CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

A Study of Project Management Plan of Dasu Hydropower Project Executed by Water and Power Development Authority, Government of Pakistan

by

Mahad Ali Zafar

A project submitted in partial fulfillment for the degree of Master of Science

in the

Faculty of Management & Social Sciences
Department of Management Sciences

2019

First of all, I thank ALLAH Almighty who is the most merciful and beneficent. ALLAH created us and showed us a correct pathway. ALLAH always secretes sins and protects us from social troubles. I also dedicate my study to my parents.

CERTIFICATE OF APPROVAL

A Study of Project Management Plan of Dasu Hydropower Project Executed by Water and Power Development Authority, Government of Pakistan

by

Mahad Ali Zafar

MPM-171005

RESEARCH PROJECT EXAMINING COMMITTEE

S. No.	Examiner	Name	Organization
(a)	Internal Examiner	Mr. Nasir Rasool	CUST, Islamabad
(b)	Project Supervisor	Dr. Umar Nawaz Kayani	CUST, Islamabad

Dr. Umar Nawaz Kayani
Project Supervisor
April, 2019

Dr. Sajid Bashir
Head
Dept. of Management Sciences
April, 2019

Dr. Arshad Hassan
Dean
Faculty of Management & Social Sciences
April, 2019

Author's Declaration

I, **Mahad Ali Zafar (Registration No: MPM-171005)**, hereby state that my MS project titled "**A Study of Project Management Plan of Dasu Hydropower Project Executed by Water and Power Development Authority, Government of Pakistan**" is my own work and has not been submitted previously by me for taking any degree from **Capital University of Science and Technology, Islamabad** or anywhere else in the country/abroad.

At any time if my statement is found to be incorrect even after my graduation, the University has the right to withdraw my MS Degree.

Mahad Ali Zafar
Registration No: MPM-171005

Plagiarism Undertaking

I solemnly declare that research work presented in this project titled "**A Study of Project Management Plan of Dasu Hydropower Project Executed by Water and Power Development Authority, Government of Pakistan**" is solely my research work with no significant contribution from any other person. Small contribution/help wherever taken has been dully acknowledged and that complete project has been written by me.

I understand the zero tolerance policy of the HEC and Capital University of Science and Technology towards plagiarism. Therefore, I as an author of the above titled project declare that no portion of my project has been plagiarized and any material used as reference is properly referred/cited.

I undertake that if I am found guilty of any formal plagiarism in the above titled project even after award of MS Degree, the University reserves the right to withdraw/revoke my MS degree and that HEC and the University have the right to publish my name on the HEC/University website on which names of students are placed who submitted plagiarized work.

Mahad Ali Zafar
Registration No: MPM-171005

Acknowledgements

I want to acknowledge our Holy Prophet Hazrat Muhammad (P.B.U.H) the man who is the great leader and base of all knowledge in the world. Now I want to acknowledge the hard work, help and kindness of our supervisor Dr. Umar Nawaz Kayani who was always there for me during my work and treated me well and give me full guidance and knowledge about my study.

Mahad Ali Zafar

Registration No: MPM-171005

Abstract

The report is about a study of Project Management Plan (PMP) of Dasu Hydropower Project (DHP) Executed by Water and Power Development Authority, Government of Pakistan (WAPDA). For this purpose, actual data of Dasu project was analyzed using knowledge of PMP. The information is collected through Project Documents, Interviews of Project Managers in DHP, Interviews of Project Managers in WAPDA and Organizational Historical Artifacts. After the analysis, we evaluated the existing Dasu Hydropower Project (DHP) against the PMP template. In which we try to evaluate that whether the existing DHP plan is based on the guidelines of project management plan template or not. To evaluate DHP plan in the light of PMP template. We try to establish a proper Change Control Flow Chart (CCFC). We also establish Risk Register (RR) on the basis of information given in their DHP plan.

Contents

List of Figures

List of Tables

Abbreviations

Acronym	**W**hat (it) **S**tands **F**or
WAPDA	Water and Power Development Authority
DHP	Dasu Hydropower Project
HPD	Hydropower Development
GOP	Government of Pakistan
KPK	Khyber Pakhtunkhwa
UIV	Upper Indus Valley
EARF	Environmental Assessment and Review Framework
ESIA	Environmental and Social Impact Assessment
ROR	Run of River
DB	Diamer-Basha
DHC	Dasu Hydropower Consultants
WFI	World Finance Institute
WCAP	Water sector Capacity building and Advisory service Project
WWF	World Wildlife Fund
WB OP	World Bank Operational Policies
WEC	Wapda Environmental Cell
GHG	Green Gas Emission
RCC	Roller Compacted Concrete
LAA	Land Acquisition Act
TOR	Turn of References
SOW	Scope of Work
EMP	Environmental Management Plan
NEQS	National Environmental Quality Standards

EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
Pak-EPA	Pakistan Environmental Protection Agency
U/s	Up Stream
D/s	Down Stream
RAP	Resettlement Action Plan
EU-DHP	Environment Unit-Dasu Hydro Project
SRMP	Social and Resettlement Management Plan
MASL	Meter Above Sea Level
NSWCC	National Surface Water Classification Criteria
ESMP	Environmental and Social Management Plan
COD	Chemical Oxygen Demand
TDS	Total Dissolved Solids
NSDWQ	National Standards for Drinking Water Quality
TSS	Total Suspended Solids
PMU	Project Management Plan
WB	World Bank
WWBs	World Wide Banks
ICOLD	International Commission of Large Dams
SUPARCO	Pakistan Space and Upper Atmosphere Research Commission
HAP	Health Action Plan
IPCC	International Panel on Climate Change
FGD	Focus Group Discussions
CSC	Construction Supervision Consultants
PRP	Participatory Resettlement Planning
SDP	Social Development Plan
PPP	Post Project Period
PM	Particulate Matter
CO	Carbon Monoxide
SO	Southern Connecticut

NOx	Nitrogen Dioxide
HBL	Habib Bank Limited
MW	Mega Watt
KW	Kilo Watt
OHS	Occupational Health and Safety

Chapter 1

Introduction

Electric energy is very important for the survival of modern life. The supply of energy and prosperity of a country are linked with each other. There is a need of electricity in every field of life such as railway stations, hospitals, schools, colleges, universities, banks, offices, factories and many other fields. These all sectors are entirely depending on electricity. Without electricity they couldnt function properly. Everything will turn into grave yards. The electricity production capacity is limited in Pakistan. There is a need to produce more electricity so the sectors could meet their needs easily. Because of the increase in needs as compared with the production of electricity is less. The production of electricity is insufficient to overcome the rising needs of future. Because of this we have to face load shedding in the country that has caused hurdles in sectors. Energy crisis has badly disturbed our social, cultural and economic life. In hospitals patients face problems because of load shedding. In factories work stops due to lack of energy. All the problems and crisis can diminish, if the production of electricity increases. It can be produced by different ways. We can generate electricity from wind, water, oil, coal and gas. But water is the cheapest source of producing electricity. The production of electricity can be increased by setting up more power stations. We should build more dams to store water in order to generate electricity at cheap rates.

WAPDA has proposed its 2025 vision program to overcome energy crisis in Pakistan. That is known as Dasu hydropower project (DHP). DHP is major project

planned and initialized by the GOP to overcome the energy crisis in Pakistan. It converts the thermal generated electricity to hydropower generation, which is less in price as compared to thermal generated electricity. It reduces the expense of electricity. The main purpose of DHP is provide electricity to everyone at cheap rates with availability of 24/7. DHP is located in Upper Indus Valley (KPK) province. The project is divided into 3 key elements.

1. Powerhouse, main dam, composite house and its related services.
2. Reconstruction of 65 km of KKH.
3. Transmission lines for power evacuation from the powerhouse.

After completion of (1) and (2), third will be started. EARF must be organized as a separate file that will provides direction in succeeding their objectives.

DHP built into 2 stages each stage divided into 2 further parts (phases). It means 4 phases in 2 stages. 1st stage will be completed in 7 years (2015 to 2022) after completion of DB dam 2nd stage will start.

1.1 Project Purpose or Justification

Our main purpose is to overcome energy crisis. Considering rates at cheap price. Previous energy ways were expensive and less effective and were harmful for the environment. We used thermal generated energy that caused a lot of air pollution. The raw material was imported from other countries, therefore was costly. Now we have a lot of new ways (e.g. wind, water, thermal and etc.) to overcome energy crisis. We prefer hydropower instead because it is less expensive and healthy for environment.

1.2 Objectives

In this project we evaluated the existing Dasu Hydropower Project (DHP) against the PMP template. In which we try to evaluate that whether the existing DHP plan is based on the guidelines of project management plan template or not.

1. To evaluate DHP plan in the light of PMP template.
2. We also try to establish a proper change control flow chart.
3. To establish risk register on the basis of information given in their DHP plan.

The general objectives of project are to increase the growth of electricity. The main objective of the project is provided electricity to every person in cheap rate. The thermal generated electricity is expensive as compared to hydropower. Hydropower is environment friendly. The project can even guide establishment of WAPDA capability to put together destiny hydropower initiatives and control Pakistans big hydropower potential.

1.2.1 Primary Business Objectives

Table 1.1: Primary Business Objectives

Reference No.	**Business Objective Description**	**Specific Goal**
01	To control expenses	It could decrease the expenses of electricity via 2025
02	To provide cheap electricity	It reduces the cost of consumer by 2025
03	To be easily accessible	It could be provided to every person until 2025
04	To meet the time component.	It could be completed within time
05	To control the environmental pollution	It reduces the coal consumption up to 75% by 2025
06	To make strict rules and regulations	It reduces the theft of electricity

1.2.2 Primary Project Deliverables

Table 1.2: Project Objectives (Primary Project Deliverables)

Business Objective Ref. No.	**Project Objective Ref. No.**	**Project Objective / Primary Deliverable Description**
02	01	Sustainable expansion of Pakistan's power era capacity.
03	02	Link the growing hole among supply and demand.
02	03	The fee of electricity period could be appreciably decreased and foreign exchange might be stored with the aid of reducing gas imports.
03	04	To assist establishment of WAPDA capability to put together destiny hydropower tasks and achieve Pakistans enormous hydropower capacity.
05	05	To Present the Environmental Management Plan (EMP).
05	06	Ambient air quality is maintained at properties adjacent to worksites, quarry sites, stockpile location and along KKH throughout the construction phase.
06	07	To apply Legislation and Policies in Pakistan.
01	08	To manage construction worksite to prevent environmental harm.
05	09	Reduce the potential for impacts resulting from topographical changes and soil contamination during construction.
02	10	Other Sources of Renewable Energy.
02	11	To build the capacity of WAPDA, Technical Assistance and Training.

1.3 Benefits

1. It will help in Industrial production.
2. It will grow the energy period potential.
3. It will increase the performance of power.
4. It will decrease the value of energy.
5. It's going to decrease the wastage of fossil gasoline.
6. It will support the greenhouse effect.
7. It will reduce the imports of gas.
8. The cost of electricity will reduce.
9. It will increase the power era capability of WAPDA.
10. It might be beneficial to prevent pollution, maintain herbal assets.
11. It will help in prevention of floods.
12. It benefits in controlling the capability for diminished air quality and noise pollutants.
13. It might benefit the woodland act.1927.
14. The guidelines provide for the unified and coordinated the development of WAPDA.
15. It will help to complete the work efficiency.
16. It will help to control the mismanagement of resources.
17. It will be helpful for the building up capacity of the project.

1.4 Project Success Criteria

The project would be having the following success criteria:

1. The electricity will be available to customers 24/7.
2. Energy resources will be properly utilized.
3. Investors will encourage for the investment in country.
4. Increase the export of the country.
5. Increase the foreign exchange reserves.
6. Zero pollution incidents.
7. Zero impact on human and wild life.
8. 100% of site personnel are trained in the environmental induction.
9. 50% of excavated rocks to be reused as aggregates and road fill.
10. Landscaping of all disturbed area.
11. Zero community complaints regarding diminished air quality.

Chapter 2

Change Management Plan and Scope Description

Change management may be defined as a dependent approach to meet specific goal. Its positive outcomes by project manager and his team by making some actions in the form of activities. The basic purpose of change management is to applying different strategies for effecting change, helping people to accept change, in monitoring and controlling change. Some important thing that may be affecting by change management are project scope and project cost, it may be change when we make any change in project. We use different tools for managing change. These tools are called change management tools. In this project we use flowchart. The list of some change management tools is following:

1. Flowcharts/ Process Maps
2. ADKAR Analysis
3. Culture Mapping
4. Force Field Analysis
5. Stakeholder Analysis
6. Kotters 8 Step Change Model

7. Lewins Change Model

8. Gantt Charts

2.1 Project Change Control Flowchart

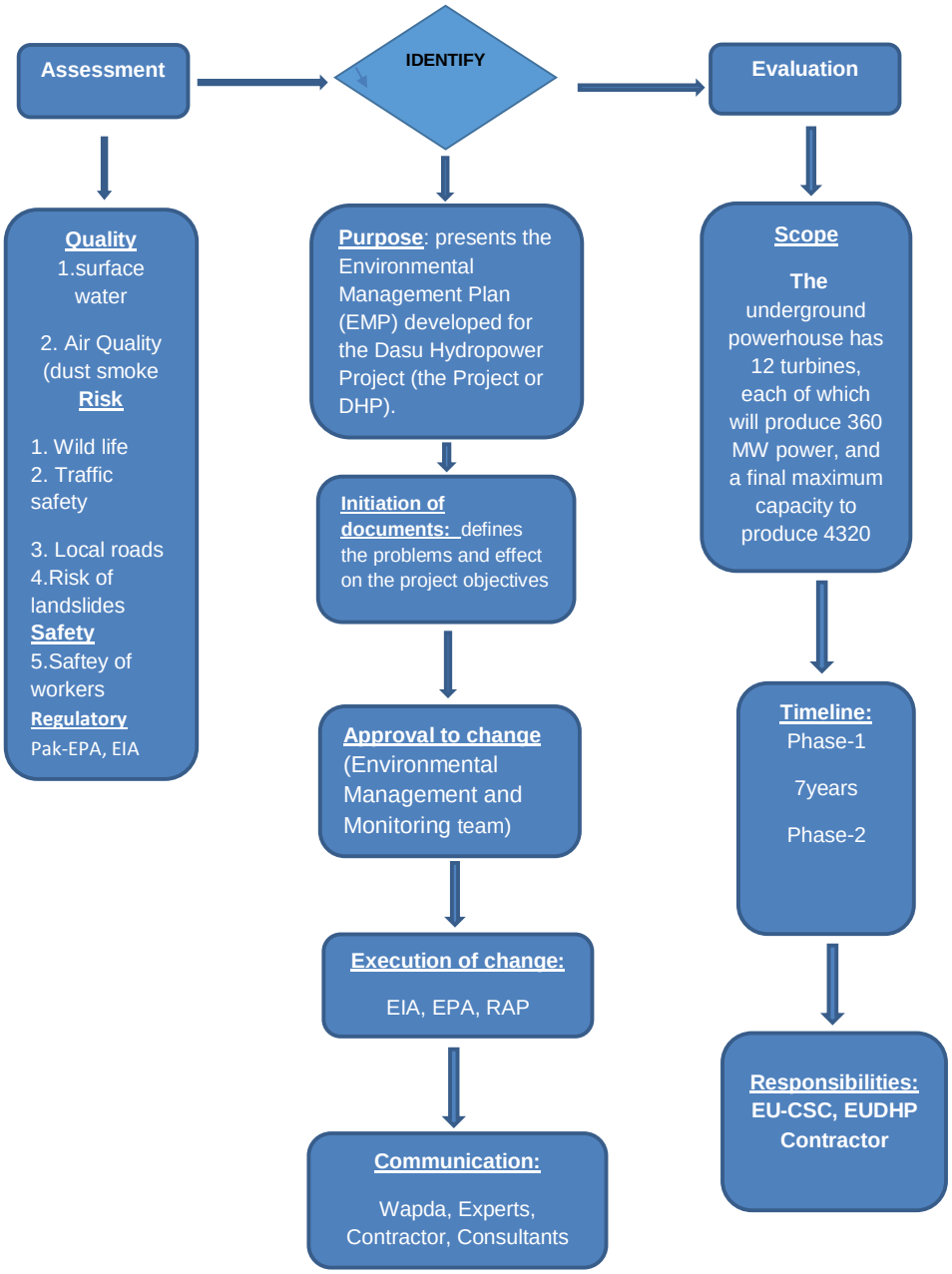


FIGURE 2.1: Project Change Control Flowchart

Table 2.1: Project Change Request Form Template

Change Request
Project: DASU HYDROPOWER PROJECT
Change requester: Contractors
Change category: **Schedule** **Cost Scope** **Resources** ✓ **Quality testing**
Does this change affect: ✓ Corrective area Updates
Describe the change being requested by : EU-CSC, EUDHP
Describe the Reason for change:
Technical changes required to implement this change:
Describe risk involved:
Cost needed to implement this change: Cost required 0.54 million US$ for the implementation of this change on water.
Disposition: ✓ Approved Reject
Justification for approval: The need for the analysis of water quality should be upto the mark and there is a requirement for the sampling and analysis through national recognized laboratory.
Change board approval: **Environment management unit**
Name:
Signature:
Date:

Table 2.2: Project Change Log Template

Dasu Hydro Power Project Change Log Template					
Total Change Request	200	**Open change request**	40	**Approved Change Request**	20
Change Request #	**Description of Requested Change**	**Originator of Request**	**Priority**	**Date Submitted**	**Status**
1	Description 1	Muhammad	2	10/10/2016	In review
2	Description 2	Ali	1	10/10/2016	Approved
3	Description 3	Abdus Sami	3	10/10/2016	On hold
4	Description 4	Abdur Raouf	1	11/10/2016	Approved
Approval Section:					

2.2 Scope Description

2.2.1 Location

DHP is located on Indus River 7 km U/s of Dasu Town, District Kohistan, Khyber Pakhtunkhwa, 74 km D/s of proposed DB dam and 345 km from Islamabad (Baig, 2018).

2.2.2 Scope Statement

To provide electricity to every person in cheap rate and resolve the issue of load shedding.

2.2.3 Scope of Work

DHP built into 2 stages:

Stage-I: 1^{st} stage contain complete structure of RCC dam with connected structures of underground powerhouse having 6 faster-mills, general set up ability of 2160 MW, separate double circuit, transmission line of 500 KW, replacement of KKH (62 km), society, proper set get right of entry to highways (81 km), transmission line of 132 KW, property purchase, immigration, conservational and public guiding.

Stage-II: 2^{nd} stage contain underground powerhouse manufacturing and its connected structure and setting up of last 9 devices, transmission line of 765 KW and particular double circuit.

Chapter 3

Project Schedule, Milestone and Project Budget

3.1 Project Schedule

One of the most important phases in project is project scheduling. It plays an important role in the success or failure of any project. Different tools are used for project scheduling. Following tools are mentioned below:

1. Program, evaluation and review technique (PERT)
2. Critical path method (CPM)
3. Primavera
4. Microsoft (word, excel and project)

3.2 Milestones

Stage 1 would be completed before year 2022 with respective of the completion of all requirements in phase 1 and phase 2.

Stage 2 would be completed in year 2025 with respective of the completion of all requirements in phase 3 and phase 4.

3.3 Main Works

1. RCC dam & its appurtenant structures (Dasu-MW-01).

2. Underground powerhouse & its appurtenant structures (Dasu-MW-02).

DHP built into 2 stages:

Stage-I: 1^{st} stage contain complete structure of RCC dam with connected structures of underground powerhouse having 6 faster-mills, general set up ability of 2160 MW, separate double circuit, transmission line of 500 KW, replacement of KKH (62 km), society, proper set get right of entry to highways (81 km), transmission line of 132 KW, property purchase, immigration, conservational and public guiding.

Stage-II: 2^{nd} stage contain underground powerhouse manufacturing and its connected structure and setting up of last 9 devices, transmission line of 765 KW and particular double circuit.

Stage 1 has two phases. 1st phase starts from 2015 and produce 1080 MW electricity. Phase 2 consists of additional tunnel and three turbines and produce 2,160 MW electricity. Duration of phases is 5 years means total time period of phase 1 and phase 2 is 2015 to 2020. Stage 2 also further divided into two phases (phase 3 and phase 4). Stage 2 starts after the completion of DB dam. Phase 3 produce 3,240 MW electricity and phase 4 will produce 4,320 MW electricity.

3.4 Phased Approach in Project Implementation

The project is built into two stages (Stage 1 and stage 2). These two stages are further divided into four phases. Each stage has two phases. 1st stage contain phase 1 and phase 2 and 2nd stage contain phase 3 and phase 4. The phased approach is showed in table 4.1.

TABLE 3.1: Phased Approach to Project Development

Stage/ Phase	**Major Civil Engineering Activities**
Phase I	Preparation of access road, relocation of KKH, construction of dam and 1st part of underground complex and power generation facilities
Phase II	2^{nd} part of underground complex and power generation facilities
Phase III	3^{rd} part of underground complex and power generation facilities
Phase IV	4^{th} part of underground complex and power generation facilities

3.5 Project Components

There are five major components of the project (Table 4.2). The first three components (1, 2 and 3) relate to the physical construction of the project. Component D (D1 and D2) are about social/resettlement and environmental management. The rest relate to construction supervision, management, training and capacity building.

TABLE 3.2: Major Project Components

Component	**Description**
A Construction of Dam and Appurtenant Structures	RCC Dam with maximum height of 242 m above the foundation level and length of 570m at crest level
B Power Generation Facilities and Appurtenant Structures	Underground powerhouses to be developed in two Stages and four Phases
C Elementary & Perpetual Works	Relocation of KKH
D Social and Environmental Management Plan	D1 Social and Resettlement Management D2 Environment Management Plan D3 Early Flood Warning and Climate Change Monitoring
E- CSC and M&E Consultants for project and Social Environment Plans	E1- CSC Implementation Support E2M&E Consultants for & SMP

3.6 Constraints

There are three major constraints that can be applied to any project. These are following:

1. Time
2. Cost
3. Scope

3.6.1 Solution Constraints

The successful project is monitored on daily basis. If the project is on time, within cost and scope. Follow the activities that are defined in proposed project flowchart. It is the sign of successful project.

3.7 Project Costs

Project has two stages each stage(four phases). The financial cost of each phase is given in table 4.7.

Table 3.3: Phase Wise Cost

Financial cost in each pahse	Stage 1		Stage 2	
	Phase I	Phase II	Phase III	Phase IV
	4.654	0.761	1.560	1.014

The budgets prepared are focused on stage 1 (Phases I & II), the social and environmental costs of the phases are presented in Table. The transmission line is a separate project independent of the Dasu Project. So, the costs for transmission are not shown here.

3.8 Year Wise Costs for Social and Resettlement

Table 3.4: Year Wise Cost Estimates for Social and Resettlement Safeguards

Years	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	83.4	111.3	111.6	111.6	3.3	3.2	3.2
Cost (MUS$)	**2021**	**2022**	**2023**	**2024**	**2025**	**Total (M$)**	
	3.2	1.0	1.0	1.0	1.0	**434.80**	

Chapter 4

Quality Management Plan

When defining quality, you must consider following perspectives:

1. Product: presence of desired attributes.
2. Value: ratio of benefits to price.
3. Manufacturing: consistency in goods.
4. Customers: ability to satisfy need to of customer.

Quality has different dimensions. These are following:

1. Responsiveness
2. Tangibles
3. Service Reliability
4. Assurance
5. Empathy
6. Availability
7. Professionalism
8. Timeliness

9. Completeness

10. Pleasantness

4.1 Objectives

1. To collect information on ambient air quality (i.e. PM10, PM2.5, CO, SO2, NOx and CO2) on different sites in low and high flow seasons.

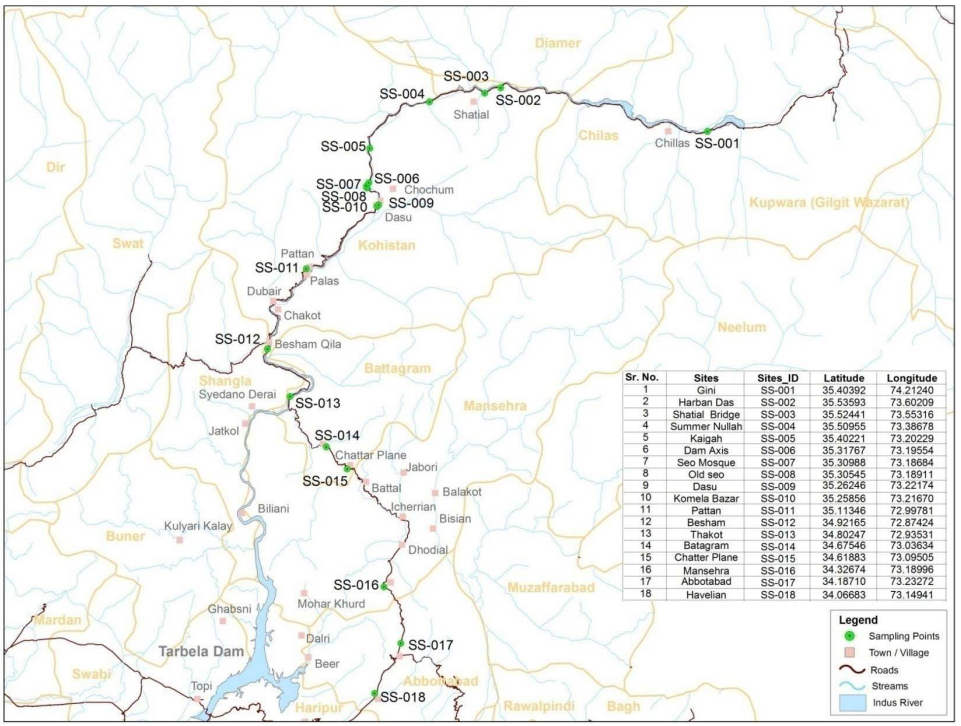
2. To collect water samples from twenty different sites (which includes Indus River, its tributaries and Tarbela reservoir) and their evaluation for 38 parameters.

3. To collect soil samples from six different sites and examine them for the presence of mercury in low and high flow seasons.

4. To collect fish samples and examine them for mercury in low and high flow seasons.

4.2 Air Quality

The air quality study included ambient air quality data collection at selected sites in the vicinity of the project. The sampling included the measurement of PM10, PM2.5, CO, SO2, NOx and CO2 concentrations as per Pakistan Environmental Protection Agency (Pak-EPA) sampling methods. The results were compared with NEQS for ambient air. Eighteen (18) monitoring locations were selected in the project area namely: 1) Gini, 2) Harban Das, 3) Shatial Bridge, 4) Summer Nullah, 5) Kaigah, 6) Dam Axis, 7) Seo Mosque, 8) Old Seo, 9) Dasu, 10) Komila Bazar 11) Pattan, 12) Besham, 13) Thakot, 14) Battagram, 15) Chattar Plane, 16) Mansehra, 17) Abbottabad and 18) Hevellian.



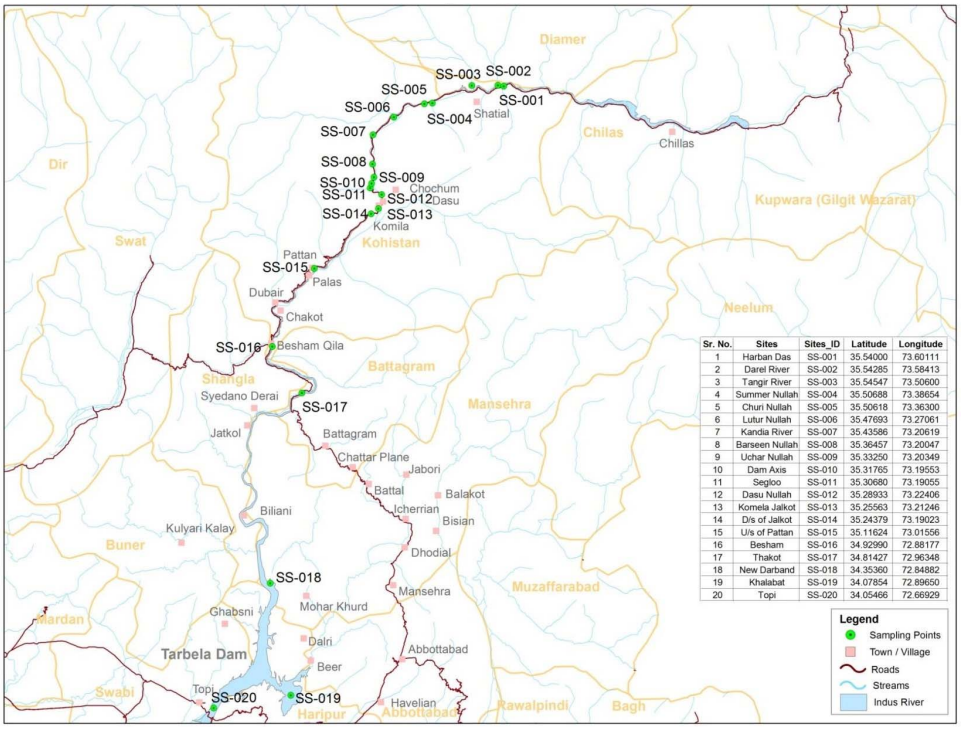
Sr. No.	Sites	Sites_ID	Latitude	Longitude
1	Gini	SS-001	35.40392	74.21240
2	Harban Das	SS-002	35.53593	73.60209
3	Shatial Bridge	SS-003	35.52441	73.55316
4	Summer Nullah	SS-004	35.50955	73.38678
5	Kaigah	SS-005	35.40221	73.20229
6	Dam Axis	SS-006	35.31767	73.19554
7	Seo Mosque	SS-007	35.30988	73.18684
8	Old seo	SS-008	35.30545	73.18911
9	Dasu	SS-009	35.26246	73.22174
10	Komela Bazar	SS-010	35.25856	73.21670
11	Pattan	SS-011	35.11346	72.99781
12	Besham	SS-012	34.92165	72.87424
13	Thakot	SS-013	34.80247	72.93531
14	Batagram	SS-014	34.67546	73.03634
15	Chatter Plane	SS-015	34.61883	73.09505
16	Mansehra	SS-016	34.32674	73.18996
17	Abbotabad	SS-017	34.18710	73.23272
18	Havelian	SS-018	34.06683	73.14941

FIGURE 4.1: Site Map of Air, Noise and Meteorology

4.3 Water Quality

Water quality part of the study included collection and analysis of water samples from Indus river and its tributaries. Twenty (20) water sampling locations were selected, in the project area, namely 1) Harban Das, 2) Darel River, 3) Tangir River, 4) Summer Nullah, 5) Churi Nullah, 6) Lutar Nullah, 7) Kandia River, 8) Barseen Gah, 9) Uchar Nullah, 10) Dam Axis, 11) Segloo, 12) Dasu Nullah, 13) Komela Jalkot, 14) D/s of Jalkot, 15) U/s of Pattan, 16) Besham, 17) Thakot, 18) New Darband, 19) Khalabat and 20) Topi. The first fifteen sites were included in both seasons while the last five were included as additional sites in the low flow season study only. Nine out of these twenty sampling sites are of Indus River, the other nine are from its tributaries and the remaining two i.e. Khalabat and Topi are from the Tarbela reservoir. The Indus river sampling sites are 1) Harban Das, 2) Dam Axis, 3) Segloo, 4) Komela Jalkot, 5) D/s of Jalkot, 6) U/s of Pattan, 7) Besham, 8) Thakot and 9) New Durban. The collected water samples were analyzed for 38 parameters. Twenty three (23) of these parameters viz. Temperature, taste, odors, pH, dissolved oxygen (DO), conductivity, turbidity, total hardness,

biochemical oxygen demand (BOD5), COD, TDS, TSS, chloride, chlorine, sodium, fluoride, Iodine, sulphate, sulphide, nitrogen ammonia, nitrate, cyanide and phenolic compounds were analyzed in field (Sayre, 1988). The remaining fifteen (15) copper, cadmium, chromium, lead, silver, zinc, nickel, arsenic, selenium, manganese, iron, barium, boron, mercury and magnesium were analyzed in laboratory on inductively coupled plasma. Since no ambient surface water standards or classification criteria has been laid out by the Pak-EPA, therefore, the water quality results were compared with Pak-EPA NSDWQ-2010 and NSWCC proposed by WWF (2007).



Sr. No.	Sites	Sites_ID	Latitude	Longitude
1	Harban Das	SS-001	35.54000	73.60111
2	Darel River	SS-002	35.54285	73.58413
3	Tangir River	SS-003	35.54547	73.50600
4	Summer Nullah	SS-004	35.50688	73.38654
5	Churi Nullah	SS-005	35.50618	73.36300
6	Lutur Nullah	SS-006	35.47693	73.27061
7	Kandia River	SS-007	35.43586	73.20619
8	Barseen Nullah	SS-008	35.36457	73.20047
9	Uchar Nullah	SS-009	35.33250	73.20349
10	Dam Axis	SS-010	35.31765	73.19553
11	Segloo	SS-011	35.30680	73.19055
12	Dasu Nullah	SS-012	35.28933	73.22406
13	Komela Jalkot	SS-013	35.25563	73.21246
14	D/s of Jalkot	SS-014	35.24379	73.19023
15	U/s of Pattan	SS-015	35.11624	73.01556
16	Besham	SS-016	34.92990	72.88177
17	Thakot	SS-017	34.81427	72.96348
18	New Darband	SS-018	34.35360	72.84882
19	Khalabat	SS-019	34.07854	72.89650
20	Topi	SS-020	34.05466	72.66929

FIGURE 4.2: Site Map of Water Sampling Locations

4.4 Soil Analysis for Mercury

Six virgin soil samples (i.e. the soil not used for agricultural) were collected along the Indus River at 1) Berseem, 2) Samar Nallah, 3) Shatial Das, 4) Duga Gah, 5) Kandiah River and 6) Tangir River for the analysis of mercury in both the High and Low flow seasons.

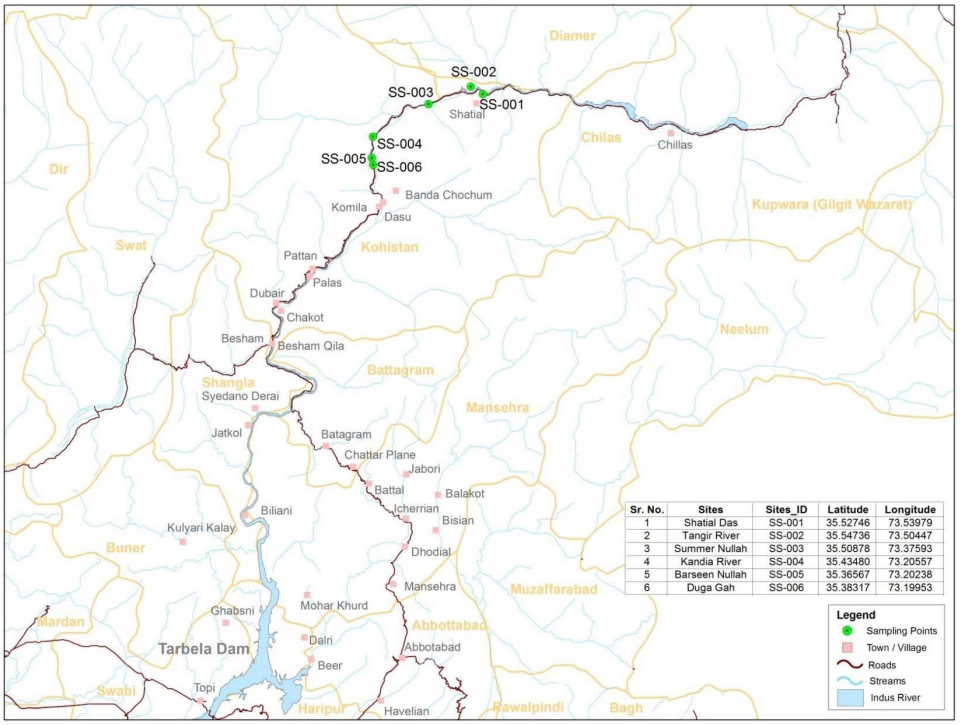


FIGURE 4.3: Site Map of Soil Sampling Locations

4.5 Standards and Methods

The ambient air quality, noise and water quality, standards and methods are presented in tables 5.1 and table 5.2.

TABLE 4.1: Noise level standards and methods

Sr. No.	**Category of Area/ Zone**	**Limit in dB(A) leq***		**Measurement Method**
		Day Time	**Night Time**	
1.	Residential area (A)	65	50	40 CFR Part 201
2.	Commercial area (B)	70	60	
3.	Industrial area (C)	80	75	
4.	Silence Zone (D)	55	45	

TABLE 4.2: Ambient Air Quality Standards and Method

Pollutant	**Averaging Time**	**Standard Pak-EPA**	**Measurement Method**
PM2.5	24 hours	35 μg/m3	β Ray absorption method
	Annual Average	15 μg/m3	
PM10	24 hours	150 μg/m3	
	Annual Average	120 μg/m3	
CO	8 hour	5 mg/m3	Non Dispersive Infrared (NDIR) method
	1 hour	10 mg/m3	
SO2	24 hour	120 μg/m3	Ultraviolet Fluorescence method
	Annual Average	80 μg/m3	
NO2	24 hour	80 μg/m3	Gas Phase Chemiluminescence
	Annual Average	40 μg/m3	
CO2	-	-	-

* NSDWQ-2010.

* NSWCC proposed by WWF-2007)

Chapter 5

Project Organization and Resources

5.1 Institutional Arrangements

All major functions and activities are independently controlled by the Project Director (PD) of Project Management Unit (PMU). PMU is further divided into sub units (i.e. EU and SRU). Environment Unit (EU) manages the implementation of ESMP, Social and Resettlement Unit (SRU) manages the social and resettlement issues of the societies (see figure 6.1).

SRU & European responsibilities are:

1. Managing, helping & directing operation of social and environmental procedures consisting of (resettlement action plan) RAP & ESMP.
2. Make sure that service provider complies with KP-EPA rules, global financial institution shields guidelines, and different requirements cited inside the SRMP & ESMP.
3. Finding exactly problems of non-obedience and notify those.
4. Signifying procedure is linking performance of contractor in terms of the ESMP towards judgment of financial expenditures, encouragement.

5. Stakeholders interaction with his or her issues approximately the construction activities.

The EU divided in to three sub parts

1. Ecology.
2. Environment.
3. OHS having subsequent members.

5.2 Resources

Funding for DASU Hydropower Stage-I

- The WB accepted the funding of stage-1 of DHP with (IDA credit of US$ 588.4 Million & IDA PCG of US$ 460 Million) on 10th of June 2014 as its 1st IDA credit.
- Credit settlement among GOP, WAPDA & WB contracted on 25th of August 2014 in PM secretariat Islamabad. Credit settlement has remained active after 20th of November 2014.
- To bond financial gap among the price of the project to be had IDA credit score so as to keep it close to the private banks.
- A group of 7 local banks ran through Instruction recommended by M/S HBL, problem happening 11^{th} of February 2016 to funding as much as RS.144 Billion in contradiction of GOP ensures WAPDA stability slip. Contract with financial institution is being finalized and be signed quickly.
- RFPs for financing up to US$ 800 Million in opposition to International Bank PCG and Government of Pakistan (GOP) guarantees distributed WWBs on March 11, 2016 when agreement after MOF. RFPs acquired from banks with the aid of deadline i.e., April 21, 2016. Evaluation of proposals is in progress.

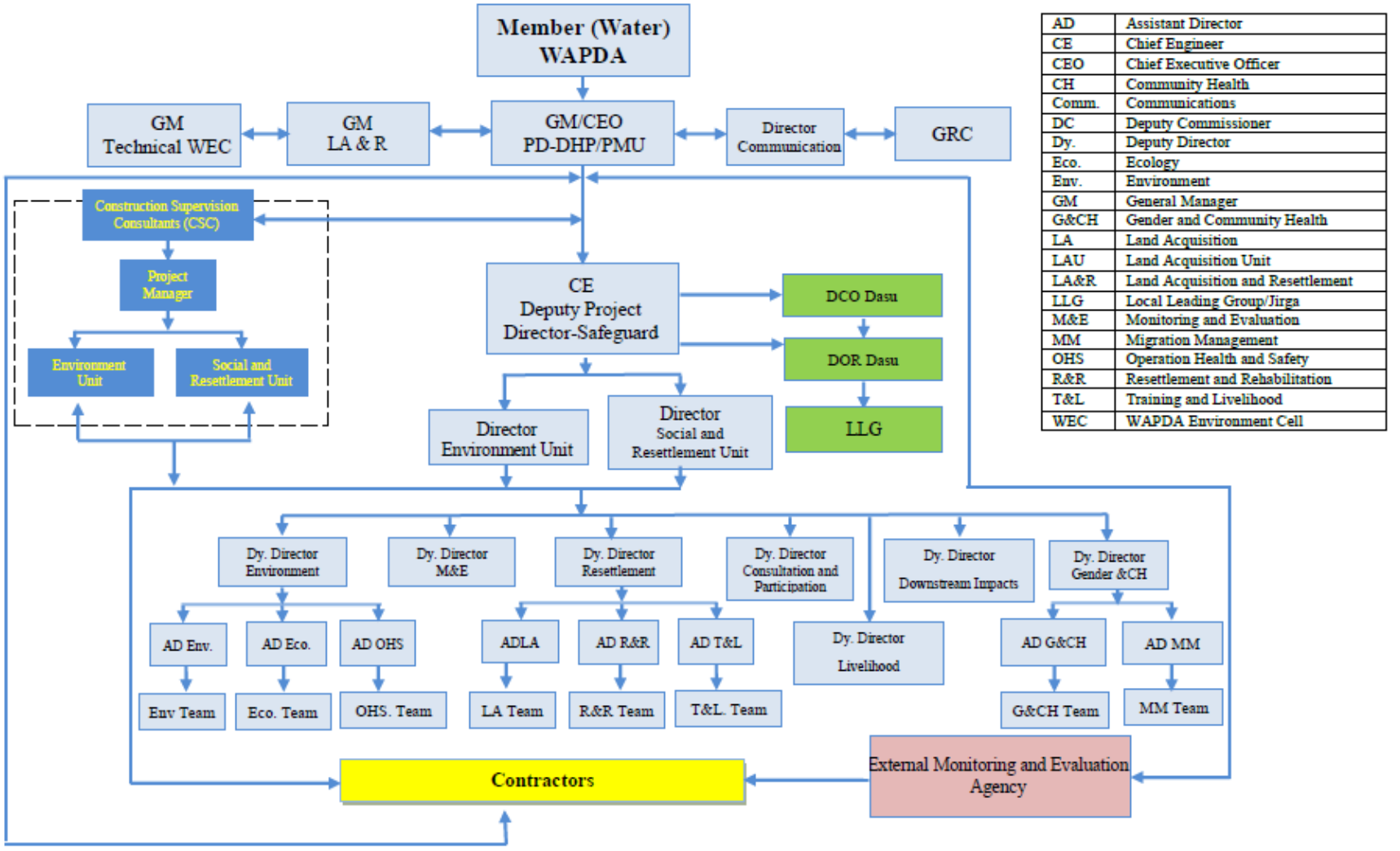


FIGURE 5.1: Organizational Chart

5.3 Financing for Project

5.3.1 World Bank (WB)

Contract among the GOP, WAPDA & the WB for IDA-1 praise people US$ 588.4 Million in unification with (IDA PCG of US$460 Million) contracted on 25th of August 2014. Debt settlement is effective because November 20, 2014. Debt is authentic till June 30, 2022.

5.3.2 Local Commercial Banks (ICB)

Contract by LCB managed via M/S HBL to funding more than RS. 144 Billion contracted happening 29th of March 2017. In May 2017 received 1st transaction of RS. 25 Billion.

5.3.3 Foreign Commercial Banks (FCB)

Settlement through M/S approval effort financial institution on behalf of US$ 350 Million credit contracted on 9th of June 2017. In 30th of June 2017 received 1st transaction of US$ 188 Million.

(W.Rex, Foster, k.Lyon, Bucknall, & R.Liden, 2014)

Chapter 6

Communications Plan

Strategic communication has become the vital part of the biggest projects as dam. Recently the progress of environmentally affected and social acceptance factors has been observed by different governance settings. It is by the dialogs and placement of point of view that more than one stakeholder includes which present as beneficial for dam and its implementation. Dams are also considered for social development rather than water and energy service and their benefits. Through strategic communications, the change in outlook demands the involvement of stakeholders and communities. Government of Pakistan and WAPDA are aware and believe on this fact that the keys to success are clearly: timely and continuous communications between project implementers and affected: adequate compensation, support and long-term contact and efforts to ensure that the disturbance in moving or transfer is balanced by some direct benefits from the project. WAPDA and DHP are learning from past lessons for improve their strategies to cope up with the demands and challenges of communications that are related to DHP and other similar projects in future. In cases of Tarbela Dam and Mangla Dam Raising projects, lack of communication with communities, weak consultation system, lack of revelation about the implementation process specially related to recompense and resettlement, and lack of daily contact with communities and stake holders that resulted misunderstanding and apprehensions on part of the affected communities. Communications are vital in development of every project to build understanding because any resistance in communication can cause demerits. Communications before, during

and after the completion of project have to be planned, intensive and consultative in nature to build understanding and less the resistance or risks, only technical solutions cannot build the consent that is required for projects to succeed.

6.1 Key Concerns

Like a major power generation project, the DHP will have several impacts of significance. Despite the impacts, the affected communities do not have hostile attitude even though there was opposition also that create mess, particularly lack of information about damage, support and relocation at the beginning of detailed design phase. Though, it slowly began to change following grand Jirga where elders presented a set of demands to cope up with the impacts of project. These are following:

1. Returning for land and other assets.
2. Relocation of sites and its facilities.
3. Service in the project.
4. Loss of income and re-establishment issue.
5. Social and environmental issues.
6. Health and safety issues.
7. Impacts of immigration and construction on workers traditional life.

6.2 Communications Objectives

This communication strategy will provide a briefed and specific structure that guide interaction Dasu Hydropower project and highlight the issues that should be addressed to build understanding and create support for this mega power project in Pakistan. These issues were identified by the conduction of situation analysis at

the initial stage of the process while developing strategies. The communications objectives of DHP were defined on the base of desired outcome, risk reduction, and the communications deficits that were identified by the communications need analysis. The objectives of the communications strategy are:

1. To increase awareness.
2. Improve knowledge.
3. Timely give information among key stakeholders.
4. To get public support and acceptance of the project.
5. To improve clearness of the project.
6. To encourage and enlarge participation of key stakeholders in decision-making.

6.3 Strategies and Actions

These objectives will be achieved through the use of following specific strategies:

- Internal communications to boom know-how, construct help for the implementation of DHP and deal with new and present issues among staffs of the undertaking, other associated government departments, and diverse establishments worried.
- Provision of timely information on the tasks, its affects, its timing, its progress, together with a mechanism to specify their issues and make certain that these are nicely taken into consideration inside the selection-making process.
- Public participation mechanisms to offer platform to have interaction with institutions, opinion leaders and implementation companions. This phased multimedia communication program is initiated to understand the challenges and it increases public help for DHP and such tasks in future.

- Media advocacy to promote precise and analytical coverage of the undertaking communications capability strengthening of DHP crew and their collaborative partners to put in force the communications strategy.

6.4 Key Findings of the Communications-Based Analysis

Following is the sequence of the key findings of the communications-based analysis:

1. Social and Cultural Structure of Kohistan.
2. Perceptions, Attitudes, Concerns, and Knowledge.
3. Communications Related Issues.

6.5 Consultation Meetings

Consultation meetings with affected people in 34 hamlets of the project affected area have been completed. The major findings of the consultation meetings are summarized as follows:

1. Resettlement Site development
2. Job and Employment
3. Livelihoods
4. Environmental and Social Issues
5. Health and safety issues
6. In-migrants and Outsiders

6.6 Charter of Demands Requested by *Jirga*

On 28 July 2011, the elders attending a grand jirga held in DC office submitted a 15-factor charter of demands to the PD as their benchmark for assisting the construction of the dam undertaking. The primary factor within the charter of demands subject reimbursement costs for received belongings (land and shape), employment, schooling and healthcare centers. WAPDA later organized a reaction to the constitution of needs. These demands are in large part inside the scope of undertaking mitigation. These mitigation measures have been taken into consideration in the social improvement framework beneath the resettlement motion plan. Since the grand jirga, several rounds of jirga meetings were held in Dasu to deal with various project issues, top among those are employment to locals in the ongoing planning work, equal distribution of jobs and other project resources between the Left & Right people and declaration of compensation rates prior to land acquisition and measurements survey.

Chapter 7

Project Risk Management

Risk is an issue that has not happened yet, it may or may not be occurred. It is an uncertain event, it may be positive effect or negative effect on project. Risk may be opportunity or threat. We can identify risks from past, present and future data.

Responding to a risk

Proactive:

Proactive are those which we plan before risk has occurred it includes:

1. Avoid
2. Transfer
3. Share
4. Enhance
5. Exploit
6. Accept
7. Research

Reactive:

Name shows that after the risk has occurred, we follow these steps:

1. Contingency plan
2. Fall back plan
3. Workaround

In this project we face following risks:

1. Risk of earthquake
2. Risk of flooding
3. Climate change
4. Greenhouse gas emission

7.1 Risk of Earthquakes

DHP is located in a hilly area known as Upper Indus Valley. Previous case studies provide us information about the earthquake occurred in this region. Before designing DHP all previous records were collected from year 1828 to 2011 by the help of international and national sources. The findings recorded had a total of 2,115 earthquakes having 3.0 magnitude. The 3 earthquakes having magnitudes 5.9 occurred just across 100km from the located dam which was then analyzed. The design of dam is according to the standards that are mentioned by the International Commission on Large Dams (ICOLD). These standards make sure the safety of the dam from an earthquake.

7.2 Risk of Landslides

Landslides are common universal occurrence on top of the mountain alongside the KKH. Landslides can take place due to the greasing rocks, with outflow of water. Using bomb to break rocks might also a reason of vibrations which could cause landslides. The same as can earthquakes and tremors. Landslide-inclined

regions 24 DHP close to the project areas which had been recognized and mapped. Some blast actions necessary into these regions must exist which are prohibited and controlled inside restrained region. Like a great deal while feasible explosive by little strength need to be there use. Tremendous concern must exist trained on the way to shield people moreover public as of the risks of sudden landslides that can also take place throughout digging and attacking machinery. Especially later than rainwater here can exist multiplied threat of such incident.

7.3 Risk of Flooding

Despite a fact that the danger of flooding into the Indus Basin might grow within upcoming years owing to the increasing atmosphere warmth, change into rain forms also elevated glacier soften into the upstream areas, in threat of flooding and associated spoil within region be little. Mainly water within the Indus comes on or after snowfall and frost softens. Furthermore, the Indus valley is slender by sharp slope. The riverbed is severely slashed keen on the edges moreover thus it might be tough intended for flood to take place. Floods into the northern regions in Pakistan, such as the UIB, are not completely linked by severe rain occasions; they can too take place behind river separation through blockage cause through landslide. Currently 2010 here has been large landslide in the Hunza valley that hindered the Hunza River moreover destroyed the significant magnitude of the KKH close to Ata-Abad, growing a lake which is fixed there. Those incidents precipitated several troubles for the nearby highway which is in contact with buy and sell with china. On 27 February 2012 the hindrance became eliminated through attacking; appear in a surprising flood that turned into listed in Dasu (upward push of 2.4m in level of water after days). A lake is fashioned after glacier and via mount or fall apart the ordinary dam, a surprising explosion flood be able to arise, now and again with devastating effects.

7.4 Climate Change

Over the past period enormous research has been accomplished to observe the things of lengthy-time period weather trade on rainfall, air, temperatures and deficiencies. Here are some results of those studies:

- Among 1980 to 2005, regularity of warmth impression (T¿40 c) extended into Pakistan northwestern area. Its anticipated that here exists a greater common duration along excessive deficiency.
- Built totally on calculations in situations of the global panel on weather trade/international panel on climate change (IPCC), estimate was formed through the Pakistan meteorological provider of boom into most every day climate, that range as of 2.8c toward 4.2c inside in 12 months 2080 intended for northern Pakistan.
- Extra weighty rain actions for the duration of monsoon period will arise up northwestern area of Pakistan. A few fashions estimated 25% more rain throughout monsoon. Therefore, regions onward in western rivers of the united states (Indus and Kabul) could extra liable to flood episodes like only experienced at some point of 2010.
- Water availability may boom significantly (throughout Kharif) however it's miles appropriate intended for cultivation inside plains (cease of Rabi period).
- Changes have been determined by rain sample through monsoon period starting 1-2 weeks before moreover winter rain limited against February.

Latest research has fixed lying on the consequences of glacier soften. Foremost troubles toward live checked, amongst balance:

1. A significance in addition of snowfall and glacier soften lying on the hydrology of the Indus.

2. A detected adjustment inside the glaciers volume.

3. Consequences about humidity exchange scheduled measurement of water (W, 2016).

7.5 Greenhouse Gas Emissions

Major GHG discharge at some stage in the development section of the project involves CO2, methane (CH4) and N2O. Other GHG are less difficult because creation and practical actions are related to the task aren't in all likelihood to generate their size-able portions. In the course of production (2015 to 2020), the subsequent GHG quantity had been anticipated:

1. Yearly moderate production of 21,527 tons CO2e.

2. All through the overall creation duration 129,161 tons CO2e.

3. At some stage in operation the once a year emission had been expected on 5,484 tons CO2e.

7.6 Risk Register

Risk register is the basic part of risk management system. In which we note down detailed about the risk (i.e. ID, Rank, Name, Description and etc.). In this project we identify the different risks. DHP is located on Indus River 7 km U/s of Dasu Town, District Kohistan, Khyber Pakhtunkhwa (KPK). The location of the project is in hilly area so, the most of the risks are related to natural disaster (i.e. earthquakes, flooding, landslides and etc.). Further detailed about the risks are mentioned in table 8.1.

TABLE 7.1: Risk Register

S. No	**Rank**	**Category**	**Risk Name**	**Description**
1	1	Natural Disaster	Earthquakes	Its natural disaster no one can handle it
2	1		Landslides	
3	2		Flooding	
4	2		Climate change	
5	4	Finance	Underestimating of budget	Budget may not enough
6	5	Operational	Scope creep	Changes are not met
7	3	Operational	show working strategy	Huge gap b/w planned vs actual

Chapter 8

Stakeholder Analysis

Stakeholders are those who are directly or in directly involves in project. Stakeholder may be external or internal. We have five levels of stakeholders. These are following:

1. Unaware
2. Resistant
3. Neutral
4. Supportive
5. Leading

How to identify stakeholder?

We can identify stakeholders through:

1. Brainstorming
2. Meetings
3. Historical data & etc.

In this project we identify following stakeholders:

1. WAPDA
2. Government of Pakistan
3. World Bank
4. Local Commercial Banks
5. Foreign Commercial Banks
6. DHP employees
7. People of KPK

8.1 Overview

Broad consultations were carried out in detailed design phase of the project, mainly by community consultations, jirgas and stakeholder consultation workshops. Community consultations have various methods for example, household level interview, participatory rural appraisal (PRA), community meetings and focus group discussion (FGD). Important issues were mainly addressed by community elders at jirga meetings. In some ways, typical participatory tools such as PRA and FGD and small group meetings are controlled through political family and decision-making systems. So, jirga meetings are major element for revelation and decision-making in project area. Objectives of the consultation meetings are:

- Analyze issues of household and community levels and make solutions for resolving the same issues.
- Encourage participation of the local people, local level government stakeholders, selected representatives and other community representatives to make occasion to occupy themselves and state their ideas.
- Need suggestions of the community to justify the expected bad environmental and social impacts and expected benefits of the project.

- Take the views of several categories of vulnerable group, discuss impacts and benefits of project in these groups, and determine their expectations about benefits of project.
- Make strategies to less the likely social and environmental bad impacts in connection or conjunction among government stakeholders.
- Encourage specialist and community-based relocation advance strategies.
- Socially prepare the community with assurance and capability to deal with dislocation, environmental and relocation management.

While interacting with the community, important features of the project, likely social and environmental impacts of the project and scope of ESA study were explained to the participants. Likewise, during the consultation workshops, pamphlets were distributed to the participants, that contain information about the project and impacts of projects, frameworks improvement and ToRs of the ESA study. Overall 2,440 people participate in different conferences and their related workshops. These are held b/w the month of April & October in 2012.

TABLE 8.1: Number of Participants Involved in Various Meetings

	Events	**Total members**
i	Environment Survey	1,430
ii	Consultations and Jirga's meeting	720
iii	National Consultative Workshops	290
	Overall	**2,440**

Chapter 9

Monitoring and Control Procedures

9.1 Why it is Important?

Monitoring is mostly on regular/daily basis. Evaluating is at the end time. A well-functioning monitoring and evaluating system is critical part of good project management and accountability. Timely and reliable monitoring and evaluating provides information to support project implementation with accurate evidence-based reporting that informs management and decision making to guide and improve project performance.

9.2 Monitoring Plan

This plan includes twin goal. It is planned:

1. To tell the constructors task in the course of undertaking implementation so as to control reliable consensus with exact saving amount in the end..
2. Evaluate certain social & environmental effect on effort of overcoming achievements of various challenges over the years.

First category of observing would be executed through the engineer representative and managed with the aid of an independent environmental control representative. The second one kind of tracking may be commissioned through WAPDA and completed through a neighborhood organization, consultant and with enough practice in social & environmental control. Complete payment around monitoring is envisioned of US$ 0.50 Million.

9.3 Third Party Monitoring

Wapda will hire qualified individuals thats will out sourced (Third Party) in 6 months contract time. The basic purpose is to validation and authentication in the EMP and SRMP operations.

9.4 Audits

Audits will be internally conducted to oversee the effectiveness of social and environmental management of the project. It is stated that the WEC carries these operations for 6 months period. ESMP and SRMP will be conducted by the specialists of audit firms by their annual reports. Reexamination will be done of EMP an SRMP and further upgradation will be shared in a report with them.

9.5 Annual Review of ESMP and SRMP

CSC below direction to PMU and WEC will highlight yearly calculate of the relevance and capability ESMP and SRMP inside a mild of their personal observing & managing in addition to idea of 3rd celebration audits & monitoring talk over in advance. CSC reviews ESMP & SRMP in situation extensive breaks, limitations remain acknowledged in all strategies.

9.6 Reporting

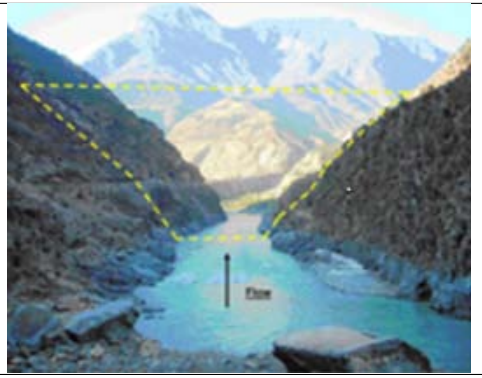
Right preparation is important intended for demo, broadcasting and replying to facts that emerge after different environmentally friendly tracking management plans. These are too vital for translation, environmentally friendly control structures audit-able. still, a main concentration should continue to be at the pragmatic manipulate of affects, no longer the advent of complex bureaucratic techniques. The CSC make month-to-month and continuing info protecting several components of the ESMP operation plus possible constructing, consequence & compliance monitoring & objection modify.

Chapter 10

Conclusion

This study was a detailed case of a hydro power project by the name of Dasu Hydropower Project (DHP). By Which we will overcome the energy crisis in Pakistan. To use modern techniques an effectiveness for the generation of power energy by natural reservoirs available. This project will fulfill all our countries energy needs and will support the energy sector of Pakistan. This will create job opportunities and provide support in local sector all across the country. It will also at a large-scale decrease air pollution. It will be helpful in developing a healthy environment. Much cheaper electricity at a low unit price will be generated in comparison with thermal energy. It will also save our capital of importing foreign oils from other countries which we use as fuel. By this economically we will be stable and slowly be prospering in coming years. Load shedding issue will be resolved an overall it will help in other developments sector projects all across the country. The crux of overall project is presented in table 11.1.

Table 10.1: Overall Project Summary

Location: 7 km upstream of Dasu Town on Indus River, 74 km downstream of Diamer Basha Dam and 350 km from Islamabad			
Salient Features			
Dam Height	242 m		
Dam Type	RCC Gravity Dam		
Installed Capacity	4,320 MW (Stage-I 2,160 MW)		
Annual Energy	21,485 GWh		
Objectives	To Generate Electricity		
Execution by	WAPDA		
Consultants	DHC JV, M/s Nippon Koei (Japan) Lead Firm M/s Dolsar (Turkey) with local sub-consultants of M/s DMC, M/s NDC & M/s PES		
Contractors	M/s China Gezhouba Group Company (CGGC) main work contractor		
Construction Period	5 years (Stage-I) with Generation of 2,160 MW (12,220 GWh)		
Commencement Date (Stage-I)	June 2017		
Completion Date (Stage-I)	February 2023		
Financial Status (Rs. Million)	**Local**	**Foreign**	**Total**
PC-I Stage-I Cost (28.03.2014)	267,545.800	218,547.500	486,093.300
PSDP Allocation 2018-2019	73,200.000	3,000.000	76,200.000

10.1 Limitations and Suggestions

10.1.1 Limitations

Some ideas were not beneficial for project. Raw material caused problem. Environment was gentle and friendly. People were unaware they were not co-operative.

10.1.2 Suggestions

Latest ideas should be implement. Fine material and new machinery should be provided. There is need to aware people about its benefits. People should co-operate. Government should give great concern. It will be beneficial project if it developed carefully and genuinely.

Bibliography

Aziz, R., & Ahmad, M. B. (2015). Impact of electricity on Pakistan's Power Crisis. *International Journal of Electricity and Energy,* 5(3), 45-56.

Baig, K. F. (2018). Organizational Causes and Control of project scope creep in Pakistan hydro-power projects. *Journal of Strategy and Performance Managementl, 6*(4), 130-144.

M.Kamran. (2018). Current status and future success of renewable energy in Pakistan. *Renewable and Sustainable Energy Reviews, 82*, 609-617.

Sayre, I. M. (1988). International standards for drinking water. *Journal-American Water Works Association, 80*(1), 53-60.

Wilson.H (2016). Annandale, Climate Change, Sediment Management, and Sustainable Development.*International Journal of Management Sciences* 5(2), 11-17.

W.Rex, Foster, V., k.Lyon, Bucknall, J., & R.Liden. (2014). Supporting Hydropower: An Overview of the World Bank Group's Engagement, 10(15), 32-43.