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ISLAMIC REPUBLIC OF PAKISTAN

BALOCHISTAN NEEDS ASSESSMENT

DEVELOPMENT ISSUES AND PROSPECTS

PART II - *WATER AND AGRICULTURE*

JANUARY 2013

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SUMMARY

Water, Agriculture and Domestic Water Sectors

Background

1. Scarcity of water is the critical constraint to the development in Balochistan. While some 87% of Pakistan's total available water is contributed by the Indus Basin Irrigation System (IBIS), Balochistan lies at its periphery and relies largely on non-perennial and some perennial sources of water (from IBIS and outside IBIS). Water availability during 2005 was 556 m^3/ha per annum, only one-seventh of the level in other three provinces. And while Pakistan's water economy is highly integrated, allowing for risk pooling, Balochistan's water economy is highly segmented, with 18 river basins accounting for its vast territory. Rural livelihoods are dependent on precipitation and these were severely affected during drought of 1998-05. Crops can fail after a seasonal drought, whereas livestock and orchards are vulnerable to persistent drought. Since 97% of water use is by agriculture, any strategy to deal with water scarcity has to assign this sector a higher priority.

Key Issues

2. The **key issues** for the three sectors, namely, **water, agriculture and domestic water supply** are outlined in the report. Water has to be seen in totality and a comprehensive strategy is needed for its development and management. The **key issues** related to the **water sector** are:

- Floodwater is the largest resource of water in the province, almost two-third of total available water, but hardly 40% is utilized. Groundwater constitutes around 4% of total water available but this is an over-utilized resource.
- Extreme variability in the availability of floodwater in all the River basins, as water available at 75% probability is almost one-eighth of the water available at 25% probability.
- Groundwater recharge at 75% probability is around one-third of recharge at 25% probability.
- Climatic variability in precipitation and water availability is extremely high even before the climate change, therefore with the climate change the extremes of water availability during dry and wet years will be further worsen.
- Subsidy on electric tariff for tubewells is around Rs. 8 billion per annum which resulted not only in wasteful use of water but also energy. Investments in water sector have been concentrated in the canal command areas of the Indus basin focusing a fraction of farmers. There are economic losses due to subsidy but it provided financial gains to the farmers.
- Water productivity of all the farming systems (IBIS canal commands, perennial minor irrigation, groundwater, Spate irrigation, etc.) is low.
- IWRM Policy of Balochistan was approved by the Cabinet during March 2006 but effective implementation is still awaited. Similar is the case for effective implementation of Groundwater Administration Ordinance to manage installation of tubewells based on the aquifer conditions. Institutions are weak and need reforms to improve performance of these institutions.

3. The **key issues** of **agriculture sector** are:

- ❖ Although the province is recovering from the last drought followed by floods the productivity of almost all the farming systems is still lower than the potential.
- ❖ Major impacts of climate change on agriculture will be in the form of: a) shift in boundary of crops in the hot regions due to rise in temperature; b) rise in crop water requirement due to rise in temperature which will further put pressure on scarce resources of groundwater; c) reduced productivity in dry years because there are chances that climate change will make the drought events more severe and frequent; and d) epidemic of animal diseases due to changes in climate especially in the hot regions.
- ❖ Constraints to cropping are: a) lack of adequate irrigation infrastructure; b) varying size of landholdings and scattered or remotely located farms; c) reliance on family labor for farm operations; d) low quality seeds; e) lack of fertilizers and pesticides in remote areas; f) inadequate equipment; g) lack of access to marketing; h) low public funding; and i) weak institutions.

4. The **key issues** related **to water supply** for the population of the province are:

- ❖ Uneven access and uneven quality of domestic water is a major issue in the province.
- ❖ O&M cost of public-sector water schemes is high and communities are not in a position to pay for energy bills of energy inefficient schemes. Water supply schemes transferred to the communities were taken over in the last 5 years putting burden on the national exchequer.
- ❖ Multiple players are involved in the provision of water supply: Public Health Engineering; Local Government and Rural Development; WASA; and NGOs. Schemes transferred under SAP Programme have been taken over by the public-sector because of lack of political will for the continuity of the policy. The reasons for non-functionality of these schemes are hardly addressed.

Future Potential and Opportunities

5. **Water sector** still has the potential to utilize the two-third un-utilized floodwater by developing cost-effective Spate irrigation schemes to provide water for Sailaba farming and to generate new livelihoods. Excess water during the wet years can be stored in cascades of storage dams to provide reliability to Sailaba farming to support production of value crops. Command area of existing dams is not developed fully rather no priority was assigned for the development of command area in the past projects. Groundwater schemes are widely practiced covering Kareze, tubewells, dugwells, springs, etc.

6. Highest potential for **agriculture sector** is for Sailaba farming because of availability of un-utilized floodwater. Productivity of existing Spate irrigation schemes can be doubled with provision of quality services and supplies in partnership with the private sector. In future the command areas of storage dams have to be integrated with Sailaba farming to involve all the beneficiaries. There is a need to have innovative strategy for the development of command area of storage dams. Furthermore, there is a great potential for improving efficiency of groundwater schemes both in terms of water and energy. Productivity of canal command areas can be increased along with sustainability.

7. For the **domestic water supply sector,** improvements should start by creating awareness for water conservation, as most of the rural population still considers that water is not a finite resource and it is a gift from nature. Participatory water supply schemes are the need of the day, as government is not in a position to have innovations in this sector. In the urban towns and metropolitans like Quetta, private sector operators may be encouraged to bid as private operator to provide services to the consumers – the best example is the services provided by Bahria Town in Pakistan. Monitoring of water supply schemes would provide an effective tool for improving management of physical and financial resources.

Possible Interventions for Change

8. Three areas of possible interventions have been identified for the three sectors. Until the provincial government takes serious note of policy and institutional reforms, there is hardly anything which can be achieved in all the three sectors. The priority actions are: a) policy and institutional reforms; b) investment projects and economic activities; and c) expansion and improvement in human resources

Action Plan

9. **Water sector** investment strategy must be refocused considering utilization of floodwater at the central stage because it is the largest resource of water spread all over the province. This would provide equal opportunity both for Pashtoon and Balooch areas and avoid damages to infrastructure due to floods. Floodwater in the wet years provides an opportunity for multiple uses. Returns on water sector investments were relatively low as traditional approaches developed in other provinces could not performed well in Balochistan. Innovations have to be developed within the context of river basin management approach using water balance and historical water rights. Past actions of phasing out subsidy and capping number of tubewells could not be worked out because these were not linked with reducing energy requirement. If power requirement is reduced to one-third with better productivity and reduced labour, farmers will be willing to participate in the implementation of a new and revised water sector strategy. The priority investment projects are:

- River basin water development and management projects for Nari, Porali, Zoab and Kacchi basins
- Improving performance of Pat-Feeder and Khirther canals
- Policy and institutional reforms and establishment of new institutions

10. Interventions selected for water development and management in the four river basins are: a) phase out tube well subsidy & divert resources for priority actions; b) high-efficiency irrigation systems for groundwater to reduce energy & water use; c) cascade of dams to store floodwater and integration with Spate irrigation; and d) Spate irrigation for Sailaba farming to generate new livelihoods. In addition to these four river basins, the Pat Feeder and Khirther canals also need improvement covering priority actions of: a) improving performance of canal operations for equitable distribution of water; and b) integrated management of canal and drainage system and re-use of drainage water to reduce waterlogging & salinity. Reforms are needed to convert existing institutions into high performance institutions. There is a need to establish an apex autonomous body at the provincial level with a mandate to work on policy, regulatory and planning functions. The IWRM Policy already supported establishment of Balochistan Water Resources Management Authority with Basin Water Boards to manage water at the basin level.

11. **Agriculture sector** investment strategy must be refocused considering development of Sailaba farming at the central stage because it is spread all over the province. This would provide equal opportunity both for Pashtoon and Balooch farmers to enhance and expand their livelihoods. Returns on agriculture sector investments were relatively low as the traditional approaches developed in other provinces could not perform in Balochistan. There is a need to have integration of various sub-sectors of land use to maximize the returns – crops, forestry, fisheries, livestock, fruits and vegetables. The major projects envisioned are:

- River basin agriculture development and productivity enhancement projects for Nari, Porali, Zoab and Kacchi basins;
- Improving productivity of Pat-Feeder and Khirther canals
- Policy and institutional reforms

12. The priority actions suggested for the four river basins are: a) high value agriculture under high-efficiency irrigation systems for groundwater schemes; develop command area and on-farm water management in cascades of storage dams; c) Sailaba farming under Spate irrigation to generate new livelihoods; and d) improving productivity of canal commands. There is also a need to introduce reforms in the existing institutions to make these as institutions of high performance. At the same time priority will be assigned for the involvement of private sector Supply and Service Companies in provision of services and inputs and disposal of the marketable products. Revised role of Agriculture Department should be mainly in knowledge generation, technology transfer, policy and regulatory aspects.

13. Investment strategy for the **domestic water supply sector** must be refocused considering participation of communities and the private sector in provision of services to the consumers and take over the responsibility for management and O&M of domestic water supply schemes. Recovery of O&M cost of the water supply sector was almost non-existent in Balochistan as the traditional approaches developed in other provinces could not perform well in Balochistan, thus development of local innovations and adaptations is essential. There is also an urgent need to have integration of various sub-sectors of water use (irrigation, agriculture, stockwater, water for industry and mining) and E-flows. In addition, there is a need to promote structural *changes* to adjust future demand of domestic water supply sector, while establishing or revising water entitlements of various basins and sub-sectors of water use. There is a need to have a different strategy for Balochistan considering the large area, difficult terrain and scattered and remotely located settlements so that services are provided effectively and efficiently. The action areas are:

- Implement IWRM Policy for the involvement of Water Supply Users' Organizations in the O&M domestic water supply schemes
- Strengthening of Water Supply Users' Organizations and Private Operators for services and O&M of domestic water supply schemes
- Sand filters and low-cost treatment of water supply for Sailaba areas
- High-efficiency and low-cost O&M domestic water supply schemes
- Reform existing institutions into institutions of high performance

Balochistan's Water and Agriculture Sectors –

Issues, Opportunities and Action Plan

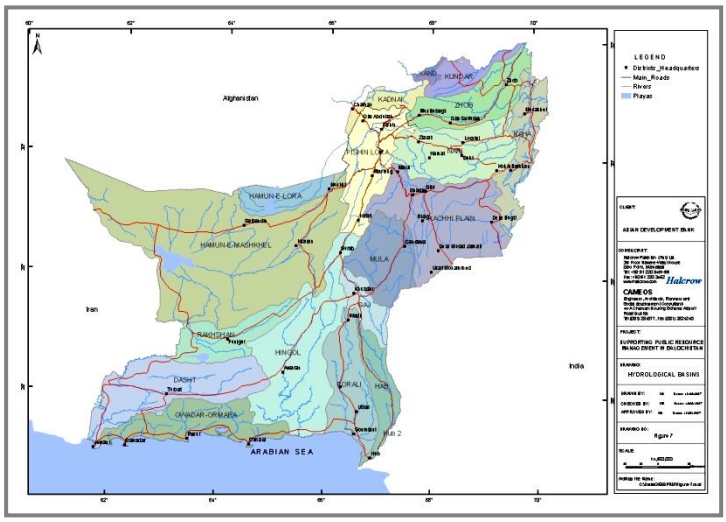
Chapter 1 SECTORAL CURRENT STATE AND KEY ISSUES

1.1 Balochistan's Water Sector

1.1.1 Water Scarcity

2.1. Scarcity of water is the critical constraint to the development in Balochistan. While some 87% of Pakistan's total available water is contributed by the Indus Basin Irrigation System (IBIS), Balochistan lies at its periphery and relies largely on non-perennial and some perennial sources of water (from IBIS and minor perennial outside IBIS). According to the estimates of PBER[1], water availability during 2005 was 556 m^3/ha per annum[2], only one-seventh of the level in other three provinces. And while Pakistan's water economy is highly integrated, allowing for risk pooling, Balochistan's water economy is highly segmented, with 18 river basins accounting for its vast territory (**Figure 1**). Rural livelihoods are dependent on availability of precipitation and these were severely affected during the last drought of 1998-05. Crops can fail after a seasonal drought, whereas livestock and orchards are vulnerable to persistent droughts. Since 97% of Balochistan's water use is by agriculture, any strategy to deal with water scarcity has to assign this sector a higher priority.

Figure 1. River basins of Balochistan



2.2. During the last three decades, Balochistan's agricultural development has been largely driven by expansions in irrigated agriculture through increases in canal-commands and spread of tubewells. While this strategy has achieved notable successes, such as the growth of high value horticulture and increased yields, it favoured a fraction of population, and is no longer sustainable. Excessive mining of groundwater has lowered water table and resulted in water deficiency in the major basins with severe environmental consequences. While there is scope to increase Balochistan's IBIS canal water supplies in line with the Pakistan Water Accord, the current capacity of irrigation infrastructure has already exhausted (World Bank 2005). In any case, the geographic reach of such measures is limited to the IBIS; whereas Balochistan's 16 other water basins face small and fluctuating water availability.

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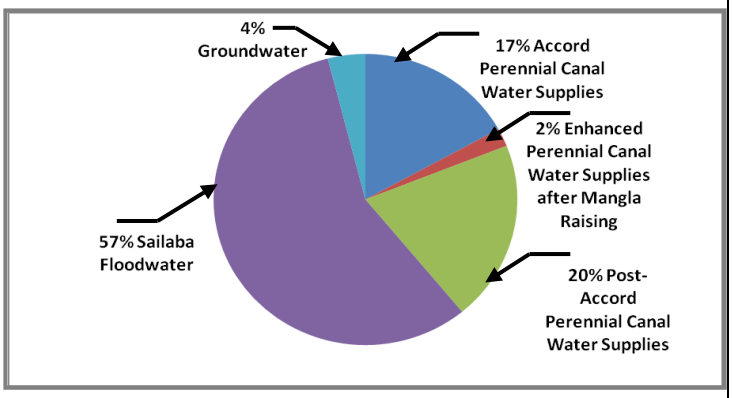
[1] *Pakistan's Balochistan Economic Report. 2008. World Bank, Asian Development Bank and Government of Balochistan. Report No. 40335 Pk. Volumes I and II.*

[2] *ha – hectare equivalent to an area of 10000 m^2*

1.1.2 Under-utilized Floodwater and Over-utilized Groundwater

2.3. In spite of water scarcity, Balochistan fails to make the most out of its available scarce resources. Three major sources of water are: a) IBIS consists of perennial and non-perennial flows as per Accord allocations; b) floodwater *(sailaba)* resources comprise of seasonal flood flows and the largest resource of water in Balochistan; and c) groundwater abstracted from tubewells, springs, dugwells, and *karezes* and is the scarce resource in the province. Out of available water of 25 billion m^3 per annum at 25% probability, just under two-fifth was utilized in 2008 (**Figure 2**). The floodwater and IBIS canal supplies constitute the Balochistan's under-utilized potential.

Figure 2. Water availability in Balochistan from different sources – Utilizing only 40%



Source: IPD (2006a; 2008).

2.4. Pakistan Water Accord of 1991 establishes clear entitlements for provinces to waters of the IBIS. Balochistan's current perennial IBIS flows are 4.78 billion m^3, and will increase by an additional 0.44 billion m^3 after Mangla Dam Raising project.

2.5. The perennial flow is restricted to the two districts of Naseerabad and Jaffarabad. Annual non-perennial supplies from the Indus, available during flood years and the brief monsoon season, are estimated to be another 5.7 billion m^3. Yet, the present capacities of the Pat Feeder and Khirther canals allow the utilization of only 3.8 billion m^3 of the overall allocated flow of 10.9 billion m^3 as per Water Accord. After the construction of the Kachhi Canal and remodelling and extension of the Pat Feeder Canal, they are projected to increase to 4.57 billion m^3 for perennial water and 1.94 billion m^3 for non-perennial water. Even after these investments, Balochistan's IBIS utilization would still fall short some 40 percent of its quota. At least two canals of the size of the Kachhi canal will have to be constructed to fully utilize water share allocated to Balochistan.

1.1.3 Impact of Variability and Change of Climate on Water Availability

Basin-wide Surface Water Availability

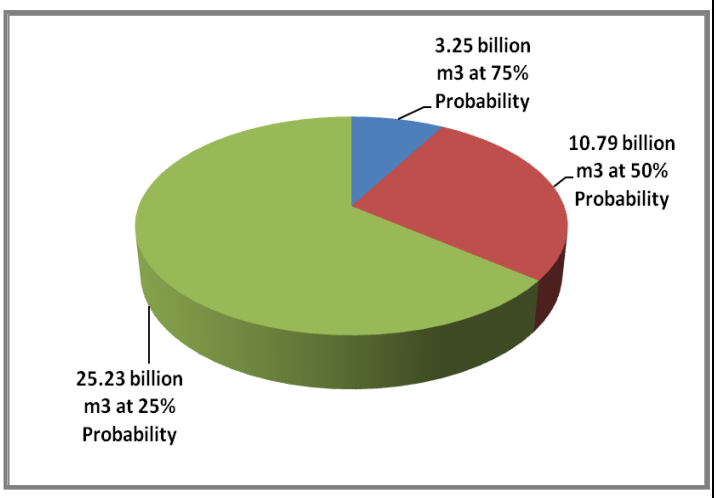
2.6. Surface water availability was assessed on the basis of 19 stream gauging stations data provided by the IPD. Similarly share from Indus River is based on the allocation made under Water Apportionment Accord. Balochistan province generates total surface flows of floodwater of 3.25, 10.79 and 25.23 billion m^3 at 75, 50 and 25% probability levels, respectively. This indicates an increase of 134% during wet year from that of mean whereas flows decrease by 70% during the dry year (**Figure 3).**

Basin-wide Groundwater Availability

2.7. Groundwater availability depends on two factors; recharge and storage in aquifers. Normally it is based on average annual recharge. Average annual recharge was evaluated on the basis of probable precipitations (75, 50 and 25%). The areal rainfall corresponding to these values comes to 77, 124 and 184 mm, respectively. Estimated average annual recharge for the

province comes to 1.38, 2.21 and 3.30 billion m^3. Variations in areal precipitation at 50% probability are 48% increase in wet year and 47% decrease in dry year. The increase in recharge is 49.5% during wet year and decrease of 37% during dry year**. Figure 4** exhibits average annual recharge in Balochistan at 3 levels of probability.

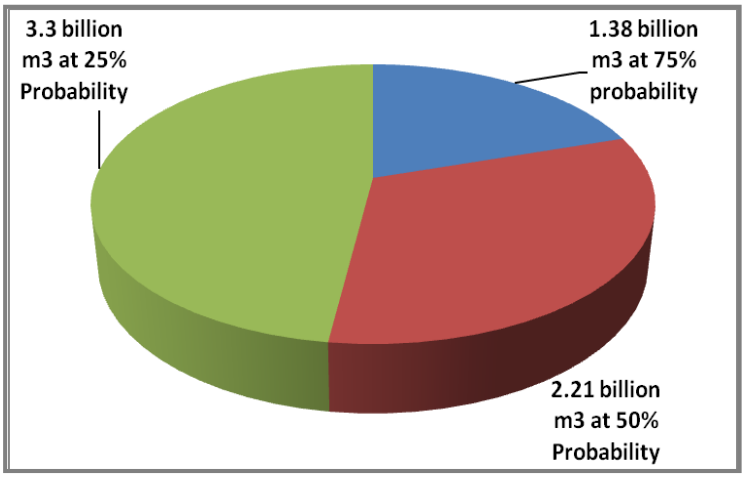
Figure 3. Floodwater availability at 3 probability levels



2.8. The neglect of sailaba (channelized floodwater) and khushkaba (localized runoff) farming systems, as well as the lack of effective drainage in the IBIS has resulted in loss of land through degradation (loss of water, loss of infrastructure during floods, etc.) and low productivity in terms of land, water and time.

2.9. The destruction of natural vegetation cover, exacerbated by the last drought affected retention of snow in highlands and of rainwater in the lowlands, thus exacerbating problem of flashfloods. As a result, the heavy silt loads carried by floodwaters quickly reduce the storage capacities of small reservoirs and render delay action dams ineffective. Estimates suggest that about a third of the vegetation cover, as compared to historical levels, is destroyed. Other environmental problems include the intrusion of saline water into fresh groundwater reservoirs in the coastal areas and at inland locations and the entry of effluents (sewage, agricultural and industrial) into freshwater or storm water streams.

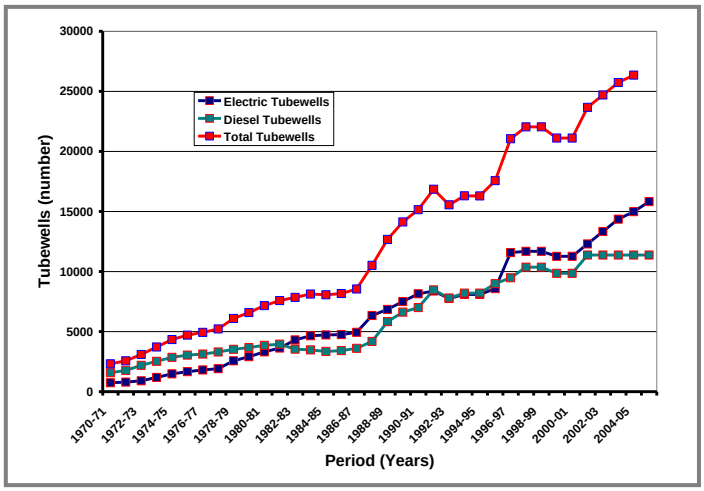
Figure 4. Annual groundwater recharge in Balochistan at 3 probability levels



2.10. Groundwater, which accounts for only 4 percent of Balochistan's water resources, is the most intensely utilized water resource in Balochistan. Some 60 percent of the available groundwater has been exploited, mostly through tubewells and dugwells. The lowering of groundwater is a common phenomenon in Balochistan, as farmers are now pumping beyond the depth of 250 m. For example, one study of the Quetta sub-basin indicated that total annual discharge was 97.6 million m^3, as compared to an annual recharge of 61.1 million m^3, thus resulting in an annual deficit of 36.5 million m^3. In the three major basins (Pishin-Lora, Nari, and Zoab Rivers), the rate of utilization is so high that it could lead to the depletion with serious

environmental consequences. The Balochistan's IWRM Policy 0f 2006 emphasized the need to initiate water resource management in the three over-drawn basins.

Figure 5. Growth of tubewells in Balochistan



Source: Agricultural Statistics of Pakistan.

2.11. The depletion of the water table is a result of the rapid growth of electric tubewells fuelled by the government's subsidy. The number of electric tubewells increased rapidly since the introduction of the National Electricity Grid System in the 70s (**Figure 5**). There were around 27,195 tubewells as of 2005-06, out of which 15,824 were electric operated. The share of electric out of overall tubewells increased from just under one third in 1970-71 to around two-third in 2005-06. Farmers pay a fixed monthly tariff of Rs. 4000 per tubewell, irrespective of usage and size of prime mover, as compared to an average actual cost of electricity of Rs. 40,000 per month. There has been a tremendous increase in electric tariff since 2005-06.

2.12. There were 11371 diesel tubewells in the same period but it is expected that actual number is much more than reported because there is no reliable data of these tubewells. With the enhanced load shedding and poor quality of power in terms of voltage fluctuations are also forcing farmers to have alternate systems with diesel prime movers.

Climatic Variability and Climate Change on Water

2.13. Probability analysis of surface and groundwater indicated that there is extreme variability in precipitation, surface water and groundwater. Even before any climatic change, the variability in availability of water is extremely high. The climate change experts are of the opinion that in arid regions of Pakistan there are chances that extremes are going to be further severe in Balochistan – droughts and floods. The last drought of 1998-2005 is one of the example indicating the severity and persistence of the drought which lasted 7 years. The floods are going to be severe as the province has experienced floods in the recent past having huge impacts on infrastructure and agriculture.

2.14. The province is already facing water scarcity and climate change will further worsen it. The major impact on agriculture sector will be the increased crop water requirement due to rise in temperature in the hot regions, whereas it will have positive impacts on growth of winter crops but higher chances of faster melting of snow in the highlands.

1.1.4 Subsidy on Electric Tariff for Tubewells

2.15. Subsidy imposes a heavy burden on the cash-strapped provincial government. In 2005-06, the subsidy amounted to Rs. 8.0 billion, shared between the Government of Pakistan (43.2 percent), the Government of Balochistan (28.4 percent), and the national power company WAPDA (28.4 percent)[5]. This equals to about one-fifth of the provincial development spending.

The cost of the subsidy is likely to go up in future - and double within the next decade according to some estimates - as the number of electric tubewells continues to grow and the pumping requirements increase due to the lowering of the water table. The cost of the electric subsidy is so large partly due to the absence of any strategic power supply management. The power company does not need to supply 8,760 hours of electric power per year, but could make farmers happy by supplying no more than 40 percent - if provided at the right time. Crop water requirement is a function of atmospheric demand expressed as evapotranspiration, which varies considerably in Balochistan. In general, summer *(kharif)* season crops, including fruits, require more water compared to winter *(Rabi)* season crops. A tubewell survey conducted by the Irrigation and Power Department found evidence for over-billing by the Quetta-based electricity company QESCO almost equal to the WAPDA contribution of the subsidy. This would suggest that WAPDA's contribution is effectively zero. QESCO has also little incentive to collect the electricity bills from the farmers as it can pass on the costs to the Government of Balochistan.

2.16. For example, peak water demand in Quetta, which is mostly a fruit growing district, is five times as high during the month of July (161mm) as in January (28 mm), corresponding to a monthly variation of power needs from 3 to 16 hours per day (Figure 6). While this fluctuation in atmospheric demand provides opportunity for conservation, there is no deliberate adjustment in power supply to exploit this variation. Better management of power supply to conform to water requirements of crops could serve multiple purposes of reducing the electric subsidy for tubewells, conserving precious groundwater, as well as improving productivity by reducing over-irrigation in the low demand months.

2.17. In addition to this fiscal and power management issue, the subsidy raises environmental, efficiency and equity concerns. First, the fixed rate tariff provides no incentives for electric tubewell farmers to conserve water. Evidence from a farmers' survey in Balochistan reveals that the water productivity of diesel tubewell irrigated farms, which grow mostly vegetables as opposed to fruits, is approximately fifty percent higher than electric tubewell irrigated farms (ADB 2006). Equally, farmers in Bangladesh and India run the subsidized tubewells from 40 percent to 250 percent longer than those operated at market cost. Second, the subsidy is inefficient in that it crowds out necessary investments in the water sector, such as in sailaba farming. The cost of the subsidy to the Government of Balochistan exceeded by 250 percent the provincial development allocation for the water sector in 2005-06. Third, the subsidy is inequitable, as it accrues (assuming two electric tubewells per farmers) to only 7,900 electric tubewell owners, compared to a total farming population of 329,868. The beneficiaries are larger and richer landowners, especially as investment costs for deep electric tubewells amount to Rs. 1.5 to Rs. 2.0 million.

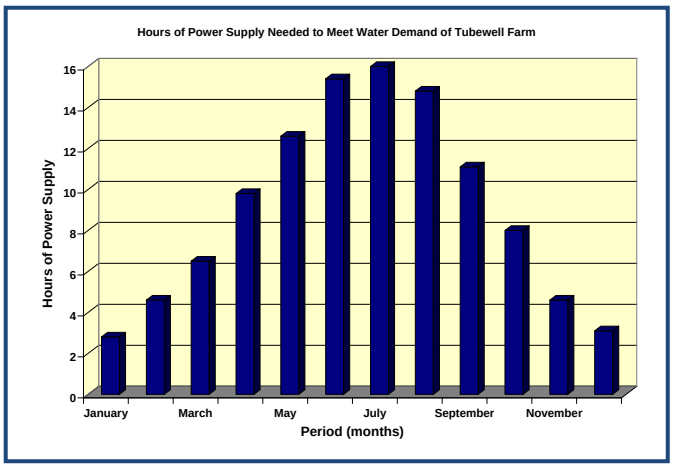
2.18. Through this regime, power supply could be restricted to 3,333 hours/year compared to maximum theoretical availability of 8760 hours/year. This would mean that a typical tubewell could provide its owner with water sufficient to meet his water requirement at the farm level. Irrigators perceive a good quality service to be the provision of power of a uniform voltage and frequency to meet peak water demand. Therefore, with intelligent management of power supply, it is possible to satisfy irrigation power demand by ensuring power of 12-16 hours during 120 days of higher water demand period in the summer season (May through August). Some power (e.g., 3-10 hours/day) would also be made available on other months of the year (**Figure 6**).

2.19. Use of off-peak power would further reduce the cost of electricity if all power was off-peak. And, as many farmers irrigate at night, this would not affect their farming practices. So, the most viable and practical solution to the current crisis involves gradually raising the farmers' share of electric tariff (from Rs. 1200/hp per year) by 15% annually – meaning increase of Rs.

180/hp per annum along with restricting annual supply of tubewell power to 3,333 hours/year, rather than the uneconomical and un-reliable 8760 theoretical hours/year currently provided.

2.20. The challenge for power companies would be to match the timing of power supply to the periods when crops need water the most. This would vary a great deal as crops grown vary within the province.

Figure 6. Hours of daily power supply needed to me water demand of tubewell farms for Quetta, Balochist



Source: Ahmad 2005a.

1.1.5 Investments in Water Sector

2.21. The Government of Balochistan's major focus of investment was on subsidy for electric tariff, rehabilitation and expansion of IBIS, minor perennial irrigation schemes and flood protection. The investment on these schemes was Rs. 16.2 billion. The major investment was on IBIS costing Rs. 10.0 billion followed by minor perennial irrigation schemes and construction of delay action or storage dams.

1.1.6 Water Productivity

2.22. The electric tubewell subsidy is only one of the factors that aggravate Balochistan's water crisis. Agriculture in Balochistan, whether irrigated or sailaba, uses too much water as farmers do not pay the social cost of water. For example, Balochistan's water productivity for wheat is less than elsewhere in Pakistan - 0.4 kg/m^3 in the canal command areas as compared to 0.6 kg/m^3 for Pakistan. And Pakistan itself is not known for its efficient use of water - water productivity for wheat in Pakistan's Punjab is half of that of Bhakra in India's Punjab. There are three main areas which can contribute to boost water productivity: water fees (Abiana), irrigation technology, and water entitlements.

Abiana

2.23. Introduced in colonial times, the provincial revenue department charges water fees (*Abiana*) from the farmers for the supply of canal water on the basis of the size of the irrigated cropped area and the type of the crop. Yet, assessment of abiana rates are low and their collection is poor. For example, abiana was assessed at Rs. 69 million for the Pat Feeder and Khirther canals in 2003-04. The potential assessment, based on a canal-irrigated area of 0.365 million ha and documented cropping patterns, amounts to Rs. 182 million. In other words, exemptions to large landowners and the concealment of cropped areas by farmers reduced the assessment to only 38 percent of its potential. Furthermore, the actually collected abiana was only Rs. 18.6 million, or 27 percent of the assessed value and just 10 percent of the potential value. This amount is considerably below the costs of operation and maintenance of the irrigation infrastructure.

2.24. The incentives of farmers to utilize water efficiently are not just weakened through the low assessments and weak recovery. No more than one-sixth to one-third of abiana is collected,

and the rates do not reflect water usage. Abiana rates are also not linked to the amount of water consumed by the crop. For example, the 2005-06 abiana rate of sugarcane, which uses about three times as much water as cotton, is only twice as high as cotton. The rates for cotton and rice are about the same. Rice not only consumes more water than cotton, but is also a major cause for the menace of waterlogging and salinity which results in production losses in the IBIS of 25 percent. The poorly functioning abiana system and tubewell subsidy imply that cropping patterns in most parts of Balochistan are not reflective of the true costs of water. For example, sugarcane, one of the most water-intensive crops, is grown in the Pat Feeder and Khirther Canal commands, and onions and apples, also highly water-intensive crops, are cultivated in the tubewell-irrigated areas.

Irrigation technology

2.25. Improved water application techniques through better timing of water supplies and improved on-farm water management (OFWM) could greatly increase the amount of output per unit of water. Timing and reliability of water are critical to provide farmers with the incentives to make the necessary investments in seeds, fertilizers, land preparation to improve yields, and to ensure water availability at critical crop-growth stages. For example, the current authorized water allocations of various canal commands are not in line with evapotranspiration requirements, cropping patterns, or cropping intensity, resulting in low productivity and wastage of water. There is also excess irrigation at the farm level due to poor surface irrigation hydraulics and unlevelled fields, which forces farmers to apply enough water to cover the highest point in the field. Access to laser levelling is to date very limited as the government maintains only a few units and the private sector has not been involved in the provision of these services.

Water entitlements

2.26. Reliability of water supply is linked to a transparent delineation and enforcement of water entitlements so that water can be effectively and equitably allocated among the stakeholders. Pakistan has an unusually long and well-established tradition of water entitlements for the IBIS. The 1991 Water Accord was a landmark achievement that clearly defined entitlements for each province and within province at the canal command level. However, the non-transparent implementation of this accord has meant that, as in the rest of the IBIS, there is considerable distrust in Balochistan among the various users, particularly among the small and large farmers, and among tail-end and head-end users. Water entitlements for floodwater or groundwater are not well-defined. There are no restrictions on the pumping of groundwater by tubewells - the right to exploit this resource rests entirely with the tubewell farmer, and although there are Water Committees at the district and provincial levels for licensing of groundwater their role is largely limited to regulating the spacing of tubewells. Users are also free to abstract any amount of water from minor perennial surface irrigation schemes, springs, and *karezes* without consideration of downstream usage or environmental consequences. Even then the Balochistan is the only province having Groundwater Administration Ordinance, but hardly implemented effectively since 1978.

2.27. During 2007, World Bank initiated a process to develop an action plan for the management of groundwater in the Pishin-Lora basin and a Mission was launched by GWMATE for building the guidelines. Later on under the World Bank financed Balochistan Small Scale Irrigation Project (BSSIP) the Action Plan was updated and stakeholders' consultations were organized to have ownership of the provincial government during 2008-09. Suggestions were also made by GWMATE for the revision and to update the Groundwater Administration

Ordinance of 1978. The Mission also supported establishment of Balochistan Water Resources Management Authority (BWRMA) but even if such an authority takes time to establish the efforts have to be made for developing institutional arrangements for managing groundwater at the pilot scale, the Quetta sub-basin (GWMATE 2007).

1.1.7 Policy, Institutions and Capacity

Policy

2.28. Balochistan is the only province which has formulated IWRM[3] Policy and approved by the cabinet of Government of Balochistan during March 2006 and was promulgated by the government. However, the policy could not be effectively implemented. The major limitations are inadequate institutional framework, lack of capacity of existing institutions and inadequate political will.

2.29. The IWRM Policy 2006 puts emphasis on the adoption of basin approach for the management of water resources starting from the three over-drawn basins of Pishin-Lora, Nari and Zoab rivers. This approach has been adopted under the World Bank's financed project entitled "Balochistan Small Scale Irrigation (BSSIP)" based on the outcome of the GWMATE Mission who developed the guidelines for the formulation of an Action Plan for the management of groundwater resources in the Pishin-Lora basin in conjunction with surface water. Pishin-Lora is the most over-drawn basin and Action Plan for the Quetta Sub-Basin was developed in the BSSIP and adopted by the government through extensive stakeholders' meetings. Recently, the Government of Balochistan advertised an RFP for the detailed feasibility study for project preparation, design and implementation support for the "Management of Water in the Nari basin", where similar Action Plan will be prepared for the management of water resources. The last date for the submission of proposals is 30th April 2012. The feasibility study will be completed in a period of 12 months followed by implementation phase of 60 months.

2.30. The Groundwater Administration Ordinance was promulgated in 1978 in Balochistan. The Water Committees have been established in various regions and districts for the award of licenses for the installation of new tubewells. The Water Committees of Quetta and few other districts are functioning well, whereas in remote areas the implementation is not effective as tubewells are being installed without considering the prescribed criteria of aquifer characteristics, water balance, safe yield and well spacing. The real issue is how to enforce effective implementation of IWRM Policy and Groundwater Administration Ordinance. The other issue is to review the policy and ordinance and make changes for effective enforcement and to continuously update these policies considering the new and emerging issues.

Institutions

Currently, the institutions are organized in a traditional manner without considering the ground realities. There is no specialization for various land use systems: canal commands, small dams, Spate irrigation and Sailaba farming, groundwater covering tubewells, Kareze and springs, etc. Irrigation Department is organized under three Offices of the Chief Engineers covering North, South and Canal Irrigation. Another Chief Engineer as Director General of Water Resources Planning, Development and Monitoring Directorate is largely involved in provision of drilling equipment to the clients in addition to providing secretariat support for the implementation of

[3] *Integrated Water Resources Management*

Groundwater Administration Ordinance. The ADB-TA 4560 has provided a consultancy for reorganization of the Directorate but implementation is still awaited.

2.31. The IWRM Policy recommended establishment of Balochistan Water Resources Management Authority (BWRMA) and Basin Water Boards for the major basins in Balochistan but no action has been taken so far. Until this authority is in place, it is not possible to manage water at the basin level with active participation of the stakeholders. Furthermore, the BWRMA will be the custodian of implementation of IWRM Policy and Groundwater Administration Ordinance. Because policy formulation is not a one time job and future modifications would require participation of all the stakeholders.

2.32. The major challenge is how to institutionalize the basin approach of managing water of major river basins in Balochistan and the policy of reforming institutions be implemented as per policy of the government.

2.33. There are serious capacity shortcomings in the existing institutions and reforms are needed to ensure focusing of the interventions as per local situation with an objective to create new and sustained livelihoods for the local.

Balochistan Socio-economic Condition

2.34. The principal strengths of Balochistan's economy are natural resource base: climate suitable for high value fruits, crops and vegetables; water resources from surface and groundwater; large tract of land; rangelands for livestock production; and coast with potential for marine fisheries. While the economy lacks diversification at the local level, the distinct ecological systems in different areas - flood-plains, uplands, and deserts to the coastal area - lead to a considerable variety at the provincial level. Balochistan's agriculture focuses on non-staple and high-value products, suitable for the water-scarce high-altitude environment, in addition to crop cultivation in the canal-irrigated districts in the northeast close to the IBIS. The northern area specializes in horticulture; the central and western districts engage foremost in livestock rearing, and the coastal belt relies on fisheries.

2.35. Balochistan has the weakest long-term growth performance of all provinces. From 1972-73 to 2004-05, the economy expanded 2.7 times in Balochistan, 3.6 times in KPK and Sindh, and 4.0 times in Punjab. The growth divergence has widened historic income differences and Balochistan's per capita income level of $400 in 2004 was only two-third of Pakistan's level. Balochistan's rate of structural change and urbanization was also lower than elsewhere. Yet, Pakistan's five-year economic recovery has improved Balochistan's growth prospects. Its recent upswing is broad-based, and the economic uplift initiatives and transport investments are accelerating the process of urbanization (PBER 2008).

2.36. The *quality of employment is worse in* Balochistan than in other provinces. Workers produce about one quarter less than workers in KPK and Punjab, and over one third less than workers in Sindh. The labor market is marked by duality, as less than one in five workers holds a regularly salaried job, of which the private sector supplies just one in four and while the job quality is worse than elsewhere, workers in Balochistan migrate less other workers. The projected increase of Balochistan's population from 7.8 million in 2005 to 11.1 million in 2025, poses major challenges for policymakers in terms of providing education and employment opportunities. However, Balochistan's labor market is already improving noticeably. The economic recovery was labour-intensive, generating 900,000 jobs in the last eight years, and the share of workers with some education increased by 7 percent from 1999-2000 to 2005-06. Wage

increases have benefited workers on regular jobs, are likely to spill over to irregular jobs due to rising labor demand from construction projects and agriculture. In addition, labor reforms hold the promise of reducing barriers to regular jobs. Improved connectivity will also facilitate mobility of labour. The demographics suggest that the labour force could rise from 4.1 million in 2005 to 7.2 million in 2025. Based on the historic employment elasticities, creating an additional 158,000 jobs annually for these workers should be well within reach with economic growth of at least 6.5 percent. As the schooling of the future labor force is likely to be more egalitarian, a rising labour force participation rate could become an important force for provincial convergence (PBER 2007).

2.37. The number of poor people of rural Balochistan increased from 1.5 million people in 1948-49 to 2.1 million people in 2004-05. While ***poverty*** *rose in* rural *areas,* it declined in urban areas. Manufacturing, government spending and services, Balochistan's main drivers of the economic recovery, have generated incomes in cities, but less so in villages. The principal challenge going forward is to ensure that rural households share in the growth experience, as in the other three provinces. And there is a reason for optimism. Most importantly, the drought, which depressed economic activity in rural Balochistan, finally ended in 2005. This supported the sharp rise in labor force participation in rural areas from 2003-04 to 2005-06. More public resources, combined with greater efficiency and equity of spending, should further contribute to lower poverty (PBER 2007).

2.38. The quest for Balochistan's economic development is challenging. We need to look no further than the province's own record on growth, employment, poverty reduction, and social development to appreciate the scale of the challenge. Yet, today's prospects offer the best opportunity in many decades to put the province on a path towards prosperity. One reason for optimism is the province's own reform initiatives in areas of subnational responsibilities, which include the services for agriculture, irrigation, water supply and sanitation. Over the last four years, a good national economy has led to *a* greater resource flow through the NFC Award from the center to the province, as well as scaled-up central investments, such as Kachhi canal irrigation project. Finally, as Pakistan's prospects *have* improved overall, there is a better chance for progress on a third set of issues that have to be tackled jointly by the federal and provincial governments. They include the sharing of national water resources and the inter-governmental fiscal relations.

1.2 Current State and Key Issues of Agriculture Sector

1.2.1 Recovering from the Drought

2.39. Agriculture and livestock have a direct impact on the livelihood of the majority of the rural population. The crop sub-sector contributes about three-fifth of Balochistan's agricultural value added, and close to one-fifth of Balochistan's overall value added. While these shares are virtually unchanged compared to the early 90s, the value of production grew by about 150 percent from the early 90s to the mid-90s, and then declined by 20 percent up to the early 21st century. The principal culprit for this poor performance is the drought, which induced a decline in production volumes by about 7 percent annually between 1998-99 and 2002-03. The reduction in crop values would have been larger without a marked shift to higher value crops. In the early 90s, farmers switched from field crops to vegetables, and since the mid-90s, from vegetables to fruits mostly in response to changes in output prices.

2.40. Similarly, orchards expanded in the early 2000s, boosting their contribution to Balochistan's agricultural output. Overall, about 1.9 million hectares were under cultivation,

about 6 percent of Balochistan's geographic area, in 2003-04, compared to 1.7 million hectares in 1994-95.

1.2.2 Impacts of Climatic Variability and Climate Change on Agriculture

2.41. The largest potential of agriculture in the province is in areas of Spate irrigation where farmers are practicing Sailaba farming. The extreme climatic variability and climate change impacts due to frequent and severe droughts and floods would affect agriculture adversely. In the drought years, the area commanded by floodwater is almost 20% of the potential in wet years. In the last drought, the rural communities have migrated to urban areas for the search of livelihoods and they lost millions of animal heads. There are chances that in future impacts on water scarcity will be severe. Similarly, the wet years causing floods, would affect the standing crops and farmers' infrastructure in the field more severely. Major impacts of climatic variability and climate change on agriculture are:

- Reduction in availability of water due to prolonged droughts and pressure on groundwater will increase having higher abstractions to save high value orchards and vegetables;
- Rise in temperature will increase crop water requirement resulting in reduced productivity
- Shift in the boundaries of crops due to rise in growing degree days (due to accumulative effect of rise in temperature) in hot climates
- Positive impacts on winter crops in cooler highlands due to better growth and transpiration because of rise in temperature but there will be more chances of melting of scarce snow and reduced recharge to groundwater.
- Severe droughts may result in complete drying of orchards which was observed in most of the highlands in the last drought – Pishin-Lora, Nari and Zoab basins.
- More severe epidemics of animal diseases and shortage of stock water resulting in loss of animals and reduced productivity due to shortage of water. In the last droughts most of the animals were died due to shortage of stock water rather than shortage of fodder.

1.2.3 Constraints to Cropping

2.42. Whatever progress to date, the yields of most crops are low compared to other provinces and other developing countries. While the fluctuating availability of water is one of the crucial causes of low yields, inefficient use of irrigation water, lack of infrastructure, lack of certified and pure seeds, and slow adoption of technology particularly for post-harvest handling, including storage and transport, have also reduced Balochistan's yields.

2.43. ***Lack of irrigation:*** According to the 2000 Agricultural Census, five in six farmers in Balochistan do not have any canal commanded, tubewell, or minor irrigation scheme, and are fully exposed to the vagaries of the weather. For irrigated agriculture, farm gross margins are highest in the canal irrigated area of Nasirabad connected to the Indus River. In the rest of the province, close to half of the irrigation relies on pumping groundwater through tubewells, in addition to gravity flow springs (21 percent), minor irrigation schemes (18 percent), and karezes (12 percent). Such systems have helped to boost incomes in the cool temperate highlands, which depend heavily on orchards, but less so in the other hot arid lowland plains and coastal subtropical zones without major fruit plantations. The reliance on tubewell irrigation is

unsustainable in this water-scarce province (see further details in water sector). Income from non-irrigated crops dwindled as a result of the long-standing drought.

2.44. ***Varying Size of Landholdings:*** Low population densities and limited agricultural development suggest that there is no shortage of agricultural land. Indeed, about five in six rural farming households claim to have ownership of their land plots. Tenancy is widespread only in the canal commanded areas of Nasirabad, where close to two-fifth of the farmers rent land. In addition, much of the land in non-settled areas is under the discretion of tribal chiefs, but there are no official statistics of ownership patterns. Furthermore, most land plots are small. According to the Agricultural Census 2000, five in six farms in Balochistan have an area of less than 10 hectares, covering no more than 36 percent of the provincial cultivated area; and three in ten farms have an area of less than 2 hectares. Farm sizes vary largely across ago-ecological zones. In the canal commanded areas, over two-third of the geographic area was cultivated in 2002-03, and all of the cultivated land was cropped. In the other zones, at most one-sixth of the land was cultivated, and at most half of that land was cropped.

2.45. ***Reliance on family labor:*** The small farm sizes and large family sizes leave little room for job creation for non-family workers. Out of the 332,687 farm households recorded in the 2000 Agricultural Census, only some 13,097 (4 percent) employ any permanently hired labour. Among farms with less than 10 hectares holding sizes, the ratio is only 2 percent. Overall, out of the 783,000 farm workers, only some 31,592 were hired.

2.46. ***Low quality seeds:*** Only a small proportion of Balochistan's major crops are planted with certified seed of improved high yielding cultivars. For example, only about 2 percent of the estimated required improved wheat seed was available. The seed multiplication, production and marketing through the private sector have been disappointing as high transport costs and low volumes make this activity unprofitable. Out of Pakistan's 367 registered seed companies, only 3 are based in Balochistan; and out of nationwide 10,528 seed dealers, less than 0.3 percent are located in Balochistan. Private companies provided only 5.5 percent of the required seeds. The public sector fared not much better, and provided only 8.4 percent of the required seeds. One constraint on increasing seed availability is the low storage capacity. The province can store only 3,500 metric tons, less than one-third of the seed provisions in 2001, and only 10 percent of the storage capacity is in the private sector. The infrastructure for the certification of nursery stocks for horticultural seedlings is also till underdeveloped. Balochistan is still in the process of setting up fruit seedling testing laboratories and registration procedures of private nurseries for producing certified fruit plants.

2.47. ***Lack of fertilizers and pesticides in remote areas:*** The liberalization of agricultural input supply in early 90s increased the use of fertilizers and pesticides. Fertilizer consumption in Balochistan rose from 30 kg per hectare in the mid-90s to above 150 kg per hectare in the mid-2000s. As the sales of fertilizer products increased from about 110,000 million tons in 1996-97 to over 145,000 million tons in 2002-03, the share supplied by the Department of Agriculture dropped from 15 percent to 1.5 percent. Yet, lack of private profitability and the phasing out of the public distribution system implies that fertilizers and pesticides are rarely applied to field crops in remote areas.

2.48. ***Inadequate equipment:*** While some 60 percent of the farm area in 2000 was cultivated with tractors, the equipment used was often not suited to soil conditions. There is little knowledge about efficient land preparation techniques, equipment care and maintenance. There is also a shortage of effective maintenance facilities, spare parts and qualified mechanics.

2.49. ***Marketing:*** Apart from wheat where the federally announced support prices acts as trend setter, the prices of the main agricultural commodities, including fruits and vegetables, are market-based. Nevertheless, the low population density and prevalence of subsistence farming outside the urban centers leads to a low consumer demand and weak agricultural marketing systems. There is no adequate storage, processing, packaging, and refrigerated transport facilities. The province has only two regulated markets: Quetta (for fruits) and Nasirabad (crops). Elsewhere, farmers sell their produce to middlemen without knowledge of market prices and supply. While further yield improvements are important, strengthening the value chain can reap high returns to the farmer.

2.50. ***Low public funding:*** While agriculture, including livestock, accounts for almost one third of Balochistan's GDP and is the main source of livelihood for close three-quarter of the population, it received just 3.5 percent of funding from the provincial annual development plan in 2004-05, compared to 7.6 percent in 2002-03. Even including water, the share of development funding declined from 42 percent in 2002-03 to less than 15 percent in 2004-05. There is no reliable information on the trends of non-development expenditures due to lack of district-level data.

2.51. ***Weak institutions:*** There is a dearth of drought-resistant technologies and innovative crop substitutions that reflect local circumstances. The institutional framework does not match the requirements of the field realities. The available courses and training modules at the Agricultural Training Institute are not adapted to the changing needs of the farming communities, and the capacity of the faculty staff is inadequate. The accountability of staff and monitoring of activities by communities is weak.

1.3 Current State and Key Issues of Domestic Water Supply

1.3.1 Uneven Access and Uneven Quality

2.52. Safe drinking water is one of the most basic human requirements. Balochistan's access to improved drinking water sources is likely to have increased since the late 90s, although the data classification makes it impossible to know by how much. At a minimum, improved water sources include water from pumped water pipeline network, which rose from 33 percent in 1998-99 to 46 percent in 2006-07. The other two categories, wells and rivers, streams and other sources, could include both improved water sources (protected wells or springs) and unimproved water sources (unprotected springs, rivers or ponds, and water tankers). The reliance of households on rivers, streams and other sources increased, probably due to the lowering of the water during the drought which made pumps and wells less productive.

2.53. The improvements in drinking water supply are matched by similar progress in sanitation. Human wastes cause sickness. When wastes are left on the ground near drinking water, whether at source, in a pipeline, tank, or domestic utensil, come into contact with the water, the bacteria can contaminate that water and unsafe for drinking. The share of Balochistan's households with flush toilets increased from 10 percent in 1998-99 to 25 percent in 2006-07, although the share of households with no toilet remained unchanged.

2.54. The modest advances have not come cheaply. For the last six years, Balochistan outspent the other provinces on water supply and sanitation, as might be expected in view of the higher cost of service delivery due to remoteness and arid terrain. In 2005-06, the disbursed budget was Rs. 263 per capita in Balochistan, compared to Rs. 78 in Punjab, Rs. 34 in NWFP, and Rs. 17 in

Sindh. In addition, per capita spending rose in real term by about 50 percent from the early to the mid-2000s, indicating a greater emphasis on closing the coverage gap.

2.55. Whatever the progress, Balochistan still lags far behind the other provinces in the access to improved water sources, and there are large gap in coverage between urban and rural areas, *and* non-poor and poor households. In the absence of a public piped delivery system as well as a shallow groundwater table, less than one in two households in Balochistan get their water from a tap or a pump. In contrast, almost all households in Punjab obtain drinking water from taps and pumps. In the mountainous areas, water supply is usually from springs and streams while in the low-lying areas it is from tubewells and dugwells. In the urban areas, water is increasingly delivered through pipes, from groundwater, rivers, and streams. The intra-district variation is also enormous. Access to piped water in rural areas varies from over 50 percent in Quetta and Pishin to below 10 percent in Ziarat, Lasbella, Ketch, Plunger and Jhal Magi. In terms of sanitation, just about one in twenty rural households in Balochistan, have flush toilets, compared to three in five urban households. Similar service gaps are present for waste management. According to the 2003-04 MICS data, about three-quarter of rural households, and one quarter of urban households, dispose of wastewater in open streets or fields, and about ninety percent of rural households and half of urban households dispose of solid waste in open fields.

2.56. Even in the areas with water access, there is no systematic monitoring of the quantity or, even more critically, quality of drinking water supply. The availability of a water tap does not ensure that drinking water is being supplied regularly or it is safe in short or long term. In Quetta, even though four-fifth of all households have access to the piped network, most receive water for no more than half an hour a day and instead rely on water tankers operated by the private sector. They are expensive in per unit cost of delivered water and can be suspect in terms of quality.

2.57. Water at the source such as tubewells and springs, outside population centers, may generally be free from biological contamination. In the distribution network and at delivery points, it is likely to be contaminated because of lack of solid waste and wastewater management systems as well as hygiene education and sanitation awareness. Recent studies[4] by UNICEF and the Pakistan Council of Research in Water Resources suggest that it is important to screen sources for chemical contaminations such as arsenic and excessive fluorides. While chemical testing is usually required at the source on, at least, an annual basis, biological testing is required, at least, on a monthly basis and based on population size. Proximity to industrial and agricultural activity also warrants careful and regular monitoring of chemical contamination. Unfortunately, in Balochistan, as in the rest of the country, there is no systematic monitoring of quality unless there is an outbreak of disease.

2.58. Drinking water related diseases, categorized as water-borne, water-based, water-related, and water-scarce diseases, comprise almost 80 percent of the known diseases in the developing world. However, there is no coordination between health and water supply sectors to monitor these diseases to improve drinking water supply. As an example of co-relation in Balochistan, the incidence of diarrhea among children is lower for households with access to piped drinking water and a toilet.

[4] Post-flood water quality assessment report in Sindh and Balochistan. Pakistan Council of Research in Water Resources, Islamabad, Pakistan and UNICEF. 2010

1.3.2 Multiple Players and Little Empowerment

2.59. In view of Balochistan's vast landmass and scarce resources, delivery of adequate water and sanitation services is a challenge. However, problems are further compounded by the poor management of these scarce resources due to weak accountability between citizens, policy-makers, and service delivery staff. Like elsewhere in the country, there is a lack of clarity over responsibilities for delivery of water supply and sanitation service in the province. The 2001 Local Government Ordinance stipulates that the service delivery responsibility for water and sanitation should reside with the Tehsil Municipal Administrations (TMAs), with the exception of the city district of Quetta where this responsibility is devolved to the district government. As part of this reform, it was envisaged that the staff of the public health and engineering department be reassigned to the TMAs; a public health and engineering nucleus units be established at the district level for intra-district coordination of tehsil spatial plans; and provincial-level technical pools be set up to include expertise on water supply and sanitation previously available at the level of chief and superintending engineers. These provisions are yet to be implemented, and the provincial department with offices in the districts remains responsible for planning and implementation of water and sanitation schemes. Similarly, the Quetta Water and Sanitation Agency (WASA), continues to provide these services in the city as autonomous corporate entity. TMAs are endowed with only the staff of the erstwhile urban councils, whose capacity is limited to street sweeping and collection of domestic garbage to deliver it to the nearest collection point. Provincial agencies also implement federally financed vertical programs mostly related to drinking water and, to a lesser extent, drainage. These include the drought package, the Prime Minister's special drought package, the President's special project for Quetta water supply, and the Prime Minister's clean drinking water project. In addition, each member of the provincial assembly is provided with development funds, a considerable proportion of which is spent on water and sanitation schemes with little participation from the local government. Overall, the plethora of initiatives and unclear demarcation of roles and responsibilities have compromised the planning and implementation of water supply and sanitation services and wasted precious resources.

2.60. The jurisdictional confusion extends to the staffing of TMAs. Prior to devolution, only urban areas had the functional equivalent of TMAs, which were known as municipal and town committees. These were staffed by the local council service whose appointments were controlled by the local government board. Under devolution, these municipal bodies were merged into the new structure of TMAs, and the local council staff, which is now managed by the local government and rural development department, was allocated to the new posts created. As per the Local Government Ordinance, each TMA is to be staffed by 5 officers of grade 16 or above, namely one town municipal officer, and tehsil officers for finance, planning, regulation, and infrastructure. However, as there are many more TMAs than former municipal bodies, additional officers were posted by the services and general administration department. As a result, there are two different departments administrating senior staff in TMAs with little coordination between them.

2.61. Since the public health and engineering department (PHED) was not devolved, there is also a serious shortage of technical staff in TMAs. According to a recent study of 14 TMAs conducted under the ADB's devolved social services project, 50 percent of the posts for tehsil officers on finance, and over 70 percent of the posts for tehsil officers on regulation and for planning were vacant. TMAs are not only short of human but also of financial resources. They received only about 9 percent of the share of total transfers from the provincial consolidated fund in 2006-07. This amounts to a per capita allocation of Rs. 173 as compared to Rs. 1670

for the district governments. TMAs also have few own source revenues. The urban immovable property tax is according to the Local Governance Ordinance supposed to be the main TMA tax source, but the provincial government has not transferred it to them. The TMAs end up spending the bulk of the finances on wages, leaving little for expanding service delivery and investment.

2.62. The lack of devolution is worsened through weak community participation. Under the 1992 to 2000 Social Action Program, communities in Balochistan and the rest of the country were supposed to be an integral part of the identification, planning, and operation of water and sanitation schemes. According to official policy, new schemes were only be constructed by the public health and engineering, local and rural development departments if the beneficiary community agreed to take over and operate and maintain the scheme upon completion. And indeed, out of the 1856 schemes of the PHED, 1129 were transferred to beneficiary communities. Yet, a general lack of institutional support to communities doomed this initiative from the outset. In a reversal of the national policy, the provincial assembly recently decided to transfer these schemes back to the PHED.

Chapter 2 FUTURE POTENTIAL AND OPPORTUNITIES

2.1 Water Sector

2.1. The current situation of water sector in Balochistan can be summarized as: wasteful use with extremely low productivity of water in agriculture; investments are largely concentrated for a smaller segment of the farming community (IBIS and tubewells commands); depriving the larger segment of the community and resulted in in-equitable distribution of scarce financial resources in the form of subsidy to electric tubewells; lower returns on investments; and causing serious inter-generational issues for having access to scarce resources of groundwater. The potential opportunities for managing and sustaining scarce water resources covering all sources of water (surface and groundwater) and all sub-sectors of water use (domestic, agriculture, mining and nature) to ensure welfare of the society, as a whole, are:

- ***Spate Irrigation***: Floodwater is the largest source of water available in the province of Balochistan – around 10.8 and 25.2 billion m^3 of water under 50 and 25% probability levels, respectively. Thus there is an ample potential to develop Spate irrigation to command 0.5 and 1.0 million ha during average (probability of 1 out of 2) and wet (probability of 1 out of 4) years, respectively. The strategy must be to develop command area considering water availability in the wet year so that flood management and groundwater recharge are the part of the strategy. This will provide new livelihoods to the local population who is suffering from unemployment and lack of adequate food security and nutritional health. This will benefit at least 200,000 families, if water is distributed equitably and investments are made to develop Sailaba farming rather than merely diversion of floodwater i.e. the on-going schemes. The development of Spate irrigation and Sailaba farming in the longer run will help to generate new aquifers or recharge existing aquifers and reduce chances of flood damages.

- ***Cascades of Storage Dams***: The linked opportunity with the Spate irrigation is the storage of floodwater in small dams especially during the wet years to attenuate the flood peaks and integrate fully with the downstream command area development and Spate irrigation management. The target is to provide reliable sources of water for high-value horticulture in areas having better micro-climatic advantages. The other target is to introduce groundwater recharge strategies for building new aquifers by recharging the groundwater in periods of high floods and at the same time reduce the chances of flood damages. There is a potential to

develop 40000 ha of perennial irrigation schemes using high efficiency irrigation for high value agriculture. This will benefit 10000 families assuming average farm size of 4 ha. The Shabo headworks and four storage tanks in the Pishin district is an excellent example of developing schemes of Spate irrigation with cascade of storage tanks. This scheme was built in 1880 and part of it is still functional. The approach of cascades of storage tanks brought reliability to the Spate irrigation for high value agriculture and still regarded as most innovative intervention in the world.

- ***Command Area of Existing Small Dams***: There is a great potential for developing and managing command area of the existing small dams (i.e. Sabakzai and Mirani) to develop designed command area of around 16000 ha with a potential of doubling the cropping intensity and the productivity. The extremely poor development of command area in the dams constructed in the last decade especially the newly constructed dams of Sabakzai and Mirani provide potential to fully utilize the stored water to maximize the returns. Otherwise, the benefits of stored water will be lost as every dam has a finite life. The use of high efficiency irrigation system would help to double the command area from that of flood irrigation.

- ***Kareze Irrigation***: There is a great potential to modernize the Kareze irrigation and development of command area for producing high value agriculture with high efficiency irrigation techniques. There is an opportunity to integrate watershed management to enhance recharge of groundwater so that these schemes can be sustained on longer terms. Also there is a need to enforce Groundwater Administration Ordinance of 1978 to cap/restrict installation of new tubewells in the catchment and command area and ensure that water and energy are used efficiently. It is important to mention that Kareze system is still the best option of sustainable use of groundwater for the benefit of the local communities without any subsidy for power as irrigation is designed under a gravity-fed system. The indiscriminate use of groundwater through tubewells in the last 4 decades has resulted in drying up of the Kareze systems, whereas these systems were sustained over millenniums. The policy reforms are essential to sustain the Kareze system in the longer run.

- ***Performance of Canal irrigation***: There is a high potential for doubling rather tripling the productivity of canal irrigated agriculture through improving performance of Pat Feeder and Khirther canals and to control waterlogging and salinity. There is an ample potential to double the productivity through improved operation and management of the canal system so that water is provided equitably to meet the crop water requirement – meeting the peak demand and reduce waterlogging and salinity in the command area.

2.2 Agriculture Sector

2.2. The current situation of the agriculture sector can be summarized as having extremely low productivity linked with wasteful use of water; and investments are largely concentrated for supporting public-sector programmes in the area of on-farm water management and agricultural productivity. The major part of investments are for a smaller segment of the farming community (IBIS and tubewells) depriving the larger segment of the community and resulted in in-equitable distribution of scarce financial resources, lower returns on investments and causing extremely low productivity of Sailaba and Khushkaba farming systems. The potential opportunities for managing and sustaining various farming systems for the welfare of the society, as a whole, are:

- ***Sailaba Farming***: There is an ample potential for the management of 1.0 million ha of Sailaba farming under Spate irrigation for providing new livelihoods to the local

population who is suffering from unemployment and inadequate food and nutritional security. This will benefit at least 200,000 rural and resource-poor families, if services and inputs are provided effectively and timely by the private sector to largely grow cereals, small-grains and arid horticulture. Development of local level private enterprises would provide an opportunity to encourage the national and regional companies to work in partnership with the local small-scale enterprises. Multi-national and national companies are hesitant to perform in Balochistan due to the scale, remoteness and security concerns. Partnership of the multi-national companies with the small scale local enterprises is the only option to work in Balochistan. For this option, the Agriculture Department must play a support role for the development of local enterprises for the provision of services to the farmers. However, the government of Balochistan has to reform the existing public-sector institutions to have revised role of these institutions to work through the private sector.

- ***Integrating Command Area of Storage Dams with Sailaba Farming***: Command area of new storage dams needs to be integrated fully with the command area of Sailaba farming under traditional Spate irrigation systems. There is a great potential to introduce high-value horticulture in areas having access to perennial water and better micro-climatic advantages. The other opportunity is to introduce high value and high-efficiency irrigated agriculture in areas where either groundwater is recharged or new aquifers are developed by recharging the groundwater in periods of high floods and reduce the chances of flood damages. There is also potential for the development of 40000 ha of perennial irrigation schemes using high efficiency irrigation for high value agriculture. This will benefit 10000 families. The real challenge is how to manage water rights and apportionment for the commands of small dams and Spate irrigation areas, as the past experience especially in the Mirani dam highlighted that there are serious conflicts between water users on traditional and new water rights associated with the command area.

- ***Command Area of Existing Small Dams***: There is a tremendous potential for developing and managing command area of existing small dams (i.e. Sabakzai and Mirani) to introduce high value and high efficiency agriculture on around 16000 ha with a potential of doubling the current cropping intensity and productivity. This would help to get the benefit of stored water as early as possible because every storage dam has limited life due to siltation. The strategy will be to harness benefits of stored water prior to the loss of live storage due to siltation.

- ***Kareze Irrigation***: There is a great potential for the modernization of Kareze command area using high efficiency irrigation techniques for producing high value agriculture to maximize productivity of scarce water resources. Also there is an opportunity to integrate the watershed management interventions (check dams, water harvesting, plantation of trees, shrubs and grasses) to enhance recharge of groundwater and produce fuelwood, grasses and arid fruits, so that local communities have stake in watershed management. Generally, it is hard for the local communities to perceive the benefits of watershed management until these practices are translated in terms of income generation. There is another opportunity and an option to sustain Kareze irrigation farming system for future generations by managing water and energy use efficiency of tubewells around the Kareze system. Indiscriminate use of groundwater through tubewells had adverse impacts on lowering of water table and making water pumping as an uneconomical option for future farming.

- ***Canal Irrigated Agriculture:*** There is a high potential for the management of canal irrigated agriculture to manage waterlogging and salinity, adjusting cropping pattern with water availability and soil conditions to enhance productivity of agriculture per unit area, time and water both in the Pat Feeder and Khirther canals. There is an ample potential to double the productivity and to reclaim the land lost due to waterlogging and salinity, which is around 20% of the total command area of the two canals i.e. 80000 ha.

2.3 Water Supply Sector

2.3. Current situation of water supply sector can be summarized as poor performance of the public-sector water supply schemes due to extremely low funding for the O&M of the schemes and poor collection of water fee. Almost half of household level water-supply connections are billed in Quetta and rest are unauthorized connections. Out of the billed consumers almost half of them are not paying the bills. The groundwater mining is a serious concern in Quetta and in other large cities due to over-pumping. The water supply schemes were transferred to communities during 90s under the Social Action Programme (SAP) but after the termination of the programme most of the schemes have been taken over by the public-sector putting additional burden on the public exchequer. Piped water supply services are not available in the remote areas where communities are dependent on runoff and floodwater stored in ponds and small dams or the canal water stored in ponds. The quality of stored water in ponds is poor. The worst scenario is the canal command areas where during a period of one month of canal closure, only source of water is the stagnant water in the pond or the seepage in the pond, as in most of the area groundwater is brackish. The potential opportunities for managing and sustaining water supply schemes for water and health security and welfare of the society, as a whole, are:

- ***Creating Awareness for Water Conservation***: There is an opportunity to create awareness among the civil society that groundwater in Quetta and other cities is a limiting and a finite resource and it must be used efficiently and effectively. The advancement in audio-visual technology and mass communication medium provides an opportunity for making water conservation *"everybody's business"*.

- ***Participatory Management of Water Supply Schemes and Innovations***: The public-sector schemes are being managed at lower performance and the sector is not in a position to manage the schemes cost-effectively. The involvement and capacity of communities have to be enhanced for O&M and management of water supply schemes. There are ample experiences where schemes were fully transferred to the community but success was limited as most of the schemes are over-designed and power requirement is extremely high. There are opportunities to have innovations in the redesigning of these schemes to make it responsive to water and energy use efficiency so that communities are in a position to pay the energy bills and also maintain these schemes. Most of the schemes are poor in water and energy use efficiency and that is an opportunity for improvement. This option will work well in remote areas where operation of these schemes by the public-sector was not possible due to the scattered nature of the schemes.

- ***Privatization of Water Supply Schemes in Urban Towns***: Privatization of water supply schemes is possible in larger urban towns and cities i.e. Quetta, Loralie and Pishin so that better services can be provided to the households. If water fee is linked with better and effective services there is an opportunity that consumer will pay higher water charges. Furthermore, there is an opportunity to regularize the unauthorized connections so that water supply network is managed effectively and equitably. A one-time penalty may be imposed to regularize the unauthorized connections (almost half of total connections) so

that half of the consumers also join as partners for effective management of the water supply schemes.

- ***Monitoring of Water Supply Schemes***: There is an opportunity to improve performance of water supply schemes in urban and rural areas if water level, groundwater abstractions, water and energy use, and water quality are monitored and data are made available to the institutions involved in O&M of the water supply schemes – community organizations, TMAs, PHED and WASA. Furthermore, coordination between all the stakeholders' institutions is essential for effective collection, sharing and utilization of data.

- ***Improving Institutional Arrangement and Performance***: There is an urgent need to develop and manage institutions of higher performance in public, private and community sectors through institutional reforms supported in IWRM Policy 2006 through capacity building programmes. Until the capacities and ownership is improved there is hardly any opportunity for cost-effective management of these schemes. Clear-cut responsibilities have to be identified for all the institutions covering PHED, WASA, LGRD, TMAs and local community organizations. PHED may take over regulatory and support role to coordinate activities at all levels.

Chapter 3 POSSIBLE INTERVENTIONS FOR CHANGE

3.1 Water Sector

3.1.1Policy and Institutional Reforms

- Enforcement of IWRM Policy of Balochistan of 2006 and Groundwater Administration Ordinance of 1978 is needed in an effective and efficient manner. Furthermore, implementation of the water management approach at the basin level started initially in the Pishin-Lora basin in the World Bank financed BSSIP should be expanded to Nari and Zoab river basins – the three over-drawn basins of Balochistan.
- Review of existing policy and institutions to adjust these with changing environments due to rising prices of fuel, water scarcity and higher cost of O&M for irrigation and water supply schemes.
- Initiate sub-sector specific institutional reviews and evaluations to convert existing institutions into institutions of high performance:

    - Irrigation and Power Department
    - Balochistan Water Resources Management Authority – yet to be established
    - Revisiting the concept of regional offices to meet the ecological and climatic requirement and varying land use systems in an environment of climate change and water scarcity
    - Directorate of Water Resources Planning, Development and Monitoring
    - Linkages and joint planning and programming with Agriculture, PHED and LGRD Departments, WASA and TMAs.

3.1.2 Investment Projects and Economic Activities

- Water sector investment projects are needed for development and management of water resources in the following areas:

- Groundwater schemes (Kareze, Springs, Tubewells, Dugwells, etc.)
- Spate irrigation schemes for harnessing and management of floodwater
- Small dams and command area
- Minor perennial irrigation schemes using surface and groundwater
- Canal network of Pat Feeder and Khirther canals

3.1.3 Expansion and Improvement in Human Resources

- There is a need to reassess human resources requirement for the reformed institutions of higher performance including knowledge, management and development institutions
- Develop water and agriculture in-service and higher Training Programmes in collaboration with Balochistan Water Resources Management Authority and Department of Agriculture
- The re-assessment for expansion and improvement of human resources has to be seen in the context of current system of budgeting and availability of financial resources where major part of the budget is consumed for salary and allowances and mobility and very meagre resources are left for the O&M. Therefore, small and effective institutions are needed where performance is higher and based on knowledge and skills; cost-recovery is ensured starting from O&M and ultimately recovering the investment cost. The surplus staff and experts have to be re-oriented to perform revised roles as institutional reforms fail in the past because of lack of political support for dispensing the surplus staff and lack of financial resources for providing Golden Hand-Shake.

3.2 Agriculture Sector

3.2.1 Policy and Institutional Reforms

- Formulate Agriculture Policy for Balochistan in line with the IWRM Policy 2006 to cover all major farming systems – canal irrigated, Sailaba and Khushkaba farming, groundwater (Kareze, Springs, Tubewells, Dugwells) farming, farming in commands of Small Dams, etc.
- Review of existing institutions to adjust these with changing environments due to rising prices of inputs, water scarcity and higher cost of production.
- Initiate sub-sector specific institutional reviews and evaluations to convert existing institutions into institutions of high performance:

    - Department of Agriculture
    - Directorate General of Agricultural Research
    - Directorate General of Agriculture Extension
    - Directorate of On-Farm Water Management
    - Revisiting the concept of regional research institutes and offices of agricultural extension to meet the ecological and climatic requirements and varying land use systems in an environment of climate change, water scarcity, low productivity and low profitability. The most important aspect is to have different institutional set-up for the province looking at scattered farms and remoteness of the major ecologies.
    - Linkages and joint planning and programming with irrigation and power, forestry and livestock departments.

3.2.2 Investment Projects and Economic Activities

- Agriculture sector investment projects are needed to enhance agricultural productivity in the following areas:

    - Management of groundwater farming schemes (Kareze, Springs, Tubewells, Dugwells, etc.)
    - Improvement and rehabilitation of Sailaba farming under Spate irrigation
    - Improvement and rehabilitation of Khushkaba farming using runoff from adjacent lands
    - Development of command area of existing and new small dams
    - Development of command area of minor perennial irrigation schemes using surface and groundwater
    - Improving productivity of commands of Pat Feeder and Khirther canals
    - Development of Coastal farming systems

3.2.3 Expansion and Improvement in Human Resources

- There is a need to reassess human resources requirement for the reformed institutions of higher performance including knowledge, management and development institutions
- Develop water and agriculture in-service and higher Training Programmes in collaboration with Irrigation and Power, Livestock and Forestry Departments
- The re-assessment for expansion and improvement of human resources has to be seen in the context of current system of budgeting and availability of financial resources where major part of the budget is consumed for salary and allowances and mobility and very meagre resources are left for field research and extension. Therefore, small and effective institutions are needed where performance is higher and based on knowledge and skills. Interaction with the private sector has to be developed in terms of provision of inputs and disposal of outputs.

3.3 Water Supply Sector

3.3.1 Policy and Institutional Reforms

- Re-formulation of Drinking Water Policy for Balochistan in line with the IWRM Policy of Balochistan of 2006, Groundwater Administration Ordinance of 1978 and the National Drinking Water Policy including the role of communities and private sector.
- Review of existing policy and institutions to adjust these with changing environments due to rising prices of fuel, water scarcity and higher cost of O&M.
- Initiate sub-sector specific institutional reviews and evaluations to convert existing institutions into institutions of high performance:

    - Public Health Engineering Department
    - Q-WASA
    - Revisiting the concept of regional offices to meet the ecological and climatic requirement and varying sources of water availability in an environment of climate change and water scarcity
    - Linkages and joint planning and programming with Irrigation and Power and LGRD Departments and WASA.

3.3.2 Investment Projects and Economic Activities

- Water supply sector investment projects are needed for converting existing water and energy inefficient water supply schemes into participatory schemes or hand-over management to the private operators to operate these schemes on higher water and energy use efficiency in the following areas:

    - Canal water based water supply schemes – the neglected area
    - Runoff stored in earthen ponds – the most neglected areas
    - Groundwater based water supply schemes – tubewells, springs, Kareze, dugwells, etc.

3.3.3 Expansion and Improvement in Human Resources

- There is a need to reassess the human resources requirement for the reformed institutions of higher performance including knowledge, management and development institutions in the public, community and private sectors.
- Develop participatory water supply in-service and higher Training Programmes in collaboration with other stakeholders (NGOs, Private sector, CBOs)
- The re-assessment for expansion and improvement of human resources has to be seen in the context of current system of budgeting and availability of financial resources where major part of the budget is consumed for salary and allowances and mobility and very meagre resources are left for O&M. Therefore, small and effective institutions are needed where performance is higher and based on knowledge and skills and cost-recovery is ensured starting from O&M and ultimately recovering the investment cost. Role of communities and private operators have to be expanded.

Chapter 4 ACTION PLAN

4.1 Water Sector

4.1 Balochistan is in urgent need for a new strategy for the water sector representing ground realities covering all sources of water (surface and groundwater) and addressing all sub-sectors of water use (domestic, agriculture, mining and nature). Since 97 percent of Balochistan's water use is by agriculture, any new strategy to deal with the water shortage has to put this sector at the central stage. Balochistan's water strategy should:

- ***Investment****:* Water sector investment strategy must be refocused considering development and utilization of floodwater at the central stage because it is the largest resource of water spread all over the province – around two-third of total water availability in the province. This would provide equal opportunity both for Pashtoon and Balooch areas and avoid damages to infrastructure due to flash floods in the wet years. Floodwater in the wet years provides an opportunity to utilize it for multiple uses. Water sector priority investment projects are:

    - Phase out tubewell subsidy gradually and divert these financial resources for priority action areas related to all the farming systems of agriculture
    - Promote development and management of Spate Irrigation for sailaba farming to generate new livelihoods for the resource-poor and deprived communities in remote areas
    - Introduce *high-efficiency irrigation* systems for groundwater schemes – tubewells,

dugwells, springs, Kareze with an objective to curtail energy use to one-third of the current use.
  - Construct cascades of storage dams to capture presently un-utilized floodwater and integrate these schemes with Sailaba farming to continue maintaining traditional water rights for the lower riparian – water balance under historical water rights
  - Improving performance of canal commands – Pat-feeder and Khirther canals and minor perennial irrigation schemes

- ***Innovation****:* Returns on water sector investments were relatively low in Balochistan as the traditional approaches developed in other provinces could not performed well in Balochistan, thus local innovations and adaptations are essential. These innovations have to be developed within the context of river basin management considering the approach of water balance using the historical water rights. Any new water development should not affect the historical rights of the upper and lower riparian. The suggested innovations are:
  - Develop innovations considering the river basin management approach and ensuring water entitlements of all the farming communities;
  - Convert low efficiency pumping systems into high efficiency to reduce losses of water and energy use – reducing the current energy use to one-third;
  - Initiate pilot schemes for the introduction of micro-irrigation techniques
  - Encourage farmers to switch to high value and water-efficient crops in all the farming systems as per comparative advantages. This would help to design cost-effective irrigation schemes in the future;

- ***Integration***: There is a need to have integration of various sub-sectors of water use (agriculture, stockwater, domestic water, water for industry and mining) and E-flows. In addition, there is a need to promote structural *changes* to adjust future demand of non-agricultural sectors;
- ***Institutions****:* There is a need to have a different strategy for institutions of Balochistan considering the large area, difficult terrain and scattered and remotely located settlements so that returns on investments are higher and services are provided effectively and efficiently. The institutional reform areas are:
  - ***Capacity***: Launch IWRM programmes through a sound watershed management plan with the medium-term objective of setting-up a Water Resource Management Authority as an apex body to coordinate activities of water sector institutions and as a regulatory body;
  - ***Incentives***: Increase abiana assessments and cost recovery, and establish water entitlements for the large basins.

4.2 The Action Plan for the Water sector is given in **Table 1**.

4.3 Estimated cost of the water sector's action plan can be recovered from the savings of the phasing out of subsidy on electric tubewells in a period of 9 years, considering there is no increase in number of tubewells, no rise in electric tariff and no increase in groundwater abstraction. As these assumptions are not true in the real-life situation, it is expected that the cost of investments can be recovered from the savings of phasing out of the subsidy in a period of 5 years.

4.4 The new strategy proposed for the water sector's Action Plan is to implement interventions to provide incentives to the farmers and then link phasing out of subsidy with these

incentives like introduction of high efficiency irrigation systems, cascade of small storage dams, etc. The past actions of phasing out subsidy and capping of number of tubewells could not be worked out because these were not linked with reducing the energy requirement. If power requirement is reduced to one-third with better productivity and reduced labour, farmers will be willing to participate in the implementation of a new and revised water sector strategy.

4.2 Agriculture Sector

4.5 Balochistan requires a new agriculture strategy. The province is predominantly an arid region, and thus water is essential for all sort of high value agriculture covering crops, fruits and vegetables. Productivity of agriculture under both the perennial and non-perennial irrigation farming systems is low in terms of land, water and time. The role of private sector is also limited and farmers are not having access to improved inputs at right time and at right prices. Thus, any strategy to deal with agriculture sector in Balochistan has to put partnership with the private sector and role of the private sector in provision of services to the farmers has to place it at the central stage. Balochistan's agriculture strategy should:

- ***Investment****:* Agriculture sector investment strategy must be refocused considering development of Sailaba farming at the central stage because it is the farming system spread all over the province. This would provide equal opportunity both for Pashtoon and Balooch farmers to enhance and expand their livelihoods. The agriculture sector priority investment projects are:

  - Promote Sailaba farming to generate new livelihoods and to enhance productivity
  - Introduce high value cropping pattern under *high-efficiency irrigation* systems for groundwater schemes – tubewells, dugwells, springs, Kareze
  - Development of command area and on-farm water management in cascades of small storage dams
  - Improving productivity and sustainability of canal commands – Pat-feeder and Khirther canals and minor perennial irrigation schemes

- ***Innovation****:* Returns on agriculture sector investments were relatively low in Balochistan as the traditional approaches developed in other provinces could not perform in Balochistan, thus development of local innovations and adaptations is essential. The suggested innovations in agriculture sector are:

  - Introduce production technologies for high value agriculture initially under pilot schemes for the introduction of micro-irrigation techniques and then scaling up of these interventions in groundwater schemes (tubewells, Dugwells, Kareze, springs, etc.)
  - Encourage farmers to switch to high value and water-efficient crops in Sailaba and Khushkaba farming systems;
  - Encourage farmers to have higher productivity cropping pattern for canal commands and management of waterlogging and soil salinity

- ***Integration***: There is a need to have integration of various sub-sectors of land use to maximize the returns – crops, forestry, fisheries, livestock, fruits and vegetables;

- ***Institutions****:* There is a need to have a different strategy for agriculture sector of Balochistan considering the large area, difficult terrain and scattered and remotely

located settlements so that returns on investments are higher and services are provided effectively and efficiently to the farmers by the private sector. The institutional reforms are:

- ***Capacity***: Launch IWRM and agriculture programmes for major farming systems and ecologies with the medium-term objective of setting-up a research and extension facilities for the major land use systems and ecologies;
- ***Incentives***: Support the private sector for the provision of quality inputs and disposal of the output.

4.6 The Action Plan for the agriculture sector is given in Table 2.

4.7 Strategy for the agriculture sector's Action Plan is to implement interventions to provide incentives to the farmers and then link phasing out of subsidy for electric tubewells with these incentives like introduction of high value agriculture under high efficiency irrigation systems, development of command area of cascades of small storage dams, etc.

4.3 Water Supply Sector

4.8 Balochistan is in urgent need for a new water supply strategy. Since 3 percent of Balochistan's water use is by non-agriculture sub-sectors (largely the domestic water sub-sector), any strategy to deal with the shortage of water supply has to put agriculture sector at the central stage. Balochistan's water supply strategy should:

- ***Investment****:* Investment strategy for the water supply sector must be refocused considering participation of communities and the private sector in provision of services to the consumers and take over the responsibility for management and O&M of water supply schemes. Priority investment projects for the water supply sector are:

  - Converting energy inefficient water supply schemes to energy efficient schemes and low O&M; and handing over of modified schemes to the community organizations
  - Promote the role of private operators for managing the water supply schemes in large urban centres and to improve recovery of water fee
  - Introduce cost-effective techniques for low cost pumping of water, storage, delivery network and metering

- ***Innovation****:* Recovery of O&M cost of the water supply sector was almost non-existent in Balochistan as the traditional approaches developed in other provinces could not perform well in Balochistan, thus development of local innovations and adaptations is essential. The suggested innovations in the water supply sector are:

  - Convert low efficiency water pumping systems with high efficiency to reduce losses of water and energy use;
  - Initiate pilot schemes for water pumping, delivery and storage;
  - Develop cost-effective water supply schemes for areas where water stored in ponds is used for multiple purposes.

- ***Integration***: There is an urgent need to have integration of various sub-sectors of water use (irrigation, agriculture, stockwater, water for industry and mining) and E-flows. In addition there is a need to promote structural *changes* to adjust future demand of water supply sector, while establishing or revising water entitlements of various

basins and sub-sectors of water use;

- ***Institutions****:* There is a need to have a different strategy for Balochistan considering the large area, difficult terrain and scattered and remotely located settlements so that services are provided effectively and efficiently. The reform areas are:

    - ***Capacity***: Launch programmes for building capacity of communities for managing and O&M of water supply schemes;
    - ***Incentives***: Increase water fee and recovery, and include all the unauthorized connections by according legal status to all. Encourage private sector for taking over the role of managing large urban schemes.

4.9 The Action Plan for the Water supply sector is given in Table 3.

4.10 The new strategy for water supply sector's Action Plan is to implement interventions to provide incentives to the water supply community organizations and then link phasing out of subsidy for the electric bill and O&M of these schemes. The past actions of phasing out subsidy on electric bills and O&M of water supply schemes could not be continued after the termination of the BRMP and Social Action Programme.

4.11 Workshop Proceedings[5]

The important aspects raised during the workshop are listed below and these were utilized in the modification of the Action Plan and the Result Matrix.

Water Resources Development and Management

- The workshop indicated that tubewell numbers are capped since the implementation of the BRMP. What needed is to assign a direction to the subsidy. So that the subsidy has a positive role on the efficient use of scarce resources of groundwater and productivity is enhanced through the use of high efficiency pumps.
- It was also suggested that efforts should be made to replace existing pumps with high efficiency pumps of reduced size with drip irrigation.
- The flood management was suggested as a priority action area looking at the current floods in Balochistan and the Irrigation Department fully endorsed it.
- Based on the economic situation it was suggested that protocols be signed between the Departments for having formal linkages for joint planning and implementation.
- The workshop made it clear that restructuring should be made through reducing the support staff and re-orientation of staff for improving performance of the existing institutions through the use of less number of well qualified and trained staff with ratio of professional to staff of 1:2. The surplus staff be reoriented for the restructured mandate. There should not be additional burden on the non-development budget

Agricultural Development and Productivity Enhancement

[5] A technical workshop to discuss the findings of the Balochistan report and the sectoral assessments was held in September 2012 in Islamabad with the participation of Balochistan Government officials and Bank staff and consultants

- It was highlighted that there is a need for having discipline, allocation of resources and appointment of right man for the right job so that prioritized and sequenced actions are implemented in the forthcoming projects. It was suggested that there is a need for the formulation of strategy and prioritized and sequenced Action Plan which was endorsed by all. The action plan would include all sources of water and all the land use and farming systems in line with the IWRM Policy of Balochistan and the BDNA Result Matrix and the Document.
- The workshop made it clear that restructuring should be made through reducing the support staff and re-orientation of staff for improving performance of the existing institutions through the use of less number of well qualified and trained staff with ratio of professional to staff of 1:2. The surplus staff be reoriented for the restructured mandate.
- The need for strengthening the existing markets and provision of market information to the farmers was highlighted. This is already part of the private sector involvement policy and be further strengthened after the development of Policy and suggest changes in the Marketing Act. Private sector has to be encouraged for the provision of marketing facilities and information.
- It was suggested that protocols be signed between the Departments for having formal linkages for joint planning and implementation

Domestic Water Supply

- The workshop suggested that the government has a priority for the provision of water supply for domestic and industrial sectors of Gwadar port and city. It was emphasized that the provision of water supply should be on regular basis and cost-effective for domestic and industrial users.
- Project will replace existing low efficiency pumps with high energy and water efficient pumps and also low-cost in terms of O&M of these schemes.
- It was suggested that protocols be signed between the Departments for having formal linkages for joint planning and implementation.
- The workshop made it clear that restructuring should be made through reducing the support staff and re-orientation of staff for improving performance of the existing institutions through the use of less number of well qualified and trained staff with ratio of professional to staff of 1:2. The surplus staff be reoriented for the restructured mandate. There should not be burden on the non-development budget.

Table 1. Action Plan for the Water Resources Development and Management (post-Workshop Version)

Priority Action/ Intervention	Description	Unit of Measure	Time Span			Estimated Costs (US$ in million)	Implementing Institutions	Expected Changes/benefits resulting from action
			Short Term (<2 years)	Medium Term (>2 & <5 years)	Long Term (>5 years)			
Water Resources Development and Management in Selected River Basins - Nari, Polari, Zoab, Kacchi	Phase out tubewell subsidy by assigning direction to the subsidy and divert resources for priority interventions - high efficiency electric pumps coupled with drip irrigation	Reduction in subsidy in monetary terms, number of electric tubewells capped including illegal connections	X	X	X	Savings	Finance, irrigation	Reduced subsidy, reduced consumption of electricity and groundwater
	High efficiency irrigation systems for groundwater schemes (tubewells, wells, kareze, springs etc.) for existing diesel operated pumps (to reduce the operational cost)	reduced energy use, reduced pumpage of groundwater		X	X	100	Agriculture, private sector	Savings in groundwater use, savings in energy use, increased farmers income
	Cascade of dams to store floodwater and integration with spate irrigation using spill-over floodwater	Number of dams, storage of dams, canal irrigated area, spate irrigated area		X	X	30	Irrigation	New irrigated lands, enhanced agricultural production, recharge to groundwater

	Spate irrigation for Saliaba farming without storage dams	spate irrigated area		X	X	100	Irrigation	New irrigated lands, enhanced agricultural production, recharge to groundwater
IBIS Canal Irrigation - Pat Feeder and Khirther Canals	Improving performance of secondary canal operations for equitable distribution of water through: improving conveyance efficiency, water control structures, water measurement and monitoring	Equitable distribution of water, tail farmers getting their entitled share, reduced water thefts, reduced water conflicts		X	X	37	Irrigation	Increased crop productivity, increased cropping intensity, reduced waterlogging and salinity
	Integrated management of canal and drainage system through: drainage in Khirther canal and disposal of drainage surplus	Reduced area under waterlogging, reduced area under salinity		X	X	47	Irrigation	Increased crop productivity, increased cropping intensity, reduced waterlogging and salinity
Management of floods and floodwater	discussions with Government of Sindh for disposal of floodwater	Joint protocol for handling of floodwater between the two provinces	X			-	Irrigation	Agreement between Balochistan and Sindh to resolve the issue
	Preparation of flood management plans for Balochistan	Plan prepared for flood management	X			5	Irrigation	Sustainable management of flood and floodwater

	Construction of flood protection and disposal structures and modification of existing structures	Flood protection and disposal structures constructed or modified	X	X	X	21	Irrigation	Mitigation of the flood damages to infrastructure and agriculture
Policy and Institutional Reforms and Strengthening	Formulation and signing of protocol between Irrigation and Agriculture, Forestry, Public Health and Livestock Departments	Protocol signed	X			-	Irrigation, Agriculture, Forestry, Livestock, Public Health	All the sub-sectors of water use and all the major farming systems are addressed and agreement on joint planning and implementation
	Reform existing institutions though providing: training and education, developing service structure, instrumentation for data collection for water measurement, ground water etc. i.e. water resources planning, development and monitoring directorate, field offices	Number of trainees, number of staff with higher education, attraction for educated staff to join Department	X			11		Effective implementation of development schemes. Less turnover of staff.
Total Cost						**351.0**		

Table 2. Action Plan for Agricultural Development and Productivity Enhancement (post-Workshop Version)

Priority Action/ Intervention	Description	Unit of Measure	Time Span			Estimated Costs (US$ in million)	Implementing Institutions	Expected Changes/benefits resulting from action
			Short Term (<2 years)	Medium Term (>2 & <5 years)	Long Term (>5 years)			
Formulation of Strategy and Detailed Action Plan for Agriculture in Balochistan	Formulation of strategy covering all land use and farming systems in Balochistan: canal irrigated, minor perennial canals, groundwater schemes, spate irrigation, etc. Action plan for each of the land use and farming systems (crops, fruits, vegetables etc.)	1. Strategy document 2. Action Plan Document	X			0.10	Agriculture, Planning and Development	More sustainable development of agriculture in the province. Projects are prioritised and sequenced to add value to investment
Agriculture Development and Productivity Enhancement in selected River Basins - Nari, Polari, Zoab, Kacchi	High value agriculture (cash crops, fruits, vegetables, flowers etc.) under high efficiency irrigation for groundwater schemes - tubewells, wells, Kareze etc.	Area under cash crops, fruits, vegetables. Productivity of crops. Cropping intensity		X	X	21	Agriculture, private sector	Enhanced income to farmers, increased exports of fruits and vegetables
	Develop command area and on-farm water management in cascades of dams - watercourse improvement. Laser leveling, bed-furrow irrigation, high value crops (cash crops, fruits, vegetables etc.) using spillover floodwater	Area developed in acres, irrigation facility in acres, cropped area in acres, cropping intensity in %		X	X	85	Agriculture, private sector	Increased irrigation facility, new livelihoods, enhanced income to farmers

	Sailaba farming under spate irrigation without dams	Increased irrigated area, enhanced cropped area, enhanced cropping intensity		X	X	63	Agriculture, private sector	Increased irrigation facility, new livelihoods, enhanced income to farmers
	Improving water productivity and sustainability of minor perennial irrigation schemes	Increased irrigated area, enhanced cropped area, enhanced cropping intensity		X	X	26	Agriculture, private sector	Increased irrigation facility, new livelihoods, enhanced income to farmers
IBIS Canal Irrigation - Pat Feeder and Khirther Canals	Improving water productivity and sustainability of pat feeder and khirther canals	Increased irrigated area, enhanced cropped area, enhanced cropping intensity, enhanced water productivity		X	X	16	Agriculture, private sector	Increased irrigation facility, new livelihoods, enhanced income to farmers, reduced waterlogging and salinity

Institutional Reforms and Strengthening	Reform existing institutions through providing: training and education, developing service structures i.e. agricultural planning, agricultural statistics, agricultural research, agricultural extension, agricultural engineering	Number of trainees, number of staff with higher education, attraction for educated staff to join Department		X	X	5	Agriculture, Planning and Development	Effective implementation of development schemes. Less turnover of staff.
Policy Reforms	Involvement of private sector in provision of services and supplies and disposal of marketable products	Services for irrigation, laser leveling etc. Supplies like: seed, plants, fertiliser etc. Marketing of produce and products	X	X	X	0.5	Agriculture, Planning and Development	Private sector developed. Quality services and supplies available to farmers on time.
	Formulation and signing of protocol between Irrigation and Agriculture, Forestry and Livestock Departments	Protocol signed	X			-	Agriculture, Irrigation, Forestry, Livestock	All the sub-sectors of water use and all the major farming systems are addressed and agreement on joint planning and implementation
Total Cost						**216.6**		

Table 3. Action Plan for Domestic Water Supply (post-Workshop Version)

Priority Action/ Intervention	Description	Unit of Measure	Time Span			Estimated Costs (US$ in million)	Implementing Institutions	Expected Changes/benefits resulting from action
			Short Term (<2 years)	Medium Term (>2 & <5 years)	Long Term (>5 years)			
Domestic Water Policy	Implement IWRM Policy for involvement of water users' organisations in the O&M of the schemes	Water supply schemes taken over by users' institutions for the O&M of the schemes	X			5	PHED, LGRD, WASA, TMAs NGOs	Reduced burden of O&M of Water Supply Schemes on the Non-Development budget of the PHED
	Strengthening of Water Users' Organisations and Private Sector Companies for providing services and O&M of the schemes	Number of schemes taken over by Water Users' Organisations and/or private sector companies for services and O&M		X	X	16	PED, LGRD, WASA, TMAs, NGOs, private sector companies	Reduced burden of O&M of water supply schemes on the non-development budget of the PHED. Better quality of services provided to users.
Domestic Water Supply Technologies	Sand filters and low-cost treatment of water supply for Sailaba areas	Number of low-cost treatment systems installed	X	X	X	21	LGRD, Agriculture, NGOs, private sector companies	Provision of clean and relatively safe water to the poor segments of the province - Sailaba population is the poorest among the poor

	High efficiency and low-cost O&M water supply schemes	Number of high efficiency and low cost O&M schemes completed	X	X	X	53	LGRD, Agriculture, NGOs, private sector companies	Reduced energy bill. Reduced O&M cost of water supply schemes. Reduced burden of O&M on non-development budget
	Development of low-cost groundwater and seawater desalinisation systems for domestic and industrial water supply in Gwadar	Number of options tested and appropriately selected, number of selected schemes installed	X	X	X	5	PHED, Irrigation, Private Sector Companies	Provision of freshwater supply for domestic and industrial uses
Policy and Institutional Reforms and Strengthening	Formulation and signing of protocol between PHED, Irrigation, Agriculture, Livestock, LGRD Departments and WASA	Protocol signed	X			-		All the sub-sectors of water use are addressed and agreement on joint planning and implementation
	Reform existing institutions through providing: training and education, developing service structure. Instrumentation for measurement of surface and groundwater data	Number of trainees, number of staff with higher education, attraction for educated staff to join Department	X			11		Improved implementation of development schemes, less turnover of staff
Total Cost						**111.0**		