

# IRRIGATION DEPARTMENT GOVERNMENT OF BALOCHISTAN



## **PRESENTATION/BRIEF ON WATER RESOURCE DEVELOPMENT IN BALOCHISTAN**

**2014**

# **GEOGRAPHICAL, HYDROLOGICAL AND OTHER GENERAL INFORMATION OF THE PROVINCE.**

## **INTRODUCTION**

The Balochistan Province comprising of 32 Districts, spreads virtually as a plateau, and area wise is largest Province of the Country. It has borders with Afghanistan in the North and Iran in the south-west. The characteristic of the Province are as under:-

- **Area** : 347,185 Sq. Km constituting about 44% of the Country
- **Population** : 6.566 million as of 1998 census as per population growth rate the present day population is about 10.00 million

## **General Characteristics**

- Arid with scanty rainfall varying from 12 – 14 inches in the North to 4 – 6 inches per annum in the South.
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# DISTRICT MAP OF BALOCHISTAN



## **MANDATE AND RESPONSIBILITIES OF IRRIGATION DEPARTMENT.**

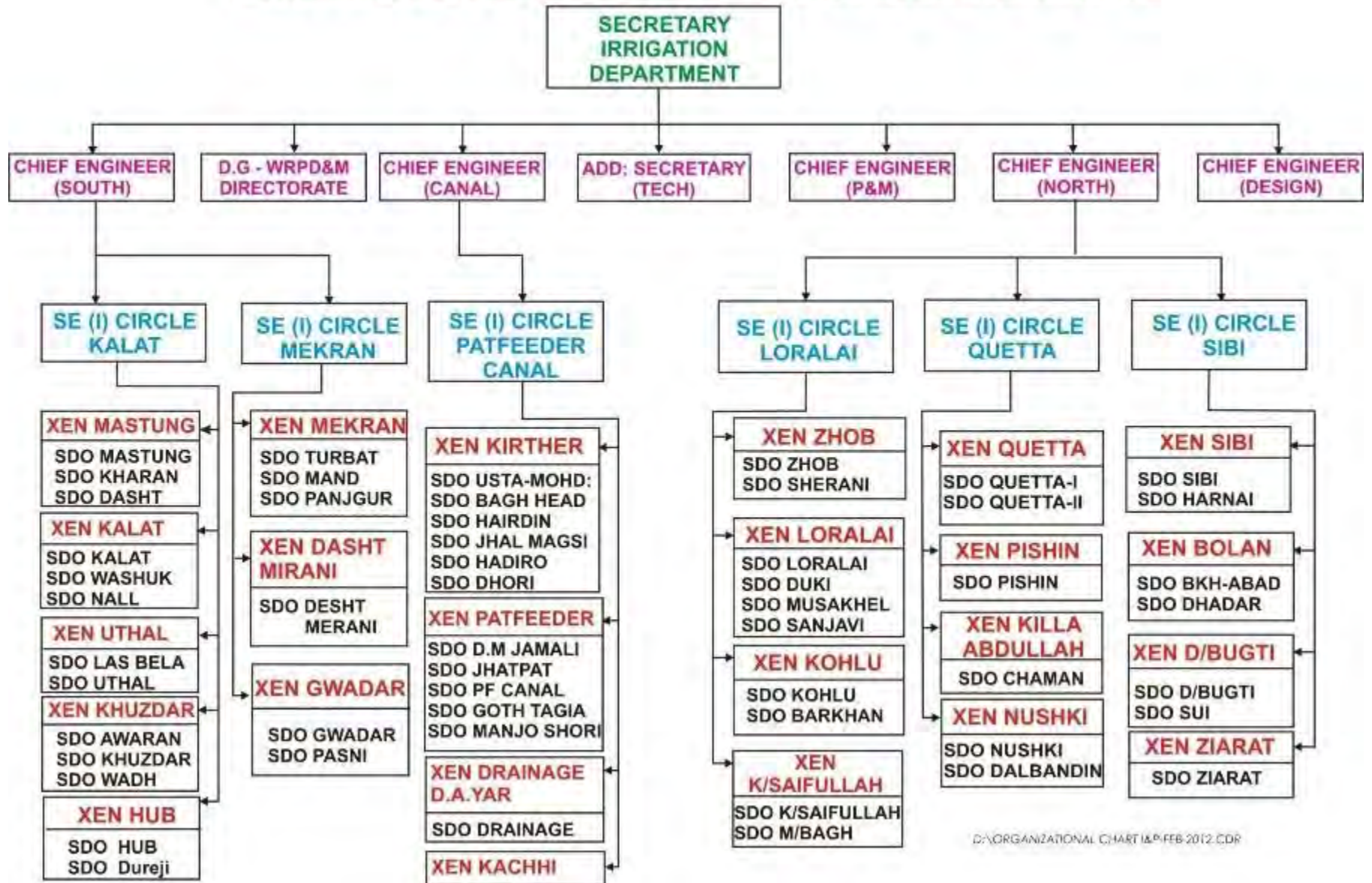
- **The Irrigation Department came under the Administrative control of Provincial Government in the year 1970 when the One Unit was disintegrated and Balochistan Province was formed.**

**The Irrigation Department is mainly responsible for Planning, Investigation, Implementation and maintenance of Storage/ Delay-Action Dams, Perennial and Flood Irrigation Schemes**

- **The PID is also mandated for Flood Protection Schemes as well as Operation and Maintenance of Canal Irrigation System (Indus System) in the Province.**
- **Water Resources Planning, Development and Monitoring Directorate besides monitoring of ground water resources also carry out the ground water exploration in the Province for Irrigated Agriculture.**



# ORGANIZATIONAL SETUP OF IRRIGATION DEPARTMENT

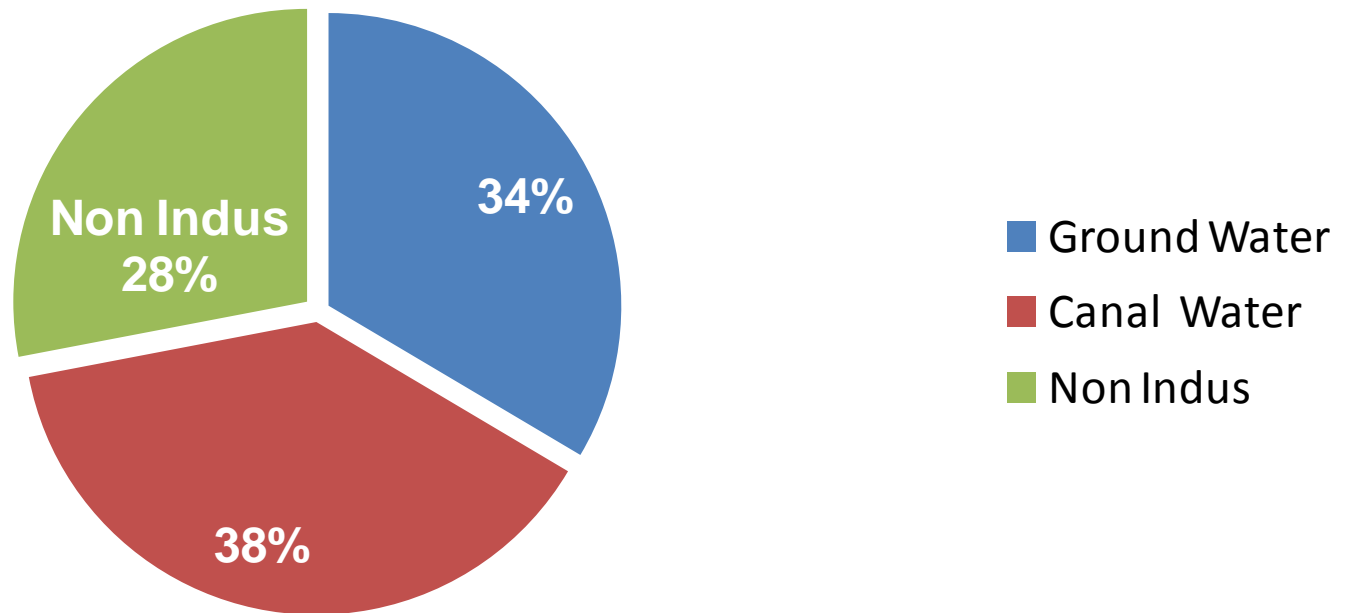


## WATER RESOURCES OF THE PROVINCE

Million Acre Feet

S.#	Description	Quantity (MAF)		
		Available	Utilized	Balance
<b>A. Indus Water as per Indus Accord</b>				
1	Perennial	3.870	3.052	0.820
2	Flood	4.620	--	4.620
<b>Total</b>		<b>8.490</b>	<b>3.052</b>	<b>5.440</b>
<b>B. Non Indus Basin</b>				
1	Flood Runoff	10.793	2.222	8.571
2	Groundwater	2.210	2.659	(-) 0.459
<b>Total</b>		<b>13.003</b>	<b>4.881</b>	<b>8.112</b>
<b>G. Total</b>		<b>21.493</b>	<b>7.933</b>	<b>13.552</b>

## MEANS OF WATER EXPLOITATION IN BALOCHISTAN



## AVAILABILITY, PRESENT AND PROPOSED UTILIZATION OF WATER AS PER INDUS WATER ACCORD 1991.

### a) WATER AVAILABILITY

■ Perennial as per Water Accord	= 3.870 MAF
■ Share of Balochistan as result of Mangla Dam Raising	= 0.360 MAF
■ Flood Supplies	= <u>4.620 MAF</u>
<b>Total</b>	<b>= 8.850 MAF</b>

### b) PRESENT UTILIZATION

■ Patfeeder Canal	= 1.8604 MAF
■ Khirther Canal	= 0.8586 MAF
■ Uch Canal	= 0.0989 MAF
■ Manuthi Canal	= 0.0566 MAF
■ Khan Wah, Faizabad and Direct Outlets	= <u>0.1775 MAF</u>
<b>Total</b>	<b>= 3.0520 MAF</b>

### c) PROPOSED UTILIZATION AGAINST BALANCE AVAILABILITY

■ Patfeeder Remodelling and Extension	= 0.2020 MAF
■ Kachhi Canal (0.451 MAF Perennial + 1.570 MAF Flood)	= <u>2.0210 MAF</u>
<b>Total</b>	<b>= 2.2230 MAF</b>



# **WATER RESOURCES OF THE PROVINCE**

## **HYDROLOGICAL INFORMATION**

- **Total River Basins in Balochistan** **18**
- **Sub Basins** **73**
- **The annual average rainfall** **80-250 mm.**
- **Decline of water table due to over draft.** **2-3 m per year**
- **Balochistan is an arid zone with scanty rain and extreme / moderate Temperatures.**
- **Total average annual runoff generated** **10.793 MAF**
- **Runoff utilized / conserved so far through Dams / Flood Dispersal Structures.** **2.222 MAF**
- **Balance available to be harnessed through Storage Dams / Flood Dispersal Structures** **8.571 MAF**

# BASIN MAP OF BALOCHISTAN



## **SURFACE WATER AVAILABILITY IN BALOCHISTAN**

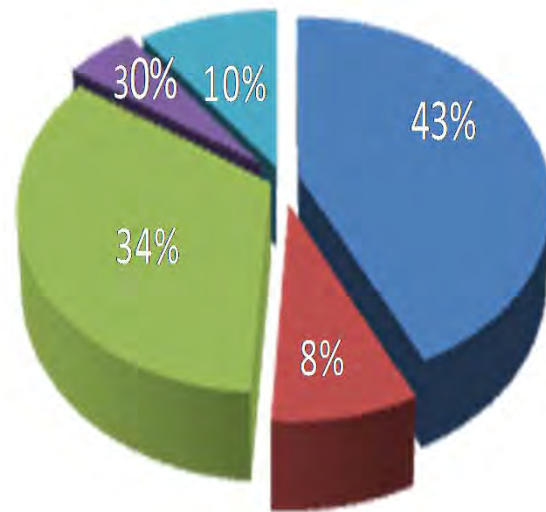
(MCM)

<b>Basin</b>	<b>Water Available</b>	<b>Water Use</b>	<b>Balance Available</b>
Dasht River Basin	660	83	577
Gaj River Basin	233	25	207
Gawadar - Ormara	546	64	482
Hamun-e-Lora	189	28	161
Hamun-e-Mashkel	2078	312	1766
Hingol River Basin	942	136	806
Hub River Basin	380	80	300
Kachhi Plain	1902	634	1268
Kadanai River Basin	77	10	67
Kaha Basin	515	103	413
Kand River Basin	18	2	16
Kunder River Basin	103	27	76
Mula River Basin	338	43	295
Nari River Basin	817	126	691
Pishin Lora Basin	302	169	133
Porali River Basin	1106	237	869
Rakhshan River Basin	320	34	286
Zhob River Basin	267	110	157
<b>Balochistan</b>	<b>10793</b>	<b>2223</b>	<b>8570</b>

## LAND USE OF THE PROVINCE

<b>LAND USE</b>	<b>AREA (MILLION HECTARES)</b>	<b>PERCENT OF CULTIVATED AREA</b>
<b>Geographical Area</b>	<b>34.72</b>	<b>--</b>
<b>Cultivated Area</b>	<b>2.09</b>	<b>--</b>
<b>Irrigated Area</b>	<b>0.98</b>	<b>47</b>
<b>Saliaba Area</b>	<b>0.85</b>	<b>41</b>
<b>Khushkaba Area</b>	<b>0.26</b>	<b>12</b>

# Means of Irrigation



- Indus Basin Government Canals
- Private Canals
- Tubewells
- wells
- others

# **Water Scarcity Issues in the Province**



## **REASONS FOR WATER SCARCITY**

- **Water availability in Balochistan has always been remained deficient against the demand, as per UN standards availability of 30 gallon water per capita is ideal arrangement but in Balochistan hardly 10 gallon of water per capita is being made available to about 60% of population.**
- **In-efficient use of the available surface water resources, in-discriminate exploitation of the ground water, wastage of heavy flood water, watershed degradation, coupled with the phenomenon of climate change leading to extreme events of flood and drought has made water management a difficult mandate.**
- **Despite huge interventions in water sector, population growth urbanization, development of the mining, industrial sector and expansion in agriculture activities the water demand has increased, putting great stress on the water resources of the province which are otherwise in deficit due to peculiar environment of the region.**

## **MAIN REASONS FOR WATER SCARCITY**

- 1. Geographic Location**
- 2. Low Rainfall**
- 3. Geo-Morphological Characteristics**
- 4. Global Warming Climate Change & its Impacts (Drought, Flooding Sea level raise)**
- 5. Poor Watershed Management / Watershed degradation.**
- 6. Traditional Cropping Pattern / Irrigation Systems (Flooding of field)**
- 7. Rapid Growth in Population/Urbanization**
- 8. Poor Mass-Awareness**
- 9. Poor legislative frame works and its Implementation.**

- **Problem of global warming is believed to be the result of :**
  - a) **Excessive human activities i.e. the burning of fossils fuel oil, Coal, Natural Gas**
  - b) **Excessive use of Fertilizer, pesticides, insecticide in agricultural activities,**
  - c) **Improper disposal of industrial and solid waste**
  
- **All the above activities gases such a Carbon dioxide, Methane, Sulfar hecta florid and other substances called green house gases.**
  
- **In addition to these gases water vapors in the atmosphere is also in abundance having green house effect, which are best insulator of heat which absorbs most of the heat transmitted from Sun our planet which makes the Earth surface and lower atmosphere warmer lading to Global warming which ultimately leads to climate change.**

## **DROUGHT OCCURRENCES IN BALOCHISTAN**

### **1878 - 2013**

<b>Category of Drought</b>	<b>Precipitation Deficiency as % of Average</b>	<b>Total Occurrences</b>	<b>Average Recurrence Interval</b>
<b>Mild</b>	<b>20 to 29</b>	<b>13</b>	<b>9</b>
<b>Moderate</b>	<b>30 to 39</b>	<b>12</b>	<b>11</b>
<b>Severe</b>	<b>40 and More</b>	<b>8</b>	<b>13</b>

The province of Balochistan has suffered long drought spell of 8 years from 1997-2005 and also 3 continual high intensity cyclonic, river an and excessive rain floods in 2007 2010, 2012 having divesting impacts on all social sectors but more pronounced on water sector.

## **ISSUES / CHALLENGES**

- **Growing demand of water for different social sectors to ensure, sustainable progress.**
- **Sharpe depleting ground water table due to over draft / exploitation.**
- **Poor / limited canal infrastructure and its poor maintenance.**
- **Water logging and salinity issues in canal command area.**
- **Drying up surface water bodies due to scanty rainfall in the catchment area, degradation in the water shed area.**
- **Pollution of fresh water aquifer due to intrusion of saline water.**
- **Frequent floods and drought due to climate change factor and its negative impacts.**
- **Poor pricing and valuation of water.**
- **In-equitable distribution and water allocation for different sectors.**

## **TARGETS AND GOALS**

- 1. Since attaining provincial status, no water policy could have been formulated, adopted in the province which is imperatively required evolving strategy and time bound action plan to be implemented on fast track enabling to contain the day by day aggravating situation before 2015.**
- 2. The province to have ensure adequate and sustainable water resources (by 2030) through holistic development and efficient management of available and new water resources.**
  - Rain water harvesting through efficient water shed management.**
  - Ban on uncontrolled with drawl of ground water.**
  - Improvised cropping pattern suiting to environment and Water situation.**
  - Use of spate Irrigation (Sailaba and Khushkaba).**
  - Introduction of efficient irrigation technology.**
- 3. Efficient plan and development of water budget to meet the requirement of different sectors as actual requirements basis.**



- 4. Check on massive Rural Migration to Urban Centers**
- 5. Check on development and industrialization in the Piedmont Region of the Valleys**
- 6. Behavioral Change in the Community.**
- 7. Address of Inter Provincial Water related issues (water sharing, drainage and flood related issues).**
- 8. Institutional reforms, capacity building through advance learning and research at all the levels stakeholders to ensure, effective response against the challenges.**

## **WATER POLICY**

- **The provincial Irrigation Department has formulated the provincial water policy to effectively encounter the immense challenges.**
- **The basic documents of water policy is approved by Provincial Cabinet. However unfortunately the same is not transformed into an Act.**
- **The policy is aimed at to achieve the following aims and objectives.**
  - **Efficient conservation and management of the available water resources.**
  - **Maximum harnessing of the flood and rain water through efficient water shed management and development of surface water bodies.**
  - **Efficient Ground Water recharge measures to arrest sharp depleting ground water levels Quetta, especially in Pishin Lora, Nari and Porali basins.**
  - **Increase of ground water exploitation in the areas of Dasht, Rakhshan, Human Mashkhail and Hingol river basins where potential exist.**

- **Effective measures against water losses and equitable distribution of water amongst beneficiaries.**
- **Efficient drainage system to mitigate the problem of water logging and salinity.**
- **Identification of technically feasible and economically viable and community oriented schemes through professionals and timely completion of the projects for effective harnessing and dividend generation from water recourses.**
- **Institutional reforms and capacity building to make the organization and professionals equally dynamic and responsive future challenges a head for assured sustainability of water resources.**

## **STEPS INITIATED**

- 1. The Provincial Irrigation Department is fully cognizant of the alarming situation and have initiated various steps as recharge measures to contain the problem of sharply depleting ground water table, and to develop surface water bodies to shift acute stress from ground water to surface water bodies and storage building (both).**
- 2. A Committee comprising the Senior Engineers of the Department have been constituted for identification of potential sites for harnessing/conservation of flood flows and its purposeful utilization.**
- 3. The Federal government through the efforts of Provincial Government has approved a PC-II for detailed feasibility study of water resource development through construction of Medium Storage Dams in Balochistan and allocated Rs.100.0 million in the Federal PSDP for financial year 2013-14. Consultants are being hired.**

## **STEPS INITIATED**

- 4. Consultants have been hired to undertake Detailed Feasibility Study for construction of Dispersal Structures on Zhob River for gainful utilization of huge quantity of water which is being wasted due to the non availability of infrastructures. As a result of Detailed Survey/Investigation a Proposal for Construction of Dispersal Structures of Zhob River costing Rs.10.0 Billion have been prepared and being processed for approval of the competent authority.**
  
- 5. The World Bank financed Project BSSIP (Balochistan Small Scale Irrigation Project) has already engaged consultants for the detailed feasibilities of integrated water resource management of Nari and Porali Basins at a cost of Rs.17.0 Billion and 13.5 Billion respectively.**

# MEANS OF IRRIGATION

- The following are important mean of irrigation in the Province with expended area arid and semi arid climate.

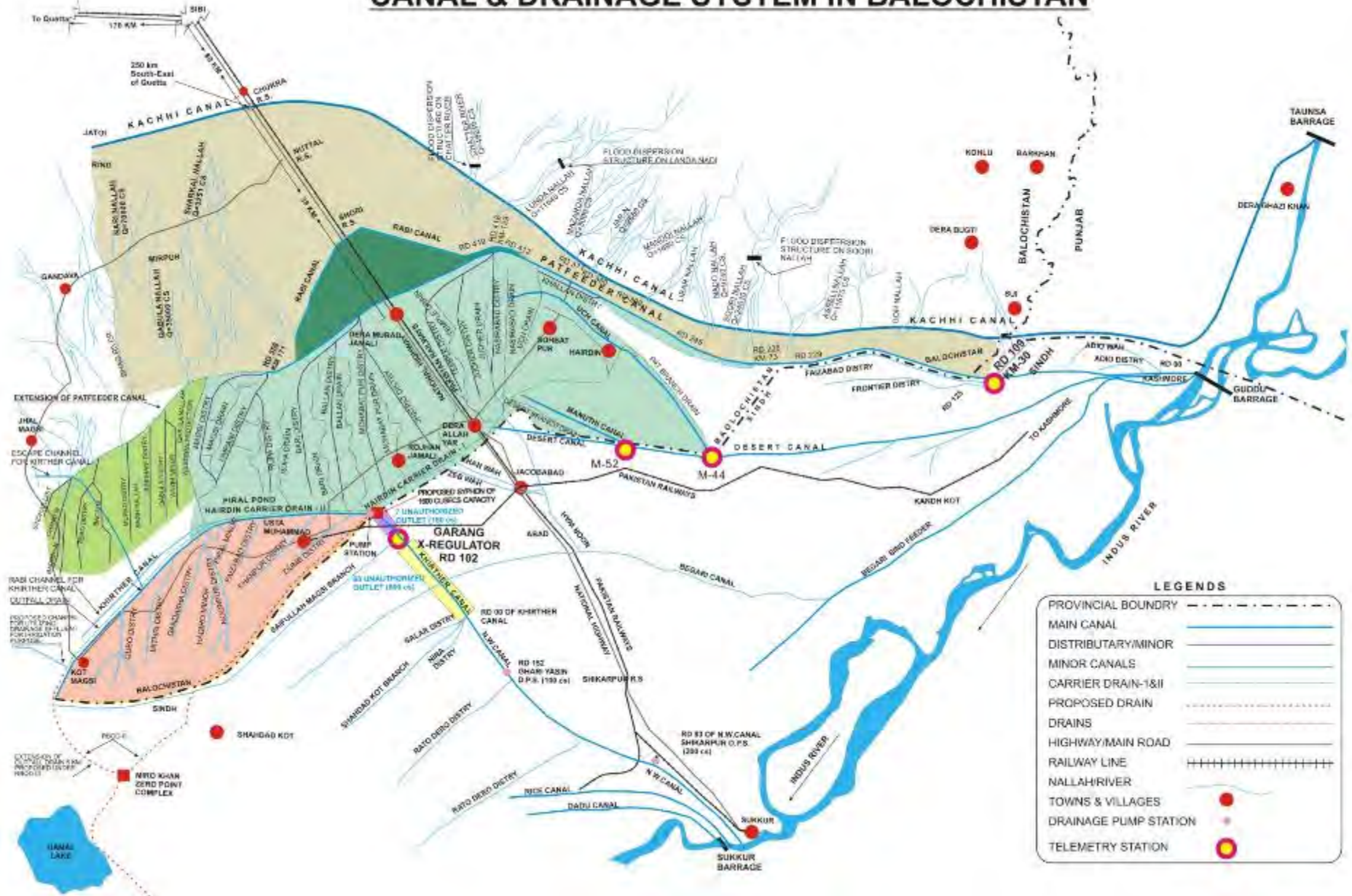
## a) Canal Irrigation system

## b) Surface Irrigation system

- i) Dams
- ii) Perennial flow
- iii) Spate/Sialaba Irrigation
- iv) Ground Water resources



# CANAL & DRAINAGE SYSTEM IN BALOCHISTAN



➤ **Patfeeder Canal System**

Year of Commissioning	1969
Main Canal Length	171 KM
Distribution Network Length	953 KM
Discharge (present)	6700 Cs
Command Area (present)	508,425 acres

➤ **Kirther Canal System**

Year of Commissioning	1932
Main Canal Length	84 KM
Distribution Network Length	200 KM
Discharge	2400 Cs
Command Area (Total)	266,000 acres

➤ **Uch Canal**

Year of Commissioning	1901
Main Canal Length	53 KM
Discharge	700 Cs
Command Area	68,000 acres

➤ **Manuthi Canal**

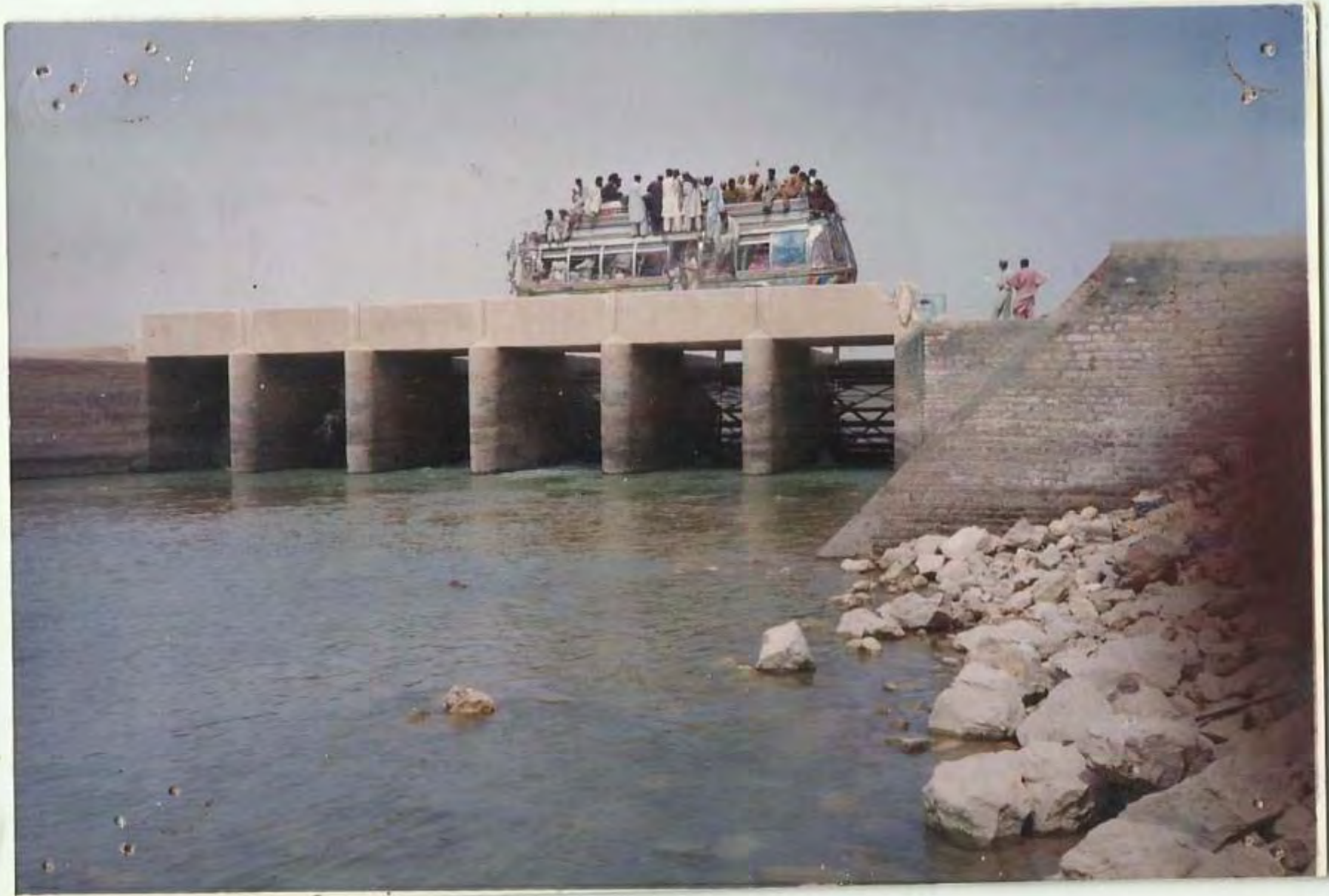
<b>Year of Commissioning</b>	<b>1909</b>
<b>Main Canal Length</b>	<b>23 KM</b>
<b>Discharge</b>	<b>600 Cs</b>
<b>Command Area (Total)</b>	<b>28,000 acres</b>

➤ **Drainage System**

<b>Main/Carrier Drain Length</b>	<b>90 KM</b>
<b>Network Length</b>	<b>1419 KM</b>
<b>Discharge</b>	<b>1200 Cs</b>
<b>Catchments Area</b>	<b>555,972 acres</b>

















## **SURFACE IRRIGATION**

- The PID during the past two decades has focused on the construction of and medium size dams in the province with the following objectives
- Conservation of Run-off
- Agriculture Extension
- Ground Water Recharge
- Flood Mitigation
- Soil Erosion Control
- Poverty Alleviation through increase in the Agriculture productivity and employment Generation



## **SURFACE IRRIGATION**

- **During the past decade, the PID Balochistan with the assistance of Federal Government has constructed following dams in the Province.**
  - i) **Miran Dam District Kech.**
  - ii) **Sabakzai Dam District Zhob**
  - iii) **Hub Dam District Lasbella**
  - iv) **Bund Khushdil Khan District Pishin.**
- **In addition following Dams are under implementation with the financial assistance of Federal Government.**
  - i) **Toiwar/Batozai Dam District killa Saifullah.**
  - ii) **Shadi Kaur Dam Pasni District Gwadar.**
- **Focusing on the importance of the Dams, the PID Balochistan is also implementing 100 Dams Project in the Province in a phased manner as under:-**
  - i) **Construction of 20 Dams in Balochistan (Package-I).**
  - ii) **Construction of 26 Dams in Balochistan (Package-II).**
  - iii) **Construction of 50 Dams in Balochistan (Package-III),  
(The PC-I for Package-III is under process).**

# **SURFACE IRRIGATION**

- **DAMS IN PIPELINE.**

**WAPDA has prepared detailed Feasibility Studies of following dams which are in pipeline for implementation.**

- i) Winder Dam District Lasbella**
- ii) Hingol Dam District Lasbella**
- iii) Noulang Dam District Jhal Magsi.**
- iv) Garuk Dam District Kharan**
- v) Pilar Dam District Awaran**
- vi) Basol Dam District Gwadar**
- vii) Badanzai Dam District Zhob.**

## **ACCOMPLISHMENTS IN WATER CONSERVATION AND FLOOD MITIGATION MEASURES**

- **MIRANI DAM DISTRICT KECH. (IMPLEMENTED BY WAPDA)**

- **Approved Cost** : **Rs. 5861.00 million**

- **Storage Capacity** : **305000 Acre feet**

- **Command Area** : **33,000 Acres**

- **Status** : **Dam operationalized during 2008**



## **ACCOMPLISHMENTS IN WATER CONSERVATION AND FLOOD MITIGATION MEASURES**

- **SABAKZAI DAM DISTRICT ZHOB.**

- **Approved Cost** : **Rs. 1960.82 million**
- **Storage Capacity** : **32,000 Acre feet.**
- **Command Area** : **8000 Acres**
- **Status** : **Dam operationalized during 2009.**





## **ACCOMPLISHMENTS IN WATER CONSERVATION AND FLOOD MITIGATION MEASURES**

### **Hub Dam District Lasbela**

- **Approved / Completion Cost : Rs. 843.597 million**
- **Year of Construction : (1980)**
- **Storage Capacity : 717,000 Acre feet.**
- **Command Area : 18000 Acres**
  
- **The water from Hub Dam is distributed in the ratio of 63.30% (100 MGD/186 cusecs) and 36.70% (61 MGD/110 cusecs) between Sindh and Balochistan province through Karachi Canal (14 miles) and Lasbela Canal (21 miles). In Balochistan, the water is used for meeting the drinking water requirement of Lasbela Town and the adjoining settlements, Irrigation of about 18000 acres in Tehsil Hub and 158 Industrial units (in Hub area).**





*Shanmug A*  
photography

# **BUND KHUSHDIL KHAN (BKK)**

## **SALIENT FEATURE**

**Location**

**District Pishin**

**Date of construction**

**Rs.1890.00 million**

**Original capacity of Reservoir**

**1<sup>st</sup> Remodeling**

**1914 to enhanced the capacity of the reservoir to 23000 acre feet for agriculture activities in the command area over 10000 acres.**

**2<sup>nd</sup> Remodeling under BSSI Project**

**In progress**

## **Scope of work.**

- Existing Main Dam to be raised by 3m up to level 1548.81 m**
- Construction of new Peripheral Bund in total length of 7.78 km**
- Conservation Level will be raised up to 1546.25 m increasing the Reservoir Capacity from present 6.17 MCM (5000 Acre ft) to 18.5 MCM (15000 Acre-ft)**
- Construction of new Spillway with 1000 year flood capacity of 179 cumec with flood level of 1548.0m**



# **IMPORTANT DAMS UNDER CONSTRUCTION**

## TOIWAR/BATOZAI STORAGE DAM IN KILLA SAIFULLAH.

*(Being implemented by I&P Deptt)*

- **Approved Cost** : **Rs. 2371.980 million**
- **R/Cost** : **Rs. 4344.743 million**
- **Expend: upto 30 June 2013** : **Rs. 1439.603 million**
- **Allocation for 2013-14** : **Rs. 500.000 million**
- **Storage Capacity** : **95,000 Acre Feet**
- **Command Area** : **11500 Acres as well as to meet drinking water requirement of the adjoining areas.**
- **Project Components** :
- **Current Status** : **Physical Progress = 35%**  
**Financial Progress = 34%**





# SHADI KAUR STORAGE DAM, PASNI, DISTRICT GAWDAR

## INTRODUCTION

- Project Approved cost Rs. 4149.2 million
- Project components - Storage Dam, Spillway and Irrigation Network
- Reservoir Gross Storage Capacity – 45.64 Million Cubic Meter
- Project to supply 70 cusecs to irrigate 7,600 acres of land
- Supply of 4.4 cusecs of potable water for drinking purposes to Pasni Town and its surrounding areas

## PROJECT BENEFITS

- Availability of assured water for irrigation purposes
- Provision of potable drinking water for Pasni and its surrounding population
- Up-lifting of socio economic conditions of 326 farm families of project area
- Direct and indirect job opportunities
- Recharge of groundwater aquifer
- Mitigation of flood losses

❖ Financial Progress	:	58%
❖ Physical Progress	:	72%





## **SAWAR KAUR STORAGE DAM DISTRICT GWADAR**

- **Approved Cost** : **Rs. 491.000 million**
- **Revised Cost** : **Rs. 792.277 million**
- **Expenditure upto 30-6-2013** : **Rs. 326.925 Million**
- **Allocation for 2013-14** : **Rs.100.000 Million**
- **Exp: during 2013-14** : **Rs. 247.912 Million**
- **Total Exp: upto date** : **Rs. 574.837 Million**
- **Storage Capacity** : **45000 Acre feet**
  
- **Command area** : **8000 acres besides drinking water requirements of the area and industrial requirement at Karwat Gawdar.**
  
- **Physical Progress** : **70%**
- **Current Status** : **Work in Progress**







## SMALL DAMS COMPLETED FOR CONSERVATION OF FLOOD FLOW IN BALOCHISTAN

Sr.#	District	No. of Dams	Completion Cost (Rs. In Million)	Storages Capacity (Acre-feet)
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### A) NORTH ZONE

1	Quetta	31	437.428	5973
2	Nushki	8	95.353	16238
3	Pishin	54	353.256	16904
4	Killa Abdullah	23	147.166	3812.56
5	Musakhail	5	78.487	2587
6	Loralai	21	435.251	12906
7	Ziarat	26	135.358	6019
8	Kohlu	10	153.672	2416
9	Barkhan	7	217.025	1719
10	Killa Saifullah	23	241.190	7075
11	Zhob	16	323.530	143600
12	Dera Bughti	2	8.000	334
13	Chagai	2	44.627	2100
14	Jhal Magsi	1	8.000	400
	<b>Sub Total (A) :-</b>	<b>229</b>	<b>2678.343</b>	<b>222083.56</b>

**SMALL DAMS COMPLETED FOR CONSERVATION OF FLOOD  
FLOW IN BALOCHISTAN**

Sr.#	District	No. of Dams	Completion Cost (Rs. In Million)	Storages Capacity (Acre-feet)
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**B) SOUTH ZONE**

1	Lasbela	11	198.832	17413
2	Kech	16	107.194	22257
3	Panjgur	6	41.528	92
4	Gwadar	5	233.424	58335
5	Mastung	14	94.230	5306
6	Kalat	24	157.669	5741
7	Kharan	2	15.660	1094
8	Khuzdar	17	277.168	14297
9	Awaran	2	37.315	138
	<b>Sub Total (B)</b>	<b>97</b>	<b>1163.020</b>	<b>124673</b>
	<b>G.Total (A+B)</b>	<b>326</b>	<b>3841.363</b>	<b>346756.56</b>

## **100 DAMS PROJECT**

- The Provincial Government in view of the sharp depleting ground water table in the Province due to over exploitation for agriculture purposes has planned to shift the stress from groundwater acquire to the surface water bodies.
- For the purpose full utilization of the huge potential of flood water about 63% of the water budget the Province Government has conceived a project of construction of 100 dams in the Province with the financial assistance of Federal Government.

### **Salient Feature.**

- Project cost : Rs. 9.00 Billion
- Sponsoring Agency : Federal Minister of Water & Power.
- Executing Agency : Provincial Irrigation Department through PMU.
- Scope of work : Constt: of 100 Dams in 3-phases i) 20, ii) 26 & iii) 54 Dams.



**CONSTRUCTION OF 100 DAMS IN BALOCHISTAN**  
**(PACKAGE-I, 20 DAMS)**

**Progress (North Zone)**

<b>Sr.#</b>	<b>Name of sub-projects</b>	<b>Approved Bid Cost (Variation-1 &amp; 2)</b>	<b>Physical Progress (%)</b>	<b>Financial Progress (%)</b>
1	Kumbri Delay Action Dam, District Bolan (Replacement of Mushkaf)	272.010	92	67
2	Darmin Delay Action Dam, District Chaghi	223.995	100	100
3	Arambai Delay Action Dam, District Killa Abdullah	116.525	100	100
4	Tor Kane Delay Action Dam, District Killa Saifullah	107.846	100	91
5	Surghund Delay Action Dam, District Loralai	137.361	100	98
6	Bund Delay Action Dam, District Musakhail	38.322	100	100
7	Bostan Delay Action Dam, District Pishin	121.849	100	100
8	Barak Delay Action Dam, District Quetta	60.764	100	100
9	Spezandai Delay Action Dam, District Ziarat	76.868	100	78

## Progress (North Zone)

Sr.#	NAME OF SUB-PROJECT	Approved Bid Cost (Variation-1&2)	Physical Progress (%)	Financial Progress (%)
1	Jodair Delay Action Dam, District Awaran.	50.617	100	100
2	Chapchal Delay Action Dam, District Kalat	52.550	100	99
3	Miskin Delay Action Dam, District Gawadar <i>(Approved cost 70.035 M, work order Cost 53.049 M, variation 1 cost 17.514 M)</i>	17.514	25	100
4	Sasool Delay Action Dam, District Khuzdar	121.850	100	100
5	Darwar Delay Action Dam, District Kech	140.182	48	48
6	Taigh Delay Action Dam, District Khuzdar	97.370	100	98
7	Uthandaro Delay Action Dam, District Lasbella	170.847	100	100
8	Chiltan Delay Action Dam Katori, District Mastung <i>(Replacement of Sariab)</i>	134.06	100	87
9	Sur-e-Aab Delay Action Dam, District Panjgoor	122.493	100	98
10	Kashi Delay Action Dam (Replacement of Bahlool Dam and Shabook Dam)	127.689	12	--
11	Makola Dam (replacement of Shahzanik Miskin Dams against savings of the dam)	55.000	20	--
	<b>TOTAL (Civil Works)</b>	<b>2467.714</b>		



## 100 Dams Project (Package-II - 26 Small Dams)

S. No.	NAME OF SUB-PROJECT	DISTRICT	Approved Bid Cost	Updated/ Modified PC-I Cost	Physical Progress (%)	Financial Progress (%)
<b>NORTH ZONE</b>						
1	Nahar Kot Dam	Barkhan	307.081	307.620	42	23
2	Dhudar / Gugat Dam	Jhal Magsi	88.125	86.410	22	5
3	Makhal Dam	Killa Abdullah	60.684	63.980	31	19
4	Malgagi Dam	Killa Saifullah	268.135	251.940	72	24
5	Murgha Faqirzai Dam	Killa Saifullah	249.920	275.020	52	24
6	Dargai Zakhpail Dam	Loralai	259.908	253.550	58	30
7	Kaluwaal Dam	Nushki	105.790	101.950	47	24
8	Manzari Dam & Badal Karez Check Dam	Pishin	199.337	205.620	61	30
9	Tang Nohsar Dam	Quetta	92.552	92.550	72	55
10	Murghabal Dam	Sherani	82.027	82.030	--	--
11	Sharig Dam	Sibi	106.990	109.710	62	50
12	Dabar Dam	Zhob	57.269	55.610	25	18
13	Zawa Dam	Ziarat	42.682	42.680	--	--
14	Mirdadzai Dam	Musakhel	126.917	116.470	28	12

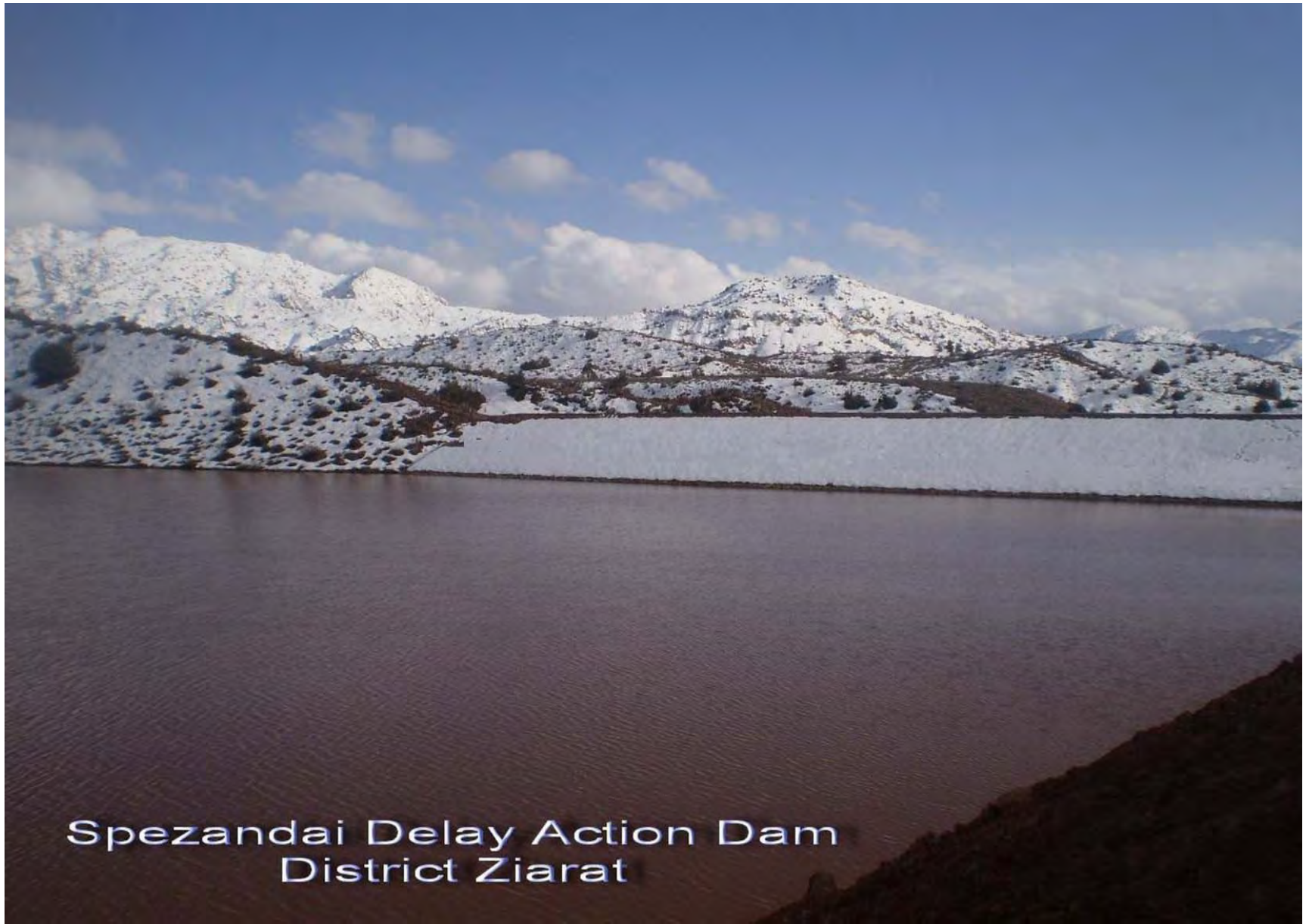
## 100 Dams Project (Package-II - 26 Small Dams)

S. No.	NAME OF SUB-PROJECT	DISTRICT	Approved Bid Cost	Updated/ Modified PC-I Cost	Physical Progress (%)	Financial Progress (%)
<b>SOUTH ZONE</b>						
15	Harambo Dam in replacement Sang-e-Kalat Dam	Khuzdar	203.010	200.000	30	2
16	Roomro Dam	Gwadar	200.140	199.950	60	40
17	Katki Khaisar Dam	Kalat	185.661	173.400	10	
18	Shashlok Dam	Kalat	73.724	76.060	45	20
19	Rakhshan Rai & Anari Mirap in replacement of Tariki Gravity Dam	Kalat	251.673	255.000	7	--
20	Thank Dam	Kech	81.323	76.930	19	8
21	Hushtri Dam Nal Area	Khuzdar	187.339	177.930	78	40
22	Lohi Dam	Khuzdar	277.543	259.400	52	27
23	Kukar	Lasbela	250.742	231.170	64	34
24	Dulay Kanak Dam	Mastung	129.093	126.170	96	75
25	Asimabad Dam & Marrave Check Dam	Mastung	79.477	81.890	22	9
26	Nivano Dam	Panjgur	190.475	168.770	53	44
	Gauge Reading Observation Huts (26 Nos)	Various Districts	20.950	20.950	--	--
<b>TOTAL (Civil Works)</b>			<b>2,131.149</b>	<b>2,047.620</b>		



**Surghund Dam - A View of Reservoir, District Loralai**





Spezandai Delay Action Dam  
District Ziarat

**A view of Embankment & Reservoir, District Ziarat**



**Arambi Dam – Embankment**





**Bostan Dam – Distirct Pishin**



**Bostan Dam – Distirct Pishin**





Bund Dam - District Musakhail



**Jodair Dam - Reservoir**





**Sur-e-Aab Dam - Reservoir**





**Uthandaro Dam - Reservoir**



**Uthandaro Dam – Conveyance System**

## OTHER MEDIUM SIZE PROJECTS IN PIPELINE

<b>S. No</b>	<b>Name of projects</b>	<b>Estimated Cost (Rs. In Billion)</b>	<b>Command area (Acre)</b>
1	Winder Storage Dam District Lesbela	12.904	10,000
2	Noulong Storage Dam District Jhal Magsi	9.74	36,000
3	Hingol Storage Dam District Lasbela	26.50	90,000
4	Garuk Storage Dam District Kharan	7.92	8,000
5	Pilar Storage Dam District Awaran	10.07	9,000
6	Badenzai Storage Dam District Zhob	18.07	20,000
7	Basol Storage Dam District Gwadar	5.30	For drinking water requirement



## **SPATE IRRIGATION**

- In the Province of Balochistan the major and minor rivers generates 12 – 14 million MAF of flood water out of which only 2 – 3 million MAF of flood water is utilized whereas the rest of the flood water which is about 63% of the water resources of the Province goes waste down the stream for want of required infrastructure.
- The Spate/Sailaba Irrigation is decades old traditional mean of Irrigation in the Province where the available land at alongwith the banks of the rivers is irrigated in the flood season through flood diversions and dispersal structures.
- Spade Irrigation not only supplements the agriculture production but also increase the recharge zone.
- Spate Irrigation System represents 41% of the total cultivated area about 4.68 million hectors.
- The PID has planned construction of Dispersal Structure at different rivers having potential flood discharge for the efficiently utilization and Agriculture Development.

## **SPATE IRRIGATION**

### **SIX FLOOD DISPERSAL STRUCTURES ON NARI RIVER, DISTRICT KACHHI.**

- Spate irrigation on Nari River is one of the oldest and largest irrigation system in Balochistan. Under the system the farmers construct earthen bunds/gandas across Nari River at Mithri, Erri, Haji Shaher, Ghazi, Touk, Khokar to divert flood water to the fields
- These bunds were unsustainable / unreliable and were usually washed away in medium to high floods. These were then reconstructed by the community through their own resources.
- The Government of Balochistan therefore planned to construct dispersal structures at these locations so as to ensure that the flood water is sustainably / reliably diverted to the fields to irrigate more than 100 ,000 acres of fertile culturable land.

### **Project Benefits**

- The Project after implementation will assist in conserving 287 MCM (232.596 Acre ft.) of flood water for irrigating about 36,854 hectares (91,030 acres) of fertile culturable Land









# **SURFACE IRRIGATION**

## **KAREZES**

Irrigation through Karez System is centuries old system in the rural areas of the province comprising of 100 of shallow depth wells connected through underground tunnel/conveyance system with mother well emerging from the mountain foot with the gravity flow towards the valleys.

The karez system is owned by the community with the sharing formula and the responsibility of O&M to be collectively perform by the particular community.

The total No of karezes prior to 1970 is estimated as 6000 but with the provision of electricity from the National Transmission System the Co-shareror in the karezes have switch over to the individual ownership by executing open surface water wells and later on to the deep tubewell to extract more water and bring more area under command.

Still about 500 karezes exist in different Districts of the Province with a limited under command area and the discharge from the karezes depend on the pattern and interval rains in the Province.

## **SURFACE IRRIGATION**

### **KAREZES**

- **The PID has rehabilitated a large No of karezes particularly after the drought period through financial assistance from Asian Development Bank as well as through the resources of Provincial Government mostly in Drought affected Districts of the Province.**
- **1000 Karezes under the above programmes have been rehabilitated at the cost of Rs.500.00 million involving Cleaning, Extension and Lining of conveyance system.**
- **The PID Balochistan has recently rehabilitated 15 karezes in District Pishin, Killa Abdullah, Mastung and Kalat Districts through a World Bank financed Balochistan Small Scale Irrigation Project (BSSIP) at a cost of Rs.550/- million with cleaning, extension, lining of conveyance system and construction of check dams upstream to help recharge of the karez.**











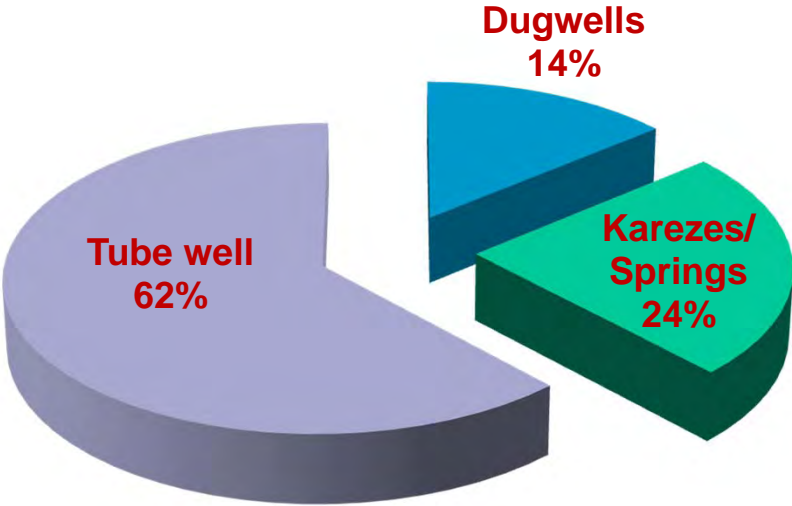
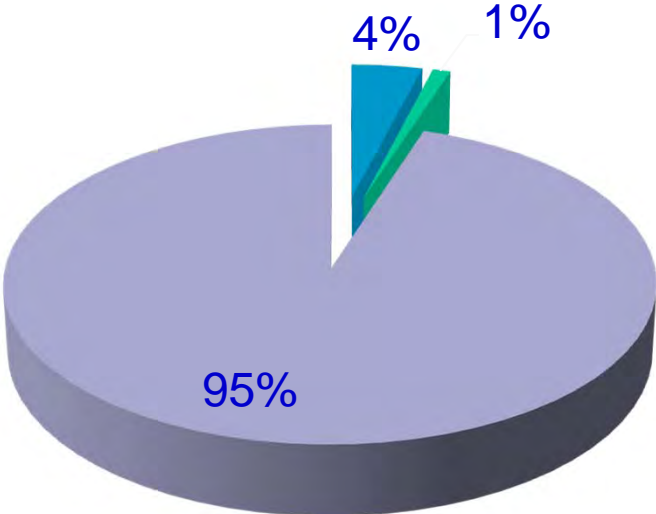


# Groundwater resources

- The Groundwater resources in the Province also is important source of Irrigation particularly out side the canal zone.
- The Groundwater is extracted through open surface shallow wells as well as through deep tube wells .
- However the groundwater resources have extensively and indiscriminately been exploited during the past three decades which has seriously damaged the quantity and quality of the ground water aquifer resulting into the sharp annual depletion ranging from 1-3 meter in different water basins of the Province.
- The Provincial Government is taking remedial measures to augment the ground water table through adopting ground water recharge measures, ban on installation of new tube wells and capping of the subsidy on already installed tube wells.
- Plans have been formulated to meaning full harvesting of huge flood water through construction of surface water body to shift acute pressure from ground water resource to the surface water bodies.

# Sector Wise use of Groundwater & Extraction of Ground water for Agriculture Purposes

- People
- Livestock
- Agriculture

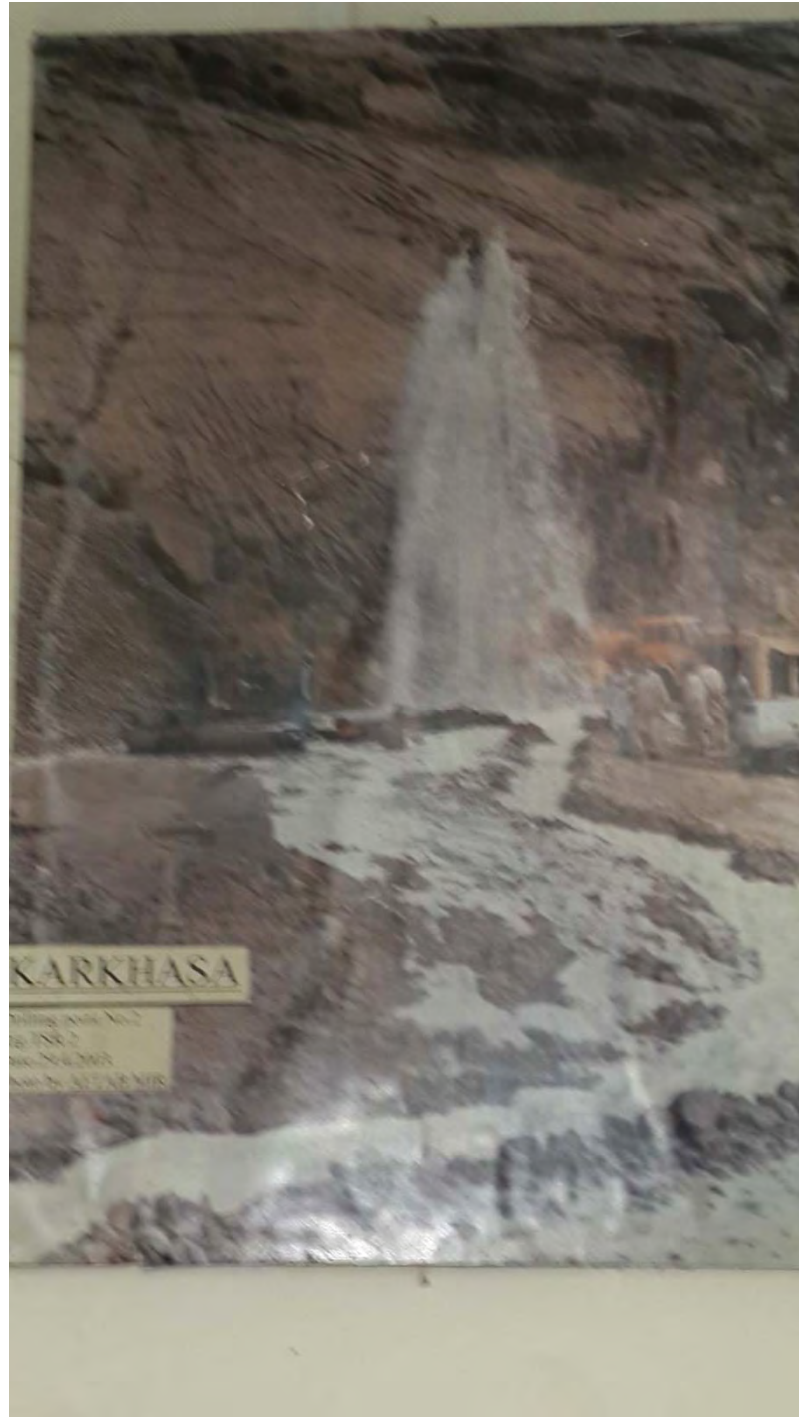






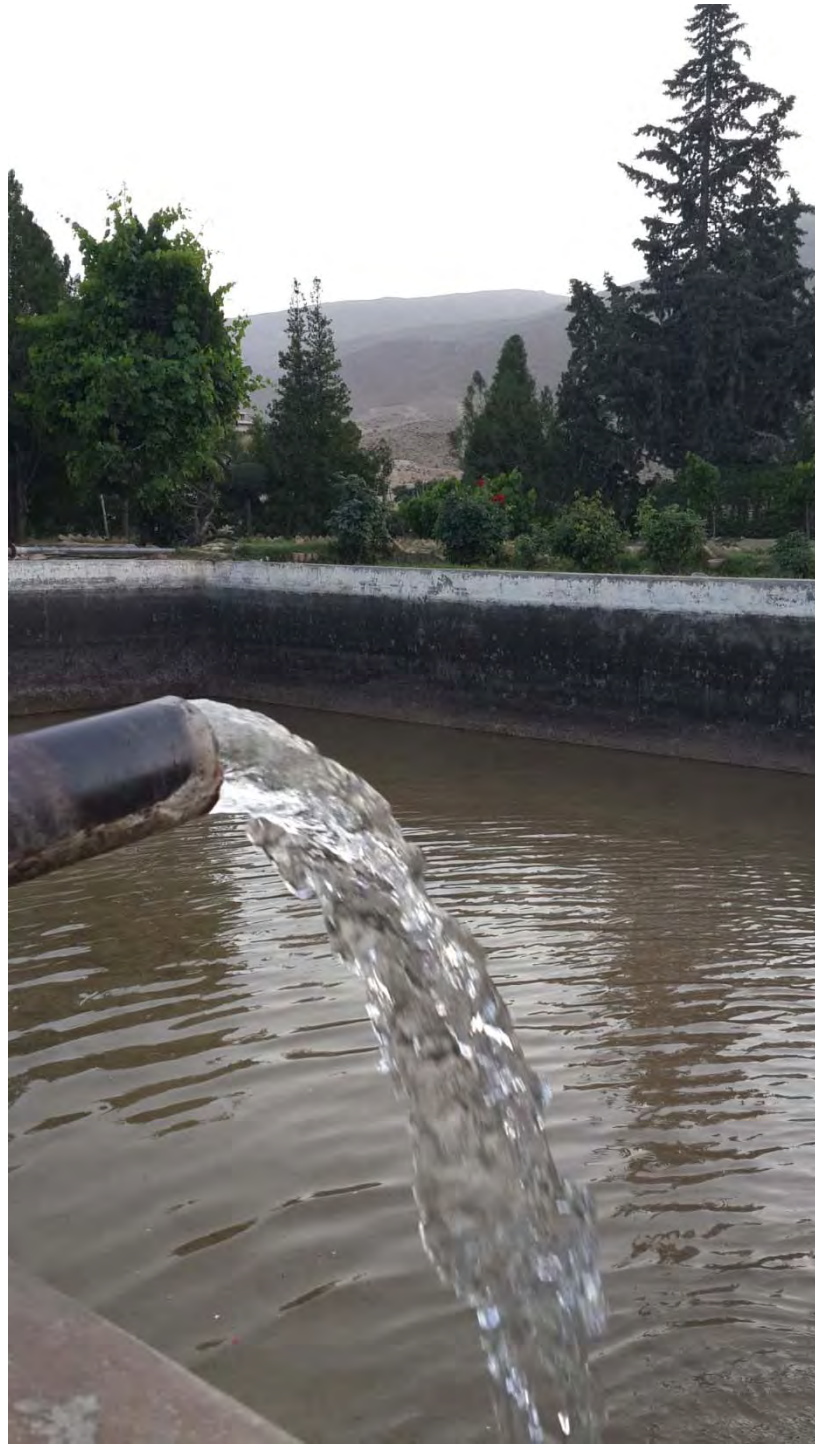






**KARKHASA**

Spring No. 2  
to 1982  
No. 2/4/2005  
No. 2/4/2005





# Rain water harvesting

- The growing demand of water against the scarce water resources is the one of the biggest challenge of 21<sup>st</sup> Century as the regular water supplies through conventional system is on decline and rain water harvesting can thus prove as an important alternative and supplementary resource.
- Through efficient rain water harvesting practices the short supplies can be augmented both in the rural and urban centers.
- Rain water harvesting is low cost simple technique easily practicable with to supplement the scarce water resources and as a better alternative against the breakish ground and polluted surface water.
- In the arid and semi arid region the rain water practices are rather more important to collect it as efficiently as possible otherwise the rain water resource available may be lost through surface run off and evaporation.

## **Continue.**

- **During the past decades the rain water harvesting is actively introduced in the rural and urban areas and as it gains popularity being accessible, affordable and relatively clean source at the domestic / local level.**
- **Owing to the pollution of ground water and surface water, water scarcity, increase in the population the available water resources are depleting as such the communities have to turn to new resources through rain water harvesting practices.**
- **Rain water harvesting practices are observed as of great importance in the arid and semi arid regions and in the areas of small coral volcanic islands, remote and scattered human settlements.**

## **CONTINUE.**

- **Rain water harvesting is defined as method of inducing, collecting, storing and conserving local runoff for house hold, drinking, livestock as well as for small scale agricultural activities in the arid and semi arid regions.**
- **The rain water harvesting practices are mostly adopted practiced in the arid and semi arid zones with the limited annual rain fall, where rain water harvesting i.e. use of surface runoff can be a potential source to supplement to address water scarcity issues.**
- **Rain water harvesting in the arid and semi arid region is illustrated by micro catchment area measuring few hundred square meter with adjacent basin area where runoff is stored and conserved for consumption of trees and bushes and also for the consumption of small local population.**
- **Rain water harvesting technology is quite simple for collecting rain water from roof tops catchment, land surface catchment with the conveyance system for transfer of rain water to be collected in the storage tank.**

## **HISTORY RAIN WATER HARVESTING**

- The history of rain water harvesting in Asia can be traced back to 9<sup>th</sup> and 10<sup>th</sup> century where the rural population had been collecting/harvesting rain water from Roofs micro catchment areas in simple tanks and pounds laying thick layer of red clay on the bottom of the pounds to minimize seepage losses. Trees planted on the edge of the pounds help to minimize evaporation losses from the pound.

## **LEVEL OF INVOLVEMENT AND SKILLS**

- In different parts of Asia the Governmental and non-government Organization are involved in rain water harvesting particularly in Thailand and Philippine both the Governmental and community organization as well as through house hold based initiatives the use of rainwater harvesting technology is expanded particularly in the water scarce region

## **CULTURAL ACCEPTABILITY**

- Rain water harvesting is accepted as viable practice for augmentation of fresh water as the bacteriological contents of the rain water collected from the small catchment is less and also the quality of water harvested from the properly maintained roof tops catchment connected with the storage tank having better covers is preferable for drinking purposes as such rain water harvesting practices are widely acceptable.



## **SUITABILITY AND DEVELOPMENT COST**

- Rain water harvesting is equally suitable in the urban as well as rural areas as it augments Municipal Water Supply for house hold and drinking water purposes as it does not requires highly skill manpower .
- The rain water harvesting technology and practices are highly cost effective which depend of the type of catchment, conveyance and storage tank and material used.
- The cost of rain harvesting technology and arrangements is for less than cost involve in the development of shallow dug wells, tube wells and also does not involve huge O&M cost.

## **EFFECTIVENESS OF TECHNOLOGY**

- The feasibility and efficiency of the rain water system harvesting in a particular locality depends on the amount and intensity of the rain. The length of catchment area the gradient/slops of the micro catchment area. These variables can however be adjusted according to the house hold requirement and needs in particular area.

## **Benefits/Advantages**

- **Improvement in the quality of ground water.**
- **Rise in the water levels in the wells and bore wells that are drying up.**
- **Mitigation of the effects of drought.**
- **Attainment of drought proofing.**
- **An ideal solution to water problems in areas having inadequate water resources.**
- **Reduction in the soil erosion as the surface runoff is reduces.**
- **Decrease in the choking of storm drains and flooding of roads.**
- **Saving of energy to lift ground water (one meter rise in water level saves 0.4 Kilowatt hour of electricity).**
- **The rain water harvesting technology are simple to install and operate. Common people particularly in the rural area can be easily trained in the rain water harvesting practices. The construction material required are cheap and radials available and it is convents that it provides water for consumption at the spot.**
- **The maintenance is also quite cheap and simple which involves periodic cleaning of the tanks regular inspection of the conveyance system.**

## **Benefits/Advantages**

- **The main objectives of rain water harvesting is purposeful utilization of available rain water to meet the local requirements without much financial implications.**
- **Rain water practices are highly helpful in the areas facing water scarcity and facing threats of drought or drought like situation.**
- **Rain /flood water harvesting reduces the cast of portable water being less cost incentive.**
- **Rain flood water harvesting reduces pressure on already under stress ground water resources and raises ground water table.**
- **Soil erosion due to heavy flesh floods in the river bed can be reduced through rain/flood water harvesting.**
- **Rain water harvesting reduces accumulation of salt in the soil which is harmful to the growth of plants and allow better root growth and also increases drought resistance in plants.**

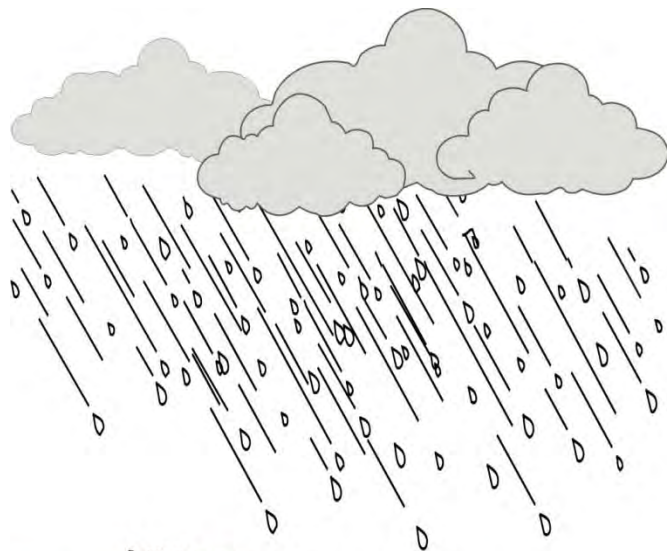
## **DIS-ADVANTAGES**

- The major disadvantage to the rain water harvesting technology is the limited and un-certain rain falls.
- Further that the technology suits the poorest of the poor in the rural areas as such does not attract much resources and attention of the authorities of water sector development agencies who mostly focus on the large scale project instead of investment in the traditional public water supplies.

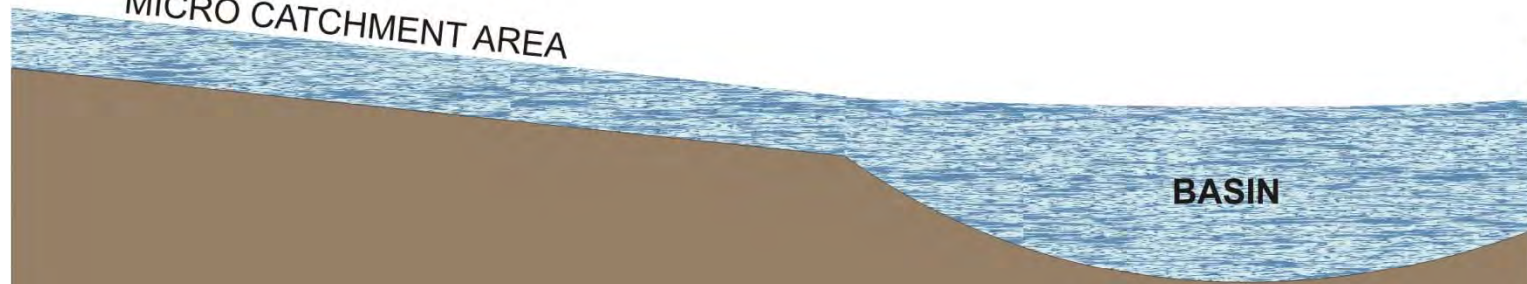
## **LIMITATIONS**

- Ground slopes are main limitations defeating efficient rain/flood water harvesting in particular areas of high/medium altitude mountain ranges where gradient/slope is high, greater than 5%.
- In the areas with uneven surface and uneven distribution of runoff huge earth works get involve having financial implications hence unfeasible for the local formers.
- The texture of the soil of the local area is again very important, soil high quantity of sand and gravel the most permeable formations allow high infiltration as compare to the intensity and number/intervals of rains and runoff.





MICRO CATCHMENT AREA

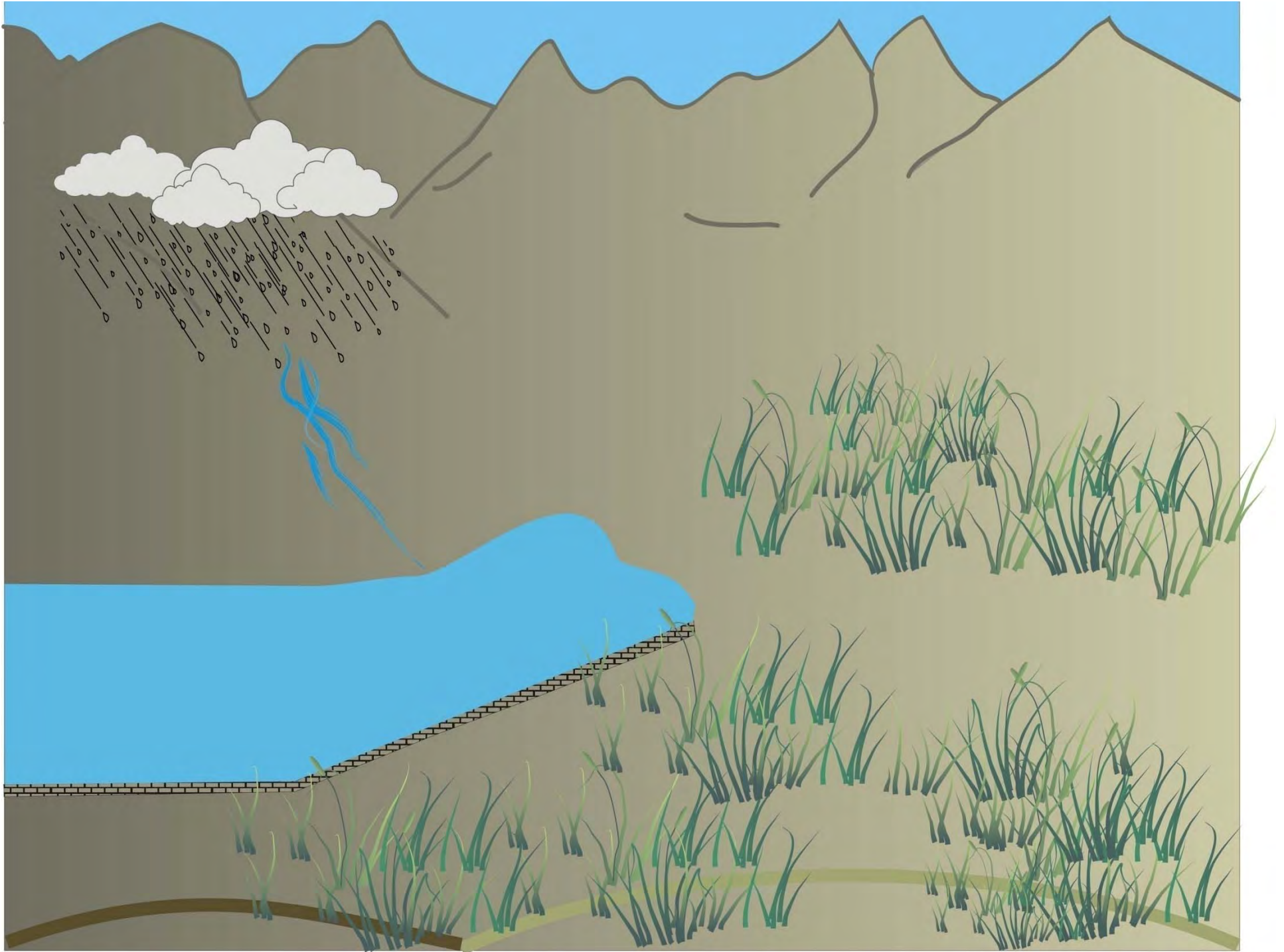


BASIN

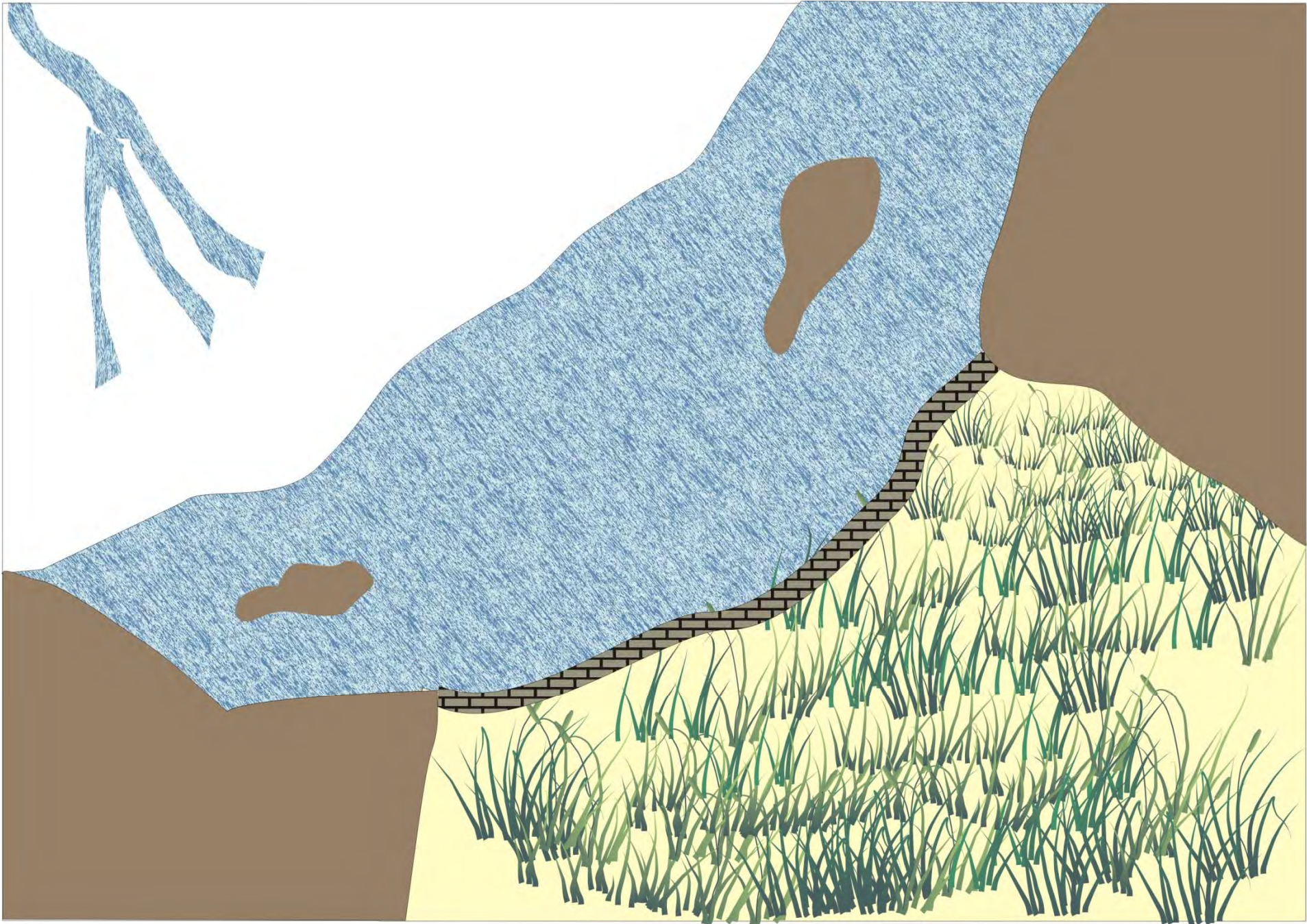
TREE ROOT ZONE



MICRO BUND







## **RAIN WATER HARVESTING IN BALOCHISTAN PROVINCE**

- **The climate of the province ranges from semi arid to arid with extreme variation in the temperature , the mean annual precipitation varies from less 50mm to more then 400mm in the valley.**
- **Most of the precipitation is received in the higher mountain during the winter between 250 mm to 350mm.**
- **Due to high gradient and slopes the rain water usually flow in flesh down the stream and as such rainwater harvesting practices are opted in the low plains mainly through construction of micro bundates and pit holes for the limited local consumption of nomadic population.**
- **In the given geographical, geomorphologic and climatic conditions the rain water and flood water harvesting are more relevant and important in the context of the province which facing serious challenges of water scarcity for progression in different social sectors.**



## **RAIN WATER HARVESTING IN BALOCHISTAN PROVINCE**

- **Due to limited rains and deficient availability of surface and under ground water resources out of 30.00 million acre cultivable land only 4 .00 million acre of land is put under cultivation which hardly 7% of the geographical area of the province 44%**
- **Out of total cultivated area of 4.00 million acre 47% of the cultivable land is irrigated whereas 53% of the remaining cultivable land is under Sailaba and Khuskaba irrigation using flood and rain water resources.**
- **The land under Khuskaba farming is 0.26 million ha about 12% of the total cultivated land.**
- **Khuskaba irrigation is traditional system of farming irrigated through local runoff from the adjacent catchment**
- **The agriculture economy of the province is though dominated by irrigated crops yet Sailaba (flood irrigation) and Khuskaba ( rainfall/local runoff) agricultural activities provides livelihood to the sizeable rural population.**

# Water Harvesting in Balochistan

- In the centre and north-east of Balochistan Province seven districts are defined as highland rained areas. These districts, are Quetta, Kalat, Pishin, Loralai, Zhob, Kachi and Khuzdar have a total geographical area of 14.9 million hectares.
- In Balochistan, runoff farming system is named as Khushkaba and it goes back as early as 3000 BC and provided economic basis for some of the early civilizations.
- These systems are located in highlands of Khurasan Range, on eastern slopes of Suleiman Range and Central Brahui Range which are characterized as temperate, where precipitation is gentle and spread over a longer period.
- Rain fed Khushkaba system depends upon direct rains. The farmers sometimes develop a small catchment area on upper side of the field and the rainwater is harvested for farming on the lower side.

# Water Harvesting in Balochistan

- Sometimes no catchment area exists and the water is directly harvested in the cultivation fields.
- The major agricultural crops of these rain fed districts are wheat, tobacco, potato, apple, grape and barley. Farming in the district is mostly rained (Barani).
- The scarcity of water in these district calls for adopting comprehensive water harvesting and management strategies in order to meet the demands for agricultural and domestic water needs, which can be met through rainwater harvesting.

# Rain Water Practices in Balochistan

Variety of rain water harvesting practices are opted/adopted in the Province according to the Geomorphologic features of the land.

## 1. Steeply Sloping Land

- 1.1 Forestry Plantations on edges and beds
- 1.2 Range Development.

## 2. Gently sloping Land

- 2.1 Contour Terracing
- 2.2 Grassed Waterways to control flow
- 2.3 Pasture Development.

## 3. Terraced Land

- 3.1 Field Leveling
- 3.2 Construction of Bandats
- 3.3 Ridge and Furrow or Contour Furrows
- 3.4 Improved tillage practices
- 3.5 Development of Micro Catchment
- 3.6 Improved drought resistant crop varieties etc.



# Rain Water Practices in Balochistan

- Two type of rain water harvesting practices are adopted / common in the region.
  1. Rain Water Harvesting for storage for future local / domestic use.
  2. Rain Water Harvesting as Ground Water Recharge measures.

The Rain water is so harvested by adopting traditional techniques and construction of surface and under ground structures.
- Small Micro Dams
- Check Dams
- Weirs
- Ponds

# Rainfall Regimes

Annual Rainfalls:

< 250 mm ]      Development Micro catchments

## 4. Small Stream

4.1      Diversion Weirs and Channels

4.2      Check Dams for Storage

## 5. Depressions.

5.1      Storage Ponds

5.2      Reservoirs

5.3      Check Dams

## RAIN WATER HARVESTING SCHEMES EXECUTED

The Provincial Irrigation Department has undertaken different projects for rain water harvesting at the cost of Rs.369.00 million for the last three years with the details as below:-

<b>S #</b>	<b>Fin. Year</b>	<b>Name of Scheme</b>	<b>No</b>	<b>App.Cost (Rs.M)</b>
1	2010-11	Construction of MICRO Bandat for Agriculture District Harnai	50	30.00
2	2010-11	Strengthening and raising of Zamindara MICRO Bandat in Dureji area District Lasbella	10	10.00
3	2011-12	Construction of Small MICRO Bandats at District Gwader	100	100.00
4	2012-13	Construction of MICRO Bandats District Musa Khail	60	65.00
5	2012-13	Small Irrigation Schemes (Bandats) in Musa Khail	140	153.985
6	2013-14	Construction of MICRO Bandats District Kech	130	149.00
7	2013-14	Constt: of MICRO Zamnidara Bandats District Kech	20	15.40
8	2013-14	Construction of MICRO District Jhal Magsi	50	60.00
<b>Total:</b>			<b>560</b>	<b>583.385</b>













































**THANK YOU.**