling points of the area.

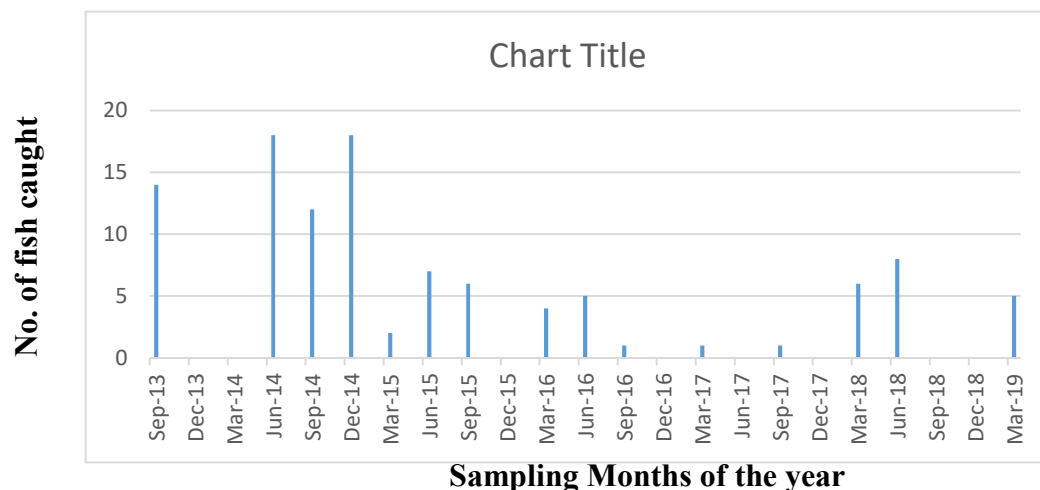
Table

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	0	0	0	0	0	0	0

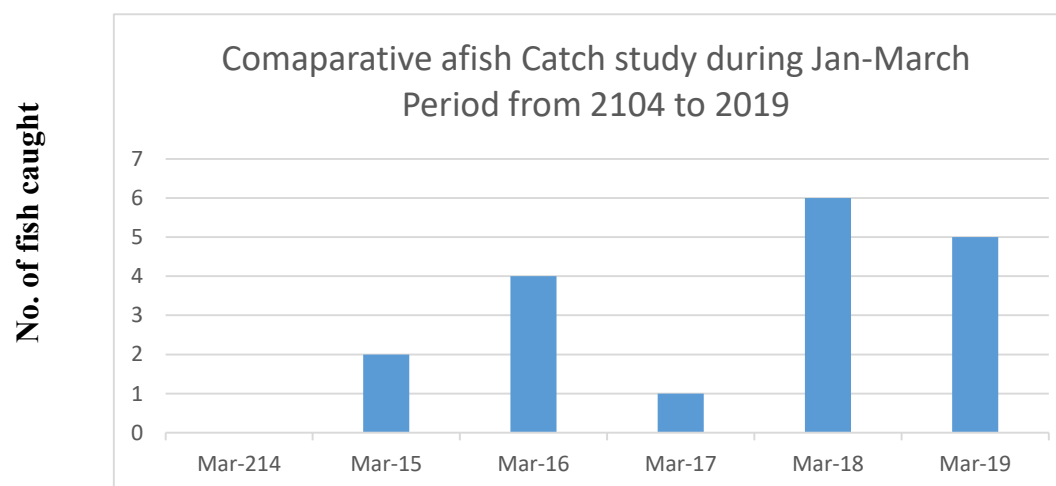
23	April 2019	1	1	0	2	0	1	5
----	------------	---	---	---	---	---	---	---

The graph below shows the trend of fish catch over the study period of September 2013 to March 2019



The graph produced below shows the trend of fish catch during the month of march/April covering whole study period, shows that the catch remains almost the same. This is the breeding time of the fish and Schizothrax species migrate from the tail of the river towards up and this migration stops at weir due to obstruction. The bigger size fish is found here during the breeding months (April and October).

Low water flow (2.25 m³/s) in the river has changed the ecology and breeding grounds of the fish. The water is more centered and its quality downstream and, in the reservoir, has changed which has affected the fisheries. A ‘Fisheries Management Plan’ is the process of development which, hopefully, will cater all the aspects of fisheries rehabilitation in the project area of the River Kunhar.



Sampling Months of the year

7. Impacts of dams on fish resources

It is during the Dam Operation Phase - which can typically span 30 to 70 years - that the most impacts on fisheries and aquatic environments take place. Petts (1984) and Welcome (1985) produced comprehensive reviews of dam impacts on fisheries and aquatic ecology at global level, while Bernacsek (1984a; 1997a) carried out detailed analysis of the impacts of dams on aquatic environment and fisheries in Africa and South-east Asia.

Impacts of Patrind Hydropower Project can be grouped into two categories: 1) impacts which affect the fish directly, and 2) impacts which affect the fisheries environments (upstream river, reservoir, downstream river).

Category 1 impacts include the following:

- The dam constitutes a barrier to upstream migration for almost all fish species. This prevents brood stock from reaching their spawning grounds during the breeding season.
- Downstream migration past the dam may also be difficult or impossible for many fish species. Fish migrating into the reservoir from affluent streams may be unable to find their way to the dam site and subsequently downstream through discharge structures. This can affect spawning and recruitment.

Category 2 impacts include the following:

- Thermal stratification of reservoirs during the warm season can result in deoxygenation of the hypolimnion. Cool and/or anoxic water discharged from the hypolimnion can reduce water quality downstream and negatively impact fish stocks and fisheries.
- Dams with large storage reservoirs can produce abnormally low discharge flows in the downstream river channel, and reduce or eliminate inundation downstream floodplains. The reduced water level and duration and area of inundation limit fish production.
- Reservoirs trap sediments brought in by affluent streams. The turbidity of outflow water of the dam is usually low and there is no deposition of nutrient-rich sediment on the downstream floodplain or delta. This will reduce the fertility and productivity of downstream aquatic environments.

- In the case of sediment release from the reservoir, turbidity can become very high which can create problems for the downstream fauna and flora.
- Sediments trapped in the reservoir may be contaminated with pesticides and industrial chemicals from catchment sources, and residues can enter the reservoir food chain and taint fish.
- Infestation of the reservoir with floating macrophytes can cause a decrease in water quality in the reservoir and in downstream discharge. This is typically initiated by the release of nutrients from drowned vegetation and soil, resulting in a trophic upsurge of primary production and proliferation of floating plants during the first few years after filling as it has been observed in the Patrind reservoir. Large mats of floating macrophytes can lead to deoxygenation and acidification of the water column. Under such conditions fish biodiversity and production is reduced with only air breathing species able to survive. Deployment of most types of fishing gear becomes impossible.
- In most reservoir, trees and brush are not cleared before first filling. Fishermen routinely lose large quantities of gillnets in drowned forests which continue to ghost fish and cause excessive fish mortality.
- The watercourse change downstream disturbs the breeding grounds and sudden shortage or excess in flow can harm the productivity of the fish up to several kilometers in areas with gentle bottom gradients.
- In many reservoirs the moisture-rich drawdown zone is used for agricultural production. Usually pesticides are used to control pest infestation, and this results in contamination of reservoir fish, leading to a health hazard for consumers.
- In most cases, the construction of a dam results in changes in fish biodiversity and stock abundance. Usually, the number of fish species declines. Stocks of long-distance migrating species and fast flowing water species decline while stocks of pelagic species and species that prefer slow moving water (i.e. pre-adapted to lacustrine conditions) increase.

8. Recommended Mitigation Measures

Although the ideal situation cannot be restored in the disturbed ecology of the river in the project area but still several measures have been suggested to mitigate the adverse impacts to some extent on fisheries of the hydropower project area.

8.1 Maintenance of flow level

There is a dewatering effect downstream during the dry season due to the flow diversion and damming of the river. The effect is local and it has overcome to some extent by releasing compensation flow downstream. Compensation flow for the conservation of micro-flora, aquatic insects and fish in the dewatering zone should be within 10-20% of the regular flow. Regular releases of flushing flows will maintain quality of spawning gravel scouring fine sediments away. The compensation flow varies with the quantity of water flow in the river. The minimum regular compensation discharge during the low flow is 2.2 m³/s.

8.2 Screens and fish exclusion devices

Entrapment of fish is a critical issue and some provision should be made to protect the fish against entrapment and impingement. Installation of appropriate screen devices at the intake will divert the fish from water intakes.

8.3 Maintenance of spawning grounds

Some resident and medium migratory fish such as stone roller (*G. gotyla*), stone loaches (*N. beavani*), catfish (*Glyptothorax kashmiriansis*), murrel (*C. punctatus*) and *Scizothorx* species utilize gravel bed areas for spawning. Considerable loss of spawning grounds of these species has taken place immediately below dams. Adequate attention must be given to the protection of the spawning and nursery gravel beds. Where needed, additional measures should be taken during the preparation and implementation of the proposed 'Fisheries management Plan'

8.4 Fish hatchery

A reservoir associated hatchery should produce seed of important native fish which are most affected by dam projects. Stocking the reservoir and tail water will replenish the losses resulting from the disappearance of the natural spawning grounds and from secession of migrations. The fishers should be provided seed from the government hatchery to grow fish in ponds to market size. This provides alternative means of subsistence and income, thus reducing the pressure of the capture fishery on native stocks.

8.5 Reservoir fishery

While regular fish stocking is one way of enhancing reservoir fish stocks, reservoir-based aquaculture is also a useful enhancement practice. Beveridge and Phillips (1988) reviewed the cage, pen and enclosure practices in reservoirs and it can provide income to the local fisher communities. Local fish species could be cultured on experimental basis in the reservoir of the Patrind dam. Fisheries departments of Government of KPK and AJK should start this practice as the project authorities of Patrind project may not handle this intervention.

9. RECOMMENDATIONS

Adequate attention should be given to the conservation of cold-water fish to maintain their gene pool. There is no staff of KPK or AJK Fisheries department for the protection of the area but the project has few this facility at a limited level. Both the department should authorize the project staff to exercise the legal provisions of protection in the area. This will also control the illegal methods used for poaching of fish.

- expansion of cold-water aquaculture will help local people and sustain livelihood of fisher communities
- development of sport fishery will enhance tourism and strengthen local and national income
- fish breeding grounds should be improved downstream for the resident and semi migratory species.

10. References

- Beveridge, M.C.M. and M.J. Phillips, 1988. Aquaculture in reservoirs. In: Proceedings of a Workshop on Reservoir Fishery Management in Asia (S.S. De Silva, ed.): 234-243. IDRC, Ottawa..
- EIA-Bheri-Babai, 1999. Environment Impact Assessment Stage - 1, Baseline Report of Bheri-Babai Hydroelectric Project. By New Era/Nippon Koei/JICA, December.
- EIA-Budhi Ganga, 1998. Medium Hydropower Study Project (MHSP) of Budhi Ganga (BG - O) Hydropower Project Vol. 1 & 2. Main Volume by METCON Consultants Pvt. Ltd., November.
- EIA-Dudh Koshi, 1998. Project Preparation and Studies Directorate, Projects Preparation Department, Medium Hydropower Study Project of Dudh Koshi
- Hydroelectric Project, NEA. EIA Volumes 1-4, CIWEC. Kathmandu, August. EIA-Tamur, 1998. NEA Medium Hydropower Study Project. EIA Report of Fisheries Baseline and Impact Assessment, Tamur Hydropower Project by Canadian International Water Energy Consultant (CIWEC). July.
- Helland-Hansen, E., T. Holtedahl and K.A. Liye, 1995. Environmental Effects. Vol. 3. Hydropower Development. Norwegian Institute of Technology.
- HMG, 1993. National Guidelines for EIA (Environment Impact Assessment) of Hydro-Electric Projects. HMG, Nepal.
- Proceedings of a Workshop on Reservoir Fishery Management in Asia (S.S. De Silva, ed.): 87-93. IDRC, Ottawa.
- Shrestha, J., 1997. Enumeration of the fishes of Nepal. Biodiversity profil project. HMG/N and Government of Netherlands Enroconsults, Arnhem, The Netherlands.
- Shrestha, T.K., 1997. Status, Ecology and Behavior of Fishes of Arun River (Nepal). In: Recent Advances in Fish Ecology, Limnology and Eco-conservation (S. Nath, ed.), III: 1-26.
- Swar, D., 1992. Effect of impoundment on the indigenous fish population in Indrasarovar Reservoir, Nepal. In: Reservoir Fishing Management in Asia (S. S. De Silva, ed.): 111-118. IDRC, Ottawa.
- Yearly Progress, 2055/56. Limnobiological/Biological Study of Sunkoshi River. In: Yearly Progress Report of Inland Aquaculture Fisheries Section Balaju. Kathmandu.

Annexure-3

Plantation Campaign, 2019

As an integral part of our Environment Management Plan and as a mitigation measure to the removal of vegetation during construction phase SHPL (Owner Company) and K-Water (O&M Contractor) carried out tree plantation on both sites of the project. This plantation will not only compensate for the removal of vegetation in need for construction but will help these slopes reclaim naturally and help control of soil erosion.

On powerhouse site 2,410 plants were planted and at Weir site 1,790 plants were planted on the desired locations.

Following Plant species were planted;

Plantation Details

Sr. No	Plant Name	Quantity	Powerhouse Site	Weir Site
1.	Walnut	200	100	100
2.	Cheer	400	200	200
3.	Robenia	800	400	400
4.	Ailenthus	800	400	400
5.	Mulberry	500	250	250
6.	Anjeer	100	60	40
7.	Bamboo	400	400	
8.	Besa/Lositrum	300	200	100
9.	Sharole	300	150	150
10.	Phagwara	200	50	150
11.	Narri	200	200	
12.	Total		2,410	1,790

Plantation Locations at Weir Site



Plantation Locations at Weir Site Disposal Area



Plantation Locations at Power House Site



Photographs



Annexure-4

Tentative CSR Plan

	Procedure for Corporate Social Responsibility			Version 01
	Doc. ID:	Issue Date:	Rev. #	
	K Water / HSEP-002	June 11, 2015	00	

Table 01: Annual CSR Plan 2019 (Tentative)

S. #	Area	Scheme / Project	Location	Tentative Cost (Rs)	Tentive Execution Date	Beneficiaries / Benefits / Purpose
01	Drinking Water	Donation of water tank and water pipes to residents of Alra Village	Alra (Powerhouse Area)	65,000	September 2019	To improve drinking water supply to local communities
02	Livelihood	Distribution of 20 sewing machines among poor women of Alra and Lower Chatter villages	Alra, Lower Chatter (Powerhouse Area)	160,000	September 2019	To improve livelihood of poor women / families of local communities
03	Water	Donation of water pump to residents of Lower Chatter living close to powerhouse	Lower Chatter (Powerhouse Area)	20,000	September 2019	To improve drinking water supply to local communities
04	Cultural	Donation of UPS to local mosque in Lower Chatter Village	Lower Chatter (Powerhouse Area)	30,000	October 2019	To facilitate local communities in performing their cultural work
05	Livelihood	Distribution of 30 sewing machines among poor women of Patrind, Sirati and Tarchella villages	Patrind, Sirati, Tarchella (Weir site)	240,000	October 2019	To improve livelihood of poor women / families of local communities
06	Cultural	Donation of fan, water cooler and carpet to local mosque in Shoran Village	Shoran Village (Weir site)	85,000	October 2019	To facilitate local communities in performing their cultural work
Total Cost (Rs / USD)				Rs. 600,000 / USD 4,280.21(01 USD=Rs 140.18)		

Note: Schemes / projects may change, if required / demanded by communities.

Prepared By:	Manager HSE & CSR
Approved By:	GM Patrind HPP
Date:	March 21, 2019

Annexure-5

Vegetation Monitoring Study

Impact of Patrind hydropower project on vegetation



Study Report

Jan-Mar, 2019

Edinburgh  DIRECT AID

Contents

1. Background	56
2. Introduction.....	57
3. Study Area	57
4. Objectives.....	57
5. Forest Types (Ecological Zonation):	57
6. Vegetation Cover.....	58
7. Methodology	60
8. Impacts of Dam:	60
9. Findings and Observations.....	64
10. Recommendations	66
11. Status of Implementation of recommendations:	67
12. Acknowledgements	67
13. References	67

1. Background

The vegetation is affected by the construction of the dams under several aspects:

- a) Local communities immediately cut and remove the trees as soon as they get the compensation of the marked trees.
- b) Constructional phase also affects the immediate vegetation in the bed and surrounding steep slopes
- c) Construction of water diversion tunnel impacts the vegetation due to thrill
- d) Riparian species are affected due to change in hydrological pattern after the construction of the dam.
- e) Invasive species may come in the area due to change in the humidity around the reservoir.
- f) Tunnel outlet construction in the fragile soil may lead to the erosion.

Dams and reservoirs can be used to supply drinking water, generate hydroelectric power, increase the water supply for irrigation, provide recreational opportunities, and flood control. The construction of dams and other similar projects throughout the world including Pakistan have generated considerable environmental and political debate. The construction of a weir on the river flow obstructs the water affecting downstream and upstream ecology.

Pakistan has large below the required area under productive forests. It has about 4.5% of its area as compared to a minimum requirement of 25%. This, again, is threatened due to such activities that damage the tree cover. Damming, road construction, huge transmission lines, housing schemes and such other activities are alarming issues. Reduction in forest cover means shortage of underground water storage, warming up the atmosphere and creation of more environmental disaster risks.

Planners have to take environmental care while designing the mega projects of dams, highways, construction of concrete buildings. There is a very high demand of irrigation water and energy in the country for agriculture and industry. Dams and reservoirs can be used to supply drinking water, generate hydroelectric power, increase the water supply for irrigation, provide recreational opportunities, and flood control. All this is true but it is required to take care of the natural balance as well. In constructing these dams, one must be conscious of the losses we face and the quality of life we scarify. The scoring will tell us the importance of having such facilities or otherwise.

2. Introduction

The Northern zone of Pakistan receives about 60'' of average rainfall except in the areas of dry temperate zone. This much precipitation can support the greenery in the area but, unfortunately, our demand and unwise use of resources have led us to massive loss of land cover. The forest cover is reducing in a fast pace and mature trees are seldom seen in the forest areas. Scrub forests are also shrinking due other land uses like, housing etc. There is no land use policy in the state. Housing societies are growing on fertile agricultural lands. Road construction on the steep slopes have disturbed the land stability causing massive erosion problems. There is no check and balance in the nature. Lack of land stabilization is further deteriorating the area and it is showing an ugly picture of denudation and landslide throughout the mountain ranges. Development projects are started without realizing their negative impacts especially in the mountain region. The 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 lies in the Himalayas subtropical zone with Chirpine as a major associate of the broad-leaved trees.

The land acquired for the construction of dam has been cleared of the vegetation by the local community even if it is not used under the project.

The outlet side has faced the problem of landslide and immediate area behind the powerhouse has been enforced with concrete structure.

3. Study Area

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 above mean sea level and around the powerhouse at Alda (34° 20' 06'' N, 73° 27' 18'' 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.

4. Objectives

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.

5. 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 and
- b) Subtropical Chir pine Forest with a major tree species of Chir Pine.

6. Vegetation Cover

Vegetative cover exists of all three stages i.e., Tree cover, bush canopy and herbs and grasses as understory. Project site vegetation does not contain any species listed as endangered or threatened by the Government of Pakistan or IUCN. Only two species *Celtis austarlus* (Batculd) and *Ficus carica* (Enjeer) were found rare in Pakistan but they are listed as common for the rest of the world. Some of these trees have been submerged in the reservoir water but most of the trees were cut by the affected communities of the area before the rise of water. The presence of these two species above the highest water level will not be disturbed as they were found above the submerged area and away from the affected land area. Other vegetation species were found protected and common in Pakistan and for the rest of the world. Therefore, it is concluded that there will be no negative impacts of Patrind Hydropower Project on the conservation status of the high hill vegetation of the area.

The area around the Powerhouse at Alda is mostly dominated by the Chirpine species on the mountain slopes. There is a transmission line connecting grid station at Rampura in Muzaffarabad and other supplying power to Hazara in KPK. The lines pass through the forest so the tree canopy coming under this line has been cleared.

SHPL (Owner Company) and K-Water (O&M Contractor) carried out tree plantation on both sites of the project. This plantation will not only compensate the removal of vegetation in construction but will help these slopes reclaim naturally and help control of soil erosion.

On powerhouse site 2,410 plants were planted and at Weir site 1,790 plants were planted on the desired locations.

Following Plant species were planted;

Plantation Details

Sr. No	Plant Name	Quantity	Powerhouse Site	Weir Site
13.	Walnut	200	100	100
14.	Cheer	400	200	200
15.	Robenia	800	400	400
16.	Ailanthus	800	400	400
17.	Mulberry	500	250	250
18.	Anjeer	100	60	40
19.	Bamboo	400	400	
20.	Besa/Lositrum	300	200	100
21.	Sharole	300	150	150
22.	Phagwar	200	50	150
23.	Narri	200	200	
24.	Total		2,410	1,790

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

<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
Batcud	<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>Ailanthus 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
Talli (shisham)	<i>Dalbergia sisso</i>	furniture wood	common

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

7. 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.

8. Impacts of Dam:

Impoundment impact on vegetation cover is through the increase in local humidity level. This increase may favour the invasion of some unwanted plant species like paper mulberry.

The riparian species are affected by the frequent change in the hydrological flow. Species last time reported along the riverside have been flown away with the flush water release. Very small plants are seen coming up at the riversides but these may also be washed away with floodwater. The vegetation cover on the slopes along the right bank of the reservoir

are getting denser due to increase in moisture content. This is a positive impact on the vegetation of the dam side.

The landslide behind the powerhouse has been treated with some bioengineering works and excellent plantation of suitable species has been carried out. The deep rooted species of Walnut (*Juglans regia*), soil binder species of Injeer (*Ficus caraca*), native species of Chipine (*Pinus roxburghii*), early sprouting species of Mulberry (*Morus alba*) and other soil binder species have been planted on both sides of the project area i.e., powerhouse and weir sides. Inspection on the success percentage has been carried out during the study and it was found that the porcupine has damaged Chirpine saplings along the roadside towards corner 2 and 4 behind powerhouse.



Porcupine damage to Chir Pine trees along the road

EDA facilitated the project by requesting the relevant experts of the University of AJK in seeking their support for controlling the attack of the Porcupine on the newly planted saplings of Chir Pine. Four Scholars headed by Mrs. Nuzhat Shafi, Head of the Zoology Department of the University of AJK has very kindly, visited the area and they assured their full assistance in controlling the porcupine attack on the saplings. They visited the area and promised to carry on the appropriate action in stopping the attack of the vermin.

They also met the GM Mr. Kim and assured their involvement in this regard and other related issues.



Head of Zoology Department of AJK university meeting with General Manager



Head of Zoology Department of AJK university assistance in controlling the porcupine attack on the saplings



Lush green view of plantation of last year



A good view of sprouted plant planted this year

The slide area was also planted by the project authority and some area was taken up by the Forest Department of AJK. The plantation carried out by the forest department in the live slide area has been damaged by erosion. They have also constructed gabion check walls of dry stone masonry to control the soil movement in the slide area.



Image showing the fresh planted and gabion check walls fixed area behind the powerhouse



Picture showing project plantation at the base of the slide and gabion work by Forest Department



Plantation along the river bed to stabilize the area

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. The sapling coming during the dry spell are eroded away by sudden splash of water which will not allow the establishment of

plant community on the riversides. 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.

- ii) The slope area of the weir side has also been planted with selected plants and their success seems to be higher than 60%, which is a good sign.
- iii) Fresh plantation of Chir pine along the road behind the powerhouse has been damaged by the porcupine. University scholars of AJK have committed to control the vermin attack. This area needs to be re-planted either by Chir pine or deodar saplings can also be tried as they are not attacked by the porcupine.
- iv) Forest department authorities of AJK have placed check walls of dry-stone wire gabions at the base of the adjacent slide and stream area. This is a good effort to control the rapid erosion.
- v) Plantation carried out two years back have shown a good result and plants are grown up and established their root system in the soil.
- vi) 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.
- vii) 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 Shorran village.
- viii) The dense cover of weed (*Benthium* species) observed last time has been removed and this shows the action on the recommendations.
- ix) The concrete area behind the powerhouse has many steps. Floral earthen pots of larger size should be placed here with plant climbers and creepers. This will make good green look of the area.



Pic: Concrete beds ideal for putting earthen pots with bails, creepers, and climbers

10. Recommendations

1. The slope area close to weir point has been planted with good recommended plant species. Their survival percentage seems to be higher than 60%, which shows a good result. The area should be beaten up with new plants where dieback is observed.
2. 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.
3. The mass of soil under the slide at the right bank of river Jhelum has been planted with root-shoot cuttings of bamboo. This should be repeated for at least two more years to get the plantation well established.
4. There is a weed, Gajar Booti (*Bethium* species) near the residential building just adjacent to the slide. This is scavenger plant causes much damage to the environment and soil. The project has engaged the labor to remove it but care should be taken of its regrowth.
5. The concreted area have provision of steps which can be used for placing earthen pots with some creepers so that it cloud look green and represent a pleasant view
6. The area under the Power Poles at corner 4 have also been planted with plants for the land cover and beautification and coming season will give look of the area. Die back should be covered with replantation.



Pic: Satellite image of landslide area with marked details

11. Status of Implementation of recommendations:

- a. A sufficient effort has been done to cover the slopes with appropriate plant species and it needs to be continued with beating up the gapes
- b. Landscaping Plan is under process and this should be finalized for the application of planned measures in controlling the slide area and increasing the vegetative cover.
- c. Bethium weed has been removed by engaging the labor but needs continues watch of its regrowth.

12. 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 the logistic facility to our team of experts but their relevant staff also supported us during the field visits. My special thanks to Mr. Qamar, Mr. Atif and Mr. Imran Yousaf for their valuable inputs during all our field work.

13. References

- i) Plants of Pakistan, TJ Roberts
- ii) Pakistan Journal of Forestry, periodic publications of Pakistan Forest institute Peshawar
- iii) Impact of small farm dams on the environment of South Africa
- iv) Environmental and social impacts of dams in India-Ice virtual Library
- v) Positive and negative impacts of dams a debate – Shodhganga
- vi) Dams and their environmental impacts
<https://www.slideshare.net/MOHDSALMAN52/dams-and-thier-environmental-impacts>

Annexure-6

Noise Monitoring Report



Monthly - Noise Survey Report

Date: 29th Jan, 2019

Sr. No	Location	Type	Time Day/Night	1 st Reading db (A)	2 nd Reading db (A)	3 rd Reading db (A)	Average Reading db (A)	NEQ% db (A)	Remarks
1.	First Floor	Office Area (Commercial)	Day	58.2	56.3	56.1	56.8	65	
2.	Ground Floor	Office Area (Commercial)	Day	46.1	46.9	47.3	46.7	65	
3.	Basement-1	Process Area (Industrial)	Day	51.3	54.3	57.2	54.9	85	
4.	Basement-2	Process Area (Industrial)	Day	45.3	47.6	48.9	47.2	85	
5.	Basement-3	Process Area (Industrial)	Day	57.4	61.3	62.2	60.3	85	
6.	O & M Building	Residential Area	Day	44.3	43.9	45.6	44.5	55	
7.	Korean Accommodation	Residential Area	Day	51.9	52.4	53.7	52.6	55	
8.a	Alda Village Point 1 Day Time	Residential Area	Day	48.7	49.2	49.4	49.1	55	
8.b	Alda Village Point 1 Night Time	Residential Area	Night	44.2	44.8	42.9	44.3	45	
9.a	Alda Village Point 2 Day Time	Residential Area	Day	46.6	53.2	49.8	49.8	55	
9.b	Alda Village Point 2 Night Time	Residential Area	Night	42.5	43.2	43.5	43.6	45	

Monitored By: Jason Young & Maqida

NOTE :- No Turbine was operational

Signature: 



Monthly - Noise Survey Report

Date: 19th - February, 2019

Sr. No	Location	Type	Time Day/Night	1 st Reading db (A)	2 nd Reading db (A)	3 rd Reading db (A)	Average Reading db (A)	NEQs db (A)	Remarks
1.	First Floor	Office Area (Commercial)	Day-	55.7	54.9	56.2	55.6	65	
2.	Ground Floor	Office Area (Commercial)	Day-	54.9	55.6	55.3	55.2	65	
3.	Basement-1	Process Area (Industrial)	Day-	82.6	74.4	83.7	80.2	85	
4.	Basement-2	Process Area (Industrial)	Day-	84.8	81.6	82.8	83.06	85	
5.	Basement-3	Process Area (Industrial)	Day-	80.9	81.4	83.8	82.03	85	
6.	O & M Building	Residential Area	Day-	47.9	46.5	46.7	47.03	55	
7.	Korean Accommodation	Residential Area	Day-	42.8	41.8	43.6	42.71	55	
8.a	Alda Village Point 1 Day Time	Residential Area	Day-	42.3	42.4	41.5	42.06	55	
8.b	Alda Village Point 1 Night Time	Residential Area	Night	44.2	43.9	43.1	43.7	45	
9.a	Alda Village Point 2 Day Time	Residential Area	Day-	43.3	41.0	41.9	42.06	55	
9.b	Alda Village Point 2 Night Time	Residential Area	Night-	46.2	41.3	42.1	43.2	45	

Monitored By: Samman Yousof

Note: Turbine(01) was operating at 100% Efficiency.
 producing (50 MW) - Day Time
 :- At night Time one Turbine was operating
 at (25 MW)

Signature: 



Monthly - Noise Survey Report

Date: 24th March, 2019

Sr. No	Location	Type	Time Day/Night	1 st Reading db (A)	2 nd Reading db (A)	3 rd Reading db (A)	Average Reading db (A)	NEQNs db (A)	Remarks
1.	First Floor	Office Area (Commercial)	Day.	58.5	54.9	56.3	56.5	65	
2.	Ground Floor	Office Area (Commercial)	Day.	59.3	58.2	58.1	58.5	65	
3.	Basement-1	Process Area (Industrial)	Day.	83.5	84.0	83.9	83.8	85	
4.	Basement-2	Process Area (Industrial)	Day.	76.4	86.2	83.2	81.9	85	
5.	Basement-3	Process Area (Industrial)	Day.	83.8	84.1	83.8	83.9	85	
6.	O & M Building	Residential Area	Day.	46.7	45.9	46.3	46.3	55	
7.	Korean Accommodation	Residential Area	Day.	43.2	44.3	44.1	43.8	55	
8.a	Alda Village Point 1 Day Time	Residential Area	Day.	42.4	40.9	41.2	41.5	55	
8.b	Alda Village Point 1 Night Time	Residential Area	Night.	44.1	43.6	43.4	43.7	45	
9.a	Alda Village Point 2 Day Time	Residential Area	Day.	43.3	43.6	41.8	42.9	55	
9.b	Alda Village Point 2 Night Time	Residential Area	Night.	41.2	43.1	43.6	42.6	45	

Monitored By: Imman Yousaf

NOTE:- (02) Turbines was operating. Each was producing (25 MW) and was at 50% efficiency.

Signature: 

Annexure-7

Waste Transfer Notes



Certificate of Waste Management Service

Waste collected from Patrind hydropower Project was disposed off at Shadra disposal site (Government Approved Disposal Site) after segregation having particular listed below:

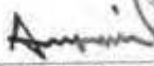
Month of Jan-2019

Waste Management Service

Particulars

DATE	WASTE TYPE	WEIGHT	RECYCLE WASTE
03-Jan-19	Non Hazardous waste	310 KG	20 KG
10-Jan-19	Non Hazardous waste	316 KG	
17-Jan-19	Non Hazardous waste	321 KG	
24-Jan-19	Non Hazardous waste	329 KG	




Authorized sign

Stamp

Issue Date 1, Feb, 2019

Page 1 of 1

First Floor, Haji Saad Plaza,
Main Buxar Chowk, Chetra
Bakhtawar Park Road,
Chak Shahzad Islamabad.

House # A/5, New Block T,
Minatabad, Nazim Tibetta Colony,
North Nazimabad, Karachi

• qadri319@gmail.com
• khazamenshi.qadri319@gmail.com
• sidra.khan319@gmail.com

051-8355816 ~ 8355817
0311-8182097, 0543-8593067,
0355-8113085, 0355-8113678,
0346-8182071

M/S QADRI ENTERPRISES

Waste Management Service

Dry Food, Oily Rags & Recycle Waste According to Waste Tracking From

DRY TRASH		Location : Patirind Hydro Power Project		MONTH OF JAN :2019																													
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
KG		0	0	225	0	0	0	0	0	0	238	0	0	0	0	0	0	230	0	0	0	0	0	0	240	0	0	0	0	0	0	0	938
		310					316					321					329																

FOOD WASTE		Location : Patirind Hydro Power Project		MONTH OF JAN :2019																													
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
KG		0	0	75	0	0	0	0	0	0	88	0	0	0	0	0	0	80	0	0	0	0	0	0	74	0	0	0	0	0	0	296	

OILY RAGS		Location : Patirind Hydro Power Project		MONTH OF JAN :2019																													
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
KG		0	0	10	0	0	0	0	0	0	12	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	42	
		310					316					321					329																

Description	FOOD WASTE	DRY TRASH	OILY RAGS	DOENRY+OILY+TOTAL	RECYCLE
Total Kg	296	938	42	1276	20



M/s Qadri Enterprises

PEST CONTROL WASTE MANAGEMENT & WATER TANK CLEANING SERVICE

Certificate of Waste Management Service

Waste collected from Patrind hydropower Project was disposed off at Shadra disposal site (Government Approved Disposal Site) after segregation having particular listed below:

Month of Feb-2019

Waste Management Service

Particulars

DATE	WASTE TYPE	WEIGHT	RECYCLE WASTE
04-Feb-19	Non Hazardous waste	324 KG	17 KG
11-Feb-19	Non Hazardous waste	315 KG	
18-Feb-19	Non Hazardous waste	322 KG	
25-Feb-19	Non Hazardous waste	290 KG	



Authorized sign

Stamp

Issue Date 28, Feb, 2019

Page 1 of 1

First Floor, Haji Saad Plaza,
Main Bazar Chowk, Cherta-
Badrinagar Park Road,
Chak Shuhad Idharabad.

House # A/5, Near Black T,
Mustafabad, District Bhutto Colony,
North Nazimabad, Karachi

• qadri319@gmail.com
• hshamsarid.qadri319@gmail.com
• mishackhush319@gmail.com

031-8355816 - 8355817
0351-8182997- 0343-8993387
0355-8113085, 0355-8117474,
0346-8382077

M/S QADRI ENTERPRISES																																																	
Waste Management Service																																																	
Dry,Food,Oily Rags & Recycle Waste According to Waste Tracking From																																																	
Location : Patrind Hydro Power Project															MONTH OF FEB:2019																																		
DRY TRASH																																																	
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	KG																
KG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
FOOD WASTE																																																	
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	KG																
KG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
OILY RAGS																																																	
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	KG																
KG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																
334															318															322										290									
																														322										290									
Description	FOOD WASTE							DRY TRASH							OILY RAGS							FOOD/OILY RAGS TOTAL							RECYCLE																				
Total Kg	310							308							48							1361							12																				



M/s Qadri Enterprises

PEST CONTROL WASTE MANAGEMENT & WATER TANK CLEANING SERVICE

Certificate of Waste Management Service

Waste collected from Patrind hydropower Project was disposed off at Shadra disposal site (Government Approved Disposal Site) after segregation having particular listed below:

Month of March-2019

Waste Management Service

Particulars

DATE	WASTE TYPE	WEIGHT	RECYCLE WASTE
04-March-19	Non Hazardous waste	313 KG	20 KG
11-March-19	Non Hazardous waste	326 KG	
20-March-19	Non Hazardous waste	344KG	
30-March-19	Non Hazardous waste	310 KG	



Authorized sign

Stamp

Issue Date 1, April, 2019

Page 1 of 1

First Floor, Haji Saad Plaza,
Main Bazar Chowk, Chaita
Bakhtawar Park Road,
Chak Shahzad Islamabad.

House # A/5, Near Block T,
Mustafabad, Puzat Bhotra Colony,
North Nazimabad, Karachi

• qadri319@gmail.com
• khatamseed.qadri319@gmail.com
• nshahkhan319@gmail.com

051-8333816 - 8333817
0331-8182097- 0343-8393367
0355-8113085, 0355-8113474
0346-8182071

M/S QADRI ENTERPRISES
Waste Management Service

Dry Food, Oily Rags & Recycle Waste According to Waste Tracking From

DRY TRASH		Location : Patrind Hydro Power Project																															MONTH OF MARCH 2019	
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	
KG		0	0	0	230	0	0	0	0	0	0	250	0	0	0	0	0	0	0	0	0	260	0	0	0	0	0	0	0	0	330	0	975	

FOOD WASTE																																	TOTAL
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	KG
KG		0	0	0	70	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	60	0	375

OILY RAGS																																	TOTAL
Date		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	KG
KG		0	0	0	12	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	45	

		313									326									344									319								
--	--	-----	--	--	--	--	--	--	--	--	-----	--	--	--	--	--	--	--	--	-----	--	--	--	--	--	--	--	--	-----	--	--	--	--	--	--	--	--

Description	FOOD WASTE	DRY TRASH	OILY RAGS	OOD+DRY+OILY =TOTAL	RECYCLE
Total Kg	273	975	45	1293	20

Annexure-8

Fire Fighting, First Aid Trainings & Emergency Evacuation Drill Report

Report for firefighting, First aid Trainings & Emergency Drills				
Project:	Patrind Hydro Power Plant (PHPP)	Trainers:	Civil Defence Team	
Participants:	Staff of PHPP	Conducted By:	HSE Team	
Firefighting training (Theory + Practical)	Date:	15-03-2019	Time:	9:30AM to 12:00PM
First aid training	Date:	26-03-2019	Time:	10:00AM to 11:30AM
Emergency evacuation drill (General)	Date:	26-03-2019	Time:	20 minutes
Firefighting & first aid drill (Specific)	Date:	26-03-2019	Time:	20 minutes

Brief summary:

Firefighting and first aid trainings were given to the staff of Patrind Hydro Power Plant by Civil Defence. The emergency evacuation drill (general for all staff), firefighting and first aid drill (Specific for site emergency response team) were conducted as well. All trainings & drills sessions were successfully managed by the HSE team to prepare the staff to handle the emergency situation proficiently. Following were the main objectives:

(a): Firefighting training

- Awareness about fire chemistry, classification and common causes of fire
- Methods of fire extinction (Starvation, smothering & cooling)
- Fire extinguishers and their types
- Method of using fire extinguishers etc.

(b): First aid training

- Awareness regarding immediate treatment to prevent the condition be worst in case of emergency
- Methods of bleeding control through the bandage
- Emergency Moves
- Methods of using splints in case of fractures
- Cardiopulmonary Resuscitation (CPR)
- External Chest Compression (ECC)
- Artificial Respiration (AR) etc.

(c): Emergency drills (Evacuation, Firefighting & First aid)

- To ensure the safety, health and wellbeing of employees during emergency
- The time of emergency announcement was 11:45AM
- The first arrival during emergency evacuation at assembly point was 11:46AM
- Most employees reached at assembly point on 11:47AM
- Last employee reached at assembly point on 11:48AM
- The specific drill announcement (Firefighting & first aid) was on 12:00PM
- Site emergency response team (SERT) arrival time was 12:01PM
- Fire extinguishing time was 12:02PM
- First aid treatment completed at 12:04PM

Photographs



Firefighting training (Theory + Practical)



First aid training



Emergency drills (Evacuation, Firefighting & First aid)