

Revival of Balochistan Water Resources Program

Ather Ashraf

December 15, 2022

Summary

Revival of Balochistan Water Resources Program (BWRP)” is an EU-funded program to contribute to the transition of rural irrigated agriculture and livestock farming systems in the arid regions of Balochistan towards lower water use and sustainable agricultural and livestock farming systems.

The BWRP’s TA component is being implemented jointly by Landell Mills and International Water Management Institute (IWMI). One of the objectives of the project is to strengthen governance of water resources and rangelands in Balochistan. This will include reinforcing the organizational and administrative capacity of water authorities to adopt strategic decisions, along with improving the policy and legal framework for water and land use in the agricultural and livestock sector.

Integrated water resource management (IWRM) will also be developed, grounded on a strategic Provincial Water Resources master plan to be implemented at all levels. In addition, one of the objectives of the BWRP project is to reinforce the capacities of the educational and research institutions in Balochistan to provide suitable agro-technology training and education, including conducting applied research on agro-ecological livestock and agriculture production.

Objectives

The main objective of the short-term international consultancy assignment is to:

- Review and evaluate the multi-criteria being employed to rank and select the basins, sub-basins, and watersheds/catchments to implement new/improved techniques and systems at large scale for increasing groundwater recharge, improved rangeland management, and low water intensity agriculture;
- Identify and suggest the most appropriate improvements in the multi-criteria or its weightage for objective ranking and selection of watersheds/catchments to implement these new/improved techniques and systems at large scale for increasing groundwater recharge, improved rangeland management and low water intensity agriculture; and
- Hold a stakeholder’s workshop for representatives from the community, local government (district/tehsil / union council) and the TA Team / FAO to present findings, and recommendations.

Key Tasks

The following key tasks are anticipated to be undertaken by the multicriteria evaluation consultant:

- To devise a proper methodology for MCDA
- Study BWRP and its requirements for the selection of basins, sub-basins, and watersheds/catchments
- Review the multi-criteria along with the methodology being employed to evaluate basins, sub-basins, and watersheds/catchments
- Suggest improvements in the multi-criteria being employed to evaluate basins, sub-basins, and watersheds/catchments, if any
- Review and evaluate weightage according to recognized parameters/factors
- If appropriate, undertake sensitivity and uncertainty and rank
- Identify and rank prequalification of high-ranking basins, sub-basins, and watersheds/catchment
- Identify and rank prequalification of high-candidate watersheds

Deliverables

The international multi-criteria consultant will be required to work in close collaboration with FAO and Landell Mills team of experts to accomplish the following deliverables

- Prepare a comprehensive report after review and evaluation of the multicriteria being employed to rank and select the basins, sub-basins/catchments.
- Suggest improvements in the multicriteria or its weightage for objective ranking and selection of watersheds/catchments and prepare a handbook on the application of multi-criteria for selection of watersheds/catchment.

1 Review

1.1 Area of Interest

Area of Interest in this study is Balochistan. It is area wise largest province of Pakistan. The extent is from 60.86989° to 70.265642° on East side and from 24.877092° to 32.62977° to North side. It consists of 37 districts, which are as show in figure 1 and details are in table 1,

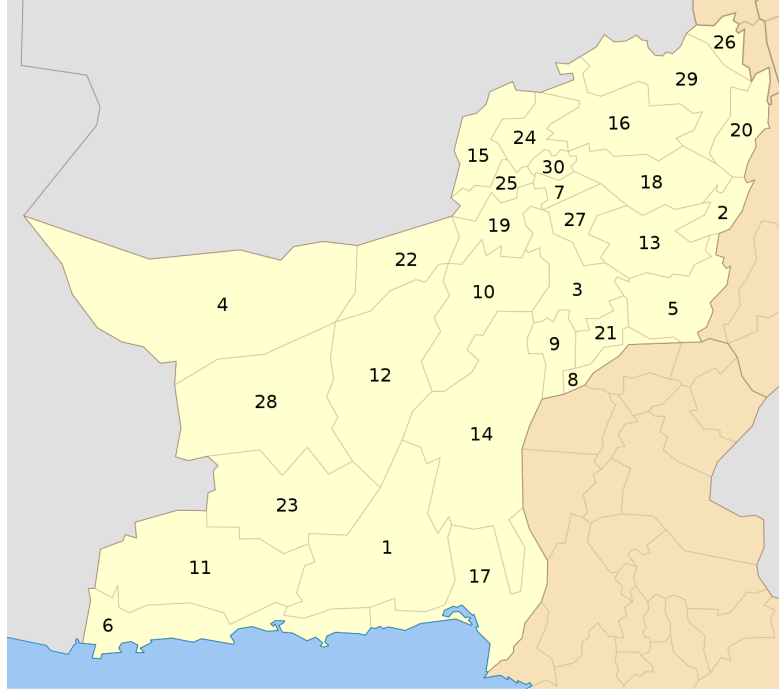


Figure 1: District Information

Sr. No.	District	Area (km2)	Population (1998)	Population (2017)	Density (pop/km2)
1	Awaran	29510	118173	121821	4
2	Barkhan	3514	103545	171025	49
3	Kachhi	5682	255480	309932	55
4	Chagai	44748	104534	226517	5
5	Chaman	1341	151854	434561	324
6	Dera Bugti	10160	181310	313110	31
7	Duki	4233	115976	152977	36
8	Gwadar	12637	185498	262253	21
9	Harnai	2492	76652	97052	39
10	Hub	6716	163194	339640	51
11	Jafarabad	1643	291290	513972	313
12	Jhal Magsi	3615	109941	148900	41
13	Kalat	7654	144433	211201	28
14	Kech	22539	413204	907182	40
15	Kharan	14958	96900	162766	11
16	Kohlu	7610	99846	213933	28
17	Khuzdar	35380	417466	798896	23
18	Lasbela	8437	149501	236631	28
19	Loralai	3785	134171	244446	65
20	Mastung	3308	150039	265676	80
21	Musakhel	5728	134056	167243	29
22	Nasirabad	3387	245894	487847	144

23	Nushki	5797	98030	178947	31
24	Qila Abdullah	3553	208870	323793	91
25	Qila Saifullah	6831	193553	342932	50
26	Panjgur	16891	234051	315353	19
27	Pishin	6218	376728	736903	119
28	Quetta	3447	774547	2269473	658
29	Sherani	4310	81684	152952	35
30	Sibi	7121	136322	179751	25
31	Sohbatpur	802	141527	200426	250
32	Surab	762	93401	200857	264
33	Washuk	33093	110009	175712	5
34	Zhob	15987	193458	310354	19
35	Ziarat	3301	80748	160095	48
36	Karezat	N/A (Part of Pashin district)			
37	Usta Mohammad	N/A (part of Ja-farabad district)			

Table 1: District Information

1.2 Basin Information

The study area consist of 18 basins, which are as show in figure 2 and details are in table 2

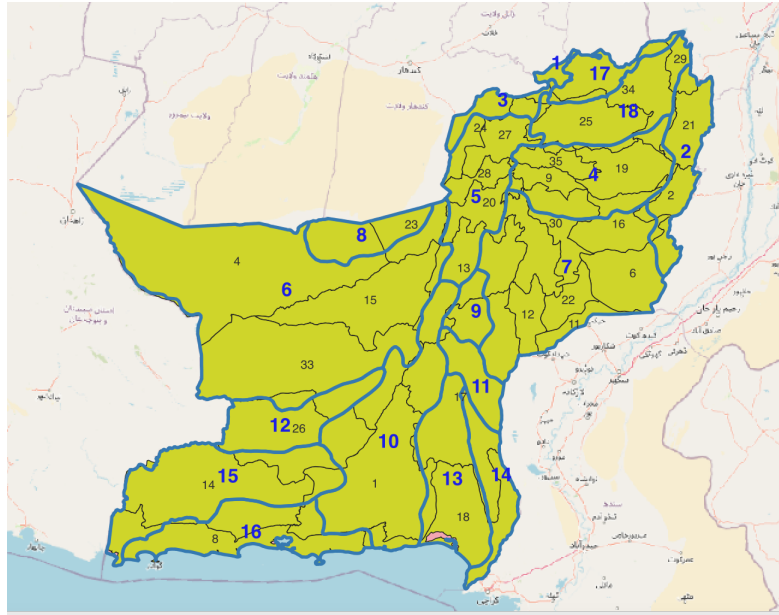


Figure 2: Basin Map

Basin Id	Name	Area
1	KAND RIVER BASIN	1117.406
2	KAHA RIVER BASIN	12000.864
3	KADNAI RIVER BASIN	4282.876
4	NARI RIVER BASIN	21708.743
5	PISHIN LORA BASIN	18152.095
6	HAMUN-E-MASHKHEL BASIN	85204.746
7	KACHHI PLAIN BASIN	43575.396
8	HAMUN-E-LORA BASIN	8281.098
9	MULA RIVER BASIN	4670.923

10	HINGOL RIVER BASIN	35548.887
11	GAJ RIVER BASIN	6000.184
12	RAKSHAN RIVER BASIN	12322.828
13	PORALI RIVER BASIN	18389.847
14	HAB RIVER BASIN	8532.902
15	DASHT RIVER BASIN	27644.378
16	GWADAR-ORMARA BASIN	16975.713
17	KUNDAR RIVER BASIN	6233.997
18	ZHOB RIVER BASIN	16447.431

Table 2: Basins Information

Out of these 18 district four has been selected, i.e., Nari River Basin, Pishin Lora Basin, Hingol River Basin, and Hamon-e-Mashkhel Basin. These basin are shown as shaded area in figure 3 and their corresponding district are shown in table 3

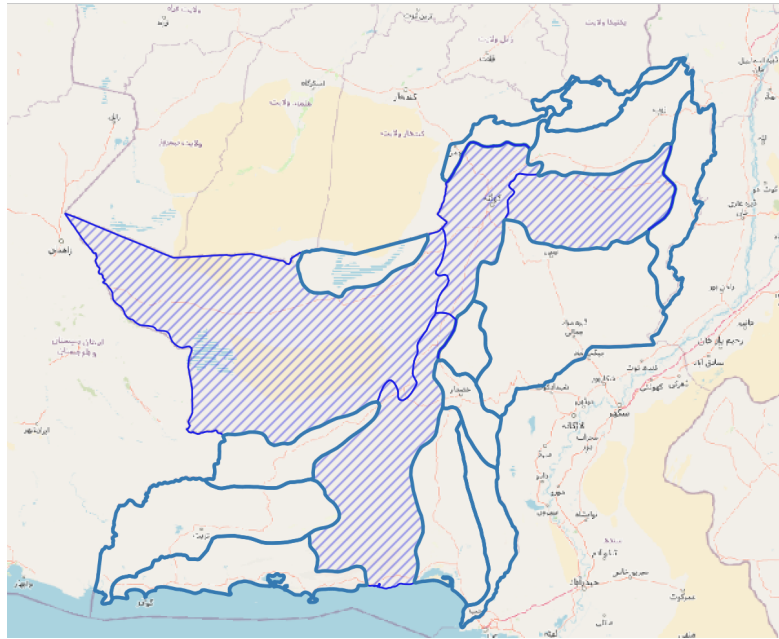


Figure 3: Selected Basins

Basin	DISTRICT	District_tblid
Hamun-e-Mashkhel Basin	Chagai	4.0
	Kalat	13.0
	Kharan	15.0
	Khuzdar	17.0
	Mastung	20.0
	Nushki	23.0
	Panjgur	26.0
	Quetta	28.0
	Washuk	33.0
Hingol River Basin	Awaran	1.0
	Gwadar	8.0
	Kalat	13.0
	Kharan	15.0
	Khuzdar	17.0
	Lasbela	18.0
	Panjgur	26.0

	Washuk	33.0
Nari River Basin	Barkhan	2.0
	Bolan	
	Harnai	9.0
	Kohlu	16.0
	Loralai	19.0
	Mastung	20.0
	Musakhel	21.0
	Pishin	27.0
	Qilla Saifullah	25.0
	Quetta	28.0
	Sibi	30.0
	Zhob	34.0
	Ziarat	35.0
Pishin Lora Basin	Bolan	
	Harnai	9.0
	Kalat	13.0
	Mastung	20.0
	Nushki	23.0
	Pishin	27.0
	Qilla Abdullah	24.0
	Qilla Saifullah	25.0
	Quetta	28.0
	Ziarat	35.0

Table 3: Basin Districts

1.3 Methodology for Selection of River Basins

A Spatial Multi-criteria analysis is conducted by Food and Agriculture Organization Pakistan(FAOPk) for the revival of water resources in Pakistan. The analysis is conducted at three level, i.e., River Basin level, District level, and Union Council level as shown in figure 4.

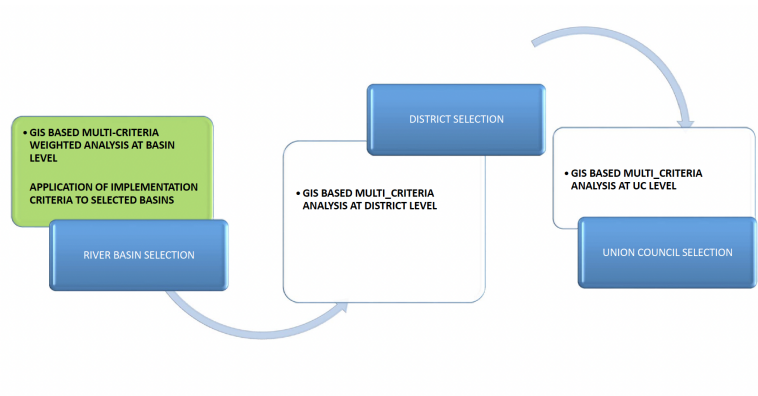


Figure 4: Multi-Criteria Analysis Approach

At River basin level 5 criteria are utilized dividing into medium and high priority with 15% and 20% weightage respectively. The criteria are shown in table 4 and indicator used for these criteria are in table 5

Criteria	Priority	Weigtage
Potential for Rainfed/Flood Plan Cropping	Medium	0.15
Potential for Surface Water Harvesting	Medium	0.15
Socio-Ecnomic Indicators	Medium	0.15

Potential for Water Conservation	High	0.2
Potential for Enhancing Rangeland Production a...	High	0.2

Table 4: Criteria for River Basin Selection

Criteria	Indicator Map	Unit	Weightage	Source
Potential for Water Conservation and Harvesting	Ground Water Depletion Index		20.0	Department of Irrigation, Government of Balochi...
	Surplus Surface Water (MAF)	BCM	15.0	Department of Irrigation, Government of Balochi...
Potential for Livestock based Interventions	Livestock Density	Animal/250 sq.km	20.0	FAO Geonetwork
Potential for Enhancing Rangeland Production	Area Under Rangeland	Sq. km	15.0	FAO, SUPARCO
Potential for Rainfed Cropping	Area Under Rainfed / Floodplain	Sq. km	15.0	FAO, SUPARCO
Socio-Economic	Food Insecurities	% of household	15.0	UNDP, Ministry of Planning
	Poverty Index		-	National Nutrition Survey
	Population Density		-	Census, 2017

Table 5: Indicator Maps for MCA of River Basin

Based on these analysis 6 basins are shortlisted, i.e.,

- Kacchi
- Nari
- Kaha
- Pishin
- Hamun-e-Mashkhel
- Hingol

1.4 Methodology for Selection of Watershed

For selection of watersheds a basin level River Basin Technical Working Groups have already been proposed. Approximately 8 watersheds in each basin will be finally selected based on a multicriteria decision analysis including step 1. Desk review and step 2. Rapid assessment in the watersheds to assess suitability. The selection of watersheds process initially begins in 2 rivers basins Pishin and Nari. Selection of watersheds will be tasked through the RB-TWG, in September, 2022.

To make a reference in June 2022 the selection process of the following 4 river basins have been completed through an established Multicriteria Decision Analysis (MCDA). The selected, yet to be notified, river basins include:

- Pishin Lora Basin
- Nari River Basin
- Hamun e Maskel
- Hingol River Basin

Selection Criteria of each watershed will include a two steps approach.

1.4.1 Step 1 Desk review of GIS MCDA by the River Basin Technical Working Group RB-TWG.

This will be based on information extracted from ranking of watersheds derived through GIS based Multicriteria analysis for prequalification of high candidate watersheds where field assessment can proceed. The results of GIS based MCDA for watersheds will be presented to the River Basin Technical Working Group for building for feedback and developing consensus. The GIS based MCDA considers Relevance to the RBWRP defined Result Areas as principal criterion summarized in the table below.

CRITERIA	INDICATOR (watershed level)	WEIGHT	TINF	Data Source
Potential for Ground Water Recharge	Average annual Rainfall (as an indicator of Water availability)	0.60	75% weigh-tage	CHIRPS Satellite Data
-	Area under Rangelands (sq.km)	0.20	-	FAO, SU-PARCO
-	Area under Wetlands (sq.km)	0.20	-	FAO, SU-PARCO
-	Total	1.00	-	-
Potential for Surface Water harvesting	Average annual rainfall for 20 years (mm)	0.70	-	CHIRPS Satellite Data
-	Run-off potential based on soil texture	0.20	-	FEWSNET
-	Population density	0.10	-	LandScan 2020
-	Total	1.00	-	-
Potential For Livestock Based Interventions	Livestock Density	0.30	-	FAO
-	Area under rangelands (sq.km)	0.60	-	FAO, SU-PARCO
-	Condition of rangelands (sq.km)	0.10	-	FAO, SU-PARCO
-	Total	1.00	-	-
Potential for development of value chains for low water economy	To be done in Desk review and Rapid Assessment in the watershed	0.34	25% Weigh-tage	-
Potential for command area development	To be done in Desk review and Rapid Assessment in the watershed	0.33	-	-
Presence of community based Institutions with track record of implementing development project	To be done in Desk review and Rapid Assessment ...	0.33	-	-
-	Total	1.00	-	-

1.4.2 Step 2 Field level assessment in the prequalified watersheds

Step 2 of the selection criteria is the Ground truthing by conducting field level assessment in the prequalified watersheds by RB-TWG consisting of NRM experts (from FAO and Landel Mills) with line department government field staff. A field assessment methodology will be developed well before the rapid assessment. Based on above criteria Step 1 and Step 2 Recommendations for high candidate watershed will be formulated by the RB-TWG. Accordingly IWRM plans will be prepared based on the findings of GIS based decision analysis and ground truthing by rapid assessment in the field. Exclusion criteria for disqualification of include one or more of the following:

1. Areas with relatively low productivity potential for livestock and cropping in comparison to other areas that is
2. Desert and hyper arid areas, (Annual Average Rainfall below 100 mm).
3. Areas with High Security Risk