

**Integrated
Water Resources Management Policy
Balochistan**

Approved Policy Document

**Department of Irrigation and Power
Government of Balochistan**

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Abbreviations and Acronym

ADB	Asian Development Bank
APN	Asia Pacific Network
ARI	Agricultural Research Institute ¹
AZRC	Arid Zone Research Centre of the Pakistan Agricultural Research Council
BCIAP	Balochistan Community Irrigation and Agriculture Project
BCS	Balochistan Conservation Strategy
BIDA	Balochistan Irrigation and Drainage Authority
BMIADP	Balochistan Minor Irrigation and Agricultural Development Project
BRMP	Balochistan Resource Management Programme
BRSP	Balochistan Rural Support Programme
CBOs	Community Based Organizations
CISU	Community Irrigation Support Unit of the BCIAP
DCO	District Coordination Officer
DERA	Drought Emergent Relief Assistance
DIMRAC	Drought Impact Mitigation and Recovery Assistance Component
DPDM	Directorate of Planning, Development and Management of the IPD
EC	Electrical Conductivity
EFB	Environmental Foundation of Balochistan
EPA	environmental Protection Agency
FAO	Food and Agriculture Organization of the UN
FOs	Farmers Organizations
GCSIC	Global Change Impact Study Centre
GDP	Gross Domestic Product
GOB	Government of Balochistan
GOP	Government of Pakistan
ha	hectare
IBIS	Indus Basin Irrigation System
IPD	Irrigation and Power Department of Balochistan
IUCN	International Union for the Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
Kharif	Summer Crops Growing Season representing period from April September
Khushkaba	Incident Rainfall and localized Runoff Farming System
m ³	cubic meter
MPA	Member Provincial Assembly
NARC	National Agricultural Research Centre
NDP	National Drainage Project of WAPDA
NESPAK	National Engineering Services of Pakistan
NGOs	Non-Governmental Organizations
NOAA	Satellite Data
NRSP	National Rural Support Programme
NWFP	North Western Frontier Province
O&M	Operation and Maintenance
OFWM	On-Farm Water Management
P&D	Planning and Development
PARC	Pakistan Agricultural Research Council
PC-II	Planning Commission Performa for the Feasibility Studies
PCRWR	Pakistan Council of Research in Water Resources
PCSIR	Pakistan Council for Scientific and Industrial Research
PHED	Public Health Engineering Department

PM	Prime Minister of Pakistan
PMD	Pakistan Meteorological Department
PPTA	Project Preparatory Technical Assistance
QESCO	Quetta Electric Supply Company
R&D	Research and Development
Rabi	Winter Crops Growing Season representing period from October to March
RBOD	Right Bank Outfall Drain
Sailaba	Spate Irrigation Farming System
SAR	Sodium Adsorption Ratio
TA	Technical Assistance
TDS	Total Dissolved Solids
UN	United Nations
UNDP	United Nations Development Programme
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Authority
WHO	World Health Organization
WRC	Water Resources Research Centre, PCRWR
WRD	Water Resources Development
WRM	Water Resources Management
WRMA	Water Resources Management Authority of Balochistan
WRRC	Water Resources Research Centre
WRI	Water Resources Research Institute of the NARC
WUAs	Water Users Associations

Executive Summary

Inefficient water use, wastage of surface water and indiscriminate abstraction of groundwater resources coupled with **water scarcity** have aggravated the current situation making management of water resources a real complex and a difficult task in the Balochistan province of Pakistan. Only 30% of total available water resources are utilized in an average year. The **persistent drought** during the last eight years (1998-06) had resulted in negative impacts on the availability of water and livelihood of rural communities. The issues identified for the development and management of water resources in the province of Balochistan are:

- **Adequacy and reliability of data** is one of the major factors affecting planning, development and management of water resources;
- **Increasing demand** of water due to increasing population of human and livestock;
- **Reduced recharge** to groundwater due to destruction of vegetal cover, which is a root cause of watershed degradation posing serious concerns for managing water;
- **Lowering of water table** and mining of groundwater due to increased number of tubewells and enhanced pumpage;
- **Inefficient use** of water for *Sailaba* and *Khushkaba* farming systems;
- **Lack of coordination** between water and agriculture sectors;
- **Lack of integrated approach** to project formulation;
- Inadequate and ineffective **monitoring and evaluation** of integrated projects;
- **Socio-political character** of the province and lack of political will to manage the water resources;
- **Inefficient and ineffective management of water** for agriculture and other sub-sectors of water use;
- **Environmental concerns** related to waterlogging and salinity in commands of *Pat Feeder* and *Khirthar* canals, indiscriminate abstraction of groundwater, wastage of floodwater, etc.;
- Lack of appropriate **assessment and recovery** of *Abiana* for the canal irrigation systems;
- **Un-planned subsidy** on electric tariff for tubewells having burden on the financial resources of the Balochistan government and resulted in the indiscriminate use of groundwater;
- **Lack of adoption** of water conservation interventions for recharging the groundwater;
- Inadequate and ineffective **participation of stakeholders** especially the water users in managing water;
- **Institutional** set-up and constraints restricting effective management of water resources;
- **Lack of adoption** of high efficiency irrigation systems in agriculture; and
- Continued and indiscriminate abstraction of **groundwater**.

No comprehensive **Water Policy** was available in the province and stakeholders had a consensus on the need to have a comprehensive Water Policy and Time Bound Action Plan. It was with this spirit that **Water Policy Formulation** activity was well received by all the stakeholders. There was also a consensus on the need for having effective implementation of the Policy in all sub-sectors of water use.

Integrated Water Resources Management (IWRM) approach was adopted in formulating the Policy for sixteen **Policy Thrust Areas**, which are essential for improving and sustaining the management of surface and groundwater resources in the province. Policy thrust areas were identified after evaluating issues related to sub-sectors of water use instead of using the traditional approach focusing only on the sources of water (surface and groundwater). This

approach would also help the stakeholders to own and implement the IWRM Policy pertaining to their sub-sectors of water use.

Along with the IWRM approach, the **water-poverty-environment framework** was used as criteria, while evaluating issues and formulating policy and reforms. **Basin approach** is recommended for management of water in a holistic manner. For the purpose of basin level planning, framework of **watershed-water-farming** systems is recommended to enhance water productivity and to achieve sustainability of water use.

The Provincial Cabinet in its meeting on March 9th 2006 approved all the policy thrust areas except the "Electric Tariff for Tubewells". Fifteen policy thrust areas approved for the IWRM Policy are:

- i. Water availability and potential for development
- ii. Water resources assessment and monitoring
- iii. Managing water demand
- iv. Linking water development with IWRM approach
- v. IWRM for agriculture
- vi. Adjusting crops and cropping pattern with water availability
- vii. IWRM for other sub-sectors (non-agricultural) of water use
- viii. Environmental water management
- ix. Cost recovery of irrigation infrastructure
- x. Cost effectivity of water conservation interventions
- xi. Promoting inter-provincial cooperation
- xii. Fostering participation
- xiii. Institutional restructuring and strengthening
- xiv. High efficiency irrigation systems
- xv. Groundwater development and management

Policy and reforms are outlined under each of the policy thrust areas, which will be implemented by all sub-sectors of water use. Along with the policy and reforms, themes for research and feasibility studies and areas of capacity building have also been identified. Financial support, as a grant, for the Technical Assistance to support the implementation of the IWRM Policy has already been provided under the Balochistan Resource Management Programme. The Department of Irrigation and Power, Government of Balochistan is the implementing agency for the Technical Assistance Grant Project.

1. The Context

1.1. National Perspective

The First Comprehensive **National Draft Water Policy** was formulated to optimize the development of water resources (surface and groundwater) and to enhance productivity and sustainability of water in agriculture and other sub-sectors of water use, which is now in the process of approval by the federal government.

Around 93% of annual available water is being used by the agriculture sector; therefore, the emphasis of the National Draft Water Policy is to contribute to food security and poverty reduction by fostering sustainable increases in productivity of water through optimal supply and effective management at the basin level. The First Comprehensive **National Draft Water Policy** is **aimed** to achieve the followings:

- Efficient management and conservation of existing water resources;
- Optimal development of potential water resources;
- Steps to minimize time and cost overruns in completion of water sector projects;
- Equitable water distribution in various areas and canal commands;
- Measures to reverse rapidly declining groundwater levels in low-recharge areas;
- Increased groundwater exploitation in high-recharge areas;
- Effective drainage interventions to maximize crop production;
- Improved flood control and protective measures;
- Steps to ensure acceptable and safe quality of water;
- Minimization of salt build-up and other environmental hazards in irrigated areas; and
- Institutional reforms to make the managing organizations more dynamic and responsive.

The **National Draft Water Policy** articulated that the water resources management and development in Pakistan face immense **challenges** for resolving many diverse problems. The most critical of these is a very high temporal and spatial variation in water availability. The temporal variation is evident from the fact that highest annual flows are double of the lowest flows based on the last 70 years data of river flows. In addition, there is a considerable seasonality in river flows. Nearly 81 % of river flows and 65% of precipitation occur during the three monsoon months, while quality of groundwater largely varies with depth and location. The spatial variations are in terms of precipitation, groundwater quality and availability of canal supplies. The variation in rainfall is in the range of 100-750 mm per annum in the Indus basin.

Ever expanding water needs for the growing economy and the population for meeting its food and fiber requirements, and the advent of frequent floods and droughts, add to the complexity of water management. The **Key Issues**, related to the water resources development and management and sustainability of irrigated agriculture, were identified in the First Comprehensive **National Draft Water Policy**, are:

- Growing need of water to meet requirements of rising population besides socio-economic demands;
- Very high variations, both in terms of space and time, in the availability of water resources;
- Reduction in the availability of surface water, due to silting of dams;
- Lack of proper maintenance of the canal system leading to unsatisfactory service;
- Waterlogging and salinization of areas in various canal commands of the Indus Basin System;
- Lack of commitment by various organizations on the need for provision of drainage network as a part and parcel of the irrigation network;

- Over exploitation of groundwater resources, thus, rendering large areas out of reach of poor farmers and exhaustion of groundwater aquifers;
- Pollution of aquifers due to lateral movement of saline water or upward movement of highly mineralized deep water;
- Lack of proper disposal of saline effluent;
- Contamination of river water due to disposal of industrial waste, household wastewater and field overflows contaminated with fertilizers and pesticides;
- Inadequate participation of consumers;
- Frequent floods and droughts and climate change impacts on water availability;
- Lack of inter-provincial consensus on developmental strategy and mistrust between provinces on equitable water distribution;
- Proper pricing/valuation of water; and
- Quality of water in all sub-sectors.

The **Guiding Principles**, which formed the basis for formulating the First Comprehensive **National Draft Water Policy**, are:

- By the year 2025, Pakistan should have adequate quantity as well as quality of water, equitably distributed to meet the needs of all users through an efficient management, institutional and legal system that would ensure sustainable utilization of its water resources;
- Water has to support economic and social development with due consideration to the environment, quality of life, economic value of resources, ability to pay and the participation of all stakeholders;
- National water-resource development and management should be undertaken in a holistic, determined, and sustained manner;
- Insofar as is feasible, planning, development, and management of water resources should be decentralized to appropriate levels responding to basin boundaries and/or canal systems;
- Delivery of specific water services should be delegated to autonomous and accountable public and/or cooperative agencies providing water services in a defined geographical area to their customers and members for an appropriate charge, but with proper and effective regulatory functions to be performed by an independent body;
- Water use in society should be sustainable with appropriate incentives, regulatory controls, public education, promoting economic efficiency, conservation of water resources, and protection of environment, within a transparent policy framework;
- Shared water resources within and between provinces should be appropriately allocated, delivered equitably and efficiently for the mutual benefit of all riparian users;
- Water sector activities should be participatory and consultative at each level, leading to commitment by stakeholders and action that is socially acceptable; and
- Successful water sector reforms require sustained capacity building, monitoring, evaluation, research, and learning at all levels, to respond effectively to changing needs at the national, basin, project, service entity, and community level.

1.2. Provincial Perspective

1.2.1. Need for IWRM Policy for Balochistan

Despite the extensive developments in the water sector, population growth, rapid urbanization, mining sector development and industrialization are imposing **growing demands and pressures** on water resources of the Balochistan province, which are extremely deficient due to arid environment. The expanding imbalance between supply and demand, has led to shortages and unhealthy competition amongst end-users besides causing severe **environmental**

degradation in the form of: a) persistent increase in waterlogging and salinization in the IBIS area of *Pat Feeder* and *Khirthar* canals; b) inefficient and ineffective irrigation management in minor irrigation schemes leading to loss of precious water; c) lowering of water table and mining of groundwater in the over-drawn basins (i.e. Pishin-Lora, Nari and Zoab); d) neglect of *Sailaba* and *Khushkaba* farming systems with reduced recharge to the groundwater; e) entry of sewage, agricultural and industrial effluents into freshwater or storm water streams; and f) intrusion of saline water into fresh groundwater reservoirs in the coastal areas and at certain inland locations.

During the last three decades (1976-2005), Balochistan's development was driven by **expansion in the irrigated agriculture** (area and production); especially the rate of increase in tubewell-irrigated area was relatively much higher than the surface irrigated area. Improved agricultural practices in the surface irrigated area (IBIS and minor irrigation schemes) have contributed for substantial yield increases, as well as the development of high value horticulture through the indiscriminate abstraction of groundwater resources. These interventions have contributed in the agricultural economy of the Balochistan's province through **contribution** of 52% to the provincial **GDP** to keep pace with the provincial demand in meeting the food and fiber requirements and for export of fruits and vegetables. Whilst in other water related sectors, notably urban and rural water supply, the pace of development has not kept up with the need, whereby significant proportions of the population remained deprived of the benefit of clean and safe water supply for domestic needs and sanitation facilities, resulting in a heavy cost to the province in terms of people's health.

Currently, the **surface water resources** of the province constitute 96% of the total water resources available per annum, whereas the rest 4% is available from the groundwater resources. The major part of the fresh groundwater resources has already been exploited; therefore, the potential for future development lies in the development of the available surface water resources. Out of that around 63% of the available water resources are from floodwater. Therefore, development of floodwater has to be given highest priority in the future. In the past, emphasis has been placed on the development of **groundwater**, as the Governments of Pakistan and Balochistan are jointly providing subsidy of around Rs. 7 billion (for the year 2004-05) to the electric tubewell owners, which might be around 7000 in the province. This number is based on the actual number of tubewells in operation and assuming that on an average a farmer owns two tubewells. The studies conducted under the policy formulation Technical Assistance revealed that there are farmers who even own over 12 tubewells, whereas many farmers own two or more tubewells. It is important to mention that the electric tubewell owners represent around 3% of the total farms of Balochistan (around 243,000 farms) – a fractional segment of the total farming community.

The contribution of the Government of Balochistan for the tubewell subsidy was around Rs. 2.1 billions for the year 2004-05. The electric subsidy hardly leaves any significant financial resources available with the Government of Balochistan for the development and management of the water resources in the province. Furthermore, there is a **distortion** in the **policy** of supporting minor segment of the farming community by neglecting the diesel tubewell owners of the same number and a large number of *Sailaba*, *Khushkaba* and livestock farmers. The neglect of *Sailaba* and *Khushkaba* farming systems has also affected the traditional and natural system of groundwater recharge.

The subsidy on electricity has another dimension, because it resulted in wasteful use of water, as **farmers** pay only 10% of the total electricity bill. Thus they are not yet aware of the value of water even after the persistent drought and drying of wells during the last eight years (1998-06). In addition, the persistent drought had resulted in adverse effects on the water table and the mining of groundwater resources throughout the province. The rapid decline in water table has

further created a situation where pumped groundwater is not going to be economical to grow agricultural crops within the existing framework of irrigated farming.

The future of the Balochistan province is likely to be dominated by increasing **pressure on water**, both driven by the increasing population (set to increase by over 50% by the year 2025), rising urbanization (the urban population is expected to double in the next 25 years) and increased contribution of the agriculture sector in provision of livelihood to the large population. The domestic water supply sub-sector will require significant investment and improvements in the management, efficiency and equity of availability and service delivery. Increased storage of floodwater will be required around the urban areas like Quetta City and Gwadar to recharge the groundwater through construction of dams. This must be matched by increasing efficiency of water use in the irrigation, industrial as well as urban and rural potable water supplies. The added investment and enhanced efficiency needs will also require that the beneficiaries are more involved in the management of the systems than has been the case to date, and that the beneficiaries will have to pay for services both to ensure that the costs are covered and that they use the services efficiently. The level of investment required will also drive the need to mobilize capital from all sources, including the private sector wherever feasible, which is most likely in the urban water supply and sanitation. The water markets in the private sector for domestic needs now provide water tankers to urban households. During the last persistent drought, farmers have used water tankers, paying Rs. 250 per tanker, to provide life saving irrigation to their orchards after drying of wells and *Karezes*. Large number of orchards was affected by drought and these owners are now working as labour in urban areas to earn their livelihood.

The **rising competition for water** must be seen against increasing concerns about the deterioration of water quality and the environment. In-effective wastewater treatment facilities and saline drainage effluents are resulting in increasing pollution loads in the freshwater streams as well as the salinization of farmlands in the IBIS commands. Gradually declining water availability and quality concerns also raise serious threats for very few wetlands of the province, coastal areas and national parks.

In short, there is an emerging need to have a **shift** in the existing **policy** of water development, which does not consider development within the overall framework of integrated water resources management (IWRM) at the basin level. Therefore, there is a need to **link development with the framework of IWRM**, so that, any future water developments may not lead towards further deterioration of the existing resources rather the target should be the up-gradation of the resources. This would also require a shift in the policy instead of having emphasis on the development of groundwater, rather a highest priority should be given to Spate irrigation development for *Sailaba* areas with an objective to increase the command area and enhance the groundwater recharge. Thus the development of check and delay action dams has to be seen within the context of storage of water within *Sailaba* areas to support supplemental irrigation during dry spells and persistent droughts.

The **basin approach** is essential for the implementation of the **IWRM Policy**. This could be accomplished by development of IWRM plans at the basin and sub-basin levels. In addition to this, there is a need that such plans should be prepared within the framework of **watershed-water-farming**, so that, productivity and sustainability of available water resources must be ensured at the basin level with an objective to enhance profitability of the farming systems.

In summary, there is a need to use IWRM approach to have "**Blue Revolution**" in the province, which over the next 50 years will provide water on sustainable basis, service delivery, usage efficiencies and equities in availability of water to meet targets of agricultural production, public health and environmental management. Therefore, for sustained agricultural production,

alleviation of poverty and combating environmental degradation, every drop of available water should be conserved and production per unit of water be optimized, as has been amply indicated by the recent persistent drought and declining of groundwater resources in the province. The shortage of water was so acute that orchards have been dried and some of the farmers have lost their source of livelihood in almost all the districts.

In terms of development of **additional water** resources, the new water resources in future would largely come from managing the demand and saving of existing losses. Therefore, the emphasis has to be placed on the management of resources and development has to be seen in the overall context of IWRM. The development of water should be aimed to have cost-effective interventions without transferring the burden of O&M to the Government of Balochistan, which can only be achieved through active participation of water users in the IWRM.

The afore-mentioned **objectives** can only be achieved by having a policy, which addresses all the sources and sub-sectors of water use. Past strategies for the development and abstraction of groundwater resources have raised questions as to what is a judicious and balanced level of groundwater resources management for the province. All such problems need to be addressed with an objective to form the basis of the IWRM Policy.

No comprehensive water policy was available in the province of Balochistan. Therefore, the **IWRM Policy** was needed for the **Balochistan** province and thus the Government has given highest priority for the formulation of the policy.

1.2.2. Guiding Principles for IWRM Policy, Balochistan

The **Guiding Principles**, which formed the basis for formulating the **Balochistan's First Comprehensive IWRM Policy**, are:

- Balochistan's water resource management should be undertaken in a holistic, determined and sustainable manner to meet provincial development goals and to protect the fragile environments;
- Planning, management and development of specific water resources should be based on participatory approach and decentralized to an appropriate level responding to basin boundaries as a hydrological unit – the IWRM approach;
- Delivery of specific water services should be delegated to autonomous and accountable public, private or cooperative agencies providing measured water services in a defined geographical area to their customers and/or members for an appropriate fee;
- Water use in society having fragile ecosystems should be sustainable at all costs - with incentives, regulatory controls and public education, promoting economic efficiency, conservation of water resources and protection of the environment - with a transparent policy framework;
- Shared water resources within and between communities should be allocated efficiently for the mutual benefit of all riparian users – including canal supplies, *Sailaba* and *Khshkhaba* farming systems;
- Water sector activities should be participatory and consultative at each level, leading to commitment by stakeholders and action that is socially and culturally acceptable; and
- Successful water sector reforms require a commitment to sustained capacity building, monitoring, evaluation, research and learning at all levels to respond effectively to changing needs at the provincial, basin, district, project, service entity and community level.

1.2.3. Strategies for Formulating the IWRM Policy, Balochistan

The **Strategies** adopted for formulation of the **Balochistan's First Comprehensive IWRM Policy** are:

- Prepare and adopt a provincial IWRM Policy and Action Agenda, based on a provincial water sector assessment made under the Pakistan Water Strategy, Draft National Water Policy and the Balochistan Conservation Strategy;
- Establishment of an apex organization to support formulation and enforcement of water laws and regulations, formulation and implementation of water policy, planning of integrated projects, strengthening of information and water sector institutions, and monitoring and evaluation of integrated projects;
- Invest to manage the provincial priority river basins, including development of physical infrastructure, institutions and capacity building;
- Increase the autonomy and accountability of service providers in the water supply and irrigation sectors;
- Develop incentives, regulations and awareness for sustainable water use especially the groundwater resources, which are extremely meager in the province;
- Manage the use of shared water resources and develop cooperation between and within communities and provinces;
- Enhance water information, consultation and partnerships; and
- Invest in capacity building, monitoring and learning.

1.3. Framework for IWRM Policy

1.3.1. The IWRM Approach

The **IWRM** concepts and principles have now been well accepted by majority of the stakeholders involved in water management all over the world. However, translating these concepts and principles into practice is a real challenge for Pakistan, because the country, in general, has been facing difficulty in implementing the Institutional Reform Agenda in the water sector, which is a key factor in implementing the IWRM. The situation in the Balochistan province of Pakistan is rather more difficult and complex, as the province is not having an adequate capacity in implementing the water sector projects, especially the integrated projects. Therefore, implementation of the IWRM approach will require further capacity building of the public-sector institutions. Furthermore, the IWRM framework also provides an opportunity to effectively coordinate the scarce manpower resource available in the province.

The four Dublin **principles** related to **IWRM** are:

- i. Water as a finite and vulnerable resource;
- ii. Participatory approach;
- iii. The important role of women; and
- iv. Water as an economic good.

The four principles of IWRM were followed in the formulation of the Balochistan's IWRM policy. The integrated approach is essential for managing the scarce water resources available in the province. In addition to this, the persistent drought and the emerging climate changes are going to further aggravate the situation of mining of groundwater resources and migration of rural communities to the urban areas.

1.3.2. Water-Poverty-Environment Framework

Poverty in Balochistan province is higher compared to other provinces. The fragile environments of Balochistan province due to aridity and persistent droughts also demand that the resource management be linked with the overall objective of poverty-reduction and environmental rehabilitation. Therefore, within the IWRM framework, the Policy and Reforms were evaluated considering the **poverty-reduction and environmental-management** framework. The objective of the Balochistan's IWRM Policy is to improve productivity and sustainability of water without affecting the resource base rather in this process, the resources must be upgraded.

The **IWRM Policy** should help in achieving objective of poverty-reduction through shifting benefits of policy and reforms to all segments of the society, especially the poor.

1.3.3. Watershed-Water-Farming Framework

The IWRM approach demands basin level planning for implementation of Water Resources Management (WRM) and Water Resources Development (WRD) Programmes. Therefore, within the basin, framework of **watershed-water-farming** should be used for integrated planning of WRM and WRD projects. This framework also provides an opportunity to look into ecosystems' perspective. Thus environmental implications of WRM and WRD projects could be taken care by reducing the negative impacts and externalities.

1.4. Consultation Strategy

The formulation of an implementable **IWRM Policy and Reforms** for Balochistan was based on the **Consultation Strategy** developed and adopted for having interactive dialogues with all the stakeholders during the process of policy formulation. It also relied heavily on effective feedback received from all the stakeholders through a process of consultation and interactive dialogues. An effective Consultation Strategy, therefore, was essential to aid in generating understanding and building ownership of the IWRM Policy at the grass-root level stakeholders, as well as the other stakeholders at the policy, development and management levels. The strategy was designed for consultations with the stakeholders for formulating the IWRM Policy, which was based on the four prongs. The elements of each prong are:

- **Meetings** with the **Key Individuals** for the assessment of the **Key Issues** and development of **Policy and Reforms** during March-May 2004.
 - Secretaries of the line departments like Irrigation and Power, Agriculture, Forestry, Livestock, Public Health
 - Head of the public-sector institutions like WASA, QESCO, AZRC, Agriculture Extension, Agriculture Research, PMD, PCRWR-WRC, BIDA, DPDM-IPD, etc.
 - Head of the International institutions like IUCN, IWMI, UNDP, etc.
 - Head of NGOs like BRSP, EFB, etc.
 - Professional engineers and scientists
 - Farmers and Farmers' Organizations
 - Public representatives

- **Presentation** of the **IWRM Policy Issues and Options** to **key individuals** during May-June 2004.
 - Presentation to Secretary, Chief/Superintending Engineers, Department of Irrigation and Power
 - Presentation to the Governor of Balochistan
 - Informal discussions with farmers, Farmers Organizations' and Public Representatives

- **Prepared Zero Draft of the IWRM Policy** at the end of June 2004.
- **Consultation Workshops** – A series of Consultation Workshops were organized during July-October, 2004 to generate common understanding and to have systematic feedback through presentations, interactive dialogues and group discussions. In total 9 workshops were organized to generate feedback at all levels. The details of workshops organized are:
 - **Introductory Workshop** in Quetta with Head of Line Departments, Head of the Institutions, NGOs, Public Representatives, District Governments' Nazims, Media, etc.;
 - Two **Sectoral Workshops** in Quetta with mid-level professionals of: a) Irrigation and Power Department; and b) Agriculture, Forestry, Livestock, Public Health, WASA and Research Institutions;
 - Two **Thematic Workshops** with emphasis on **Sailaba and Khushkaba** Systems at Khuzdar and Loralai districts having participation of Nazims, DCOs, Officers of line departments, NGOs, farmers, public representatives, media, etc.;
 - One **Thematic Workshop on Irrigated Agriculture and Water Supply** at Pishin district having participation of Nazims, DCOs, Officers of line departments, NGOs, farmers, public representatives, media, etc.;
 - One **Thematic Workshop on Water Supply and Coastal Areas** at Gwadar district having participation of Nazims, DCOs, Officers of line departments, NGOs, farmers, public representatives, media, etc.;
 - **Institutional Workshop** at Quetta on the “Establishment of Balochistan Water Resources Management Authority” with Head of Line Departments, Head of the Institutions, NGOs, Public Representatives, District Governments' Nazims, Media, etc. This workshop was organized with an objective to present the Concept Paper of the “Balochistan Water Resources Management Authority” to the stakeholders in the light of the IWRM Draft Policy and Reforms. The Governor, Government of Balochistan, chaired the Workshop;
 - **Final Workshop** was organized to share feedback of the Consultation Workshops on the IWRM Policy with the stakeholders for further fine-tuning of the Draft Policy Document. The participants include Head of Line Departments, Head of the Institutions, NGOs, Public Representatives, District Governments' Nazims, Media, etc. The Senior Minister, Planning and Development and the Minister Public Health Engineering, Government of Balochistan, jointly chaired the Workshop.
- **Comments on the Draft Final Report of the IWRM Policy** - The comments on the Draft Final Report of the IWRM Policy for Balochistan were received in the Final Workshop held in Quetta during October 2004, which were incorporated in the Final Report of the IWRM Policy during November 2004. These comments were also incorporated in the Draft IWRM Policy Document and the Time Bound Action Plan during January 2005.

1.5. Process for the Approval of IWRM Draft Policy

During December 2004, the Government of Balochistan constituted the Working Group under the Chairmanship of the Secretary, Department of Irrigation and Power and Secretaries of the Departments of Agriculture, Livestock, Forestry, Public Health, Industries, etc., as members of the Working Group. The actions taken for the approval of the IWRM Draft Policy Balochistan are:

- The IWRM Draft Policy Document was circulated to the members of the Working Group during February 2005. During April 2005, the IWRM Team Leader presented the IWRM Draft Policy to the members of the Working Group. Based on the comments given by the members of the Working Group and the written comments received from the line departments, especially from the Department of Irrigation and Power, the IWRM Draft Policy Document was finalized during May 2005.
- The Working Paper for the IWRM Draft Policy Document for the approval of the Cabinet was submitted to the Secretary Irrigation and Power Department during early June 2005.
- The Secretary, Irrigation and Power Department submitted the Working Paper along with the IWRM Draft Policy Document to the Additional Chief Secretary, Planning and Development Department, Balochistan during early June 2005.
- The Additional Chief Secretary, Government of Balochistan sent the Working Paper to the Chief Secretary, Government of Balochistan for submission to the Chief Minister, Government of Balochistan.
- The Summary for the IWRM Draft Policy was submitted to the Chief Minister during July 2005, which was approved by the Chief Minister for presentation to the Cabinet for approval of the IWRM Draft Policy.
- The Brief for the IWRM Draft Policy was re-submitted to the Chief Minister during February 2006 for inclusion of the Working Paper in the forthcoming meeting of the Provincial Cabinet.
- The Secretary, Irrigation and Power Department gave presentation to the Provincial Cabinet during its meeting held on March 9th 2006. The Provincial Cabinet approved the IWRM Policy for all the policy thrust areas except “Electric Tariff for Tubewells”.
- The S&GAD issued the Notification on March 11th 2006 for the Decision of the Cabinet regarding approval of the Draft IWRM Policy.

2. The IWRM Policy

2.1. An Overview

The population of the province is much less compared to the geographical area, as it is evident from the fact that the province geographical area is 44% of Pakistan but population is only 5% of the country's population. Therefore, the Balochistan's water resources must be seen in terms of area rather than in terms of population.

Total annual renewable freshwater resources in Pakistan are around 200 billion m³ or 2512 m³/ha of the country's geographical area. In Balochistan, the total annual renewable freshwater resources are around 26 billion m³ or 752 m³/ha, which are around 30% of the national average. There is a large spatial variability within the province as certain basins have one-half to one-third of the average resources. Thus **water scarcity** is one of the major issues faced by the Balochistan province.

Indus basin canal commands of Balochistan do not face any water scarcity because of diversions of 3.75 billion m³ of canal water supplies to an area of 0.42 million ha, which is around 1% of the provincial geographical area having 14% of the available water resources. Therefore, 99% area of the province is facing acute water scarcity.

Inefficient water use, wastage of surface water and indiscriminate exploitation of groundwater coupled with water scarcity have aggravated the situation making management of water a real complex and a difficult task. Presently, around 30% of the available water is utilized. The persistent drought during last six years (1998-04) had resulted in negative impacts on water resources and livelihood of rural communities.

No comprehensive **Water Policy** was available in the province and stakeholders had a consensus on the need to have a comprehensive Water Policy and Time Bound Action Plan. It was with this spirit that **Water Policy Formulation** activity was well received by all the stakeholders. There was also a consensus on the need for having effective implementation of the Policy in all sub-sectors of water use.

Integrated Water Resources Management (IWRM) approach was adopted in the formulation of the Water Policy. The **IWRM Policy** for Balochistan is presented for 16 **Policy Thrust Areas**, which are essential for improving and sustaining the water resources (surface and groundwater). Policy thrust areas were identified after evaluating issues of various sub-sectors of water use, which is a practical approach compared to the traditional approach focusing only on sources of water (surface and groundwater). It would also help to have effective implementation of the policy, as various stakeholders would be able to own and implement the policy pertaining to their sub-sectors.

Along with the IWRM approach, the **water-poverty-environment framework** was used as criteria, while evaluating issues and formulating policy and reforms. **Basin approach** is recommended for management of water in a holistic manner. For the basin level planning, framework of **watershed-water-farming** systems was followed to enhance water productivity and to achieve sustainability of water use.

The Secretary, Irrigation and Power Department gave presentation to the Provincial Cabinet during its meeting held on March 9th 2006. The Provincial Cabinet approved the IWRM Policy for all the policy thrust areas except "Electric Tariff for Tubewells". Fifteen policy thrust areas approved for the IWRM Policy are:

- i. Water availability and potential for development
- ii. Water resources assessment and monitoring
- iii. Managing water demand
- iv. Linking water development with IWRM approach
- v. IWRM for agriculture
- vi. Adjusting crops and cropping pattern with water availability
- vii. IWRM for other sub-sectors (non-agricultural) of water use
- viii. Environmental water management
- ix. Cost recovery of irrigation infrastructure
- x. Cost effectivity of water conservation interventions
- xi. Promoting inter-provincial cooperation
- xii. Fostering participation
- xiii. Institutional restructuring and strengthening
- xiv. High efficiency irrigation systems
- xv. Groundwater development and management

2.2. Water Availability and Potential for Development

2.2.1. Issues

- The current policy of the Government of Balochistan assigned a high priority to the development and utilization of groundwater by providing a huge subsidy on electric tariff and by investing on remodeling and development of the IBIS canal irrigation system, although floodwater contributes 63% to the total available water resources for future development. The contribution of the Indus Basin Canal supplies is around 35% and groundwater contributes only 2%. Thus the priority is not in-line with the availability of water resource for future development, which demands a shift in the current policy.
- Emphasis has been placed on the construction of delay action or check dams, but these dams do not provide any storage for irrigation or water supply. The persistent drought during the last eight years (1998-2006) indicated that delay action dams might not contribute significantly to mitigate the impacts of drought until storages for supplemental irrigation or for domestic water supply are provided. The delay action dams even in wet years contribute mainly to the recharge of localized shallow groundwater, as their contribution towards recharging deep groundwater is limited in the regional or basin context.
- Inadequate canal capacities and limited irrigation infrastructure for diversion of perennial and non-perennial water are constraining the utilization of the allocated canal water supplies in the Indus Basin Irrigation system (*Pat Feeder* and *Khirthar* canals) as per Water Apportionment Accord.
- Adequacy and reliability of hydro-meteorological and land use data are serious concerns affecting the reliable assessment of the water resources available to the province. Therefore, reassessment is frequently made to meet the short-term needs for appraising the projects by the donors. The reassessments made by the Consultants and the IPD are normally questionable in terms of reliability of data. Furthermore, there is hardly any relationship between water and land use data especially for the groundwater abstraction and the tubewell-irrigated area. It is apparent that either actual groundwater abstraction is at least 2-3 folds higher than the estimated values by various Consultants and the IPD or the tubewell-irrigated area is over-reported, by the same order.
- *Sailaba* farming system is based on Spate irrigation where spreading of floodwater is a major activity, which is also a natural source of recharging the groundwater. This system has been neglected, both by farmers and the government, after the development of

tubewell-irrigated agriculture in the province, because of higher returns from high-value deciduous fruits and vegetables.

2.2.2. Policy

- Recognize the fact that potential for development lies in surface water to meet growing needs of various sub-sectors of water use and to enhance groundwater recharge of depleted aquifers.
- Assign highest priority to *Sailaba* farming and minor perennial irrigation for development of surface waters to expand the command area and to enhance the groundwater recharge.
- Assign higher priority to Indus basin irrigation system for expanding canal network to use allocated unutilized water resources (perennial and non-perennial) as per Apportionment Accord.
- Ensure that groundwater development is restricted to basins having potential for further development.
- Undertake a study for the “Re-assessment of basin-wide availability and use of water resources (surface and groundwater) for planning of sustainable development and management of the resource”. The water use covers all sub-sectors – domestic, agriculture, industrial, environmental, etc.

2.3. Water Resources Assessment and Monitoring

2.3.1. Issues

- The spatial coverage of hydro-meteorological data network is limited as the gauging stations are limited to few basins both for measuring surface water and groundwater levels. The unplanned and inadequate hydro-meteorological stations also restrict reliable assessment of the available resources.
- Lack of trained manpower, mobility and data collection capacity are the major limitations affecting the quality and reliability of land use and agricultural data in the province. The water and land use data are hardly related to assess the reliability.
- Data acquisition, storage and retrieval systems are inadequate and thus development and maintenance of reliable databases are the major limitations in the assessment and monitoring of the water resources (surface and groundwater).
- Database development and modeling facilities of the data collecting institutions are limited due to the lack of appropriate hardware and software facilities and in-adequately trained manpower.
- Lack of career development and in-sufficient training opportunities for the data collecting institutions restrict retaining of the trained professional staff.

2.3.2. Policy

- Enforce basin-wide approach for collection of data for surface (river-flows, floodwater, runoff and precipitation) and groundwater to have reliable assessment and monitoring of the resource.
- Establish adequate and reliable data acquisition systems (spatial coverage and temporal quality) for surface and groundwater resources, agriculture and land use systems.
- Strengthen existing databases and enhance modeling facilities for effective planning and management of the resource.
- Develop and implement programmes for capacity building of the data collecting institutions.

2.4. Managing Water Demand

2.4.1. Issues

- Population increase and growing demand for food and fiber require additional water either for expanding the irrigated area or to increase the crop yields. The population increase at a growth rate of 2.5% per annum puts serious constraints on the availability, use and management of water.
- Access to water resource information is non-existent as the data collecting institutions are still maintaining raw data as records due to lack of database and information generation facilities to meet varying needs of the stakeholders.
- Public participation, in managing water demand and efficient use of water, is limited due to the lack of awareness, training and educational programmes in the province.
- Lack of training curricula and course materials related to water resources availability, water demand and water use in the province.
- Lack of awareness and educational materials is one of the major limitations in initiating any campaign for managing water resources in the province.

2.4.2. Policy

- Promote the fact that new water resources in future would largely come from managing the water demand and saving of the existing losses.
- Ensure access to water resource information by all the stakeholders to initiate beginning of water demand management for all sub-sectors of water use.
- Encourage and support effective public participation, awareness and education programmes for initiating water demand management.
- Encourage and support educational institutions (Universities, Colleges, Schools and Madrassas) to include water resource management courses in the curricula.
- Undertake a Study to “Formulate water resources management courses for education and training by active involvement of all stakeholders”.

2.5. Linking Water Development with IWRM Approach

2.5.1. Issues

- Lack of coordination among the water sector institutions is a major limitation for planning, development and implementation of the integrated projects.
- Lack of coordination between water and agriculture/forestry/livestock sectors limits joint planning, development, and implementation of irrigated agriculture and watershed management projects.
- Lack of an integrated approach to project formulation inhibits the use of a basin-wide framework and thus the development projects are still being implemented in a dis-jointed fashion.
- Lack of monitoring and evaluation capacity of the water sector institutions limits planning and designing of integrated projects and thus the objectives are hardly accomplished.
- The public representatives have their localized interests and priorities, which affect the planning of projects on technical, socio-economic, environmental, basin or physiographic considerations. The interests of the communities and ecosystems perspective are normally ignored.
- Lack of capacity of the water sector institutions in planning, design and monitoring of the integrated projects.

2.5.2. Policy

- Enforce adoption of IWRM approach as a framework for planning, formulation and implementation of water projects to achieve basin sustainability
- Undertake a Study for the “Formulation of strategy and action plan for restructuring and strengthening of Directorate of Planning, Development and Monitoring of the Department of Irrigation and Power to address needs of water sector institutions in planning, design, implementation and monitoring of IWRM Projects”.
- Undertake a Study for the “Formulation of strategy and action plan for restructuring and strengthening of Planning and Statistical Data Sections of the Agriculture Department for implementation of the integrated irrigated agriculture projects including the On-Farm Water Management”.
- Establish Design Section in the IPD for the design of engineering and management interventions related to the water sector projects

2.6. IWRM for Agriculture

2.6.1. Issues

Planning at Basin Level

- Irrigation is a provincial subject, whereas agriculture department has been devolved at the district level. There was already lack of planning at the basin level even prior to the devolution. The issues emerged due to the devolution of agriculture and other sectors at the district level, and their effects for planning at the basin level, are never addressed.
- Lack of adoption of watershed-water-farming system’s approach in planning of IWRM projects for the agriculture sector.
- Agriculture is the largest user of water consuming 97.5% of the total water resources available in the province per annum. The lack of systematic planning considering the watershed-water-farming systems’ perspective affects the cost-effectivity and sustainability of the projects and thus designed impacts are hardly achieved.

Indus Basin Irrigation System

- Overall irrigation efficiency of less than 34% is not only loss of freshwater but it causes serious issues of waterlogging and salinity affecting the productivity of land adversely.
- In the *Pat Feeder* and *Khirther* canal commands, the size of the *Mogha* command is very large, where length of the watercourse is around 10 km with a discharge of 8-10 cusecs. The length of the watercourse in the *Pat Feeder* and *Khirther* canals is normally around five-fold of the length of watercourse in the Punjab and Sindh provinces. Therefore, the conveyance losses are high and thus management of the *Mogha* command becomes a complex issue.

Minor Irrigation Schemes

- Majority of minor irrigation schemes are still being managed by the IPD, which is a burden on the government of Balochistan, as IPD is still responsible for O&M of these schemes.
- The ownership of the IPD for organizing Water Users’ Associations and building their capacity for managing the O&M of the minor irrigation schemes is still limited even after the completion of the participatory projects like BCIAP.
- Efficiency of the minor irrigation schemes is low because of the low irrigation efficiency, in-equitable distribution of water and inefficient irrigation practices.

- The inefficiency in irrigation resulted in creating shallow groundwater, which is hardly being used by farmers due to adequate availability of surface water.
- Economic efficiency of minor irrigation schemes is low due to inefficient irrigation and low productivity of water use.
- Lack of information and research for the scope and extent of shallow groundwater generation in the minor irrigation schemes is mainly due to the low-priority assigned for conjunctive use of water.

Sailaba farming System

- Water rights in the *Sailaba* areas are not sharply defined and in most of the cases lower riparian are not getting their due share of water.
- Command area is dependent on the availability of floodwater and the capacity of the users to manage the floodwater. Farmers have difficulty in managing high flows, which damage the infrastructure and crops. Whereas they face difficulty in watering the command area under low flow conditions.
- There is hardly any government support for *Sailaba* area due to the neglect and low priority assigned to this system. Hardly any support is provided to the water users' to develop and manage their *Sailaba* systems.
- The IPD is basically oriented in designing traditional surface irrigation systems and there is hardly any commitment to seek participation of water users in the selection, planning and designing of the Spate irrigation systems for the *Sailaba* areas. The knowledge of the water sector institutions in the area of Spate irrigation is also limited compared to the knowledge and experiences of the water users.
- Storage of floodwater in small dams is beyond the capacity of the water users. The IPD has never provided any support to water users in integrating the storage of water in small dams and ponds along with the facility needed for diversion of floodwater for Spate irrigation.
- Farmers do not have any source of irrigation during the drought except the shallow dugwells in localities having higher annual rainfall.

Khushkaba farming Systems

- Risks of farming in *Khushkaba* systems are higher compared to the *Sailaba* systems, as farming is solely dependent on the incident rainfall and localized runoff.
- Drought normally affects the *Khushkaba* systems adversely and the rural communities have to migrate to other areas to seek their livelihoods.
- Productivity of *Khushkaba* farming is extremely low.

2.6.2. Policy

Planning at Basin Level

- Enforce and support adoption of basin approach as a hydrological unit for sustainable planning, development and management of water resources for agriculture.
- Undertake Study for the "Formulation of Basin Management Plans for the three overdrawn basins (Pishin-Lora, Nari River and Zhob River basins) and develop a strategy for subsequent formulation of Basin Management Plans for the other basins".

Indus Basin Irrigation System

- Undertake a Study for the “Evaluation of selected *Mogha* commands of *Pat Feeder* and *Khirther* canals to integrate irrigation and drainage for enhancing water productivity and sustainability”.
- Develop and implement programme for remodeling of *Mogha* commands of *Pat Feeder* and *Khirther* canals to optimize irrigation efficiency and to reduce waterlogging and salinity.

Minor Irrigation Schemes

- Transfer minor irrigation schemes to the Water Users’ Associations after organizing them and enhancing their O&M capacity.
- Develop and support measures to improve water use and economic efficiency of irrigated agriculture under minor irrigation schemes.
- Undertake Study for the “Development of a strategy and action plan for the conjunctive use of water for minor irrigation schemes to harness shallow groundwater developed due to inefficient irrigation”.

Sailaba Farming Systems

- Undertake a Study for the “Assessment of the social and farmers’ institutional impact on water rights, water allocation and availability to the lower riparian”.
- Undertake a Study for the “Assessment of *Sailaba* and Spate irrigation systems in Balochistan and development of design manuals for cost-effective technologies”
- Ensure development of Spate Irrigation with active participation of water users to have improvements in existing systems rather than introducing traditional surface irrigation schemes.
- Encourage Water Users’ Associations to implement small-scale Spate irrigation schemes instead of contractors. Contractors may be employed only for larger schemes, where Water Users’ Associations are not having the desired capacity.
- Ensure development of multi-purpose small dams for storage of floodwater and diversion of stored water for Spate irrigation. Also encourage water users for the storage of excess water in wet years, so that they can use it for supplemental irrigation during the dry years.

Khushkaba Farming Systems

- Promote *Khushkaba* systems as an integral part of the basin plans and the rural communities should not be left due to the associated risks, because they also qualify on the front of poverty reduction.

2.7. Adjusting Crops and Cropping Pattern with Water Availability

2.7.1. Issues

- In the *Pat Feeder* and *Khirther* canal commands, productivity of rice based cropping systems is extremely low, as inefficient use of water resulted in waterlogging and salinity, which is a major cause of low water and crop productivity. The growing of rice in fine-textured and waterlogged soils is the only option available for the *Kharif* season.
- *Abiana* rates in the *Pat Feeder* and *Khirther* canals are irrespective of the amount of water used by different crops i.e. same *Abiana* rates are charged for rice and cotton crops, where rice crop requires many-fold more water than cotton.

- Even in light- and medium-textured soils rice is grown, which is not an appropriate crop due to excessive seepage losses.
- Crops and cropping patterns in the *Pat Feeder* and *Khirther* canals are also irrespective of climate, soils and crop water requirement.
- Crops and cropping pattern in *Sailaba* and *Khushkaba* farming systems do not correspond to the characteristics of the system where deep-rooted and drought tolerant crops are needed for these farming systems.

2.7.2. Policy

- Discourage farmers to grow rice and/or to encourage them to increase water productivity in Pat Feeder and Khirther canal commands by increasing *Abiana* rates of rice from Rs. 202 to Rs. 500 per acre.
- Encourage farmers to replace rice with cotton in areas having light to medium textured soils.
- Restrict the area of onions and fodders in tubewell-irrigated farms, as these crops consume large amount of water.
- Undertake a Study for the “Identification of crops and cropping patterns for *Sailaba* and *Khushkaba* farming systems considering drought tolerance, climatic conditions and root characteristics”.
- Undertake a Study for the “Identification of crops and cropping pattern for irrigated crops (surface and groundwater systems) considering water productivity and climatic conditions”.

2.8. IWRM for Other Sub-sectors (non-agricultural) of Water Use

2.8.1. Issues

- The water supply pipeline losses in Quetta City are around 40% due to leaky pipelines. In Quetta City, still the galvanized iron or steel pipes are used for water supply, which are sensitive to corrosion and also sensitive to freezing and thawing during the winter season.
- Water meters have not been installed in urban water supply schemes and consumers are charged on flat rate, therefore, water consumers do not follow any conservation practices, as there is no incentive for the consumers.
- The service charge on water is very low and does not cover all the O&M and capital expenses. As there is little value assigned to water, therefore, consumers normally practice wasteful use of water.
- The sewage system is faulty because of considerable leakage from sewage lines. The tertiary and secondary sewage lines are disposing sewage into the open waterways, which are normally constructed for disposing the storm-water. Therefore, the leaky pipelines for water supply are liable to get polluted through seepage of sewage effluents.
- In rural areas, water stored in earthen ponds is used for both domestic and stockwater purposes. The stored water is liable to be polluted due to entry of livestock in the ponded area. As the depth of water is reduced in the pond with sedimentation of silt and debris, obnoxious weeds are normally grown which affect the water quality adversely.
- The mobilized communities could not manage the standard water supply schemes on sustainable basis due to higher O&M cost of the pumped water supply schemes in terms of high electric tariffs.
- There are few wetlands and water bodies in the province but there is no information available regarding their water needs. In general, no information is available for water needs of the prevailing ecosystems.

2.8.2. Policy

- Assign higher priority to water conservation measures including installation of water meters for domestic water supply in urban centers/towns so that consumers pay for the amount of water consumed. Ensure high quality standards for the construction of under implementation schemes for the Quetta city because of severe mining of groundwater.
- Enforce sliding scale of water tariff to provide incentives to poor people who consume less water.
- Encourage projects for replacement of leaky pipeline to reduce water losses and to provide safe and clean water to the consumers in all the cities and towns of Balochistan.
- Undertake a Study for the “Development of Sustainable Rural Water Supply Schemes for domestic and stockwater use, which are cost-effective (capital and O&M)”.
- Undertake a Study for the “Assessment of renewable energy sources and utilization for water supply schemes”.
- Undertake a study for the “Assessment of minimum water requirement for ecosystems of Balochistan”.
- Assign responsibility to Livestock Department for the development of stockwater.
- Promote construction of small storage dams for domestic purposes. Such storages can also be used for irrigation purposes, if excess water is available. This is the only source of water available for domestic needs in the coastal areas like Gwadar, as the deep groundwater is brackish in quality, and shallow groundwater is polluted due to the disposal of the sewage water into the septic tank system.

2.9. Environmental Water Management

2.9.1. Issues

- The province is facing acute shortage of water even then the drainage disposal system is being built to dispose effluents to the outfall drain. The concept of drainage as disposal of effluents is not relevant to the province of Balochistan, as no water can be categorized as wastewater because of the acute shortage of water in the province. The quality of drainage effluents is reasonable to grow fuelwood and forage plants. The quality of these effluents during the *Kharif* season is almost similar to the freshwater.
- Sewage from urban areas is being disposed into storm-water streams, which is being leached down and polluting the shallow groundwater. Use of shallow groundwater in large urban areas is not safe for human consumption.
- No treatment system has been installed in the urban areas of the province. Even in other provinces, metropolitans and municipalities are facing difficulty in paying the O&M cost of the treatment system. Most of the installed treatment systems are either non-functional or hardly operated. The basic reason is the high O&M cost due to energy intensive systems.
- Farmers are growing vegetables using raw sewage and even they are growing root and tuber vegetables, which directly absorb the effluents. The agriculture and environment departments could not even disseminate the information for type of vegetables, which can be grown safely using the raw sewage.

2.9.2. Policy

- Recognize the need for a shift in the concept of drainage as disposal (*Pat Feeder* and *Khirthar* canals) to the safe utilization of effluents for production of salt-tolerant crops, grasses and fuelwood.
- Enforce EPA legislations for restricting entry of sewage effluents into water streams

- Develop and implement low-cost treatment system for sewage effluents and safe utilization for peri-urban agriculture.

2.10. Cost Recovery of Irrigation Infrastructure

2.10.1. Issues

Indus Basin Irrigation System

- Assessment of *Abiana* in the **Pat Feeder** and *Khirthar* canals is almost one-third of the potential assessment. Under assessment is a common phenomenon in the IBIS.
- Recovery of *Abiana* is around 10% of the assessed value, which is due to lawlessness, indiscipline and rent-seeking behaviour prevailing in the system.
- *Abiana* rates are irrespective of the amount of water consumed by different crops i.e. same *Abiana* is charged for rice and cotton crops, where rice crop consumes many-fold more water than cotton.
- Cost of *Abiana* assessment and collection is higher than the recovery.

Minor Perennial Irrigation Schemes

- The minor irrigation schemes were transferred to the Water Users' Associations (WUAs) without imparting appropriate training to them. Training is essential to equip the WUAs so that they can collect the *Abiana* and act effectively in the O&M of the schemes. Therefore, training is a pre-requisite for the transfer of irrigation schemes to the WUAs.
- The mechanisms for distribution of *Abiana* between the IPD and the WUAs are not in place.

2.10.2. Policy

Indus Basin Canal Commands

- Develop and enforce a strategy for assessment and recovery of *Abiana* by increasing it initially from 10% to 30%. Subsequent increase would be made to achieve level of over 70% in a period of 3 years.
- Undertake a study for "Rationalizing *Abiana* rates based on actual consumption and to increase recovery in the Indus basin canal commands".

Minor Irrigation Schemes

- Encourage Water Users' Associations to enforce flat rates of *Abiana* in minor perennial irrigation schemes to avoid the cost related to the assessment of *Abiana*.
- Authorize Water Users Associations to collect *Abiana* and use it for day-to-day maintenance and for future investments in minor irrigation schemes for improving performance of water delivery system.

2.11. Cost-Effectivity of Water Conservation Interventions

2.11.1. Issues

- Delay action dams constructed for recharging the groundwater are hardly monitored in assessing their contribution for recharging shallow and deep groundwater and extent of their impact at basin/regional and localized levels.

- The delay action dams are being constructed without assessing their potential contribution at the basin level, even in certain cases detailed hydro-geological investigations are hardly made to support the construction of the dam and its cost-effectivity. The infiltration rate of the ponded water is continuously declining due to the sedimentation of silt and finer materials brought by the inflows of floodwater. The water inflows to these dams can be described as mud flows. The effective life of the ponded area is very much limited as some of the delay action dams lost their effectivity in 2-3 years.
- The floodwater management in *Sailaba* areas is left to the farmers. The potential of *Sailaba* areas, in terms of Spate irrigation development and linking it with the groundwater recharge, is hardly given any due consideration. Stored water in reservoirs of water diversion structures constructed for Spate irrigation is hardly used for supplemental irrigation.
- Cost-effectivity of minor irrigation schemes was never evaluated in terms of its contribution to the command area and recharge to the groundwater.

2.11.2. Policy

- Undertake a Study to “Ascertain the effectiveness of delay action dams in recharging shallow and deep aquifers and their contribution at local and basin/regional level”.
- Undertake a Study for the “Assessment and identification of potential sites for recharge of groundwater using delay action dams and to enforce the outcome for future investments”.
- Assign priority to the Spate irrigation schemes having higher cost-effectivity to increase the watering intensity of the command area and to enhance groundwater recharge.
- Assign priority to the minor irrigation schemes having higher cost-effectivity to increase the command area and to enhance groundwater recharge.

2.12. Promoting Inter-provincial Cooperation

2.12.1. Issues

- The Sindh government has shown reservations in allowing outfall for the disposal of drainage effluents (*Pat Feeder* and *Khirthar* canals) into the RBOD and its ultimate disposal to the sea.
- The distribution of shortages in the canal water supplies during the last persistent drought became a serious conflict between the Sindh and Balochistan provinces. The evapotranspiration requirements of crops of both the provinces are almost same due to similar ecology and the rice-wheat based cropping patterns.
- Public representatives, farmers’ organizations representatives and farmers never had the opportunity as a group to visit the similar ecologies in other provinces of Pakistan to get field exposure to success stories and to bring new and emerging experiences back home.

2.12.2. Policy

- Resolve on urgent basis the trans-boundary issues: a) disposal of drainage effluents from *Pat Feeder* and *Khirthar* canals; and b) diversion of canal water supplies and sharing of shortages during the drought period as per Water Apportionment Accord.
- “Arrange field trips and study tours of experts, farmers and politicians to study the groundwater use and measures of water conservation adopted by farmers of other provinces having similar ecologies”.

2.13. Fostering Participation

2.13.1. Issues

- Participation of water users is still limited as they are hardly involved either in the selection of the schemes or at the time of planning of such schemes. They have never been asked to give their opinion regarding the design and development of the schemes in terms of its capital cost and O&M expenses. Farmers' capacity in O&M cost is very limited, as they can't pay for major repairs and electricity bills.
- The existing water users' institutions are not autonomous in administrative and financial matters. Such autonomy is essential for sustainability of these institutions.
- Women role in managing water is very much limited. They are hardly involved in the planning, development and management of water schemes. Their role might be limited in the near future due to sharply defined roles for men and women. Even then women are involved in water hygiene and environmental health but their capacity is extremely limited. They do not have the basic awareness and motivation.

2.13.2. Policy

- Encourage and support participation of water users in water resource development and management schemes as an integral part of the water policy.
- Provide legal framework and support to build and strengthen water users' institutions at the basin level for sustainable management of the resource.
- Promote gender sensitization and encourage women participation in domestic water supply, water hygiene, and environmental health by providing mandatory representation in various forums.

2.14. Institutional Restructuring and Strengthening

2.14.1. Issues

- There is not any apex organization at the provincial level to coordinate, regulate and plan activities and implement policies of IWRM. Most of the institutions involved in water related activities also demand to provide institutional mechanisms for coordination, which are missing at the moment.
- Political leaders are always blamed for having interference in the development process, whereas they are never taken on board as partners. This difference in perceptions between political leaders, professional and managers is having adverse effects in improving impacts of the development projects.
- Capacities of the line departments are limited in terms of planning, design and implementation of the integrated projects because they are involved so much in the routine activities and hardly get any time for the planning and formulation of the new projects.
- Water management research for the tubewell-irrigated and *Sailaba* agriculture is almost non-existent. AZRC is mainly involved in research related to *Khushkaba*. Recently, the GOB announced the establishment of the Directorate of Agricultural Water Management Research, but still the manpower has to be recruited and infrastructure has to be developed.
- Most of the existing research institutions in the province and country are facing difficulty in relating their research agenda with the needs of the clients (water users and the line departments). There is hardly any orientation of the research institutions to initiate demand-oriented research.

2.14.2. Policy

- Establish Balochistan Water Resources Management Authority as an apex organization for formulation of policy, water allocation and regulation, enforcement of policy and reforms, planning of integrated projects and monitoring and evaluation of integrated projects.
- Undertake a Study for the “Formulation of guidelines, procedures and capacity building for Balochistan Water Resources Management Authority as an apex organization to recommend, coordinate, regulate and monitor appropriate policy measures and initiate dialogues among the stakeholders for IWRM and sustained economic growth”.
- Encourage and support measures to take political leaders on board to “Make Water as Business of Everyone”
- Undertake a Study for the “Formulation of the organizational structure for the establishment of the Basin Water Boards represented inter alia by public representatives, community leaders and tribal chiefs, in addition to experts”. Also evaluate the existing set-up of the BIDA and option of establishing the Basin Water Boards for *Pat Feeder* and *Khirthar* canals under the proposed Balochistan Water Resources Management Authority.
- Undertake a Study for the “Formulation of strategy and action plan for restructuring and strengthening the provincial line departments to implement the IWRM policy and reforms and to make them responsive to the beneficiaries (farmers and households)”.
- Undertake a Study for the “Assessment of training needs of the provincial line departments and research institutions and formulation of the training programme”.
- Undertake a Study for the “Formulation of strategy and action plan for the restructuring and strengthening of the water management research institutions to identify and prioritize the research agenda to address needs of line departments and demand of the water users”.
- Ensure the inclusion of in-service training programmes, as mandatory for promotion of technical/managerial manpower in water sector institutions.

2.15. High Efficiency Irrigation Systems

2.15.1. Issues

- The projects of high efficiency irrigation systems like sprinkler and drip irrigation failed due to the reason that project-oriented approach can not address the farmers’ needs due to inflexibility in the project design and post-projects services are almost non-existent.
- Drip irrigation systems introduced without modifications in tubewells do not provide savings in energy use. In fact, the irrigation water applications in drip irrigation systems might be around one-sixth of the flood irrigation. Thus savings in water and energy use should be the objective for the introduction of such systems.
- Private sector involvement in the installation of drip irrigation system is very much limited. Although private sector is manufacturing the components of the drip and sprinkler irrigation systems, but there is a complete lack of Irrigation Companies for providing services to the farmers on turnkey basis.
- Facility for manufacturing of drip irrigation systems is not available in the Balochistan province, as most of the Plastic Industries involved in manufacturing of the drip and sprinkler irrigation systems are located in Lahore and Karachi.
- Lack of capacity of the line departments to regulate quality and to enforce measures for appropriate installation of sprinkler and drip irrigation systems using locally manufactured components.

2.15.2. Policy

- Constitute a special “Water Conservation and Management Fund” jointly by the GOP/GOB and the donors as an endowment for initiating well-designed Pilots under the WRM Authority.
- Encourage redesign and remodeling of tubewells prior to the installation of drip irrigation systems to reduce size of the pumping system and to reduce consumption of electricity.
- Encourage and support private sector for the installation of drip and sprinkler irrigation systems at farmers’ fields through development of local Irrigation Service Companies.
- Encourage and support the private sector to initiate local manufacturing of drip and sprinkler irrigation systems in Balochistan.
- Enforce regulatory measures for quality installation of drip and sprinkler irrigation systems and ensure provision of technical backstopping by the public-sector institutions.

2.16. Groundwater Development and Management

2.16.1. Issues

- The lowering of water table and groundwater mining issues are acute in the Pishin-Lora, Nari and Zhob river basins, as these three basins are overdrawn. Some of the basins do not have any further potential for development, whereas others are still having chance for further development of the groundwater.
- The electricity is not uniformly available in all the basins. In the three overdrawn basins, there is still sufficient electric supply available for further development of groundwater. However, in basins where there is potential for development of groundwater, electricity is already in short supply.
- Availability of electricity had direct impact in mining of groundwater in the province. Furthermore, there is hardly any collaboration between the IPD and the QESCO.
- Farmers at most of the locations are facing problems with reliable supply of electricity. Most of the farmers complain that there are huge variations in the voltage, which affect the performance of their electric motors and accessories. They are facing this problem to the extent that one time losses due to voltage fluctuations are tremendous i.e. Rs. 15,000 to Rs. 30,000. Under the BRMP-TA studies, most of the farmers in Loralai and Khuzdar districts have indicated that availability of useable power supply is not more than six hours per day. The fluctuations in voltage also affect the farmers’ schedules of irrigation, as they cannot meet their peak demand, which affect the productivity of their fruits and vegetables.
- In the coastal areas of Bela, Gwadar and Pasni, there is a very shallow lens of freshwater overlain with the brackish groundwater. The indiscriminate development of groundwater will redistribute the salts in the groundwater and intrusion of brackish water into the freshwater zone will take place. Incidence of seawater intrusion has already been witnessed due to the pumping of groundwater. The concept of skimming wells is not yet common in these areas.

2.16.2. Policy

- Impose ban on installation of new agricultural tubewells in the three over-drawn basins – Pishin-Lora, Nari River and Zoab River. Installation of tubewells for drinking purposes should be restricted only in case of replacement of dried wells.
- Allow replacement of dried agricultural tubewells in basins having limited potential for development.
- Restrict installation of new agricultural tubewells to basins having potential for sustainable development.

- The QESCO may be made responsible for providing reliable power supply to the farmers and other consumers involved in pumping of groundwater and irrigation related activities.
- Introduce the concept of skimming dugwells in the coastal areas including the Gwadar and ban may be imposed on the installation of tubewells, which will certainly induce the intrusion of seawater into the thin freshwater lens in available in these areas.