NATIONAL SCHOOL OF PUBLIC POLICY
NATIONAL MANAGEMENT COLLEGE
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THE THREAT OF CLIMATE CHANGE IN BALOCHISTAN

by
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PhD (Public Policy & Governance)




"BALOCHISTAN-
TRANSFORMING TRAGEDY AND NEGLECT INTO PROMISE"

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GLOSSARY OF TERMS

- BWA - Baluchistan Water Authority
- BWDB - Baluchistan Water Development Board
- CDWP - Central Development Working Party
- CMIT - Chief Minister's Inspection Team
- DCO - District Coordination Officer
- DDWP - Departmental Development Working Party
- ECNEC - Executive Committee of the National Economic Council
- FMMP - Flood Management Master Plan
- GOB - Government of Balochistan
- IUCN - International Union for Conservation of Nature
- IWT - Indus Water Treaty
- IRSA - Indus River System Authority
- MAF - Million Acre Feet
- PSDP - Public Sector Development Programme
- SDGs - Sustainable Development Goals
- WBM - Water Balance Model
- WMO - Water Management Organization
- WUA - Water Users Association

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A. TASK/REQUIREMENTS OF SYNDICATE

1. Drought Management: Develop strategies to mitigate the impact of droughts in Balochistan, including measures like rainwater harvesting and the construction of water storage infrastructure such as ponds and small dams. These actions can help alleviate water scarcity and improve water availability for vulnerable communities.
2. Addressing Water Scarcity: Focus on water resource management in Balochistan to combat water shortages, especially in desert areas. Explore sustainable solutions to ensure water availability for both agricultural and domestic purposes, considering the specific needs and challenges of the region.
3. Flash Flood Management: Develop integrated watershed management plans to tackle flash floods in Balochistan. This can involve measures like expanding forest coverage and implementing flood control mechanisms to minimize the impact of flash floods on communities and infrastructure.
4. Conservation of Habitats and Ecosystems: Prioritize the conservation of habitats and ecosystems in Balochistan, considering their importance in maintaining biodiversity and ecological balance. Develop strategies to protect and restore these ecosystems, taking into account the specific environmental challenges faced in the region.
5. Comprehensive Assessment: Conduct a critical analysis of the current situation in Balochistan regarding droughts, flash floods, and threats to the ecosystem. This assessment should provide a clear understanding of the challenges and their underlying causes to inform the development of effective policies and strategies.
6. Policy Formulation: Develop a comprehensive policy framework that addresses the identified challenges and provides a roadmap for managing climate change impacts in Balochistan. The policy should be economically viable, socially acceptable, and culturally coherent, aligning with the aspirations and ideals of the local communities.
7. Operationalization: Outline a set of actionable steps to operationalize the proposed policy. This should include specific actions, timelines, responsible stakeholders, and resource requirements. The implementation plan should be realistic, taking into account the capacity and resources available for effective policy execution

B. METHODOLOGY & RESEARCH PROCESS ADOPTED

The Group employed a comprehensive research methodology to gather and analyze data for our study. We utilized a combination of primary and secondary sources, including group discussions, structured and semi-structured interviews, and engagement with relevant officers from the concerned Departments of the Government of Balochistan.

Our primary data collection involved conducting interviews with key stakeholders, professionals, and experts in the field. These interviews provided us with valuable insights and firsthand information on the subject matter. The group discussions held with relevant officers from the government departments allowed us to gather diverse perspectives and understand the challenges and opportunities faced by Balochistan.

In addition to primary data, we extensively utilized web resources to gather secondary data. This involved accessing reputable sources, research papers, reports, and publications related to climate change, socio-economic impact, and relevant case studies. These sources provided us with a broader understanding of the topic and enriched our analysis. Furthermore, we employed both qualitative and quantitative research methods to ensure a comprehensive examination of the subject. Qualitative research helped us capture nuanced insights, understand perspectives, and explore the social and economic implications of climate change in Balochistan. Quantitative research, on the other hand, enabled us to gather statistical data and analyze trends, patterns, and impacts quantitatively.

By combining primary and secondary data, as well as qualitative and quantitative research approaches, we aimed to present a holistic and well-rounded analysis of the threat of climate change and its socio-economic impact on Balochistan.

C. INSTITUTIONS ACCESSED

Government Entities in Balochistan related to flood, drought, and water management:

- Balochistan Irrigation Department
- Balochistan Disaster Management Authority (BDMA)
- Balochistan Environmental Protection Agency (BEPA)
- Balochistan Forest and Wildlife Department
- Balochistan Agriculture Department
- Balochistan Public Health Engineering Department
- Balochistan Fisheries Department
- Balochistan Livestock and Dairy Development Department
- Balochistan Soil and Water Conservation Department
- Balochistan Planning and Development Department

Non-Governmental Organizations (NGOs) and Civil Society Organizations (CSOs) in Balochistan related to flood, drought, and water management:

- Sustainable Development Policy Institute (SDPI)
- Pakistan Fisherfolk Forum (PFF)
- Strengthening Participatory Organization (SPO)
- Aga Khan Rural Support Program (AKRSP)
- National Rural Support Program (NRSP)
- Oxfam
- Islamic Relief
- Rural Community Development Council (RCDC)
- Strengthening Human Rights and Peace-building Process (SHARP)
- Society for Conservation and Protection of Environment (SCOPE)
- Balochistan Rural Support Program (BRSP)

D. A SCOPE OF THE STUDY

- Analysis of Droughts, Flash flood, ecological issues in Baluchistan
- Impact of the above in Baluchistan
- Analysis of the institutional responses
- Way forward in the shape of logical framework matrix

SECTION-I: AN INTRODUCTION

Water and ecology form the foundation of any civilization. The culture and society of Balochistan revolve around the precious resource of water and the delicate balance of its ecology. This province is characterized by contrasts, showcasing both beauty and harshness. If we can effectively manage these aspects, it will provide hope and prosperity for the people of Balochistan.

In this study, we delve into the critical issues of water scarcity, floods, and the delicate ecology of Balochistan. Located in the southwestern region of Pakistan, Balochistan is a province characterized by a unique and fragile ecosystem. The availability of water resources, the occurrence of devastating floods, and the intricate balance of its ecological systems pose significant challenges to the sustainable development and well-being of the region.

Water scarcity has emerged as a pressing concern in Balochistan, where the arid and semi-arid climate, coupled with erratic rainfall patterns, creates a constant struggle for water resources. As the demand for water increases due to population growth, urbanization, and agricultural practices, the limited availability of freshwater sources becomes a critical issue. We explore the causes and consequences of water scarcity in Balochistan, highlighting the impact on various sectors, including agriculture, livestock, and the livelihoods of local communities.

Additionally, the province of Balochistan is prone to periodic floods particularly in the summer 2022, which wreak havoc on the landscape and the lives of its inhabitants. We examine the causes and consequences of floods in Balochistan, exploring the interplay between natural factors such as heavy rainfall, flash floods, and riverine flooding, as well as human-induced factors such as deforestation, human settlements on river beds, and inadequate flood control infrastructure. The chapter investigates the social, economic, and environmental implications of floods, emphasizing the need for effective disaster management strategies and sustainable development practices.

Furthermore, we delve into the ecology of Balochistan, a region renowned for its diverse ecosystems, including deserts, mountains, coastal areas, and wetlands. These ecosystems harbor unique flora and fauna, playing a crucial role in maintaining ecological balance and providing essential ecosystem services. We examine the vulnerability of Balochistan's ecology to climate change, habitat destruction, and overexploitation of natural resources. The chapter emphasizes the importance of preserving and conserving the delicate ecological systems of Balochistan to ensure the long-term sustainability and resilience of the region.

ANALYSIS OF RECENT FLOOD

During the study conducted within a limited timeframe, the main focus was on analyzing the flood events that occurred in 2022. This particular year was marked by unusual weather patterns attributed to climate change. One notable observation was the absence of a typical spring season, replaced instead by erratic weather patterns and heat waves. The region experienced exceptionally heavy rainfall and cloud bursts, resulting in a precipitation level that was 5.1 times higher than the average rainfall recorded over the past 30 years. This intense rainfall started with a pre-monsoon spell on June 13th, 2022, followed by the arrival of the normal monsoon on July 4th, 2022. The impact of these extreme weather conditions was substantial, leading to the declaration of 32 out of 34 districts as Calamity Hit Areas. This designation reflects the severity of the flood-related damages and the urgent need for disaster management and recovery efforts.

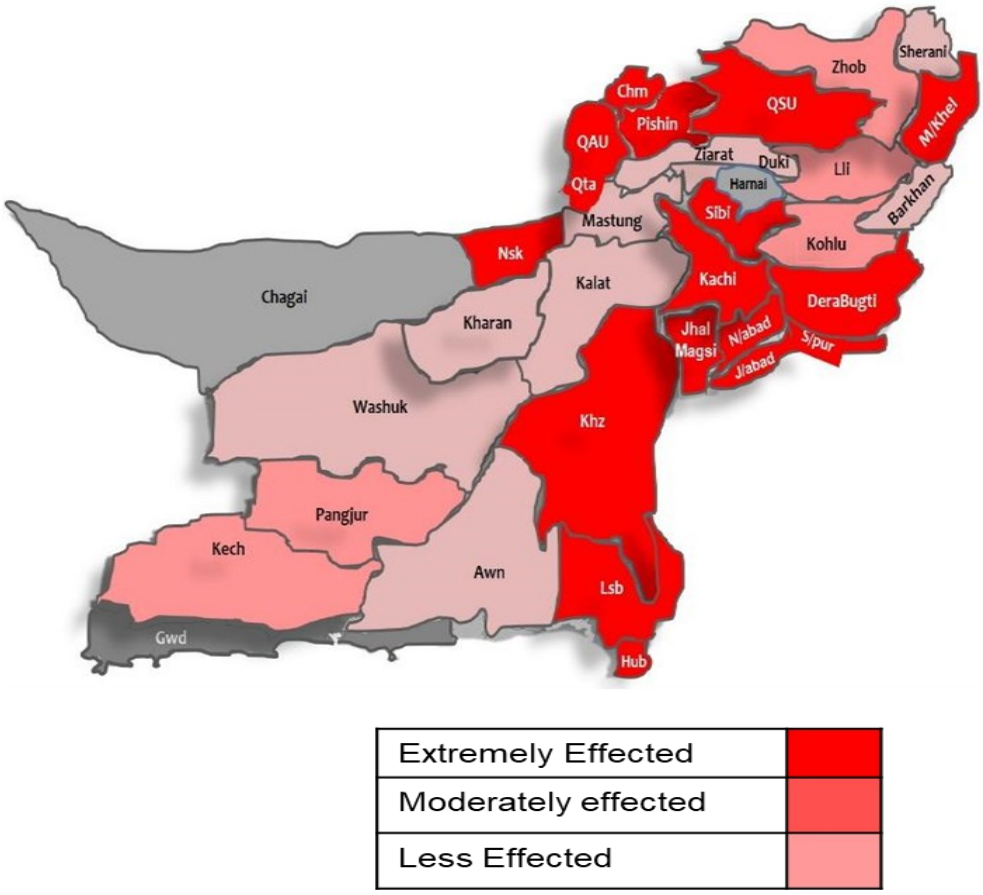


Figure 1 Map showing Flood disater in Balochistan (source: Bureau of Statistics)

Balochistan, an area heavily affected by the floods of 2022, witnessed significant damage and losses across various sectors. The analysis of the flood's impact reveals the extent of the devastation experienced by the region. Human casualties were unfortunately a part of this disaster, with a total of 238 reported fatalities. The floods also displaced a large number of people, resulting in over 1,295,000

individuals becoming internally displaced persons (IDPs) or temporarily displaced persons (TDPs) from their households.

The agricultural sector, a vital component of Balochistan's economy, suffered substantial losses. The floodwaters affected more than 1.2 million acres of agricultural crops and orchards, leading to severe damage and disruption in the farming community.

Livestock and poultry were also significantly impacted, with a reported loss exceeding 328,832 animals. This loss not only has immediate economic consequences for the farmers but also affects the long-term livelihoods and food security of the region.

Residential areas bore the brunt of the floods, with a large number of houses affected. Preliminary estimates indicate that over 76,970 houses were completely damaged, while more than 152,335 houses suffered partial damage. The destruction of homes has left numerous families displaced and in urgent need of shelter and support.

The infrastructure network in Balochistan faced severe challenges as well. Approximately 25 roads, including the N65 Quetta-Sukkur road, were open only for light traffic. However, the M8 Khuzdar-Qubo Saeed Khan road remained closed due to the flood damage. Additionally, a rail bridge at Kolpur was washed away, disrupting railway connectivity. The flood impact on dams was significant, with 103 dams being breached or affected out of the total strategic dams, while only six dams remained unaffected.

The overall road network, including highways, roads, and link roads, suffered damage along approximately 2,221 kilometers. This further hamper transportation and connectivity within the region, impeding relief efforts and economic activities. Given the magnitude of the flood damage and its wide-ranging impact, it is crucial to prioritize recovery and rehabilitation efforts in Balochistan. This includes providing immediate relief and shelter to affected communities, restoring infrastructure, revitalizing the agricultural sector, and implementing long-term measures to mitigate the impact of future floods in the region.

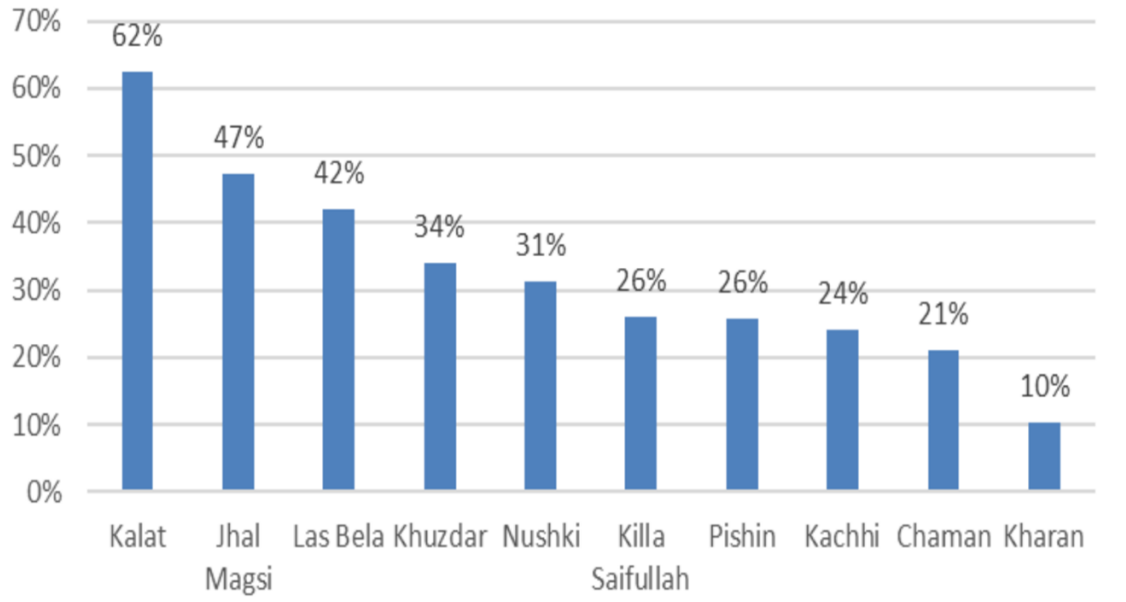


Figure 2 Disaster Hit Areas (source: Government of Balochistan)

FLOOD: INSTITUTIONAL RESPONSE RESCUE & RELIEF

In response to the flood disaster, various institutions were involved in rescue and relief operations in Balochistan. Their efforts aimed to provide immediate assistance and support to the affected population. Rescue and evacuation operations were carried out, leading to the successful rescue and evacuation of over 125,000 people. Additionally, more than 1,000,000 individuals were reached with various forms of assistance, ensuring their safety and well-being during the flood crisis. To address the immediate food needs of the affected households, ration supplies were distributed. One-month ration packages, designed to support households of eight people, were provided to over 142,589 households. Organizations such as Sailani, Al Mustafa Trust, Edhi, UN agencies, INGOs, and NGOs played a crucial role in providing cooked meals to those affected.

Non-food items, including tents, were essential in providing temporary shelter to displaced individuals and families. Over 76,000 tents were distributed to provide shelter to those who had lost their homes due to the floods. Additional items such as tarpaulin sheets, quilts, mosquito nets, kitchen sets, water coolers, hygiene kits, charpai (traditional woven bed), and first aid kits were also provided in large quantities to meet the immediate needs of the affected population.

The Benazir Income Support Program (BISP) played a significant role in extending financial assistance to flood-affected individuals. Cash support was provided to 241,063 beneficiaries, amounting to a total of 5.2 billion Pakistani rupees (approximately 6.02 billion USD). This financial aid aimed to help people cope with the economic challenges and losses they faced due to the floods. To address the loss of life and provide some relief to affected families, ex-gratia compensation was provided by the Provincial Disaster Management Authority (PDMA) and the National Disaster Management Authority (NDMA). PDMA provided compensation to 276 families, while NDMA supported 183 families through this initiative. In addition to government efforts, various international and local non-governmental organizations (NGOs) and civil society organizations (CSOs) actively participated in supporting the flood-affected communities. A total of 41 NGOs were engaged in relief efforts, operating across 24 districts in Balochistan.

The collective response from these institutions, both governmental and non-governmental, helped provide immediate rescue, relief, and support to the flood-affected population. Their efforts played a crucial role in mitigating the impact of the disaster and assisting individuals and communities in their recovery process.

MAJOR CAUSES OF DAMAGE DUE TO FLOOD 2022

The damages caused by the flood of 2022 in Balochistan can be attributed to several major factors. These factors shed light on the vulnerabilities and shortcomings that contributed to the severity of the flood's impact

One significant cause was the absence of high-tech meteorological forecasting systems. Inadequate access to accurate and timely weather information made it challenging to anticipate and prepare for the extreme rainfall events that triggered the flood. Improved meteorological forecasting capabilities would have enabled authorities to issue timely warnings and implement necessary preventive measures.

Another critical factor was the lack of a robust community-based early warning communication mechanism. The absence of effective systems to disseminate flood warnings to vulnerable communities

hindered their ability to evacuate or take necessary precautions in a timely manner. Establishing reliable early warning systems and promoting community engagement in disaster preparedness is crucial for minimizing the impact of future floods.

Human settlement on river beds exacerbated the flood damage. Encroachments and settlements in high-risk areas, such as river beds, increased the vulnerability of communities to flood-related hazards. Relocating settlements away from flood-prone areas and implementing appropriate land-use planning measures can help reduce the risks associated with human settlements in hazardous zones.

The existing dams in the region were found to be technically inefficient, unable to effectively regulate and control the flow of water during heavy rainfall events. This inefficiency amplified the intensity of the floodwaters and contributed to the extent of the damages. Improving the technical efficiency and maintenance of dams is essential to enhance their capacity for flood mitigation.

Poor quality dam construction resulting from widespread corruption further aggravated the flood's impact. Construction practices compromised by corruption led to inadequate structural integrity and compromised the ability of dams to withstand flooding events. Ensuring transparent and accountable construction practices is vital for constructing robust infrastructure that can effectively manage floodwaters.

The absence of check dams and limited water storage capacity also played a role in exacerbating the flood damages. Check dams act as barriers to slow down the flow of water and reduce its erosive force. Their absence in the affected areas increased the speed and intensity of the floodwaters, causing more severe damage downstream. Constructing check dams and increasing water storage capacity can help regulate water flow and mitigate flood risks.

Delays in relief work were observed due to weak communication, coordination, and logistics among the government, communities, and non-governmental organizations (NGOs). Effective coordination mechanisms, improved communication networks, and streamlined logistics are essential for timely and efficient delivery of relief services, ensuring that affected communities receive the necessary support and aid without unnecessary delays.

Addressing these major causes of damage requires concerted efforts from all stakeholders, including government agencies, community organizations, and civil society. Enhancing meteorological forecasting capabilities, establishing robust early warning systems, promoting responsible land-use planning, improving dam construction quality and maintenance, constructing check dams, and strengthening communication and coordination networks are essential steps towards better flood management and reducing the impact of future flood events in Balochistan.

ANALYSIS OF WATER RESOURCE UTILIZATION OF RIVERS & FLOOD WATER

When we delve into the diverse terrain of Balochistan, it becomes evident that it is indeed the "Hasht deh Aab"" "ہشت دہ آب "(the land of eight waters), akin to the famous "Punj Aab" " پنج آب " (the land of five rivers). Balochistan boasts a remarkable abundance of natural resources, including 18 rivers that traverse its landscapes, symbolizing 18 reservoirs of water. This water wealth gives rise to 18 distinct ecologies, each with its own unique characteristics and biodiversity.

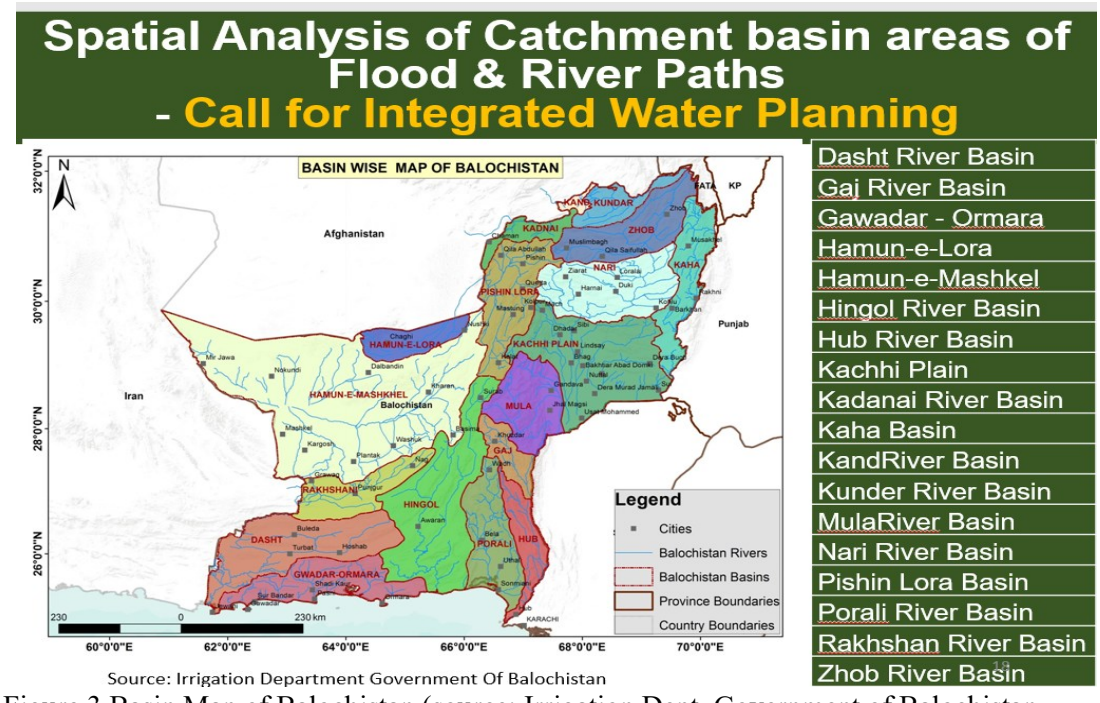
Similarly, the cultural tapestry of Balochistan is woven with rich diversity, as reflected in its 18 distinct dialects. However, this vibrant province also faces 18 types of challenges, ranging from socio-economic issues to environmental concerns, each necessitating in-depth research and tailored solutions.

To unlock the full potential of Balochistan, it is imperative to explore and understand these multifaceted dimensions. This calls for comprehensive studies, innovative research, and collaborative efforts to unravel the complexities and devise context-specific strategies. By investing in further research, we can unravel the hidden treasures within each of the 18 facets, ultimately paving the way for sustainable development and prosperity in Balochistan. An analysis of water resource utilization reveals the available water balance in various river basins and the potential for utilizing excess water in Balochistan. This assessment provides insights into the water resources of 18 rivers and floodwater in the region.

In the Dasht River Basin, there is a water balance of 577 million acre-feet (maf/a), indicating the potential available water resources for utilization. Similarly, the Gaj River Basin has a balance of 207 maf/a, while the Gawadar-Ormara area has 482 maf/a of available water. The Hamun-e-Lora basin shows a water balance of 161 maf/a, and the Hamun-e-Mashkel basin has a significant balance of 1766 maf/a, highlighting a substantial water resource in that area.

In the Hingol River Basin, there is a water balance of 806 maf/a, and the Hub River Basin has 300 maf/a of available water. The Kachhi Plain shows a considerable water balance of 1268 maf/a, indicating significant potential for water resource utilization. Other basins with available water resources include the Kadanai River Basin with 67 maf/a, the Kaha Basin with 413 maf/a, and the Kand River Basin with 16 maf/a. The Kunder River Basin has 76 maf/a of available water, and the Mula River Basin has 295 maf/a.

The Nari River Basin shows a water balance of 691 maf/a, and the Pishin Lora Basin has a balance of 133 maf/a. The Porali River Basin has a considerable water balance of 869 maf/a, and the Rakhshan River Basin shows 286 maf/a of available water.



Source: Irrigation Department Government Of Balochistan

Figure 3 Basin Map of Balochistan (source: Irrigation Dept. Government of Balochistan

Lastly, the Zhob River Basin has a water balance of 157 maf/a. In total, these 18 river basins and floodwaters in Balochistan offer a combined water resource of 8570 maf/a.

This analysis calls for the utilization of excess water in these basins to meet the water demands of various sectors and promote sustainable development. Efficient water management practices, including the construction of reservoirs, irrigation systems, and water conservation initiatives, can harness the available water resources to support agriculture, domestic needs, and industrial requirements in Balochistan.In Balochistan two types of dry land systems are prevailing:

Khushkaba: It is a type of farming in which only localized (with in field) run off is generated and crop suffer moderate to severe moisture stress during crop cycle.

Sailaba: It is a type of farming in which water is harvested through temporary streams, and crops complete its life cycle on the stored moisture.

Over than half of the cultivated land of Balochistan, i.e. 53% is under floodwater (Sailaba) and rainfall and localized runoff (Khushkhaba) farming systems. About 47% of the land is irrigated. Both irrigated and non-irrigated farming systems provide livelihoods to the lowest segments of the population. Resultantly, water scarcity, arising due to population stress, inefficient management of water resources and other causes have devastating impacts on agriculture, livestock as well as other sectors of the province.1

Livestock production is one of the major sources of income for around 70% of the rural population. About 92% of the geographical area of the province is rangelands, which provide grazing to around 20 million small ruminants (sheep and goats). Large proportions of livestock owners are transhumant (45%), who commute between winter and summer quarters to adjust to seasonal feed requirements, and nomadic (50%), who constantly move between highlands and plains and sometimes cross international borders. The stock owners are entirely dependent on livestock for their livelihoods, trading livestock and livestock products (ICARDA 2010).

MAJOR OBSTACLE IN EFFECTIVE WATER MANAGEMENT

Effective water management in Balochistan is hindered by several significant obstacles, leading to water scarcity and inefficient water utilization. One key challenge is the underutilization of flood harvesting methods, with less than 50% of floodwater effectively captured and stored. To address this, it is crucial to enhance flood harvesting infrastructure and promote sustainable water storage techniques. Additionally, the absence of rainwater harvesting practices compounds the problem, resulting in significant water loss. Implementing rainwater harvesting systems at individual and community levels can supplement water supplies and alleviate pressure on other sources.

The prevalent flood irrigation method in Balochistan contributes to excessive water consumption and inefficient distribution. By adopting more water-efficient irrigation methods like drip irrigation and sprinkler systems, water wastage can be significantly reduced. Managing floods and floodwaters is also crucial, which can be achieved through the construction of check dams and storage dams to control floodwaters and facilitate aquifer recharge.

[1] Stakeholder Recommendations for Climate Change Implementation Framework, Balochistan, EU and Government of Balochistan, 2018

Excessive extraction and wastage of water through solar pumps further deplete the water table. Regulating water extraction, promoting responsible use of solar pumps, and raising awareness about water conservation practices are essential steps for sustainable water resource management. Reviving the deteriorated Karez systems, traditional underground water channels, can improve water conservation, distribution, and overall supply.

Addressing these obstacles requires a comprehensive approach involving infrastructure development, policy interventions, community participation, and awareness campaigns. By implementing sustainable practices, efficient irrigation methods, water harvesting techniques, and reviving traditional water systems, Balochistan can enhance water management and overcome the challenges associated with water scarcity..

WATER AVAILABILITY PROFILE OF BALOCHISTAN

The availability of water for Balochistan from Indus water system (perennial and flood water) is around 8.855 million acre feet (MAF) whereas the province is only able to utilize 3.052 MAF, particularly the flood water is not utilized. In the same way, the sources of water other than Indus Water System like run-off and ground water is 15.039 MAF and the province is able to utilize only 6.888 MAF. As a whole, the province has 23.894 MAF of the water resources but only 9.94 MAF is being utilized. There are prospects for utilizing 13.954 MAF of the water resources from both Indus and Non-Indus Water system.

S. No.	Description.	Availability (MAF)	Utilization (MAF)	Balance (MAF)
1.	Perennial Water	3.87+0.360*=4.230	3.052	1.178
2.	Flood Water	4.625	-	4.625
3.	Total	8.855	3.052	5.803

Table 1 Water Availability and Utilization from Indus System (Source: Irrigation Dept.)

S. No.	Description.	Availability (MAF)	Utilization (MAF)	Balance (MAF)
1.	Runoff	13.137	4.850	8.287
2.	Ground Water	1.902	2.038	- 0.136
3.	Total	15.039	6.888	8.151
Grand Total A+B		23.894	9.94	13.954

Table 2 Water Availabilityand Utilization Non-Indus water system(Source: Irrigation Dept.)

ONGOING AND PROPOSED WATER SECTOR PROJECTS AND THEIR SOURCE OF FUNDING

The ongoing water storage projects as per summary of PSDP in 2021-22 were 106 with the estimated cost of Rs. 29.667 billion whereas 157 were proposed schemes with estimated cost of Rs. 11.826 billion. The sources of funding and breakup are as under:

Government of Balochistan has allocated Rs. 28.49 billion for construction of 119 ongoing dams in 2022-2023 whereas for new dams Rs. 6.08 billion have been allocated for construction of new dams. The breakup as under:

Number of Ongoing Dams	Estimated Cost in (Million Rs)	Exp: Upto June 2022	Fin:	Allocation 2022 - 23	Fin:	Thr: Fwd:
119	28497.244	13746.98	42%	5922.437	72%	8827.822
42	6084.947	0	0%	1772.611	40%	4312.336

Table 3 Provincial PSDP 2022-23 (Source: Irrigation Dept.)

EVALUATION OF 100 DAMS PROJECT

The 100 Dams Project has been categorized into five packages covering both North and South zones of the province. As per the information made available by the Irrigation Department and the 100 Dams Project, twenty dams in package-1 and 26 dams in package-2 of the project have been fully completed. Moreover, 20 dams in package-3 of the project have achieved 76% completion status.

About 1% physical progress has been achieved for package-4, comprising 20 dams. Whereas, feasibility has been completed for 11 dams in package-5 of the project. An overview of the status of the sub-projects in various phases is given below:

No.	Package	Cost (Rs.)	Physical Progress	Financial Progress	Start/ completion	Storage (acre ft)	Command (acre)
1	Package-I 20 dams	2,467 m	100%	100%	Jan 2009-Jun 2015	44,438	25,850
2	Package-II 26 dams	4,647 m	100%	100%	Jan 2013-Dec 2019	77,456	24,000
3	Package-III 20 dams	8867 m	76%	69%	Jan 2019-June 2023	198,260	58,500

4	Package-IV 23 dams	13,513 m	1%	4% (mobilization advance)	Jan 2022-Dec 2024	144,267	54,284
5	Package-V 11 dams	Feasibility has been completed					

Table 4 Present Status of Project (source: 100 Dams Projects)

As per the information made available by the 100 Dams Project, the water storage projects will have an overall storage capacity of 464,421 acre ft. The total command area of the projects is around 162,634 acre.

CASE STUDY : IMPACT OF DAMS ON SOCIO-ECONOMIC DEVELOPMENT

For the purpose of this study, three dams have been considered for impact evaluation, given below:

NaharKot Dam (Package-2) of District Barkhan

Kumbri Dam (Package-1) of District Bolan

Bund Dam (Package-1) of District Musa Khel

A map showing the selected dams is given below.

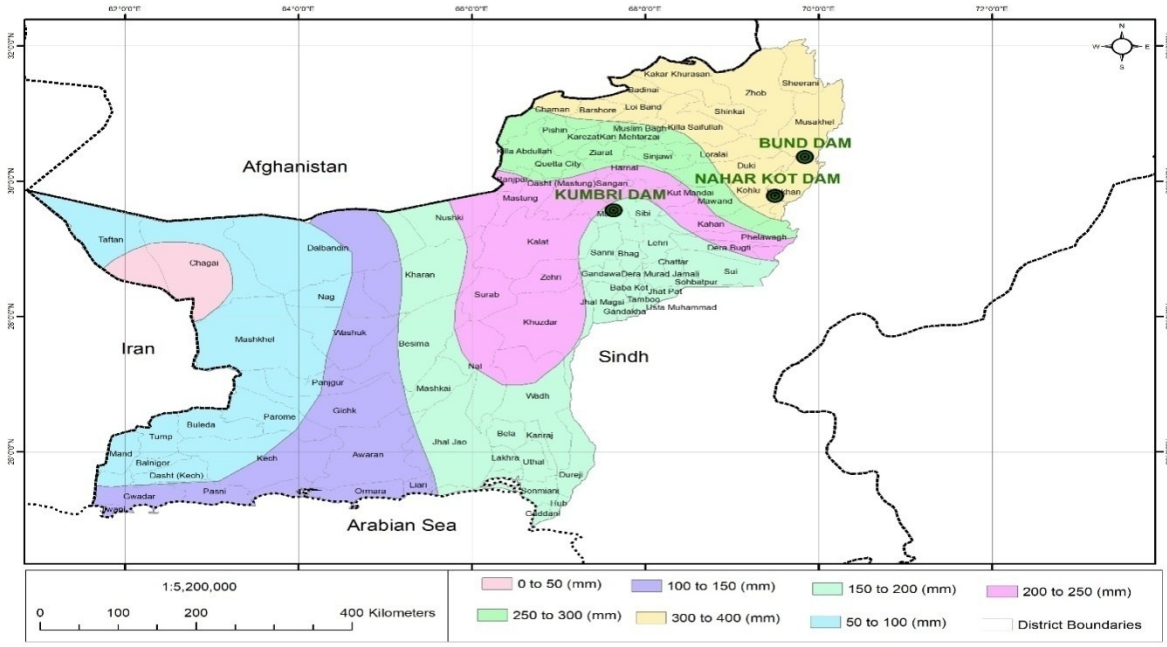


Figure 4 Map showing Selected Dams for Impact Assessment

Findings of the agricultural study, showing the change in cultivated and irrigated area are summarized below. As can be seen from the figures, the cultivated land in the command area of the three dams increased from 2,080 acres to 3,200 acres, registering an increase of 54%. Similarly, the irrigated land in the command area grew from 1,080 acres to 2,150 acres, registering an increase of 99%.

Name of Dam (District)	Before Dam	After Dam	Increased Area	Percent Increased
	Cultivated Area (acres)			
NaharKot (Barkhan)	680	950	270	40%
Kumbri (Bolan)	1,050	1,650	600	57%
Bund (Musa Khel)	350	600	250	71%
Subtotal	2,080	3,200	1,120	54%
	Irrigated Area (acres)			
NaharKot (Barkhan)	180	450	270	150%
Kumbri (Bolan)	650	1200	550	85%
Bund (Musa Khel)	250	500	250	100%
Subtotal	1,080	2,150	1,070	99%

Table 5 Cultivated and Irrigated Area (Source: 100 Dams Project)

A table showing the increase in cropped area, crop production, and gross crop production value in case of the three selected dams is given below. As can be seen from the figures, the annual total cropped area, cropped production and gross crop production value increased substantially after the construction of the dams.

Name of Dam (District)	Increase in Cropped Area (acres)	Increase in Crop Production (Tons)	Increase in Gross Crop Production Value (million Rs.)
Rabi season			
NaharKot (Barkhan)	180	1037	34.9
Kumbri (Bolan)	600	2714	88.2
Bund (Musa Khel)	250	852	34.4
Subtotal	1,030	4,603	158
Kharif season			
NaharKot (Barkhan)	270	653	85.5
Kumbri (Bolan)	550	1796	216.1
Bund (Musa Khel)	140	538	51.8
Subtotal	960	2987	353
Annual			
NaharKot (Barkhan)	450	1690	120.4
Kumbri (Bolan)	1,150	4,510	304.3
Bund (Musa Khel)	390	1390	86.1
Subtotal	1,990	7,590	511

Table 6 Increase in Cropped Area (Source: 100 Dams Project)

The table below provides detailed information on various numerical and critical aspects, including the increase in monthly village income, off-farm income per household, agricultural land value, number of installed tube wells, and depth of the tube wells for the three districts. It is evident from these details that the construction of dams had a positive impact on the farm and off-farm income of the local population, leading to an increase of over 50% in some cases. Moreover, all types of land value experienced a favorable boost.During the study, it was noted that prior to the construction of several dams in the North Zone, the water table in certain areas was depleting by at least 3 feet annually. However, after the dams were built, the groundwater level witnessed a significant rise of 20-30 feet. This improvement can be attributed to the development of a groundwater recharge system.

As a result, the cultivation area in the three districts expanded substantially, and a considerable number of tube wells were installed to meet the irrigation requirements for farming. This development also addressed the drinking water needs of the local inhabitants.The dams had a positive impact on various aspects such as groundwater recharge levels, water storage, irrigation supplies, environment, biodiversity, water availability for livestock, and the safety of infrastructure from floods. Additionally, the dams contributed to an increase in employment opportunities, particularly for seasonal laborers in the farming sector. Interestingly, the construction of dams also played a role in curbing out-migration from the three areas, and in the case of NaharKot Dam, it even led to in-migration.

Specifically, the water table depth increased in the case of NaharKot and Kumbri Dams, while the depletion rate was reduced for the Bund Dam.

	Name of Dam (District)	**NaharKot (Barkhan)**	**Kumbri (Bolan)**	**Bund (Musa Khel)**
Monthly village income	Village Income Income Before (lacs)	9	9	12
	Village Income Income After (lacs)	13	12	15
Monthly off-farm income	Monthly off-farm income per household before	15,000	12,000	15,000
	Monthly off-farm income per household after	25,000	18,000	20,000
Agri-Land value	Agri Land value before	30,000	15,000	200,000
	Agri Land value after	100,000	40,000	250,000
No. of Installed Tubewells	No. of Installed Tubewells before	800	10	20
	No. of Installed Tubewells before	1,050	15	250
Depth	No. of Tubewells at Depth (less than 250 ft)	750	-	250
Water Availability	Water Availability (days)	365	365	330

Table 7 Impact of Dams (Source: 100 Dams Project)

CASE STUDY OF KAREZ IN QUETTA

Case Study: Nau Sanjidi Karez in Quetta: Sustainable Water Management in a Balochistan Village

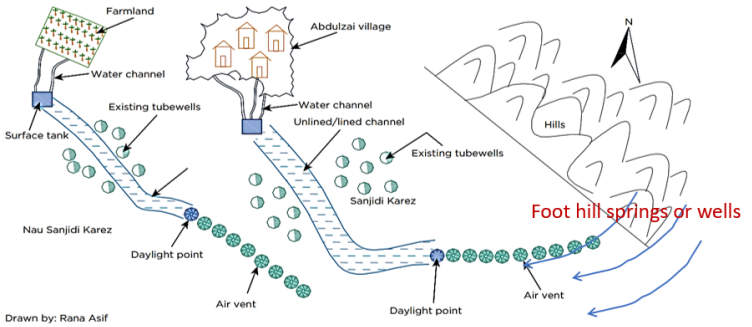
The village under study is a close-knit community in Balochistan, consisting of 16 households with a population of 1,000 people. The primary occupation of the villagers is agriculture, with most male members engaged in farming, while some have additional occupations such as government jobs, private businesses, or labor work. The village's income is primarily dependent on agriculture, with four major crops—wheat, onion, maize, and barley—being cultivated annually. The village also boasts large orchards of high-quality grapes and apples.

The village relies on two main sources of irrigation: the Nau Sanjidi Karez and the Sanjidi Karez. These ancient Karez systems have been providing water for centuries, ensuring reliable access to irrigation and domestic water for the community and their livestock. The Nau Sanjidi Karez, constructed 200 years ago, originates from the foothills of Chiltan Mountain and spans 4.1 kilometers. It features 50 air vents (wells) and a partially lined open channel.

Despite the reliability and resilience of the Karez system, the introduction of new technologies and changes in socioeconomic conditions have led farmers to seek alternate means of water access, such as tubewells. This shift has resulted in the neglect of the Karez systems and a decline in their overall quality and quantity of water. Moreover, the unregulated proliferation of tubewells, driven by government subsidies, poses a challenge to sustainable water management in the region.

To ensure the long-term viability of the Karez system and address the water management challenges, a comprehensive approach is required. One key aspect is the development of a proper regulatory framework to control the placement of tubewells and enforce regulations

impact Rehabilitation of Nau-Sanjidi Karez
in Abdullah Zai Village –Quetta
Case Study



History	Problem	Investment	Beneficiary	Impact 30%
200 year ago	Partially dysfunctional	Rs. 25 million Rs.	30 families	30% increase 252 cm/d

Groundwater Management in Balochistan: A Case Study of Karez Rehabilitation Muhammad Ashraf and Faizan ul Hasan, World Bank Group retrieved on 25-5-23 Groundwater-Management-in-Balochistan-Pakistan-2016.pdf

Figure 5 Map showing Nau Sanjidi Karez in Quetta

effectively. This would help preserve the indigenous Karez system, which acts as a buffer against droughts and provides water for the poorest households in rural Balochistan.

Additionally, investment in maintenance and watershed management activities in the catchment areas of the mother wells can enhance the quantity and quality of water from the Karez systems. By implementing these improvements, the Karez system can remain competitive with more energy and capital-intensive alternatives while ensuring sustainable water management practices.

The village's reliance on the ancient Karez system highlights the importance of preserving and maintaining this valuable resource. By implementing a regulatory framework, promoting watershed management, and investing in the Karez system's upkeep, the village can ensure sustainable water management practices that safeguard the livelihoods of its residents and preserve the ecological balance of the region.

SECTION II: DROUGHT IN BALOCHISTAN

Based on the Long-Term Climate Risk Index 2018, calculated using data from 1997 to 2016, Pakistan is ranked as the 7th most affected country by weather-related events. Recent reports from German Watch, presented at CoP 25, indicate that Pakistan now ranks as the 5th most affected country due to climate change. During this period, the annual average death toll reached 523.1 lives lost per year, with a yearly economic loss of USD 3816.82 million.

Balochistan, being one of the most drought-prone regions in Pakistan, has experienced severe drought events in the past, such as in 1967-1969, 1971, 1973-1975, 1994, 1998-2002, and 2009-2015 (Ahmed et al., 2015). In September 2018, the Pakistan Meteorological Department (PMD) issued a drought alert, warning areas like Dalbandin, Gwadar, Jiwani, Panjgur, Pasni, Nokundi, Urnmara, Quetta, and Turbat. PMD reported that districts Chagai, Noshki, Kharan, and Washuk were severely affected, leading to significant impacts on agriculture and livestock sectors and resulting in the migration of 33% of the local population to other areas (PDMA, 2018). The ongoing drought situation has created a famine-like situation in several districts, with a scarcity of rainfall.

Drought is characterized by a deficiency in precipitation, and it poses significant risks and impacts in various aspects, including climate, hydrology, agriculture, and geology (UNDP & BUITEMS, 2016). Balochistan is currently facing one of the worst natural disasters due to the drought. The study conducted in Chaghai, Kharan, Noshki, and Washuk districts reveals that drought is the major challenge faced by the local population. Since 2000, recurring droughts of varying durations and intensities have occurred, with the period from 2013 onwards being particularly alarming, witnessing a 74% decrease in rainfall. This has severely affected water management, agriculture, livestock, health, food security, and livelihoods. Groundwater depletion, caused by excessive tube well installations, inefficient irrigation systems, and inappropriate cropping patterns, has further worsened the situation. The socioeconomic consequences of drought are evident in compromised incomes, nutrition, and livelihoods of affected communities. Food prices have increased by 65%, leading to reduced food intake and malnutrition, especially among women and children. Livestock has also been severely impacted, with a 76% reduction in fodder output, affecting the rural economy. Depletion of irrigation sources has

resulted in the destruction of fruit orchards, reduced vegetable and cereal crop production, and negative effects on incomes and livelihoods. Farmers have experienced reduced incomes, forcing them to sell their assets to cope with the resource deficit, exacerbating the already severe nutritional deficiencies prevalent in Balochistan.

IMPACTS OF DROUGHT ON THE FOUR DISTRICTS- CASE STUDY

The Case Study conducted by Islamic Relief in 2018, based on the primary data on Chaghai, Kharan, Noshki and Washuk (Rakhsan Division) has been considered for analysis, impacts and institutional response on the drought to fully comprehend the threats of climate change.

IMPACT OF DROUGHT ON THE WATER RESOURCES

When rivers, lakes, ponds, and reservoirs dry up, and wells and tube wells experience reduced discharge or become unserviceable due to declining water tables (Wilhite & Glantz, 1985), the replenishment of groundwater is hindered when precipitation rates fall below the regional average. This situation further exacerbates when reliance on groundwater extraction through tube wells increases. Over-exploitation of groundwater leads to depleted water levels. While prosperity prevails when replenishment exceeds depletion, the disruption of this balance due to reduced rainfall and excessive extraction results in recurring or prolonged droughts, forcing communities to compromise their already compromised lifestyles or resort to migration.

Since 2013, Balochistan has witnessed a significant 74% decrease in rainfall, coupled with the over-exploitation of groundwater for irrigation purposes in 30 out of 36 districts. This has caused water tables to decline by 2-5 meters annually. The government's policy of groundwater sector development, technological advancements, and subsidized electricity have contributed to increased reliance on groundwater extraction, leading to a current average depletion rate of 7 meters per year. Additionally, the pursuit of higher profits from cultivating high-value fruits and vegetables has led to the proliferation of tube wells and indiscriminate pumping, further exacerbating the situation.

In many areas, existing karezes and tube wells have experienced a significant reduction in discharge flow. Farmers, desperate to save their orchards, resort to various measures. Wealthy farmers install downstream tube wells and transport water through long pipelines. Resource-poor and small farmers purchase water from nearby tube well owners, unable to afford lengthy pipelines. Water-scarce farmers without access to these options bring water to their orchards using tractor-mounted water tanks.

IMPACT OF DROUGHT ON AGRICULTURE

Rainfed agriculture has significantly declined during the ongoing drought, with more than two-thirds (70%) of local agriculture relying on rainwater. In the four districts under discussion, approximately 25% of the area is irrigated through electricity, diesel, and solar-powered tube wells, supporting the cultivation of cash crops such as onions, watermelons, cumin, seasonal vegetables, and fruit orchards. Khareef crops, including sorghum (jowar), millet (bajra), maize, mung/beans, mash beans, fruits, onions, vegetables, melons, chilies, fodder, coriander, garlic, and cotton, are prominently grown. However, the year 2018 Rabi plantation season witnessed a 0% cultivation rate in the affected districts, as reported by the Agriculture Department.

Due to recurrent droughts, approximately 84% of farmers engaged in non-irrigated agriculture experienced a 73% reduction in production. The income of the majority of these farmers, who are relatively poorer compared to irrigated farmers, suffered a significant decline, with a 71% decrease in gross incomes. Fruit orchards, a primary income source in Balochistan, were devastated, with 76% of them destroyed by severe droughts. Surprisingly, only 5% of households attempted to cultivate drought-resistant crops, while the remaining 95% never made such an effort. The combination of low groundwater levels and decreased rainfall resulted in an 84% reduction in crop area and 86% losses in crop yields, exacerbating the socioeconomic hardships faced by farmers and, in some cases, compelling them to migrate.

IMPACT OF DROUGHT ON LIVESTOCK

The study findings indicate that in Chagai, Noshki, Kharan, and Washuk, the majority of people (86%) preferred to raise small and large ruminants such as goats and camels. Unfortunately, the drought had a significant impact on their livestock, affecting 63% in Chagai, 58% in Noshki, 55% in Kharan, and 59% in Washuk. The consequences of the drought on livestock were severe, leading to animal mortality, diseases, weakness, reduced production, and subsequently lower prices. The mortality rate was particularly high among young offspring due to disease outbreaks and malnutrition. The scarcity of necessary minerals and water content in rangeland feed exacerbated the situation, resulting in a 50% decrease in livestock productivity, including dairy products (meat and milk). Livestock markets reflected the severity of the drought, with livestock prices plummeting. Herders of small stocks were compelled to sell off their animals at low prices for their own sustenance and to provide feed for the remaining livestock. This destocking had multiple socioeconomic implications, as the animals served as their capital, generating dairy products and offspring. Disposing of their stock at throwaway prices further exacerbated the situation.

IMPACT OF DROUGHT ON HEALTH AND NUTRITION

Eye diseases in the drought-affected areas have seen a significant increase of 57%, primarily attributed to the dusty climate, with cataract being a prevalent condition. The nutritional status in Balochistan is alarmingly worse than the national averages. The study highlights that 38% of children are underweight, 14% suffer from wasting, and 38% experience stunting. Additionally, nearly 50% of mothers and children exhibit deficiencies in Vitamin A, Zinc, and anemia.

The social indicators chart reveals that Balochistan scores relatively low, which can be attributed to the socioeconomic impact of drought. As a consequence of recurring and prolonged droughts, food insecurity has risen to 87%. Approximately 75% of respondents expressed concerns about the limited availability of food and essential items in the markets. This indicates sellers' reluctance to invest due to affordability issues and worsening socioeconomic conditions. In fact, 83% of the affected population reported difficulties in purchasing food for their families, highlighting the severity of the situation.

IMPACT OF DROUGHT ON MIGRATION

Migration manifests itself in various ways within the affected regions. Herders with larger flocks (500+ animals) engage in both local and cross-border migration, specifically to Afghanistan and Iran. Conversely, owners of smaller herds (20-30 animals) opt to destock their animals and relocate to urban centers. One consequence of this migration is the increased population in urban areas, exacerbating the strain on already limited resources and essential services such as healthcare and education. Urban residents endure the hardships of resource and opportunity sharing, heightened employment competition, and deteriorating law and order. The study also highlights an additional aspect of

migration. Although Chagai and Washuk experience relatively higher migration rates compared to Noshki and Kharan, 63% of the population migrated to other areas in search of water, food, and fodder. Among the migrating families, 27% encountered various challenges from host communities, including animal theft (25%), resistance to animal movement (22%), conflicts over water resources (23%), inflated prices of essential goods (10%), and restrictions on the movement of family members (3%).

INTERVENTION BY DIRECTORATE OF VEGETABLE SEED PRODUCTION, ARI, SARIAB, QUETTA

To mitigate the effect of drought the office converted the old traditional irrigation methods to drip irrigation system reducing consumption by almost 50%. They participated in promoting advanced farming techniques (vertical growing, tunnel farming). The office continued conducting of Training/workshops/ seminars to educate the farming community for using drip irrigation system and drought resistant varieties.

INTERVENTION BY LIVESTOCK DEPARTMENT

Given the low population density and widely scattered geographical areas, 15% of the area for livestock vaccination and treatment was covered.

INTERVENTION BY AGRICULTURE DEPARTMENT

The Department of Agriculture has been actively involved in providing technical assistance and guidance to farmers, focusing on implementing improved agricultural practices. This includes offering advice on pesticide application, promoting better agronomic practices, and introducing low delta crops such as grapes, olive, pistachio, and almond. To address the specific challenges of drought-prone areas, dwarf varieties of apple and selected grape varieties suitable for such conditions have been distributed under the RAHA programme of UNDP. In an effort to minimize post-harvest losses, the Pakistan Agriculture Cold Chain Development (PACCD) has established cold storages, both mega and mini, dedicated to storing major fruits in the province. Furthermore, PACCD supports farmers by facilitating the use of improved packaging materials such as plastic, paper, and cotton fabric baskets for efficient picking and packing of fruits.

INTERVENTION BY THE DEPARTMENT OF IRRIGATION

The Department is working on the development and construction of check-and delay action dams; perennial and flood irrigation schemes; rehabilitation of natural resources (karezes and springs), and; 70 Dams have been completed out of 100 Dams project.

INTERVENTION BY THE FOREST DEPARTMENT

They have reported no major intervention. They pleaded that Forest department is under financed and that there was no proper mechanism in place to monitor drought regularly possibly due to lack of political will and/or lack of funding. Lack of technical & financial capacity at the local level is also a major barrier in all the districts. Local communities also lack sensitivity towards reducing forest demolition, plantation and green Baluchistan initiative.

INTERVENTION BY PUBLIC HEALTH ENGINEERING DEPARTMENT (PHED)

The remodeling and extension of the Pat Feeder canal would result in an additional 64,372 hectares of irrigated land. In the future, the domestic, industrial, and mining sectors will heavily rely on

groundwater. Therefore, it is crucial for the Public Health Engineering Department (PHED) to collaborate with the Irrigation and Power Department (IPD) to formulate a strategy for sustainable development and management of groundwater resources. Access to water is essential for both urban and rural areas. Currently, piped water supply is available to approximately 25.3% of the population, and this percentage would increase if non-functional schemes are restored. The urban areas have a piped water supply coverage of 74%, while the rural areas have 14.7%. To ensure the well-being of the population, structural measures must be implemented to minimize health risks. The PHED requires technical and financial support to execute its existing plans and future interventions successfully.

SECTION III: GENERAL THREATS TO ECOSYSTEMS AND CONSERVATION OF HABITATS AND ECOSYSTEMS

Ecosystem:

An ecosystem refers to a geographic area in which plants, animals, and other organisms coexist with weather and landscape, creating a harmonious environment for life to thrive. Ecosystems can vary in type and size, and when interconnected, they form a larger biome. In the case of Balochistan, the province can be broadly classified into four ecological zones: cool temperate, temperate, warm temperate, and dry tropical..

GLOBAL PERSPECTIVE ON ECOSYSTEMS:

An ecosystem encompasses a geographical area where plants, animals, and organisms coexist alongside weather and landscape, fostering a balanced environment conducive to life. Ecosystems exhibit diversity in type and scale, and their interconnections contribute to the formation of broader biomes. In the context of Balochistan, the province can be broadly categorized into four ecological zones: cool temperate, temperate, warm temperate, and dry tropical. These distinct zones characterize the varied ecological makeup of Balochistan's natural surroundings.

ECOLOGY OF BALOCHISTAN:

The Balochistan plateau, located west of the Suleiman and Kirthar ranges, is a vast and rugged area comprising the Zhob and Loralai basins as well as the coastal region. It can be divided into four distinct areas: the upper highlands (Khorasan), low highlands, plains, and desert. The southern region, south of Quetta, is primarily arid desert with pockets of habitable land near water sources. The central region is dominated by Kalat, while the Bolan Pass serves as the main route to Kandahar, Afghanistan. The plains of Balochistan, although relatively small compared to the total area, include the western part of Sibi in Naseerabad Division, the plains of Kachi, Lasbela, the river Dasht plains, and some coastal plains. However, these areas are often affected by severe windstorms, making them inhospitable. Among them, Kharan stands out as the largest desert.

The ecology of Balochistan is characterized by its harsh weather conditions, extreme temperatures, predominantly arid land, frequent droughts, seasonal migration patterns, and ethnic diversity. In such challenging circumstances, adaptation becomes crucial for survival. To gain a deeper understanding of the dynamics, interactions, and the threats faced by these factors, the province's ecology is being analyzed within six main categories.

TYPES OF LAND COVER IN THE PROVINCE

Bare soil, exposed rock and desert combine to make a total of 70% of the land cover of the province.(Annex) This feature acts as a defining factor in the life and ecosystems of the province. Rangelands occupy 26.7% which again shows itself in the sources of livelihood dominated by rearing of sheep and camels by the inhabitants of the province. Water bodies are scarce and have seasonal flow.

FORESTS

Forest cover is 1.5% of the total area of Balochistan. Juniper, Chilghoza, Acacia are main types of forests alongwith thorn forest of Kandi and Pelo. Coastal mangroves are also found in parts of the coastal belt. Juniper forests are amongst the oldest in the world and are found in Ziarat, Qalat and Chautair. Makran, Lasbela, Sibi and Khuzdar have tropical desert forest.

Ban on forest land being used for non forestry purpose is needed. A study** has recommended to bring additional area under cultivation through Sailaba farming for enabling additional households to get livelihoods from agriculture and ween them away from cutting forests.

Juniper forests fulfill the fuel requirements of the adjoining communities too. People use the wood for fencing, lining of wells, as construction material and thatching. Major threat to these forests were posed by expansion of agriculture, livestock overgrazing mainly by those brought by nomads, while in Ziarat and Koshki valleys tourism is also observed as emerging threat to these forests.

WILDLIFE

Five out of ten Endangered eco-systems are in Balochistan. Two mammals,6 reptiles, 8 fresh water fish are endemic to the province. It also provides traditional route to migratory birds species including houbara, falcons, cranes, and other water fowls

Chiltan Markhor is endemic to Balochistan. It was hunted almost to extinction in 1980s but later with special plan implemented through WWF, the population has increase and is reported to be over 2000 now.

PROTECTED AREAS

Hazarganj Chiltan National Park and Hangol National Park :

Hazarganj-Chiltan National Park(Quetta and Mastung districts, covering over 27000 hectares) and Hingol National Park (in Lasbela, Gawadar and Awaran districts, covering over 60000 hectares) are managed by the Balochistan Forest and Wildlife Department.Due to the sheer size it becomes difficult for the rangers to monitor the area and use of modern techniques such as modern binoculars, drones and corresponding training of taff can produce better results.

RAMSAR SITES:

Seven Ramsar sites including Rann of Kutch, Nariri-Jaboh Lagoon, Indus Delta, Miani Hor, Astola Island, Ormara Turtle Beach and Jiwani are located in Balochistan.

ASTOLA ISLAND:

Astola Island is locally known as 'Haft Talar', or the island of seven hills. The island is a part of Pasni sub-district of Gwadar District. The Island is an ecologically important site, as it inhabits colonies of corals and its sandy beach provides nesting ground for the endangered green turtle and hawksbill turtle. The Astola saw-scaled viper is endemic to the island. The island can serve as a camping site and scuba diving, fishing. The wetland is facing threats mainly from anthropogenic activities, pollution resulting from dumping of crude used oil, washing of tankers at sea collection of turtle eggs, use of illegal fishing nets, trawling, dumping of waste materials (ghost nets) and mining of corals.

RANGELANDS AND ASSOCIATED MATTERS

Most of the rangelands in Balochistan are owned by tribes or communities, presenting an opportunity for improving vegetation in these areas. In the past, simple techniques such as hillside ditches and micro catchment areas have shown promise in enhancing vegetation. However, the depletion of vegetation has led to increased runoff and soil erosion.

Forage shortages are observed during late fall and winters, primarily due to indiscriminate grazing practices. This issue can be addressed through awareness campaigns, rotational grazing, and the establishment of fenced areas for controlled grazing. In addition to traditional livestock activities, community development initiatives should also explore non-traditional livelihood sources like floriculture, apiculture, poultry farming, and tourism.

The rangelands serve as crucial feeding grounds for livestock, particularly camels, sheep, and goats, providing essential resources such as milk, hides, and meat. However, the management of livestock production, predominantly carried out by nomads and transhumants, is hindered by their marginalized social status and nomadic lifestyle. To overcome these challenges, it is important to involve women in decision-making processes and improve the genetic quality of livestock breeds to mitigate declines in productivity resulting from excessive breeding.

COASTAL AREAS AND FISHERIES

The effects of climate change can be seen in the form of cyclones, sea intrusion and soil erosion. a national assessment report of the Climate Change Division of Pakistan, wherein, Jiwani and Sonmiani face severe erosion, Gwadar and Gadani experience moderate erosion, and Ormara faces low intensity erosion and intrusion by the sea.The erosion is so severe that seawater frequently inundates coastal settlements. In most parts of the coastal belt jetty sites have been silted up. In Pasni, dredging arrangement need to be enhanced.

Indus Delta is highly arid in character and depends on the outflow of the Indus river to maintain the sediment balance of the delta ecosystem. The delta is comprised of extensive mudflats and mangrove areas – one of the largest arid-climate mangrove areas in the world. The average annual fresh-water and silt outflow through upstream abstraction of water for irrigation has been reduced by 80%. The character of the delta has changed significantly. Those responsible for coastal zone management must recognize the significance of ecosystem changes and that they are brought about by water extraction taking place hundreds of kilometres upstream.**

MISCELLANEOUS ISSUES:

Desertification, pollution, lack of sanitation and drainage services, overfishing and marine degradation are other threats to the ecosystems in Balochistan. As vegetation is depleted and alternative sources of livelihood are not available, migration specially to the urban/settled areas is increasing. Expectation of a livelihood and better facilities serve as impetus to migration to urban areas but has resulted along with increasing population in stress on facilities such as drinking water, drainage and sanitation.

ECOSYSTEM CONSERVATION: INSTITUTIONAL RESPONSE AND PROPOSED INTERVENTIONS

Federal Government:

National Biodiversity Strategy and Action Plan was launched by Ministry of Environment. Post 18th Amendment: M/o Climate Change has a biodiversity desk. PCRW under M/o Science & Technology has introduced new technology of Leaky Dams & has grown drought resistance apples, pomegranates and shrubs. PARC BARDC of M/o NFSR is running 5 institutes in Turbat, Lasbella, Barkhan & Jafferabad. NGOs and donor agencies are partners.

Provincial Government:

Conservation Strategy of Balochistan is an IUCN document but has interventions in collaboration with the district set-up too. Integrated District Development visions have been developed for Quetta, Mastung, and Lasbela districts. Astola Island has been declared as the first Marine Protected Area and a Management Plan for this area is underway. Other innovative interventions have also been undertaken by different departments of the provincial governments:

Forest Department has undertaken "Reversing Deforestation and Degradation in High Conservation Value Chilghoza Pine Forests" under the Global Environment Facility. It aims at creating a value chain for the farmers.The department has also carried out a successful intervention of introducing new drought resistance atriplex plantation in collaboration with Arid Zone Authority.

CLIMATE RESILIENCE AND CLIMATE JUSTICE

Climate resilience refers to the ability of a system, such as a community, ecosystem, or infrastructure, to withstand and recover from the impacts of climate change. It involves building adaptive capacity, implementing risk reduction measures, and enhancing the ability to bounce back from climate-related shocks and stresses. Climate justice, on the other hand, emphasizes the equitable distribution of both the burdens and benefits of climate change. It recognizes that vulnerable communities, particularly those in developing countries, often bear the brunt of climate impacts despite contributing the least to global greenhouse gas emissions. Climate justice calls for fair and inclusive approaches to address climate change, ensuring that marginalized populations are not disproportionately affected and have access to resources and opportunities for adaptation and mitigation.

BALOCHISTAN: CLIMATE RESILIENCE, SECURITY, AND SUITABILITY

Climate resilience, security, and suitability are critical considerations in the context of Balochistan, a region vulnerable to climate change impacts. Balochistan, located in southwestern Pakistan, faces numerous climate-related challenges, including water scarcity, drought, and extreme weather events. As a result, it is crucial to develop strategies and measures that enhance the region's resilience to climate change while ensuring the security and suitability of its inhabitants.

Climate resilience refers to the ability of a system to anticipate, cope with, recover from, and adapt to climate-related shocks and stresses. In Balochistan, building climate resilience involves various aspects. Firstly, improving water management and ensuring water security is paramount. This can be

achieved through sustainable water conservation practices, efficient irrigation systems, and the construction of water storage infrastructure such as dams and check-dams. Additionally, promoting sustainable agriculture practices is vital for enhancing climate resilience and food security in Balochistan. Encouraging the use of climate-smart agricultural techniques, such as drought-resistant crop varieties and precision irrigation methods, can help farmers adapt to changing climate conditions and reduce vulnerability.

Ensuring the security of the region entails addressing the social and economic implications of climate change. This includes safeguarding livelihoods, reducing poverty, and strengthening social safety nets for vulnerable communities. Enhancing education and awareness about climate change impacts can also contribute to the overall security of the population, empowering individuals to make informed decisions and take proactive measures. Hence, suitability refers to the appropriateness of development and infrastructure projects in the context of climate change. It is crucial to consider the long-term viability and environmental sustainability of any development initiatives. Assessing the potential climate risks and impacts on infrastructure, land use, and urban planning can help identify and implement suitable adaptation measures.

BALOCHISTAN: VERTICAL AND HORIZONTAL LINKAGES TO TACKLE THREAT OF CLIMATE CHANGE

To effectively tackle the climate threats in Balochistan, it is crucial to establish both vertical and horizontal linkages among various stakeholders. Vertical linkages involve connecting different levels of government, from local to provincial and national, as well as engaging international organizations and experts. These linkages facilitate the exchange of knowledge, resources, and expertise, enabling the development and implementation of effective climate change adaptation and mitigation strategies.

Vertical linkages also enhance coordination and collaboration among different government departments, such as water resources, agriculture, and disaster management, ensuring a cohesive and integrated approach to climate action. By aligning policies, sharing information, and coordinating efforts, vertical linkages enable a more efficient response to climate threats. On the other hand, horizontal linkages involve fostering connections among different sectors, communities, and stakeholders within Balochistan. This includes collaboration between government agencies, research institutions, civil society organizations, community groups, and the private sector. Horizontal linkages facilitate the sharing of best practices, lessons learned, and innovative solutions to address climate challenges.

By establishing horizontal linkages, diverse perspectives and knowledge can be brought together, promoting inclusive decision-making processes and the participation of all relevant actors. This facilitates the identification and implementation of context-specific climate resilience measures that address the unique needs and vulnerabilities of different communities and sectors in Balochistan. Hence, vertical and horizontal linkages play a crucial role in enhancing the collective response to climate threats in Balochistan. By promoting collaboration, information sharing, and coordination among stakeholders at different levels, these linkages strengthen the capacity to tackle climate change effectively and build a more resilient future for the region.

SECTION VI: CONCLUSION AND RECOMMENDATIONS

CONCLUSIONS

- Construction of additional high-quality dams can significantly enhance water management in Balochistan. By effectively managing floodwater through the construction of efficient dams, an additional 13.9 million acre-feet per annum (maf/a) of water can be utilized for the benefit of the population. This would greatly contribute to addressing water scarcity and ensuring a sustainable water supply.

- The implementation of innovative techniques, such as drip irrigation and improved systems of Karez, holds great potential for mitigating the impact of severe weather events. By adopting these traditional and innovative water management practices, the province can optimize water usage and improve agricultural productivity while reducing water wastage.

- The preservation and protection of livestock, fauna, and flora are essential for the ecological balance and economic well-being of Balochistan. Droughts and floods pose significant risks to these valuable assets. However, implementing mitigation measures based on well-researched strategies can help safeguard and improve the resilience of these resources. This includes measures such as improved grazing practices, early warning systems for livestock, and conservation efforts for biodiversity.

- To achieve sustainable economic prosperity and improve the livelihoods of the people of Balochistan, an integrated and comprehensive strategy for water management, agriculture, livestock, and ecosystem preservation is urgently needed. Such a strategy should be developed with the aim of addressing the interconnected challenges faced by the province. By prioritizing water management, promoting efficient agricultural practices, and conserving natural resources, this strategy can alleviate feelings of deprivation and alienation among the population, leading to a more prosperous and sustainable future for Balochistan.

RECOMMENDATIONS

In our pursuit of turning aspirations into concrete achievements, we embrace the harmonious integration of ***wish, will, and wisdom***. Wish embodies our visionary imagination, will represents our resolute determination, and wisdom encompasses the synergistic power of collaborative teamwork and technological advancements. With this guiding philosophy, we have identified more than two dozen potential propositions that hold promise for transformation into comprehensive project proposals, consolidated within the PC-1 framework. While this write-up offers a concise overview. However, annexure I & II provide the logical framework matrices for eight selected proposals, facilitating the enhancement of imagination and construction of robust project proposals.

As we embark on this transformative journey, we remain steadfast in our commitment to harness the power of collaboration, leverage cutting-edge technologies, and embrace the wisdom stemming from diverse perspectives. Together, we can bridge the gap between imagination and reality, forging a path towards a brighter and more prosperous future of Balochistan. Propositions exhibited beneath are manifestation of imagination and determination and surely require more deliberation for converting dreams into reality.

Policy & Governance

1. **DEVELOPMENT OF AN INTEGRATED MULTI-SECTORIAL WATER DROUGHT MANAGEMENT POLICY FRAMEWORK:** A comprehensive policy framework should be established to guide water and drought management practices across various sectors. This framework should address issues such as water allocation, conservation, and sustainable utilization.
2. **DEVISING AN INTEGRATED WATER CONSERVATION POLICY:** A policy focused on water conservation should be developed to promote efficient water use in agriculture, domestic settings, and industries. This policy can include measures such as promoting water-saving technologies, enforcing water usage regulations, and incentivizing water conservation practices.
3. **STRENGTHENING GOVERNANCE AND REGULATORY FRAMEWORKS:** Enhance governance structures and regulatory frameworks related to water management. This includes enforcing existing regulations, improving accountability mechanisms, and promoting transparent and inclusive decision-making processes.
4. **FORMULATION OF A POLICY TO CURTAIL UNABATED WATER EXTRACTION:** Regulating and controlling water extraction is essential to prevent overexploitation and depletion of water resources. A policy framework should be formulated to monitor and manage water extraction, ensuring its sustainability for future generations.
5. **CONTINUOUS MONITORING AND EVALUATION:** Establish a robust monitoring and evaluation framework to assess the effectiveness of water management interventions. Regular monitoring of water availability, usage, and impact will enable adaptive management approaches and facilitate the refinement of strategies over time.

Innovative Interventions

6. **ESTABLISHMENT OF FLOOD AND DROUGHT EARLY WARNING AND MITIGATION SYSTEMS:** Developing effective early warning systems for floods and droughts can help communities and authorities take timely preventive and mitigation measures. These systems should incorporate advanced meteorological forecasting, monitoring, and communication tools.
7. **ESTABLISHMENT OF A DROUGHT INFORMATION DISSEMINATION MECHANISM AND EMERGENCY MITIGATION SYSTEM:** A robust system for disseminating timely drought information and implementing emergency measures is crucial to protect agriculture, livestock, livelihoods, and water resources. This system should facilitate early warning and response mechanisms to minimize the impact of droughts on vulnerable communities.
8. **LEAKY AND SAILABA DAMS FOR BRINGING MORE LAND UNDER CULTIVATION:** Constructing leaky dams and sailaba dams can increase the availability of water for irrigation, allowing for the cultivation of more land. These dams can help capture and store rainfall runoff, contributing to sustainable agricultural practices.
9. **REHABILITATION OF KAREZ SYSTEMS:** The rehabilitation of traditional Karez systems is essential to conserve and distribute water effectively. Rehabilitating these underground water channels can improve water availability for agriculture and domestic use, especially in arid regions.
10. **IMPLEMENTATION OF DRIP IRRIGATION SYSTEMS:** Drip irrigation is a water-efficient technique that delivers water directly to the roots of plants. Promoting and implementing drip irrigation systems can reduce water wastage and improve crop productivity in water-scarce areas.
11. **SOLAR REVERSE OSMOSIS, ATMOSPHERIC WATER CONDENSATION, AND NIGHT ATMOSPHERIC CONDENSATION:** The proposal for Balochistan aims to implement innovative water harvesting techniques, including solar reverse osmosis in coastal areas, solar powered and wind powered atmospheric water condensation in the areas with high humidity, and night atmospheric condensation. These methods will help address the water scarcity issue by harnessing renewable energy and capturing moisture from the atmosphere, ensuring a sustainable and reliable water supply for the region.
12. **SUSTAINABLE GROUNDWATER MANAGEMENT TECHNIQUES:** Adopting sustainable groundwater management techniques, such as artificial recharge methods and groundwater monitoring systems, can help regulate groundwater extraction and ensure its long-term availability.
13. **PROMOTION OF COMMUNITY-BASED WATER MANAGEMENT:** Encourage the participation of local communities in water management by establishing water user associations and involving them in decision-making processes. This approach fosters a sense of ownership and responsibility among community members, leading to more sustainable water management practices.
14. **ADOPTION OF SMART WATER TECHNOLOGIES:** Embrace innovative technologies such as remote sensing, Internet of Things (IoT), and data analytics to optimize water usage, detect leaks, and monitor water quality. Smart water technologies can improve efficiency, reduce wastage, and enable real-time decision-making for water management
15. **IMPLEMENTATION OF SETTLEMENT RESTRICTIONS ON RIVER BEDS:** Restricting human settlements on river beds is crucial to minimize the risks associated with floods and ensure the safety of communities. Implementing policies and regulations to prevent settlements in vulnerable areas can mitigate the impact of floods and protect lives and properties.

16. **CROP INSURANCE TO MITIGATE FARMERS' LOSSES:** Introducing crop insurance schemes can provide financial protection to farmers against crop losses due to floods, droughts, or other natural disasters. Crop insurance programs can help farmers recover and rebuild their livelihoods after adverse events.
17. **ENHANCED TRAINING OF AGRICULTURE RESEARCH AND DEVELOPMENT DEPARTMENTS AND FARMERS:** Strengthening training programs for agriculture R&D departments and farmers is crucial to disseminate knowledge about best crop practices, water-efficient irrigation designs, and sustainable agricultural techniques. This training can enhance the capacity of stakeholders to make informed decisions and adopt efficient water management practices.
18. **STRENGTHENING RESEARCH AND DATA COLLECTION:** Invest in research and data collection initiatives to gather accurate and up-to-date information on water availability, usage, and quality. This data will inform decision-making processes and enable evidence-based water management strategies.
19. **PUBLIC AWARENESS AND EDUCATION CAMPAIGNS:** Launch public awareness and education campaigns to promote water conservation practices, the importance of sustainable water management, and the consequences of water wastage. Engage schools, local media, and community organizations to disseminate information and raise awareness about responsible water usage.
20. **ENCOURAGING PUBLIC-PRIVATE PARTNERSHIPS:** Foster partnerships between the government, private sector, and civil society organizations to leverage resources, expertise, and innovation for water management initiatives. These collaborations can facilitate the implementation of sustainable water projects and enhance the efficiency of water resource utilization..
21. **FINANCIAL INCENTIVES AND SUPPORT:** Provide financial incentives and support mechanisms to encourage farmers and stakeholders to adopt water-efficient technologies and practices. This can include subsidies for drip irrigation systems, grants for water conservation projects, and access to affordable credit for implementing water-saving measures.
22. **LPG CYLINDERS DISTRIBUTING SYSTEM MAY BE INTRODUCED TO PROTECT FOREST:** Introduce LPG cylinder distribution system to protect forests. With an objective to reducing reliance on fuelwood, promote sustainable forest management. Establishing distribution centers, raising awareness and providing training. Hence decreasing fuelwood consumption, improved forest conservation.
23. **COLLABORATION WITH INTERNATIONAL ORGANIZATIONS AND DONORS:** Collaborate with international organizations, donors, and development agencies to access technical expertise, financial resources, and best practices in water management. Engage in knowledge-sharing platforms and seek support for implementing sustainable water management projects.
24. **INTRODUCING DROUGHT-RESISTANT CROPS, VEGETABLES, AND FRUITS:** Promote the cultivation of crop varieties that are resilient to drought conditions. Provide farmers with access to high-quality seeds and technologies that enhance water efficiency and improve crop yields in water-scarce environments.
25. **LOW-INTEREST AGRICULTURE LOANS AND EMERGENCY ASSISTANCE PROGRAMS DURING DROUGHT:** Establish financial support programs, such as low-interest loans and emergency assistance, to help farmers cope with the financial burden of drought. These programs can provide relief during periods of crop failure and support farmers in adopting resilient agricultural practices.
26. **COOPERATIVES FOR DROUGHT-TOLERANT CROPS:** Encourage the formation of agricultural cooperatives that focus on cultivating drought-tolerant and quick-maturing crops. These

cooperatives can provide access to shared resources, knowledge exchange, and collective marketing opportunities for farmers.

27. **ADDRESSING DEFORESTATION AND DESERTIFICATION:** Implement measures to combat deforestation and desertification, such as promoting afforestation and reforestation initiatives. Improving soil management techniques, such as contour plowing and terracing, can help decrease soil erosion, increase water retention, and enhance the overall health of agricultural lands.
28. **ALTERNATIVE LIVELIHOODS AND LINKAGES WITH ECO-TOURISM:** Explore opportunities for diversifying income sources and creating alternative livelihoods for communities dependent on agriculture. Develop linkages between agriculture and eco-tourism to leverage the region's natural resources and cultural heritage, providing additional income streams and reducing dependency on agriculture during drought periods.
29. **SANITATION IMPROVEMENT FOR WASTE DISPOSAL AND WATER STORAGE:** Enhance sanitation infrastructure and practices to control waste disposal and protect water sources from contamination. Implement proper waste management systems, including waste treatment facilities, to safeguard water quality and promote public health.
30. **MOBILE CLINICS IN DROUGHT-STRICKEN AREAS:** Establish mobile healthcare clinics to provide medical services, including basic healthcare and preventive measures, in remote and drought-affected areas. These mobile clinics can ensure access to healthcare for vulnerable communities facing water scarcity and associated health challenges.
31. **STRENGTHEN LOCAL WATER STORAGE AND DISTRIBUTION MECHANISMS:** Improve local water storage infrastructure, such as constructing small reservoirs, ponds, and community-based water storage tanks. Strengthen the capacity of local communities to manage and distribute water resources effectively, particularly during drought periods, ensuring equitable access and reducing dependency on external water sources.
32. **RAINWATER HARVESTING SYSTEMS:** Promote the adoption of rainwater harvesting systems at the community and household levels. Educate communities about the benefits of rainwater harvesting and provide technical support for the installation and maintenance of rainwater harvesting structures.
33. **WATER CONSERVATION CAMPAIGNS:** Launch public awareness campaigns to educate communities about the importance of water conservation, efficient water use, and hygiene practices. Engage local leaders, community-based organizations, and educational institutions to disseminate information and encourage behavior change towards responsible water usage.

ANNEXURE I: LOGICAL FRAMEWORK MATRIX OF THREE SELECTED INTERVENTIONS

Name of The Intervention A:

Drought information mechanism and emergency mitigation mechanism be established to protect agriculture, live stock, lively hood and water resources

	Project	Indicator	Means of Verification	Risks Assumption
Goal	To Save human, live stock and agriculture and curbing migrating trends	Better health and nutrition of human, alive stock and agriculture	Survey for assessing quality of life and economic condition	discontinuity of the policy
Outcome	Improved availability of food, fodder, medicine, water and formal information mechanism	Stock of Food, fodder seeds , medicines and water availability in the all drought prone areas		Continuity of the program And non comprehensive and inclusive approach
Outputs	Stock of food, fodder, medicine, water and formal information apparatus			Non of Coverage targeted areas
Activities	1. Involvement and pooling of resources of Fed, Prov, district gov and NGOs/INGOs 2. Projects of Early warning system 3. Projects Water, food, fodder, medicine storage 4. Project of Communication mechanism 5. Ensuring logistics and trained staff			• Law & Order • Difference of opinion amongst stakeholders • Fund leakages • Shortage of Skilled Human resources

Name of The Intervention 2: **Conversion of traditional irrigation to Drip Irrigation system**				
	Project	**Indicator**	**Means of Verification**	**Risks Assumption**
Goal	**Effective utilization of available water resources**	Increased cultivated area Increase products Improved socio-economics status	**Survey for assessing socio-economic conditions**	**discontinuity of the policy**
Outcome	**Water conservation through saving water and expanded agriculture activities**	• Number of farms converted to drip irrigation • Number trained farmers • Number trained staff of line departments • Amount transferred through subsidies • Availability of drip irrigation apparatus		**Continuity of the program And non comprehensive and inclusive approach**
Outputs	• Trained farmer to handle drip irrigation system • Subdued of drip irrigation apparatus			**Non of Coverage targeted areas**
Activities	1. Involvement and pooling of resources of Fed, Prov, district gov and NGOs/INGos 2. Projects of training of farmers 3. Projects of production of drip irrigation apparatus within the provinces 4. Solar pannel installation for motorizing 5. Project of subsidizing the farmer 6. Ensuring logistics and trained staff			• Law & Order • Difference of opinion amongst stakeholders • Fund leakages • Shortage of Skilled Human resources

Name of The Intervention 3:
Assessment and mapping of ecosystems

	Project	Indicator	Means of Verification	Risks Assumption
Goal	To provide a platform for strategic planning& conservation interventions	Published assessment which can be updated and availability of tools	proof of the document being used by all relevant stakeholders	lack of ownership from multiple stakeholders Lack of sufficient HR capacity
Outcome	Opportunities of targeted funding Tapping global climate funding Improved conversation	• Proof of tapping new funding opportunities • Availability of framework for policy makers • Number of community participation in decision making • Quantified gaps in sub components of integrated conservation strategies		Funding streams may not be consistent or certain Lack of tenure
Outputs	Each stakeholder is given identified goal posts against which it will report progress			Lack of consensus and possible turf wars
Activities	1. Stakeholder identification and consensus building 2. Survey teams to be trained on globally accepted tools for ecosystem services and mapping on agreed reporting 3. Tools to be developed in identified sectors for future updating 4. Satellite Mapping and ground serveys 5. Assessment to be made available online and on information sharing forums			• Access issues to cover whole of province • Discontinuity in usage and lack of updation

ANNXURE II:

4. LOGICAL FRAMEWORK MATRIX FOR RAINWATER HARVESTING SYSTEMS IN BALOCHISTAN:

Introduction:

Promote the adoption of rainwater harvesting systems at the community and household levels. Educate communities about the benefits of rainwater harvesting and provide technical support for the installation and maintenance of rainwater harvesting structures.

Objective:

Promote the adoption of rainwater harvesting systems at the community and household levels in Balochistan.

Goal:

To ensure sustainable water availability and improve water security in Balochistan through the implementation of rainwater harvesting systems.

Outputs:

- Conduct awareness campaigns and educational programs on rainwater harvesting in targeted communities.
- Provide technical training and support to community members for the installation and maintenance of rainwater harvesting structures.
- Establish community-based rainwater harvesting demonstration sites.
- Develop guidelines and manuals for rainwater harvesting system installation and maintenance.
- Facilitate access to financing options for the implementation of rainwater harvesting systems.

Activities:

- Develop educational materials and conduct workshops to raise awareness about rainwater harvesting benefits.
- Conduct training sessions for community members on rainwater harvesting system installation and maintenance.
- Identify suitable locations for community-based rainwater harvesting demonstration sites.
- Collaborate with local authorities and experts to develop guidelines and manuals for rainwater harvesting systems.
- Establish partnerships with financial institutions to provide affordable financing options for rainwater harvesting projects.

Indicators:

- Number of communities and households adopting rainwater harvesting systems.
- Percentage increase in water availability and water security in targeted communities.

- Number of trained community members in rainwater harvesting system installation and maintenance.
- Number of community-based rainwater harvesting demonstration sites established.
- Availability and utilization of guidelines and manuals for rainwater harvesting systems.
- Number of financing options accessed for rainwater harvesting projects.

Assumptions:

- Community members are willing to adopt rainwater harvesting systems.
- Adequate technical expertise and resources are available for the installation and maintenance of rainwater harvesting structures.
- Supportive policies and regulations are in place to facilitate the implementation of rainwater harvesting systems.
- Availability of funding and collaboration with financial institutions for financing options.

Risks:

- Lack of community participation and willingness to adopt rainwater harvesting systems.
- Insufficient technical expertise and resources for the installation and maintenance of rainwater harvesting structures.
- Inadequate political support and regulatory barriers for rainwater harvesting implementation.
- Limited availability of funding and limited collaboration with financial institutions for financing options.

Monitoring and Evaluation:

Regular monitoring and evaluation will be conducted to assess the progress of the project based on the defined indicators. Data collection methods will include surveys, interviews, and site visits. The findings will inform any necessary adjustments or improvements to the project implementation.

5. LOGICAL FRAMEWORK MATRIX FOR

INTRODUCING DROUGHT-RESISTANT CROPS, VEGETABLES, AND FRUITS

Introduction:

Promote the cultivation of crop varieties that are resilient to drought conditions. Provide farmers with access to high-quality seeds and technologies that enhance water efficiency and improve crop yields in water-scarce environments.

Project Objective:

To promote the cultivation of drought-resistant crops, vegetables, and fruits in water-scarce environments by providing farmers with access to high-quality seeds and water-efficient technologies, leading to improved crop yields and enhanced resilience to drought conditions.

Project Components:

Component 1: Capacity Building

- Conduct training sessions for farmers on the cultivation and management of drought-resistant crops, vegetables, and fruits.
- Provide education on water-efficient irrigation techniques and sustainable farming practices.
- Foster knowledge exchange and peer-to-peer learning among farmers.

Component 2: Seed Distribution

- Establish seed banks to store and distribute high-quality seeds of drought-resistant crop varieties.
- Develop partnerships with seed companies and agricultural research institutions to ensure a diverse range of resilient crop varieties.
- Facilitate the distribution of seeds to farmers through local agricultural extension services.

Component 3: Technology Adoption

- Introduce and promote water-efficient technologies such as drip irrigation systems, mulching, and rainwater harvesting techniques.
- Provide technical assistance and training to farmers on the proper use and maintenance of these technologies.
- Monitor and evaluate the adoption and effectiveness of these technologies in improving water efficiency and crop yields.

Component 4: Monitoring and Evaluation

- Establish a comprehensive monitoring and evaluation system to assess the project's impact on crop productivity, water efficiency, and farmers' livelihoods.

- Regularly collect and analyze data on crop yields, water usage, and farmers' income to measure project outcomes and make necessary adjustments.

Expected Results:

- Increased adoption of drought-resistant crop varieties among farmers.
- Enhanced water efficiency in crop production through the use of water-efficient technologies.
- Improved crop yields and agricultural productivity in water-scarce environments.
- Enhanced resilience of farmers to drought conditions and improved livelihoods.

Assumptions and Risks:

- Availability of necessary funding and resources throughout the project duration.
- Farmer willingness to adopt new farming practices and technologies.
- Adequate infrastructure and support systems for seed distribution and technology adoption.
- Effective collaboration and coordination with relevant stakeholders and local authorities.

Key Stakeholders:

- Farmers and farming communities
- Agricultural extension services
- Seed companies and research institutions
- Local government authorities
- Non-governmental organizations (NGOs) and development agencies
- Community-based organizations

6. LOGICAL FRAMEWORK MATRIX FOR

MOBILE CLINICS IN DROUGHT-STRICKEN AREA:

Introduction:

Establish mobile healthcare clinics to provide medical services, including basic healthcare and preventive measures, in remote and drought-affected areas. These mobile clinics can ensure access to healthcare for vulnerable communities facing water scarcity and associated health challenges.

Objective:

To establish mobile healthcare clinics in drought-stricken areas to provide medical services, including basic healthcare and preventive measures, ensuring access to healthcare for vulnerable communities facing water scarcity and associated health challenges.

Activities:

- Procure and equip mobile clinics with necessary medical supplies and equipment.
- Recruit and train healthcare professionals and support staff for mobile clinics.
- Develop a schedule and route plan for mobile clinics to reach remote and drought-affected areas.
- Conduct regular medical camps and health awareness campaigns in targeted communities.
- Provide basic healthcare services, including primary healthcare, vaccinations, and maternal and child health services.
- Offer preventive measures such as health education, hygiene promotion, and disease prevention campaigns.
- Collaborate with local authorities and community leaders to identify target areas and ensure community participation.
- Monitor and evaluate the effectiveness of mobile clinic operations and services.

Inputs:

- Funding for the procurement of mobile clinics, medical supplies, and equipment.
- Human resources including healthcare professionals, support staff, and trainers.
- Transportation vehicles for mobile clinics.
- Collaboration and coordination with local authorities, community leaders, and stakeholders.
- Information and communication technology infrastructure for data management and reporting.

Outputs:

- Operational mobile clinics equipped with necessary medical supplies.
- Trained healthcare professionals and support staff.

- Regular provision of medical services in targeted areas.
- Increased access to basic healthcare and preventive measures for vulnerable communities.
- Improved health awareness and hygiene practices in the targeted communities.

Outcomes:

- Enhanced healthcare accessibility for drought-affected communities.
- Improved health outcomes and reduced morbidity and mortality rates.
- Increased awareness and adoption of preventive measures.
- Strengthened community resilience and well-being in the face of water scarcity and associated health challenges.

Impact:

Improved overall health and well-being of drought-stricken areas through accessible and effective healthcare services, contributing to the sustainable development of vulnerable communities.

7. LOGICAL FRAMEWORK MATRIX FOR

SOLAR REVERSE OSMOSIS, ATMOSPHERIC WATER CONDENSATION, AND NIGHT ATMOSPHERIC CONDENSATION

Introduction:

The proposal for Balochistan aims to implement innovative water harvesting techniques, including solar reverse osmosis in coastal areas, solar powered and wind powered atmospheric water condensation in the areas with high humidity, and night atmospheric condensation. These methods will help address the water scarcity issue by harnessing renewable energy and capturing moisture from the atmosphere, ensuring a sustainable and reliable water supply for the region.

Project Objective:

To address water scarcity in Balochistan by implementing innovative water harvesting techniques, including solar reverse osmosis, atmospheric water condensation, and night atmospheric condensation.

Project Components:

Solar Reverse Osmosis in Coastal Areas:

- Install solar-powered reverse osmosis systems in coastal regions.
- Conduct feasibility studies and site assessments for system placement.
- Procure and install reverse osmosis units.
- Provide training and capacity building for system operation and maintenance.

Solar and Wind Powered Atmospheric Water Condensation in Humid Areas:

- Set up solar and wind-powered atmospheric water condensation systems in high humidity areas.
- Conduct site assessments to identify suitable locations.
- Procure and install atmospheric water condensation units.
- Establish monitoring and maintenance mechanisms.

Night Atmospheric Condensation:

- Develop and deploy innovative technologies for night atmospheric condensation.
- Conduct research and development to optimize the condensation process.
- Test and pilot the technology in suitable locations.
- Scale up the technology based on successful pilot outcomes.

Project Outputs:

- Installed solar reverse osmosis systems in coastal areas.
- Operational solar and wind-powered atmospheric water condensation systems in humid areas.
- Developed and deployed night atmospheric condensation technology.
- Trained personnel in system operation and maintenance.
- Research and development reports on the optimization of atmospheric water harvesting technologies.

Project Outcomes:

- Increased access to clean and reliable water in coastal areas through solar reverse osmosis.
- Improved water availability in high humidity areas through solar and wind-powered atmospheric water condensation.
- Enhanced water security through the development and deployment of night atmospheric condensation technology.
- Enhanced capacity of local communities and stakeholders in managing and maintaining the water harvesting systems.
- Increased knowledge and understanding of innovative water harvesting technologies through research and development activities.

Project Indicators:

- Number of solar reverse osmosis systems installed.
- Quantity of water produced through atmospheric water condensation systems.
- Efficiency of night atmospheric condensation technology.
- Number of trained personnel in system operation and maintenance.
- Research reports produced and disseminated.

Project Risks:

- Technical challenges in implementing the innovative water harvesting technologies.
- Limited availability of suitable locations for system installation.
- Financial constraints in procuring and maintaining the equipment.
- Lack of community awareness and acceptance of the new technologies.
- Dependence on favorable weather conditions for effective water harvesting.

Project Assumptions:

- Adequate funding will be secured to support the project implementation.
- Availability of skilled technicians and engineers for system installation and maintenance.
- Support and cooperation from local communities and stakeholders.
- Favorable weather conditions for effective water harvesting.
- Government policies and regulations that promote renewable energy and water resource management.

Project Budget:

The project budget will be determined based on the detailed project planning, including the cost of equipment, installation, training, research and development activities, and ongoing operation and maintenance expenses.

Project Duration:

The project is planned to be implemented over a period of 3 years taking into account the time required for system installation, testing, training, and monitoring of outcomes.

Monitoring and Evaluation:

Regular monitoring and evaluation will be conducted throughout the project to assess the progress, effectiveness, and impact of the implemented water harvesting techniques. Key indicators will be tracked, and adjustments will be made as necessary to ensure the project's success.

8. LOGICAL FRAMEWORK MATRIX

LPG CYLINDERS DISTRIBUTING SYSTEM MAY BE INTRODUCED TO PROTECT FOREST.

Objective:

To introduce an LPG cylinder distributing system to protect the forest.

Goal:

To reduce the dependence on traditional fuelwood consumption and promote sustainable forest management.

Outcomes:

Increased availability of LPG cylinders in the target area.

Output:

Establishment of LPG cylinder distribution centers in strategic locations.

Activities:

- Conduct market research, identify suitable distribution centers, establish partnerships with LPG suppliers, set up distribution infrastructure.
- Increased adoption of LPG as an alternative to fuelwood.

Output: Awareness campaigns and capacity building programs on the benefits of LPG.

Activities:

- Conduct community awareness campaigns, organize training workshops on safe handling and usage of LPG, distribute educational materials.

Decreased demand for fuelwood in the target area.

Output: Reduction in fuelwood consumption.

Activities: Monitor fuelwood consumption levels, promote LPG as a viable alternative, conduct surveys to measure behavior change.

Improved forest conservation and reduced deforestation.

Output: Decreased pressure on forest resources.

Activities: Monitor forest condition and deforestation rates, conduct patrols and enforcement activities, engage local communities in forest conservation initiatives.

Indicators:

- Number of LPG distribution centers established.
- Number of households using LPG cylinders.

- Reduction in fuelwood consumption per household.
- Decrease in deforestation rates.
- Community satisfaction with the LPG distributing system.
- Percentage increase in forest cover.

Assumptions:

- Availability of affordable and reliable LPG supply.
- Cooperation and support from local communities and stakeholders.
- Adequate funding and resources for implementation.
- Government policies supporting the use of LPG as an alternative fuel.
- Proper maintenance and safety measures in place for the LPG distributing system.

Risks and Mitigation:

Risk: Insufficient demand for LPG cylinders.

Mitigation: Conduct thorough market research, engage in targeted awareness campaigns, and offer incentives for adoption.

Risk: Limited accessibility to LPG distribution centers.

Mitigation: Identify strategic locations for distribution centers, establish mobile distribution units, and explore partnerships with local retailers.

Risk: Safety hazards associated with LPG usage.

Mitigation: Conduct comprehensive training programs on safe handling and usage, promote safety guidelines, and monitor adherence to safety protocols.

Risk: Resistance from traditional fuelwood users.

Mitigation: Engage in dialogue with communities, provide education on the benefits of LPG, and address concerns through effective communication.

Budget:

The proposed budget will cover expenses related to establishing distribution centers, conducting awareness campaigns and training programs, monitoring activities, and ensuring the sustainability of the project. A detailed budget breakdown will be developed during the project planning phase.

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