Balochistan Integrated Water Resources Management & Development Project
GOVERNMENT OF BALOCHISTAN

Consultancy Services for Monitoring & Evaluation (M&E) Under Balochistan Integrated Water Resources Management and Development Project (BIWRMDP)

Final Monitoring and Evaluation Report

February 2025

MM Pakistan (Pvt) Ltd.

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Abbreviations and Acronyms

ADB	Asian Development Bank
AIT	Associate in Information Technology
AWS	Automatic Weather Station
BFW	Balochistan Forest and Wildlife
BIDA	Balochistan Irrigation and Drainage Authority
BIWRMDP	Balochistan Integrated Water Resource Management and Development Project
BOQs	Bill of Quantities
BUITEMS	Balochistan University of Information Technology, Engineering and Management Sciences
CAD	Command Area Development/Computer Aided Design
CBO	Community Based Organization
CESMPs	Contractors' Environmental and Social Management Plans
CGM	Community Grazing Monitor
EMP	Environmental Monitoring Plan
EPA	Environment Protection Agency
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussion
FO	Farmer Organization
GE	Ghazi Enterprise
GIS	Geographical Information System
GMW	Ground Water Monitoring Well
GOB	Government of Balochistan
GPS	Global Positioning Station
GRL	Ghulam Rasool Lehri
GTE	Global Technical Enterprise
Ha	Hectare
HEIS	High efficiency Irrigation System IDI In Depth Interview
IEE	Initial Environmental Examination
IRIs	Intermediate Result Indicators
IUCN	International Union for Conservation of Nature IWM Integrated Water Management
IWMI	International Water Management Institute IWRM Integrated Water Resources Management
JV	Joint Venture
LC	Letter of Credit
Ltd	Limited
m	Meter
M&E	Monitoring and Evaluation
MBs	Measurement Bills
MIS	Management Information System
MMP	MM Pakistan
MS	Master of Science
NARC	National Agricultural Research Centre
PAD	Project Appraisal Document

PDOs	Project Development Objectives
PHE	Public Health Engineering
PIS	Perennial Irrigation Scheme
PIUs	Project Implementation Unit
PMU	Project Management Unit
PSIAC	Project Supervision and Implementation Consultant
PVC	Polyvinyl Chloride
Pvt	Private
QA	Quality Assurance
QC	Quality Control
RBM	Result Based Monitoring
RE	Resident Engineer
RF	Result Framework
RG	Rain Gauge
RSA	Rapid Social Assessment Unit of World Bank
SEA	Strategic Environmental Assessment/ Social and Environmental Assessment
SG	Stream flow Gauge
TDI	Training Delivery Institutes
UET	University of Engineering and Technology
UNO	United Nations Organization
VLD	Volunteer Land Donation
VWCs	Village Watershed Committees
WC	Watercourse
WB	The World Bank
WST	Water Storage Tank
WUA	Water Users Association
ZE	Zarghoon Enterprise

Executive Summary

Pakistan's population is approximately 255[1] million, with a per capita income of $2,405[2]. While the first half of the second decade saw economic growth, the latter half experienced a decline due to a weak private sector, public sector inefficiencies, and security challenges. Despite its vast size and resources, Balochistan remains the least developed province, characterized by low GDP per capita, poor literacy rates, limited access to clean water, and high costs associated with delivering goods and services.

i) Pakistan Water Sector: Water plays a vital role in Pakistan's economy, particularly in agriculture. However, its availability is inconsistent, compounded by limited storage capacity. Climate change poses a growing threat to water security, leading to unpredictable water availability and heightened risks of floods and droughts. The Indus River system serves as the primary water source, with the Federal Ministry of Water and Power overseeing the management of water resources.

ii) Balochistan Water Sector: Balochistan is grappling with water shortages, rising temperatures, and frequent droughts, all of which are severely affecting agriculture and livestock. The province has limited access to water from the Indus River, and infrastructure challenges impede effective water distribution. Over-extraction of groundwater has led to declining water levels. While the economy is heavily reliant on agriculture, ongoing issues of inadequate investment and governance challenges continue to hinder progress.

iii) Balochistan Water Institutions: The Balochistan Irrigation Department was responsible for managing water resources but faced significant challenges, including inadequate hydrological data and a lack of expertise. The Water Users' Association Ordinance called for collective action in water management, but its implementation was limited. Cultural constraints also resulted in minimal involvement of women in water management activities.

iv) Balochistan Water Policy: In 2006, the Government of Balochistan (GoB) adopted an Integrated Water Resources Management (IWRM) Policy with support from the Asian Development Bank (ADB). The policy highlighted the province’s severe water scarcity, inefficient and wasteful usage, ongoing droughts, and the negative impact on rural livelihoods and economic growth. It is structured around 16 key "thrust areas" aimed at improving and ensuring the sustainable management of both surface and groundwater resources.

The project, implemented by the Government of Balochistan (GoB), focuses on enhancing water resources planning, management, and monitoring, while promoting the adoption of water-efficient practices and technologies among water users. It targets communities in the Nari and Porali river basins of Balochistan, covering an area of 80,840 square kilometers.

The Project had three major components with five sub-components following an integrated water resources management approach including: (i) new irrigation infrastructure and improved irrigation management, (ii) improved agriculture management and promotion of drought tolerant cropping to improve soil and water conservation; (iii) better decision making by farmers based on analysis of soil, improved water availability, and weather advisories; (iv) new and improved water supply systems, (v) enhanced flood protection and (vi) improved watershed and rangeland management to improve soil moisture retention, reduce erosion and improve groundwater recharge. These activities not only have a positive impact on environmental sustainability but also build resilience to climate change. A comprehensive Environmental Assessment (EA) has been carried out for the Project.

The Monitoring and Evaluation is the part of Balochistan Integrated Water Resource Management and Development Project and MM Pakistan has been engaged as consultant for carrying out the M&E of the project. MM Pakistan has signed an agreement on 25th of the October 2022 with the project authorities for accomplishment of this assignment of Monitoring and Evaluation of BIWRMDP. As an essential part of the assignment and to take the first step towards monitoring and evaluation, the consultants has proposed the M&E Framework which:

[1] www.worldometers.info

[2] Data.worldbank.org

- determines the extent to which the project is on track and to make any needed corrections accordingly;
- make informed decisions regarding management and delivery;
- ensure the most effective and efficient use of resources;
- evaluate the extent to which the project is having or has had the desired outputs.

The M&E framework was prepared and explained with respect to following parameters.

- The foreseen change due to BIWRMDP intervention
- The Results Framework
- Ascertaining the indicator for change
- The information collection tools and approach
- Methodology for sampling, data collection and analysis
- Reporting mechanism

The tools used for M&E are briefly defined as follows:

a) Observation

The observations made by M&E staff at the implementation site form an important basis for progress monitoring of the project component as well as it reveals the quality of the works. Though observations include qualitative and quantitative data, however to treat these inputs separately, separate sections will be made in the tools for information collection.

b) Step-in Survey

Step-in surveys provide the direct feedback from the stakeholders and in this respect considered as more thorough and reliable way of information collection. It is more useful in getting information related to outcome and impact of a project.

It is generally administered through a long questionnaire comprising different sections based on the objectives and scope of assignment. The data is generally collected through random selection of respondents and structured tool to provide information in quantitative terms suitable to carry out statistical analyses.

c) Spot Check

The spot checks are being designed to examine the efficiency, transparency and legitimacy of the project implementation and immediate feedback from the stakeholder / beneficiaries. The basis of information and its analyses for M&E of BIWRMDP will be the records collected from and provided by PMU BIWRMDP to the M&E consultants.

d) Focus Group Discussion

The Focus Group Discussions (FGD) will be conducted at community level from beneficiaries who are residents or carrying out business in the area or other group of stakeholders with 8 to 12 homogenous participants. These will include project beneficiary groups and a few community activists and key informants from the locality. The scope of the focus groups will be to address those issues which are more qualitative in nature and can be best answered by project beneficiary community members rather than individual beneficiaries.

e) In-depth Interviews

These interviews are taken from individuals who are having in-depth knowledge of the area and project. This is also applied to those segments of the stakeholders which are not covered in the step-in surveys and FGDs. A list of such individuals will be developed based on the knowledge of the area and other partners to this assignment.

GIS as the vital characteristic of M&E Mechanism: It has been decided that GIS would be one of the main characteristics of the Monitoring and Evaluation Mechanism. All the indicators would be gauged with the help of tools and the outputs of the tools would be used and analyzed though GIS system. The GIS system would help the Management and other authorities of the Project through provision of the real time information about the progress of the project, gaps in the progress of the project,

In the light of the World Bank guidelines for Environmental and Social Standards (ESS), checklists were prepared for concerned assessment. The project however, does not pose or not expected to have significant or irreversible environmental and social impacts. It has been envisaged that the impacts would be primarily associated with temporary disruption due to development of irrigation systems, flood control structures and water supply schemes.

In line with the requirements, the Project Implementation Unit (PMU) has initially developed an Environmental and Social Management Plan (ESMP) to set out the principles, rules, guidelines and procedures for broadly assessing the generic environmental and social consequences of the project and to satisfy Bank's EA requirements and applicable legal legislations. For every scheme the contractor has provided Contractor Environment and Social Management Plan (CESMP).

The findings presented in this report are the result of comprehensive data collection and validation processes. Primary data was collected through field visits to the Nari and Porali River Basins, utilizing methods such as site observations, Focus Group Discussions (FGDs) with Farmer Organizations (FOs), Water User Associations (WUAs), and Village Watershed Committees (VWCs), along with Key Informant Interviews (KIIs) and spot checks at various project sites. Additionally, secondary data was sourced from project partners, including the Project Supervision and Implementation Assistance Consultants (PSIAC), PMU, Project Implementation Units (PIUs), and international organizations like the International Union for Conservation of Nature (IUCN), Food and Agriculture Organization (FAO), International Water Management Institute (IWMI), and Buraq Integrated Solutions. GIS tools were employed to validate and cross-check the data, ensuring precise and detailed reporting of the project's progress throughout the quarter.

The ultimate progress achieved by BIWRMDP is reflected in the following Table.

Indicator type	Indicator	Unit measurement	Achievement	Target
PDO	Irrigated Command area with improved water management services	Ha	24,320	26,275
PDO	Quality assured hydro-met data from project basins publicly available in an online data management system (Percentage)	%	100	90
PDO	Direct project beneficiaries (Number) Including female beneficiaries (%)	Number	407,913 49.41	414,000 46.5 % (female)
IRI	Person-days of water management/planning training for government staff. (Days)	Days	7,333	500
IRI	Active climate, streamflow and groundwater monitoring stations (Number)	Number	43	43
IRI	IWRM Reforms Roadmap Document endorsed by the Cabinet. (Text)	Text	Yes	Yes
IRI	Area provided with irrigation and drainage services. (Ha)	Ha	57,191	50,000
IRI	Water users provided with new/improved irrigation & drainage services (Number) Including female beneficiaries (%)	Number	210,060 49.41%	250,000 30%

Indicator type	Indicator	Unit measurement	Achievement	Target
IRI	Operational water user associations created and/or strengthened (Number)	Number	120	30
IRI	Area of watershed restored/reforested (Ha)	Ha	4,193	4,000
IRI	Number of community drinking water points installed/rehabilitated (Number)	Number	58	10
IRI	Surveyed beneficiaries satisfied with project implementation (Percentage)	Percent	82.5	80

A survey was carried out during the last quarter of 2024 wherein information was collected from a sample of 400 beneficiary farmers from the two river basins. Based on investment, area and population, the sample was distributed in a ratio of 2/3rd for Nari river basin and 1/3rd for Porali river basin.

The BIWRMDP intervention influenced the household earning member dynamics along the Nari and Purali rivers. Post-intervention, the proportion of single-earner households dropped to 39.8%, and the average number of earners increased to 2.0 overall, indicating enhanced income-sharing within families. The Nari River region saw stability in its average (2.1), while Purali River improved from 1.2 to 1.7.

The proportion of households without unemployed members increased from 59.9% to 62.9%, reflecting the project's positive impact.

The findings indicate that targeted interventions have effectively reduce unemployment, particularly in the Purali River area, highlighting the project's success in fostering economic opportunities.

The project's impact on household income sources revealed major shifts. Overall, diversification of income sources highlights enhanced resilience and sustainability within the communities post-intervention.

The overall average income across both regions rose from PKR 655,061 before the intervention to PKR 939,136 afterward, indicating the project's positive impact on household income levels.

The household expenditures before and after the intervention reveals remarkable shifts in spending patterns across two regions, Nari and Purali River. The households in both regions saw an increase in the average expenditure in the PKR 30,001 - 50,000 range. Generally, the project appears to have encouraged more households to allocate higher amounts towards monthly expenditures, with a general upward trend in average expenditure across all categories. The intervention resulted in higher overall household expenditures, particularly in food, education, and health, suggesting improved economic conditions for households.

As a whole, 25.6% of respondents experienced positive changes in income generating opportunities. The project led to broader income generation, especially through business ventures and agricultural labour.

Due to provision of flood protection infrastructure / measures under BIWRMDP, the beneficiaries claiming losses were reduced from 83.3% to 44.8%.

The survey data illustrates a positive shift towards satisfaction with flood resilience management before and after the intervention. The percentage of "highly satisfied" respondents increased to 2.7% whereas the "satisfied respondents were 51%.

Post-intervention, a considerable improvement in perception about groundwater levels was observed. Across both river basins, 69.4% of participants perceived groundwater levels had risen.

Before the project intervention, respondents along the Nari and Purali Rivers had mixed perceptions about soil conservation. After the project, 71.1% of Nari River respondents and 83.1% of Purali River respondents acknowledged soil conservation. In terms of benefits, the majority of respondents from the Nari River with 91.4% emphasized the protection of fertile land, compared to 71.3% from Purali River, highlighting a clear regional difference. 57.5% of Nari River respondents noted increased productivity, while 73.5% of Purali River respondents saw this benefit. Water-saving was acknowledged by 51.1% in Nari and 68.4% in Purali, showing a notable regional difference in perceived benefits.

Among the respondents, 88% of households in Nari River and 94.9% in Purali River considered themselves as landowners. The agricultural project brought changes to landholding patterns across both Nari River and Purali River regions.

Before the project, the average total farm size was 16.93 acres, with the Nari River holding 20.82 acres and Purali River 9.31 acres. Post-intervention, the overall farm size increased to 19.20 acres, with Nari River rising to 24.08 acres.

The intervention of lining watercourses has shown varying results across two regions, Nari River and Purali River, with overall benefits. Data revealed that the most prominent benefit in both areas is the increase in water quantity, particularly in the Nari River at 78.7%. The reduction in water losses was most noticeable in the Nari River at 62.4%, compared to 17.1% in Purali River.

The maintenance time was reduced, with 62.9% of respondents in Purali River highlighting this advantage. When examining water savings, data indicated that 36% of respondents from both regions experienced water savings of 21-30%, while 30.2% in Nari River reported savings exceeding 30%.

The data from Nari River and Purali River, showed differences in the use of laser land levelling techniques and the average land levelling area. In terms of adoption, 39.1% of farmers in Nari River and 55.2% in Purali River have employed the technique, with an overall usage of 44.5%. Meanwhile, 60.9% in Nari River and 44.9% in Purali River have not used it.

When examining land levelling area, the average area levelled in Nari River is higher, with average of 10.8 acres compared to Purali River's 7.8 acres. Nari River also shows a greater proportion of larger fields levelled.

Overall, the land levelling technique is more prevalent and involves larger areas in Nari River.

Data showed that the majority of households in the Nari River basin at 80.4% experienced water savings, while 91.8% reported increased productivity. In the Purali River basin, the most common benefit was increased productivity, with 42.7% reporting water savings. Overall, 61.4% of households noted water savings, and 83.3% saw productivity gains. The most common water savings due to land levelling were in the 11-20% range, particularly in the Nari River basin. The flood irrigation is the predominant method used in both basins (100%).

However, after the intervention, a significant shift is observed in the reliability of surface water sources. In both river systems, the reliability of surface water improved notably, with 76% of respondents from both regions now considering the water as reliable or highly reliable, compared to only 70% before.

The annual cropping intensity has been increased from 134% to 148.7%. Before intervention, the overall Rabi cropping intensity was 64% while after the intervention it in increased to 72.8%. For Kharif, it was 70% before intervention while it increased to 76% after intervention.

The wheat production data before and after the intervention demonstrates notable improvements in both productivity and efficiency.

Following the intervention in the Nari and Purali river regions, significant changes in livestock inventories were observed. In total, 57.6% of households experienced an increase in livestock, with a more pronounced rise in the Purali River at 67% compared to Nari River at 35.6%. This growth is mainly attributed to increased fodder productivity, particularly in Purali. The availability of increased water and grass also played a role, though to a lesser extent.

The satisfaction level with the project intervention indicated that 70% of respondents across both basins were satisfied, with 10.2% highly satisfied. Dissatisfaction was reported by 9.6%, while 2.2% were highly dissatisfied.

Among satisfied respondents 72.3% attributed their satisfaction to increased water quantity and productivity, while others cited increased cultivable area and improved living conditions. However, reasons for dissatisfaction included works not done properly i.e. 56.5%, lack of community involvement were 40.3%, and no works done in some areas were 3.2% of respondents.

The Baluchistan Integrated Water Resources Management and Development Project (BIWRMDP) has undertaken a comprehensive Environmental and Social Impact Assessment (ESIA) to align with national laws and the World Bank's Environmental and Social Framework. This assessment established guidelines to identify, mitigate, and manage potential environmental impacts while promoting sustainability. Environmental

and Social Impacts Management Plans (ESIMPs) and Contractors' Environmental and Social Impact Management Plans (CESIMPs) were developed to ensure proper management.

The Project Supervision and Implementation Assistance Consultants (PSIAC) were engaged to oversee compliance with environmental safeguards, ensuring the preparation and monitoring of ESIMPs. They provided regular progress reports to the Project Management Unit (PMU), while third-party consultants offered additional oversight.

Nine primary indicators and 40 sub-indicators were developed to evaluate the environmental and social performance across various projects. The data from the third to sixth quarterly reports were analyzed to minimize inconsistencies, and findings revealed variable compliance rates across projects, ranging from 25% to 57.5%.

In addition to the environmental compliance efforts, the BIWRMDP aimed to establish a hydro-meteorological data collection and management system, enhancing decision-making for water resource planning. The network of monitoring stations in the Nari and Porali river basins was successfully installed, including climate stations, rainfall recording stations, and groundwater monitoring wells. The centralized IT platform that manages this data facilitate better decision-making by integrating hydro-meteorological data with spatial information. However, challenges such as security concerns, coordination gaps with the Meteorology Department, human resource constraints, and financial limitations hindered full operational success. Recommendations for improvement include establishing data-sharing agreements, expanding training programs for technical staff, and securing additional funding through climate finance mechanisms.

The Watershed Management and Rangeland Management initiative in Baluchistan addresses critical environmental issues such as water scarcity, soil degradation, and deforestation, with significant achievements in integrated water management and afforestation. In the Porali Basin, dry afforestation through water harvesting was successfully carried out, along with block plantation on state and community lands. These initiatives helped mitigate flash floods, improve biodiversity, and enhance carbon sequestration. Despite these successes, the projects face challenges such as financial sustainability for maintenance and high infrastructure costs. Recommendations focus on exploring revenue-generating activities, securing long-term funding, and improving infrastructure for better maintenance.

The BIWRMDP has also made significant strides in mangrove plantation initiatives, especially in Miani Hor and Lasbela, restoring large areas of mangrove forests. These projects have created job opportunities, supported local livelihoods, and contributed to environmental benefits such as carbon storage and marine ecosystem support. However, illegal logging, pollution, and climate change pose ongoing challenges. Future initiatives should focus on increasing community awareness, improving coordination between government agencies, and securing long-term funding.

The construction of check dams in the Porali and Nari River Basins has contributed to soil erosion reduction, groundwater recharge, and flash flood mitigation. However, challenges such as siltation, high construction costs, and risks related to dam placement persist. Recommendations include regular maintenance and desilting of dams, the use of modern technologies like GIS for optimal dam placement, and integrating check dams with other soil conservation measures.

The BIWRMDP has significantly contributed to water resource management, environmental restoration, and community resilience in Baluchistan. Continued investment and strategic management are essential to sustain the ecological and economic benefits generated by these projects.

Chapter 1: Introduction and Background

1.1 Background of the Region

Balochistan3, the largest of the four provinces of Pakistan, spreads over an area of 347,190 sq. kms. forming 43.6% of the total area of Pakistan. It has clustered population and is smallest with respect to other provinces. Its population, according to 2017 census, was 12.33 million, having a low density per square kilometre. Approximately4 72.4% of the population lives in rural areas and mainly depends on agriculture and livestock as sources of livelihood. Physically, Balochistan is an extensive plateau of rough terrain divided into basins by ranges of sufficient heights and ruggedness. Broadly, Balochistan geographic area can be divided in to four distinct zones: Upper high lands, lower high lands, plains, and deserts.

The upper highlands, known locally as Khorasan, rise as high as 3,700 meters, with valley floors about 1,500 meters above sea levels. The Upper High Lands fall mainly in districts Zhob, Killa Saifullah, Pishin, Quetta, Ziarat and Kalat. It comprises a number of ranges such as Sulaiman, Toba Kakari, Murdar, Zarghoon, Takatu, and Chiltan ranges. The highlands include Makran, Kharan and Chaghi ranges in the West and Sulaiman in the east.

The Lower High Lands have an altitude ranging from 1,970 to 3,940 ft. (600 to 1200 M). They are located in the south-eastern Balochistan, except eastern part of Kachhi, the southern end of Dera Bugti and Nasirabad districts. Some are extension of lower high lands that exist at boundaries of Gwadar, Turbat, Panjgur, Kharan and Chaghi districts.

Balochistan has relatively small area of plains as compared to its total land area. They include the Kachhi plain, situated in the south of Sibi and extending into Nasirabad Division, the southern part of Dera Bugti district, and narrow plain area along the Mekran coast. The plains of Kachhi, Las Bela and that of river Dasht cover sizable area. Mountains dominate the terrain, and valley floors, and piedmont plain make up only 15% of the landscape.

The western part of the province, mostly in Kharan and Chaghi districts, consists of vast plains covered with black gravel surface and broad expanses of sand dunes.

The coastal-line is about 760 Kilometers long, with a number of peninsulas and promontories. The coastal area is not effectively connected with the interior; the steep hills rise abruptly beyond the narrow coastal plain. Ports, such as Somiani and Pasni are unsheltered. Federal and provincial governments have comprehensive development plans that feature a deep-sea port at Gwadar and a coastal highway.

The Irrigation Department, under which BIWRMDP is being implemented, comes under the administrative control of the Government of Balochistan. After the dissolution of One Unit in 1970 Balochistan Province was formed. The general information regarding land utilization in the province is provided in Table-1.1:

Table 1.1: Land Utilization Pattern, Million Hectare (MHa)[5]

S. No	Description	Area (MHa)
1	Area not available for cultivation (58.6%)	20.346
2	Forest (5%)	1.875
3	Culturable Waste1 (25.1%)	8.715
4	Fallow (6.5%)	2.257
5	Net sown	1.528
Total Geographical Area		34.720

[3] https://balochistan.gov.pk/explore-balochistan/about-balochistan/

[4] http://pbs.gov.pk.com

[5] Agriculture Statistics of Balochistan, 2019-20.

1.2 Climate

The climate of the upper highlands is characterized by very cold winters and warm summers. Winters of the lower highlands vary from extremely cold in the northern districts to mild conditions closer to the Makran coast. Summers are hot and dry in the arid zones of Chaghi and Kharan districts are extremely hot in summer. The plain areas are also very hot in summer with temperatures rising as high as 120 degrees F (50 degrees C). Winters are mild on the plains with the temperature, never falling below the freezing point. The desert climate is characterized by hot and very arid conditions. Occasionally strong windstorms make these areas very inhospitable.

1.2.1 Rainfall

Average annual precipitation in Balochistan varies from 2 to 20 inches (50 to 500 mm). Maximum precipitation falls in the north-eastern areas with annual average rain fall ranging from 8 to 20 inches (200 to 500 mm). It decreases in the south and the eastern parts and is minimum in Naukundi. Kharan and Dalbandin area, rainfall ranges between 1 to 2 inches (25 to 50mm). Evaporation rates are higher than the precipitation and generally vary from 72 to 76 inches (1830 1930 mm) per annum. However, the recent historically abnormal rainfall in Balochistan has a surprising element for the planners and decision makers.

1.3 River and Streams

All rivers and streams are part of three major drainage systems. Coastal drainage system is characterized by small, ephemeral streams and hill torrents. Rivers and streams that do not possess any significant perennial flow constitute Inland system that dominates the central and north-western area of the province. Nari, Kaha and Gaj rivers are part of Indus drainage system located in the north-eastern margins of the province. The flow in rivers is typified by spring runoff and occasional flash floods. The rivers beds are dry and look like small streams. Stream gradients are high and the rate of run off is very rapid. The Zhob River Basin drains towards the northeast into the Gomal River which ultimately joins the Indus River. Streams along the border of Punjab and Sindh provinces flow toward the east and southeast into the Indus River. Central and western Balochistan drains towards the south and the southwest into the Arabian Sea. Some areas located in districts Chaghi, Kharan, and Panjgur drain into playa lakes, locally called ”Hamun” such as Humun-e-Lora and Hamun-e-Mashkel etc.

The important rivers in Balochistan are Zhob, Nari, Bolan, Pishin, Lora, Mula, Hub, Porali, Hingol, Rakshan and Dasht.

1.4 Agriculture in Balochistan[6]

1.4.1 Land Ownership and Tenure System

As far as the land ownership in the region is concerned, the cultivated area is under personal ownership. Those lands which have not been brought under governmental control belong to the tribe residing in the area. Farming is normally done by landlords with the help of laborers on the pattern of share cropping or with the laborers on cash contract for an agricultural year.

1.4.2 Cropping Seasons

There are two seasons of crops, namely Kharif and Rabi seasons. These crops are sown in summer and harvested in late summer or early autumn, while Rabi crops are sown in winter or early summer and harvested accordingly. Rabi crops are wheat, barley, vegetable and fodder. The crops grown during Kharif are fruits, melons, vegetables, potato, fodder, onion etc. Almost all the crops grown during Kharif season are cash crops, reflecting that the farmers are commercial, minded; as they mostly produce for the market. This also indicates that agriculture in the province is a settled sector. In addition to this melon is the crop which is sown both on irrigated and un-irrigated areas showing that the farmers are rational in using the scarce resource (water) in a proficient and effective manner. Rural women are indulged in the agricultural activities inside their own fields. At the time of sowing and reaping the crops, the demand for seasonal labour rises and male

[6] Promotion of Agriculture of Balochistan (Research Study), (Planning and Research Department) ZBTL

labour is employed on daily wages for this function. Rural local male labour has been replaced to some extent by skilled Afghan refugees, who are said to be reliable and obedient.

1.4.3 Cropping Pattern

Balochistan produces high delta crops along with the subsistence crops. During Rabi, wheat captures the major percentage of the irrigated area followed by vegetables, cumin, fodder and barley. In Kharif season, a major share goes to fruit production followed by vegetable and melon. Onion and fodder are also vital Kharif crops. Having a glance at the nature of Rabi and Kharif crops, it is obvious that the farmers mostly produce for the market. Within fruits apples and grapes can be singled out as major province fruits. Wheat is the second major crop. Vegetables hold third place in ranking

1.4.4 Cultivated and Uncultivated Area

Out of the total area of 34.7 M. Ha, hardly 2.06 million (5.9 percent) is cultivated and 54 per cent remains current fallow due to lack of water. Besides, there are 4.85 million hectares of cultural wasteland which can be brought under cultivation subject to the availability of water. Although the total cropped area of Balochistan is 3.8 per cent of the total cropped area of the country (22.76 M. Ha), and yet the province is the largest contributor to the national production of apples (82 percent), peaches (69 percent), grapes (97.6 percent), pomegranates (82 percent), dates (64 per cent), almonds (93.5 percent) and plums (49 percent). However, over-irrigation has resulted in severe over-mining of ground water. Again, in spite of limitation of irrigation water, yields per hectare of several crops are highest in the country such as castor seed, while those of Mash, Jowar and Sesamum crops are the second highest in the country.

While considering the production of vegetables in Kharif season, which has increased considerably from 119658 tonnes (2013-14) to 120841 tonnes (2017-18) showing a growing rate of 0.99% in production. At the same time, in Rabi season the production of vegetables has declined from 295827 tonnes (2013- 14) to 274425 tonnes (2017-18) significantly with a decreasing rate of -7.23, reason for this reduction needs to be find out. Whereas considering the condiments, production has been increased from 508040 tonnes (2013-14) to 696810 tonnes (2017-18) showing a growth rate of 37.16%, that is a tremendous increase in the production. This is the good sign and shows that agriculture is growing in Baluchistan.

Chapter 2: Balochistan Integrated Water Resources Management and Development Project[7]

The project was being implemented by the Government of Balochistan (GoB), for improved water resources planning, management and monitoring, and increased adoption of water-efficient practices and technologies by water users, in targeted communities in the Nari, and Porali river basins of Balochistan covering 80,840 Kilo Meter Square (km^2).

The Project had three major components with five sub-components following an integrated water resources management approach including: (i) new irrigation infrastructure and improved irrigation management, (ii) improved agriculture management and promotion of drought tolerant cropping to improve soil and water conservation; (iii) better decision making by farmers based on analysis of soil, improved water availability, and weather advisories; (iv) new and improved water supply systems, (v) enhanced flood protection and (vi) improved watershed and rangeland management to improve soil moisture retention, reduce erosion and improve groundwater recharge. These activities not only have a positive impact on environmental sustainability but also build resilience to climate change. A comprehensive Environmental Assessment (EA) has been carried out for the Project.

2.1 The Project Context

Agriculture is the mainstay of Balochistan economy. About 60% of the GDP and 67% of 13.2 million Balochistan's population live in rural areas and mainly depend on agriculture and related activities for their livelihood. The shortage of water, severely constrains agricultural development, and only 1.5 million of Balochistan's 35 MHa is cultivated. Climatic conditions range from dry to hyper-arid and annual rainfall varies from 80 mm in the west to 250 mm in the east. Soils are mostly thin and calcareous, low in organic matter and prone to erosion. Balochistan farmers can be split between Khushkaba - those who grow rain-fed crops and also run small livestock flocks, and Sailaba - those who have access to irrigation water and grow irrigated crops.

The main rain-fed crops are wheat, sorghum, rapeseed, mustard and fodder. The main irrigated crops are wheat, rice, apples, apricots, peaches, grapes, pomegranates, dates and vegetables. Only 37% of Balochistan's cultivated land is under perennial irrigation; most of the farmers in the province rely on erratic partial irrigation. An estimated 47% of the population live below the official poverty line (33% nationally). Annual per capita GDP is US$757 (US$1,297 nationally), literacy rate is 50% (58% nationally) and less than 15% of people have access to safe water supply. In Pakistan, agriculture accounts for 20.88% of GDP and 43.5% of employment in the fiscal year of 2014-15. Agriculture GDP consists of 32.8% major crops, 11.1% minor crops, 53.2% livestock, 2.9% fisheries and forestry. Through its production, agriculture contributes 60% to the country's export earnings and 45% of the nation's labour force. Pakistan is among the top 20 global producers in over 48 different agricultural commodities including rice, sugarcane, wheat and cotton.

Irrigation is critical for agriculture in Balochistan. In total including small and large there are 18 river basins in Balochistan. Surface water from Indus Basin Irrigation System (IBIS) mainly contributes irrigation scheme in Balochistan. In addition, flood flows, perennial base flows in rivers, subsurface flow through river gravels, springs and groundwater also support small scale irrigation schemes. The estimated total perennial irrigated area during the fiscal year 2013-14 was 1.08 million ha of which 40% is irrigated by the Pat Feeder, Desert and Khirthar canals from the Gudu and Sukkur barrages on the Indus River. Private canals irrigate 0.13 million ha and tubewells and dug wells irrigate 0.42 million ha and 0.05 million ha, respectively. Karezes, springs and minor irrigation sources irrigate 0.05 million ha (Pakistan Bureau of Statistics, 2015).

[7] Environmental Assessment (Reviewed Draft for Disclosure) January 2016, BIWRMDP, Irrigation Department GoB

Spate irrigation (traditionally known as Sailaba farming) remains common as is rainwater harvesting (Khushkaba). Area under Sailaba and Khushkaba irrigation is about 0.87 million ha (Agricultural Statistics of Pakistan, 2011). Therefore, the total irrigated area is about 1.95 million ha. Sailaba and Khushkaba farming are dependent on occasional rainfall and floods. There are significant opportunities exists for spate irrigation if additional floodwaters are effectively diverted; prospects exist at Nari, Porali, Kaha, Hingol, Zoab and Rakhshan river basins. Spate Irrigation has dual purposes, it can support agriculture production and also recharges groundwater and helps mitigate flood damages. There is huge potential for rainwater harvesting across Balochistan to the benefit of poor remote settlements.

2.1.1 Need for improvement in Water Resources Management

The poor coverage and reliability of hydro-meteorological data is preventing effective planning and management of water resources. Much of Balochistan has no groundwater monitoring network, despite the critical status of the groundwater resources, and the surface water data monitoring network is inadequate. The institutions lack expertise in hydro-meteorological monitoring, field sites are remote, field staffs are under supervised and data transmission infrastructure are inadequate.

Annual average rainfall in Balochistan is less than 200 mm, with as few as 7 rain days per year in the desert areas and a maximum of 28 rain days in the mountain areas. Annual average surface water generated in Balochistan is around 10.8 billion m^3 of which around 21% is utilized. Approximately 8 and 13% of the surface water are utilized in the Porali and Nari river basins, respectively. This low utilization of surface water is due to the lack of limited storage and diversion infrastructure especially for the episodic flood flows. Under the Water Apportionment Accord of 1991, Balochistan has a water allocation of around 5.7 billion m^3 of floodwaters and a further allocation of 4.8 billion m^3 from perennial canals of the Indus Basin Irrigation System.

Due to the inadequate and poorly maintained canal infrastructure, only 36% of this combined allocation is utilized. Major portion of the water is lost along the inefficient conveyance and on-farm application. Unreliability of surface water and the dilapidated water infrastructures, groundwater became critical water resources in Balochistan. Intense rainfall events, deforestation, and virtually no mechanism to naturally recharging groundwater table and episodic and over-exploitation of groundwater is leading to rapid decline of groundwater tables. Investing in new water infrastructure and rehabilitation of existing facilities are urgently needed to address critical state of agriculture, food security, and economic development in the province.

Severe drought condition in a range of 4 to 5 years frequency is dominant in Balochistan. Intense dry periods take heavy toll on the livelihood patterns of the local population as irrigation and potable water resources run dry. Water availability is drastically reduced during extended droughts.

Loss of life, destruction of settlements and irrigation infrastructure during the 2022, 2010 and 2007 floods led to significant reduction in agricultural production. The lack of adequate water storage facilities, flood retention areas as well as flood protection dykes exacerbated the damages experienced during those years and will cause damages again in the future. To minimize flood risk, construction of storage facilities and flood protection works are very urgent.

To improve the long-term sustainability of the environment and livelihoods of local communities, changes in current land use practices and associated resource use are required. Currently, watersheds in the province are in a very poor and derelict state. Major investments are required to rehabilitate the watersheds in close collaboration with local communities and the Departments of Agriculture, Irrigation, and Forestry. This will make major improvements on rangeland and ground water recharge.

Environmental protection activities through community involvement is needed to conserve protected areas especially Juniper forests and Mangrove forests, and protecting riverine flora along major rivers and streams.

Inefficient irrigation practices, such as, flooding orchard fields, by reducing water use efficiency to below 30% and unlined water conveyance channels from the source to the farms, causing seepage losses of up to 45 to 50% in the system are some of the bottlenecks of the water productivity.

Effective water management in Balochistan is highly dependent on governance, institutional capacity, institutional set up, and political will and commitment by the public sector. Irrigation service delivery is currently managed independently among the agriculture and irrigation sectors without proper collaboration. At the

community level, little interaction or information exchange among communities and the Government of Balochistan (GOB) are present, on available options to them to increase water productivity in a long-term.

River flows are highly dependent on the global climate change, including changes in glacial melt, temperature, and precipitation patterns. This phenomenon tends to increase the frequency of floods and droughts. Analyses conducted by various projects concluded that all rainfall/snow-fed rivers will have significant reduction in long-term discharge. Glacier-fed rivers will increase their discharges by 10-15 percent through 2050 but thereafter also significantly reduce their discharges due to the disappearance of glaciers in the Hindu Kush-Himalayas.

Climate change and the issues highlighted above on inadequate water management, followed by the population growth, urbanization, mining, and industrialization in the future will exacerbate scarcity of water in Balochistan. With a 3% population growth, a significant resource requirement is expected. In addition, the mining sector, which is the driving force of future economic growth in Balochistan, will require additional water, further aggravating the resource scarcity. In this context, the GOB adopted the IWRM approach in 2005 for formulating a policy including sixteen policy thrust areas, which are essential for improving and sustaining the management of surface and groundwater resources in the province.

2.2 Need, Approach and Methodology for M&E of BIWRMDP

The project is important in the context of economic development of the province. The total project cost is tuned to USD 110.9 million. For such an investment, it was felt that an independent agent should be engaged for M&E. In compliance, MMP was engaged through competitive bidding for providing consultancy services for M&E of BIWRMDP.

It was mandated in the terms of reference for the M&E consultants to provide detailed approach and methodology for their services. A number of meetings were held between the PMU, PSIA and WB which guided in formulation and refining the M&E service delivery.

The M&E system proposed by the consultants is based on three layers as follows:

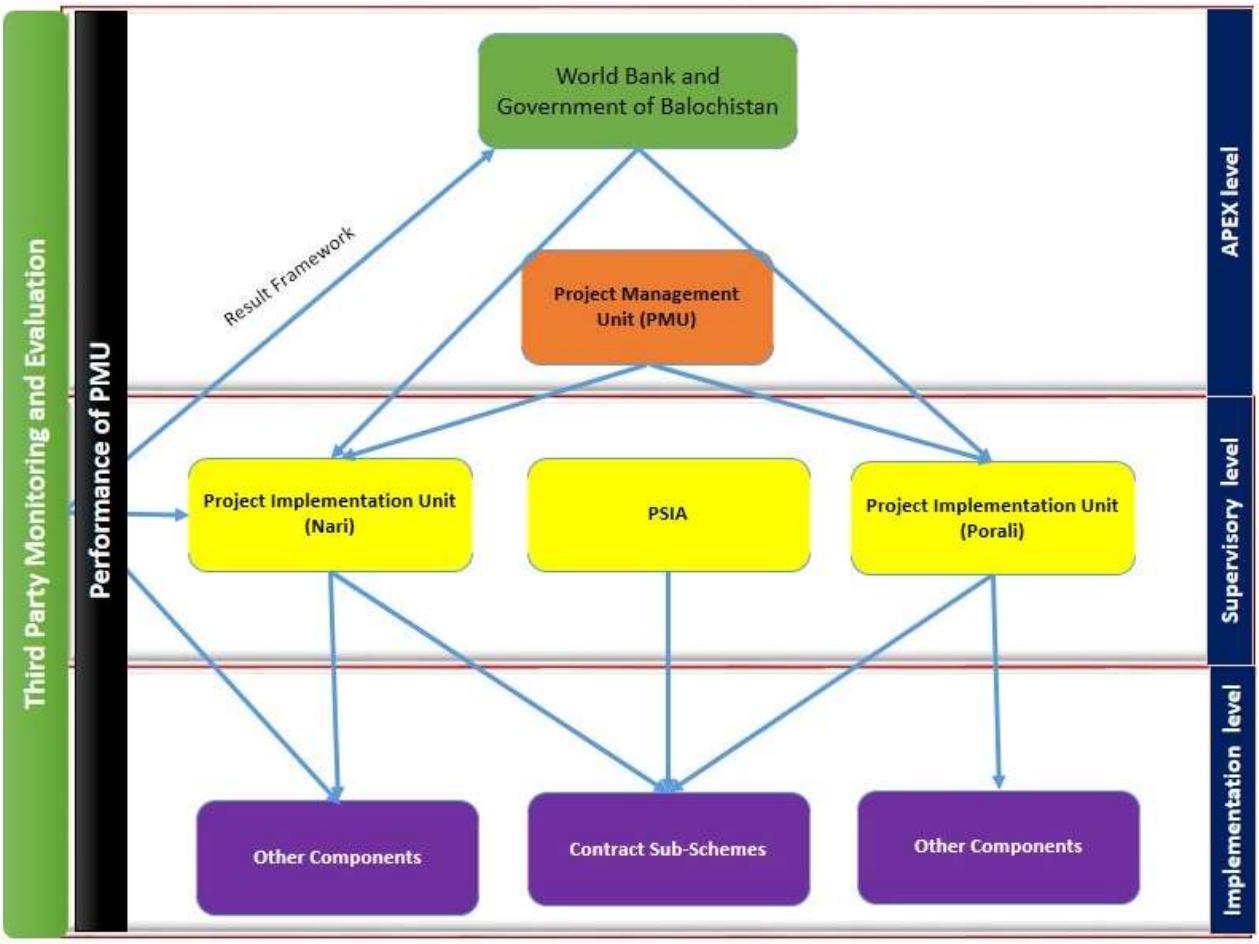
- Apex level (overall management and advisory)
- Supervisory level (managing the implementation)
- Field level (on-ground execution)

At apex level, the main stakeholders are the financers, planners and decision makers. These include WB, Steering Committee at GoB and PMU BIWRMDP. These stakeholders will be mainly looking at the goals and targets of the project including Results Framework (RF). Keeping in view the importance of RF a separate module/chapter is provided to explain the indicators, methodology of assessment and measurement of achievement as a function of M&E system.

At the supervisory level, the main actors are PSIA, Project Implementation Units (PIUs) with a controlling role of PMU. Thus, the PMU needs to act at Apex level as well as supervisory level. These actors are required to design, develop and implement the project. The critical factors for them will be the appropriateness of design, the implementation plan (scheme-wise), quality assurance, environmental and social assessment, Operation and Management plan and coordination. The M&E consultants will mainly rely on the information generated at PMU, PSIA and PIU, however, get these validated through field visits.

At the filed level, the important stakeholders are the contractors engaged for execution of the construction, the social and environmental initiatives, the suppliers, affectees, Farmer Organizations, (FOs) Water User Associations (WUAs), beneficiaries (male and female) and farmers. The M&E consultants will visit the sites for validation of the data provided at supervisory level. However, where a detailed survey is required, the M&E Consultants role will be limited to development of ToRs, assistance in designing methodology and survey tools, ensuring information quality and evaluation of reports.

Figure 2.1: Monitoring and Evaluation System



Correspondingly, modules for approach and methodology for this important assignment have been built upon the features of the BIWRMDP given as follows:

Module – 1: The Project Development Objectives (PDOs) and the Results Based Monitoring

Module – 2: The Project Components

Module – 3: The Proposed Monitoring and Evaluation Framework and Mechanism

Module – 4: Other related activities (interventions)

Though the activities under the fore given modules overlap, however for the purpose of self-containment some repetition is inevitable. Each of the above modules is given in the form of chapters provided hereafter.

Chapter 3: Monitoring and Evaluation Framework and Mechanism

The Monitoring and Evaluation is the part of Balochistan Integrated Water Resource Management and Development Project and MM Pakistan has been engaged as consultant for carrying out the M&E of the project. MM Pakistan has signed an agreement on 25th of the October 2022 with the project authorities for accomplishment of this assignment of Monitoring and Evaluation of BIWRMDP. As an essential part of the assignment and to take the first step towards monitoring and evaluation, the consultants has proposed the M&E Framework which:

- determines the extent to which the project is on track and to make any needed corrections accordingly;
- make informed decisions regarding management and delivery;
- ensure the most effective and efficient use of resources;
- evaluate the extent to which the project is having or has had the desired outputs.

Monitoring means tracking the key elements of program performance on a regular basis (inputs, activities, results). In contrast, evaluation is the episodic assessment of the change in targeted results that can be attributed to the project intervention or the analysis of inputs and activities to determine their contribution to results.

Results-Based Management (RBM) is a management strategy aimed at achieving important changes in the way organizations operate, with improving performance in terms of results as the central orientation. RBM provides the management framework with tools for strategic planning, risk management, performance monitoring and evaluation. Its primary purpose is to improve efficiency and effectiveness through organizational learning, and secondly to fulfil accountability obligations through performance reporting.

For a Results-based Strategy following details are considered:

- Aim of longer-term improvement in irrigation and agriculture
- Improvements aimed at by the end of the project period
- Understanding success - which outcome targets need to be met
- Strategic programs and critical interventions = outputs
- Financial, human, material, and technical resources = inputs
- The extent to which the objectives of a project are consistent with provincial and direct beneficiaries' needs.
- The extent to which the objectives of the project are still valid
- Relevance of the project to the provincial needs and target.
- Whether activities of the project consistent with the overall goal and the attainment of its objectives
- Whether the activities of the project consistent with the intended impacts and effects

3.1 Features of M&E Framework

The M&E framework has been prepared and explained with respect to following parameters.

- The foreseen change due to BIWRMDP intervention
- The Results Framework

- Ascertaining the indicator for change
- The information collection tools and approach
- Methodology for sampling, data collection and analysis
- Reporting mechanism

Each of the above features of M&E framework has been defined in details in the following sections

3.2 The Foreseen Change due to BIWRMDP Intervention

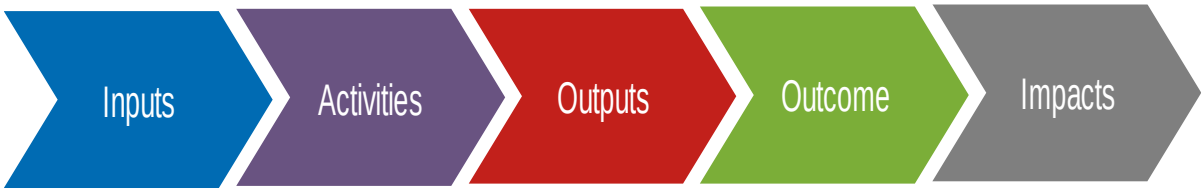
The rationale of BIWRMDP is provided in Chapter-1 and 2. After the intervention of the project it is expected that it will improve the livelihoods of the rural poor in Balochistan through local-level participation to build stronger and more resilient communities. It will drive economic development through more efficient, productive and sustainable management and use of water resources.

The project will improve the livelihoods of the current generation of poor people, and introduce the reforms needed to contribute towards long-term poverty reduction. Increased Productivity in Farms in Selected Irrigation Schemes (which includes prioritizing water resources management and community water supply).

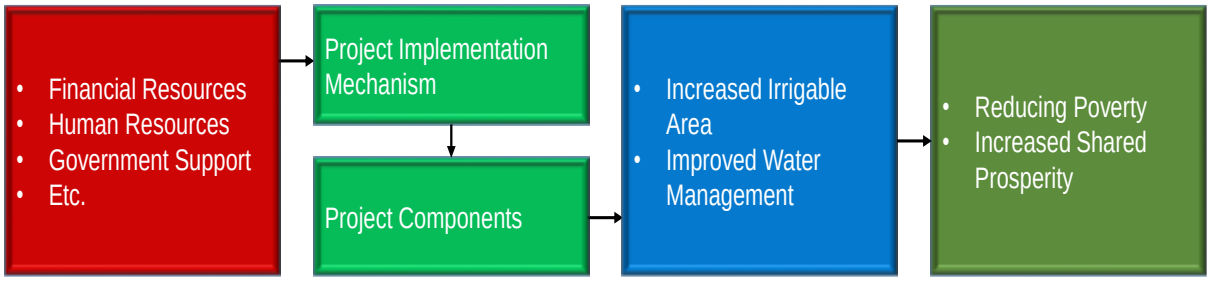
The project will contribute towards increased resilience to disasters in targeted regions. The Project will support implementation of priority areas of the Balochistan IWRM Policy that target poverty and environmental sustainability and will establish a road-map for fuller and longer-term implementation of the full policy across the province.

3.2.1 Pathway to Change

Although change to beneficiaries through a project intervention can be complex it can be helpful to present project and strategy in the form of a change pathway, or an impact chain. This describes how M&E will contribute to desired outcomes (objectives); which will in turn contribute to final impacts (aims). A simplified impact chain looks like this:



In practice impact chain is unlikely to be linear: there may be multiple outcomes and impacts and there may be interactions and feedback loops between different parts of the pathway. For BIWRMDP the above concept is translated as follows:



Monitoring information and experiences will track the progress and highlight any need for changes. The consultants will use different approaches to gather necessary information and data. Our overarching method adopted for delivering M&E services to suit framework development approach is given below:

5.2.2 Advocating participation: it is crucial to have all stakeholders involved in planning and decision-making processes, and subsequently buying into the implementation and management of the

BIWRMDP components. Throughout the implementation of the monitoring activities participation will be linked to involvement and commitment from all stakeholders.

5.2.3 Social inclusion: through different mechanisms we will strive to promote social inclusion. First of all at the design stage, through the development of methodologies for the M&E of BIWRMDP which will explicitly require the samples to include representatives from the poorest and most vulnerable groups, including women. Secondly, during implementation whereby, as appropriate, extra efforts are made to ensure an adequate representation of all stakeholders, including those whose voices so far, have not or have been sufficiently heard in the monitoring and evaluation work.

5.2.4 Obtaining reliable results: the design of the collection instruments and the sample size ensures that statistically significant results are obtained and tabulated in a timely manner for the preparation of quarterly statistical and brief progress reports specifying results, analysis and recommendations.

5.2.5 Fostering flexibility: we believe that in client orientation approach, flexibility is an important mean to achieve sustainable results. It is essential to be able to adapt the implementation strategy, approach and schedules where required, obviously in close consultation with PMU BIWRMDP.

5.2.6 Innovative practices with local knowledge: to provide an efficient and effective team, optimum combination of regional expertise and local knowledge is appropriate.

3.3 The Result Framework

The Results Framework prepared at the time of start of the project provided in PAD in 2016 was revised and updated. A detailed review of the revised RF has been made in Chapter-3.

3.3.1 Ascertaining the Indicators for Change

Indicators are signposts of change along the path to development. They describe the way to track intended results and are critical for monitoring and evaluation. Good performance indicators are a critical part of the M&E framework. In particular, indicators can help to:

- Inform decision making for ongoing program or project management
- Measure progress and achievements, as understood by the different stakeholders
- Clarify consistency between activities, outputs, outcomes and impacts
- Ensure legitimacy and accountability to all stakeholders by demonstrating progress
- Assess project and staff performance.

The process of formulating indicators should begin with the following questions:

- How can we measure that the expected results are being achieved?
- What type of information can demonstrate a positive change?
- What can be feasibly monitored with given resource and capacity constraints?
- Will timely information be available for the different monitoring exercises?
- What will the system of data collection be and who will be responsible?

Based on above, Chapter-3 provided the indicators from RF of BIWRMDP, the baseline and benchmarking, unit of measurement, approach and methodology for assessment and end and intermediate targets.

3.4 Information Collection Tools and Approach

The primary goal of monitoring and evaluation (M&E) is to generate valid and reliable empirical findings on the BIWRMDP implementation so that the intervention core objectives are overall achieved in a timely manner. The consultants have proposed systematic M&E design which is supposed to have provisions for

periodic qualitative and quantitative measures (indicators and indices) of project achievement. Additionally, the M&E Consultants will be assessing the outcome which lead towards desired impact of BIWRMDP. Although monitoring and evaluation in many ways are two ends of a continuum, yet conceptually they could also be separated from one another. These tools are defined in detail later in this Chapter.

3.4.1 Secondary Data

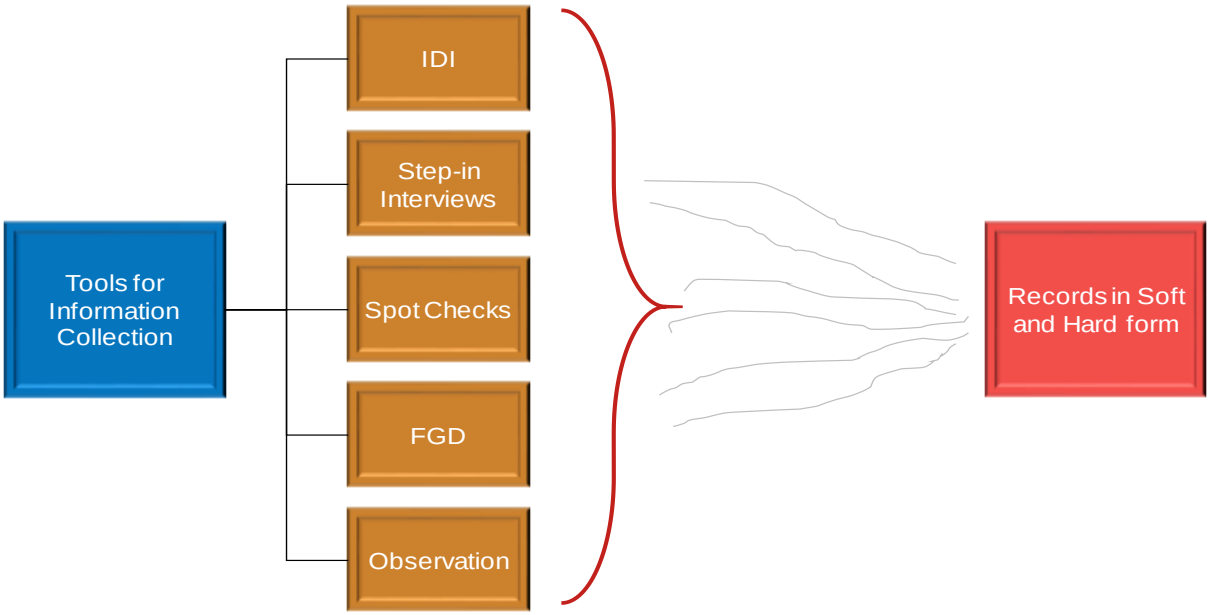
This is one of the most important bases of information for M&E of BIWRMDP considering the framework development approach. A variety of records will be prepared, maintained and made available for each of the project sub-components and its related interventions: internal systems and records to track project activities; processes and output indicators; keeping records of relevant secondary information to track changes in outcomes and impacts and accompanying internal records, such as policy changes, relevant surveys / databases. Some of the types of these records of general nature which will provide the information basis for M&E are given below:

- Basis of prioritization
- Stakeholders consultations and their inputs
- Feasibility and design basis
- Related studies carried out
- Agreement with the service providers and contractors
- Work plan prepared and agreed
- Maps and shop drawings
- Auto CAD drawings
- ESIA or IEE
- Stakeholders' consultation and feedback
- ESMP or EMP / checklists
- Inception, periodic and end of project reports
- BOQs and MBs
- Plans of human resource deployment on project components and sub-components
- Permissions and permits obtained
- Correspondence between PMU and service providers or contractors
- Project supervision reports
- Decisions made by management
- Variations in contracts and agreements
- Financial plan and disbursement

3.4.2 Primary Data

The information gathered from observations, records and spot checks will form the basis for progress monitoring especially the physical work. This information will form the basis for key experts providing M&E consultancy services especially addressing all project components including survey tools for collecting feedback and physical progress monitoring. Figure 5.1 describes primary data collection tools. These tools are defined following the figure.

Figure 3.1: Bases of M&E Information



3.4.2.1 Observation

Though it is not considered as a separate tool it forms an important and critical section of a tool frequently useful for physical progress monitoring. The observations made by M&E staff at the implementation site form an important basis for progress monitoring of the project component as well as it reveals the quality of the works. Though observations include qualitative and quantitative data, however to treat these inputs separately, separate sections will be made in the tools for information collection.

In general, it is more structured and provides basis for review of the current situation and comparison of progress and performance from one point of time to another. Observation will be one of the key instruments for gauging the physical progress against a project component.

The key observations for physical construction include but not limited to:

f) General:

- Locality details
- Activity evidence
- Number of labours,
- Number of supervisors,
- quality assurance staff,
- skill matrix,
- hours of working,
- health and safety measures,
- drinking water for staff
- presence and awareness of ESMP
- Compliance with different rules and regulations

g) Site Observations

Availability of following documents:

- Site Office / Site Camp

- Site Clearance/ Dismantle (If required)
- Availability of Topographic Survey
- Reports Soil Testing / Investigation of Soil
- Standard Codes
- Test (soil, etc.)
- Detail Drawings/ Shops Drawings
- BOQs (Bill of Quantities)
- Permits and Sanctions (Approval from concerned department)
- Compliance with environmental and social management plan
- Traffic management plan, if any
- Last Progress Report
- Health and safety manual and practices

h) Human Resource

- Resident Engineer (RE)
- Site Supervisor
- QA/QC officer
- Skill / unskilled labours
- Equipment's (like, excavators, dozers, cranes, concreting mixer, scaffolding/shuttering, dewatering pumps etc.)
- Materials (like reinforcement, cement, sand, gravel, blocks, asphalt etc.)
- Implementation of structural member (like beam, columns, slabs, foundations, pavement etc.)
- Estimations and bills
- Progress of work should be as per schedule, also construction should be as per drawings
- On field management like knowledge of form-work, concreting, safety measures, etc.
- Coordination with labour
- Safety signs

i) Facilities

- Potable water
- Uniform
- Helmet, jacket, safety shoe and safety glasses
- First aid box
- Toilets
- Store
- Time sheet /attendance record

j) Social and Environmental

- Child labour
- Working hours
- Women labour
- Coordination with other agencies
- Community participation
- Community accountability

- Trees and plantation

The qualitative information gathered from the field is equally important as it provides the information about those aspects which were not covered by the quantitative approach. The qualitative data will be collected by using different statistical scales (e.g. Likert). A separate approach will be adopted for coding tabulating and analysis of the qualitative data. The factors used for qualitative data will be selected in a manner that they can be triangulated with the other quantitative information and facilitate the management in taking course correction and mitigating any associated risks.

k) Step-in Survey

Step-in surveys provide the direct feedback from the stakeholders and in this respect considered as more thorough and reliable way of information collection. It is more useful in getting information related to outcome and impact of a project.

It is generally administered through a long questionnaire comprising different sections based on the objectives and scope of assignment. The data is generally collected through random selection of respondents and structured tool to provide information in quantitative terms suitable to carry out statistical analyses.

l) Spot Check

The spot checks are being designed to examine the efficiency, transparency and legitimacy of the project implementation and immediate feedback from the stakeholder / beneficiaries. The basis of information and its analyses for M&E of BIWRMDP will be the records collected from and provided by PMU BIWRMDP to the M&E consultants.

The spot checks are also being designed to provide evidence on the transparency, effectiveness and efficiency of the grievance procedures in place. This component will focus on grievances related to implementation of project components.

This exercise will help determine how accurately the project sub-component is implemented according to the concept, objectives, design basis and plan prepared at the initial stage or changes made thereafter. The team will seek information on various issues including delays, deviations with ESMP, design, etc.

The team will assess the performance and efficiency of grievance redress mechanism. The spot checks will be designed not only to examine the implementation aspects of the project but also to assess if it is having the desired impact on beneficiaries. The spot checks are visualized as one of the key mechanisms to provide timely information on field level activities. The spot check survey is expected to be a quantitative and analytical exercise that will be based on a representative and statistically significant sample.

These include conducting random and often unannounced visits to observe how certain activities are being conducted. The Consultant's field teams will follow the entire process through a shadowing regime. At each point, spot checks would be held to observe the process and report on its effectiveness, efficiency and transparency.

The main outputs expected from the spot checks are periodic reports specifying results, analysis, conclusions and key recommendations which will then be expected to guide the implementation of the BIWRMDP and enhance its implementation effectiveness and efficiency.

m) Approach for Designing Spot Checks

The main sections of the Spot Check tools will be

- An observation section comprising structured questions to get information about the field activity
- A feedback section comprising questions from:
  - Implementing teams on site

- Beneficiaries / stakeholders
- Other regulatory bodies, if present

- ESMP and its compliance
- Qualitative feedback of the M&E team visiting site comprising their overall impression, issues and overall implementation arrangement.

These instruments need to be field tested and the teams are trained in their administration. The survey instruments are in English but translated copy are provided in Urdu to the Enumerators during training.

Too often it is seen that there is a tendency in such surveys to collect too much information which is seldom used and does not add significant value to the analysis. One of the principal challenges for the Consultant's team will be to collect the right amount of information which is actually relevant and of use to meet the main objectives of the spot check exercise. Thus, checklists and questionnaires will be short and to the point and considerable discipline will be exercised to ensure that only relevant questions are collected.

n) Focus Group Discussion

The Focus Group Discussions (FGD) will be conducted at community level from beneficiaries who are residents or carrying out business in the area or other group of stakeholders with 8 to 12 homogenous participants. These will include project beneficiary groups and a few community activists and key informants from the locality. The scope of the focus groups will be to address those issues which are more qualitative in nature and can be best answered by project beneficiary community members rather than individual beneficiaries. These will include questions such as whether they know a consultation has been taken place at the time of design or inception, their understanding and perception of the project and its short, medium and long-term benefits, outcome and impact. Added to these parameters will be comments of the beneficiaries on overall implementation, the issues they are facing, views of communication and information flows between project implementing agency and beneficiaries, and their recommendations on how these could be strengthened to enhance accountability and transparency.

The type of information mainly gathered through FGDs is qualitative but can collect quantitative data too (e.g. through group rankings or rating exercises). The benefits of this approach can be a useful way of getting opinions from a range of people through generating in depth discussion. Group power dynamics may prevent some people from speaking up, although breaking into small groups followed by plenary sessions when everyone comes together again can help. Participants may just say what they think interviewer / facilitator wants to hear. Sometimes the answers may be difficult to analyse and aggregate, and cannot be used to generalize to the wider population.

o) In-depth Interviews

These interviews are taken from individuals who are having in-depth knowledge of the area and project. This is also applied to those segments of the stakeholders which are not covered in the step-in surveys and FGDs. A list of such individuals will be developed based on the knowledge of the area and other partners to this assignment.

3.5 Some parameters used in developing tools for data collection

For establishment of practicable M&E mechanism for BIWRMDP, it has been decided to utilize tools for both primary data collection as per Result Framework. For the purpose, tools are developed. These tools cover all the Result Framework Indicators and some of the indictors about the performance and process monitoring would be assessed. The tools are live documents and would be improved and refined after consultation with stakeholders pre-testing and the utilization in field.

The details of the tools are as:

Tools for Component-A of BIWRMD Project:

Three tools have been developed and would be applied for gathering the data about the component A-1 and A-2. Data about the establishments of hydro-met stations, their effectiveness and level of flow of data would be gathered and analysed with the help of these tools-1 for monitoring. Likewise, the data about the sub component of component A, the capacity building plan would be gathered and assessed with the rest of the two developed tools. The progress about the capacity building event would be gauged covering the number of trainings, number of participants, number of days, lesson learned and suggestion through feedback by the participants and others. These tools would applied periodically on quarter, six monthly and annual bases.

Tools for Component-B of BIWRMD Project:

Component-B of the project covers almost all the physical target along with Farmers organization and Water user Association. For monitoring of these physical and social targets, number of the tools have been developed and the data about these targets assessment would be gathered through these tools. The tools would be frequently used at field level and for data collection for quarterly, six monthly and annual monitoring reports. These tools would be utilized for gathering data about but not limited, to the following areas of physical and social targets.

- **Irrigation Schemes**
  - Schemes installed, constructed or rehabilitated
  - Male and female beneficiaries of all schemes
  - Water Users Association (WUA) and Farmers Organization (number of formed and number of operational organizations)
  - Water Supply Schemes (Beneficiaries, Community Based Organizations (CBO), WUA (number formed and number of operational)
  - Flood Protection Bunds (number of targets and number of constructed structures)
  - Watershed management (grazing management, rangeland Improvement, soil and water conservation, plantation)
  - On-farm Management and Agriculture Productivity (FO mobilization, remodelling and lining of water courses and Command Area Development (CAD)
  - Construction of WST (Water Storage Tanks, PIS, CAD)
  - Remodelling of PIS, CAD, Kacha Tracks for Forma to nearby shingle road
  - CAD construction of earthen Water Course WC
  - Area provided Improved Drainage Services (Hectares)
  - Schemes Management Agreements Signed (Number)
  - Schemes Management Agreements Implemented (Number)
  - Potable Drinking Water Available to Communities
  - Water Points Installed/Rehabilitated (Number)
  - Surveyed beneficiaries satisfied with project implementation
- **Spate Irrigation**
  - Spate Command Area Development (CAD), Structural cost for Water Courses (WC)
  - Spate CAD earthen storage reservoir
  - Spate CAD Kacha Track for farm to nearby shingle road
- **Khushkaba**
  - Khshkaba farming system (water harvesting terracing system)
  - Digging of pits and compost filling

- Seeding of native grasses
- Run-off water conveyance system
- Water Storage ponds for recharges
- Tracks from farm to nearby shingle road

Watershed Management Interventions

- **Grazing Management**
  - Demarcation of Community Rangeland Area
  - Grazing Management through Community Grazing Monitors (CGM)
  - Forest area brought under Management Plan (ha)
- **Rangeland Improvement**
  - Planting of fodder species through Water Harvesting Techniques
  - Annual re-seeding
  - Stock Water Pond
- **Soil & water Conservation**
  - Construction of loose and pack stone check structures
  - Construction of Gabion structures
- **Training**
  - 27,857 Farmers

Tools for Component-C of BIWRMD Project:

Component-C of the project is about Management of the project and hence a tool for assessment of the burning rate and other aspects including performance and process indicators would be developed after time and again consultation with officials of consultant and PMU and data would be gathered and analyzed accordingly.

GIS as the vital characteristic of M&E Mechanism

Keeping in the mind, the key purpose of the M&E of BIWRMDP, it has been decided that GIS would be the main characteristic of the Monitoring and Evaluation Mechanism. All the indicators would be gauged with the help of tools and the outputs of the tools would be used and analyzed though GIS system. The GIS system would help the Management and other authorities of the Project through provision of the real time information about the progress of the project, gaps in the progress of the project, timeframe of the targets and status, immediate actions required, and other aspects of the project. GIS system will ensure the in-time networking of stakeholders of the project and will provide an opportunity to expedite the performance of the project through indicating the authorities for getting the prompt decisions. In this context, a dashboard facility would be developed and provided at PMU and at other levels of the project.

3.6 Tools Developed for M&E of BIWRMDP

Tool-1 Outline of Step-in Survey for assessment of Irrigable Command Area with improved water management services

A final version of this questionnaire will be developed towards the end of the project to capture the respective target given in the RF. It will be updated to capture the adequacy and equity of water distribution.

Tool-2 Observation Checklist for assessment of usefulness of hydro-met data

This questionnaire will capture the location, status of installation, functionality, accessibility to government staff and general public. These parameters will be expanded for delineation of true status of the component.

Tool-3 Checklist for assessment of strengthening of capability of staff through provision of training

The information will be collected from secondary data recording the date, duration, name of department, number of participants (male / female) supplemented by participants' feedbacks.

Tool-4 Assessment of CESMP and EMP

This will be captured through IDIs with contractors, responsible staff from PMU, PIU and other concerned staff from relevant government departments.

Tool-5 IDI with a senior representative Water User Association

In-depth interviews with a representative of Water User Association capturing information related to area of jurisdiction, beneficiaries, agriculture practices, cultivability, and accessibility to water services

Chapter 4: Other related activities

4.1 Background

In the light of the World Bank guidelines for Environmental and Social Standards (ESS), checklists have been prepared for concerned assessment. The project however, does not pose or not expected to have significant or irreversible environmental and social impacts. It has been envisaged that the impacts would be primarily associated with temporary disruption due to development of irrigation systems, flood control structures and water supply schemes.

In line with the requirements, the Project Implementation Unit (PMU) has initially developed an Environmental and Social Management Plan (ESMP) to set out the principles, rules, guidelines and procedures for broadly assessing the generic environmental and social consequences of the project and to satisfy Bank's EA requirements and applicable legal legislations.

The ESMP provides details of the pertinent policies, guidelines, principles, objectives and approach for avoiding, minimizing and/or mitigating the possible adverse environmental and social impacts that could be confronted during the implementation of BIWRMDP.

The ESMPs provide project specific guidelines for; the smooth implementation of environmental and social safeguards and the management and mitigation of the environmental and social impacts associated with the construction and operational phases of each of the three sub-projects.

For every scheme the contractor is supposed to provide Contractor Environment and Social Management Plan (CESMP). It is reported that most of the contractors have developed CESMP's for their respective works. These CESMPs will be reviewed and the M&E consultants will ascertain compliance against the commitments and claims.

4.2 Implementation / Monitoring of ESMP/GAP Requirements

As anticipated in the Project's major formal documents including the Project Appraisal Document (PAD) and the Environmental and Social Management Framework (ESMP), the overall approach of the M&E Consultants in the perspective of ESMP implementation and monitoring are outlined as follows:

1. The M&E Consultants have to monitor and evaluate project performance and impacts—including Environmental and Social Management Plans (ESMPs), and a gender action framework—during and after construction.
2. M&E Consultants will be responsible for the review of the environmental and social aspects of the project as well as providing guidance to the PMU for early identification and resolution of related problems in the project.
3. The M&E Consultants will carry out independent evaluation of environmental and social safeguards.

This section is sub-divided in two major parts; Part-one is covering the Environment, Health and Safety (EHS) aspects of the assignment whereas Part-two is covering the Social, Gender and Grievance Redressal aspects:

4.3 Part – A: Monitoring & Evaluation of Environment and Social Management Plans

4.3.1 Understanding of the TORs – ESMPs Implementation & Monitoring

In line with the Terms of Reference (TOR) requirements, the Consultants will assist PMU-BIWRMDP to track implementation progress on the ESMPs as well as performing the post construction independent evaluation of environmental and social plans. The M&E Consultants during monitoring the project

performance and impact will closely monitor and assess the environmental and social management plans (ESMPs) and gender action frameworks, during and after construction.

M&E Consultants will be working in close coordination with the PMU and will provide proactive assistance in reviewing and supervising the management of environmental and social aspects of the project as well as providing guidance to the PMU in early identification and resolution of anticipated Environmental and Social problems that may arise during and after the construction of the project.

4.3.2 Methodology & Approach

The M&E Consultants will assist the PMU to ensure compliance in line with the Bank's Environmental and Social Safeguards standards. The consultants have reviewed:

1. Primary / Secondary Data
2. Developed of Checklist based Monitoring System for the effective site monitoring of the Environmental, Health and Safety requirements mentioned in the ESMPs, PAD and Contracts.
3. Devising Key Performance Indicators for the effective monitoring of the ESMPs / EMMPs and to have meaningful impact evaluation.

Keeping proactive coordination with the PMU – Environmental Specialist and providing continuous support and assistance to the PMU for smooth implementation of the Project's Environmental, Health and Safety requirements and quality reporting to the World Bank (WB) and other relevant agencies as per the TOR requirements.

The methodology and approach of the M&E Consultants for performing these tasks is further defined hereunder:

4.3.3 Review of Data / Documents / Information / Approvals

The Consultants reviewed initial documents prepared at various levels. This information will be supplemented by approvals and guidelines etc. relevant to the project for the establishment of baseline and to devise the way forward for the monitoring and evaluation of the project. Documental review involves review of the documents including those prepared / issued by the PMU, PSIA Consultants, Contractors and relevant government agencies. These include, but not limited to the Project Appraisal Document (PAD), ESMF, ESMPs, EMMPs, Site Specific Environmental Plans, Dumping Site Approvals, CSC's and Contractor Monthly / Quarterly Progress Reports and specific correspondence held between the PMU. PSIAC and Contractors etc.

The Consultants has prepared checklists for the effective monitoring of ESMPs documents during construction and post-construction stages. All the field visits will be properly documented and the findings will be regularly communicated to the PMU through Monthly Monitoring Reports. Mainly, the following major documents (not limited to) will be monitored and their implementation on site will be assessed:

a) Monitoring of ESMPs and EMMPs

These ESMPs of the BIWRMDP sub-projects have been prepared in line with the WB guidelines. Each of the three ESMPs provides extensive guidelines for the mitigation, monitoring, and institutional measures to be taken during construction and operational stages to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. As per the main TOR requirements, the M&E Consultants will closely monitor and assess the implementation of the Environment, Health and Safety aspects of all the three sub-project ESMPs. All the shortcomings / good practices etc. at the sites will be well documented and timely communicated to the PMU for their further necessary actions. EMMPs, which are the essential part of ESMPs will also be closely monitored for their implementation during both construction and operational phases.

b) Monitoring of Impacts / Revision of Site-Specific Plans

Monitoring of the following activities will be carried out to track the achievement of mitigation and preventative measures if they are outlined in the ESMPs:

- Review of the Dumping Site Approvals.
- Review of Site-Specific Environmental Management Plans and suggesting guidelines for revision (if required).
- Review of Health and Safety Plans and suggesting guidelines for revision (if required).
- Review of Waste Management Plan, review and suggesting guidelines for revision (if required).
- Fuels and Hazardous Substances.
- Barricading of Project Site in the populated areas.
- Checking the status of project drivers and the possession of necessary licenses.
- Checking speed limit signs in the project area.
- Checking the status of public complaints(s) redressal system.
- Facilities and Living conditions at Worker Camps / Barracks.
- Checking the overall housekeeping at the Project Sites.

c) Review of Environmental Monitoring Reports

The Environmental Monitoring Reports prepared by the construction supervision consultants will be periodically reviewed by the M&E Consultants and keeping in view the status of construction activities, necessary localized alterations in the monitoring plan will be proposed such as any changes in monitoring parameters, change of monitoring locations etc.

d) Review of Accident Records

The M&E Consultants will examine the accident records for the sub-project sites in pursuance of the M&E activities.

e) Review of CSC's / Contractor MPRs

In order to have a clear understanding of the past events and to understand the original baseline conditions of the sub-project sites, review of CSC's / Contractors MPRs and correspondence related to Environmental, Health and Safety issues will be reviewed.

f) Review of Training Plans / Needs

The M&E Consultants will monitor the implementation of training requirements as mentioned in the ESMPs and based on the site requirements, will propose needs of any changes in the training plan.

4.4 Voluntarily Land Donation Process

The process of Voluntarily Land Donation Process (VLD) consists of following tasks:

- People's participation in implementation of Land Acquisition Plan.
- Activities of VLDs are coordinated with the government department especially Revenue Department in determining the affected land owners through CADETRIAL records of the Revenue Department of the concerned district.
- Effectiveness of Grievance Redress (GRC) and relevance of the participatory approach suggested in GRM.

- Monitoring activities of the touts and elites and their followers in the process of Land Acquisition Program.
- Effectiveness of the training of workers/officials for VLD acquisition.
- Records of VLD reported, kept at each and every level.

i) Approach and Methodology for Assessment

Monitoring of the above-mentioned processes of voluntarily land Donation/acquisition is mainly concerned with the governance and transparency of the process adopted for voluntarily land acquisitions through its relevance, participation level of affectees and effectiveness of GRM and Grievance Redress Committee (GRCs). The processes of voluntarily Land Donation will be assessed/ monitored by:

People's Participation in ESMP Implementation

- Critical review, analysis, assessment of ESMPs of the Schemes and its implementation process including participation of land donors and communities such as FOs/WUAs in relevant part of the plan.

Coordination with Relevant Departments

- Assessment of the process of affected land owners' identification and estimation of land required and departments involved
- Contents of land acquisition plan.
- CADESTRIAL map approved/verified by Revenue Department of the concerned district and attached With the Land Acquisition Plan of each scheme?
- Agreements made with land donors regarding land acquisition and indicating that Land is voluntarily donated by land owners.
- Registration of agreement with district revenue department and other relevant agencies.

Effectiveness of Grievance Redress Committee (GRC)

Effectiveness of the GRC will be assessed by its composition, representation of affectees in committees, participation of affectees' in decision making.

- Assessment will also be made based on access of affectees to GRC, complaints registered with GRC, process of complaints registration, percentage of registered complains resolved by GRC within stipulated time period.
- Satisfaction of aggrieved persons with resolution suggested by GRC.
- Agreement made between complainant and GRC regarding implementation of the solution of problem.

Relevance of Grievance Redress Mechanism (GRM)

- Relevance of the GRM proposed by BIWRMD project for implementation in various irrigation schemes will be reviewed regarding its components, processes and implementation of complaints resolutions in the context of participation of affectees at various stages of GRM implementation.

Activities of the Touts and Elites and their Followers

Touts and elite classes such as political leaders, tribal chiefs and other powerful and influential persons play pivotal role in the acceptance of any change in the area as their followers are strongly dictated by them.

- Activities of touts, elite peoples and their followers will be assessed by their role in the process of land acquisition program by analysing either their activities remained facilitating the process of land acquisition program or opposing it?
- Efforts of the workers/ officials involved in the land acquisition plans implementation regarding mobilization and motivation of the touts and elites for gaining their support in the implementation of land acquisition program.

Effectiveness of the Training

Effectiveness of training of workers/officials engaged in the process of land acquisition program implementation by judging the extent to which the officials remained successful in achieving the land acquisition targets within stipulated time schedule by complying all procedures of land acquisition plan.

i) VLD Record

This component will be assessed by examining the record of VLD maintained or not at various places and in the way by complying the land acquisition process and record maintenance requirement.

ii) Frequency of the assessment

The progress against this indicator will be assessed and reported on quarterly basis and the end targets will be compared once all the stations are installed and performing the desired functions as envisaged.

Information will be collected from:

PMU, PIUs, contractor, official of the Land Acquisition Plan implementation, GRC and other relevant organizations such as FOs and WUAs

Chapter 5: Progressive Development

The Final Monitoring and Evaluation (M&E) Report has been prepared in accordance with the agreement between the Project Management Unit (PMU) of the Balochistan Integrated Water Resources Management and Development Project (BIWRMDP) and MM Pakistan (MMP) Pvt. Ltd., the firm contracted to provide M&E services. This report follows the structure and approach of previous M&E reports, incorporating enhancements for improved clarity and analysis. It provides an overview of the progress achieved across various components of the project throughout its duration.

The findings presented in this report are the result of comprehensive data collection and validation processes. Primary data was collected through field visits to the Nari and Porali River Basins, utilizing methods such as site observations, Focus Group Discussions (FGDs) with Farmer Organizations (FOs), Water User Associations (WUAs), and Village Watershed Committees (VWCs), along with Key Informant Interviews (KIIs) and spot checks at various project sites. Additionally, secondary data was sourced from project partners, including the Project Supervision and Implementation Assistance Consultants (PSIAC), PMU, Project Implementation Units (PIUs), and international organizations like the International Union for Conservation of Nature (IUCN), Food and Agriculture Organization (FAO), International Water Management Institute (IWMI), and Buraq Integrated Solutions. GIS tools were employed to validate and cross-check the data, ensuring precise and detailed reporting of the project's progress throughout the quarter.

This report highlights the progress made towards achieving the objectives outlined in the Results Framework, with a focus on the project's development outcomes, outputs, and intermediate results. Key findings indicate substantial **progress**, which aimed to provide reliable hydro-meteorological (hydro-met) data. While all 43 monitoring stations have been physically installed, challenges such as inconsistent electricity supply and delays in the installation of the main server in Quetta have impacted the availability of real-time data. Despite these setbacks, temporary measures, such as manually syncing data to a contractor's server in Islamabad, have been implemented to ensure continued progress.

Progress on the Result Framework (RF) indicator for the BIWRMD project, including variations resulting from the reconstruction process and as agreed upon by the World Bank (WB) and the Government of Balochistan (GoB), is summarized in Table 5.2.

Significant progress has been made in establishing 43 hydro-met monitoring stations, including Automatic Weather Stations (AWS), Stream Flow Gauges, Rain Gauges, and Groundwater Monitoring Wells. Despite security challenges, the final station in Spin Tangai has been completed, achieving 100% overall completion. This includes successful site verification, construction, and initial data collection. Similarly, for training government staff, a total of 7,333 person-days of training have been delivered.

The target for improving irrigation services was 26,275 hectares, whereas the project has achieved 23,852 hectares (90.7%), with ongoing efforts to address the remaining gap. Other intermediate outcomes also reflect strong performance, including the signing of 16 scheme management agreements, exceeding the target of 15, and the installation or rehabilitation of 102 community drinking water points, surpassing the target of 58. Additionally, 119 Water User Associations (WUAs) have been formed or strengthened, achieving 91.5% of the target.

The project has made significant progress toward achieving its development goals, though some challenges have remained. These include delays in establishing hydro-met systems, disruptions caused by security issues, and difficulties in synchronizing real-time data. To address these challenges, several recommendations were implemented, such as accelerating coordination between the Asian Development Bank (ADB) and the World Bank (WB) for server installations, enhancing security partnerships, and strengthening monitoring mechanisms. As a result, data synchronization has been successfully achieved, and the process of delivering data to stakeholders is completed.

This progress report highlights key advancements in sustainable water resource management in Balochistan, underscoring the project's ongoing efforts and commitment despite existing challenges. It provides a clear record of accomplishments while outlining the next steps necessary to overcome obstacles and ensure the project's timely and effective completion.

The document offers a detailed analysis of the project's overall achievements, focusing on performance indicators, intermediate outcomes, and outputs across various components. These include advancements in water management training, integrated water resource management (IWRM) reforms, irrigation system improvements, forest management, and community-driven initiatives, all of which are aligned with the project's development objectives (PDOs).

The approval of the IWRM Reform Roadmap Policy Document and the implementation of its short-term action points were key objectives. To achieve this, the team identified the primary output as the development of a donor-coordinated IWRM reforms roadmap. Recognizing the importance of creating a comprehensive IWRM policy and ensuring its effective implementation, a target was set to draft a detailed policy document along with an actionable roadmap. As part of this effort, the FAO was engaged to review the draft IWRM policy initially developed by the ADB and to assist in the development of the Water Law Reforms Roadmap and Water Act.

In the third quarter of 2024, substantial progress was made on this indicator, with key activities successfully completed. A gender perspective was integrated into the IWRM policy, demonstrating a commitment to inclusivity. Extensive discussions took place with relevant departments, including the Secretary of Irrigation, Government of Balochistan, focusing on institutional restructuring. A strategy paper outlining the restructuring of Balochistan's water sector was submitted, highlighting the project's focus on sustainable water management.

The project worked closely with the Technical Working Committee of the BWIRMDP and organized a stakeholder consultation workshop to foster collaboration and gather valuable feedback. As part of the roadmap development, a concept note on Water Law Reforms was submitted, setting the stage for legislative progress. Six additional concept notes were shared with the PMU for review, reflecting a systematic and organized approach to the initiative.

A draft IWRM policy was finalized and reviewed by the Law Department, marking a significant milestone. The draft has now been formally approved by the Provincial Cabinet of the Government of Balochistan. The FAO successfully developed the Water Act, which is now approved by the Provincial Cabinet.

These achievements underscore the project's commitment to implementing sustainable water management reforms, laying the foundation for long-term benefits in Balochistan's water sector.

The outcome to improve community-based water management in selected irrigation schemes in Balochistan. Progress is monitored through an indicator that tracks the irrigable command area enhanced by community-based water management services. The project set a target of improving water management services across 26,275 hectares. To assess progress, the M&E consultant employed various methods, including FGDs, KIIs, GIS mapping, and transact surveys. Since the full impact of the intervention is still unfolding, advanced GIS tools were used to ensure an accurate evaluation. By the end of the Project 24,320 hectares of the irrigable command area had been improved, representing 92.6% of the target. This measurement reflects the schemes completed and inspected by the M&E team during the fourth quarter of 2024.

Another outcome was focused on delivering irrigation and drainage services to the targeted areas. The project aimed to cover 50,000 hectares, divided across three irrigation systems: perennial; spate; and Khushkaba. Progress was evaluated using FGDs, transact surveys, and GIS tools. By the end of 2024, the improved area under irrigation and drainage services reached 57,191 hectares, achieving 114.4% of the target. This progress demonstrates the project's effective strategies and strong potential to meet the target within the remaining timeframe.

The project also aimed to enhance irrigation and flood management, improve access to drinking water, and build institutional and community capacity to support water users in the Nari and Porali River Basins. Significant outputs and outcomes were achieved under the PDO framework, reflecting substantial progress toward the project's overall objectives.

Table 5.1: Project Component and beneficiaries

S.#	Component	Beneficiaries
1	Irrigation Schemes	136,544
2	Water Supply Schemes	114,045
3	Flood Protect Bund	47,984
4	On-farm Water Management	48,536
5	FarmersTraining	3,303
6	Watershed Management	47,501
	Total	407,913

The project targets to enhance water management and agricultural practices in the target area, emphasizing greater involvement of women and building farmers' skills. As per the 2017 Population Census, women account for 49.4% of the area's total population, which equals approximately 201,509 females. This data is essential for designing initiatives that engage female water users effectively.

A key milestone of the project is forming and strengthening WUAs. **T**he goal was set as 30 operational WUAs by the end of the project. 120 WUAs have been successfully formed, achieving four times of the given target.

Another significant part of the project is creating command area development plans. The goal was to develop two plans, one for the Nari River basin and another for the Porali River basin. Although the plans are still in progress, the M&E team has validated the updates provided by the PMU.

Training of farmers in improved irrigation and agricultural techniques was considered essential. The goal is to train water user farmers in soil conservation and better farming practices. The International Water Management Institute (IWMI) was tasked with developing the training materials and delivering the sessions. Overall 3,303 farmers completed the training. Apart from farmers training, 7,333 government staff were also provided with

The project is progressing well toward its objectives, focusing on strengthening WUAs, creating key area plans, and providing essential training to farmers.

Overall 4,193 hectares has been successfully restored / afforested, surpassing the target by 105%. M&E teams verified this achievement through field visits, site assessments, and modern Geographic Information Systems (GIS) methods, ensuring the results were accurate and satisfactory. Progress also included setting up nurseries, producing and distributing plants to farmers and institutions, with activities documented and verified in both the Nari and Porali basins. All the mangrove plantation phases were completed by the International Union for Conservation of Nature (IUCN), with final reports submitted. Geo-Spatial Technology further validated the accuracy of block plantation areas, as shown in detailed measurements and figures.

As far as establishment of watershed management committees, 26 committees had been successfully formed, meeting the target fully. The M&E team confirmed this progress through site visits and conversations with the committees.

For beneficiary satisfaction with the project's implementation, the target was 80%. Based on a detailed survey at the end of the project, 82.5% of beneficiaries were satisfied with the project's execution.

As for the preparation of Environmental and Social Management Plans (ESMPs), 10 out of 18 received approval from the World Bank, The PMU is also working on developing three Environmental Audit Reports.

Table 5.2: Resulted progress on the project indicators in percentage

Indicators of the project	End Targets Cumulative Progress								
		Project Completion	7th quarter	6th quarter	5th quarter	4th quarter	3rd quarter	2nd quarter	1st quarter
Outcome: Quality assured hydro-met data available	100 (%)	100%	-						
Active climate, stream flow and groundwater monitoring stations. 43 (Number)	100 (%)	100%	100 (%)	,55%	55%	42.8%	30%	0%	0%
Person-days training for government staff	500	7,333	6,463	5,968	5,968	4,473	3,447	2,392	
IWRM reforms roadmap policy document	Completed	Completed							
Irrigable command area with improved services	26,275 (Hectares)	24,320 Ha	23,852 Ha	23,031Ha	23,031 Ha	21,335	19,864 Ha	9,899 Ha	-
Area provided with irrigation and drainage services	50,000 (Hectares)	57,191 Ha	57191 Ha	53,776 Ha	53,776 Ha	45,400 Ha	43,500 Ha	31,298 Ha	-
Number of community drinking water points installed/rehabilitated	10 (Points)	58 points	58 points	58 Points	58 Points	36 points	36 points	31 points	-
Water users provided with new/improved irrigation services	250,000 (Persons) as per restructuring paper	210,060	185,080	185,080	185,080	166,000	165,000	117,859	-
Operational Water User Associations created and/or strengthened	30 (Number)	120 Number	119	119	119	89	88	88	65
Number of farmers completed extension training on improved agricultural production		3,303	3,303	2,916	2,916	-	-	-	-

Indicators of the project	End Targets	Cumulative Progress							
Water Shed Area Restored/ Reforested	4,000 (Hectares)	4,193 Ha	4,193 Ha	4,193 Ha	2,780 Ha	2,780 Ha	2,780 Ha	1,870 Ha	1,377 Ha
Number of Watershed Committees established and operational		26 Number	26 Number	22 Number	22 Number	22 Number	22 Number	22 Number	22 Number
Direct project beneficiaries	414,000 (Number)	407,913	371,235	370,848	370,848	307,188	306,360	-	-
Females Based on composition of the population	30%	201,509 (49.41%)	172,444	172,444	172,444		140,881	-	-
Beneficiaries satisfied with project implementation	80 (%)	82.5%					82.%	-	-

Chapter 6: Results Framework and Achievement

Indicator type	Indicator	Unit measurement	Base-line	Achievement	Target
PDO	Irrigated Command area with improved water management services	Ha	0	24,320	26,275
PDO	Quality assured hydro-met data from project basins publicly available in an online data management system (Percentage)	%	0	100	90
PDO	Direct project beneficiaries (Number) Including female beneficiaries (%)	Number	0	407,913 49.41	414,000 46.5 % (female)
IRI	Person-days of water management/planning training for government staff. (Days)	Days	0	t,333	500
IRI	Active climate, streamflow and groundwater monitoring stations (Number)	Number	0	43	43
IRI	IWRM Reforms Roadmap Document endorsed by the Cabinet. (Text)	Text	No	Yes	Yes
IRI	Area provided with irrigation and drainage services. (Ha)	Ha	0	57,191	50,000
IRI	Water users provided with new/improved irrigation & drainage services (Number) Including female beneficiaries (%)	Number	0	210,060 49.41%	250,000 30%
IRI	Operational water user associations created and/or strengthened (Number)	Number	0	120	30
IRI	Area of watershed restored/reforested (Ha)	Ha	0	4,193	4,000
IRI	Number of community drinking water points installed/rehabilitated (Number)	Number	0	58	10
IRI	Surveyed beneficiaries satisfied with project implementation (Percentage)	Percent	0	82.5	80

Detailed Indicators Profiles:

Irrigable Command area with improved water management services
Precise Definition: Irrigable command area reflects aggregate farm sizes receiving water through the improved system, including those which are or can be cultivated using flood-based irrigation systems. The term "improved water management services" was used to emphasize service delivery. The methodology for calculating this indicator has also changed: Its measurement is now based not on the gross area

developed/rehabilitated but on irrigable command areas where there is improvement in terms of (i) adequacy of water delivery and (ii) equity in water delivery for their production area.

"User perception" refers to opinions of a representative sample of water users within the target project area, as established through appropriate survey methodologies, who are able to tell the change in their cultivation area (in hectares) before and after the scheme is rehabilitated/constructed.

"adequacy" refers to the capacity an irrigation system to meet water demands of farmers. This is subjective as the farmers make efforts to provide required water to the crops either through irrigation system or ground water. Feedback from farmer who in the past filling the availability gap with ground water will not provide a positive response for the adequacy

"equity" refers to the degree of meeting agreed water service standards (or allocation) irrespective of location within the scheme (head, middle, tail) or other factors. The water rights are well defined in many areas and equity is safeguarded more rigorously.

Unit of Measure: Hectare

Baseline: Zero

Target 26,275 Hectares

Disaggregated by: Beneficiary men and women per scheme

Data Source: Project design documents, Satellite images, Baseline and end-line survey results and M&E reports

Data Collection and Calculation Method:

User perception

About 74% of the sample of water users agree that scheme optimum irrigation delivery capacity is at-least improved from previous years in average intake.

Schemes: Nari Gargorge, Gundacha Nurg Hinjri, Nimi and Khuzdar

Adequacy: After one cultivation cycle, at least 75% of the beneficiary farmers viewed that they are receiving sufficient water for irrigation after the scheme is rehabilitated/constructed

Equity: After one cultivation cycle, at-least 90% of the farmers at the head, 80% at the mid and 70% of the farmers at the tail viewed that they are receiving sufficient water for irrigation.

This PDO level indicator description and the end target at the time of appraisal was "Irrigated area within project schemes with good management practice" and 70,000 Hectares respectively. This indicator description and the end target was lately revised during restructuring. The reasons for this change as provided in the Aide memoire QUOTE for clarity and considering that most of the concerned irrigation schemes are spate irrigation systems, the Indicator name is revised: the term " Irrigated command area" is replaced by "Irrigable command area" to reflect the fact that in flood-based irrigation systems actual irrigated area is highly dependent on the availability of floods which is very variable. The term "good water management practices" is replaced by the term "improved water management services" to emphasize service delivery. The methodology for calculating this indicator is also changed: Its measurement is now based not on the gross area developed/rehabilitated but on irrigable command areas where there is improvement in terms of (i) adequacy of water delivery and (ii) equity in water delivery for their production area. As a result of this redefinition, the baseline and the target values have been readjusted. The baseline

value is set to 0 to ensure easier measuring and the target value is set to 26,275ha based on surveys and expert opinion UNQUOTE.

Significant works was undertaken for lining the canals and water courses, construction of weirs for streamlining of river water, introducing improved on-farm water management activities. By virtue of this investment, benefits not only were flown towards existing farmers for on-going cultivation, but opportunities were available for increasing irrigable area.

The M&E consultants engaged a geospatial technology expert who estimated the irrigable land area through remotely sensed satellite data. Through land use, land cover and digital elevation models according to the estimate made by the expert, it is realized that the total irrigable command area with improved services to date is 24,320 Hectare meeting 92.56 percent of the end target. However, since some of the channels are recently completed and expecting water to flow in these channels, the aggregate irrigable command area may surpass the end target.

By carrying out change detection analysis, the worth of the investment in developing irrigation system under BIWRMDP can be appreciated. Using Lidar Analysis in ArcGIS 10 for Forestry Application, (GIS mapping & remote sensing application) increase in crop area from 2018 to 2024 has been worked out as 11,076 to 16,145 Hectares respectively.

A sample of such difference is reflected in Annex-3.

Frequency of Data collection: Start, mid and end of project

Responsibility of Data collection: PSIA, M&E Team, Survey Firm

Actual Achievement Reported: 24,320 Hectares - 92.56 Percent

PDO: Quality-assured hydro-met data from project basins publicly available in an online data system

Precise Definition:

Percent of hydro-met stations installed by the project that are both (i) being operated in line with the Quality Management Framework recommended by the World Meteorological Organization (WMO-QMF) and (ii) are continuously making the data publicly available through the dashboard accessible to the stakeholders.

"quality assured" refers to the processes and technologies involved in ensuring the conformance of data values to business requirements and acceptance criteria, i

"publicly available in online data system" means that any person can access the live hydro-met data from the project basins through the internet with no restriction. The specialized data will be shared with concerned department/authority whereas generalized data will be available to the public using the website

Unit of Measure: Percent

Baseline: Zero

Target:

Disaggregated by: Not applicable

Data Source: website

Data Collection Method and Calculation: 43 number of Hydrometeorological stations installed that are (i) quality assured and (ii) for which measurement readings are publicly available / total number of Hydro-met stations installed. The end target for the indicator was set for installation equipment for Automatic Weather Stations, Stream Flow Gauge, Automatic Rain Gauge and Ground Water Monitoring at 150 sites in Nari and Porali River Basins and making 90 percent of the information available in online data system. However, due to downsizing of BIWRMDP in two stages by USD 90 million and USD 25 million, the end target was reduced to installation of 43 stations. During the life of the project all these stations were reported as installed and being operated for relaying the required information to a central database in Quetta managed by the Irrigation Department of Government of Balochistan. By the end of the BIWRMDP, software engineers were hired to incorporate the information centrally and make it accessible to generally to public at large and especially to people living in Nari and Porali River basins. As such it can be inferred that the information being relayed from the 43 stations are available in an online data system and available to 100% of stakeholders. Strictly speaking, the benefits of the investment made for these met-stations should reach and used in general by masses and in particular by the farmers of Nari and Porali river basins. If the objective of the investment is translated to the effective use of met information by relevant stakeholders, significant efforts are required in making people aware of the system and providing training to use the information. Various points of hydro-met stations, relay of information to and from the central data server in Quetta is shown in the map provided in Annexure 3.
Frequency of Data collection: Quarterly
Responsibility of Data collection: PSIA-M&E - ID
Actual Achievement Reported: 100 Percent

PDO: Direct project beneficiaries (Number) Including female beneficiaries (%)
Precise Definition: Total number of individuals in the project target area who directly derive benefits from improvements to (i) irrigation systems, (ii) drinking water supply, (iii) watershed management, (iv) forestry, (v) capacity building, On Farm Water Management and (vi) institutional strengthening.
Unit of Measure: Number
Baseline: Zero
Target: 414,000
Disaggregated by: Project basin
Data Source: (1) WUA/ registry at each project scheme and farmers benefited from OFWM (2) list of households serviced by water points (i.e., newly installed or rehabilitated by the project), Participants of trainings, beneficiaries of forestry and watershed management measures
Data Collection Method and Calculation

1. The count of all registered irrigation water users within the targeted schemes, including beneficiaries of (i) irrigation systems, (ii) On Farm Water Management, (iii) drinking water supply, (vi) watershed management, iv) forestry, (vi) capacity building, and (vii) institutional strengthening. This includes individuals benefiting from trainings, flood protection structures, and water supply schemes.
2. The number of households benefiting from each water point is multiplied by the average household size in the area.
3. Comparing maps generated through Lidar Analysis in ArcGIS 10 for Forestry Application, (GIS mapping & remote sensing application) of the command areas from 2018 to 2024 reflects an increase in built area by 100%. The built area comprises, housing and related structures, roads, etc. It clearly demonstrates that the investment through BIWRMDP has attracted inhabitation in the command area thus increasing the number of beneficiaries.

Frequency of Data collection: Quarterly

Responsibility of Data collection: PSIA-M&E/Director PMD

Actual Achievement Reported: An updated calculation has shown a total of 407,913 (98.5 percent of the target) including 49.41 Percent (as against 46.5 percent) female beneficiaries.

Name of Scheme	Irrigation Schemes	Water Supply Schemes	Flood Protection Schemes	Agriculture Schemes	Watershed & Rangeland	Trainings (Participant)	Target Beneficiaries
Nari Gorge Scheme (PIS)	76,750	19,896	-	24,267	-	1,360	122,273
Mushkaf Scheme (FIS)	13,443	6,864	-	7,840	-	274	28,421
Sehan Scheme (FIS)	7,042	10,061	-	6,039	-	276	23,418
Sibi Water Supply	-	75,000	-		-		85,000
Nari Gorge Flood Protection Scheme			18,430				18,430
Tariqabad Flood Protection Scheme			8,064				8,064
Watershed Nari River					29,945		29,945
Shab e Maidan Scheme	5,053	-	-	1,315	-	134	6,502
Gandacha Scheme	31,355	1,120	6,450	7,690	-	1,022	47,637
Nimi Scheme	2,108	1,104	2,320	774		141	6,447
Khuzdar Scheme	793	-	2,870	611	-	96	4,370
Flood Protection Bund Porali Basin	-	-	4,650				4,650
Faizu Flood Protection Bund Porali Basin	-	-	5,200				5,200
Watershed Porali River	-	-			14,056		14,056
Mangroves Plantation at Miani Hor	-	-			3,500		3,500
Target Beneficiaries	**136,544**	**114,045**	**47,984**	**48,536**	**47,501**	**3,303**	**407,913**

Name of Indicator: Person-days of water management/planning training for government staff

Precise Definition: "person days" refers to the length of training delivered in days multiplied by the number of participants "Water management and planning" comprises all training events delivered related to hydrology, irrigation engineering, irrigated agriculture, soil moisture management, water accounting, water and sanitation and water distribution "Government staff" refers to staff from the following government agencies: Irrigation Department, Public Health Engineering Department, Forestry Department, Environment Department, Livestock department, Agriculture department
Unit of Measure: number of days
Baseline: ZERO
Target: 500-person days
Disaggregated by: Sex
Data Source: List of males/females participants of each training event delivered (i.e. sign-in sheet)
Data Collection Method / Calculation: (1) Multiplication of training duration (in days) of each training event with number of participants; (2) Sum up person day of training of each training event; (3) calculate % females
Frequency of Data collection: after delivery of each training event and part of quarterly Reports
Responsibility of Data collection: Training Specialist-PSIAC, and M&E Specialist PMU in collaboration with service providers of respective training events
Actual Achievement Reported: Aggregate number of person-days of training has been worked out at 7,333.
Name of Indicator: IWRM Reforms Roadmap Document endorsed by the Cabinet.
Precise Definition: This indicator is introduced to reflect the expected intermediate result under Sub-component A1 that is supporting institutional strengthening and restructuring expected to determine appropriate institutional arrangements for the initial stages of IWRMI in Balochistan. This intermediate result is anticipated to contribute to the project objective of "strengthening provincial government capacity for water resources monitoring and management". "IWRM reform" refers to the policy objectives stipulated in the 2006 Balochistan Integrated Water Resources Management Policy, as potentially amended during the duration of the Project. "Roadmap" refers to a document stipulating objectives, actions, costs and implementation arrangements. Actions in such roadmap would cover short-, medium-term, and long-term actions. "Endorsed" means the approval of the Roadmap by the provincial cabinet of Balochistan.
Unit of Measure: Text
Baseline: Not Prepared

Target: Prepared and approved by the provincial cabinet
Data Source: PMU BIWRMDP / ID / PSIA / FAO
Information Collection Method: In light of the experience of FAO for preparing such document for the Sindh government, BIWRMDP invited them for assistance. After an in-depth research and involvement of various stakeholders, the document has been prepared and submitted the IWRM policy.
Frequency of Data collection: Through regular follow-up
Responsibility of Data collection: PSIA and M&E Specialist PMU in collaboration with FAO
Actual Achievement Reported: IWRM Policy was prepared by FAO and submitted to the GoB. The Chief Minister, Balochistan approved the policy and presented to the provincial cabinet. The cabinet in principle approved the document. The Law Department is currently reviewing the policy and will be presented in the provincial assembly for enactment.

Name of Indicator: Active climate, streamflow and groundwater monitoring stations
Precise Definition: **"Climate monitoring stations"** refers to the integration of satellite observations, ground-based data and forecast models to monitor and forecast changes in the weather and climate of a specific area of region (water-basin) **"Groundwater monitoring stations"** refers to tools and installations to measure the level of groundwater mostly by a submersible pressure transmitter and is directly suspended by their cable into the well, borehole, deep bore well or monitoring well. **"Streamflow monitoring stations"** is the process of measuring the water discharge or flow at a particular point on a stream or river. Hence, a water velocity or level as a substitute and use a rating curve to calculate the actual stream gauge measurement. Stream gauging can be done using a permanent gauging station or taking consistent spot measurements with a portable instrument. **"active"** means that measurement is undertaken as scheduled and information is processed and transmitted to Central data center, which will be then placed on the designated website. **"Stations"** are permanent physical points of measurement, which may combine multiple measurements. In this situation an individual or group visits the sites periodically throughout the year to take gauge measurements under different environmental conditions and records the data to build the historical record based on these spot measurements.
Unit of Measure: Number of individual stations
Baseline: Zero
Target: 43 stations: - Automatic Weather Stations — 7 Nos - Automatic Rain Gauging Stations — 12 Nos - Stream Flow gauging Stations — 9 Nos - Establishment of Ground Water Monitoring Wells — 15 Nos

Disaggregated by: **(1)** Climate monitoring stations **(2)** groundwater monitoring stations (3) Streamflow monitoring stations **(4)** Automatic Rain Gauge Stattions
Data Source: Installation completion reports by contractor, documentation of measurement readings of each station.
Data Collection Method: Validation of documentation of measurement readings for each station; Count of stations installed by the project that are regularly documenting and transmitting measurement readings as per plan and physical verification
Frequency of Data collection: **System data:** Groundwater, stream-flow and climate stations would produce data on real time basis.
Responsibility of Data collection: PSIA (submits to PMU as part of Quarterly or semi-annual reporting)
Actual Achievement Reported: All the 43 stations have been installed at the specified location and the equipment are relaying information to the central database managed at ID, Quetta

Area provided with irrigation and drainage services. (Ha)
Precise Definition: Total irrigation command area for which irrigation and drainage civil works (headworks, dams, canals, channels) have been newly constructed or fully rehabilitated (i.e., contract was completed) and a functional infrastructure is handed over to the WUA
Unit of Measure: Hectares
Baseline: Zero
Target: 50,000 **Hectares**
Disaggregated by: River Basins
Data Source: Progress reports by contractor and supervising agency and M&E Reports
Data Collection Method / Calculation: Contract Completion Reports, field visits, Satellite images of **Sehan Mushkaf and Sheb-Medan**
Frequency of Data collection: Quarterly
Responsibility of Data collection: PSIA-M&E
Actual Achievement Reported: An Over area of 57,000 Hectares has been provided with improved irrigation and drainage services thus achieving 114% of the target. Using Lidar Analysis in ArcGIS 10 for Forestry Application, (GIS mapping & remote sensing application), the comparison between 2018 and 2024 of the visible water bodies was made. It is transpired that an increase by 500 percent has taken place in the last six years.

Number of water users provided with new/improved irrigation services
Including female beneficiaries (%)

Precise Definition:

Total number of Water Users receiving new or improved irrigation services as a result of the project

"Water users" refer to the number of water users that have access to new/improved irrigation and drainage services through the project.

Irrigation services refers to the better delivery of water to, arable land, including better timing, quantity, quality, and cost-effectiveness for the water users.

New irrigation services refer to the provision of irrigation in an area that has not had these services before. The area is not necessarily newly cropped or newly productive land, but is newly provided with irrigation and drainage services, and may have been rain-fed land before.

Improved irrigation services refer to the upgrading, rehabilitation, and/or modernization of irrigation or drainage services in an area with existing irrigation and drainage services.

Unit of Measure: Number of water users

Baseline: Zero

Target: 250,000: Female 30 percent

Disaggregated by: Sex

Data Source: Construction completion report; Register of Water Users farming land in the service area.

Data Collection Method: review of construction supervisory reports; drone pictures after spate event; Evapotranspiration maps during crop growing season, Beneficiary survey

Frequency of Data collection: Annual

Responsibility of Data collection: PSIA-M&E

Actual Achievement Reported: The aggregate water users estimated at 233,064 reaching 93.22% of the target set for this IRI. As far as the female water users are concerned, being 49.41 percent of the population surpassing the 30% target set for this sub-indicator.

Name of Scheme	Irrigation Schemes	Agriculture Schemes	Flood Irrigation	Target Beneficiaries
Nari Gorge Scheme (PIS)	76,750	24,267	18,430	101,017
Mushkaf Scheme (FIS)	13,443	7,840		21,283
Sehan Scheme (FIS)	7,042	6,039		13,081
Sibi Water Supply				
Nari Gorge Flood Protection Scheme				
Tariqabad Flood Protection Scheme			8064	
Watershed Nari River				
Shab e Maidan Scheme	5,053	1,315		6,368
Gandacha Scheme	31,355	7,690	6,450	39,045

Nimi Scheme	2,108	774	2320	2,882
Khuzdar Scheme	793	611	2870	1,404
Flood Protection Bund Porali Basin			4650	
Faizu Flood Protection Bund Porali Basin			5200	
Watershed Porali River				
Mangroves Plantation at Miani Hor				
Target Beneficiaries	**136,544**	**48,536**	**47,984**	**233,064**

Operational Water User Associations created and/or strengthened

Precise Definition:

"Water User Association" refers to a formal body registered under "On Farm Water Management & Water Users Association Ordinance [Act]-1981 (Amended 2001)" of Pakistan,

"created" refers to newly established WUA and "strengthened" refers to WUA that were formally already existent, but have received capacity development support through the project

"**Operational"** means that minimum functional roles and responsibilities of a WUA are in place and being implemented or enforced (e.g., water allocation rules, management of maintenance, by-laws, transparent decision making)

"Strengthened" means that the WUAs received planned trainings and are supported by respective project staff and line departments to function properly as per their mandate.

"Watercourse" means any channel which is supplied with water from a canal/scheme, but which is not maintained at the cost of Government and such subsidiary works belonging to any such channel.

Unit of Measure: Number

Baseline: Considered Zero

Target: 30

Disaggregated by: Water courses at each scheme

Data Source: legal document proving the formal registration of the WUA , WUA by-laws, meeting records, physical watercourses survey, activity report/pictures, Invoices, bank account statements, or physical evidence of above improvements,

Data Collection Method: semi-structure interviews, administration of checklist assessing compliance with functional roles and responsibilities that a WUA is supposed to undertake the following functions as per Ordinance:

1. Demolishing of the old watercourse;
2. Removing of vegetation including trees, etc. growing in the way of a watercourse sanctioned by Government;
3. Unloading of the banks of the watercourse by physical removal of the silt deposit;
4. Clearance of silt from the bed of the watercourse;
5. Re-alignment of the watercourse based on engineering survey and design;
6. Installation of *pacca nakkas* at sanctioned sites;
7. Construction of culverts on the crossings;

8. Brick-lining of weak reaches of the watercourse up to certain fixed limit; A WUA which undertakes any of the above 4 functions regularly (within six months) would be considered operational). Need checklist for assessing "operational" or not operational also using institutional performance measures.
Frequency of Data collection: **Registered:** Quarterly **Strengthened:** Quarterly **Operational:** Biannually
Responsibility of Data collection: PSIA-M&E/On-farm Watershed management Department
Actual Achievement Reported: During the life of BIWRMDP 120 Water User Association were mobilized, formed and registered with ID. This IRI indicator has achieved 400 percent of the set target.

Area of watershed restored/reforested
Precise Definition: The area of watershed restored refers to the execution of set of interventions to improve, restore the degraded watershed through soil erosion control, water conservation measures, afforestation through water harvesting technique, block plantation, rangeland improvement with focus on pasture and bio mass production and mangroves afforestation. This indicator measures in hectares the land restored, improved through water conservation and soil erosion control measures, pasture and bio mass production to promote natural vegetation cover and enhance the production of forests with focus on land brought under afforestation and mangroves plantation
Unit of Measure: Hectares
Baseline: Zero
Target: 4,000 Hectares
Disaggregated by: None
Data Source: Management plans, topographic GIS data
Data Collection Method / Calculation: Lidar Analysis in ArcGIS 10 for Forestry Application, (GIS mapping & remote sensing application) **Schemes: (**Construction of check reservoirs, dry afforestation through water harvesting technique, block plantation, mangroves plantation, rangeland restoration and improvement)
Frequency of Data collection: Biannually
Responsibility of Data collection: M&E-PSIA, GIS Specialist (PSIA) / Deputy Conservator, Forest
Actual Achievement Reported: A total watershed area of 4,193 Hectares was restored / reforested reaching 104.82 Percent of the target.

Sr. No	Detail of Activities	Location	In Ha
1	Dry- Afforestation and Range Improvement through water harvesting technique with plantation and sowing Nari Basin -Lot-1 Construction of Earthen Bandat (4,280 No's) on 2,140 acres, with (89,600) plantation	Bakra G Bolak Sibi, Gadi Bar Forest Loralai	866
2	Dry- Afforestation and Range Improvement through water harvesting technique with plantation and sowing Porali Basin-Lot-2 Construction of Earthen Bandat (5,480 No's) on 2,740 acres, with (99640) plantation,	Awra Uthal, Wadh/ Khuzdar	1,109
3	Block Plantation in Nari Basin Package-1 Planting 182,830 plants on 235 acres, & tube-well (5 No's), with solar system (5-No), laying of pipe, water storage tank (5-Nos), Forest hut (2-No), watering, protection.	Dephal Forest Sibi and Gadi Bar Loralai	95
4	Block Plantation in Porali Basin Lot-2 182,830 plants on 205 acres, tube-well (5 No's), with solar system (5- No's), lying of pipe, water storage tank (5-Nos), Forest hut (2-Nos), watering, protection.	Uthal, Wadh/Khuzdar	95
5	Mangroves Plantation in Miani Hor Dam Lasbela through IUCN 1,155,000 mangroves plants on 520 acres, trainings for community and forest department (12-Nos)	Miani Hoar Lesbella	206
6	Up-scaling of Mangroves Plantation in the coastal area of Lasbela through IUCN 2,613,000 mangroves plants on 1500-acres, trainings, mangroves watcher hut (1- No), mangroves management plan, mangroves nursery (5-Nos)	Miani Hoar Lesbella	607
7	Rangeland Improvement/ Rehabilitation and allied activities in Nari & Porali through IUCN. Social mobilization, production of rangeland reserves through re-seeding on 1500-acres, production of 200 fodder plots, construction of 150 No's of stock water ponds, plantation on 300-acres through water harvesting, establishing grazing management institutes 2.Nos, preparation of grazing management plans 2-Nos, Rangeland restoration protection on 8000 acres through community monitors, preparation of watershed and rangeland management plans 4 Nos.	Mekhtar, Sehan in Loralai Nari Basin, Lasbeal and Wadh/ Khuzdar in Porali Basin	1,214
	Total Area in Hectares		4,193

Number of community drinking water points installed/rehabilitated
Precise Definition: Total number of community drinking water points that were newly provided or rehabilitated by the project, and that as a result are supplying clean drinking water to the community every day during the agreed time
Unit of Measure: Number of water points
Baseline: Zero
Target: 10 water points
Disaggregated by: - Target Villages

Data Source: geo-referenced pictures taken during field visits, water quality testing at water point, formal inspection issuance by local authority (PHE)
Data Collection Method: field visits, water quality testing results, inspection results by local authority overseeing water supply
Frequency of Data collection: quarterly
Responsibility of Data collection: PSIA-M&E, PHE
Actual Achievement Reported: A total number of 58 water points were installed reaching 580 percent of the set target

(Surveyed) % of total beneficiaries satisfied with project implementation
Precise Definition: #% of total number of farmer beneficiaries in the project area who express satisfaction with the benefits directly derived from improvements to (i) irrigation systems (ii) drinking water supply iii) Flood protection iv) On-farm water management v) trainings and support in institutionalization (WUAs, FOs, etc).
Unit of Measure: Percent of beneficiaries
Baseline: Zero
Target: 80 percent
Disaggregated by:
Data Source: household sample survey / End-line Survey
Data Collection Method: structured interviews of household heads in all project communities
Frequency of Data collection: Annually / End-line
Responsibility of Data collection: PMU-M&E
Actual Achievement Reported: The End-line survey revealed the satisfaction level for irrigation as 82.5 percent whereas 78% of the potable water users were highly satisfied / satisfied with the provided system.

Chapter 7: Outcome and Impact

The investment for development of infrastructure under BIWRMDP was mainly for irrigation system in order to enhance availability and accessibility to farmers for improving their economic condition. As provided in IR (PCR), information was collected from a sample of 400 beneficiary farmers from the two river basins. Based on investment, area and population, the sample was distributed in a ratio of 2/3rd for Nari river basin and 1/3rd for Porali river basin.

The beneficiaries approached by the field teams by mainly focusing on the channels and water courses developed and rehabilitated. Since some of the farmers were getting benefits both from the interventions under B.1: Infrastructure Investments and B.2: On Farm Water Management and Agriculture Productivity, feedback from the largest group of beneficiaries was possible. The information was collected, based on multiple response, from 68.9% of total beneficiaries of PIS, 31.1% of FIS, 24.9% from Khuskaba and 2.7% of Flood Protection. All the respondents interviewed were male. Information authentication can be judged through the fact that 78.4% of the beneficiaries provided their CNIC numbers whereas about 60% provided their telephone numbers. Table: 7.1 provides the distribution of different types of beneficiaries.

Table 7.1: Type of beneficiaries

Based on multiple response

Schemes	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
PIS	142	53.4	135	99.3	277	68.9
Spate/FIS	95	35.7	30	22.1	125	31.1
Khuskaba	100	37.6	-	-	100	24.9
Flood Protection	8	3.0	3	2.2	11	2.7

Challenge in collection of information could be gauged from the fact that only 36.8% of the respondents were literate. Of these literates, only 22.3% did get education above secondary level. Table 7.2 provides the education level of the respondents.

Table 7.2: Level of schooling

Schooling	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Primary	17	32.7	23	24.0	40	27.0
Middle	14	26.9	25	26.0	39	26.4
Secondary	13	25.0	23	24.0	36	24.3
Intermediate	3	5.8	10	10.4	13	8.8
Graduate	3	5.8	9	9.4	12	8.1
Post graduate	2	3.9	6	6.3	8	5.4
Overall	52	100.0	96	100.0	148	100.0

The number of nuclear households has shown a changing trend as in the case of rest of Pakistan as 68.9 percent of the households comprised of one family. Of the total households 61.2% were comprised of members in a range of 5 to 10. Average household size was worked out at 9.1. Table-xx and xxx and xxx provides the profile of the respondent households.

C- Household Profile

Table 7.3: Type of household

Type	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Nuclear	162	60.9	115	84.6	277	68.9
Joint	104	39.1	21	15.4	125	31.1
Overall	266	100.0	136	100.0	402	100.0

Table 7.4: Household Size

Numbers	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Up-to 5 members	27	10.2	4.5	26	19.1	4.7	53	13.2	4.6
5 - 10 members	161	60.5	7.7	85	62.5	7.7	246	61.2	7.7
11 - 15 members	52	19.6	12.9	18	13.2	12.4	70	17.4	12.7
Above 15 members	26	9.8	19.3	7	5.2	19.3	33	8.2	19.3
Overall	266	100.0	9.5	136	100.0	8.3	402	100.0	9.1

The intervention influenced the household earning member dynamics along the Nari and Purali rivers. Pre-intervention data showed that 53.5% households predominantly had one earning member, with an average of 1.8 earners overall. The presence of households with two or more earners was modest, and those with six or more earners were rare.

Post-intervention, the proportion of single-earner households dropped to 39.8%, and the average number of earners increased to 2.0 overall, indicating enhanced income-sharing within families. The Nari River region saw stability in its average (2.1), while Purali River improved from 1.2 to 1.7.

These findings underscore the intervention's role in fostering multi-earner household growth, promoting economic resilience in the community.

Table 7.5: Number of total earning member in the household before project intervention

Number	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
One	100	37.6	1.0	115	84.6	1.0	215	53.5	1.0
Two	89	33.5	2.0	17	12.5	2.0	106	26.4	2.0
Three	53	19.9	3.0	4	2.9	3.0	57	14.2	3.0
Four - Five	17	6.4	4.2	-	-	-	17	4.2	4.2
Six - Eight	7	2.6	6.7	-	-	-	7	1.7	6.7
Above Eight	-	-	-	-	-	-	-	-	-
Overall	266	100.0	2.1	136	100.0	1.2	402	100.0	1.8

Table 7.6: Table D-16: Number of earning member in the household after project intervention

Number	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
One	93	35.0	1.0	67	49.3	1.0	160	39.8	1.0
Two	92	34.6	2.0	51	37.5	2.0	143	35.6	2.0
Three	51	19.2	3.0	13	9.6	3.0	64	15.9	3.0
Four - Five	24	9.0	4.1	4	2.9	4.0	28	7.0	4.1
Six - Eight	6	2.3	6.7	1	0.7	6.0	7	1.7	6.6
Above Eight	-	-	-	-	-	-	-	-	-
Overall	266	100.0	2.1	136	100.0	1.7	402	100.0	2.0

Before the intervention, unemployment among household members aged 18-60 years was notable, with an overall incidence of 40.1% across the Nari and Purali River areas. Specifically, 39.8% of households in the Nari River and 40.4% in the Purali River reported unemployed members.

Post-intervention, unemployment decreased to 37.1% overall, with Nari River seeing a slight reduction to 38.7% and Purali River experiencing a more significant drop to 33.8%.

The proportion of households without unemployed members increased from 59.9% to 62.9%, reflecting the project's positive impact.

The findings indicate that targeted interventions can effectively reduce unemployment, particularly in the Purali River area, highlighting the project's success in fostering economic opportunities.

Table 7.7: Incidence of unemployed members (between 18 - 60 years) in the household before intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	106	39.8	55	40.4	161	40.1
No	160	60.2	81	59.6	241	59.9
Overall	266	100.0	136	100.0	402	100.0

Table 7.8: Incidence of unemployed members (between 18 - 60 years) in the household after project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	103	38.7	46	33.8	149	37.1
No	163	61.3	90	66.2	253	62.9
Overall	266	100.0	136	100.0	402	100.0

The project's impact on household income sources revealed major shifts.

Before the intervention, farming dominated as the primary income source, with 96.3% of households overall engaged.

Post-intervention, farming remained stable at 96.0%. Notably, income from livestock increased substantially, from 15.2% to 23.4%, reflecting improved livestock practices and accessibility in the Purali River area. Agri-labour surged from 3.7% to 11.2%, particularly benefiting Purali households. Livestock products as an income source rose markedly in Purali, from 6.6% to 18.4%. Reliance on government and private jobs decreased slightly. Support programs like BISP showed a minor increase, aiding vulnerable families.

Overall, diversification of income sources highlights enhanced resilience and sustainability within the communities post-intervention.

Table 7.9: Sources of household income before project intervention

Based on multiple response

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Farming	253	95.1	134	98.5	387	96.3
Land Leased out/share-out cropping	40	15.0	6	4.4	46	11.4
Rent from Agri machinery	22	8.3	2	1.5	24	6.0
Tube-well water	-	-	-	-	-	-
Livestock products	1	0.4	9	6.6	10	2.5
Livestock	22	8.3	39	28.7	61	15.2
Agri-labour	10	3.8	5	3.7	15	3.7
Government job	27	10.2	14	10.3	41	10.2
Private Job	18	6.8	2	1.5	20	5.0
Labour	27	10.2	2	1.5	29	7.2
Business	18	6.8	2	1.5	20	5.0
Remittance	-	-	-	-	-	-
BISP fund	50	18.8	6	4.4	56	13.9
Zakat	-	-	-	-	-	-
Pension	-	-	2	1.5	2	0.5

Table 7.10: Sources of household income after project intervention

Based on multiple response

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Farming	254	95.5	132	97.1	386	96.0
Land Leased out/share-out	36	13.5	6	4.4	42	10.5
Rent from Agri machinery	23	8.7	3	2.2	26	6.5
Tube-well water	-	-	-	-	-	-
Livestock products	1	0.4	25	18.4	26	6.5
Livestock	24	9.0	70	51.5	94	23.4
Agri-labour	5	1.9	40	29.4	45	11.2
Government job	25	9.4	12	8.8	37	9.2

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Private Job	13	4.9	4	2.9	17	4.2
Labour	23	8.7	5	3.7	28	7.0
Business	24	9.0	4	2.9	28	7.0
Remittance	-	-	-	-	-	-
BISP fund	52	19.6	7	5.2	59	14.7
Zakat	-	-	-	-	-	-
Pension	-	-	1	0.7	1	0.3

The annual household income before and after project intervention reveals notable improvements across both the Nari River and Purali River regions.

Before the intervention, households in the Nari River had a mean income of PKR 776,130, while those in the Purali River averaged PKR 418,265.

Post-intervention, the Nari River saw an increase in mean income to PKR 1,071,392, and the Purali River rose to PKR 680,460, reflecting a significant positive change.

The proportion of households earning above PKR 1,000,000 increased dramatically, from 23.3% to 39.9% in Nari River, and from 5.9% to 13.2% in Purali River.

The overall average income across both regions rose from PKR 655,061 before the intervention to PKR 939,136 afterward, indicating the project's positive impact on household income levels.

Table 7.11: Annual household income before project intervention

Income	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
Up-to PKR 100,000	17	6.4	57,059	4	2.9	50,000	21	5.2	55,714
PKR 100,001 - PKR 200,000	7	2.6	142,429	17	12.5	176,176	24	6.0	166,333
PKR 200,001 - PKR 300,000	15	5.6	260,267	44	32.4	249,818	59	14.7	252,475
PKR 300,001 - PKR 500,000	67	25.2	435,728	41	30.2	404,854	108	26.9	424,007
PKR 500,001 = PKR 700,000	49	18.4	612,910	11	8.1	603,091	60	14.9	611,110
PKR 700,001 - PKR 1,000,000	49	18.4	855,976	11	8.1	808,364	60	14.9	847,247
Above PKR 1,000,000	62	23.3	1,603,394	8	5.9	1,321,500	70	17.4	1,571,177
Overall	266	100.0	776,130	136	100.0	418,265	402	100.0	655,061

Table 7.12: Annual household income after project intervention

Income	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
Up-to PKR 100,000	7	2.6	69,286	2	1.5	84,750	9	2.2	72,722
PKR 100,001 - PKR 200,000	11	4.1	143,527	1	0.7	158,000	12	3.0	144,733

Income	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
PKR 200,001 - PKR 300,000	6	2.3	278,333	10	7.4	289,500	16	4.0	285,313
PKR 300,001 - PKR 500,000	36	13.5	404,450	39	28.7	406,923	75	18.7	405,736
PKR 500,001 = PKR 700,000	46	17.3	620,609	42	30.9	582,357	88	21.9	602,352
PKR 700,001 - PKR 1,000,000	54	20.3	847,774	24	17.7	798,750	78	19.4	832,690
Above PKR 1,000,000	106	39.9	1,814,796	18	13.2	1,656,722	124	30.9	1,791,850
Overall	266	100.0	1,071,392	136	100.0	680,460	402	100.0	939,136

The household expenditures before and after the intervention reveals remarkable shifts in spending patterns across two regions, Nari and Purali River.

Before the intervention, a major portion of households in both regions, 38.4% in Nari River and 12.5% in Purali River, spent above PKR 50,000, with an average expenditure of PKR 87,227 and PKR 85,059, respectively.

After the intervention, the proportion of households spending above PKR 50,000 remained high, at 47.0% in Nari River and 39.7% in Purali River, though with a slightly reduced mean expenditure of PKR 77,703 and PKR 75,979, respectively.

The households in both regions saw an increase in the average expenditure in the PKR 30,001 - 50,000 range. Generally, the project appears to have encouraged more households to allocate higher amounts towards monthly expenditures, with a general upward trend in average expenditure across all categories.

Table 7.13: Monthly household expenditures before project intervention

Expenditure	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
Up-to PKR 5,000	2	0.8	3,950	-	-	-	2	0.5	3,950
PKR 5,001 - PKR 10,000	1	0.4	8,700	-	-	-	1	0.3	8,700
PKR 10,001 - PKR 20,000	25	9.4	16,047	37	27.2	17,325	62	15.4	16,810
PKR 20,001 - PKR 30,000	54	20.3	25,684	48	35.3	24,344	102	25.4	25,054
PKR 30,001 - PKR 50,000	82	30.8	37,726	34	25.0	38,794	116	28.9	38,039
Above PKR 50,000	102	38.4	87,227	17	12.5	85,059	119	29.6	86,917
Overall	266	100.0	51,862	136	100.0	33,636	402	100.0	45,696

Table 7.14: Monthly household expenditures after project intervention

Expenditure	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	-	-	-	-	-	-	-	-	-
Up-to PKR 5,000	-	-	-	-	-	-	-	-	-
PKR 5,001 - PKR 10,000	-	-	-	-	-	-	-	-	-
PKR 10,001 - PKR 20,000	1	0.4	15,900	-	-	-	1	0.3	15,900

Expenditure	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
PKR 20,001 - PKR 30,000	21	7.9	26,521	30	22.1	27,097	51	12.7	26,860
PKR 30,001 - PKR 50,000	119	44.7	41,371	52	38.2	39,391	171	42.5	40,768
Above PKR 50,000	125	47.0	77,703	54	39.7	75,979	179	44.5	77,183
Overall	266	100.0	57,176	136	100.0	51,206	402	100.0	55,157

The comparison of household expenditures before and after the intervention reveals important changes in spending patterns.

Before the intervention, food was the largest expenditure, with the Nari River at 56.4% and the Purali River at 61.3%.

After the intervention, food expenses increased to 62.0% for Nari River and 63.8% for Purali River, reflecting a major rise in consumption.

Education expenditures saw an improvement, rising from 4.7% overall to 5.8%, with the Nari River reaching 6.5%. Health spending also increased, with Nari River rising from 8.1% to 9.6%. Other categories like loan repayment and repair/maintenance of houses saw fluctuating trends, with entertainment remaining largely unchanged.

The intervention resulted in higher overall household expenditures, particularly in food, education, and health, suggesting improved economic conditions for households.

Table 7.15: Category wise monthly household expenditures before project intervention

Category	Nari River		Purali River		Overall	
	Percentage	Mean	Percentage	Mean	Percentage	Mean
Food	56.4	23,194	61.3	19,995	58.1	22,111
Education	5.5	3,449	3.2	1,271	4.7	2,712
Health	8.1	4,330	8.0	2,760	8.1	3,799
House rent	0.2	79	0.2	37	0.2	65
Transportation	5.6	2,825	5.0	1,943	5.4	2,526
Clothing	8.1	3,662	5.7	1,962	7.3	3,087
Entertainment	0.5	509	-	-	0.3	337
Loan repayment	0.7	505	0.4	176	0.6	394
Utilities bill	2.2	1,272	-	-	1.4	842
Repair & maintenance of house	0.8	788	0.3	104	0.6	557
Others	11.8	11,250	16.1	5,388	13.3	9,267
Total	100.0	51,862	100.0	33,636	100.0	45,696

Table 7.16: Category wise monthly household expenditures after project intervention

Items	Nari River		Purali River		Overall	
	Percentage	Mean	Percentage	Mean	Percentage	Mean
Food	62.0	32,263	63.8	31,695	62.6	32,071
Education	6.5	4,958	4.3	2,670	5.8	4,184
Health	9.6	6,252	8.4	4,579	9.2	5,686
House rent	0.1	79	0.1	37	0.1	65
Transportation	7.4	4,055	6.3	3,314	7.0	3,804
Clothing	8.1	5,250	6.7	3,344	7.6	4,605
Entertainment	0.9	677	-	-	0.6	448
Loan repayment	0.6	408	1.8	1,040	1.0	622
Utilities bill	2.8	1,850	-	-	1.8	1,224
Repair & maintenance of house	2.0	1,311	0.6	327	1.5	978
Others	0.1	73	8.1	4,200	2.8	1,469
Overall	100.0	57,176	100.0	51,206	100.0	55,157

The data reflects an increase in the incidence of new income-generating opportunities following the project intervention.

Before the intervention, 81.6% of participants in Nari River and 60.3% in Purali River had no new opportunities. Post-intervention, 18.4% of Nari River participants and 39.7% of Purali River participants reported having new income sources.

As a whole, 25.6% of respondents experienced positive changes. The intervention was particularly effective in Purali River, where nearly 40% saw improvements, indicating the project's significant impact.

Table 7.17: Incidence of project intervention create new income generating opportunities

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	49	18.4	54	39.7	103	25.6
No	217	81.6	82	60.3	299	74.4
Overall	266	100.0	136	100.0	402	100.0

The project intervention significantly increased income-generating opportunities across the Nari and Purali River areas.

Before the intervention, the majority of opportunities were agricultural labor with 43.7%, followed by new businesses with 22.3%. In the Nari River region, 46.9% of participants started new businesses, whereas agricultural labor accounted for 75.9% in Purali River. Opportunities like livestock increases and tunnel farming emerged post-intervention, reflecting a shift from traditional agriculture to more diverse income sources.

The project led to broader income generation, especially through business ventures and agricultural labour.

Table 7.18: Type of opportunities created for income generation due to project intervention

Opportunities	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Agri labour	4	8.2	41	75.9	45	43.7
Increase cultivated area	4	8.2	3	5.6	7	6.8
Increase productivity	3	6.1	-	-	3	2.9
Leased out more area	1	2.0	-	-	1	1.0
Tunnel farming	-	-	2	3.7	2	1.9
Increase livestock	-	-	7	13.0	7	6.8
Job with contractor	11	22.5	1	1.9	12	11.7
Machinery used in project	3	6.1	-	-	3	2.9
Start new business	23	46.9	-	-	23	22.3
Overall	49	100.0	54	100.0	103	100.0

Before the intervention, a substantial majority of households along the Nari and Purali rivers reported no new business or employment, with 86.5% and 98.5% respectively. However, after the project, 9.4% of households in the Nari River area started a new business, while only 0.7% did so in the Purali River area. Employment linked to the project impacted 4.1% of Nari River households and 0.7% in Purali River.

The intervention had a modest effect, with 6.5% of households starting businesses and 3.0% securing employment.

Table 7.19: Incidence of member of household started new business or received employment directly related to project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Business	25	9.4	1	0.7	26	6.5
Employment	11	4.1	1	0.7	12	3.0
None	230	86.5	134	98.5	364	90.6
Overall	266	100.0	136	100.0	402	100.0

E - Flood Mitigation

Before the project intervention, the incidence of losses due to floods was significantly high. In the Nari River area, 81.2% reported losses, while Purali River faced 87.5% losses, making the overall incidence of 83.3%.

Post-intervention, the results show a considerable reduction in losses; in Nari River area saw a decrease to 52.6% of respondents reporting losses, while Purali River dropped to 29.4%.

The overall reduction across both rivers was 44.8% (180), indicating a positive impact of the intervention.

Table 7.20: Incidence of losses due to flood before project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	216	81.2	119	87.5	335	83.3

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
No	50	18.8	17	12.5	67	16.7
Overall	266	100.0	136	100.0	402	100.0

Table 7.21: Incidence of losses due to flood after project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	140	52.6	40	29.4	180	44.8
No	126	47.4	96	70.6	222	55.2
Overall	266	100.0	136	100.0	402	100.0

The data illustrates a shift in flood resilience management satisfaction before and after the intervention across two river regions. In Nari River, 48.1% were satisfied post-intervention, compared to 56.6% in Purali River. The percentage of dissatisfied individuals decreased overall, with a drop responses from 15.4% (Nari) and 30.2% (Purali) before intervention to a combined 20.4%.

The percentage of "highly satisfied" respondents increased to 2.7%, indicating a positive effect of the project in enhancing community satisfaction.

Table 7.22: Level of satisfaction with the flood resilience management after project intervention

Level of satisfaction	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Highly satisfied	10	3.8	1	0.7	11	2.7
Satisfied	128	48.1	77	56.6	205	51.0
Neutral	85	32.0	15	11.0	100	24.9
Dissatisfied	41	15.4	41	30.2	82	20.4
Highly dissatisfied	2	0.8	2	1.5	4	1.0
Overall	266	100.0	136	100.0	402	100.0

Before the project, knowledge about watershed management was low, with 77.8% of respondents from Nari River and 49.3% from Purali River indicating a lack of awareness. In total, 68.2% of respondents were unaware of watershed management.

However, post-intervention, a considerable improvement in perception about groundwater levels was observed. In the Nari River, 64.7% believed the groundwater level had increased, while 78.7% of Purali River respondents shared the same view. Across both areas, 69.4% of participants felt groundwater levels had risen.

These findings suggest that the intervention successfully raised awareness of watershed management and positively impacted the perception of groundwater levels, reflecting the project's effectiveness in fostering both knowledge and environmental improvements.

Table 7.23: Prevalence of knowledge about the watershed management

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	59	22.2	69	50.7	128	31.8
No	207	77.8	67	49.3	274	68.2
Overall	266	100.0	136	100.0	402	100.0

Table 7.24: Perception about the change in groundwater level after project intervention

Perception	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Increase	172	64.7	107	78.7	279	69.4
Decrease	21	7.9	3	2.2	24	6.0
No change	73	27.4	26	19.1	99	24.6
Overall	266	100.0	136	100.0	402	100.0

The groundwater levels in the Nari and Purali rivers were meaningfully impacted by both natural events and project interventions.

Before the intervention, the average groundwater level in the Nari River was 125.7 feet, compared to 207.5 feet in the Purali River.

After intervention, the levels dropped to 101.3 feet and 175.1 feet, respectively. The overall average groundwater level decreased from 153.4 feet to 126.3 feet.

Several factors contributed to these changes, with flood events playing a major role. The 2022 flood notably affected both rivers, especially in the Nari River (94.8%). Other contributing factors included occasional floods (44.9%), heavy rains (67.3%), and watershed management efforts, particularly in the Purali River (50.9%).

These findings highlight the combined effects of natural and managed interventions on groundwater levels.

Table 7.25: Average Level of groundwater before and after project intervention (Feet)

Time	Nari River			Purali River			Overall		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
Before intervention	125.7	450.0	40.0	207.5	290.0	25.0	153.4	450.0	25.0
After intervention	101.3	360.0	30.0	175.1	490.0	24.0	126.3	490.0	24.0

Before the project intervention, respondents along the Nari and Purali Rivers had mixed perceptions about soil conservation.

After the project, 71.1% of Nari River respondents and 83.1% of Purali River respondents reported a positive change, with an overall increase to 75.1%. **This suggests that the project positively influenced soil conservation awareness.**

In terms of benefits, the majority of respondents from the Nari River with 91.4% emphasized the protection of fertile land, compared to 71.3% from Purali River, highlighting a clear regional difference.

57.5% of Nari River respondents noted increased productivity, while 73.5% of Purali River respondents saw this benefit. Water-saving was acknowledged by 51.1% in Nari and 68.4% in Purali, showing a notable regional difference in perceived benefits.

These findings demonstrate the project's success in improving soil conservation knowledge and its tangible benefits.

Table 7.26: Perceptions of respondents regarding soil conservation after project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	189	71.1	113	83.1	302	75.1
No	77	29.0	23	16.9	100	24.9
Overall	266	100.0	136	100.0	402	100.0

Table 7.27: Benefits of soil conservation

Based on multiple response

Benefits	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Protect fertile land	243	91.4	97	71.3	340	84.6
Increase productivity	153	57.5	100	73.5	253	62.9
Water saving	136	51.1	93	68.4	229	57.0
Don’t know	9	3.4	17	12.5	26	6.5

F - Agriculture Profile

Among the respondents, 88% of households in Nari River and 94.9% in Purali River were landowners. The proportion of owners-cum-tenants/sharecroppers was higher in Nari River at 8.7% than Purali River at 4.4%. Tenants/sharecroppers were minimal, especially in Purali River at 0.7%.

Table 7.28: Tenancy status

Status	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Owner	234	88.0	129	94.9	363	90.3
Owner-cum-tenant/sharecropper	23	8.7	6	4.4	29	7.2
Tenant/Sharecropper	9	3.4	1	0.7	10	2.5
Overall	266	100.0	136	100.0	402	100.0

The agricultural project brought changes to landholding patterns across both Nari River and Purali River regions.

Before the project, the average total farm size was 16.93 acres, with the Nari River holding 20.82 acres and Purali River 9.31 acres.

Post-intervention, the overall farm size increased to 19.20 acres, with Nari River rising to 24.08 acres.

Significant improvements were observed in the PIS irrigated area and the own landholding, highlighting enhanced resource utilization and farm productivity. Cultivable waste areas were reduced, showcasing the project’s impact in improving agricultural sustainability.

Before the project intervention, the majority of farms along the Nari River and Purali River were concentrated in the 12.51-25.0 acre range, with an average size of 18.5 acres and 17.7 acres, respectively. The proportion of larger farms (above 25 acres) was minimal.

Post-intervention, there was a notable increase in farm sizes along both rivers, especially in the 12.51-25.0-acre category, where the average farm size increased slightly to 19.3 acres for Nari River and 17.9 acres for Purali River. Furthermore, there was a considerable rise in the number of farms larger than 25 acres, with average sizes of 49.4 acres on Nari River and 33.0 acres on Purali River.

The farm size growth after the intervention reflects improved agricultural conditions and resource availability, boosting productivity and sustainability.

Table 7.29: Farm Size before project intervention

Farm size	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	5	1.9	-	-	-	-	5	1.2	-
Up-to 5 Acres	23	8.7	3.9	53	39.0	3.9	76	18.9	3.9
5.1 - 12.5 Acres	70	26.3	9.1	54	39.7	8.4	124	30.9	8.8
12.51 - 25.0 Acres	116	43.6	18.5	22	16.2	17.7	138	34.3	18.4
Above 25.0 Acres	52	19.6	51.2	7	5.2	30.4	59	14.7	48.8
Overall	266	100.0	20.8	136	100.0	9.3	402	100.0	16.9

Table 7.30: Farm Size after project intervention

Farm size	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
None	5	1.9	-	-	-	-	5	1.2	-
Up-to 5 Acres	14	5.3	3.9	51	37.5	3.9	65	16.2	3.9
5.1 - 12.5 Acres	55	20.7	9.8	53	39.0	8.5	108	26.9	9.1
12.51 - 25.0 Acres	122	45.9	19.3	26	19.1	17.9	148	36.8	19.1
Above 25.0 Acres	70	26.3	49.4	6	4.4	33.0	76	18.9	48.1
Overall	266	100.0	24.1	136	100.0	9.6	402	100.0	19.2

G - Irrigation Profile

Before the project intervention, the primary sources of irrigation for farmers were the PIS (Nari River: 57.9%, Purali River: 89.7%), followed by Spate/FIS, Tube wells, and Rainfed methods.

After the intervention, while the reliance on PIS remained similar (Nari River: 57.1%, Purali River: 93.4%), there was a noticeable reduction in the use of Spate/FIS (from 44.7% to 36.1% for Nari and 25% to 11.8% for Purali). Rainfed irrigation saw a slight increase (from 25.2% to 29.3% for Nari), while its use in Purali ceased. Tube wells continued to have a minimal role in irrigation (Nari River: 22.9% to 22.6%, Purali River: 8.1% to 7.4%).

The findings highlight a shift towards more stable irrigation methods such as PIS, with a decline in traditional, irregular sources like Spate/FIS.

Table 7.31: Source of irrigation before project intervention

Based on multiple response

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
PIS	154	57.9	122	89.7	276	68.7
Spate/FIS	119	44.7	34	25.0	153	38.1
Tube well	61	22.9	11	8.1	72	17.9
Rainfed	67	25.2	1	0.7	68	16.9

Table 7.32: Source of irrigation after the project intervention

Based on multiple response

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
PIS	152	57.1	127	93.4	279	69.4
FIS/Spate	96	36.1	16	11.8	112	27.9
Tube well	60	22.6	10	7.4	70	17.4
Rainfed	78	29.3	-	-	78	19.4

Before the project intervention, farmers perceptions about lining watercourses were mixed. In the Nari River area, only 19.9% supported the lining, while 68.8% opposed it. Conversely, in the Purali River area, 26.5% favored lining, with 73.5% opposing it. ***The overall consensus across both areas showed a 22.1% support rate, highlighting a major resistance to the idea.***

Regarding the length of watercourses, 43% of farmers in the Nari River reported a watercourse length of up to 500 meters, whereas 72.2% in the Purali River had similar lengths. ***This suggests varied infrastructure needs before the intervention.***

The intervention led to noticeable benefits. In Nari River, 78.7% of farmers observed an increase in water quantity, and 62.4% noted reduced water losses, ***highlighting the intervention's effectiveness in improving irrigation efficiency.***

Table 7.33: Farmers' perception about the lining of watercourse before project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	53	19.9	36	26.5	89	22.1
No	183	68.8	100	73.5	283	70.4
NA	30	11.3	-	-	30	7.5
Overall	266	100.0	136	100.0	402	100.0

Table 7.34: Approximately length of lined watercourse before project intervention

Length	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Up-to 500 meters	17	32.1	351	26	72.2	216	43	48.3	269
501 - 1000 meters	12	22.6	793	10	27.8	740	22	24.7	769

Length	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
1001 - 2000 meters	14	26.4	1,529	-	-	-	14	15.7	1,529
Above 2000 meters	10	18.9	5,220	-	-	-	10	11.2	5,220
Overall	53	100.0	1,681	36	100.0	361	89	100.0	1,147

The intervention of lining watercourses has shown varying results across two regions, Nari River and Purali River, with overall benefits. Data revealed that the most prominent benefit in both areas is the increase in water quantity, particularly in the Nari River at 78.7%. The reduction in water losses was most noticeable in the Nari River at 62.4%, compared to 17.1% in Purali River.

The maintenance time was reduced, with 62.9% of respondents in Purali River highlighting this advantage. When examining water savings, data indicated that 36% of respondents from both regions experienced water savings of 21-30%, while 30.2% in Nari River reported savings exceeding 30%.

The overall data highlights the substantial effectiveness of watercourse lining in water management across both regions.

Table 7.35: Benefits of lined watercourse

Based on multiple response

Benefits	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Reduce water losses	30	62.4	6	17.1	36	45.8
Reduce watercourse maintenance time	15	54.2	18	62.9	33	61.9
Increase water quantity	28	78.7	13	105.7	41	83.1
Reduce time to irrigate land	1	4.8	5	14.3	6	9.3

Table 7.36: Percentage of water saving due to lining of watercourse

Percentage	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Up to 10%	3	5.7	15	41.7	18	20.2
11 - 20%	14	26.4	6	16.7	20	22.5
21 - 30%	20	37.7	12	33.3	32	36.0
Above 30%	16	30.2	3	8.3	19	21.4
Overall	53	100.0	36	100.0	89	100.0

The data from Nari River and Purali River, showed differences in the use of laser land levelling techniques and the average land levelling area. In terms of adoption, 39.1% of farmers in Nari River and 55.2% in Purali River have employed the technique, with an overall usage of 44.5%. Meanwhile, 60.9% in Nari River and 44.9% in Purali River have not used it.

When examining land levelling area, the average area levelled in Nari River is higher, with average of 10.8 acres compared to Purali River's 7.8 acres. Nari River also shows a greater proportion of larger fields levelled.

Overall, the land levelling technique is more prevalent and involves larger areas in Nari River.

Table 7.37: Incidence of laser land levelling technique used

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	104	39.1	75	55.2	179	44.5
No	162	60.9	61	44.9	223	55.5
Overall	266	100.0	136	100.0	402	100.0

Table 7.38: land levelling area

Area	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Up-to 5 Acres	38	36.5	4.6	36	48.0	4.1	74	41.3	4.4
5.1 - 10 Acres	41	39.4	9.2	27	36.0	8.0	68	38.0	8.7
10.1 - 20 Acres	17	16.4	16.3	9	12.0	13.8	26	14.5	15.4
Above 20 Acres	8	7.7	36.8	3	4.0	31.0	11	6.2	35.2
Overall	104	100.0	10.8	75	100.0	7.8	179	100.0	9.5

Data showed that the majority of households in the Nari River basin at 80.4% experienced water savings, while 91.8% reported increased productivity. In the Purali River basin, the most common benefit was increased productivity, with 42.7% reporting water savings. Overall, 61.4% of households noted water savings, and 83.3% saw productivity gains. The most common water savings due to land levelling were in the 11-20% range, particularly in the Nari River basin. The flood irrigation is the predominant method used in both basins (100%).

These findings reflect the critical role of land levelling and water-saving techniques in improving agricultural productivity across the project areas.

Table 7.39: Benefits of land levelling

Based on multiple response

Benefits	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Water saving/reduce water losses	65	80.4	32	42.7	97	61.4
Increase productivity	47	91.8	35	75.8	82	83.3
Increase cultivable land	8	22.0	15	44.6	23	34.5
Increase land fertility	6	5.8	21	37.0	27	20.9

Table 7.40: Percentage of water saving due to land levelling

Percentage	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Up to 10%	5	4.8	18	24.0	23	12.9
11 - 20%	61	58.7	4	5.3	65	36.3
21 - 30%	34	32.7	46	61.4	80	44.7
Above 30%	4	3.8	7	9.3	11	6.1

Percentage	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Overall	104	100.0	75	100.0	179	100.0

However, after the intervention, a significant shift is observed in the reliability of surface water sources. In both river systems, the reliability of surface water improved notably, with 76% of respondents from both regions now considering the water as reliable or highly reliable, compared to only 70% before.

In contrast, the number of those rating the water as highly unreliable or unreliable decreased significantly, reflecting the positive impact of the project on water reliability. Findings demonstrate that the intervention successfully enhanced water availability, contributing to more reliable and sustainable irrigation practices for the communities.

Table 7.41: Reliability of surface water after project intervention

Reliability	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Highly unreliable	2	1.3	1	0.8	3	1.1
Unreliable	9	5.9	20	15.8	29	10.4
Indifferent	16	10.5	4	3.2	20	7.2
Reliable	114	75.0	98	77.2	212	76.0
Highly reliable	11	7.2	4	3.2	15	5.4
Overall	152	100.0	127	100.0	279	100.0

H - Agriculture Practices

Before the intervention, Nari River having a larger cropped area for the Rabi season (13.09 acres) compared to Purali River (6.34 acres). For Kharif, the overall cropped area was 10.34 acres, again higher in Nari River (12.41 acres).

Post-intervention, the cropped area increased for both seasons, particularly in the Nari River basin. Cropping intensity also showed improvements, with over 58% of households in both river basins achieving cropping intensity above 50% in the Rabi season. Annual cropping intensity increased significantly, with 45.5% of households achieving over 125%.

These results indicate an overall positive shift in agricultural practices, highlighting improved productivity and land use efficiency.

Table 7.42: Cropped area before project intervention (Acres)

Season	Area	Nari River	Purali River	Overall
		Mean	Mean	Mean
Rabi	Cropped area	13.09	6.34	10.8
	Fellow area	7.21	2.96	5.77
Kharif	Cropped area	12.41	6.29	10.34
	Fellow area	7.89	3.01	6.24
Orchard area		0.52	0.01	0.35

Table 7.43: Cropped area after project intervention (Acres)

Season	Area	Nari River	Purali River	Overall
		Mean	Mean	Mean
Rabi	Cropped area	15.45	7.67	12.82
	Fellow area	8.05	1.96	5.99
Kharif	Cropped area	15.53	7.82	12.92
	Fellow area	7.97	1.82	5.89
Orchard area		0.58	0.01	0.39

The comparison of Rabi cropping intensity before and after the intervention reveals significant improvements in cropping patterns.

Before the project, the majority of farmers along the Nari River at 71.1% and Purali River at 66.2% reported Rabi cropping intensities above 50%, with an overall average intensity of 64%.

After the intervention, the percentage of farmers with Rabi cropping intensities above 50% increased to 73.7% along the Nari River and 86% along the Purali River, with the overall average intensity rising to 72.8% in Rabi. Moreover, the proportion of farmers with zero cropping intensity decreased notably from 17.2% before the intervention to just 4.2% after.

The results suggest that the project effectively enhanced cropping intensity, promoting higher agricultural productivity, especially in the high-intensity categories, contributing to increased food security.

Table 7.44: Rabi cropping intensity before project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	29	10.9	-	40	29.4	-	69	17.2	-
Up-to 20%	1	0.4	20.0	-	-	-	1	0.3	20.0
21 - 30%	9	3.4	25.1	-	-	-	9	2.2	25.1
31 - 50%	38	14.3	43.9	6	4.4	48.3	44	11.0	44.5
Above 50%	189	71.1	81.1	90	66.2	91.0	279	69.4	84.3
Overall	266	100.0	64.8	136	100.0	62.4	402	100.0	64.0

Table 7.45: Rabi cropping intensity after project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	17	6.4	-	-	-	-	17	4.2	-
Up-to 20%	-	-	-	-	-	-	-	-	-
21 - 30%	8	3.0	28.2	-	-	-	8	2.0	28.2
31 - 50%	45	16.9	44.6	19	14.0	47.1	64	15.9	45.4
Above 50%	196	73.7	81.0	117	86.0	87.6	313	77.9	83.5
Overall	266	100.0	68.1	136	100.0	82.0	402	100.0	72.8

Prior to the project intervention, the overall Kharif cropping intensity revealed that 71.9% of the area or farmers had a cropping intensity greater than 50%. On average, the cropping intensity during the Kharif season across both river basins was 70%.

In contrast, following the intervention, 85.3% of the farmers achieved a cropping intensity of 83.6% in kharif season. Overall, the cropping intensity across all farmers in the Kharif season reached 76%. The data indicates significant improvements in cropping intensity, particularly in areas where the intensity exceeded 50%. At the Nari River, the percentage of farmers with cropping intensity above 50% grew from 71.8% (mean 83.7) to 80.8% (mean 81.2). Similarly, the Purali River saw an increase of farmers from 72.1% (mean 87.6) to 94.1% (mean 87.6).

The intervention effectively boosted cropping intensity, with the overall mean intensity rising from 70% to 76% in Kharif season.

Table 7.46: Kharif cropping intensity before project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	21	7.9	-	6	4.4	-	27	6.7	-
Up-to 20%	1	0.4	20.0	-	-	-	1	0.3	20.0
21 - 30%	5	1.9	25.5	3	2.2	26.2	8	2.0	25.8
31 - 50%	48	18.1	42.0	29	21.3	46.1	77	19.2	43.5
Above 50%	191	71.8	83.7	98	72.1	87.6	289	71.9	85.0
Overall	266	100.0	68.2	136	100.0	73.5	402	100.0	70.0

Table 7.47: Kharif cropping intensity after project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	16	6.0	-	2	1.5	-	18	4.5	-
Up-to 20%	-	-	-	-	-	-	-	-	-
21 - 30%	-	-	-	1	0.7	25.0	1	0.3	25.0
31 - 50%	35	13.2	46.0	5	3.7	43.0	40	10.0	45.6
Above 50%	215	80.8	81.2	128	94.1	87.6	343	85.3	83.6
Overall	266	100.0	71.7	136	100.0	84.2	402	100.0	76.0

Before the project intervention, the annual cropping intensity in the Nari and Purali rivers showed a predominance of high-intensity agriculture. In the Nari River, 60.2% of the area's farmers had cropping intensities above 125%, with an average intensity of 161.7%. Similarly, the Purali River showed 61% of the area's farmers above 125%, with a higher average intensity of 173.9%.

After the intervention, the percentage of areas with zero cropping intensity reduced significantly, dropping from 4% to 2.7% overall. The area with high cropping intensity above 125% increased further, reaching 74.1% across both rivers. The average intensity also saw an overall increase from 134% to 148.7%.

These findings indicate a positive impact on agricultural productivity, with increased cropping intensity and efficiency across both river systems after the intervention.

Table 7.48: Annual cropping intensity before project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	13	4.9	-	3	2.2	-	16	4.0	-
Up-to 50%	-	-	-	13	9.6	48.3	13	3.2	48.3
51 - 75%	6	2.3	65.1	11	8.1	63.9	17	4.2	64.3
76 - 100%	45	16.9	93.7	18	13.2	99.2	63	15.7	95.3
100 - 125%	42	15.8	116.7	8	5.9	116.6	50	12.4	116.7
Above 125%	160	60.2	161.7	83	61.0	173.9	243	60.5	165.9
Overall	266	100.0	133.0	136	100.0	135.9	402	100.0	134.0

Table 7.49: Annual cropping intensity after project intervention

Percentage	Nari River			Purali River			Overall		
	No.	%	Mean	No.	%	Mean	No.	%	Mean
Zero	11	4.1	-	-	-	-	11	2.7	-
Up-to 50%	1	0.4	50.0	1	0.7	40.0	2	0.5	45.0
51 - 75%	4	1.5	65.0	-	-	-	4	1.0	65.0
76 - 100%	30	11.3	96.4	3	2.2	96.7	33	8.2	96.4
100 - 125%	41	15.4	115.4	13	9.6	120.2	54	13.4	116.6
Above 125%	179	67.3	163.5	119	87.5	174.0	298	74.1	167.7
Overall	266	100.0	139.8	136	100.0	166.2	402	100.0	148.7

The wheat production data before and after the intervention demonstrates notable improvements in both productivity and efficiency.

Before the project, 327 farmers across the Nari and Purali rivers cultivated an average of 10.8 acres with a yield of 21.9 mounds per acre. The cost of production per acre was PKR 32,077, and farmers sold 104.9 mounds overall.

After the intervention, the number of farmers increased to 383, with the cultivated area expanding to 11.9 acres. Yield per acre rose to 26.4 mounds, a 20.5% increase. Production costs slightly increased to PKR 35,718 per acre, but total production surged to 319.3 mounds, and sales grew to 188.6 mounds.

I - Livestock

Data showed that the incidence of livestock ownership displays a difference between the two basins, with 77.9% of households in the Purali River basin owning livestock, compared to only 16.9% in the Nari River basin. Overall, 37.6% of households had livestock. In terms of livestock inventory, the average number of large ruminants was similar in both basins, with Nari River households having slightly fewer adult ruminants in milk and dry than those in Purali River. Small ruminants were more prevalent in the Nari River basin.

The data highlighted significant regional disparities in livestock ownership and inventory.

Table 7.50: Incidence of livestock ownership

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	45	16.9	106	77.9	151	37.6
No	221	83.1	30	22.1	251	62.4
Overall	266	100.0	136	100.0	402	100.0

Table 7.51: Livestock Inventory

Ruminants	Type	Nari River	Purali River	Overall
		Mean	Mean	Mean
Large Ruminants	Adult – in Milk	0.98	1.18	1.12
	Adult – Dry	0.76	0.64	0.68
	Young	0.87	0.80	0.82
	Total	2.60	2.62	2.62
Small Ruminants	Adult – in Milk	1.84	2.95	2.62
	Adult – Dry	6.71	4.25	4.99
	Young	4.00	3.00	3.30
	Total	12.56	10.21	10.91
Chicken Total		5.76	4.48	4.86

Following the intervention in the Nari and Purali river regions, significant changes in livestock inventories were observed. In total, 57.6% of households experienced an increase in livestock, with a more pronounced rise in the Purali River at 67% compared to Nari River at 35.6%. This growth is mainly attributed to increased fodder productivity, particularly in Purali. The availability of increased water and grass also played a role, though to a lesser extent.

However, 9.9% of households noted a decrease, primarily due to diseases, a common issue across both rivers. The remaining 32.5% reported no change in livestock inventory, with the main reason being a lack of willingness to increase, especially in Purali, where 95.5% of respondents cited this reason.

These findings reflect varied impacts of the intervention based on regional factors. These findings highlight the project's positive impact on livestock inventory, particularly through improved fodder availability and overall livestock management practices.

Table 7.52: Change in livestock inventory after the project intervention

Change	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Increase	16	35.6	71	67.0	87	57.6
Decrease	2	4.4	13	12.3	15	9.9
No change	27	60.0	22	20.8	49	32.5
Overall	45	100.0	106	100.0	151	100.0

J - Project Awareness and Satisfaction

The findings highlighted strong awareness and satisfaction with the BIWRMDP project across the Nari and Purali River basins. Data shows that 91% of respondents knew about the project, with full awareness in Purali (100%) and slightly lower awareness in Nari at 86.5%. It also revealed that 85.5% were aware of the project's interventions, with comparable awareness levels in Nari at 84.3%)and Purali at 87.5%.

Data identified irrigation schemes as the most recognized intervention at 96.4% overall, followed by flood protection at 52% and potable drinking water at 45.2%. Awareness of hydro-met systems were 9.4% and rangeland at 24.2% was lower.

These findings indicate high project visibility, with variations in familiarity across specific interventions and regions.

Table 7.53: Knowledge about the BIWRMDP

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	230	86.5	136	100.0	366	91.0
No	36	13.5	-	-	36	9.0
Overall	266	100.0	136	100.0	402	100.0

Table 7.54: Awareness about the BIWRMDP interventions

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	194	84.3	119	87.5	313	85.5
No	36	15.7	17	12.5	53	14.5
Overall	230	100.0	136	100.0	366	100.0

Table 7.55: Knowledge about the BIWRMDP interventions

Based on multiple response

Interventions	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Hydro-met	21	11.0	8	6.7	29	9.4
Irrigation scheme	194	100.0	108	90.5	302	96.4
Potable drinking water	64	33.1	77	64.8	141	45.2
Watershed	64	33.1	66	55.2	130	41.5
Rangeland	21	11.0	54	45.7	76	24.2
Flood protection	64	33.1	99	82.9	163	52.0

The data from highlighted limited knowledge, accessibility, and utilization of Hydro-met information among households before and after the project intervention.

Before the intervention, only 8.3% of households (11.0% in Nari River and 3.8% in Purali River) were aware of Hydro-met information.

Post-intervention, accessibility to Hydro-met data was minimal, with only 0.3% of households accessing it, specifically in the Purali River basin, and social media being the sole source. Utilization was equally restricted, with the single case reported using Hydro-met data for monsoon prediction.

These findings indicate a critical gap in the dissemination and practical use of Hydro-met information, underscoring the need for focused strategies to enhance awareness, accessibility, and application of such data among beneficiaries.

Table 7.56: Knowledge about the Hydro-met information before project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	21	11.0	5	3.8	26	8.3
No	173	89.0	114	96.2	287	91.7
Overall	194	100	119	100	313	100

Table 7.57: Incidence of accessibility to Hydro-met data after project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	-	-	1	0.8	1	0.3
No	194	100.0	118	99.2	312	99.7
Overall	194	100.0	119	100.0	313	100.0

Table 7.58: Assess to Hydro-met data after project intervention

Source	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Social media	-	-	1	100	1	100
Overall	-	-	1	100	1	100

Table 7.59: Utilization of Hydro-met data after project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Monsoon prediction	-	-	1	100	1	100
Overall	-	-	1	100	1	100

Farmers' awareness of Hydro-met data is extremely low, with 98.7% expressing uncertainty. Only 3% in Purali found it "Highly useful," and 1% rated it "To some extent" useful.

The lack of knowledge indicates a need for awareness campaigns to enhance understanding and utilization of Hydro-met data for local benefits.

Table 7.60: Farmers' thought about the accessibility of Hydro-met data for local residents

Rating	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Highly useful	-	-	3	2.9	3	1.0
Useful	-	-	-	-	-	-
To some extend	-	-	1	1.0	1	0.3

Rating	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Not useful	-	-	-	-	-	-
Don't know	194	100.0	115	96.2	309	98.7
Overall	194	100.0	119	100.0	313	100.0

Data showed that none of the respondents across both basins reported receiving training during the project. However, 81.2% of respondents overall benefited from the project interventions, with 82.0% in the Nari River basin and 79.8% in the Purali River basin. The remaining 18.8% of respondents did not report any benefits.

These findings highlight the need to integrate training into future projects to enhance the long-term benefits and sustainability of interventions.

Table 7.61: Incidence of receiving training during the project

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	-	-	-	-	-	-
No	194	100	119	100	313	100
Overall	194	100	119	100	313	100

Table 7.62: Incidence of receiving benefits for project intervention

Incidence	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Yes	159	82.0	95	79.8	254	81.2
No	35	18.0	24	20.2	59	18.8
Overall	194	100	119	100	313	100

The satisfaction level with the project intervention indicated that 70% of respondents across both basins were satisfied, with 10.2% highly satisfied. Dissatisfaction was reported by 9.6%, while 2.2% were highly dissatisfied.

Among satisfied respondents 72.3% attributed their satisfaction to increased water quantity and productivity, while others cited increased cultivable area and improved living conditions. However, reasons for dissatisfaction included works not done properly i.e. 56.5%, lack of community involvement were 40.3%, and no works done in some areas were 3.2% of respondants.

These results underscore the project's significant positive impact on water access and productivity while highlighting areas for improved community engagement and quality assurance.

Table 7.63: Level of satisfaction with the project intervention

Level of satisfaction	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Highly satisfied	23	11.9	9	7.6	32	10.2
Satisfied	134	69.1	85	71.4	219	70.0
Neutral	15	7.7	10	8.4	25	8.0
Dissatisfied	16	8.2	14	11.8	30	9.6

Level of satisfaction	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Highly dissatisfied	6	3.1	1	0.8	7	2.2
Overall	194	100	119	100	313	100

Table 7.64: Reasons for satisfied with the project intervention

Reasons	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Increase water quantity & Increase productivity	157	100.0	24	25.9	181	72.3
Easy access to potable water	-	-	7	7.4	7	2.8
Reduce flood losses	-	-	8	8.6	8	3.2
Increase cultivable area	-	-	32	34.6	32	12.9
Improve living condition	-	-	22	23.5	22	8.8
Overall	157	100.0	94	100.0	251	100.0

Table 7.65: Reasons for not satisfied with the project intervention

Reasons	Nari River		Purali River		Overall	
	No.	%	No.	%	No.	%
Works not done properly	21	56.8	14	56.0	35	56.5
No works done in our area	-	-	2	8.0	2	3.2
No community involvement	16	43.2	9	36.0	25	40.3
Overall	37	100.0	25	100.0	62	100.0

Chapter 8: Environmental Assessment

8.1 Compliance with the Indicators Set to Safeguard the Environmental Impacts of the Project

8.1.1 Introduction

Assessing the environmental impacts—including physical, biological, and socio-economic dimensions—of large-scale projects is a critical requirement under national environmental laws. For the BIWRMDP, this assessment aligns with both national regulations and the World Bank's Environmental and Social Framework, ensuring that potential adverse impacts are identified, mitigated, and managed effectively. Accordingly, an Environmental and Social Impact Assessment (ESIA) was conducted for the overall project. This assessment laid the groundwork for the development of Environmental and Social Impacts Management Plans (ESIMPs) and Contractors' Environmental and Social Impacts Management Plans (CESIMPs) for selected sub-projects.

The ESIA process is designed to safeguard against environmental degradation and socio-economic disruption by ensuring compliance with predefined guidelines. The ESIMPs and CESIMPs are structured to address the challenges encountered during both the construction and operational phases, providing a roadmap for sustainable project implementation. These plans not only mitigate negative environmental and social impacts but also enhance project benefits by promoting sustainability and resilience.

8.1.2 Institutional Arrangements

To implement the environmental safeguards effectively, the BIWRMDP engaged Project Supervision and Implementation Assistance Consultants (PSIAC). Their role encompassed the following responsibilities:

- Preparing ESIMPs for 18 sub-projects, ensuring alignment with both national regulations and World Bank guidelines.
- Preparation of monitoring checklist for small project
- Monitoring the implementation of ESIMPs and CESIMPs during project execution.
- Providing regular progress reports to the Project Management Unit (PMU), highlighting compliance and areas needing improvement.

To ensure a robust monitoring mechanism, a comprehensive set of indicators was developed. These indicators served as benchmarks to evaluate the project's environmental and social performance. Cross-verification of compliance was conducted by the PMU, with additional oversight from MM Pakistan as Third-Party Monitoring and Evaluation (M&E) consultants.

The financial aspect of ESIMP implementation was meticulously planned, with dedicated budgets allocated for each sub-project component. Contractors were held responsible for executing the environmental safeguards, while PSIAC's role extended to monitoring their performance and recommending the release of funds based on satisfactory compliance. This layered approach ensured accountability at every stage of the project lifecycle.

8.1.3 Evaluation Criteria

To assess the effectiveness of ESIMP and CESIMP implementation, a detailed evaluation framework was established. Nine major sub-projects were selected as case studies, representing a cross-section of the broader project. MM Pakistan, as the monitoring agency, produced and submitted eight quarterly reports, providing a continuous stream of data for evaluation.

Given the dynamic nature of project execution, data inconsistencies are common at the initial and final stages. These inconsistencies are often attributed to delays in staff recruitment at the beginning and early

departures toward the project's conclusion. To minimize these variables and ensure a fair assessment, data from the 3rd, 4th, 5th, and 6th quarterly reports was prioritized. These quarters represent the project's peak operational phase, where all components were expected to be functioning at full capacity with optimal resource deployment.

The evaluation process involved analyzing both quantitative and qualitative data to gauge compliance levels and identify gaps in implementation. Key performance indicators (KPIs) were used to measure adherence to environmental and social standards, while stakeholder consultations provided additional context and insights. The findings of this comprehensive evaluation are detailed in subsequent sections, highlighting the successes achieved and challenges encountered during the project's implementation phase.

8.1.4 Indicators and sub-indicators

Nine indicators and 40 sub-indicators were selected for evaluation of compliance. The nine indicators are given below while the 40 sub indicators are given in Annex 1 of this report.

i. Health & safety
ii. Waste Management
iii. Air Pollution Control
iv. Water Pollution Control
v. Noise Control
vi. Traffic management
vii. Storage of Chemical Goods
viii. Training Record
ix. Recruitment of environmental health & safety Staff

8.1.5 Findings of evaluation.

8.1.5.1 Overall compliance

An evaluation of the overall compliance for eight projects was conducted, assessing nine indicators and 40 sub-indicators (refer to Annex 1) over a period of four quarters. The compliance percentages varied significantly across the projects, ranging from 25% to 57.5%.

The lowest compliance (25%) was observed at the Mushkaf Contractor's Camp, (Narri River Basin) reflecting considerable room for improvement in adhering to environmental and social safeguard requirements.

The highest compliance (57.5%) was recorded at the Shub-ai Madain Irrigation Project (Porali River Basin, indicating comparatively better adherence to the established guidelines.

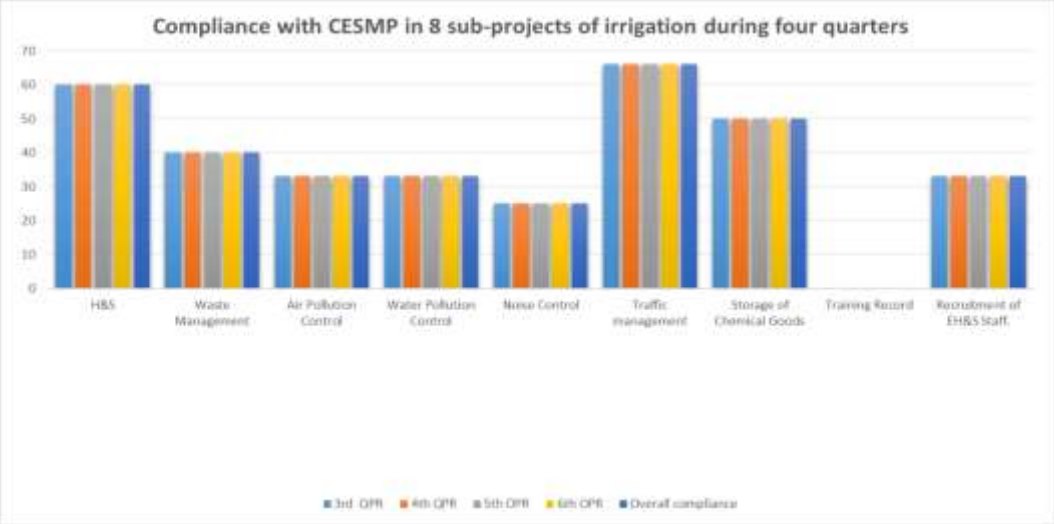
These findings highlight the variability in implementation effectiveness among the different sub-projects, necessitating targeted interventions to address gaps in low-performing areas. A detailed breakdown of the compliance results is presented in Table 1 and illustrated in Figure 1 below.

Table 8.1: Overall compliance of the 8 sub-projects with the indicator and sub-indicators during four quarters

S. No	Name of scheme	3rd QPR (Oct23)	4th QPR (Jan.24)	5th QPR (Apri24)	6th report (July 24)	Overall compliance
1	Nimi Irrigation Scheme (Porali River Bssin)	42.5	42.5	42.5	42.5%	42.5
2	Gundacha Irrigation Scheme (Porali River Basin)	55	55	55	55	55
3	Shub-ai Madain (Porali River Basin)	57.5	57.5	57.5	57.5	57.5
4	Sehan Irrigation Scheme (Narri River Basin)	72	25	25	25	36.8
5	Sehan Package 1 (Narri River Basin)	30	25	25	25	26.2

S. No	Name of scheme	3rd QPR (Oct23)	4th QPR (Jan.24)	5th QPR (Apri24)	6th report (July 24)	Overall compliance
6	Sehan Jan Brothers (Narri River Basin)	67.5	27.5	27.5	27.5	37.5
7	Conduit channel zero point in Sibi Musa Jan Co. (water supply schem sibi town, Narri Rivber Basin)	77.5	32.5	32.5	32.5	43.8
8	Mushkaf Contractor Camp Noor-ul-Haq Brothers. (flood Irrigation Scheme, Narri River Basin)	-	25	25	25	25
	Average performance	57.4	32.18	32.18	32.18	40.5

Figure 8.1: Overall compliance of the 8 sub-projects during four quarters



8.1.5.2 Compliance of Individual Projects with Individual Indicators

To evaluate the compliance of individual indicators, two irrigation projects were selected, one each from the Nari and Porali River Basins.

i) Nimmi Irrigation Scheme (Porali River Basin): Compliance with Individual Indicators

For this project, compliance was assessed against 40 sub-indicators of 9 primary indicators over four quarters. The data, collected and submitted by the MMP, underwent detailed analysis.

The findings revealed that the Nimmi Irrigation Scheme complied with 17 sub-indicators, while it failed to comply with 23 sub-indicators, resulting in an overall compliance rate of 42.5%. The poorest performance areas included:

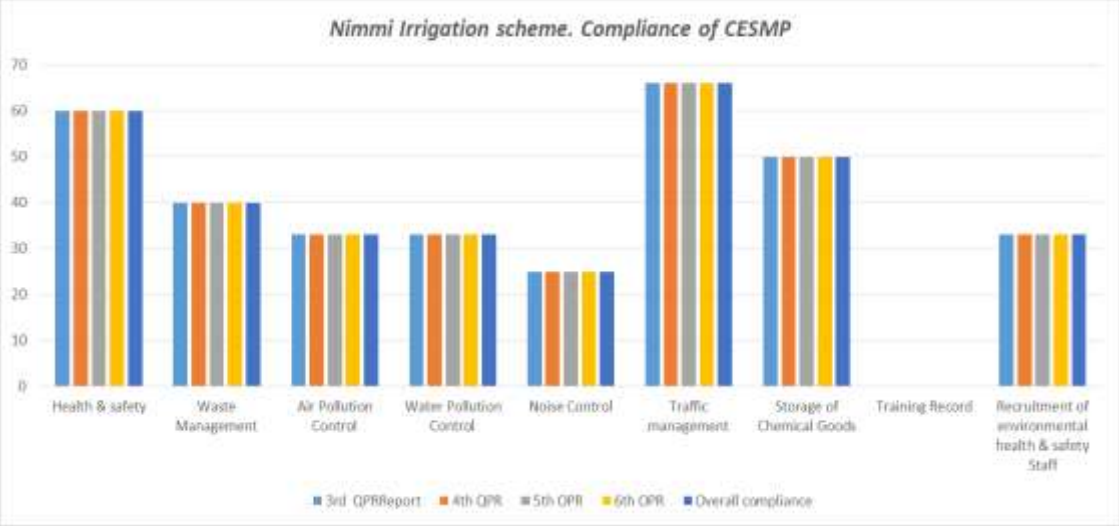
- Training Records: Compliance was recorded at 0%.
- Noise Pollution Management: Compliance stood at 25%.
- Recruitment/Availability of Environmental, Health, and Safety Staff: Compliance was 33%.
- Air and Water Quality Monitoring: Compliance reached only 33%.

These results underscore significant gaps in project implementation, particularly in capacity-building initiatives and environmental monitoring measures. A detailed breakdown of the findings is presented in the table below:

Table 8.2: Compliance of Nimmi Irrigation project (Porali River Basin) with 40 sub-indicators of 9 indicators.

S. No	Indicators	3rd QPR	4th QPR	5th QPR	6th QPR	Overall compliance
1	Health & safety	60	60	60	60	**60**
2	Waste Management	40	40	40	40	**40**
3	Air Pollution Control	33	33	33	33	**33**
4	Water Pollution Control	33	33	33	33	**33**
5	Noise Control	25	25	25	25	**25**
6	Traffic management	66	66	66	66	**66**
7	Storage of Chemical Goods	50	50	50	50	**50**
8	Training Record	0	0	0	0	**0**
9	Recruitment of environmental health & safety Staff	33	33	33	33	**33**
	Overall compliance (indicator and percentage)	**17/40 42.5%**	**17/40 42.5%**	**17/40 42.5%**	**17/40 42.5 %**	**42.5%**

Figure 8.2: Compliance of Nimmi Irrigation (Porali River Basin) project with 40 sub indicators of 9 indicators.



ii) Sehan Package-1 irrigation scheme located at Nari River Basin

On the whole, this project complied with 10 sub-indicators out of 40 during three quarters and with 12 sub-indicators during one quarter. This results in an overall compliance rate of 26.25%. The worst performance areas were as follows:

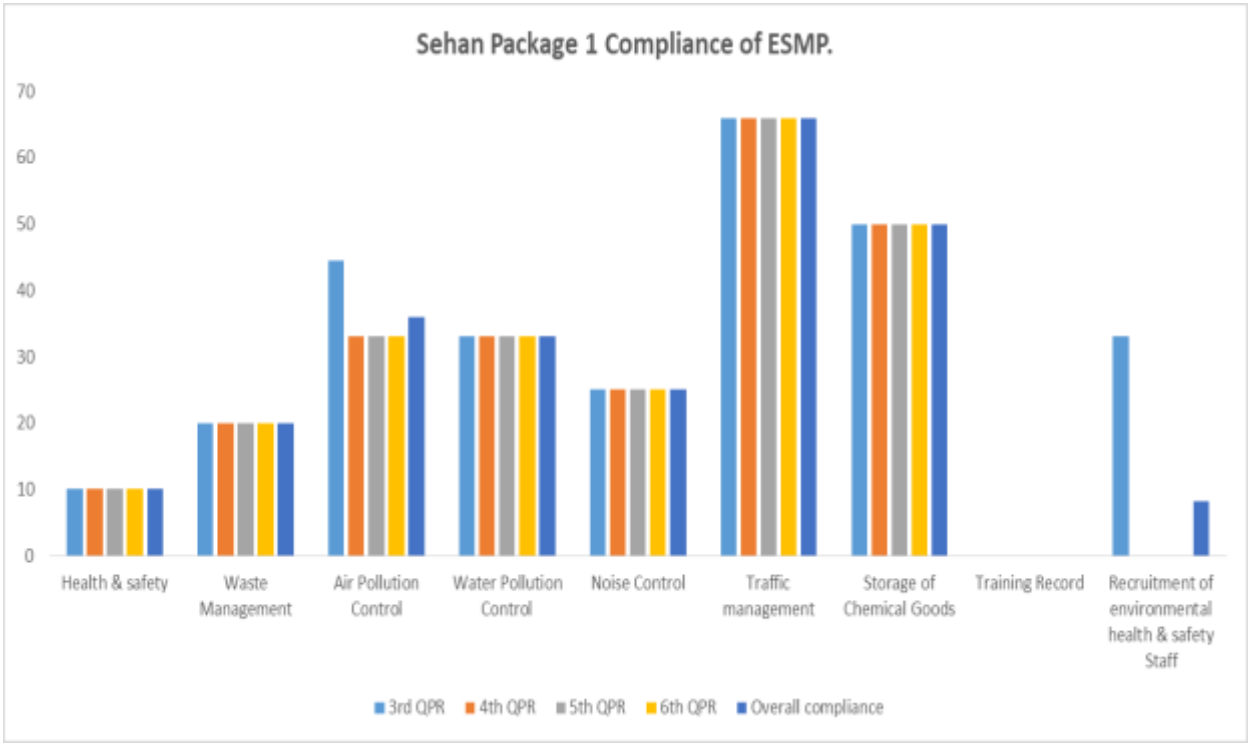
- Training Records: Compliance was recorded at 0%.
- Recruitment/Availability of Environmental Staff: Compliance was 8.25%.
- Health and Safety Staff Availability: Compliance stood at 10%.

These findings reflect critical shortcomings in capacity building, staff recruitment, and implementation of health and safety measures. A detailed breakdown of the findings is given in the table below:

Table 8.3: Sehan Package 1 (Narri River Basin) Compliance with environmental, health and safety indicators.

Indicators	3rd QPR	4th QPR	5th QPR	6th QPR	Overall compliance
Health & safety	10	10	10	10	**10**
Waste Management	20	20	20	20	**20**
Air Pollution Control	44.4	33	33	33	**35.9**
Water Pollution Control	33	33	33	33	**33**
Noise Control	25	25	25	25	**25**
Traffic management	66	66	66	66	**66**
Storage of Chemical Goods	50	50	50	50	**50**
Training Record	0	0	0	0	**0**
Recruitment of environmental health & safety Staff	33	0	0	0	**8.25**
Overall compliance	**12/28 30%**	**10/30 25 %**	**10/30 25%**	**10/30 25%**	**26.25%**

Figure 8.3: Sehan Package 1 Compliance with environmental, health and safety indicators.



iii) Evaluation of Compliance and Budget Allocation for Nimmi Irrigation Project (Porali River basin)

A highly transparent mechanism has been established for implementing the Environmental and Social Impact Management Plan (ESIMP). A dedicated budget has been allocated for each component of the Environmental and Social Management Plan (ESMP), to be executed by contractors. The contractor's payment bills are reviewed and initially recommended by the Project Supervision and Implementation Advisory Committee (PSIAC) to the Project Management Unit (PMU). The PMU further verifies the bills before submitting them to the Project Director (PD) for final approval and payment.

Upon reviewing the budget allocation for the Nimmi Irrigation Project, it is evident that 45.5% of the total budget is designated for staff (35.5%) and training (8.9%). However, the compliance performance for these two indicators remains subpar, with a 0% compliance rate for training records and only 25% compliance for staff recruitment and availability.

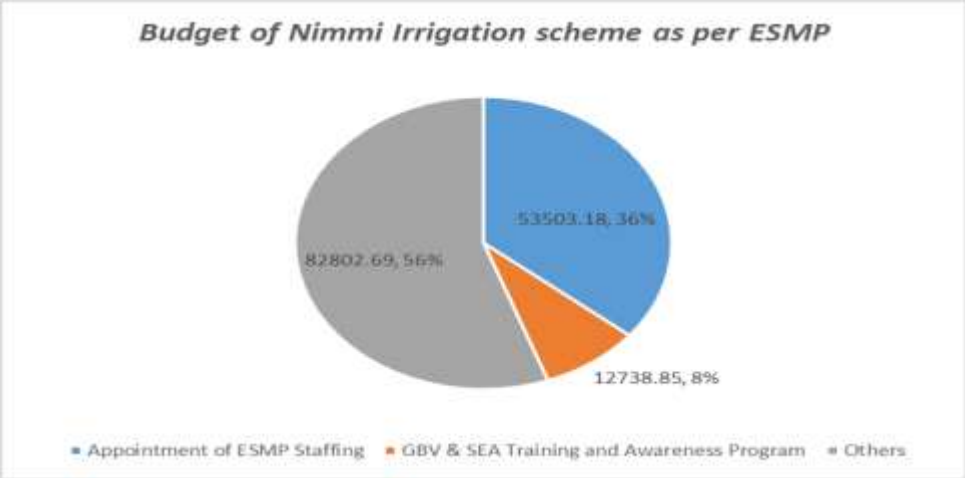


Table 8.4: Nimmi Irrigation scheme. Budget for Compliance of CESMP

S.No	Description	Cost in PKR @156/-	Cost in USD	% age
1.	Preparation and Implementation of Contractor ESMP (Pollution Prevention Plan (Air/Noise/Waste/Sanitary waste management plans), Traffic Management Plan, EHS training Plan)	150,000 Rupees/Month X 24 months= 3,600,000 Rupees	22930	15.38%
2.	Preparation and Implementation of Contractor Health and Safety Plan (Detailed HSP, emergency plan)	150,000 Rupees/Month X 24= 3,600,000 Rupees	22930	15.38%
3.	**Appointment of ESMP Staffing**	**350,000 Rupees/Month 24 months= 8,400,000 Rupees**	**53503.18**	**35.9%**
4.	Baseline Ambient Air/Water/Noise Monitoring	3,000,000 Rupees (lumpsum for 2 years)	19108.3	12.8%
5.	GRM (All expenses to be incurred in GRM implementation)[8]	1,300,000 Rupees	8280.25	5.55%
6.	**Trainings on GBV and SEA for Contractor and PSIA staff including awareness session for the communities and develop printing materials to be disseminated.**	**Total= 2 M** (be included in Contractor's budget)	**12738.85**	**8.55%**
7.	One ground water hand pump in each sub-project settlement	Total=1,000,000 (to be included in	6369.43	4.27%

S.No	Description	Cost in PKR @156/-	Cost in USD	% age
		Contractor's budget)		
9	Contingency[9]	500,000 Rupees	3184.71	2.1
	Total ESMP Budget	23,400,000 (PKR)	149044.72 USD	

iv) Evaluation of Compliance and Budget Allocation for Sehan Package-1 (Narri River Basin)

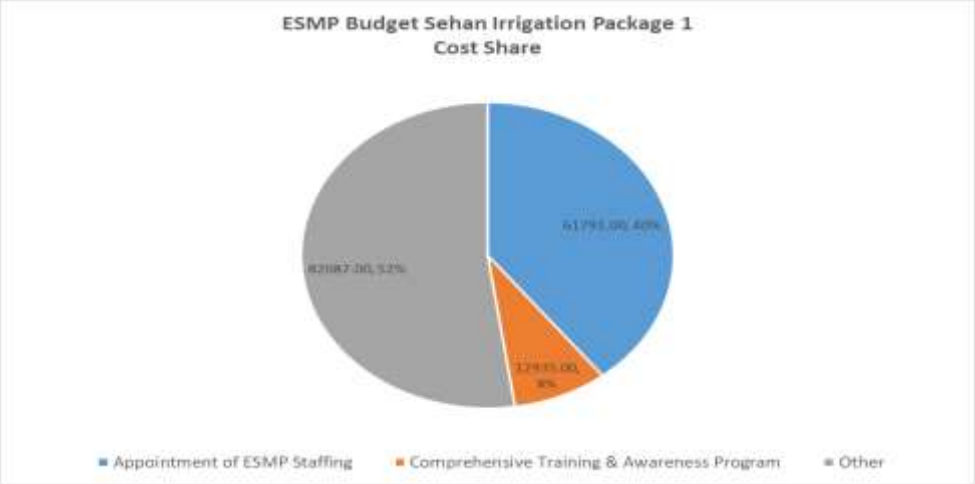
Upon reviewing the budget allocated for the Sehan Package-1 irrigation project, it is observed that nearly half of the total budget (50.1%) is allocated for staff (41.4%) and training (8.7%). However, the compliance performance for these two indicators is concerning, with 0% compliance for training records and only 8.25% compliance for staff recruitment and availability. The findings are presented in Table 4 and Figure 4 below.

Table 8.5: Sehan Package -1 Irrigation scheme. Budget for Compliance of CESMP

S. No.	Description	Estimated Cost (PKR)	In US $ *@ 201 PKR*	
1.	Preparation and Implementation of Contractor Environmental and Social Management Plan	Rs. 5,750,000 Rup	28,607 $	19.1 %
2.	Preparation and Implementation of Contractor Health and Safety Plan *emergency plan) (Detailed HSP,*	5,750,000 Rupees	28,607$	19.1%
	Appointment of ESMP Staffing:	**12,420,000 Rupees**	**61,791 $**	**41.4 %**
4.	Baseline Ambient Air/Water/Noise Monitoring (and machinery	1,000,000 Rupees	4975 $	3.3%
5.	Develop GRM Mechanism and training of GRM committees, contractor, and PSIA staff (All expenses to be incurred in GRM implementation)	1,000,000 Rupees *(Cost to be borne by PMU)*	4,975 $	3.3%
6.	**Training on Covid-19, environmental health and safety, GBV and SEA, for Contractor and PSIA staff including awareness sessions for the communities and develop printing materials to be disseminated[39].**	**PKR 200,000 lump-sum /event (250 number of persons, 13 trainings & 6 sessions). Total=2,600,000 (Cost to be borne by PMU)**	**12,935 $**	**8.7 %**
7.	Dealing with Covid-19 Emergency	1,500,000 (Cost be borne by PMU)	7,462 $	5%

S. No.	Description	Estimated Cost (PKR)	In US $ *@ 201 PKR*	
8.	Contingency [10]	15,000,00 *(be borne by PMU)*	7462 $	5%
9.	Total ESMP Budget	30,020,000 PKR	149,353[42] $	10$%??

Figure 8.4: Sehan Package -1 Irrigation scheme. Budget for Compliance of CESMP



v) Compliance in project located in Porali and Narri River Basin.

When compare three irrigation projects located in Porali Rivber Basin (Nimi Irrigation Scheme, Gundacha Irrigation Scheme and Shub-ai Madain with the three irrigation schemes located in Narri Irrigation Basin (Sehan Irrigation Scheme, Sehan Package 1, and Sehan Jan Brothers there is marked difference with average compliance at 45.6% in Porali Basin Projects against 33.5% compliance in projects located in Narri River Basin.

8.1.5.3 Conclusion:

The overall performance in implementing the Environmental and Social Management Plan (ESMP) has been below expectations. The Nimmi Irrigation Scheme (Porlai Basin) shows weak compliance, with a rate of 42.5%, while the Sehan Package-1 (Nari Basin) performs even worse, with a compliance rate of just 26.25%.

Staff recruitment and training records are the most poorly performing indicators across both schemes. In the Nimmi Irrigation Scheme, staff recruitment compliance stands at 25%, with no compliance (0%) recorded for training. Similarly, in Sehan Package-1, staff recruitment compliance is only 8.25%, and training compliance remains at 0%. This trend of poor performance in staff recruitment and training indicators is evident across all projects.

When comparing the overall performance of health safety and environmental indicators in the projects located at two River Basins, the projects located in the Porlai River Basin have shown relatively better performance compared to those in the Nari River Basin.

8.1.5.4 Suggestions:

The outcome of the evaluation should be compared with the budget releases and expenditures to assess the alignment between financial allocations and actual performance.

8.1.5.5 Recommendation:

No payments should be made to contractors unless the Environmental Specialist at the Project Management Unit (PMU) verifies that expenditures are in accordance with the requirements of the ESIMP.

8.2 Sub-Component A2: Hydro-Meteorological Data Collection and Management

8.2.1 PDO Outcome 1: Hydro-Met Data Accessible Online

The primary objective of this sub-component under the Balochistan Integrated Water Resources Management and Development Project (BIWRMDP) is to establish a robust hydro-meteorological data collection and management system. This system is designed to provide online accessibility to real-time and historical data, thereby supporting evidence-based water resource planning and decision-making for various stakeholders. Farmers, government officials, and researchers across Balochistan will benefit from this data-driven platform.

Monitoring networks in the Nari and Porali river basins have been established to systematically collect and transmit climate, surface water, and groundwater data. The system ensures reliable data storage and retrieval for stakeholders, including public access to critical information.

This effort directly addresses the persistent gap in water resource planning caused by the absence of reliable and accessible data. Government officials engaged in irrigation, agriculture, and disaster management are among the primary beneficiaries, as the newly generated datasets will enhance their ability to allocate resources effectively, mitigate risks, and plan for sustainable development.

To meet the PDO outcome, a network of monitoring stations was established across the Nari and Porali river basins, ensuring data availability from critical locations. These installations are detailed in subsequent sections, with specific descriptions of the stations and their contributions to achieving the project's objectives.

8.2.2 Output 1.1 of PDO Outcome 1: Operational Hydro-Met and Groundwater Monitoring Stations.

For decades, Balochistan has suffered from the absence of reliable hydro-meteorological data due to the deterioration of existing systems, compounded by recurring natural disasters such as floods and droughts. Recognizing this gap, the BIWRMD project has taken significant steps to establish a comprehensive network of hydro-meteorological instruments. These installations aim to provide real-time and historical data essential for water resource management, agricultural planning, and disaster risk reduction.

Table 8.6: Installation of Hydro-Met Infrastructure/Stations

Sr. No	Description	Total
1	Fully automatic climate stations and communications	7
2	Rainfall recording stations and communication	12
3	Stream flow gauging stations and communications	9
4	Groundwater monitoring wells	15
	Total	**43**

Source: Buraq Integrated Solutions

This infrastructure lays the foundation for sustainable water resource management by integrating advanced technology and data analytics. Each type of station plays a critical role in capturing specific data points, which are then synthesized into actionable insights for water management and climate adaptation strategies.

8.2.3 Evaluation

8.2.3.1 Physical Progress

By December 2024, all 43 planned hydro-meteorological instruments had been successfully installed, marking a significant milestone for the BIWRMD project. These installations include climate stations, rainfall recording stations, stream flow gauging stations, and groundwater monitoring wells. A detailed list of the installation sites is provided in the appendix.

Additionally, telecommunication systems, data storage facilities, and analysis software have been fully operationalized. This infrastructure ensures seamless data collection, transmission, and analysis. Government staff were trained in operating and maintaining these systems, as well as in performing advanced water resource analysis and modelling. These capacity-building efforts are integral to the project's sustainability.

To further enhance the utility of collected data, the project has invested in a centralized IT system. This system is equipped to compile, store, and manage hydro-meteorological data while integrating it with spatial information layers representing the Nari and Porali river basins. This integration facilitates GIS-based analysis, empowering stakeholders to make data-driven decisions in water resource management, disaster mitigation, and climate adaptation.

8.2.3.2 Shortcomings/observations along with suggestions and recommendations

I. Site Selection

The selection of monitoring sites was initially guided by technical factors such as elevation, hydrological importance, and the intended purpose of data collection. However, due to prevailing security concerns in Balochistan, the safety of instruments became the primary consideration. Consequently, most installations were sited near irrigation department offices and other secured facilities, ensuring protection but potentially limiting spatial coverage.

A. Fully Automatic Climate Stations (FACS)

FACS were installed at strategically chosen locations to provide comprehensive climate data, including temperature, humidity, wind speed, and solar radiation. These stations support long-term analysis of climate trends and inform decision-making for agriculture and water management. List and pictures of FACS installed under the project are given at Annex 2.1.

Observations: The prioritization of security resulted in station placement near irrigation offices, which may have limited their spatial representativeness, particularly in remote agricultural areas.

B. Rainfall Recording Stations (RRS)

Rainfall recording stations monitor spatial rainfall variability, critical for understanding flood risks and groundwater recharge. These stations provide data essential for designing flood mitigation measures and assessing water availability in arid and semi-arid zones. List and pictures of RRS installed the project are given in Annex 2.2.

Observations: While installations near secure facilities ensured safety, the lack of coverage in remote, rainfall-prone areas could limit the data's utility for regional planning.

C. Groundwater Monitoring Wells (GWMW)

Groundwater monitoring wells focus on aquifers critical for irrigation, drinking water, and industrial use. They track groundwater levels, quality, and recharge rates, providing data vital for sustainable water management. List and pictures of GWRM installed under the project are given Annex 2.3.

Observations: Due to security constraints, wells were installed near institutional facilities, potentially excluding critical over-extraction zones from the monitoring network.

D. Stream Flow Gauging Stations (SFGs).

Maintaining streamflow gauges presents several challenges, including environmental factors like sedimentation, floods, erosion, debris, and seasonal changes all of which can damage equipment or disrupt measurements. Technological issues, such as sensor malfunctions, calibration needs, and data transmission failures, further complicate operations. Logistical constraints, including the remote locations of gauges, limited power supply, and resource shortages, make maintenance difficult. Additionally, factors like channel shifts, biological activity, and calibration drift can compromise data accuracy. List of SFGs are installed under the project are given in Annex 2.4.

Addressing these issues requires regular maintenance, durable and automated equipment, protective measures, and adequate funding and skilled personnel

While the emphasis on security was justified, it compromised the spatial and functional coverage of the monitoring network. A balanced approach, incorporating both secure installations and community-managed stations, could have enhanced the data's representativeness and utility.

Recommendations

i. Periodic evaluation of the monitoring network's effectiveness in meeting project objectives, including data accuracy, spatial coverage, and decision-making support.
ii. Collaboration with the Meteorology Department and other stakeholders to address gaps in data coverage.
iii. Consider future expansions that balance security and functional needs.

II Lack of Coordination with the Meteorology Department and Duplication of Equipment

A significant challenge identified during the evaluation was the lack of coordination between the BIWRMD project and the Meteorology Department. This gap resulted in resource duplication and inefficiencies, undermining the potential benefits of the hydro-meteorological network.

A. Duplication of Efforts

Redundant installations at locations such as Loralai and Much led to unnecessary financial and technical resource expenditures.

B. Data Silos

The absence of a data-sharing mechanism between the BIWRMD project and the Meteorology Department restricted the comprehensive use of collected data, limiting its impact on policy and planning.

E. Missed Synergies

The Meteorology Department's expertise in climate monitoring and forecasting could have significantly enhanced the BIWRMD project. However, the lack of collaboration meant these synergies remained untapped.

Recommendations

i. Establish a Memorandum of Understanding (MoU) to facilitate data-sharing and collaboration.

ii. Develop a centralized data repository accessible to both the Meteorology Department and the BIWRMD project.
iii. Conduct an audit to identify and eliminate redundancies, optimizing resource allocation.

III. Institutional and Human Resource Constraints

A. Insufficient Training.

The BIWRMD project has taken some steps toward capacity building by arranging foreign training for 4-5 Assistant Directors as Master Trainers. These trainers are expected to be proficient in the installation, operation, and troubleshooting of hydro-meteorological equipment. However, this effort has been limited to a small group, leaving a significant portion of the technical staff without adequate training. As a result, most personnel lack the skills required for effective data collection, analysis, and system maintenance. This skills gap can hinder the project's objectives, especially in ensuring the long-term functionality and utility of the monitoring systems.

B. Staff Turnover.

High turnover and frequent transfers of government staff are recurring challenges in Balochistan. Such disruptions not only result in the loss of institutional knowledge but also hinder continuity in system operation and maintenance. Newly assigned personnel often lack familiarity with the technical systems, leading to delays in troubleshooting, data analysis, and decision-making processes.

Recommendations.

i. **Immediate Training at the District Level**

a. Conduct district-level training programs for technical staff, leveraging the expertise of the Master Trainers already trained under the project. These programs should focus on the practical aspects of equipment handling, data analysis, and troubleshooting. By creating a larger pool of skilled personnel, the system can maintain continuity despite staff transfers or resignations.

b. Extend training to include field operators, irrigation staff, and other relevant personnel to ensure a comprehensive skill set is available across the workforce.

ii. Ongoing Professional Development

a. Institutionalize continuous professional development programs for irrigation department staff. Topics should include advanced equipment operations, data modeling, and calibration techniques. Workshops and refresher courses should be conducted periodically to keep the staff updated on technological advancements and best practices.

iii. Building Strategic Partnerships

a. Forge collaborations with academic institutions, research centers, and relevant government departments such as the Meteorology Department and Agriculture Department. These partnerships can facilitate knowledge sharing, technical assistance, and joint capacity-building initiatives.

b. Introduce internship and fellowship programs in collaboration with universities to involve young professionals and students in hydro-meteorological data management and water resource planning.

iv. Establishment of a Dedicated Unit

a. Create a dedicated unit within the Irrigation Department for managing hydro-meteorological data. This unit should be responsible for data collection, storage, analysis, and dissemination.

IV. Financial Constraints

A. Budgetary Challenges

Maintenance and operational budgets for hydro-meteorological systems are often insufficient. Delayed allocation of funds can lead to breakdowns going unrepaired, reduced system efficiency, and missed opportunities for data collection. The costs associated with state-of-the-art equipment, software, and IT systems are significant, particularly in resource-constrained environments like Balochistan. These financial limitations can jeopardize the project's sustainability and scalability.

B. Procurement and Maintenance Costs

The high costs of procuring, installing, and maintaining advanced monitoring systems pose a significant challenge. For example, specialized equipment such as automatic weather stations and groundwater monitoring wells require periodic calibration, which adds to operational expenses. Power supply issues, especially in remote areas, further increase costs by necessitating alternative energy solutions such as solar panels.

Recommendations

i. **Awareness Campaigns**

a. Launch awareness campaigns targeting policymakers, stakeholders, and funding agencies to emphasize the critical role of hydro-meteorological data in resource management, disaster risk reduction, and climate change adaptation. Highlighting the socio-economic benefits of investing in these systems can garner greater financial support.

ii. **Leveraging Climate Finance Mechanisms**

a. Secure international funding by aligning the project's objectives with global climate finance mechanisms such as the Green Climate Fund (GCF), Global Environment Facility (GEF), and other donor agencies. These organizations prioritize initiatives that contribute to climate resilience and sustainable development.

b. Prepare project proposals and applications highlighting the BIWRMDP's potential to address climate vulnerabilities and support sustainable water management.

iii. **Monetization of Data Services**

a. Explore opportunities to monetize hydro-meteorological data by providing subscription-based services to other projects/departments and research institutions. Revenue generated from these services can help sustain the network's operations.

V. Use and Purpose of Hydro-Meteorological Data

The data collected serves multiple critical purposes:

1. **Water Resource Planning:** Enables efficient water allocation.
2. **Flood and Drought Management:** Supports early warning systems.
3. **Climate Change Adaptation:** Provides evidence for adaptive measures.
4. **Policy Formulation:** Empowers evidence-based decision-making.
5. **Public Awareness:** Promotes transparency and community engagement.

Recommendations for Future Expansion

1. Extend the monitoring network to additional river basins.

2. Incorporate advanced climate modelling tools.
3. Develop mobile applications for real-time alerts.
4. Add soil moisture monitoring for precision agriculture.
5. Partner with global initiatives to enhance data-sharing and expertise.

8.3 Watershed Management and Rangeland Management Plant Production through Raising of Nurseries and other allied Activities

8.3.1 Introduction.

The arid and semi-arid landscapes of Baluchistan face significant environmental challenges, including water scarcity, soil degradation, deforestation, and the adverse impacts of climate change. To address these pressing issues, a series of innovative projects have been launched, focusing on integrated water management, afforestation, and ecosystem restoration in key river basins such as Porali and Nari. These initiatives, including the construction of check dams, compact and cluster plantation schemes, and water harvesting for dry afforestation, aim to enhance groundwater recharge, reduce soil erosion, mitigate climate change, and improve the livelihoods of local communities. This report critically examines the environmental and climatic benefits of these projects, highlights the challenges encountered, and provides actionable recommendations to ensure their long-term sustainability and effectiveness.

8.3.2 Physical progress.

A summary of the major sub-projects along with physical progress is given below

Sr. No	Name of Scheme	Location	Start Date	Physical Progress (October 2024)
1	Dry Afforestation through water harvesting structures in Porali Basin (Package-2)	Porali River Basin	04/29/21	100%
2	Construction of Check dams Porali River Basin (Package 2)	Porali River Basin	07/10/21	89%
3	Construction of Check dams for Nari Basin	Narri River Basin	11/13/21	100%
4	Compact, Cluster and Blok Plantation (Lot 1 – Nari Basin)	Narri River Basin	11/13/21	100%
5	Compact, Cluster and Blok Plantation (Lot 2 – Porali Basin)	Porali River Basin	11/13/21	100%

Source PSIASC and field visits by MMP staff.

8.3.3 Evaluation:

Two project located at Porali basin one each from Dry afforestation and the other of block plantation were selected for evaluation. Gist of evaluation below.

8.3.3.1 Dry Afforestation through Water Harvesting Structures in Porali Basin

Location **Porali River Basin**

Start Date **04/29/21**

Physical Progress (October 2024) **100%**

Project scope. Water harvesting through Earthen Bunds (4,400 Nos) on 2,940 acres. Along with plantation and sowing -Package-2 in Juman bent/ Nurge Hingri Awra Uthal, Wadh/ Khuzdar and Shab e Medan. Porali Basin. Plantation of 117,600 plants.watering, protection and maintenance.

8.3.3.2 Earthen bunds (Eyebrow shape) planation

One of the very successful interventions of the BIWRMP plantation in Uthal and other regions of Porali basin was plantation through the Eyebrow technique. This is a micro-catchment water harvesting technique that involves creating crescent-shaped structures, often called "eyebrows," to capture and retain rainwater around the base of plants or trees in dry or arid regions. These structures are designed to maximize water infiltration and minimize runoff, improving the survival and growth rates of vegetation. Along with use this technique, nativ drought resistance species are selected which will have a good survival rate in case of extreme weather.

Fig. Eyebrow plantation in Uthal region

a. Advantages:

This technique reduces surface runoff and increases water availability for plants and prevents soil erosion on slopes. It enhances the establishment and growth of vegetation in arid and semi-arid regions and requires minimal tools and materials. It encourages the growth of native plant species and supports ecological balance. It is a good technique for climate adaptation to mitigate the effects of water scarcity and enhance vegetation cover in degraded landscapes

b. Long-term benefits of dry afforestation through water harvesting towards the environment and climate change

Dry afforestation through water harvesting has significant long-term environmental and climate change benefits. Addressing water conservation, soil health, and ecosystem restoration contributes to sustainable land management and climate resilience. Vegetation absorbs atmospheric CO_2, reducing the overall greenhouse gas concentration. It prevents land degradation and promotes vegetation which helps regulate local climate and reduces the impacts of extreme heat. Improved soil moisture and groundwater recharge make ecosystems more resilient to prolonged dry spells. It also reduces the intensity of flash floods by slowing down water runoff and enhancing absorption into the ground. Below are the key long-term benefits:

- Enhances vegetation cover in arid regions, which mitigates desertification and reduces soil erosion.
- Supports biodiversity by creating habitats for wildlife.
- Sequesters carbon, contributing to climate change mitigation.
- Promotes water conservation by utilizing harvested water efficiently for afforestation.

c. Challenges:

- Limited availability of water during prolonged droughts.
- Maintenance of water harvesting structures requires sustained funding and technical expertise.

d. Maintenance:

- Check structures after rainfall for breaches or erosion,
- Repair damaged berms and remove any accumulated debris.

e. Suggestions:

- Use satellite monitoring to track the success of afforestation and water harvesting over time.

Name of the scheme:	**Block Plantation on State Forest and Community lands in Porali Basin Lot-2 at Awra state forest land Uthal, Shabe e Medan/ Wadh Khuzdar.**
Location	**Porali River Basin**
Start Date	**04/29/21**
Physical Progress (October 2024)	**100%**
Project scope.	**222,600 plants on 300 acres, bore (5- No), solar system (5-No), laying of pipe, water storage tank (10-No), watcher hut (1-No) watering etc**

8.3.3.3 Block Plantation.

Block plantation using solar tube wells is an effective strategy for rehabilitating degraded lands, particularly in arid and semi-arid regions like Uthal and other parts of Balochistan. This approach combines renewable energy, water management, and reforestation techniques to address land degradation and climate challenges. A very successful intervention of the BIWRMP was observed in Polari basin.

8.3.3.4 Block Plantation: Advantages, Long-term Benefits, Maintenance, and Suggestions

a. Advantages

- **Efficient Use of Renewable Energy:** Utilizing solar-powered tube wells ensures a sustainable water source for plantation, minimizing dependency on conventional energy.
- **Rehabilitation of Degraded Lands:** The initiative helps restore soil fertility, making barren lands productive again.
- **Climate Resilience:** Afforestation in arid regions reduces the risk of desertification and provides a natural shield against extreme weather events.
- **Water Resource Optimization:** The project integrates water harvesting and storage systems, addressing water scarcity issues effectively.

b. Long-term Benefits of Dry Afforestation through Water Harvesting

- **Environmental Restoration:** Increased green cover improves biodiversity, enhances soil quality, and reduces erosion.
- **Carbon Sequestration:** Large-scale plantations act as carbon sinks, contributing to the mitigation of global warming.
- **Enhanced Water Cycle:** Water harvesting structures recharge groundwater and improve water availability for future use.
- **Climate Change Adaptation:** By promoting vegetation in arid and semi-arid regions, the project helps stabilize microclimates and reduces the adverse impacts of climate change.
- **Livelihood Opportunities:** The initiative creates long-term economic benefits for local communities through jobs related to plantation, maintenance, and ecotourism.

c. Challenges in Block Plantation Projects.

Water Scarcity: Limited rainfall, groundwater depletion, and water resource competition.

High Costs: Expensive infrastructure and land preparation.

Maintenance Issues: Funding gaps and lack of skilled technicians for upkeep.

Climate Change Impacts: Erratic weather, droughts, and heat stress on plants.

d. Maintenance

Proper upkeep of water harvesting structures and plantation areas is crucial for long-term success.

- **Regular Monitoring**:
  - Inspect structures after rainfall to identify breaches or erosion.
  - Ensure water storage tanks and pipelines are functioning effectively.
- **Repair and Clean-Up**:
  - Fix damaged berms or embankments to prevent water loss.
  - Clear debris from water harvesting structures to maintain efficiency.
- **Sustained Funding**: Maintenance requires consistent financial resources and technical expertise to ensure the longevity of the project.

e. Suggestions

- **Policy Support:** Advocate for long-term government funding and incentives for similar afforestation projects.
- **Expansion Opportunities:** Extend the scope of the project to other regions in Balochistan facing similar environmental challenges

8.4 Common Challenges after Project Completion and Recommendation for both Components (eyebrow and block plantation)

8.4.1 Financial Sustainability:

Problem: Solar tube wells and related equipment (pumps, pipes) may experience wear and tear over time, especially in harsh weather conditions. Similarly, extreme weather events like hailstones may damage the solar panel. All these will require finances and financial constraints after project completion can hinder the long-term maintenance of the plantation, especially if revenues or external funding are insufficient.

Recommendation:

i. Explore alternative revenue-generating activities linked to the plantation, such as eco-tourism, agro-processing, or selling by-products (e.g., wood, fruits).
ii. Secure long-term funding by aligning the project with international climate financing mechanisms (e.g., GCF).
iii. Promote awareness campaigns to ensure community involvement in plantation protection and sustainability.

8.4.2 Watch and ward system:

To look after the plantation a proper guard room with extra space for storage of equipment is required. The is no proper room for the guard and any equipment to be stored. The Guards are using the temporary wooden structure given below at various block plantation sites. These are not suitable at all for any human being to during harsh weather and rain.

Fig. Guard room at the site of block and eye-brow plantation in Uthal (Porali basin)

Recommendation:

i. Establish proper guard rooms for the watch and ward staff of the project
ii. Establish a regular maintenance schedule for the infrastructure of solar power systems and water storage tanks.

8.4.3 Contributions to Climate Change Mitigation

Over time, the project can offset significant greenhouse gas emissions because trees and shrubs absorb CO_2 from the atmosphere, acting as carbon sinks. Renewable Energy Integration by using solar tube wells reduce reliance on fossil fuel-powered pumps, lowering the project's carbon footprint. They also promote the use of clean energy, aligning with climate action goals. Increased vegetation moderates local temperatures and humidity and enhances cloud formation and local precipitation through evapotranspiration.

8.4.4 Contributions to Environmental Improvement

Vegetation stabilizes soil, preventing erosion and improving fertility over time. Organic matter from plants enhances soil structure and water-holding capacity. It provides habitat for native species, encouraging the return of flora and fauna and increases pollinators, supporting surrounding agricultural activities. The root systems increase water infiltration, helping recharge aquifers and reducing the risk of over-extraction. Provides opportunities for employment and improves access to water and land productivity for agriculture and livestock.

8.4.5 Economic value and rate of return (RoR).

The traditional economic evaluations of block plantation projects in arid areas tend to overlook the environmental and climate benefits, focusing mainly on immediate costs and financial returns. To address this gap, it's important to incorporate environmental such as carbon sequestration, water retention, soil fertility improvement, habitat restoration, and climate resilience into the economic value assessment, especially when dealing with degraded or arid lands.

8.5 Construction of Check Dams, Porali River and Nari River Basin (Package-2)

Benefits:

- Reduces soil erosion and sediment transport, improving land stability and water quality downstream.
- Enhances groundwater recharge, providing a sustainable water source for agriculture and communities.
- Mitigates flash floods, protecting infrastructure and human lives.
- Supports vegetation growth by increasing soil moisture.

Challenges:

- Siltation of dams over time, reducing their storage capacity.
- High construction costs and technical demands in remote areas.
- Risk of improper dam placement, leading to suboptimal performance.

Suggestions:

- Regularly desilt and maintain dams to ensure functionality.
- Integrate modern technologies like GIS to optimize dam placement.
- Combine check dams with additional measures like contour bunding for maximum impact.

8.6 Mangrove Planation

8.6.1 Introduction.

Mangroves are salt-tolerant trees and shrubs in tropical and subtropical intertidal zones, forming ecosystems that provide coastal protection, carbon storage, and habitats for diverse species, including economically significant fish.

8.6.1.1 Mangroves in Balochistan Province.

Mangroves in Balochistan are sparse due to its rocky coastline. They historically thrived in Miani Hor, Kalmat Khor, and Jiwani Bay, with smaller planted patches now in areas like Shadi Khor and Sawar Khor.

8.6.1.2 Miani Hor.

Miani Hor, Pakistan's largest coastal lagoon, hosts 75% of Balochistan's mangroves and all three of the country's mangrove species (Avicennia marina, Rhizophora mucronata, Ceriops tagal), making it a biodiversity hotspot.

Site Description

Spanning 60 km and 83,846 hectares, Miani Hor connects to the Arabian Sea via a 4 km-wide mouth. Located in an arid zone, it receives less than 200 mm of annual rainfall, with highly variable freshwater inputs and frequent droughts

Environmental Characteristics
Salinity in Miani Hor rose from 39–42 ppt (1993) to 48 ppt (2024) due to reduced freshwater inflow and climate change. Decreased river discharge causes sand deposition, hindering mangrove growth.

Management Efforts.

Mangrove cover increased from 1,480 hectares (1990) to 4,280 hectares (2020) through nurseries and community-based initiatives. Awareness efforts have shifted locals' views, recognizing mangroves as vital storm barriers.

National and International Importance
Miani Hor, spanning 7,471 hectares on Balochistan's coast, is a Ramsar site (since 2001) recognized for its biodiversity. In 2022, 4,280 hectares of its mangroves were declared Protected Forests under the Balochistan Forest Act, allowing sustainable personal use of resources.

Threats to Mangrove Ecosystems

- **Degradation:** Mangroves face deforestation from wood extraction and damage from camel browsing, hindering regeneration.
- **Pollution:** Waste disposal disrupts ecosystems and smothers roots.
- **Climate Change:** Rising sea levels and salinity threaten mangrove survival.

Conservation Efforts
Initiatives include mangrove restoration for coastal defense, community-based fisheries management for sustainability, and sand dune stabilization to prevent erosion.

8.6.2 Intervention under the BIWRMP.

(B-2 Sub Components i.e Watershed (dry and block plantation, Mangrove plantation) & Rangeland Management).

8.6.2.1 Introduction

The Government of Balochistan, in collaboration with the World Bank and the International Union for Conservation of Nature (IUCN Pakistan), initiated a 34-month mangrove plantation project at the Porali River Delta in Miani Hor. Spanning from March 1, 2021, to April 30, 2024, this project aimed to restore 2,010 acres of mangrove forests using species such as *Rhizophora mucronata*, *Ceriops tagal*, and *Avicennia marina*. The primary focus was on enhancing the capacity of local fisherfolk, including women, while improving livelihoods and alleviating poverty in marginalized fishing communities.

8.6.2.2 Physical Progress

- **Project Name**: Mangrove Plantation in Miani Hor
  - **Physical Progress**: 510 acres planted with 1,155,000 plants (*Rhizophora mucronata*, *Avicennia marina*, *Ceriops tagal*).
  - **Training**: 15 training sessions conducted.
  - **Completion**: 100% Completed.
- **Project Name**: Up-scaling of Mangroves Plantation in the Coastal Area of Lasbela
  - **Physical Progress**: 1,500 acres planted with 2,613,000 plants (*Rhizophora mucronata*, *Avicennia marina*, *Ceriops tagal*).
  - **Completion**: 100% Completed.

I. Achievements

- Mangrove plantation over 510 acres with 1,155,000 plants executed in 2021 and 2022.
- Scaling of mangrove plantations over 1,500 acres in Lasbela executed in 2022-23.
- **Key Activities**:
  - Site assessment surveys.I
  - Social mobilization of 10 communities.
  - Seed collection with community involvement.
  - Establishment of four community nurseries, engaging both Sindhi and Baloch women.
  - Internship opportunities for university students (7 male, 3 female).
  - Community-led maintenance and seed collection awareness.

8.6.2.3 Project Benefits

I. Livelihood Enhancement for Fisherfolk

- Mangrove rehabilitation in Miani Hor has created nurseries for fish, shrimp, and crabs, improving local fisheries.
- Local fisherfolk, including women, received training on the ecological and economic importance of mangroves, boosting fish stocks and enabling better market sales.
- This effort supports income generation, enabling families to afford essentials like clean water, healthcare, and education.

II. Employment Opportunities

- The project created 737 job opportunities for local fishers through seed collection, transportation, and plantation, resulting in earnings totalling PKR 33,165,000 over 22,110 workdays.

III. Gender Inclusion

- 140 women from coastal communities engaged in seed collection and plantation, earning PKR 1,005,000 over 670 days.
- Despite cultural barriers, these women gained skills, participated in public events, and contributed to mangrove conservation.

IV. Support for Boat Owners

- 40 boat owners earned PKR 3,300,000 for 300 trips during the project, improving their quality of life.

V. Financial Empowerment for Women

- Through targeted policies, 140 women earned PKR 1,005,000, economically empowering them and strengthening their role in the community.

VI. Sustainable Livelihoods

The mangrove forest in Miani Hor presents opportunities for sustainable livelihoods through:

- **Coastal Aquaculture:** Creeks and lagoons in Miani Hor are ideal for low-cost, low-risk aquaculture using mud crabs.
- **Mangrove-based Ecotourism:** The natural beauty of Miani Hor attracts tourists, providing potential employment as guides and boatmen.
- **Small Grant Projects:** Grants from initiatives like Mangroves for the Future (MFF) support community-led aquaculture trials and ecotourism development.

8.6.3.4 Mangrove Carbon Sequestration and Carbon Marketing

I. Introduction the Paris Agreement of COP-21 (2016) set global targets to limit temperature rise to below 2°C. Pakistan, under its NDC, aims to reduce emissions by 50% by 2030. Mangroves in Balochistan serve as effective carbon sinks, storing up to 90% of carbon in their roots and soil. One hectare of mangrove forest can store five times more carbon than terrestrial forests, making them crucial for climate change mitigation.

II. Mangrove Carbon Marketing

- Carbon credits allow trading of emissions reductions, with one credit representing one tonne of CO2 sequestered.
- The Delta Blue Carbon project in Balochistan has successfully sold carbon credits in the voluntary market, generating revenue for mangrove conservation.

III. Financing Mechanisms

- Potential funding sources for mangrove-based climate projects include the Green Climate Fund (GCF), Adaptation Fund (AF), and Global Environment Facility (GEF).

8.6.3.5 Threats to Mangrove Ecosystems

- **Overexploitation:** Though traditional wood extraction has declined, illegal commercial logging persists, necessitating stricter enforcement.
- **Urban Expansion:** Urban and industrial expansion poses a severe threat to mangrove areas.
- Grazing & Overfishing: Grazing by camels and illegal fishing with fine mesh nets harm juvenile fish populations, leading to long-term declines in fish stocks.
- **Salinity & Pollution:** Rising salinity and pollution, especially from heavy metals, damage mangroves and reduce their ability to support marine life.
- **Climate Change:** Increased temperatures, reduced rainfall, and rising salinity endanger mangrove ecosystems, fisheries, and coastal communities.

8.6.3.6 Challenges:

- Limited community awareness and capacity to manage natural resources sustainably.
- Insufficient coordination among government agencies and communities in coastal resource management.
- Inadequate funding and financial sustainability for mangrove restoration efforts.
- Poor data management and reporting, resulting in challenges to assess long-term impacts accurately.
- Climate variability, including unpredictable weather patterns, hinders long-term planning and plantation success.

8.6.3.7 Research Needs

- **Salinity Tolerance:** Further testing is needed on the salinity tolerance of key mangrove species.
- **Salinity Profiling:** Annual salinity profiling in Miani Hor during dry and wet seasons.
- **Sedimentation Dynamics**: Study sedimentation processes and sand deposition in Miani Hor.
- **Mud Crab Conservation:** Research on habitat enhancement for mud crabs.
- **Total Economic Value (TEV):** New assessments of mangrove ecosystems' total economic value.
- **Biodiversity & Ecotourism:** Explore biodiversity and ecotourism opportunities.

8.6.3.8 Data Management and Reporting

- **Data Documentation:** Future projects should document GPS coordinates, species, propagation methods, survival rates, and project expenditure.
- **Reporting Standards:** Ensure inclusion of location data, satellite imagery, and project costs.

- **Data Repositories:** Recommend the establishment of GIS-based data repositories by Forest Departments in Sindh and Balochistan.

8.6.3.9 Capacity Development

- **Awareness Raising:** Tailored education efforts for decision-makers, resource managers, and coastal communities.
- **Forest Department Training:** Equip Forest Departments with knowledge on ecosystem management, climate resilience, and coastal zone management.
- **Community Capacity:** Provide coastal communities with skills to diversify incomes and build resilience to climate impacts.

Mangrove species planted under the BIWRMP

Pic-1: Rizophora mucronata

Pic-2: Ceriops tagal

Pic-3: Avicennia marina

Chapter 9: Conclusion and Recommendation

9.1 From end-line survey

- The percentage of single-earner households decreased to 39.8%, while the average number of earners per household rose to 2.0, reflecting an increase in income-sharing within families. These results highlight the intervention's contribution to the growth of multi-earner households, strengthening economic resilience within the community.
- The percentage of households with no unemployed members rose from 59.9% to 62.9%, demonstrating the project's positive effect. These findings suggest that targeted interventions can effectively reduce unemployment, particularly in the Purali River area, emphasizing the project's success in creating economic opportunities.
- The average annual income across both regions increased from PKR 655,061 prior to the intervention to PKR 939,136 afterward, highlighting the project's positive effect on household income levels.
- Households in both river basins experienced an increase in average monthly expenditure within the PKR 30,001 - 50,000 range. Overall, the project seems to have encouraged households to allocate more towards monthly expenses, with a noticeable upward trend in average expenditure across all categories. The intervention led to higher overall household spending, particularly on food, education, and healthcare, indicating improved economic conditions for households.
- Overall, 25.6% of respondents reported gaining new income-generating opportunities. The intervention was particularly successful in the Purali River area, where nearly 40% of participants saw improvements, highlighting the project's substantial impact. The initiative fostered greater income generation, particularly through business ventures and agricultural labour. While the effect was modest, 6.5% of households started businesses, and 3.0% secured employment.
- As a result of the flood protection infrastructure and measures provided under the BIWRMDP, the percentage of beneficiaries reporting losses decreased from 83.3% to 44.8%.
- The survey data shows a positive shift in satisfaction with flood resilience management before and after the intervention. The percentage of respondents who were "highly satisfied" rose to 2.7%, while 51% of respondents reported being "satisfied.
- Following the intervention, a significant improvement in perceptions of groundwater levels was noted. In both river basins, 69.4% of participants believed that groundwater levels had increased.
- The feedback from respondents suggests that the project has effectively improved soil conservation knowledge and provided tangible benefits.
- Prior to the project, the average total farm size was 16.93 acres, with the Nari River at 20.82 acres and the Purali River at 9.31 acres. After the intervention, the overall farm size grew to 19.20 acres, with the Nari River increasing to 24.08 acres. Notable improvements were seen in the PIS irrigated areas and in own landholdings, demonstrating better resource utilization and increased farm productivity. Additionally, cultivable waste areas were reduced, reflecting the project's positive impact on agricultural sustainability.
- The watercourse lining intervention has yielded varying results across the Nari River and Purali River regions, with overall positive outcomes. The data shows that the most significant benefit in both areas was an increase in water quantity, especially in the Nari River, which saw a 78.7% improvement. Water loss reduction was most pronounced in the Nari River at 62.4%, compared to 17.1% in the Purali River. Overall, the data underscores the substantial effectiveness of watercourse lining in improving water management across both regions.
- In terms of land levelling, the average area levelled in the Nari River is larger, with an average of

10.8 acres compared to 7.8 acres in the Purali River. Additionally, the Nari River has a higher proportion of larger fields that have been levelled. Overall, land levelling is more widespread and covers larger areas in the Nari River. These findings highlight the essential role of land levelling and water-saving techniques in enhancing agricultural productivity across the project areas.

- In contrast, the number of respondents rating the water as highly unreliable or unreliable dropped significantly, indicating the project's positive impact on water reliability. The findings show that the intervention effectively improved water availability, leading to more reliable and sustainable irrigation practices for the communities.
- These results reflect a positive overall shift in agricultural practices, demonstrating enhanced productivity and greater land use efficiency.
- The annual cropping intensity increased from 134% to 148.7%. Prior to the intervention, the overall Rabi cropping intensity was 64%, which rose to 72.8% afterward. For Kharif, it was 70% before the intervention and increased to 76% after. These findings highlight a positive impact on agricultural productivity, with improved cropping intensity and efficiency across both river systems following the intervention.
- The wheat production data before and after the intervention demonstrates notable improvements in both productivity and efficiency.
- After the intervention in the Nari and Purali river regions, notable changes in livestock inventories were observed. This growth can be largely attributed to enhanced fodder productivity, especially in Purali. The availability of more water and grass also contributed, though to a lesser extent.
- The satisfaction levels with the project intervention revealed that 70% of respondents across both basins were satisfied, with 10.2% expressing high satisfaction. Dissatisfaction was reported by 9.6%, and 2.2% were highly dissatisfied.

9.2 From In-depth Interviews

The key factors have been summarised based on the inputs and opinions provided through In-depth Interviews (IDIs) with different stakeholders and prominent implementers during the field survey[11]. The key factors that influenced project design and preparation of project components and sub-components are given below.

I. Selection of sites for implementing project components was initially based on willingness and acceptance of the specified interventions by the local communities. Though it has taken time and resulted in cancellation[12] of one major site included in BIWRMDP, the approach facilitated the PMU in successfully implementation of the project by considering the preferences and desires of the beneficiaries.

II. The initial design of the project components was based on the site conditions and requirements. The most optimal solution was considered while designing the project components. While preparing structural designs, especially for the weirs and flood protection, historical data on flood and its intensity was considered. The designs were discussed with concerned communities to incorporate their comments. Accordingly, necessary amendments were made not only in the prepared designs but complimented through additional facilities or an expanded scope of work.

III. While designing project components, especial care was taken to accommodate gender consideration by making provisions for washing places for women. Additionally, platforms were made to provide facilities for drinking and bathing livestock. Wherever possible embankments were upgraded for vehicle movement and transportation. On demand specific provisions were made for using flood water for irrigation purposes to those communities who had such rights conventionally.

IV. After the devastating flood of 2022, some of the infrastructure was redesigned to address future

[11] Field Visit Report, December, 2024

[12] The irrigation scheme for Yattabad was dropped due to consultation failure at the initial stage of BIWRMDP.

conditions due to climate change and its intensity. The designs were upgraded to support flood based on 1,000 years. The assessment and redesigning have taken ample time for restart of work after the 2022 flood.

V. The locations of hydro-meteorological stations were identified based on the expansive coverage of data from Nari and Porali river basins. However, other considerations, like sustainability and security were also made. This has ensured safety of the equipment in the hostile environment and risk prone area of Nari and Porali river basins.

VI. Innovative and self-sustainability considerations were made for block plantation by creating water availability and accessibility. This has ensured sustainability of the intervention made under BIWRMDP.

VII. For small potable water supply schemes, independent structures were developed for housing solar plates and other accessories required to run the submersible pumps. This has ensured water availability in light of frequent break-down of electricity supplies.

VIII. FAO took the lead in drafting the IWRM policy and the water bill at the request of the Government of Balochistan. The IWRM policy was endorsed in July 2024, approved by the provincial cabinet and the water bill is being prepared for presenting to the Balochistan Assembly. Therefore, the policy developed during 2006 has reached to a level demonstrating commitment of the Balochistan government and the Irrigation department for undertaking future projects.

Factors that influenced the project's progress and implementation especially focusing on delays and interruptions.

I. A significant period, after approval of the project and WB loan, was lost because of no progress on the implementation. Thereafter, the loan was suspended that delayed the implementation of BIWRMDP. The situation was further aggravated due to late approval (after two years) from government, especially from provincial cabinet. Hinderances were faced, causing delays, while sorting out discrepancies between PAD, PC-I and financial agreement. Further, the project was significantly delayed due to inquiries by federal agencies and non-awareness of environmental, social and fiduciary protocols. A significant involvement of the PMU was observed while collecting data and responding to the queries of federal agencies.

II. Lack of practical knowledge of WB's stringent procurement rules, their complexity and on-ground applicability have taken time for contract management. PMU had to encounter a number of cases in court of law which delayed timely engagement of contractors and service provider.

III. One of the most challenging factors reported by almost all the participants of IDIs was the law and order situation, especially in the Nari region. Incidents that caused serious interruptions were noted as follows:

a. Blocking main highways and killing people after identifying their origin
b. Frequent road blocks at different points of main roads by the surrounding area residents to pressurise the government to resolve some major or minor issues
c. Phone calls threatening the stakeholders involved in design and implementation of the project components.
d. Frequent strikes and lockdowns in major cities.
e. Long ques at check points for identity verification.

The contractors had to provide additional security to safeguard their workers from the challenging security threats. Due to security situation it has taken time to select appropriate places for installing MET equipment.

IV. BIWRMDP was initially faced the challenge of COVID19 which literally halted the implementation. Thereafter, the WB funding was reduced to US$ 110 Million.

V. The unprecedented Flood in 2022 had serious implication for project completion:

a. It demolished some of the infrastructure developed under BIWRMDP

b. Flood water took time to recede, making the sites accessible and restart works.
c. Delays in deciding to compensate contractors for losses incurred due to the flood.
d. Roads were seriously damaged, making access to sites challenging.

VI. The remoteness of sites and long traveling time hampered overall and sub-component implementation progress and quality assurance.

VII. Although good measures were practiced for community involvement, this aspect remained challenging for the contractors, implementation supervisors and design engineers. After agreeing on the design consideration, communities frequently demanded changes and additional facilities.

VIII. The sustainability of schemes was having some serious considerations during the implementation Transfer of infrastructure facilities and ownership of the project may haunt the implementers at the close and beyond the life of the project.

IX. A major challenge may arise when the Sibbi water supply scheme is handed over to local council. Since the secondary and tertiary networks have not been upgraded, matching the new bulk supply with the existing supply network may take time to reach the benefits to the households.

X. Contractor labour refused to follow the health and safety measures due to extreme weather, attitude and instinct approach.

XI. Delays in importing meteorological equipment due to regulatory environment and high fluctuation in exchange rate.

XII. Changes in PMU management made by the Irrigation Department of the Government of Balochistan hampered continuity and affected PMU staff confidence.

XIII. Most of the community members were illiterate. Explaining the design and getting feedback was challenging. As a result, the interference during implementation and dis-satisfaction, although minimal, could be observed. Due to tribal culture, other social issues created continuous challenges for implementers.

XIV. Variability in market prices for materials posed challenges to timely project implementation and made budgeting and procurement planning uncertain. Abrupt depreciation of Pak Rupee against US Dollar made a challenging situation for contractors and implementers to keep the costs within the agreed value of the contract.

XV. The active role of federal agencies responsible for accountability created a threat to officials responsible for implementation. This led to a stalemate in the development sector, affecting projects where funds were routed through the government.

XVI. With respect to the sub-component – OFWM, setting modalities for receiving beneficiary contribution and reaching consensus thereof consumed significant period effecting the project timelines.

Summary of key lessons learned based on the information gathered through discussions with key stakeholders (in-depth interviews), focus group discussions and quantitative data collected.

1. **Adaptability:** Adjusting project scope to align with local capacity and priorities can significantly improve outcomes. IWRM policy in this respect will be trajectory for successful implementation of future projects for the maximum involvement of stakeholders for reaching benefits to the targeted population. For future projects, the financers should critically review and ensure implementation arrangements and a robust plan for institutional strengthening and stakeholders' mobilization. **C**onsultations with beneficiaries will provide better design and alignment with community needs. Frequent changes in government counterparts and delayed responses from officials slowed the project's progress, particularly in document approval and feedback processes. Protocols for due diligence need to be an essential part of the loan agreement ensuring adequate attention of government counterpart.

2. **Development of Mangroves:** Timely arrangement of seeds was challenging, impacting implementation targets and slowing down project progress. Celebrating the international days, plantation campaigns, and awareness session played will play a key role in stakeholder networking

and providing opportunities for project projection and publicity. This prospect is important for continued support from the government and funding agencies as it contributes to involvement of beneficiaries at the grass root level and improving their resources.

3. **Training Needs Assessment (TNA):** Before planning training events, a TNA is essential to focus on the areas where capacity and skills need enhancement. This ensures desired output from the trained staff. Similarly, training to non-officer cadre staff would improve the support services required by the concerned departments. Furthermore, training of beneficiaries is important as the investments can optimally utilized by them especially related to new concepts and trends.

4. **Hydro-met information:** Though a robust investment has been made in providing 43 hydro-met stations, along with a system to relay the data to the general public, awareness for using the information by less literate population is challenging. For future intervention, public information campaigns should be devised for reaching the benefits optimally.

5. **Cultural and Gender Sensitivity:** Though women participation in WUA was emphasised, other efforts are needed at the time of project component designing for inclusive planning. Considering the cultural barriers, gender balance needs to be maintained while mobilizing communities and other stakeholders.

Annexure 1: Indicators and sub-indicators used during the evaluation of compliance

A. Indicators

1. Health & safety (sub-indicators 10)
2. Waste Management (5)
3. Air Pollution Control (9)
4. Water Pollution Control (3)
5. Noise Control (4)
6. Traffic management (3)
7. Storage of Chemical Goods (2)
8. Training Record (1)
9. Recruitment of environmental health & safety Staff (3)

B. Sub Indicators

1. Health and safety (10)

(1) Drinking water availability for laborers/employees?
(2) Proper latrines (at least one latrine per 20 persons) are available?
(3) Personnel Protection Equipment (PPE) available for workers?
(4) Check on engaging/ employing child labour?
(5) Are fire extinguishers properly maintained and not expired at camp site? Escape not blocked/ obstructed?
(6) Any accident(s) happened and incidents reported and reviewed, and corrective & preventive actions identified and recorded?
(7) Is any fatality recorded during the last month?
(8) Proper security arrangements done both at camp and work sites?
(9) Availability of first aid kits at work and camp sites?
(10) Awareness regarding HIV/AIDS and other infectious diseases?

2. Waste Management (5)

(1) Are the camp/work sites kept clean and tidy? (e.g., litter free, good housekeeping)?
(2) Is waste being stored onsite temporarily within a designated area?
(3) Are separated labelled containers/ areas provided for facilitating recycling and waste segregation?
(4) Are construction wastes/ recyclable wastes and general refuse removed off site regularly?
(5) Is any type of waste being disposed-off in the open fields?

3. Air pollution (9)

(1) Are the construction sites watered to minimize dust generated?
(2) Are stockpiles of dusty materials (size with more than 20 bags cement) covered?
(3) Are all vehicles carrying dusty loads covered/ sprayed with water prior to leaving the site?
(4) Are demolition work areas watered?
(5) Are dusty roads paved and/or sprayed with water?
(6) Are all vehicles and construction machinery properly maintained and tuned up regularly to conform NEQS?
(7) (any black smoke is observed, please indicate the vehicle/ plant/ equipment and location)

(8) Hoarding (not <2.4m high) provided along boundaries and properly maintained (any damage/ opening observed, please indicate the location).
(9) Are speed control measures applied? (e.g. speed limit signs and instructions to drivers)

4. Water pollution (3)

(1) Is the sanitary wastewater directed to the on-site soak pit and/or septic tank?
(2) Are there any wastewater discharged to the storm drains?
(3) Is the public road/area around the site entrance and site hoarding kept clean and free of muddy water?

5. Waste management (5)

(1) Are the camp/work sites kept clean and tidy? (e.g., litter-free, good housekeeping)?
(2) Is waste being stored onsite temporarily within a designated area?
(3) Are separated labelled containers/ areas provided for facilitating recycling and waste segregation?
(4) Are construction wastes/ recyclable wastes and general refuse removed off site regularly?
(5) Is any type of waste being disposed-off in the open fields?

6. Traffic management (3)

(1) Do vehicles observe speed limit?
(2) Does movement of all vehicles to and from construction camp/sites restricted to designated roads only?
(3) Are drivers careful/ watchful for wild and domestic animals?

7. Storage of Chemical Goods (2)

(1) Are fuels, oils and lubricants stored and labelled properly?
(2) Are proper measures to control oil spillage during maintenance of vehicles and construction machinery? (e.g., use of drip trays)

8. Training Record (1)

(1) Is training record available?

10. Recruitment of environmental health & safety Staff (3)

(1) Is the Environmental staff fully deployed at camp and construction site for implementation of ESMP and CESMP?
(2) Is the paramedic staff fully deployed at camp and construction site for implementation of ESMP and CESMP?
(3) Is top management of contractor staff playing pro-active role for supervising the implementation of CESMP & ESMP?

Annexure 2: List of Hydro mat equipment provided under the BIWRMP

List of Automatic Weather Stations (AWS)

Site Code	Name of Site Location	District
AWS-1	Irrigation Office Loralai	Loralai
AWS-2	Irrigation Office Harnai	Harnai
AWS-3	Irrigation Office Sibi	Sibi
AWS-4	Irrigation Office Dera Murad Jamali	Naseeabad
AWS-5	Irrigation Office Khuzdar	Khuzdar
AWS-6	Irrigation Office Bela	Lasbela
AWS-7	Winder Dam (Uthal).	Lasbela

AWS-1 Loralai

AWS-3 Sibi

List of Automatic Rainfall Gauge Station (ARG)

Site Code	Name of Site Location	District
ARG-1	Mekhtar	Lorala
ARG-2	Irrigation Office Dukki	Dukki
ARG-3	Chapper Rift (Mangi)	Ziarat
ARG-4	Speen Tangi	Harnai
ARG-5	Irrigation Office Kohlu	Kohlu
ARG-6	Mach near FC Checkpost	Kacchi
ARG-7	Bhaag (City Hospital)	Kacchi
ARG-8	Irrigation Office Usta Muhammad	Usta Mohammad
ARG-9	Ornach	Lasbela
ARG-10	Aranji (Sinchi)	Lasbela
ARG-11	Shab e Medan	Lasbela
ARG-12	Phat Gidar	Khuzdar

ARG-1 Mekhter

ARG-4 Kohlu

List of Ground Monitoring Station

	Name of site location	District
GWM-1	Viaro Farm Lasbela	**Lasbela**
GWM-2	Balochistan Residential College Uthal	**Lasbela**
GWM-3	Irrigation Office Uthal	**Lasbela**
GWM-4	Got Safar Winder	**Lasbela**
GWM-5	Govt. Boys School Winder	**Lasbela**
GWM-6	Lasbela University of Agriculture Uthal	**Lasbela**
GWM-7	Irrigation Office Sibi	Sibi
GWM-8	Daipal Road Sibi	Sibi
GWM-9	Luni Road Sibi	Sibi
GWM-10	DC House Loralai	Loralai
GWM-11	B&R Colony Loralai	Loralai
GWM-12	AL Hijra School Ziarat	Ziarat
GWM-13	Govt. Boys School Dukki	Dukki
GWM-14	Irrigation Office Dukki	Dukki
GWM-15	Irrigation Colony Harnai	Harnai

GWM-1. Viaro Farm Lasbela

GWM-3. Irrigation Office Uthal

List of Stream Flow Gauging Stations (SFGs).

Code	Name of Site Location	District
SFG	Ghati Bridge	Dukki
SFG-2	Speen Tangi	Harnai
SFG-3	Nari Gorge Weir	Sibi
SFG-4	Kundlani (Bolan Weir)	Kacchi
SFG-5	Nari Down Stream	Sibi
SFG-6	Nurg Hingri Weir	Lasbela
SFG-7	Mai Gundrani	Lasbela
SFG-8	Titian	Lasbela
SFG-9	Kanraj (Shab e Medan)	Lasbela

SFG-2 Speen Tangi

SFG-3 Nari Gorge Weir