# FEASIBILITY STUDY FOR EXPLORING WATER POTENTIAL OF SOAN RIVER

## GENERAL PROJECT DESCRIPTION

### INTRODUCTION:

The Soan River is a stream in the Potohar or North Punjab region of Pakistan, and drains much of the water of Pothohar. It starts near the small village of Bun in the foothills of Patriata and Murree. It provides water to Simly Dam, which is the water reservoir for Islamabad. Near Pharwala Fort it cuts through a high mountain range at a location called Soan cut. As streams do not typically form across mountains of this height, it is likely that the Soan was there before the formation of this range. Ling stream, following a relatively long course through Lehtrar and Kahuta joins the Soan near Sihala on southern side of Village Gagri.

The Islamabad Highway crosses this stream near Sihala at the Kak Pul bridge. The Ling Stream joins the Soan river just before the Kak Pul. Two other streams, the Korang River and the Lai stream, join the Soan just before and just after the Soan Bridge, respectively. After following a path along a big curve, the stream reaches the Kalabagh proposed dam Site close to Pirpiyahi where it falls into the Indus river. There is a railway station by the name of Sohan and a railway bridge very close to it.

The Soan river is more than 250 kilometres (160 mi) long. Due to its mountainous course and shallow bed, it is rarely used for irrigation purposes. Chinese rahu, mahseer, snakehead, balm, and catfish species are the main inhabitants of the river, including many species of turtles and tortoises.

The Soan Basin lies between Latitudes 32 °-40’ and 33 °-55 ' and covers an area of 4,335 Square Miles, of which about 30% on the East is hilly and the remaining 70% comprises of rolling plains. The rainfall in the hilly reaches is heavy and that in the plains is low. The total yield of the Basin has been assessed as 1.525 MAF. Due to its topography, there is great scope for developing the irrigation potential in the Basin.

### RAINFALL

The Soan Basin receives its maximum rainfall during the South - west monsoon season June to September. The monsoon winds strike the Murree Mills, which present an almost un-interrupted barrier ranging from 2,000 to 7,500 ft, in elevation and loss a considerable portion of moisture. The amount of rainfall on the hills, at any place, is governed largely by the orographic features. This factor introduces considerable variation in the rainfall.

As the crest of the hills forms the general water shed of the basin, and the average slope of the country therefrom is towards the west, the conditions in the interior are somewhat unfavorable for heavy precipitation. There are in all 29 rain gauge stations in the basin, With the exception of Murree, Rawalpindi, Fatehjung, Gujar Khan for which rainfall data is available.

In Soan Basin, high rainfall zone along the Murree Hills forms the boundary on the East for a distance of about 60 miles, and many streams big and small carry the drainage of this basin into Soan River, while west of the Murree range annual rainfall gradually decreases till it reaches a minimum of about 12" at Mianwali.

July, August and September are the months of maximum precipitation, October and November are the driest months. It is observed that during June to September all parts of the basin receive their maximum rainfall, not exceeding 32 inches, the only exception being the Murree range.

In the succeeding season of October and November, the total rainfall is less than 1.5 inches except the North - Eastern part where it does not exceed 3 to 4 inches. The rainfall improves a little during December to March period, where in the plains, the total rain fall varies from 3,5 to 9 inches and in the Murree and adjacent hills between 9 to 21 inches. During two months April, May, the rainfall again decreases and in most parts of the basin varies from 0,5 to 2 inches except in Murree range, where it ranges from 3" to 6".

## WEIGHTED RAINFALL

The average annual rainfall of the basin is 27 inches of which almost 60 % falls during the four months June to September. Within the basin the Upper Soan sub - basin has the highest rainfall.

## FLOOD CONTROL

There is no flood control problem on the Soan as the river flows through deep valleys and floods are generally contained within its banks. The flood flows began with the bursting of south west Monsoons and last intermittently, through the months of July, August and September.

## BASIN PROFILES

The profile of the Soan River and its important tributaries are that it falls rapidly in the first few miles and then runs with a gentler slope. The left bank tributaries are larger and steeper than the right bank tributaries.

## STREAM FLOW RECORDS

In order to assess accurately the potentialities of river system, it is necessary to have a sufficiency of discharge measurement stations to know the volume of flow, the extent of sediment carried and suitability of waters for irrigation. No observations of discharges extended over a long period of time are available for the Soan River system.

The river has nine main tributaries in a total drainage area of 4,335 Sq. miles. The lengths of these tributaries vary from 20 to 50 miles and drainage areas from 50 to 450 sq.miles.

## SEDIMENTATION

Soan River is a monsoon fed river with very little contribution from snow melt and underground water. It flows high upto the top of the banks during the rainy months of July, August and September. The run - off during the monsoon season is more than 60% due to which the river carries comparatively more suspended sediment.

High mountainous origin with very steep slopes, coupled with more erodible soils in the lower regions is the cause of appreciable sediment in the flood waters of Soan. In higher regions, the river has a boulder and shingle bed, and as it approaches the plains, the bed gets more sandy.

## OBJECTIVE AND JUSTIFICATION

In Potohar area of Punjab, about 1.88 MAF runoff is generated annually. Out of which about 0.26 MAF runoff has been tapped so far by 57 small to medium dam projects. The balance run-off of 1.218 MAF (Approx) still flows towards sea unutilized. Ground water in potohar plateau, generally available along the natural streams, in other areas ground water is not available even up to 300 feet depth, therefore, only source of drinking water is mini to medium size reservoirs.

The Soan River is main stream of Potohar plateau and passing through 03 districts i.e Rawalpindi, Chakwal & Attock and it drains most of the area of Potohar plateau. During monsoon season, most of the runoff drains out in Indus water without any effective utilization. There is need of rain water harvesting in Soan River basin through construction of small dams, weir or diversion structure to utilize rain water for agricultural, drinking or ground water recharge purposes.

- Delineation of catchment areas, hydrology of Soan basin and potential of rain water harvesting in Soan basin.
- To create the sufficient water storages / diversion structures / weirs in Soan Basin for uninterrupted irrigation water supply and domestic water supplies to adjoining abadies & towns.
- Harnessing the flow of different streams of Soan Basin, will control the flood waters of rivers and will save the loss of life and property in the area.
- Seepage from the dams / Weirs will recharge the ground water reservoir and increase the ground resources.
- Increase in fisheries, development of recreation and employment facilities to the residents of the area.

To proceed for water conservation, 10 No. potential dam sites / weir / diversion sites will be identified during a preliminary desk study, out of these potential dam sites / weir / diversion sites or any other site indicated from some further source will be taken up and only 06 No. most feasible sites or more as per requirements will be selected for further feasibility study & detailed design.

For the feasibility study & detailed design following components of each selected sited site will be taken-up:

i. Main dam / weir / diversion structure
ii. Saddle embankment / flood bunds (if any)
iii. Spillway / Head & Cross regulators
iv. Outlet structure
v. Irrigation network
vi. Water supply system (if any)
vii. Detailed working of land to be acquired & documentation as per Land Acquisition Act 1894.
viii. Resettlement Action Plan (RAP)
ix. Environmental Studies
x. Cost, benefits & Economic feasibility

## IMPLEMENTATION ARRANGEMENTS

There is need of development of resources for water conservation and rain water harvesting through construction of new reservoir / weirs in Soan Basin to overcome water shortage in the area. For this purpose, selection of new dam sites / weir / diversion sites, head & cross regulators, development of irrigation system, potential sites to be explored and feasibility study report, complete detailed design, EIA report, resettlement plan, land acquisition process, preparation of PC-I, BOQ etc. are necessary for development of water reservoir / weirs. In this respect the topographic survey of reservoir, potential sites will be carried out. The field data regarding subsurface and surface geological investigation, geological mapping and collection / analysis of sample testing from the approved laboratory will be collected by the Small Dams Circle-II, Jhelum and this data will be supplied to the consultants for the preparation of feasibility study & detailed design reports.

The consultants will, based on the hydrological, geological, soil and topographical surveys / studies and data, carry out detailed hydraulic and structural design of different hydraulic structures. Seismic consideration will specifically be taken into account. A comprehensive slope stability analysis will also be carried out in respect of the embankment and weirs. For irrigation & water supply network, detail topographic survey, suitable channel alignment and the best hydraulic structure will be opted for socio-economic uplift of area.

The field data will be collected under the supervision of consultant, for sub surface geological investigation & topographic survey. For each selected dam / weir/ diversion structure site separate tenders will be called as per PPRA Rules.

### Hiring of Consultants

The consultant will be hired exploring potential of water conservation and rain water harvesting in Soan basin through selection of feasible sites, collection of data from field and through other sources, supervision of data collection, preparation of detailed feasibility report, hydrological study, detail engineering design, EIA report, resettlement plan, cost estimation, preparation of PC-I, detailed design tender documents, BOQ etc.

## ULTIMATE BENEFITS OF DAM / WEIRS

The following ultimate benefits / achievements are expected:

a) Exploring potential of water conservation and rain water harvesting in Soan basin.
b) Irrigation & drinking water supply to the agricultural land, cities, town, villages.
c) Flood mitigation and will also check the soil erosion.
d) Re-charging of ground water.
e) Development of Fish Culture.
f) Development of Forestry.
g) Improvement of ecology of the area.
h) Industrial development of un-productive land.
i) Development of Re-creational Resorts.
j) Check the migration of rural population to urban.

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