Study of Investments in Irrigation Water Sector in Khyber Pakhtunkhwa, Pakistan

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RECEIVED ON 10.06.2014 ACCEPTED ON 30.12.2014

ABSTRACT

Irrigation water sector is playing pivotal role in agricultural production and have prominent contribution to GDP (Gross Domestic Product) both at provincial and country level. Many of the stakeholders including different ministries/department of Federal and Provincial governments, private sectors, farmers, and NGOs (Non-Government Organizations) are investing in this sector. Although that the data and data analysis tools are present in most of the countries, yet a comprehensive information base on investments in irrigation water sector is missing. This has led to duplication at resources and beneficiaries' level on one side, as well as gaps in technical, infrastructural, institutional and managerial strategies of the irrigation water sector projects on the other. This paper analyzes investments in irrigation water sector made by government of KPK (Khyber Pakhtunkhwa) during the last 10 fiscal years' time period (2003-2013) and identifies gaps. Besides recommendations are also made in order to overcome the identified gaps/issues.

Key Words: **Irrigation Water Sector, Investments, Stakeholders, Investment Information Base, Gaps, Duplication, Recommendations.**

1. INTRODUCTION

Irrigation water sector is playing a pivotal role in contributing to achieve three goals across the globe i.e. food security, water conservation, and sustained environment with increased agricultural production [1]. It also plays important role in GDP of a country as it is closely correlated with the economic growth. Musouwir encouraged governments of developing countries to spend more of their annual budgets on the water sector [2]. This sector accounts for 70-90% of total water use in developing countries and for more than one third of water use in many of the OECD (Organization for Economic Cooperation and Development) countries [3]. The importance of irrigation in increasing agricultural production and in meeting the food security is prominent. In addition to increased agricultural productivity, irrigation has also increased the incomes of farmers, and contributed towards tackling problems of rural poverty. However Malik pointed out that due to unavailability of the consistent data set on irrigation investments, and conceptual methodologies for measuring irrigation subsidies, necessary groundwork have not been established for policy modeling [4]. This indirectly harmed the farmers in short term and agricultural productivity in long term aspects.

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Many of the research studies called for investments in irrigation water sector because of its importance. For example, Inocencio, et. al. [5] examined the trends and factors affecting performance of irrigation investments in India, and found that irrigation investments can produce positive impact upon agricultural growth. Hence it was recommended that all government and non-government stakeholders should investments to develop small and large scale irrigation water sector projects. This study was carried out through comparing 314 irrigation sector projects including 37 projects from India and the rest from South Asia, SSA (Sub-Saharan Africa), the MENA (Middle East and North Africa), LAC (Latin America and the Caribbean), SEA (Southeast Asia), and EA (East Asia) including 16 projects form Pakistan. In this study, the dataset was based on projects that have been funded by World Bank and co-financed by the given country and a multi-lateral agency. The dataset did not include projects fully funded by a government or those which were solely funded by bilateral agencies. Furthermore, due to inconsistent data, the private investments in groundwater development were not included although they were of great importance. Similarly according to the US Federal Bureau of Reclamation (Federal Agency under the US Department of the Interior, which oversees water resource management, specifically applied to the operation of the diversion, delivery, and storage projects that has been built throughout the western United States for irrigation, water supply, and hydroelectric power generation), the water sector projects are benefiting people with drinking/domestic water supply and agricultural lands with irrigation water. Hence it is recommended that appropriate amount to be allocated in annual budget for irrigation water sector projects [6].

Investments in irrigation water sector are also important because the water scarcity problem is growing day by day around the globe. Only irrigation water sector projects have potential role in responding the water scarcity problems. Johansson et al. reported that fresh water availability by 2050 AD is estimated to be 4380 cubic meter per person per year around the globe [7]. In Pakistan, per capita water availability is declining day by day and it is estimated to be 1200 cubic meter per capita per annum by 2003. This statistic is just above the water scarcity range i.e. 1000 cubic meter per capita per annum [8]. Similarly the World Bank South Asia Region strategic report has categorized Pakistan to be the most water stressed area. This report clearly mentioned main causes of water stress condition to be less financing options and poor water financing policies [9].

Pakistan, an agricultural country, about 70% of its population depends mainly upon agriculture for their livings. The agriculture sector continues to play an important role in Pakistan's economy. Currently it contributes 21% to GDP, and provides employment to 45% of the country's labor force, while 60% of the rural population derives its livelihoods from this sector [10].

KPK; being an agricultural potential province of Pakistan, has planned to invest a total of PKR 98.58 billion (19.69% of the total on-going and new projects of the country) as the MTIP (Mid Term Investment Plan) undertaken up to 2011 under the Pakistan Water Sector Strategy, Vision 2025. Total of 56% of the cited budget was planned to be invested in irrigation, drainage and Flood Control sectors while the rest of 44% was meant to be invested in Water Supply and Sanitation (38%) and Environment (06%) [11].

Currently irrigation water sector is facing problem of under financing. According to research studies on financing analysis in irrigation water sector, it is found that one of the reasons of under investment is that the information base on irrigation water sector investments is inconsistent. The World Bank South Asia Region strategic report found that unavailability of consistent knowledge base on financing options is the main cause of under investment in irrigation water sector projects [9]. Ward reviewed research on factors affecting the level and value of irrigation infrastructure investments for sustaining irrigation infrastructure on both market and institutional approaches. He concluded that weak incentives, complex property rights and financial constraints were the key reasons for under investment in irrigation sector. Through analysis he also argued that although different countries have different data collection tools and data source, however a sound information base on water sector investment does not exist which led to financial constraints/under investment issues [12].

It is also found that very rare studies are carried out to analyze and link the various investment trends, gaps, and investors' preferences in irrigation water sector. Sorting out financing gaps for irrigation infrastructure can provide a source of water to protect key ecological assets as well as meeting growing demands for other uses of water [13]. Tiwari and Dinar reported some of the key findings on how to attract stakeholders to invest into irrigation water sector in developing countries [14]. These include developing strong policy regulatory and institutional structures through consistent information base, and adoption of

sustainable water management and agricultural practices. In order to achieve long term sustainability of the projects and establishment of consistent information base, major projects need to be financed and the financing gaps should be reported [6].

Similarly institutional reforms, remodeling, and changes also affect the investments in irrigation water sector. Saleth and Dinar [15] analyzed the water institutional reforms on analytical and theoretical ground. Conclusions were made on the basis of the combination of the main findings from the reform experiences of six countries namely Australia, Chile, Morocco, Namibia, South Africa and Sri Lanka. Through utilization of the latest literature, the water institutions' analysis and their linkages with one another and with external institutions were shown. The authors urged for institutional research on irrigation water sector at both the public and private level. Saleth and Dinar also worked out institutional changes in global water sector and analyzed its trends, patterns and implications in sample size of 11 countries namely Mexico, Chile, Brazil, Spain, Morocco, Israel, South Africa, Sri Lanka, Australia, China, and India. It was found that effect of the endogenous (internal to water sector) and exogenous (outside the boundaries of both water institution and water sector) factor groups can be controlled through development of information base. A sound information base can best respond to these factors through reforms and remodeling of the irrigation water sector projects [16]. Similarly Barbero studied the financing issues to aging water sector infrastructures in Spain. He identified the policy modeling for irrigation subsidies to be the main cause contributing to the under financing of the irrigation sector [17].

According to Connor, many of the OECD countries are increasingly facing pressure to use water in other than irrigation e.g. urban uses, and in stream flows due to financing issues. He also found that improved infrastructure can substitute for reduced water quality or quantity issues [3]. Simon also studied the financing options and derived that increased transfers of water sector infrastructure controls (financial and investment) from government to farmers or other localized bodies, raises questions about future sources of financing [18].

Presently the water sector investment knowledge base is poor and inconsistent. Agricultural and environmental sustainability is closely associated with sound and consistent knowledge base for better financing options. There is considerable need for sound and consistent information base in order that economic principles are put to good use in evaluating irrigation infrastructure. For example, Briscoe found that the inadequate knowledge base, unsustainable financial system, and inappropriate policies are some of the factors amongst many other which are leading towards the water scarcity in Pakistan [19].

In KPK, in order to attain food security for growing population; agriculture is being financed via Irrigation water sector. Many stakeholders e.g. different ministries/department of Federal and Provincial governments, private sectors, farmers, NGOs etc. invest in Irrigation Water Sector in different kinds. But as a matter of fact there is no consistent information base which can reveal that which stakeholder has invested how much on which irrigation sector.

Water in general and irrigation water in particular often require initially large capital investments in infrastructure development, governments are often required to allocate water resources. A sound information base will play a vital role in achieving these data needs. Similarly a consistent information base along with applied use of economic principles have considerable potential to productively informed decisions on why, when, where, and how to develop and sustain irrigation and its infrastructure. Ultimately this will result into sustained irrigation water sector infrastructures and improved irrigation efficiency, leading towards meeting one half of the increase in water demand by 2025, Seckler, et. al. [20] estimated.

It is concluded that level of information base varies widely because the benefits, resources and capacities of water sector investment data collection are perceived differently in different countries. Similarly there also exist noticeable difference between the reported investment data and that of the actual data. The rigorous use of economic principles to formulate and implement the water sector plans is also affected by this poor information base. Through compiling the cost data for irrigated agriculture will account for financial and economic analysis. Outcome of this effort will be the greater water supply, increased reliability, and various forms of substitution between water, land, labor and infrastructure in the shape of policy modeling. Improvements in models of water supply and demand for alternative uses could be even more valuable.

Irrigation Water sector information base can be developed by understanding and analyzing the investment patterns and the investment related problems in the study area. Once a sound water sector investment information base is established, not only the

gaps may be identified but economic and time effective solutions to water crisis problems may be found. This will also help in identification of capacities (of investors and beneficiaries) for water sector interventions.

This study will address and is aimed to analyze the investments and financing issues in irrigation water sector of Khyber Pakhtunkhwa during selected time period.

2. METHODOLOGY AND DATA

As portrayed in the literature review, there is no information base available on investments in irrigation water sector in Pakistan, especially in KPK. In an effort to establish an initial information base and then to analyze its different characteristics, the direct research methodology is adopted during this study. Hence non-availability of data or research on the subject, leads towards choosing the direct research method only instead of comparative research method. Thus this research study will help open the gate to research of both the direct and comparative research in the irrigation water sector, especially related to investments.

This study is initially divided into two broad categories:

(i) Surface water
(ii) Ground water

The following guidelines are followed while deciding either the irrigation water sector project lies in the surface water or ground water category.

Broadly surface water is defined to be water on the land surface, and groundwater is water in the ground i.e. below the land surface. Surface water includes water in surface streams, reservoirs, seas, oceans, Lakes, wetlands, ice and snow. Groundwater includes water in aquifers and other geologic formations and water flowing downward into them.

2.1 Surface Water

The irrigation water projects lying in the surface water category include the following projects:

(i) Rehabilitation, construction, maintenance and feasibility study of:

  (a) Surface irrigation systems. All of the surface irrigation systems include Basin irrigation, furrow irrigation, boarder irrigation and flood irrigation (uncontrolled for most of time).
  (b) All types of dams i.e. delay action dams, diversion dams and small dams etc.
  (c) All types of canal systems either meant for irrigation or power generation.
  (d) All types of flood protection structures and small ponds.
  (e) All type of institutional capacity building measures taken across the province in order to ensure implementation of the designed surface water sector projects.
  (f) All physical infrastructures associated with the surface water sector projects. CPR (Canal Petrol Road), office establishment and special cell inauguration are good examples.

(ii) All type of monitoring, evaluation and research activities carried out to ensure quantitative and qualitative control over all of the surface water sector projects.

2.2 Ground Water

The Irrigation Water Projects lying in the ground water category:

(i) Rehabilitation, construction, maintenance, augmentation and feasibility study of:

  (a) Ground water systems e.g. tube wells etc.
  (b) All ground water recharge projects
  (c) All type of projects to control salinity and alkalinity effects of ground water on soil and agricultural crops.
  (d) All type of institutional capacity building measures taken across the province in order to ensure implementation of the designed ground water sector projects.

(ii) All type of monitoring, evaluation and research activities carried out to ensure quantitative and qualitative control over all of the ground water sector projects.

Irrigation water sector projects are also classified on the basis of purpose and type of the schemes.

Purpose of the scheme classification includes projects/schemes meant for:

(a) Development, designing, and construction
(b) Rehabilitation, repair, maintenance, or clearance
(c) Extension, improvement or revamping/remodeling, and augmentation
(d) Feasibility, survey, assessment, and training need identification or capacity building opportunities for irrigation water sector projects.

Scheme Type classification, including following projects:

(a) *Dams:* It includes construction and maintenance as well as land acquisition for large, medium, small and delay action dams and ponds.
(b) *Agricultural Physical Infrastructures:* It includes bridges, culverts, roads, and canal petrol roads.
(c) *Institutional Development:* It includes establishment or strengthening or revitalizing of Irrigation water sector department.
(d) *Irrigation:* It includes construction, restoration, rehabilitation and designing of irrigation schemes like lift irrigation systems, canal irrigation systems, Causeways, control structures (spurs, weirs, diversion heads), rod Kohi, karez and removal of encroachments etc.
(e) *Drainage:* It includes construction, restoration, rehabilitation and designing of drainage systems.
(f) *Equipment:* It includes projects in which Rehabilitation, delivery or purchase of equipment is sought or study is conducted for modern technology or equipment needs. Examples are rehabilitation of earth moving equipment, equipment need for hydrological structures etc.
(g) *Feeding Schemes:* This project type represents the rehabilitation, extension, widening, construction or remodeling of channels/canals meant to feed the irrigation system.
(h) *Flood Damages Restoration:* It includes the projects carried out for damages restoration to irrigation water sector projects due to flood during different time periods.
(i) *Flood Protection Works:* It includes construction, rehabilitation, and designing of flood protection schemes meant to protect irrigation water sector projects from floods.
(j) *Planning and Development:* It includes activities and efforts being made for strategic planning, regularization, review, monitoring and evaluation of irrigation water sector projects.
(k) *Office Infrastructure Development Schemes:* It includes development, construction and strengthening of different irrigation water sector offices both at physical infrastructural level and regularization level.
(l) *Tube Wells:* It includes surveying, designing, construction, repair and maintenance, augmentation and sinking of irrigation tube wells.

Each of the project is marked and analyzed against above mentioned classification for each district/cluster. All of the project categories with respect to scheme types include staff salaries wherever these are included in the project budgets.

For this study, an initial information base is established through utilizing the data available from the Planning and Development section (Irrigation Department), Peshawar secretariat, KPK, Pakistan. This data is in the form of annual progress review of the total projects being implemented by the government of KPK under the ADP (Annual Development Plan) for the last decade i.e. 2003-2013. As described in Table 1. Total of 688 projects studied for the said decade. These include the 460 on-going and 228 new irrigation water sector projects. All of these irrigation water sector projects are funded by government of KPK and are scheduled to be implemented across all the 25 districts of the province. The average cost allocation of the projects is PKR 14, 999.001 million per annum of the respective fiscal year. All costs are in terms of Pakistani Rupee.

The following information/data is collected for each project:

(i) Current status of the project (New or on-going)
(ii) ADP code and ADP serial number
(iii) Geographical address
(iv) Revised and approved costs
(v) Current fiscal year and cumulative expenditures
(vi) Key Performance/outcome indicators
(vii) Scheduled starting and completion dates
(viii) Progress till the respective annual progress review meeting
(ix) Working party information

By "On-going" project it is meant that the specific project is being implemented or is scheduled to be implemented during last fiscal year and the budget was allocated during previous fiscal year. While by "**New**" project it is meant that the project budget is allocated during current fiscal year and will be completed or started during current fiscal year under discussion.

Irrigation project means as a project in which irrigation is included as a project component, regardless of whether it is a major or minor component. Data availability is the limiting factor of the selection of sample projects from the population. Although there are slight differences in reporting formats for all of the ten years of the said decade, the formulation, implementation and evaluation of the irrigation project is carried out through the QPR (Quarterly Progress Review), MPR (Mid Term Progress Review) and APR (Annual Progress Review) of the Annual Development Plans.

TABLE 1. BRIEF DETAIL OF ADP WISE PROJECTS DURING 2003-2013 IN KP

Year	Total Projects	On Going Projects	New Projects	Current Fiscal Year Cost Allocation (PKR Million)
2003-2004	79	27	52	8,735.59
2004-2005	67	55	12	13,723.66
2005-2006	69	52	17	14,345.74
2006-2007	65	40	25	41,638.96
2007-2008	56	41	15	3,712.82
2008-2009	41	27	14	9,785.73
2009-2010	52	33	19	7,825.23
2010-2011	63	42	21	12,515.52
2011-2012	104	39	65	18,339.81
2012-2013	92	68	24	19,366.93
Total	688	424	264	149,990.01
			Cost of New Projects	18,259.11
			Cost of On-Going Projects	131,730.90

It is also worthy to mention here that the annual progress review is carried out for each of the ADP during August or September of the respective year (subsequently following the announcement of the Provincial annual budget during the month of June of each year).

A short coming of the irrigation (Planning and Development) archive, however, is about the data showing the number of irrigation projects it has funded in KPK. It does not reflect the detailed cost estimation and other stakeholders' contributions. It merely reflects the expenditures and cost estimation being approved by the irrigation departments at district as well as provincial level i.e. most of the data is figurative. So in brief no economic performance survey or economic analysis has been carried out so far for any of these projects. As an attempt to rectify this weakness, a structured projects data collection process can be carried out to collect the relevant data on villages, town, tehsil and district level.

In an attempt to understand the projects, each of the project is explained with respect to its type, purpose, project cost, project start year, key performance indicators for monitoring and evaluation, information of working party, achievements till the reporting date, complexities/difficulties encountered during the implementation phase and appraisal (if any).

The Type of a project is the physical classification of the project and may include diversion systems, dams, reservoirs, tank, pond, pump and lift irrigation systems, drainage or flood control systems, protection structures, recharge systems and tube wells etc.

The purpose of a project defines either the project is meant to enhance the existing irrigation water sector project (on-going) or is contributing to establish a new irrigation water sector project (New).

The project cost means total budget allocated for the project during the respective fiscal year. It is the approved cost by the competent authority.

The project start year gives the timeline of the project implementation including the proposal date (feasibility report and token application date).

The project key performance indicators are the monitoring and evaluation tools with the help of which a project is monitored or evaluated. For example kilometers of irrigation canal constructed with standard engineering specification is one of the key performance indicators for a water sector project.

The Working party information gives an idea of the parties/stakeholders involved in the implementation of the water sector project.

Achievements till reporting date reveals the total progress made since start of the project till the annual progress review meeting of the specified fiscal year. Each of the ADP is reviewed in the months of July-August of the next fiscal year.

Complexities/difficulties encountered during the implementation phase shows the lesson learnt and knowledge management of the project implementation.

Performance Appraisal may be from the donor, funding agency or even from the implementing agency which they issue after carrying out the performance appraisal surveys.

3. SCOPE OF STUDY

It is planned that only investment data in irrigation water sector in all districts of KPK for one decade (2003-2013) will be collected and analyzed during this study. Moreover, the data will be acquired from approved ADP and annual progress review reports carried out by Planning and Development section (irrigation department) of the government of KPK. This makes the project sample size to be 16.67% of the total population (i.e. 06 decades). Furthermore, the selection of the sample size fiscal year (10) is based upon data availability and its correlation with Pakistan Water Sector Strategy Vision 2025. In order to collect water sector information, the project completion and terminal reports are studied which are implemented during the mentioned course of period i.e. 2003-2013.

Where the project completion or terminal reports were not available then the implementers/stakeholders' Annual and or Mid-Year Progress Report, or the updates available on implementers/stakeholders' websites are considered. Where no data is available in the project reports, it will be obtained from FAO AQUASTAT.

Following are the parties (implementers/stakeholders) have been involved in the implementation or review of all the projects throughout the decade 2003-2013:

(a) PDWP (Provincial Development Working Party)
(b) CDWP (Capital Development Working Party)
(c) DDWP (Departmental Development Working Party)
(d) The Peshawar Secretariat Finance Department
(e) The Peshawar Secretariat Irrigation Department
(f) The Peshawar Secretariat Planning and Development section
(g) The Peshawar Secretariat Water and Power section
(h) The DAC (Departmental Accounts Committee) Peshawar secretariat.
(i) The DCSC (Departmental Consultant Selection Committee) Peshawar secretariat.
(j) The ECNEC (Executive Committee on National Economic Council) Islamabad.
(k) The PSDP (Public Sector Development Program) Islamabad.
(l) The FFD (Federal Finance Department), Islamabad.

4. RESULTS AND DISCUSSION

4.1 Overview

Before going into detail discussion on the data collected, in general, the irrigation (Planning and Development) archive has records mostly in hard form (printed and filed documents). Very few of the ADP reports are available in soft form. Similarly the document files are maintained through old record keeping practice (in lots), so most of the time it becomes difficult to reach or search out for a desired document/report.

Availability of valid data plays the limiting factor role during analysis phase of any study. The analysis of the study is based upon the data available from the Planning and Development section (Irrigation department), Peshawar Secretariat, KPK, Pakistan. The data is extracted from Annual progress review reports published by the said department for the last decade i.e. 2003-2013 under the ADP. It is important to mention here that due to non-availability of Annual Progress Review Report for the fiscal year 2004-2005, the Mid-

Year Annual Review report for the same year is used as a reference material. The Annual Review for each fiscal year is carried out at the start of next fiscal year (Second or third week of June) following announcement of the provincial annual budget. The annual review is carried out under the supervision of head of the DAC of the Planning and Development Section (Irrigation Department), Peshawar Secretariat, KPK, Pakistan.

4.2 Budget Based Cluster

The budget allocated for each of the project is the latest revised and AA (Administratively Approved) amount for the project. It is observed that some projects have been reallocated the same budget in the next fiscal year with same technical specification and is issued with administrative approval if it is not completed during the scheduled fiscal year. Examples to this are the project with ADP code 162 which was schedule to start during 2003-2004 but has been revised and re-designed 05 times till 2011-2012. Similarly project with code 40430 is mentioned in both the ADPs 2004-2005 and 2005-2006. This creates a sense of duplication.

The individual districts have been clustered according to the criteria of budget allocation in the specified decade (2003-2013). Table 2 shows the districts clusters and their clustering criteria. This table shows that the cluster L (district Swabi and Dir Lower) has been budgeted above PKR 5500 million while cluster A (including districts Lakki Marwat, Buner, Kurram Agency, Tank, Bannu, FR (Frontier Region) Bannu, Hazara, Kohat, Kohistan, Mansehra, Hangu, Shangla and Nowshera) is allocated PKR 500 million or below during the study period.

4.3 Area Location Based Cluster

While analyzing the data, it is observed that most of projects have been implemented in Peshawar Valley followed by DIK (Dera Ismail Khan), Dir, Malakand, Charsadda and Swat valleys. On the other side it is also found that despite of less number of projects in district Dir Lower (total 33); it is the largest with respect to funds allocation.

Some of the projects (for example cluster-15, Table 3) are scheduled to be implemented in all KPK depending upon emerging needs of any district. It also includes activities or interventions meant for formulation, planning and review, regularization and administrative management at provincial head quarter so that irrigation water sector projects may deliver the desired outcomes in each district.

Some of the projects are implemented in clusters because of the fact that either benefit is interrelated of the clustered districts or the type of interventions being the same in the cluster. In Table 3, there are Twenty (20) clusters identified. While studying these clusters, it is observed that the major cluster is Cluster 15 followed by Cluster 18, 17, 19, 3, 4 and 11 respectively with respect to number of projects and budget allocation. It is also visible that besides Cluster 15 with 159 projects and prominent budget allocation, the rest of the clusters have very few projects and budget allocation.

TABLE 2. INDIVIDUAL DISTRICTS CLUSTERING WITH RESPECT TO TOTAL BUDGET ALLOCATION DURING LAST DECADE (2003-2013)

District	Clusters	Intervals (Annual Budget Allocated during Last Decade in PKR (Million)
Lakki Marwat	A	less than and equal to 500 Million
Buner		
Kurram		
Tank		
Bannu		
FR Bannu		
Hazara		
Kohat		
Kohistan		
Mansehra		
Hangu		
Shangla		
Nowshera		
Haripur	B	500-1000 Million
Karak		
Abbotabad		
Dera Ismail Khan	C	1000-1500 Million
Swat	D	1500-2000 Million
Charsadda	E	2000-2500 Million
Mardan	F	2500-3000 Million
Dir Upper	G	3000-3500 Million
Chitral	H	3500-4000 Million
Peshawar		
Malakand	K	4000- 5500 Million
Dir Lower	L	Above 5500 Million
Swabi		

Following is the list of geographical coverage against which the total allocated project numbers and total allocated budget in the said decade.

TABLE 3. LIST OF DISTRICTS/CLUSTERS WITH NUMBER OF PROJECTS AND ALLOCATED BUDGET

No.	District	Projects	Budget (Million)
1.	Abbotabad	4	930.58
2.	Abbotabad, Kohat, Nowshera (Cluster 1)	4	41.91
3.	Bannu	4	84.03
4.	Buner	4	27.66
5.	Charsadda	28	2208.60
6.	Charsadda, Peshawar (Cluster 2)	2	194.00
7.	Chitral	25	3555.56
8.	Dera Ismail Khan	43	1755.84
9.	DIK and Tank (Cluster 3)	5	167.92
10.	Dir Lower	33	7257.14
11.	Dir Upper	22	3391.88
12.	Dir Lower, Swat (Cluster 4)	5	32.56
13.	Dir Lower, Malakand (Cluster 5)	1	7.50
14.	FR Bunnu	2	86.09
15.	Hangu	7	302.11
16.	Haripur	16	715.71
17.	Hazara	1	117.50
18.	Karak	16	874.50
19.	Karak, Kohat (Cluster 6)	3	3.37
20.	Kohat	6	192.78
21.	Kohistan	16	267.05
22.	Kurram	1	47.19
23.	Lakki Marwat	2	2.96
24.	Malakand	30	5217.19
25.	Mansehra	5	281.64
26.	Mardan	27	2588.40
27.	Mardan, Malakand (Cluster 7)	6	10680.30
28.	Not Identified (Cluster 8)	5	234.32
29.	Nowshera	23	741.04
30.	Peshawar	69	3808.82
31.	Peshawar, Haripur (Cluster 9)	2	133.14
32.	Peshawar, Nowshera (Cluster 10)	2	96.97
33.	Shangla	7	323.92
34.	Swabi	20	15356.81
35.	Swabi, Dir Lower and Charsadda (Cluster 11)	5	158.10
36.	Swat	26	1893.62
37.	Swat, Malakand (Cluster 12)	4	413.61
38.	Swat, Charsadda (Cluster 13)	1	554.00
39.	Tank	5	65.84
40.	Tank, DIK, Lakki Marwat, Bannu (Cluster 14)	2	196.00
41.	All KP (Cluster 15)	159	80909.29
42.	Swat, L Dir Batagram (Cluster 16)	2	4.00
43.	Southern KP (Cluster 17)	10	350.96
44.	KP Phase II (Cluster 18)	18	2404.31
45.	KP Phase III (Cluster 19)	8	641.06
46.	KP Phase IV (Cluster 20)	2	672.25
Total		688	149990.01

4.4 Funding Relation to the Ecological Data

According to Government of KPK (http://www.khyberpakhtunkhwa.gov.pk/aboutus/Climate.php), the province is divided into the following major climatic zones:

4.4.1 North Region (Chitral District)

This region is comprised of district Chitral with an average annual precipitation ranging from 100 mm per year in the far north to 23 inches in Darosh in the south. The average 16.5 inches of rainfall per year, 13.98 inches falls from December to May. Average temperatures in the valleys vary from 30°C (86°F) in July to as low as 0°C (32°F) in January.

4.4.2 South Region (Dir, Swat and Hazara)

The South Region climatic zone is consisted of districts Dir, Swat and Hazara Division, with strong summer and heavy monsoon weather conditions with respect to humidity, temperature and precipitation. In the Hazara division, at eastern parts especially district Abbotabad, the average annual rainfall is about 47 inches including 25 inches at an average during the south-west monsoon. In district Swat, the rainfall is approximately 33 inches at an average on annual basis, including about 17 inches at an average between the months June and September.

The FATA (Federally Administered Tribal Areas) has almost the same climatic conditions as compared to Dir; however, drier climate prevails in the area of Parachinar. The months October and November are the driest with rain falls below 30 mm per month. If we compare it to north region, temperatures here are a bit warmer. In the winter season, most of the areas in Swat have significant snowfall, but in Hazara division temperatures generally is around 41°F.

4.4.3 Southern North-West Region

The Southern North-west Region usually has hot and dry climatic conditions just like most parts in Pakistan. In summer the temperature in the south at district Mardan is around 45°C (113°F), while average temperature in Peshawar prevails about 40°C (104°F). This region in winter also, is warmer and usually drier than other areas of KPK, with temperatures 17°C (62°F) in Peshawar and over 20°C (68°F) in the south region of KPK. Lower temperatures at night time are observed in winter season.

The Southern part of the province has lesser rains in the monsoon season. At an average Peshawar and DIK both receive around 4, 5 inches of rain in the month of July and August while not much in June or September. It is very rare that a summer rain of higher significance will occur in many years. In the winter season, rainfall in this region reaches to its peak during the month of March, however district Peshawar at an average still receive under 10 inches between the months December and May while DIK under 4.5 inches. Some of mountain slopes for example around Kohat, rainfall in winter season could predominate but it is hard to predict.

The Southern KPK projects (Cluster 17) are designed and implemented under the DERA (Drought Emergency Recovery Assistance) program. This program has focused upon irrigation and drinking water supply in areas with less precipitation.

According to this classification and the funding clustering, it is visible that areas or clusters with less precipitation and warmer climates are funded more as compared to the areas or clusters where the precipitation is comparatively higher and have colder climates. Moreover, areas or clusters with more precipitation and colder climates have been funded for constructing water storage and conservation reservoirs such as water detention small dams, ponds and delay action dams.

It was observed that 42% of the total projects were mainly of construction and establishment type followed by Repair and Maintenance, Feasibility study and extension/improvement with 24, 19 and 15% projects respectively.

This data trend shows that as low as 19% of the projects are scheduled for feasibility studies, review, and training need assessments. This may help in identifying and attracting investors, if increased.

Projects are also categorized according to the outcome indicators for example:

(i) Construction, rehabilitation, restoration, widening or cleaning of irrigation canals, feeding channels and tube wells. These contribute towards the irrigation and drainage outcome.

(ii) Construction of protection wall, flood protection structures and flood damages restoration contributes towards the FPW (Flood Protection Works) indicator.

(iii) Designing, construction, rehabilitation and extension of dams an indicator for projects being carried out for water conservation, management and water sector projects sustainability.

(iv) The P&D (Planning and Development) project category produce the outcome of strategic planning, review and monitoring for remodeling, research based innovation, institutional development and procurement of modern equipment for the execution of irrigation project. It enables the project to be implemented in cost effective way without compromising the standardized quality.

(v) One of the most important outcome indicator used are Roads, CPR, Bridges and culverts etc. This indicator contributes towards inter-linkages of other livelihood opportunities and local market to irrigation water sector projects as well as contributes towards the overall cost efficiency and performance of the project. This indicator also leads towards transportation, accessibility for research and innovation and socio-economic well-being of the residents of the geographic area in which the irrigation water sector project is implemented.

According to the Figs. 1-2; it is observed that outcome indicator "irrigation and drainage" is the most irrigation water sector project focused category (54%) followed by dams (18%), flood protection works (13%), Bridges/culvers/roads/CPR (9%) and planning and development (6%) respectively.

5. CONCLUSIONS

In general, the Departmental Accounts Committee reviews the annual development plan on bulk expenditures, tangible progress and cost allocation basis only. Most of the data is figurative which merely reflects the expenditures and cost estimation being approved by the irrigation departments at district as well as provincial level. This leads towards weak information base where no meaningful answer can be given to the question of why some districts/clusters are scheduled for more projects and greater amount of budgets are allocated. Similarly there is no information available on other than government of KPK funding agency.

Specifically, the consolidated data shows that some districts namely Peshawar, Dir Lower, DIK, Malakand, Charsadda, Mardan, Swat, and Swabi are allocated with more projects as compared to other districts. However the data neither reflect significant district (based on other than budget/number of projects allocation) nor provides information on why a specific scheme has been re-scheduled during any fiscal year. The data also does not give meaningful information about the theme, size and population of the benefited geographic area. Some projects, if not completed during the scheduled fiscal year, have been reallocated same budget in the following fiscal year with same technical specification and issued with administrative approval. This creates a sense of duplication.

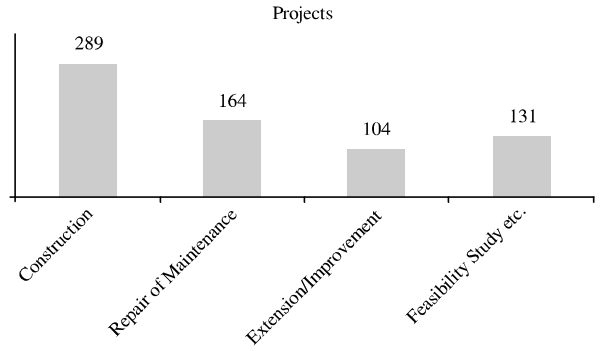

FIG. 1. PROJECT PROFILES/CLASSIFICATION WITH RESPECT TO PURPOSE OF THE PROJECT/SCHEME

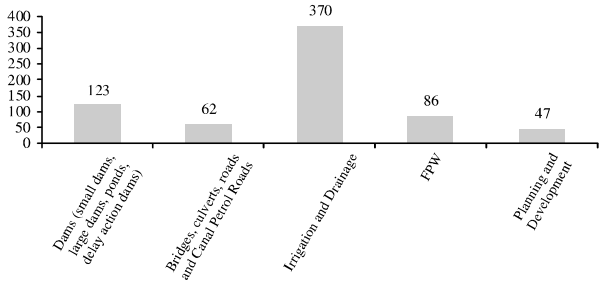

FIG. 2. PROJECT CATEGORIZATION WITH RESPECT TO OUTCOME INDICATOR

Most of the funds are allocated for construction and repair/maintenance work contributing to irrigation and drainage outcome. Efforts for feasibility, review and training need assessment survey are few, which is visible from the number of projects for planning and development outcome indicator (as low as 6% of the total projects during the whole decade). Similarly no economic performance survey with respect to contribution to agricultural per acre yield has been carried out so far. This all leads towards difficulties in identification and attraction of the investors, hence the irrigation water sector faces investments issue.

6. RECOMMENDATIONS:

(i) This study found that the government funded projects were not comprehensive with respect to data and analysis as these are only showing the figurative data having no analysis with respect to long term or short term impacts on the beneficiaries.

(ii) As a matter of fact, the present study only was able to study one decade (2003-2013) while there is still need for studies for the rest of decades (1953-2003).

(iii) During the data collection, other than government of KPK stakeholders and financing agents should also be included. The data collection process should be carried out for some districts on priority basis. These districts include Peshawar, Dir Lower, DIK, Malakand, Charsadda, Mardan, Swat, and Swabi. Similar practice should be carried out for Cluster 15,17,18,19, and 20 (having different districts from KPK) separately so that segregated data can be achieved for each of the district in this cluster.

(iv) Consolidated data collection and digitizing/processing should be carried out for all projects so that comprehensive information base is established (both in soft and hard forms).

(v) A structured projects' data collection process should be carried out to collect the relevant data on villages, town, and tehsil as well as district level.

(vi) Economic performance survey with respect to contribution to agricultural per acre yield should be carried out for all the projects. Correlation between crop yield, economic return and investment in irrigation water sector should be established. This economic performance survey will not only identify area and district/cluster of most significance but will also help in answering the question of developing a specified irrigation water sector profile in a specified district/cluster.

(vii) Economic performance survey findings and recommendations should be timely disseminated to all government and non-government stakeholders so that required action may be taken.

(viii) Efforts should be made to maintain computerized information base (figurative and narrative reports) at all district and provincial levels.

ACKNOWLEDGEMENTS

Praise to be to Almighty Allah for His consistent Blessings and Beneficence. The completion of this research work is an outcome of the continuous support and guidance of my parents, friends, and faculty members of Department of Agricultural Engineering, University of Engineering & Technology, Peshawar, and International Water Management Institute, Lahore, Pakistan. Special thanks are offered to Mr. Abdul Wajid Khan, Finance and Accounts Section, Irrigation Department, Planning and Development, Peshawar Secretariat, Mr. Muhammad Shariq, Planning and Monitoring Officer at Center of Excellence for Rural Development, Peshawar, a National Non-Governmental Organization, and Engr. Saqibullah for their support during data collection and data punching phase of this study.

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