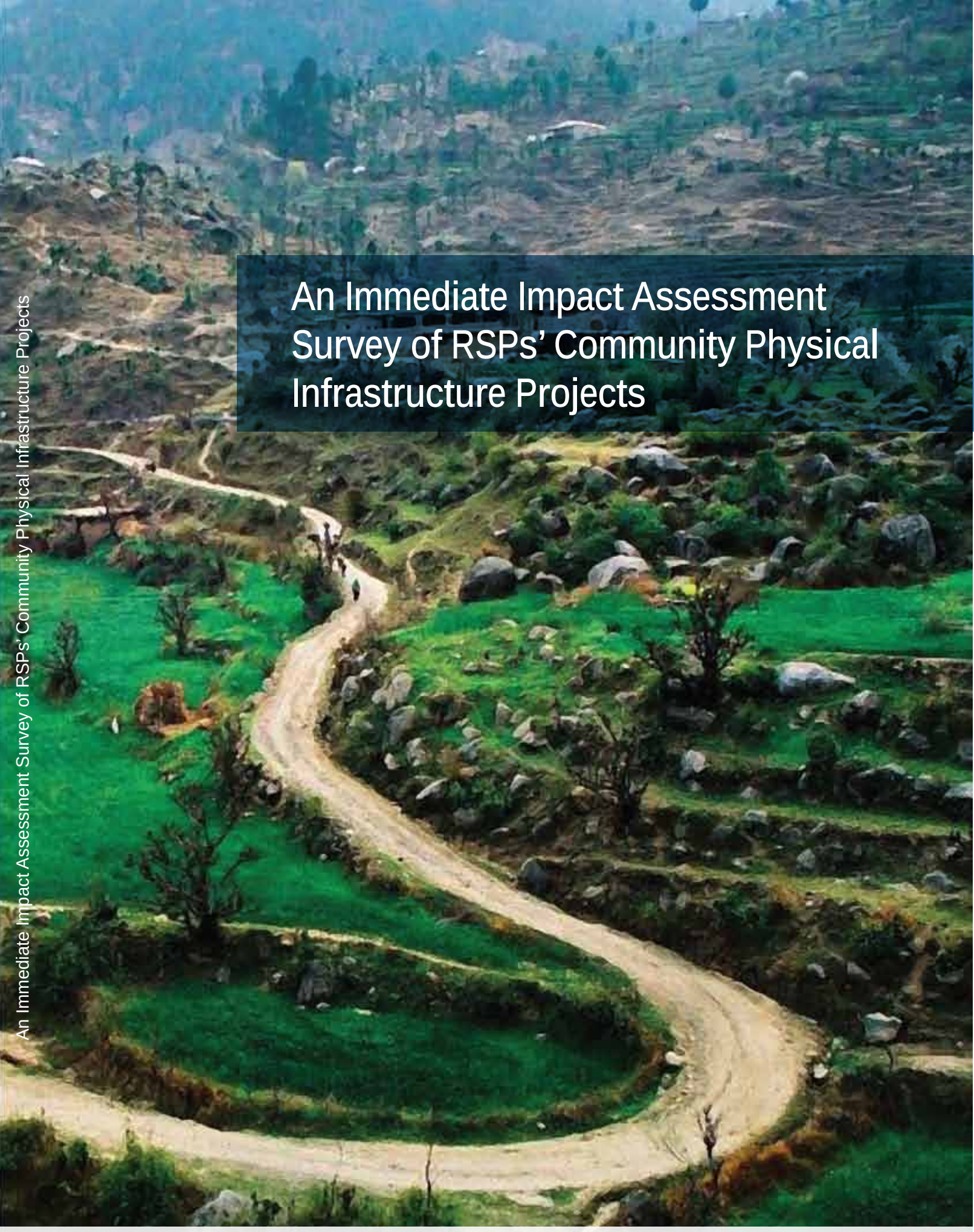

An Immediate Impact Assessment Survey of RSPs' Community Physical Infrastructure Projects

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RSPN

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BACKGROUND & INTRODUCTION

The Rural Support Programmes Network (RSPN) is a network of ten Rural Support Programmes (RSPs'), collectively the largest group of rural development programmes, working with 3.3 million rural households in 105 districts across the four provinces, Azad Jammu & Kashmir and Gilgit-Baltistan. The RSPs' aims to reduce poverty and improve the quality of life of the rural poor by harnessing peoples' potential to manage their own development through their own institutions.

The RSPs' socially mobilise rural women and men to form Community Organisations (COs), Village Organisations (VOs) and Local Support Organisations (LSOs). The RSPs' assist the community organisations – through financial and technical support and/or linkages – to undertake a wide range of developmental activities, including infrastructure, microfinance, micro insurance, skills development, agriculture, livestock, small enterprise and relief and rehabilitation.

Since the beginning of the Rural Support Programmes (RSP) in the early 1980s, what is termed Community Physical Infrastructure has been a central element in their strategy for social mobilisation and community development. In expenditure, it has been second only to micro credit. Over a third of the RSPs'' 100,000 COs have implemented a community-level CPI project. Over the years, various CPI assessments studies have been conducted. However, no national level CPI assessment exercise has been undertaken. Therefore, the RSPN has decided to conduct an Immediate Impact Assessment Survey of the RSPs' CPI schemes across all RSPs'. This report presents the findings of that survey.

1.1 Objectives and Scope of the study

The objective of this survey is to assess the immediate impact of CPIs implemented by the RSPs' as part of their social mobilisation approach to improve rural livelihoods and reduce poverty. The survey is based on data collected from a sample of 241 CPI schemes and 2400 beneficiary households. The study covers the four main and six sub-types of project:

1. Drinking Water Supply
    i. DWSS (Gravity)/Mechanised
    ii. Water Reservoir and Dug well
2. Irrigation
    i. Lining of Water Courses
    ii. Irrigation Channels/Pipe Irrigation/Karez
3. Transportation
    i. Link roads
4. Sanitation
    i. Street pavement and drainage

1.2 Organization of the Report

The report has seven Chapters. The next sections of this introductory chapter provide an overview of the RSPs" CPI strategy and operations and a summary of the survey methodology. (Details are given in Annex - III.)The survey results are presented in four chapters:

- Chapter 2: Drinking Water Schemes (DWSS)
- Chapter 3: Irrigation schemes.
- Chapter 4: Link roads.
- Chapter 5: Street pavement and drainage

Chapter 6 synthesises the results of all four types of CPI, of performance, institutional development and the benefits and impact on households. The final Chapter present the Cost Benefit Analysis of the all four types of CPI.

1.3 Overview of RSP strategy & operations in Community Physical Infrastructure

The overall objective of CPI projects is to contribute to reduced poverty. RSPs', since the establishment of AKRSP in 1982, have initiated 23,072 community-level CPI projects of different types with an accumulated investment of Rs. 9.3 billion . These projects are estimated to have directly benefited 1.95 million[1] households, and an estimated population of over 14 million[2].

Full community ownership of and priority in managing CPI projects are fundamental principles of the RSP strategy. RSP Social Organisers (SO) help the community to carry out a situation analysis, so that CO members can identify their priorities and decide on what infrastructure they need. The CO then submits a resolution to the RSP, seeking its assistance to implement the project they have chosen.

After receiving a resolution from a CO, the RSP engineer and SO conduct a technical and social feasibility survey and estimate the cost of the project. The community is expected to contribute 20%, or more in the form of land, labour, materials and/or cash. Then a Terms of Partnership (ToP) is signed between the CO and the RSP.

At this point, the leadership in project implementation and maintenance is transferred to the CO. The RSP's role is limited to technical oversight and financial support. The CO usually forms three committees amongst its members: a project implementation committee, a project audit committee and a project maintenance committee. This is intended to ensure proper implementation and maintenance of the project, and also to build community capacity to manage similar projects in the future. These committees are formed by the members of the CO and are downward accountable to the community.

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1 This does not include 39,187 items of household-level infrastructure implemented by TRDP, 5,528 Small Infrastructure for Enterprise schemes implemented on credit by NRSP and 7,588 schemes initiated by NRSP though linkages with other agencies. These interventions were not covered by the survey.

2 RSPs' have implemented two types of infrastructure project. Community level projects benefit a large number of households, e.g. an irrigation channel. Household level projects benefit individual households: e.g. economy stoves. TRDP reports each household level CPI. Other RSPs' group numbers of household items as one CPI, e.g. 10 handpumps as one, not 10.

RSPs' mobilise funds for implementing CPI schemes from projects funded by government and donors, and in some cases from their own resources. The RSPs' directly supervise and manage all the financial resources and provide technical assistance to the CO for implementation of the CPI schemes.

RSPs' also help communities to implement CPI projects in other ways. One is by assisting the community to develop linkages with government line departments, donors, and other organisations which can fund their infrastructure projects. These schemes are implemented and executed by the respective agencies, and the RSPs' only provide technical support if it is required. NRSP in partnership with the community, also provides credit plus technical assistance to implement small, individual schemes: termed as Small Infrastructure as Individual Enterprise (SIIE).

RSPs' in partnership with COs have initiated CPI schemes that include a range of water supply, drainage and sanitation, irrigation, transport and communication, and other rural infrastructure schemes. Around 30 percent of the total schemes are initiated by NRSP followed by one-fifth by SRSP and then PRSP and TRDP each almost accounting for 15 and 11 percent of the total number of CPI projects respectively. AKRSP have 13 percent of CPIs and BRSP, GBTI and SRSO have less than 3 percent of the CPI schemes. Summary of CPI schemes initiated by RSPs' is presented in Table 1.1.

Table 1.1 Summary of Completed Community-Level CPI Schemes, 1983-June 2009

RSPs'	No. of Schemes	Cost (Rs. Million)	Cost per Scheme (Rs.)	No. of Beneficiarie
AKRSP	3,035	1,412	465,356	258,568
BRSP	571	350	614,133	24,582
GBTI	451	112	248,504	56,319
NRSP	7,148	2,667	373,237	553,791
PRSP	3,608	1,072	297,117	604,126
SRSO	688	225	328,023	19,757
SRSP	4,919	2,112	429,388	329,521
TRDP	2,652	1,339	504,906	103,007
Total	23,072	9,289	3,260,664	1,949,671

Source: RSPN Outreach issue 1, 2009; NRSP Programme update June 2009

1.3.1 CPI Categories

Complete data is only available for 19,322 CPIs. These can be analysed to show when the majority were built and what different kinds of CPI were undertaken. Table 1.2 shows the distribution by date of completion. AKRSP was the only RSP implementing CPIs during the 1980s, and only NRSP joined it during the 1990s. Since 200o, however, numbers increased rapidly. Nearly seven times as many were completed in the first five years of the new millennium as in the last five of the old. That acceleration has continued into the last period: from 2006 to 2009.

Table 1.2 RSP CPIs by Date of Completion

RSP	1984 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2009	Total
AKRSP	257	238	294	419	285	1,493
BRSP	0	0	0	226	255	481
NRSP	0	124	616	2,760	3,341	6,841
PRSP	0	0	0	1,252	1,521	2,773
SRSO	0	0	0	64	524	588
SRSP	0	0	0	1,340	789	2,129
TRDP	0	0	80	797	1,775	2,652
Total	257	362	990	6,858	8,490	16,957

Note: Completion dates were not available for 2,184 CPIs and 110 were in progress at the time of analysis. AKRSP had terminated 71 projects.

RSP CPIs fall into seven main categories. These are summarised in Table 1.3.

Table 1.3 Main Categories of RSP CPI

PROJECT TYPE	No of CPIs	%	Total Cost (Rs.mil)	%	Cost per CPI	Beneficiary Hhds	Benef. Hhd/ CPI	Cost per Hhd
Comms./Transport	2,558	13.2	971	11.1	379,770	290,400	123	3,234
DWSS	4,767	24.7	2,138	24.5	448,532	249,155	52	8,626
Irrigation	7,316	37.9	3,165	36.3	432,798	321,309	225	1,924
Sanitation & DWSS	923	4.8	65	0.7	70,229	16,073	48	1,463
Sanitation & Drainage	2,445	12.7	1,022	11.7	417,852	354,083	133	3,142
Soil Conservation	581	3.0	292	3.4	503,353	29,294	176	2,860
Micro Hydel	295	1.5	674	7.7	2,291,213	36,665	145	15,801
Other	437	2.3	402	4.6	919,908	74,730	171	5,380
Grand Total	19322	100.0	8,729	100.0	451,854	1,371,708	75	6,024

Within each category, there is a very wide range of sub-types. Drinking water schemes, for example, range from mechanised tubewells complete with reticulation to individual houses to a simple hand pump.

1.4 Methodology

Measuring the long-term impact of community infrastructure projects on welfare indicators, such as income, health, education, etc, is a complex process. The standard approach is to collect baseline data for a treatment group of project beneficiaries, and for a control group outside the effect of the project. It would be normal to allow five or seven years between this baseline survey and a subsequent impact survey. Moreover, finding a control group which is truly comparable to the treatment group is a challenging task, given limited commonalities between any two sets of rural households.

RSPN is using this approach to measure the overall impact of the RSPs" holistic programmes. It has carried out a first round of baseline surveys for 16 districts, in a phased manner from 2006-08. It has also conducted follow-up surveys for 5 districts of Sindh. This process will be followed for other districts using the double-difference method of impact assessment.

However, these surveys do not differentiate the impact of the various different RSP programmes: infrastructure, micro-credit etc. Nor do they make it possible to analyse how effective those programmes have been, or help identify ways to improve them. In 2008, an RSPN impact evaluation identified this as a constraint for impact assessment in the immediate future. The evaluation recommended that the RSPs' should focus on assessing the direct and immediate impacts of individual RSP services, of which CPIs are one. It proposed the following simple process to measure the direct benefits:

Service Impact = Number of Beneficiary Households x Direct Benefit per Household

Valuing the Direct Benefit per Household (DBH) depends on the types of CPIs provided. Using this approach the aggregate impact will be estimated by first measuring the direct benefits accrued to a typical household from a CPI subtype and then multiplying it by the average number of households benefited by an average CPI of that subtype.

The central objective of the survey presented in this report is to allow as rigorous as possible an estimate of direct benefits and beneficiary numbers. Taking the example of providing a drinking water supply scheme, the benefits are likely to comprise two main elements both of which can be measured and valued without difficulty: savings in the time taken to collect water, and improvements in the quality of water.

1.4.1 Sample Selection

For the purpose of the study, CPIs were classified into the following main categories:

Irrigation: 38 percent of all schemes, with around 41 sub-types. These include feeder channels and conveyance pipes, lift irrigation, lining of water courses, storage reservoirs, siphons, sedimentation tanks, river channels, drip irrigation, land levelling and development, and the construction/repair of small dams and water ponds etc.

Drinking Water Supply Schemes (DWSS): Around one-quarter of all CPIs. Sub-types include pipe schemes, both gravity and mechanised, hand pumps, dug wells, tube wells, and reservoirs, tanks and dams.

Sanitation and Drainage: 17.4 percent of all schemes. Sub-types include Street Pavement and Drainage, Household Latrines and Bathrooms, Community Toilets, Drainage, Sanitation and Street Lighting, Sanitation and DWSS, Sanitation and sewerage systems, and washing centres.

Communication/Transportation: 13.2 percent of CPIs. This category includes, link roads, bridges, pony tracks, foot bridges, culverts, and causeways.

Around 7 percent of CPIs fall outside these four categories. These include the repair of community buildings, micro hydels, agriculture nurseries, boundary walls and a number of others.

The survey was designed to provide a representative sample of schemes from each of the four main categories across all RSPs' and the four principal Pakistani provinces. To ensure the measurement of sustained impacts, the study focussed on mature schemes, i.e. in operation for at least three years since completion. Therefore the sampling frame consisted CPI projects completed up to 2007.

Given the large number of different sub-types, it was decided to sample only the most important sub-types in each category. Table 1.4 summarises the sample frame which resulted. It covers approximately half of the CPIs for which reasonably complete records are available.

Table 1.4 The CPI Sample Frame

Categories of CPI Schemes	Population			Sample	
	# of Projects	Average # of Households	Av. Cost (Rs)	# of Projects	# of Hhds
TRANSPORT					
1. Link Roads	1,675	135	432,785	40	400
DRINKING WATER					
2. DWSS (Mech./Gravity)	1,542	55	388,958	40	400
3. Reservoir and Dug well	736	48	194,258	40	400
IRRIGATION					
4. Conveyance (Channel/Pipe/ Karez)	724	68	543,695	40	400
5. Lining of Water Courses	3,261	50	410,573	40	400
SANITATION					
6. Street Pavement & Drainage	1,719	163	445,769	40	400
Total	9,657	87	410,733	240	2,400

Source: RSPs' Records

As the table shows, at least 40 schemes were to be surveyed in each sub-category. These were selected in two stages. To keep logistics simple, districts with a significant number of schemes for the sub-category were selected. At the second stage, schemes were selected from a geographic ordered list of cumulative beneficiary households, using a random number start and a sampling interval to give the correct number of schemes. At each scheme, households for interview were randomly selected from a list of beneficiaries prepared on site. (See Annex - III for details).

In the field, the survey team collected data from 241 schemes and 2,343 households.

1.4.2 Survey Design

The survey had three principal components:

- A technical assessment carried out by a qualified engineer and the survey team leader. Starting from a review of RSP records covering the design and implementation of the project, they were asked to assess current condition and operability of the scheme.
- A focus group discussion with CO office holders and members. This concentrated on institutional aspects of the implementation and management of the CPI.
- A questionnaire interview with households benefitting from the CPI, focused on the household's participation in the project and its impact on the household livelihood.

1.4.3 Survey Implementation

A specialist firm was contracted through competitive tender to carry out the survey and enter the data into SPSS files. Seven survey teams consisted of a team leader, a sub-engineer and one male and one female enumerator. Efforts were made to hire enumerators with local knowledge and language skills for the different regions. Details of enumerator training, data entry and data QC processes are given in Annex -III. RSPN MER staff supervised the training and monitored field activities.

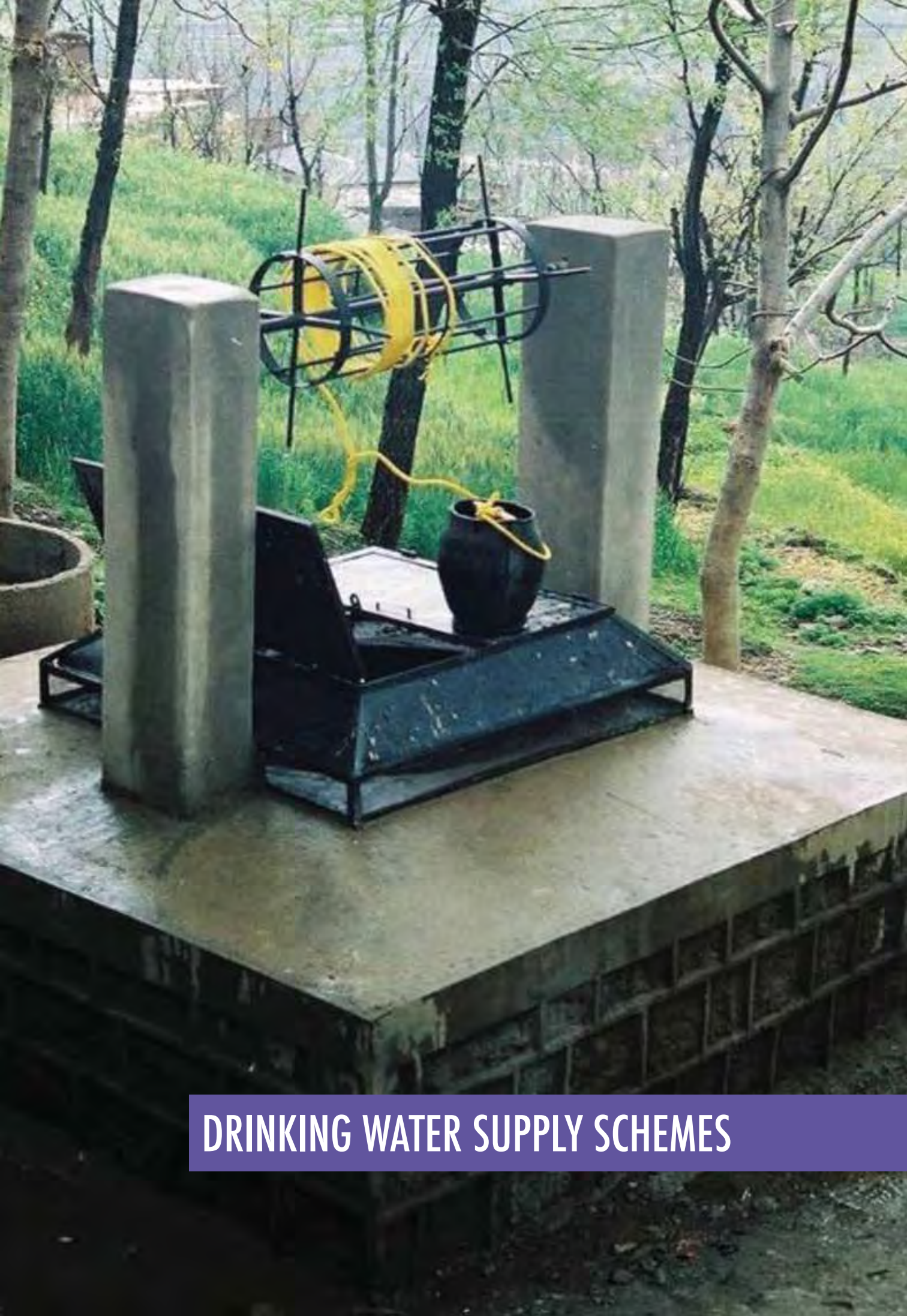
1.4.4 Methodological limitations

Survey implementation and subsequent analysis have revealed a number of methodological limitations. In large part these spring from the diverse nature of RSP CPIs and a lack of clarity about the nature of the schemes. This affected DWSS in particular. During analysis, the sample had to be re-classified to take account of significant differences between schemes the records showed as belonging to one category.

The most significant limitations concern the assessment of scheme condition and the estimate of beneficiary numbers. For the first, the Technical Assessment survey responses appear to have been based on what the Focus Group of CO members reported to the survey team. The form defined Condition as the reported percentage of water losses. This limited definition was inadequate to capture the many other ways in which a scheme might be in bad condition. However, survey team engineers' notes gave a better understanding of utilisation and condition.

A key objective of the survey was to gain an accurate estimate of the number of households currently benefitting from each scheme. However, in some cases the survey team used the target figure set when the CPI was first designed and applied an estimate of population increase to calculate an 'Actual (2009)' figure. This does not necessarily have any relation to the numbers of households which are actually using the facility. This limitation is compounded by the fact that survey teams were advised that if a CPI had less than 10 beneficiaries available for interview, then it should be excluded from the survey. It is possible to gain an estimate of beneficiary numbers from other data, but there remains some margin of error on this key parameter.

It should be noted that one of the largest sub-categories of CPI was not covered by the survey. RSPs' advised that hand pumps are household-level rather than community-level infrastructure, so they were excluded from the sample. Nevertheless, with over 2,000 schemes, hand pumps represent 11% of all CPIs by number, 14% by expenditure. Target beneficiaries are 50 households per hand pump CPI. If possible, a separate survey of this significant part of the RSP portfolio would be justified.



DRINKING WATER SUPPLY SCHEMES

2 DRINKING WATER SUPPLY SCHEMES

2.1 Overview

Table 2.1 below gives a description of DWSS in terms of projects, beneficiaries, and costs.

Table 2.1 RSP-Wise DWSS Schemes

	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Grand Total
Number of Schemes	13	80	2,068	30	3	1,163	1,410	4,767
Target beneficiary households	-	4,298	95,485	1,759	87	80,650	66,876	249,155
Beneficiary Hhd per CPI	-	53.7	46.1	58.6	29	69.3	47.4	52.4
Cost per scheme	545,899	293,060	198,373	176,555	608,279	439,921	835,727	448,532
CO contribution (%)	-	22	21.5	21.5	20	11.7	23.4	18.6

2.1.1 Gravity, Mechanised, Dug Well and DWS Reservoir Schemes

There are 20 or more DWSS subtypes although a number of these represent different combinations of the basic elements of well, lift mechanism, storage, conveyance and distribution. The more unusual schemes include desalination plants, solar pumps and windmills. However, five types account for 90% of all schemes: Dug wells (7.7%), DWS reservoirs (7.3%), mechanised schemes (17.9%), gravity flow schemes (14.7%), and hand pumps (43.1%). As mentioned in the introductory chapter, despite being the largest category of all, hand pump CPIs were excluded from the survey because they are normally household-based, and involve limited community action in the implementation, operation and maintenance stages. This leaves mechanised, gravity, dug well, and

Table 2.2 Gravity, Mechanised, Dug Well and DWS Reservoir Schemes

		AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Total
Number of Schemes	Gravity						690	1	691
	Mechanised	13	13	806	6			13	851
	Dug well						54	342	396
	DWS Reservoir			253		3	0	84	340
Target Beneficiary Hhds/ scheme	Gravity						68.7	40.0	68.6
	Mechanised	n/a	132.4	43.3	25.0			91.2	44.7
	Dug well						68.6	48.6	51.3
	DWS Reservoir			39.5		29.0		48.5	45.0
Cost per scheme	Gravity						553,654	301,663	553,289
	Mechanised	545,899	490,874	225,212	167,193			1,667,085	255,857
	Dug well						275,486	117,264	142,393
	DWS Reservoir			308,930		608,279		95,347	258803.7
CO Contribution %	Gravity						20.9	19.8	
	Mechanised	n/a	2o.0	21.2	19.6			16.0	
	Dug well						21.4	29.6	
	DWS Reservoir			26.2		20.0		27.3	

DWS reservoir schemes as the most significant subtypes. Table 2.2 summarises these schemes in terms of projects, beneficiaries, and costs. The table shows that the gravity schemes have 50 percent more target beneficiaries that others. Somewhat surprisingly, dug wells have the second highest beneficiary number. However, cost per scheme is also the highest for gravity schemes and lowest for dug well schemes. DWS reservoir schemes have the lowest number of target beneficiaries but have the second highest cost per scheme.

2.2 Technical Assessment

2.2.1 Scheme Types

This chapter presents the analysis of the survey results for 79 DWSS CPIs: 27 gravity schemes, 12 mechanised schemes, 19 dug well schemes, and 21 DWS reservoir schemes. 80 schemes were surveyed but one seems to be a hand pump CPI incorrectly classified as mechanised. This has been excluded.

The technical assessment shows significant variations within the four scheme types:

- A number of gravity, mechanised, and DWS reservoir schemes included a reticulation system with distribution lines: 81.5% of gravity schemes (21 of 27) and a third of DWS reservoir and mechanised schemes. Clearly there is a significant difference between a scheme with reticulation and a scheme without.
- Maps drawn by engineers identified pre-existing components as part of several schemes. Of 21 DWS reservoir schemes, 3 use existing hand pumps and 1 uses an existing tank. Two mechanised schemes have existing dug wells and four gravity schemes use existing tanks. One of them also uses a pre-existing distribution line. This indicates that a number of DWSS CPIs were to rehabilitate infrastructure that stopped operating or to improve on existing infrastructure. The benefits measured for such schemes should strictly only relate to the benefits added through rehabilitation or extension. Unfortunately, the survey did not anticipate the possibility of rehabilitation or extension so it is not possible to identify accurately the added-value from the CPI supported by the RSP.
- Of the DWS reservoir schemes, six are fed by rainwater. The remainder are fed from canals or water courses. In other words some are for collection and storage and others just for storage, raising different technical issues.
- DWS reservoir schemes with reticulation are expected to be mechanised. However, these were not reported to have motor pumps. This creates ambiguity in classification. Hence, benefits of schemes with and without reticulation have been juxtaposed with the stratification of benefits in terms of scheme type.

2.2.2 Scheme Specification

The Technical Assessment compared the schemes as-built with the specifications shown in the RSP records. It recorded the match between Design and Actual in terms of 6 parameters: length of pipes, channels, and distribution lines, depth of dug wells, type of pump, and tank volume. Their relevance to different scheme types is as follows:

- Gravity schemes: length of pipes and distribution lines, and tank volume
- Mechanised schemes: length of pipes and distribution lines, depth of dug wells, type of motor pump, and tank volume
- Dug well: pipe length, depth of dug wells, and tank volume
- DWS reservoir: length of pipes, channels, and distribution lines, tank volume.

Of the 6 parameters, an Exact and/or Equivalent match was found for the length of channels and distribution lines, type of pump, and number of stand posts. A partial match was observed for 'length of pipes' on 1 gravity scheme and 1 mechanised scheme. Partial match was also observed for the 'depth of dug wells' on 1 mechanised scheme and 2 dug wells. No match was only observed for the parameter 'tank volume' with regard to 3 DWS reservoir schemes. To conclude, barring a minority of schemes with selected defects, schemes were constructed to plan.

Moreover, Table 2.3 shows the actual details of DWSS schemes. The averages given tend to conceal the distribution of the stated parameters. Hence important features of the distribution are mentioned subsequent to the table.

Table 2.3 DWSS Scheme Details

		Pipe Length (m)	Channel Length (m)	Distribution Line Length (m)	Dug Well Depth (m)	Tank Volume (litres)	Pump & Motor Capacity
Gravity	N	26		21		6	
	Average	1513.5		1594.2		54773.3	
Mechanised	N	11		4	6	4	12
	Average	360.4		307.1	70.3	134438.2	7.6
Dug Well	N				18	7	
	Average				52.9	8123.5	
DWS Reservoir	N	11	9	7		16	
	Average	520	11.7	462.6		266517.1	
Total	N	48	9	32	24	33	12
	Average	1021.5	11.7	1172.6	57.2	157197.9	7.6

- Gravity schemes: A majority of schemes do not have pipes and distribution lines that are about 1.5 kilometres long, as suggested by the given averages. 65% of schemes have pipes less than 1 kilometre long, of which 27% are less than half a kilometre long. Similarly, 75% of schemes have distribution lines less than 1 kilometre long, of which 35% are less than half a kilometre long. Both averages given are biased by outliers. Two schemes have pipes exceeding 6 kilometres, and distribution lines as long as 6.4 and 1.1 kilometres. It is useful to note that one scheme is particularly large, with over 6 kilometres of pipe and distribution lines. Without these outliers the averages for pipes and distribution lines fall to 1.1 kilometres and 837 metres. Moreover, the average for tank volume is also influenced by an outlier i.e. 1 scheme has a tank volume of 198,240 litres, removing which reduces the average by about half to 26,079 litres.
- Mechanised schemes: A majority of schemes (54.5%) have pipes less than or equal to 100 metres, which is about one-third of the given average. The average is inflated by two outliers i.e. 1 and 1.5 kilometres long. Once the outliers are removed, the average falls to 152 metres. Averages for length of distribution lines and depth of dug wells conceal a variety of values. Length of 2 distribution lines are minimal i.e. 6.4 and 20 metres, whereas the remaining two exceed half a kilometre. Of the six schemes with dug wells, the smallest 4 values are 4,9,10, and 13 metres. The other two are outliers i.e. 158 and 228 metres. The average for tank volume is influenced by an outlier i.e. 394400 litres, without which the average falls to about one-half i.e. 47,784 litres.
- Dug well: The average for tank volume is largely influenced by a single outlier i.e. 50,000 litres, without which the average would fall to 1144 litres.
- DWS reservoir: The average for length of pipes is largely influenced by 2 outliers i.e. 2.4 and 3.3 kilometres long, without which the average falls to ere 10 metres. Similarly, there is an outlier regarding tank volume i.e. 2,865,700 litres, without which the average falls by about 3 times i.e. 93,238 litres.

2.2.3 Scheme Cost and Construction

The survey covered CPIs built between 2000 and 2008. DWSS in the survey were built during the following years.

- Gravity schemes: 2001-2008, excluding 2005 and 2006.
- Mechanised schemes: 2000-2007, excluding 2005.
- Dug well schemes: 2000-2006, excluding 2005.
- DWS Reservoir schemes: 2000-2007, excluding 2006.

Barring gravity schemes, the number of schemes built is spread more or less consistently through relevant years. 75% of gravity schemes were built during the years 2007 and 2008.

Table 2.4 summarises average and breakdown of total cost. Cost data for 12 schemes was not available. It has not been possible to take out the impact of Inflation that is present due to schemes being built in various years preceding the survey as noted above. Subject to that qualification, the patterns identified follow.

Table 2.4 Average Costs Per CPI – PK Rupees

	Gravity	Mechanised	Dug Well	DWS Reservoir	All Schemes
N	26	11	11	19	67
Average	705688	362520	134629	318208	445709
Minimum	62,208	137,323	40,423	96,129	40423
Maximum	3,244,833	741,848	347,700	850,563	3,244,833
% Makeup					
Material	82.0	58.8	58.2	66.2	74.8
Equipment	5.0	15.5	9.3	2.9	6.3
Skilled labour	2.9	7.9	5.8	13.1	5.8
Unskilled labour	7.2	14.4	11.0	13.8	9.8
Others	2.9	3.4	15.7	4.0	3.3

On average gravity schemes are the most expensive, even when 2 schemes that cost more than Rs. 2,000,000 are excluded. The average for such schemes then falls to Rs. 520,307. Gravity schemes are followed by mechanised, DWS reservoir schemes, and dug well schemes. Materials were by far the largest cost constituent for all scheme types. This implies low expenditure on other constituents, including unskilled labour, which entails potential employment for the community. This was a surprising result for the two apparently simpler technologies: dug wells and reservoirs.

Table 2.5 summarises the community contributions to the CPI as a percentage of the total cost for different schemes, and the average contribution made in terms of materials, equipment, skilled labour and unskilled labour. Unskilled labour was contributed to more schemes as compared to contributions made in materials and skilled labour. Contributions made in equipment were negligible.

In addition to this, community contributions as a percentage of total costs are significantly lower for gravity schemes as compared to other scheme types. In absolute terms, 11.3% is much lower than the RSP norm of 20% as the numbers of schemes for which community contributions fall below this threshold is the highest for gravity schemes. Nonetheless, such schemes are also not exclusive to gravity schemes. Such schemes constitute 29.6% (8 of 27) of gravity schemes, 16.7% (2 of 10) of mechanised schemes, 11.1% (2 of 21) of DWS reservoir schemes, and 11% (2 of 18) of dug well schemes.

Table 2.5 Community Contributions for DWSS CPIs

	Gravity	Mechanised	Dug Well	DWS Reservoir	All Schemes
N	14	11	11	19	55
Average contribution	147,652	91,958	39,706	89,098	94696.9
% Community contribution	11.3	25.4	29.5	28.0	17.4
Material:					
N	9	10	3	6	28
Average contribution	48,423	55,854	16,326	28,645	43,400
Equipment:					
N	4	0	3	0	7
Average contribution	9,048	0	44,733	0	24341.8
Skilled labour:					
N	8	1	8	13	30
Average contribution	49,177	7,104	7,443	26,583	26855.2
Unskilled Labour:					
N	9	10	9	16	44
Average contribution	125,228	44,187	11,904	53,465	57534.7

Survey engineers were asked to investigate how well the CPIs had been implemented in terms of adherence to the planned timeline and budget. The majority of schemes were completed on time and on budget. 19% of gravity and 20% of dug well schemes were completed with a delay of less than one year. The gravity schemes and half of the dug well schemes were reportedly held up by a 'delay in fund disbursement', reasons for which are not available. The other dug well CPIs were delayed by 'conflict over the scheme'. Regarding budget, there were cost overruns of up to 30% on a quarter of mechanised schemes, 10% of dug-wells, and 5% of DWS reservoirs.

2.2.4 Utilisation and Condition

Utilisation refers to the percentage of targeted households using a scheme. The survey engineer classified each scheme according to the categories described below. This was not directly measured and the responses appear to have been based on what the Focus Group of CO members reported to the survey team.

- Full utilisation: Over 70%
- Partial utilisation: 40-70%
- Limited utilisation: 10-40%
- No utilisation: Unused for 3 months prior to the survey

Condition was measured in terms of percentage of water losses. Categories of condition are described below.

- Good: No water losses
- Regular: At most 33% water losses
- Poor: More than 33% water losses
- Non-Operational: Not worked for 3 months prior to the survey

Table 2.6 below shows a cross tabulation of reported utilisation and condition of the schemes. Almost all the gravity and mechanised schemes are both fully utilised and in good condition. On the other hand, half of dug wells are not fully utilised and only 4 out of 18 (22%) are both fully utilised and in good condition. 4 wells are completely non-operational.

Half of DWS reservoirs are fully utilised and in good condition. At the other extreme, 2 out of 21 are non-operational. It should be noted that all the DWS reservoir schemes that are not fully utilised, in a poor condition, and non-operational are rain-fed, as opposed to being fed by watercourses.

- The engineer's notes suggest that there are two main causes behind the poor utilisation and condition of dug wells. Three schemes have not been completed and three supply low quantities of brackish water. Naturally this has also de-incentivised maintenance.
- Overall, 45 out of 79 (57%) DWSS schemes were fully utilised and in good condition. At the other end of the scale, 8 schemes, just over 10%, were not used at all and seven were non-operational.

Table 2.6 Cross Tabulation of Scheme Utilisation and Condition

		Condition of Scheme (Last 1 Year)				
Type of Schemes	Utilisation (last 1 year)	Good	Regular	Poor	Non-Operational	Total
Gravity	Full	23	2	1	0	26
	Partial	1	0	0	0	1
	Limited	0	0	0	0	0
	No	1	0	0	0	1
Total		25	2	1	0	28
Mechanised	Full	8	1	0	0	9
	Partial	1	0	0	0	1
	Limited	1	0	0	0	1
	No	0	0	0	1	1
Total		10	1	0	1	12
Dug well	Full	4	5	0	0	9
	Partial	0	3	0	0	3
	Limited	0	0	2	0	3
	No	0	0	0	4	3
Total		4	8	2	4	18
DWS Reservoir	Full	10	6	2	0	18
	Partial	0	0	0	0	0
	Limited	0	0	1	0	1
	No	0	0	0	2	2
Total		10	6	3	2	21
All DWSS Schemes	Full	45	14	3	0	62
	Partial	2	3	0	0	5
	Limited	1	0	3	0	4
	No	1	0	0	7	8
	Total	49	17	6	7	79

2.3 Results from the Community Questionnaire

The Community Questionnaire, completed in a focus group discussion with CO members, focused on institutional aspects of CPI implementation and management. The group was also asked to estimate the number of households currently using the CPI.

2.3.1 RSPs' Technical Support

Focus groups were asked about the number of visits made by the RSP SO and engineer, and by any others during the planning and construction phases of the CPI, and after its completion. Findings are summarised in Table 2.7. It shows that the SOs and engineers visited frequently during all phases, and their visits peaked during construction. A small number of schemes were not visited after completion. There were two CPIs, one dug well and one DWS reservoir, that no one visited.

Overall, an SO visited each scheme five times during the planning and more than 12 times during construction. For engineers, it was two to five times for planning and up to 18 times during construction. As might be expected, engineers made more visits to the more technically complex gravity and mechanised schemes. These figures indicate the high level of support RSPs' provide to COs implementing CPIs. It suggests that a CO might find it difficult to implement a CPI on its own initiative, without such support.

Table 2.7 Visits by SO, Engineer, and Any Other

		Planning/Design/Survey			Construction			After completion		
		SO	Engineer	Any other	SO	Engineer	Any other	SO	Engineer	Any other
All Schemes	N	76	75	18	76	76	24	70	69	32
	Average	6.2	3.4	2.3	11.3	14	2.1	7.90	4.8	3.3
Gravity	N	27	27	4	27	27	7	27	26	10
	Average	4.6	4.2	2	11.1	15.8	2	6.4	6.5	6.1
Mechanised	N	12	12	2	12	12	2	12	12	8
	Average	8.6	5	3	11.4	17.6	5.5	11.5	6.1	3
Dug well	N	17	16	3	17	17	7	12	14	7
	Average	6.1	2	1.6	10.3	10.4	1.1	8.4	3.2	1.2
DWS reservoir	N	20	20	8	20	20	8	20	17	7
	Average	7.2	2.6	2.6	12.5	12.5	2.4	7.8	2.3	1.6

2.3.2 CPI Management

Standard RSP practice is that COs should form three committees to manage a CPI: an Implementation Committee, a Finance/Audit Committee and an Operation and Maintenance Committee. Specific training is provided for these committees. The survey recorded how many schemes had these committees and the following aspects of their operation:

- Committee membership
- Participation in their formation
- Training received
- CO members satisfaction or not with the committees' work

53 of the 79 schemes surveyed had all three committees established: 67%. On the other hand, 15 (19%) had no committees. Of the remainder, all had an Implementation Committee and rather fewer an Audit Committee as well. The proportion of schemes with all three committees was highest for gravity schemes, at 89%, and particularly low for dug wells, at just 22%. The reasons behind this were not investigated in the survey. It can be suggested that the three-committee structure is too cumbersome for relatively simple CPIs managed by COs, many of which have only 20 to 25 members. This would explain why the full structure is more common on the more expensive gravity schemes and less so on the simpler dug wells. It less easy to see a reason why there is such a high

proportion with no committee at all.

Implementation Committees are typically the largest, with 3.8 members on average. This is followed by the Operation and Maintenance Committee, which on average has 3 members, whereas the figure for Audit Committees is 2.5 members. To put this another way, most Implementation Committees have four members and most Audit and O&M Committees have only two: the RSP recommended minimum.

As an indicator of CO member involvement in the CPI, Focus Groups were asked about their participation in the formation of the management committees. The majority – 56 out of 64 – reported that all CO members took part. At only three was it reported that the committees had been formed by the CO leadership.

Of the most important Implementation Committees, 46 out of 64, had received the stipulated function-specific training. In other words, more than a quarter of the committees had not had the training. By scheme type the proportion with training varied between 80% for gravity schemes and 58% for mechanised schemes.

A large majority of schemes, 58 out of 64, reported that all CO members were satisfied with the performance of the management committees. Almost all the remainder reported that 'most members' were satisfied. The exception was a single Implementation Committee for a DWS reservoir scheme where members were not satisfied.

In the focus group discussion, the survey sought information on CO members' participation in the planning, implementation and operation of the scheme. The groups were also asked about how money for the CO contribution was collected. Table 2.8 shows that all CO members was the most frequently reported category for all stages. RSP engineers or SOs were involved mostly in the planning stage. The category 'Anyone else' is prominent, particularly in the identification stage. This is possibly in part representative of non-member beneficiaries.

Table 2.8 Participation in CO Needs Identification, Planning, Implementation, and Operation

	Need identification		Planning and Design		Implementation		O&M	
Participation	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Only CO/VO office bearers	6	7.6	7	8.9	25	31.6	16	20.3
All CO members	55	69.6	43	54.4			46	58.2
Mostly done by RSP Engineer/SO			24	30.4	44	55.7	3	3.8
Anyone else	18	22.8	5	6.3	10	12.7	14	17.7
Total	79	100	79	100	79	100	79	100

2.3.3 Contributions to the Scheme

Focus groups were also asked whether they contributed to the construction of the CPI, and if so, what contributions were made. The groups were also asked how money for the CO contribution was collected. A small proportion of COs reported that they had not made a contribution: 4 overall.

When asked how they collected the money, just over half the COs reported that member shares were based on 'ability to pay', as opposed to the alternative 'equal share' per member.

Contributions to construction made by the CO members and other beneficiaries are summarised in Table 2.9 below. It shows that CO members contributed at almost all schemes but other beneficiaries only did so at less than half the schemes, most frequently in the form of labour. However, where

non-members do contribute cash, the contribution is substantial: often more as an average per scheme than for members. In kind contributions are nearly absent regarding other beneficiaries, but they form an important category of CO member contributions.

While an exact match is not to be expected the contributions reported by the CO focus groups are in line with those shown in the RSP record. (See table 2.5) For example, the much higher total CO contribution on gravity schemes shown in the earlier table reflects the large labour days input shown here.

Table 2.9 CO Member and Other Beneficiary Contributions to Construction

		CO members			Other beneficiaries		
		Cash PkR	Labour Days	In kind PkR	Cash PkR	Labour Days	In kind PkR
All Schemes	N	61	63	22	14	23	2
	Average	48728.4	811	29613.6	51290	945	8000
Gravity	N	16	25	10	2	8	1
	Average	60,209	1,128	37,400	79,625	853	12,000
Mechanised	N	11	11	5	5	4	0
	Average	54,804	465	18,700	20,200	725	
Dug well	N	17	11	4	3	5	1
	Average	34,675	1,037	21,250	43,270.3	1,276	4,000
DWS reservoir	N	17	16	3	4	6	0
	Average	48,043	397	33,000	82,000	937	

2.3.4 Scheme Operation

Focus groups were asked to report how their scheme had operated over the last 12 months and describe how they managed operating costs.

Table 2.10 below summarises how many schemes were non-operational for how many months. Reasons behind non-operation are given subsequent to the table for each scheme type.

Table 2.10 Non-Operational Schemes

	Number of Months								
Type of Scheme	1	2	3	5	6	9	10	12	Total
Number of Gravity schemes	3	3	0	1	0	1	0	1	9
Number of Mechanised schemes	2	1	0	0	0	0	0	1	4
Number of Dug Well schemes	2	0	0	1	0	0	0	4	7
Number of DWS Reservoir schemes	0	1	1	0	1	1	3	1	8
Total	7	5	1	2	1	2	3	7	28

Gravity

The factor with the highest frequency i.e. 44.4% (4 of 9) of non-operational gravity schemes is a blockage in the pipes, which is suggestive of a lack of maintenance. It is followed by weather-related factors such as severe rain and snow, which account for 33.3% (3 of 9) of schemes, including the suspension of one scheme for 9 months. Of the remaining two schemes, one was subject to conflict

and the other was built to specification but nonetheless deemed technically unsound. The latter has caused the suspension of the scheme for all 12 months prior to the survey.

Mechanised

Weather-related factors are relevant to half of the non-operational mechanised schemes, of which one was suspended for all 12 months prior to the survey. The remaining half are reported to be non-operational due to the motor being temporarily non-functional, the reasons behind which are not specified.

Dug Well

For dug wells, three themes standout, with each accounting for 28.6% (2 of 7) of non-operational schemes i.e. incomplete schemes, weather-related factors, and physical breakdown due to a lack of maintenance. Incomplete schemes include the single scheme that was suspended for all 12 months prior to the survey. The remaining factor is relevant to a single scheme only, which is the provision of alternative schemes by the government.

DWS Reservoir

Rain-fed reservoirs typically do not operate for the year as a whole, and hence 50% (4 of 8) of non-operating DWS reservoirs fall into this category, which include a single scheme reported to have been non-operational for 9 months and 3 schemes that did not operate for 10 months. This is followed by physical breakdown due to a lack of maintenance, which accounts for 25% (2 of 8) schemes. The remaining factors pertain to weather-related factors and non-completion of scheme, both of which account for a single scheme. Nonetheless, it is pertinent to note that the latter has caused the suspension of the scheme for all 12 months prior to the survey.

Focus groups were asked to report any costs of operating the CPI. There would be expected to be few if any such costs on gravity, dug well and reservoir schemes. However, fuel and pump operation should be significant costs on mechanised schemes. The survey team seem to have found this question difficult to handle and the results are not consistent. For example, 40% of mechanised schemes reported that they had no operating costs. On the other hand, a third of gravity schemes and a quarter of reservoirs reported operational costs. More detailed questions about operational expenditure were also difficult to interpret: e.g. the fact that 5 gravity, 2 dug well and 4 reservoirs reported expenditure on 'fuel/utility bills'.

2.3.5 Scheme Maintenance

RSPs' advise COs to establish a Maintenance Fund, and contribute a percentage of the CPI budget to set the fund up. The survey sought information from focus groups on how these funds are operating.

Focus groups were first asked who contributed to scheme maintenance. Of the 63 schemes which answered on this point, 49 reported that 'All CO members contribute', 16 'most members' and 7 'some members'. At just under half of schemes Other Beneficiaries also contributed, most frequently on mechanised schemes and least frequently on gravity schemes. Only at one DWS Reservoir did neither CO members nor others contribute.

COs were also asked how they collected contributions to scheme maintenance. The majority collect only 'when needed': 51 of 63 schemes. Only on gravity schemes is there a significant proportion,

just over half, which make 'regular charges'. Schemes were evenly split between those collecting an 'equal payment' from all and those which charge according to 'ability to pay'.

Despite RSP advice, only 61% of CPI COs have a maintenance fund. The proportion is highest for gravity schemes (21 out of 27) and lowest for mechanised and dug wells: around half. And barely a third of COs which have a fund actually use it. The proportion of active maintenance funds is particularly low for dug wells and reservoirs.

It might be expected that COs which make a regular maintenance charge would be more likely to keep an active maintenance fund. On the other hand, COs which do not use their maintenance fund, would tend to collect money for maintenance when required, as opposed to regular charges. Table 2.11 tests this proposition. A Chi-square test for independence supports the proposition (P= .004).

Table 2.11 Relation between Use of Maintenance Funds and Method of Raising Funds

		How COs collects money for maintenance		
		Regular charges	When needed	Total
Maintenance fund used	Yes	10	7	17
	No	11	20	31
	Total	21	27	48

With regard to the average amount kept in the maintenance fund, the figure is given in Table 2.12 below for the four principal schemes. These figures calculated include outliers i.e. values of PKR 150,000 and PKR 110,000 relevant to dug well and gravity schemes. Once the outliers are excluded, the average for dug wells and gravity schemes fall to PKR 11,370 and PKR 18,685. The small amounts held in the funds is a probable explanation for the large number of COs which do not use them. It seems likely that once most of the original sum deposited had been spent, many funds became inactive.

Table 2.12 Amount in the Maintenance Fund

Scheme Type	Average amount in the maintenance fund (PKR/US $ @ 83)	
Gravity	23,000	$277
DWS Reservoir	13,817	$166
Dug Well	18,666	$225
Mechanised	8,688	$105

2.3.6 Beneficiary Numbers

Focus groups were asked to say how many households are currently using the CPI as their primary source of water supply. Table 2.13 shows the average number of targeted, primary, and secondary beneficiaries for the different schemes types. Averages are shown for all schemes, including those which are not operational and have no beneficiaries, and for working schemes. Only gravity schemes were 100% operational. On average the data shows that on average primary beneficiaries reported by the Focus Group are higher than the targeted beneficiaries, i.e. the number planned for when the scheme was built. The exception was dug wells, where the number of beneficiaries was lower, even for working schemes, after excluding non-operational schemes. Overall, the difference was a small increase of about 1.4% for all schemes, including non-operational. However, paired-sample t-tests showed that the differences were not statistically significant for any scheme type.

value is for 0.3 for gravity schemes, 0.2 for mechanised schemes, 0.2 for dug well schemes, and 0.5 for DWS reservoir schemes.

Table 2.13 Scheme Beneficiaries

		Target Beneficiaries	Primary Beneficiaries All Schemes	Primary Beneficiaries Working Schemes	Secondary Beneficiaries Working Schemes
Gravity	N	28	28	28	6
	Average	60.7	68.6	68.6	38.1
	SD	41	63	63	38
Mechanised	N	12	12	11	2
	Average	82	89.5	97.6	44
	SD	103.9	132	129	8.4
Dug well	N	18	18	14	3
	Average	52.8	34.8	44.7	28.6
	SD	42	52.9	46.8	27.2
DWS reservoir	N	21	21	17	8
	Average	57.6	59.5	73.5	33.8
	SD	81.7	102.8	96.547	30.1
All Schemes	N	79	79	70	19
	Average	61.3	61.7	69.6	35.4
	SD	65.5	90.2	82.5	29.4

2.4 Beneficiary Households

At each CPI surveyed, beneficiary households were randomly selected for interview about their participation in the scheme and the effect it had had on their lives. The target was 10 households per scheme, 790 in all, but the survey fell short by 11 households and 779 DWSS beneficiary households were interviewed.

2.4.1 Household Characteristics

Table 2.14 gives the average household structure reported by interviewees. No significant differences in household structure were found between the different scheme types.

Table 2.14 Household Structure of DWSS CPI Beneficiaries

Characteristic	N	Mean	SD
Total Household	779	8.2	4.1
Adult Male	766	2.1	1.4
Adult Female	777	2.1	1.3
Male Children (<18)	627	2.0	1.7
Female Children (<18)	614	2.0	1.8

The random selection produced a sample of which about one quarter of the households were not members of the CO which had built the CPI. This did vary between scheme types, with the lowest proportion of non-members at mechanised schemes and gravity schemes (15% and 17%) and the highest at DWS reservoir schemes (35%). Just over a fifth of surveyed households were not CO members at dug well schemes.

2.4.2 Scheme Participation

Beneficiaries were asked about their participation in planning and their contributions towards the construction and maintenance of DWS CPIs. Data regarding contributions to maintenance are limited to the 12 months preceding the survey.

Almost all CO member households were involved in the planning of the CPI: between 98% on gravity schemes and 92% on DWS reservoirs. On the other hand, only about one-half of the non-member beneficiaries were involved. Dug wells stood out with the highest non-member participation, 72%. Planning was mainly carried out by males, but women from some 14 of CO member households did take part, either alone or jointly with the men from the household. Among non-members, women only took part on the gravity schemes.

Table 2.15 summarises results regarding contributions to construction in terms of the four principal scheme types. It shows some interesting patterns:

- Overall, 82% of beneficiaries contributed, 91% of CO member beneficiaries and 53% of non-member beneficiaries. Non-member participation was markedly higher on dug well schemes and lowest on reservoir schemes at 43%. As noted above, the proportion of non-member beneficiaries is much higher on DWS reservoir CPIs.
- Of those who contributed, 68% gave cash and 58% labour, indicating that a large proportion gave both. There was little difference between members and non-members on this.
- Cash contributions averaged PkR 2,100 per household, with little difference between members and non-members.
- Labour contributions averaged 32 days per household, but there was a clear division between gravity schemes, with an average contribution of 51 days and the others which averaged between 14 and 17 days.

The importance of labour contributions on gravity schemes is further underlined by the fact that beneficiaries gave labour than cash: 77% versus 42% gave labour than cash. The ratios were reversed on all other scheme types, most markedly for dug wells.

A similar analysis was done for beneficiary contributions to scheme maintenance during the previous year. It showed that far lower proportions of beneficiaries contribute to maintenance than construction: 33 percent of CO members or and 19 percent of non-members. However, there are important differences between DWSS types:

- On gravity schemes nearly half of members and 39 percent of non-members contribute, more in labour than cash: an average of 6 days per household. Cash contributions are also highest on gravity schemes: PkR 853 per household, nearly half of the contribution to the original construction.
- Maintenance contributions are next highest on mechanised schemes: 40% of CO member beneficiaries contribute PkR 888 and three days labour per household per year. About a quarter of non-members also contribute but the cash contribution is much lower.
- Beneficiary contributions to maintenance are much lower at DWS Reservoirs (21 percent of beneficiaries contributing PkR 174 and 4 days labour per household per year) and, especially, dug well schemes (7 per cent contributing PkR 464.)

It is to be expected that maintenance requirements are lower at the smaller and technically simpler dug well and reservoir schemes.

Table 2.15 Contributions to Construction

		Gravity	Mechanised	Dug Well	DWS Reservoir	All
N		270	115	175	219	779
% HHDs Contributing to CPI Construction:						
All Beneficiaries		84	87	90	72	82
CO Members		92	92	94	87	91
Non-Members		48	59	74	43	53
Make up of Contributions to CPI:						
Cash - % of HHDs:						
All Beneficiaries		42	81	90	73	68.5
CO Members		41	82	93	77.5	69
Non-Members		50	70	79	57.5	64
Amount:						
All Beneficiaries	N	95	81	142	115	433
	Average PkR/HHD	1898	2387	2755	1449	2151
	Std. Deviation	2836	1835	3654	1616	2774
CO Members	N	84	74	119	96	373
	Average PkR/HHD	1929	2372	2682	1528	2154
	Std. Deviation	2950	1699	3850	1725	2860
Non-Members	N	11	7	23	19	60
	Average PkR/HHD	1659	2543	3130	1048	2133
	Std. Deviation	1810	3119	2425	805	2183
Labour - % of HHDs:						
All Beneficiaries		77	56	31	40	58.5
CO Members		78.5	55.5	32	39	59.5
Non-Members		63.5	60	27.5	57	53
Labour Days:						
All	N	175	56	49	95	375
	Average Days/HHD	50.8	16.8	16.8	14.1	32.0
	Std. Deviation	61.4	17.2	11.6	15.3	46.5
CO Members	N	161	50	41	73	325
	Average Days/HHD	51.8	17	16.6	15.8	48
	Std. Deviation	62.029	17.8	11.5	15.3	33.9
Non-Members	N	14	6	8	22	50
	Average Days/HHD	39.7	15	17.6	13.6	21.7
	Std. Deviation	54.5	11.8	12.8	8.7	31.4

2.4.3 Household Satisfaction with the CPI

Interviewees were asked a range of questions about how they rated the CPI. The results can be summarised below.

Regarding project committees, a majority of CO member and non-member beneficiaries of gravity, mechanised, and DWS reservoir schemes rated the committees as 'Good' and 'Okay'. With reference to the former two scheme types, a lower number of non-member beneficiaries reported these

categories as compared to CO members. Moreover, the proportion of respondents unaware of the performance of committees is fairly high for DWS reservoir scheme. This category accounts for the vast majority of respondents benefiting from dug well schemes. Overall, except for dug well schemes, a majority of beneficiaries are satisfied with the performance of project committees.

Table 2.16 Satisfaction with the performance of Project Committees

		How do you rate the performance of the project committees?			
		Good	Okay	Poor	Don't know
Gravity	Member	81.7	6.7	4.9	6.7
	Non-member	58.7	10.9	6.5	23.9
Mechanised	Member	78.6	11.2	4.1	6.1
	Non-member	52.9	23.5	0.0	23.5
Dug Well	Member	16.9	6.6	2.2	74.3
	Non-member	5.1	0.0	0.0	94.9
DWS reservoir	Member	47.6	18.9	7.7	25.9
	Non-member	40.8	32.9	0.0	26.3
All Schemes	Member	58.4	10.3	4.8	26.5
	Non-member	38.8	19.1	1.7	40.4

Across all schemes types, most respondents found RSP support to be either 'Good' or 'Okay'. Nonetheless, the proportion is lower for dug well and DWS reservoir schemes, and regarding the former, the proportion of respondents reporting 'Poor' performance is substantial.

With regard to functioning of the CPI at the time of the survey, two scheme types stand out. Barely

Table 2.17 Satisfaction with RSP support

		How do you rate the performance of RSP support?			
		Good	Okay	Poor	Don't know
Gravity	Member	91.5	7.1	0.4	0.9
	Non-member	78.3	13	4.3	4.3
Mechanised	Member	71.4	26.5	2.0	0.0
	Non-member	70.6	29.4	0.0	0.0
Dug Well	Member	58.1	28.7	12.5	0.7
	Non-member	46	41	0.0	13
DWS reservoir	Member	54.5	36.4	7.7	1.4
	Non-member	61.8	32.9	0.0	5.3
All Schemes	Member	71.9	22.1	5.2	.8
	Non-member	63.5	29.2	1.1	6.2

any of the gravity schemes are reported to be non-functional, whereas more than one-third of CO members report DWS reservoir schemes to be non-functional. This suggests that the question is biased against seasonal DWS reservoir schemes. Overall, a vast majority of respondents were satisfied with the functioning of the scheme.

Table 2.18 Satisfaction with CPI functioning at the time of survey

		Is the CPI functional at present?		
		Yes	No	Don't know
Gravity	Member	98.7	0.9	0.4
	Non-member	100.0	0.0	0.0
Mechanised	Member	89.8	10.2	0.0
	Non-member	82.4	17.6	0.0
Dug Well	Member	82.4	16.9	0.7
	Non-member	82.1	17.9	0.0
DWS reservoir	Member	62.2	37.8	0.0
	Non-member	89.5	10.5	0.0
All Schemes	Member	84.9	14.8	0.3
	Non-member	89.9	10.1	0.0

An increase in water losses has been reported by less than one-tenth of the respondents. The proportion of this class of respondents is higher for gravity and mechanised schemes. However, no change in water losses was reported by about one-half of dug well beneficiaries. Hence, a majority

Table 2.19 Satisfaction with the change in water losses

		Has the quantity of water losses/wastage changed due to the CPI?			
		Increased	Not changed	Decreased	Don't know
Gravity	Member	8.5	7.6	76.8	7.1
	Non-member	6.5	26.1	65.2	2.2
Mechanised	Member	9.2	14.3	55.1	21.4
	Non-member	11.8	5.9	70.6	11.8
Dug Well	Member	5.1	49.3	36.8	8.8
	Non-member	2.6	43.6	51.3	2.6
DWS reservoir	Member	4.9	16.1	72.0	7.0
	Non-member	5.3	18.4	72.4	3.9
All Schemes	Member	7.0	20.1	63.1	9.8
	Non-member	5.6	24.7	65.7	3.9

of respondents have experienced a decrease is water losses i.e. with the exception of dug well schemes.

The risk of closure has been reported by about one-fourth of beneficiaries of gravity and mechanised schemes, whereas this category is lower for the other scheme types.

Table 2.20 Satisfaction with CPI sustainability

		Is the CPI safe from the risk of closure?	
		Yes	No
Gravity	Member	77.2	22.8
	Non-member	78.3	21.7
Mechanised	Member	66.3	33.7
	Non-member	64.7	35.3
Dug Well	Member	94.1	5.9
	Non-member	97.4	2.6
DWS reservoir	Member	80.4	19.6
	Non-member	89.5	10.5
All Schemes	Member	80.0	20.0
	Non-member	86.0	14.0

Across all scheme types, about one-tenth of users are not satisfied with the performance of the CPI. Such a high level of satisfaction is surprising given higher proportions of users expressing concerns about functioning, water losses, and the risk of closure. This maybe so because questions about overall satisfaction tend to draw favourable responses. The reasons for not being satisfied are irregular or insufficient water supply, raising concerns about water quantity. Only for mechanised schemes has the category 'Too expensive' been reported.

Table 2.21 Overall satisfaction with CPI performance

		Are you satisfied with the performance of the CPI?	
		Yes	No
Gravity	Member	97.3	2.7
	Non-member	84.8	15.2
Mechanised	Member	95.9	4.1
	Non-member	94.1	5.9
Dug Well	Member	78.7	21.3
	Non-member	89.7	10.3
DWS reservoir	Member	86.7	13.3
	Non-member	90.8	9.2
All Schemes	Member	90.3	9.7
	Non-member	89.3	10.7

2.4.4 Source

Changes in the household's main source of drinking water form the most important expected effect of a DWSS CPI. Interviewees were asked to say what their source before the CPI was and whether they were using the CPI or not. The next four tables set out how these changes have occurred for each of the four DWSS types.

Gravity CPIs

Of 270 households interviewed, 265 are using the CPI. As Table 2.22 shows, the majority were

using springs or surface water before it was built and the new schemes haves given them water either piped into the house or at least to their yard. This is a significant change from unprotected to protected water sources. Of the 5 households which are not using the CPI, one already had a house connection, two are continuing with 'multiple sources' and two with collected rainwater.

Table 2.22 Source Before and After Switch to Gravity Scheme

Gravity Scheme		CPI Source: Piped Water into Dwelling	Piped Water to Yard/Plot	Public Tap/ Standpipe	Others	Total
Source –Before CPI	Unprotected Dug Well	5	17	13	4	39
	Protected Spring	0	6	0	0	6
	Unprotected Spring	33	90	1	0	124
	Tanker Truck	9	1	0	0	10
	Surface Water	54	24	8	0	86
	Total	101	138	22	4	265

Mechanised CPIs

Table 2.23 show the same analysis for mechanised schemes. Once again a large majority are now using the CPI. Over two thirds now have water piped into the house or yard. Of the others one group has standpipes and one uses a dug well. It is not clear why the latter should be so on a mechanised scheme. It may indicate that the machinery is not operating. Before the CPI, there were three main groups using surface water, springs and dug wells respectively. As for gravity schemes there is a clear shift towards better protected and more convenient water sources. However the proportion not using the CPI is rather larger: 10.4% (12 out of 115 households). From one scheme, four households continued to use a dug well and at another five households were getter water from tanker trucks.

Table 2.23 Source Before and After Switch to Mechanised Scheme

	Mechanised	CPI Source: Piped Water into Dwelling	Piped Water to Yard/Plot	Public Tap/ Standpipe	Protected Dug Well	Total
Source Before CPI	Public tap/standpipe	4	1	0	0	5
	Tube well/borehole	2	0	0	0	2
	Protected dug well	1	5	0	0	6
	Unprotected dug well	0	3	10	9	22
	Protected spring	7	0	0	0	7
	Unprotected spring	19	6	4	1	30
	Tanker-truck	1	0	0	0	1
	Surface water	13	4	10	3	30
	Total	47	19	24	13	103

Dug Well CPIs

Table 2.24 shows the analysis for dug well schemes. Inevitably, because these schemes do not include reticulation, the changes are smaller. For example, the largest group had merely changed

from one unprotected well to another. It seems that only two of the twelve CPIs provided a protected dug well. The proportion not using the CPI was also significantly higher at 31.4%. A possible reason is that a CPI providing unprotected dug wells to households which already have access to such a source, give little incentive to substitute. This may also lie behind the fact that a relatively high proportion of dug wells are not operational. (See Table 2.23 above.)

Table 2.24 Source Before and After Switch to Dug Well Scheme

Dug Well		CPI Source: Public Tap/ Standpipe	Protected Dug Well	Unprotected Dug Well	Total
Drinking water supply - Source before RSP scheme	Unprotected dug well	1	1	91	93
	Unprotected spring	0	17	0	17
	Tanker-truck	0	1	0	1
	Surface water	2	1	6	9
	Total	3	20	97	120

DWS Reservoir CPI

Table 2.25 Source Before and After Switch to DWS Reservoir Schemes

DWS Reservoir		Drinking Water Source –After CPI: Piped into Dwelling	Piped to Yard	Public Standpipe	Unprotected Dug Well	Protected Spring	Surface Water	Other	Total
Drinking water Source before CPI	Piped water into dwelling	1	0	0	0	0	0	0	1
	Piped water into yard/plot	0	1	0	0	0	0	0	1
	Public tap/stand-pipe	3	1	0	0	0	0	0	4
	Protected dug well	0	1	0	0	0	0	0	1
	Unprotected dug well	0	1	2	0	0	1	0	4
	Protected spring	0	4	0	0	0	0	0	4
	Unprotected spring	0	5	0	0	10	0	0	15
	Rainwater collec-tion	0	0	0	0	0	1	0	1
	Tanker-truck	0	1	3	0	0	0	0	4
	Surface water	1	15	52	10	0	10	31	119
	Multiple source	0	0	0	0	0	1	0	1
	Total	5	29	57	10	10	13	31	155

The results for DWS reservoir schemes (Table 2.25) are more varied. Prior to the CPI, a large majority collected their drinking water from Surface Water. On the questionnaire this category included too wide a range of possibilities: rivers and canals as well as the more logical lakes and ponds. The CPIs have allowed some 60% to replace this with a standpipe, either in the house yard

or public. However, there were also groups which moved to dug wells, to protected springs and to 'other'. It is difficult to explain these cases. For example a reservoir CPI would not be likely to include a dug well. It is useful to note that the technical assessments did not find any reservoir scheme to have a dug well as a component (Table 2.25).

As for dug well schemes, a large proportion (29%) has not switched to the CPI source. These respondents have remained with unprotected dug wells.

2.4.5 Fetching

Reducing the burden of fetching water is a primary benefit from water supply schemes, especially schemes which include reticulation. Beneficiaries of DWSS CPIs were asked about who 'mainly' used to fetch water before the CPI, and who 'mainly' fetches water now. The following sections look at gravity and mechanised schemes, dug well and DWS reservoir schemes for the said question. Gravity and mechanised schemes have been grouped together as they share similar findings.

Gravity and Mechanised Schemes

Pre-CPI adult women 'mainly' fetched water in the majority of households using the CPI: 88% for gravity schemes and 63% for mechanised. For most of the remaining households it was either 'men and women equally' or a combination of all household members. After the CPI the proportion of 'mainly women' fell substantially: to 50% for gravity schemes and 38% for mechanised. This was because 40% of households now have water piped to the dwelling, so it no longer has to be fetched.

Some households without water piped to the dwelling spread the water collection task more equally after the CPI, about 5%. However, this reduction in the proportion mainly dependent on adult women was not statistically significant.

Dug Well Schemes

The same analysis on dug well schemes gives an opposite result. The proportion of households where it is mainly women who fetch the water actually rose slightly: from 38% to 42%. Although the change is relatively small it was statistically significant. (P = 0.008) It should be noted, however, that fetching water was shared equally between men and women or between all family members at 51% of households, both before and after the CPI: a marked difference from the gravity and mechanised schemes.

DWS Reservoir Schemes

There was little change in the way water is fetched on DWS reservoir schemes. Before the CPI, it was 'mainly' women for 58% of households and after for 56%. This small decrease is not statistically significant (p=.53).

2.4.6 Time Saved

Savings in the time taken to collect water is the principal benefit to be expected from a new drinking water scheme. Interviewees were asked about the time used to go to the water source, get water, and come back, prior to and after the CPI. The impact on time used, measured in terms of the average of changes in time used, is given for each scheme type in Table 2.26.

The results show the effect of reticulation to individual dwellings. Where this was the case – on gravity and mechanised schemes – time to collect water fell to very few minutes and there were large time savings. On dug well and reservoir schemes, the average trip to fetch water after the CPI was still over half an hour: still a substantial saving on the time before the CPI. Statistical tests showed the differences were significant and large at all types of scheme. (Paired-sample t-tests, P =.0005. Eta squared > 0.014 for all scheme types.)

Independent-sample t-tests showed the difference in time saved was significantly different between gravity and mechanised schemes, but the difference between dug well and DWS reservoir schemes was not significant (P=0.32).

Table 2.26 Change in Time Used (minutes)

Scheme Type	N	Average Time Used Before CPI	Std. Deviation	Average Time Used After CPI	Std. Deviation	Average Time Saved	Std. Deviation
Gravity	270	70.0	46.4	1.47	4.8	68.5	47.1
Mechanised	115	66.7	47.7	8.5	18.4	58.3	47.1
Dug Well	175	75.9	46.6	37	42	38.6	40.5
DWS Reservoir	219	69.9	48.2	35.2	44.6	34.7	39.3

Relating to the causes behind time saving, it is pertinent to test the hypothesis that time saving occurred due to distribution lines. Time has on average been saved for both schemes with and without distribution lines. The average time saved for schemes with and without distribution lines is 70.8 and 38.8 minutes. As expected it shows that schemes with distribution lines tend to save more time. Nonetheless, as suggested by eta squared in absolute terms the impact remains large. It is 0.68 for schemes with distribution lines and 0.40 for schemes without distribution lines.

The averages in Table 2.26 conceal wide variations between different households. For example, 8 respondents reported an increase in the time taken to fetch water after the CPI. At the other extreme some households at all four scheme types reported times of over two, three or even four hours. Similarly, significant proportions of dug well and reservoir households reported no change: 22.2% and 34.7% respectively. Hence, although on average there is no statistical difference with regard to time saved between dug well and DWS reservoir schemes, there is a larger difference in percentage of users who have experienced time saving. Table 2.27 gives an impression of this dispersion.

Table 2.27 Distribution of Change in Time Used – Minutes Saved per Trip

	All Schemes	Gravity	Mechanised	Dug Well	DWS Reservoir
Minimum	-25	-4	0	-25	-5
Maximum	260	260	220	170	175
Percentile % of hhds:					
25	15	35	25	0	0
50	40	60	45	30	20
75	65	90	90	50	60

2.4.7 Water Consumption

Together with time savings and improvements in water quality, increases in water consumption are a principal benefit to be expected from DWSS. Interviewees were asked about the quantity of water used by the household in the week prior to the survey. It is important to stress that the estimates derived depend on the interviewees and enumerator's good understanding of volumes. That said the results seem realistic.

Table 2.28 shows the average litres of water used for all uses except livestock per capita per day for the four principal scheme types. Independent-samples t-tests were conducted to compare the average litres/capita/day between the different scheme types, which suggest that that there is no statistically significant difference between dug well and DWS reservoir schemes (p=6.3).

Table 2.28 Average Litres/Capita/Day of water used

Scheme Type	N	Average	Std. Deviation	Trimmed Average
All Schemes	779	22.7	16.2	20.8
Gravity	270	20.9	15.3	19.1
Mechanised	115	28.9	22.7	26.8
Dug Well	175	22.6	16.2	20.2
DWS Reservoir	219	21.8	12.2	20.8

In developing countries 20-30 litres/capita/day are considered enough to meet basic human needs , not simply drinking water. On average all scheme types provide less than 30 litres/capita/day. The trimmed average, which is calculated without 5% of the top and bottom cases in order to remove outliers, suggests that gravity schemes provide less than 20 litres/capita/day.

Table 2.29 summarises the distribution of households by the per capita water consumption. It shows that half of all households use less than 20 litres per capita per day, and three quarters use less than 30 litres. Mechanised schemes are an exception, with higher levels across the range.

Table 2.29 Usage of water (Average Litres/Capita/Day)

	All Schemes	Gravity	Mechanised	Dug Well	DWS Reservoir
Minimum	0.9	11.7	1.9	6	0.9
Maximum	137.0	116.3	137.0	132.9	85.7
Percentile (% of households):					
25	14	11.3	10.2	16.1	15
50	19.1	18.4	25.7	18.7	19.2
75	26.7	25.7	40.5	22.9	25.7

It is pertinent to note that for schemes with distribution lines the proportion of those using less than 20 or 30 litres/capita/day is lower as compared to the general picture shown above. This discrepancy is evident from the figures stated in Table 2.30.

Table 2.30 Percentage of Users Consuming Water below Minimum Thresholds for Schemes with Distribution Lines

	Water Consumption <20 liters/capita/day	Water Consumption <30 liters/capita/day
All Schemes	20.0	31.6

2.4.8 Diseases

To capture possible benefits from cleaner, safer water, interviewees were asked if any household members had suffered diarrhoea, gastric disease, and typhoid. Results for the four principal schemes are summarised in terms of the percentage households whose members have experienced the relevant diseases. It shows little difference in the incidence of disease between the different scheme types. On perhaps the clearest indicator, mechanised and dug well schemes show the highest incidence of disease. On the other hand, the incidence of gastric diseases among the users of dug well schemes is by far the lowest for all schemes.

Table 2.31 Diarrhoea, Gastric Disease, and Typhoid Patients – All Schemes and Scheme Types

	Diarrhoea	Gastric disease	Typhoid
All schemes	11.9	6.4	6.2
Gravity	7.8	7.8	4.8
Mechanised	15.7	6.4	5.2
Dug well	16.0	1.7	8.6
DWS reservoir	11.9	7.3	6.4

In addition to this, for schemes with and without distributions lines Table 2.32 shows the percentage of households whose members have experienced the relevant diseases. Incidence of diarrhoea and typhoid is lower for schemes with distribution lines. However, the incidence of gastric disease is higher. A possible reason for this is that none of the dug well schemes have distribution lines. However, the direction of causation is unknown.

Table 2.32 Diarrhoea, Gastric Disease, and Typhoid Patients – Schemes with and without Distribution Lines

	Diarrhoea	Gastric disease	Typhoid
Schemes with Distribution Lines	8.3	8.6	4.8
Schemes without Distribution Lines	14.1	5.1	7

Perceived impact

Interviewees were asked their perceptions about how the DWSS schemes had affected health and free time for women and children. Their responses are summarised in Table 2.33. It shows a clear pattern of strongly positive perceptions at gravity and mechanised schemes and less enthusiasm on reservoir schemes and, especially, dug well schemes. In most categories, women's free time scores highest with women's health a close second. Increased children's free time was given least importance on all scheme types.

On reservoir and dug well schemes substantial minorities saw no benefits in each category: 27% to 33% for women's health and around 55% to for children's free time.

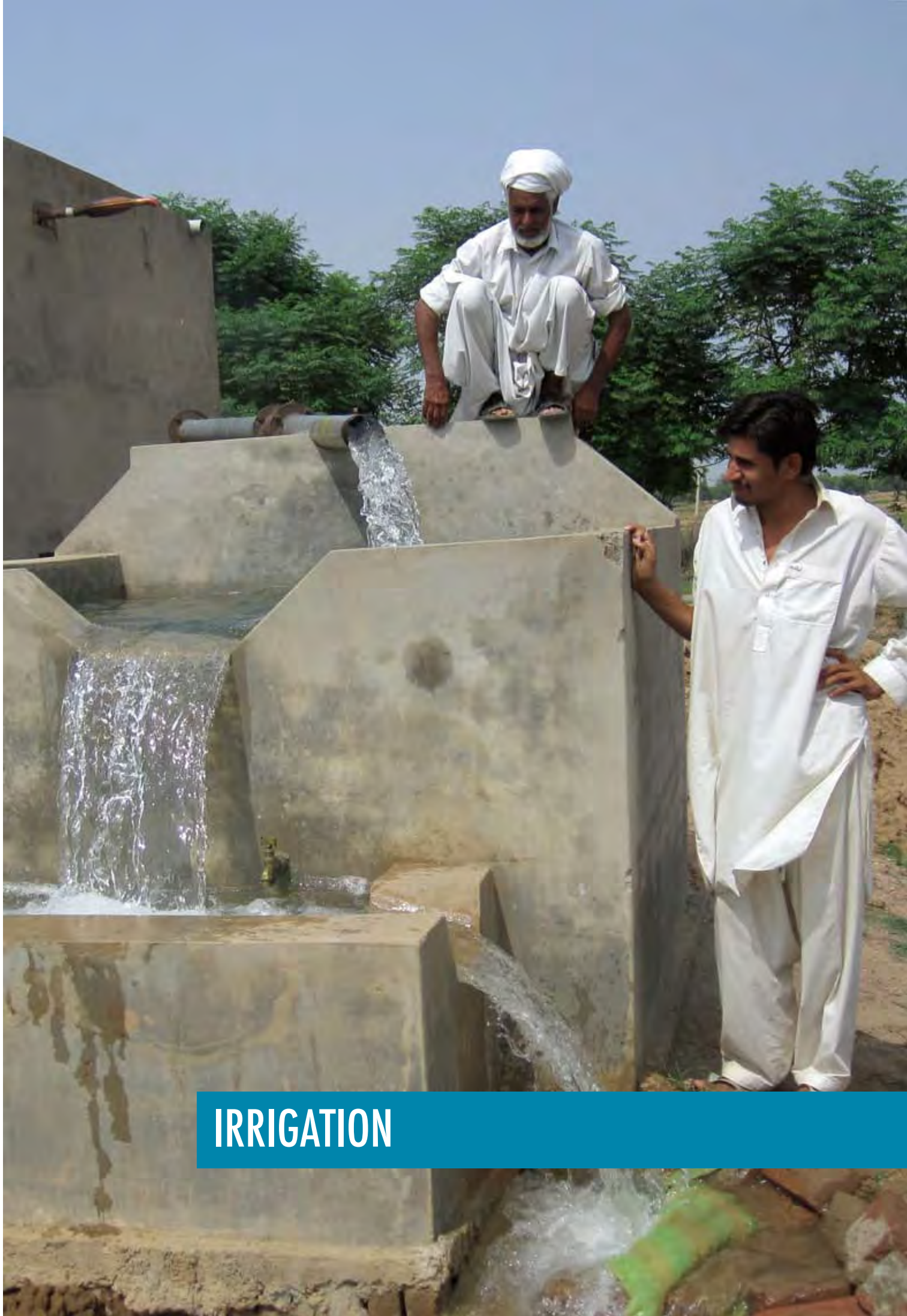
Table 2.33 Scheme Impacts

		Gravity	Mechanised	Dug Well	DWS Reservoir	All Schemes
Women's health	Large benefit	63.7	66.1	20.6	31.5	45.3
	Some benefit	9.3	27.8	44.0	41.1	28.8
	No benefit	11.9	6.1	32.6	26.9	19.9
	Negative effect	1.5		2.9	0.5	0.6
	Don't know	13.7				5.4
Children's health	Large benefit	54.4	66.6	17.1	31.1	41.2
	Some benefit	8.9	23.5	36.6	40.6	26.2
	No benefit	17.0	8.7	40.6	26.5	23.7
	Negative effect	1.1	0.9	0.6	0.5	.8
	Don't know	18.5	0.9	5.1	1.4	8.1
Women's free time	Large benefit	77.0	66.1	35.4	34.7	54.2
	Some benefit	13.3	27.8	36.0	25.1	23.9
	No benefit	5.9	6.1	25.7	40.2	20.0
	Negative effect	0.4		1.7		.5
	Don't know	3.3		1.1		1.4
Children's free time	Large benefit	40.7	57.4	11.4	18.3	30.3
	Some benefit	11.9	29.6	27.4	21.9	20.8
	No benefit	25.2	9.6	53.7	56.2	38.0
	Negative effect			0.6		.1
	Don't know	22.2	3.5	6.9	3.7	10.8

Table 2.34 shows perceived impact in terms of schemes with and without distribution lines. It clearly shows that schemes with distribution lines are associated with higher incidence of 'large benefits'. Moreover, no interviewee using schemes with distribution lines reported negative impact. This is as expected, particularly regarding leisure.

Table 2.34

	Women's health		Children's health		Women's free time		Children's free time	
	With DL	Without DL	With DL	Without DL	With DL	Without DL	With DL	Without DL
Large benefit	58.6	37.4	51.4	35.2	66.9	46.6	34.8	27.6
Some benefit	21	33.3	19.7	30.1	21.7	25.2	20.0	21.3
No benefit	9.3	26.2	14.1	29.4	8.6	26.8	27.2	44.4
Negative effect		1		1.2		.8	17.9	.2
Don't know	11.0	2.0	14.8	4.1	2.8	.6		6.5



IRRIGATION

3 IRRIGATION

3.1 Overview

Thirty-eight percent of RSP CPIs are of irrigation schemes. As of June 2009, RSPs' had completed 7,324 irrigation schemes, with target beneficiaries of 321,517 households. The average cost per scheme was Rs. 432,958, with a 27 percent contribution by the community. Table 3.1 shows the details by RSP.

Table 3.1 RSP Irrigation Schemes – 1982 to 2009

	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Total / Average
Irrigation CPIs	1,811	383	2,958	1,229	350	359	234	7,324
Beneficiary Hhd per CPI	69.0	41.0	30.7	75.1	35.6	54.0	52.1	48.4
Cost per CPI (PkR '000)	510	651	386	372	316	535	397	432
CO contribution (%)	21.1	24.9	28.5	25.6	21.8	24.5	22.5	26.7
Source: CPI data provided by RSPs'								

The schemes are very diverse. They can be stratified into 41 subtypes, grouped into six categories: drip/sprinkle irrigation, hand pumps, irrigation channels or pipes, lining of water courses, dams/reservoirs/tanks and others. Table 3.2 shows the percentage distribution of schemes according to these groups.

Table 3.2 RSP Irrigation Schemes by Category (%)

	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Total
Drip or Sprinkler	0.0	0.0	1.4	0.0	5.7	1.1	12.4	1.3
Hand Pump	0.4	0.0	0.0	0.0	8.6	0.0	12.4	0.9
Channel or pipe	92.9	43.3	32.4	0.7	46.9	40.7	8.5	42.9
Water Course Lining	0.2	3.7	63.0	99.2	36.6	49.0	15.4	47.0
Dam/Reservoir/Tank	6.2	53.0	3.2	0.0	2.3	9.2	50.4	7.8
Other	0.2	0.0	0.0	0.1	0.0	0.0	0.9	0.1
Total	100	100	100	100	100	100	100	100

Source: CPI data provided by RSPs'

The table shows, over 90% of schemes fall into two categories: conveyance (i.e. channels or pipes) and water course lining. (The first of these includes the underground water channels known as Karez.) For the survey 40 conveyance schemes were selected and 40 water course lining schemes. (See Annex – III, for details of sampling methodology.)

However, analysis of the survey results has shown that the 80 surveyed schemes need to be reclassified into four groups: water channel lining (37 schemes), conveyance (18 pipe + 2 channel), tubewell with pump (15), Karez (2 rehabilitation + 2 extension). Four schemes have been classified as miscellaneous.

3.2 Technical Assessment

3.2.1 Scheme Specification

Table 3.3 Irrigation Scheme Details

Scheme Type		Pipe Length (m)	Channel Lining Length (m)	Channel Length (m)	Dug well Depth (m)	Tube well Depth (m)	Pump Power Horse power	Karez – Rehab. Length (m)	Karez – Extend Length (m)
Pipe	Mean	731.9					30.00		
	N	18.0					1		
Channel	Mean	30.5	3506.00	2235.00					
	N	1	1	2					
Dug Well	Mean				13.00				
	N				1				
Tube Well	Mean	664.78	77.41			64.43	23.78		
	N	7	5			15	14		
Karezrehab	Mean							678.81	146.31
	N							2	1
Karez Extend	Mean								188.05
	N								2
Channel Lining	Mean	36.50	961.64						
	N	2	37						
Misc	Mean	119.17	13.58		7.31	45.72	23.50		
	N	2	1		1	1	2		
Total	Mean	605.68	897.44	2235.00	10.15	63.26	23.75	678.81	174.14
	N	30	44	2	2	16	16	2	3

The engineer on each survey team reviewed the schemes as-built in comparison with the specifications shown in the RSP records. They were asked to record the match between Design and Actual in terms of length, width and depth, materials and equipment. The match was assessed on a scale of 'Exact', Equivalent', 'Partial', 'No Match' and 'Not Existing'.

Only 2 out of 80 schemes were found not to be an Exact or Equivalent match to the specification, in terms of the principal parameter: i.e. length for conveyance and channel lining, depth for wells. Similar levels of match to specification were found across the other parameters. The conclusion – that the schemes were constructed to plan – is so clear that no further details need to be presented.

Table 3.3 presents statistics on the main features of the different schemes. They can be summarised as follows:

PIPE SCHEMES (18) – With an average length of over half a kilometre and pipe diameter between 10 and 15 centimetres, these are quite substantial schemes.

CHANNELS (2) – Of the two channel schemes, one was of a similar length, 900 metres but one was much longer at over 3 kilometres.

TUBEWELLS (15) – Tubewells were between 50 and 100 metres deep and powered by pumps of 20 to 30 horsepower. About half had distribution pipes with an average length of more than 600 metres. The alternative was lined channels, for distances below 100 metres.

KAREZ (4) – The average length of rehabilitation was nearly 700 metres but extensions were less than 200. Each Karez had two or three mother wells.

CHANNEL LINING – An average of 962 metres was rehabilitated at each scheme.

3.2.2 Scheme Cost and Construction

The survey covered CPIs built between 2000 and 2008. For irrigation, the surveyed schemes were spread throughout that period, apart from a concentration of Water Channel Lining CPIs in 2006 and 2007: 20 out of 40.

Table 3.4 summarises average costs for the four main categories of scheme.

Table 3.4 Average Costs Per CPI – Pk Rupees

	Pipe	Tube Well	Karez	Lining	All
N	18	15	4	36	79
Cost – PkR:					
Mean	1,107,154	383,555	221,765	568,514	633,273
Max	8,237,741	592,449	268,480	2,577,133	8,237,741
Min	114,631	144,212	155,400	109,636	106,642
% Make Up:					
Material	33.4	75.1	4.6	65.2	53.2
Equipment	46.4	7.3	1.1	2.5	20.3
Skilled Labour	5.1	10.1	84.0	12.4	10.4
Unskilled Labour	6.3	6.9	8.7	17.6	11.6
Others	8.7	0.6	1.4	2.3	4.5

It has not been possible to take out the impact of Inflation over the period eight year period in which the CPIs were built. Subject to that qualification, the following patterns can be identified:

PIPE SCHEMES – At over PkR 8 million, one very large scheme distorts the total cost figure. If it is excluded, the average falls to PkR 688,000. This still leaves Pipe Schemes as the most expensive category. The proportion of expenditure on unskilled labour, i.e. on potential employment for the community, was low.

TUBE WELLS – Perhaps surprisingly these relatively technical schemes were not especially expensive. As expected, materials and skilled labour were the major costs.

KAREZ – Cost for the rehabilitation and extension schemes were very similar so they are analysed as one group. The high proportion spent on skilled labour reflects the special nature of the methods used to build these traditional underground water channels. By coincidence, the average length of Karez rehabilitated is quite close to the average length of the Pipe Schemes. It is notable, therefore, that the Karez cost per CPI is only 1/3 of the cost, giving a much lower cost per metre.

LINING – These were the only schemes which offered significant employment for unskilled labour.

ALL SCHEMES – If the PkR 8 million Pipe Scheme is excluded the average cost for all irrigation CPIs was PkR 536,000, of which only 10% went to unskilled labour.

Table 3.5 summarises the community contributions to the CPI as a percentage of the total cost. Two types of scheme stand out. On Pipe Schemes the average contribution of 14% is well below the RSP norm of 20%. (Once again this is distorted by the very large PkR 8 million scheme, where the community only contributed 5%. Without that, the Pipe Scheme contribution was 19.3%.) At the other extreme, communities contributed 30% for Channel Lining, presumably because they came under a project with that requirement.

Table 3.5 Community Contributions for Irrigation CPIs

	Pipe	Tube Well	Karez	Lining	All
N	18	15	4	36	78
Community Contribution - %	13.5	25.7	22.3	30.0	22.4
Material					
No. of Communities	14	10	3	30	62
Av. Contribution PKR	74,419	121,192	3,562	88,051	87,032
Skilled Lab.					
No. of Communities	6	5	3	15	33
Av. Contribution PKR	103,062	29,336	44,000	65,764	60,043
Unskilled					
No. of Communities	13	15	3	33	69
Av. Contribution PkR	74,737	26,659	8,333	86,599	64,146
TOTAL					
No. of Communities	18	15	4	35	78
Av. Contribution – PkR	148,974	98,726	49,278	170,593	141,867

The table shows how most, but not all, communities contributed materials and unskilled labour. About a third also contributed skilled labour. Only a small minority of communities (4/78) contributed to the cost of equipment.

Survey engineers were asked to investigate how well the CPIs had been implemented in terms of adherence to the plan timeline and budget. Of 80 CPIs, only eight were not completed on time. Three of these were Pipe Schemes. In four cases the delay was caused by conflict in the area. In two cases fund disbursement was delayed.

Out of 79 valid records, only two schemes overran the budget. One case was attributed to poor community management of labour and materials, the other to inflation.

In summary, the majority of RSP irrigation CPIs surveyed were found to have been implemented to plan and budget.

3.2.3 Condition

Two aspects of scheme condition were assessed, Functionality and Maintenance. The first was

defined in terms of utilisation as a percentage of the targeted households, the second in terms of percentage water losses:

Percent Target Beneficiaries Using the Scheme (During the Last Year)

Fully Functional – Over 70%

Partially Functional – 40 to 70%

Limited Functionality – 10 to 40%

Not Functional – Less than 10% or not used in last 3 months

Maintenance

Fully Maintained – no water losses and no physical damage

Partially Maintained – up to 25% water losses and poor physical condition

Limited Maintenance – more than 25% water losses

Not Maintained – Not working for last 6 months

These definitions are potentially ambiguous, especially for irrigation schemes. People might not use a scheme that is perfectly functional: because crop markets are bad, because of conflict, because the water authorities do not supply water to the main canal and many other reasons. For seasonal irrigation, a working scheme might only be used three months in a year. And water losses are not the only measure of poor maintenance.

These difficulties are highlighted by the fact that the survey engineers found many schemes where they could not measure discharge, because the scheme was not operating in the winter season, the time of the survey, or because the canal supplying the CPI was not full at the time.

Subject to that qualification, almost all schemes (78/80) were assessed as Fully Functional, used by over 70% of the target beneficiaries. However, some 20% of schemes were assessed as less than Fully Maintained. Tube Well CPIs were the most affected, with three schemes (20%) in poor condition and two Not Maintained, i.e. non operational.

3.3 Institutional Assessment

The Community Questionnaire, completed in a focus group discussion with CO members, focussed on institutional aspects of CPI implementation and management.

3.3.1 RSP Technical Support

Table shows the average number of visits made by SO, engineer, and any other during the planning/ design/ survey and construction phases of each CPI, and after completion of the scheme. With some 14 visits during planning and 35 during construction, the figures indicate the high level of RSP support provided to the CO. Three schemes were not visited after completion and, as might be expected, but both SOs and engineers made several visits to the others.

Table 3.6 Visits by SO, Engineer, and Any Other

Visitors	During planning			During construction			After completion		
	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev
Social Organiser	80	7.98	9.903	80	14.40	13.612	77	13.52	16.446
Engineer	80	6.21	8.729	80	21.81	18.651	77	7.70	8.844
Any other	13	1.62	1.325	23	3.17	3.950	26	2.27	2.201

Analysis according to the four different CPI types showed that Karez schemes were visited somewhat less frequently than the other classes, especially by the engineers during construction. At the other end of the scale, Channel Lining schemes received the most intensive RSP support: eg 15 SO and 25 engineer visits during construction. For Karez, the figures were 19 SO visits and 7 engineer visits.

3.3.2 CPI Management Committees

Standard RSP practice is that COs should form three committees to manage a CPI: an Implementation Committee, a Finance/Audit Committee and an Operation and Maintenance Committee. The survey recorded how many schemes had these committees and the following aspects of their operation:

- committee membership
- participation in their formation
- training received
- CO members satisfaction or not with the committees' work

The following tables show the percentage of irrigation schemes for which the Implementation, Audit, and Operation and Maintenance committees were formed and the membership of the committees. Between 7.5% and 10% of schemes did not have at least one of the committees. This varied across the different types. All Tube Well and Karez CPIs had the full set of committees, but 11% of Pipe and Channel Lining CPIs had no committees.

Table 3.7 Committee Formation

		Frequency	Percent
Was a project implementation committee formed?	Yes	73	91.3
	No	7	8.8
Was a Finance/Audit committee formed?	Yes	74	92.5
	No	6	7.5
Was an Operation and Maintenance committee formed?	Yes	72	90.0
	No	8	10.0

Table 3.8 shows the average number of members of the relevant committees. The Implementation Committee is on average the largest with about 4 members, followed by the Operation and Maintenance and Audit committees with about 3 members each. An analysis of frequency shows that no committee had membership lower than the stipulated minimum 2 members. However, over half of schemes only had this minimum number, indicating perhaps that only CO activists or office holders were fully engaged with the CPI. The figures for Implementation Committees make the point.

Table 3.8 Number of Committee Members

	N	Mean	Std. Deviation
Implementation committee	73	3.67	3.84
Finance/Audit committee	74	2.92	1.58
Operation & Maintenance committee	72	3.17	1.69
% Implementation Committees with 2-Member Minimum:			
Pipe			43.8
Tube Well			46.7
Karez			25.0
Channel Linning			56.3

The Focus Group was asked who took part in forming the different committees. The ideal category of 'All CO members' was reported for 76.3%, 75%, and 73.8% of the Audit, Operation and Maintenance, Implementation committees, respectively. Only 5% reported that the committees had been formed by the CO leadership, without consultation. By scheme type, the cases where only the CO leadership was involved were concentrated in the Pipe and Channel Lining schemes, matching the result above that it was in these sectors that CPIs without any committees were found.

Training for CPI management committees is an important part of the RSP support service. However, only half of COs reported that their committees had had function specific training. : 51% for implementation committees, 54% for finance & audit and 46% for O&M. The figures were higher than the average on Channel Lining schemes, where two thirds of CPI committees had been trained.

COs were universally satisfied with the work of the committees. Three quarters reported 'all members' as satisfied and the remainder said it was 'most members'. The proportions were very similar across all scheme types.

3.3.3 Participation in Scheme Management

Table 3.9 Participation in CO Needs Identification, Planning, Implementation, and Operation

	Participation in							
	Need identification		Planning and design of the CPI		Implementation of the CPI		Operation and maintenance of the CPI	
Who participated?	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Only CO/VO office bearers	20	25.0	15	18.8	21	26.3	21	26.3
All CO members	46	57.5	32	40.0	41	51.3	45	56.3
Mostly done by RSP Engineer/SO	4	5.0	30	37.5	6	7.5	1	1.3
Anyone else	10	12.5	3	3.8	12	15.0	13	16.3
Total	80	100.0	80	100.0	80	100.0	80	100.0

In the focus group discussion, the survey sought information on CO members participation in the planning, implementation and operation of the scheme. The groups were also asked about how money for the CO contribution was collected. Table 3.9 shows that all CO members were reported to be involved in needs identification and operation and maintenance at around 56% of schemes, and slightly fewer (51%) for implementation. The percentage falls to 51% for implementation. The

lowest proportion was for planning and design. This was because this work was 'mostly done' by RSP staff at nearly two fifths of CPIs. At a quarter of schemes, only CO or VO office bearers participated, indicating how a small group of activists are dominant at a significant minority of schemes.

At only one scheme did the focus group report that the CO had not contributed to the construction of the CPI. The groups were asked how they organised the collection of money for the CO contribution. At 57.5% of schemes, members contributed according to their share of the benefits from the scheme. At 22.5%, members made 'equal share' contributions and at 16.3% of schemes, contributions were based on 'ability to pay'. 'Share of benefits' was particularly important on Tube Well and Channel Lining CPIs, where 80% of schemes are using this option.

Table 3.10 shows a breakdown of CO contributions. A number of points can be noted:

- Cash contributions were the most frequent, at 7 out 8 schemes, but labour contributions were made at over two thirds of schemes and in-kind contributions at nearly 40%.
- Non CO member households contributed at over half of all schemes. Their cash contributions were nearly equal to member contributions but labour contributions were much lower.
- The technical assessment reported an average CO contribution of PkR 141,867 (See Table 3.5). In theory, the total of the 'Mean with Zeros' figure in this table should be the same. The actual total is PkR 94,000, before the labour contribution is valued. This is a good match, providing a cross check for the data.

Table 3.10 Contributions by CO Members, Other Beneficiaries and Outsiders

	N	Mean	Std. Dev'n	Mean with Zeros
CO MEMBERS:				
No of contributing Hhds	80	32	58	32
Total cash contributed	71	63854.62	62152.54	56670.98
Total labour days contributed	55	1181.27	2129.65	812.13
Contribution in kind PkR	30	25048.33	54411.88	9393.13
OTHER BENEFICIARIES:				
No. of contributing Hhds	44	35	42	19
Total cash contributed	35	58461.57	61576.27	25576.94
Total labour days contributed	29	186.69	267.04	67.68
Contribution in kind	11	8109.09	10222.96	1115.00
OUTSIDERS:				
No. of contributing Hhds	2	2	1	1
Total cash contributed	2	61250.00	54800.77	1531.25
Total labour days contributed	1	60.00		0.75
Contribution in kind PkR	0			0.00

Note: Mean = For schemes where there was a contribution in that category, i.e. excluding zero values. Mean with zeros = for all 80 schemes surveyed.

3.3.4 Scheme Operation and Maintenance

Focus groups were asked to report how the scheme had operated over the last 12 months and describe how they managed operating and maintenance costs.

Nine schemes were reported to be non-operational, for between one and twelve months. Table 3.11

gives the details. The reasons for breakdown depend on the scheme type. As might be expected, mechanical breakdown affected Tube Well CPIs. However, three schemes (i.e. 20%) were reported to be out of use because there were other, presumably better sources available. Pipe and Channel Lining schemes were both affected by climate: rain, snow and floods. There were also two pipe schemes affected by conflict.

Table 3.11 Non-Operational Schemes By Months Out of Use and Cause

Scheme type	No.of months	Reasons for being Non-Operational						
		Machinery out of order	Rain/Snow / Floods	No Water at Source	Conflict over CPI	Alternative Available	Leakage	Total
Pipe	1				2			2
	4		1					1
	5		3					3
	6		2					2
Total			6		2			8
Tube Well	1	1						1
	2	1				1		2
	4					1		1
	10					1		1
Total		2				3		5
Lining	1		1	1			1	3
	2						1	1
	3		1					1
	4		1					1
	5		1					1
	6			1				1
	12			1				1
Total			4	3			2	9

38 out of the 80 CPIs surveyed reported that they have regular operating costs: 32 with fuel/utility bills and 12 with paid labour. One scheme had unpaid labour. The proportion reporting fuel costs is difficult to explain, as these would only be expected at tubewell schemes with powered pumps. 11 Pipe CPIs reported fuel bills and six Channel Lining CPIs. This presumably indicates that a significant proportion of these schemes are extensions or rehabilitations of existing schemes.

The average monthly fuel bill was PkR 13,420 per scheme. At schemes with paid labour, the average monthly cost was PkR 4,360. The question 'Who decides on user fees' to collect money for operating costs drew the wide range of responses shown in the table. It is noticeable that scheme operation appears to have been outsourced (tubewell owner/contractor/other) at a significant minority (10%) of schemes.

Table 3.12 Who Decides on User Fees

		Frequency	Percent
Who decides about the rate of user fee for recovering operating costs?	The O&M committee	7	8.8
	The CO leaders	8	10.0
	All CO members	8	10.0
	All beneficiaries	11	13.8
	The tubewell/motor owner	2	2.5
	Contractor	1	1.3
	Others	5	6.3
	No Operating Costs	38	47.5
	Total	80	100.0

RSPs' advise COs to establish a Maintenance Fund, and contribute a percentage of the fund costs to set the fund up. The survey sought information on how these funds are being used. 71% of COs (57) reported that they have a Maintenance Fund. The majority keep it in a bank account but the Project Committee holds it at two COs. Of the 57 funds, five were reported to have nothing in them. For the remainder, the average fund was PkR 19,502 ($234): highest on Pipe schemes (PkR 37,000) and lowest on Tube Well and Karez schemes (PkR 9,000). The majority of COs with a maintenance fund reported that it covered all (24 COs) or most (20) of the cost of maintaining the CPI. 4 COs reported that it covered none of the cost, presumably those which had nothing left in the fund.

However, more than half the CPIs which have a maintenance reported that they do not use it. The proportion using the fund was highest for tubewells (63% of those with a fund) and lowest for channel lining schemes (35%). Overall, only 38% of CPIs have and use a maintenance fund.

Of 80 CPIs surveyed, 'all' or 'most' CO members contribute to maintenance at 64, and 'all' or 'most' non-member beneficiaries contribute at 38. The most common option was for beneficiaries to contribute in proportion to their share of the benefits (39/80). Other options were on 'equal shares', at about a fifth of schemes, on 'ability to pay' at another fifth. Across the different scheme types, 'proportional to benefit' was commonest at all types except Pipe, where 'ability to pay' was the most frequent.

A related question concerned when money is collected: as a 'regular charge' or 'when needed'. The second option is the most common across all schemes. If there is one standard approach, across all schemes, it is to collect money when it is needed and in amounts that are proportional to the benefits each household gets from it.

Responses to a question about who makes decisions on using the maintenance fund were similar to those about decisions on operation and maintenance above: O&M committee (10 COs); CO Leaders (13) and All Members (12) were the three commonest options, but there was a large group which reported 'Others' (15 COs).

It might be expected that COs with an active maintenance fund would be more likely to make a regular maintenance charge to keep the fund topped up. In other words, these would be the COs which are managing their scheme maintenance in a more organised way. To test this Table 3.13 analyses the relationship between the way money is collected and the use of the maintenance fund. It gives some slight support to the idea but the fact remains that the majority of COs which use their fund still collect the money ad hoc, ie 'when needed', not as a regular charge.

Table 3.13 Relationship between Method of Collection and the Use of Maintenance Funds

		How COs collects money for maintenance			
		Not applicable	Regular charges	When needed	Total
Maintenance fund used	Yes	0	9	16	25
	No	8	9	38	55
	Total	8	18	54	80

3.3.5 Scheme benefits and Impacts

Focus groups were asked to say how many households are currently using the CPI as their primary source of irrigation water. If any are only using it as a secondary source, or not at all, they were asked to explain why. Their opinions on the main benefits of the schemes and details of any problems and conflicts were also sought.

Table 3.14 shows the average numbers of households reported to be using the CPI as their primary or secondary source of irrigation water, compared with the target number of beneficiary households, i.e. the number planned for in the scheme design. It shows that five schemes were reported to have no households using it as their primary source but that the average for schemes with primary beneficiaries was some 15% higher than the average target.

Asked why some households were not using the CPI, or only using it as a secondary source, there was one important reply: that they had access to another source (14 COs). None of the other possibilities was reported at more than one CPI.

Table 3.14 Targeted, Primary, and Secondary Beneficiaries of Irrigation Schemes

	N	Mean	SD
Targeted beneficiary households	80	53.78	81.787
Households using CPI as 1ary source	75	61.56	97.336
Households using CPI 2ary source	18	20.44	19.880

Focus groups were asked if there were any problems with the scheme at the time of interview. 23 of 80 groups said that there were. 19 CPIs needed repairs and 4 had insufficient water.

As might be expected, increased water for farming was by far the commonest main benefit reported from the irrigation CPIs: at 83% of CPIs. 10% gave time saved as the main benefit and 5% improved income.

3.4 Household Survey

At each of 80 irrigation CPIs surveyed, 10 households were to be interviewed. In the event, less than 10 were interviewed at 14 schemes and only 754 questionnaires were completed. For some reason, the biggest shortfall, 23 questionnaires or 13% of the target, was at the Piped schemes.

3.4.1 Household Characteristics

Household structure among the beneficiaries of surveyed irrigation CPIs was as follows

Table 3.15 Household Size

	Mean	SD
Household Size	9.19	5.50
Adult Male	2.55	1.64
Adult Female	2.49	1.64
Male Children (<18)	2.11	1.93
Female Children (<18)	2.05	2.17

There were no large differences in structure between the different scheme types, beyond the fact that households at the four Karez schemes were larger and had more children: 10 people on average with nearly to five children per household.

Of 754 beneficiary households, just over one quarter were not members of the CO which sponsored the CPI. The proportion of non-members was highest at the two Channel Schemes (37%) and the Channel Lining Schemes (34%). Non member household sizes were not significantly different from the overall average: 9.32 compared to 9.19.

3.4.2 Scheme Participation

Beneficiaries were asked about their involvement in planning and managing the CPI. The Table 3.16, summarises the results for the four principal scheme types. It shows clearly that nearly all CO members participated in the planning process but that less than half of the non-member beneficiaries were involved. The exception was at the Tubewell schemes where nearly three quarters of non-beneficiaries did participate. In nearly 95% of households, it was a man who participated in the planning. Again Tubewells were an exception with 7% of households involving a woman. Female involvement was even lower for non-member households, just 2%.

Household contributions to the CPI followed a similar pattern. Over 90% of CO members contributed and 68% of non members. Nearly two thirds paid in cash, an average of PkR 5,500 per household. Half of beneficiary households contributed labour: 28 days per household. For Pipe schemes, average cash and labour contributions were higher, with relatively fewer households contributing cash and more contributing labour. Cash and labour contributions were both lowest on Karez schemes. A smaller proportion of non-members contributed cash (50%) and the average contribution of PkR 3,361 was barely 60% of the average. Their labour contribution was also lower, only 41% of households, although they contributed exactly the same 28 days as CO members.

Of 461 households which contributed cash, the majority contributed less than PkR 5,000, and 87% less than PkR 10,000. However, there were also some much larger contributions, including two over PkR 450,000. Almost all of these came from CO members.

Beneficiary participation in scheme maintenance during the last years was much lower: barely a third overall. For those who were not CO members it was less than 20%. There were clear differences between the scheme types. At Karez schemes, nearly 70% were involved in maintenance, and over 40% at Pipe schemes. For those who contributed, the average cash contribution to maintenance was PkR 2,032. Average labour days were 9.66. As for scheme construction, CO members contributed more than non-members.

Table 3.16 Beneficiary Participation in the CPI

	Pipe	Tube Well	Karez	Lining	All
N	157	141	40	363	754
% HHDs Participating in the Planning:					
All Beneficiaries	82.2	92.2	87.5	79.9	84.0
CO Members	93.7	95.1	97.0	95.8	95.5
Non-Members	35.5	73.7	41.7	49.2	50.8
% HHDs Contributing to the CPI					
All Beneficiaries	84.7	87.2	82.5	87.0	86.9
CO Members	93.7	90.2	83.4	95.8	93.6
Non Members	48.4	68.4	66.6	70.2	67.7
Make up of Contributions to CPI					
Cash					
% of HHDs	42.0	78.0	60.0	64.5	61.1
Average PkR/HHD	6,857	6,338	3,582	4,984	5,491
Labour					
% of HHDs	60.5	49.6	27.5	49.0	51.9
Av. Days/HHD	42	21	10	24	28
% Households Participating in Scheme Maintenance					
All Beneficiaries	42.7	33.3	67.5	24.0	34.2
CO Members	48.4	36.9	74.4	28.9	39.5
Non-Members	19.4	10.5	45.8	14.5	19.0

3.4.3 Household Satisfaction with the CPI

Interviewees were asked a range of questions about how they rated the CPI. The results can be summarised as follows:

There were no obvious patterns of difference between scheme types on these measures of satisfaction. Although non-member ratings were consistently below those from CO members, the differences were small. 83.5% of the members and 80% of the non-members rated the performance of the project committees as good. Similarly 85% of the members and 76% of the non-members rated the RSP support as good. When asked "is the CPI functional" 94 % of the respondents responded in yes, 87% of the responded reported decrease in water losses for the pip and lining schemes and 99% of the members and 96% of the non-members showed their satisfaction with schemes. Overall, these results reflect a solid vote of confidence in the RSP CPIs. For the small group who were not satisfied with the scheme, the main reasons given were irregular and insufficient water supplies.

The questionnaire also asked about problems during CPI construction and problems at the time of interview. Only 13 households reporting problems during construction, half came from two Pipe schemes which had problems raising funds and completing the CPI. 70% of the respondents responded in yes to the question of "Is the CPI safe from risk of closure.

11% of households reported current problems with the CPI. At Karez schemes it was 28% and at Pipe schemes, 19%. These relatively high levels of reported problems do not entirely agree with the very high levels of expressed satisfaction. Almost all the households reporting current

problems cited maintenance as the main issue. There was just one complaint about the way water is distributed.

3.4.4 Farmed Area

Farmers were asked to report how much land they farmed before and after the CPI was implemented. Table 3.16 shows the averages.

Table 3.17 Land Farmed Before and After the CPI – Kanals per Household

	N	Mean	SD
Land Farmed by sample Households Before CPI	736	51.96	85.48985
Land Farmed by sample Households After CPI	754	53.09	85.36950
Land Irrigated by Using CPI as a Primary Source	754	39.72	52.35185
Land Irrigated by Using CPI as a Secondary Source	754	3.02	12.46401

The table shows a relatively small overall change in farmed area but the averages conceal two things:

- 15 households reported no farm land before the CPI. Seven of these came from one Channel scheme and three from a Pipe scheme. This may or may not indicate that the schemes created additional land. It is also possible that these farmers bought land in the area and settled after the scheme was implemented.
- Of 754 farmers, four farmed less land 'after the CPI' and 109 farmed more, including the 15 who had no land 'before'. As before, it cannot be assumed that the increases in farmed area are directly attributable to the CPI.
- Whatever the cause, just 15% of households had different farmed areas after the CPI, with net increase of 15.77 kanals per household.
- The averages are influenced by a small number of large holdings, some 15% of households with more than 10 acres (80 kanal) and six per cent with more than 18 acres (144 kanal). This should not hide the fact that 35% have less than two acres and 70% less than the overall average of 50 kanals or six acres (See Table 3.18.).

Table 3.18 shows the results analysed by scheme type. It shows marked differences between them. Karez beneficiaries have less than two acres each (16 kanal), compared to nearly 8 acres at tubewell and channel lining schemes. This reflected the fact that both tubewell and channel lining schemes had some very large farms among their beneficiary households: 8% over 18 acres. Piped schemes fall midway at just over 3 acres on average.

It is inevitable that the greatest benefits of irrigation schemes will go to those who have most land. For that reason, the distribution of benefits needs to be analysed particularly carefully for this type of scheme. The table shows the distribution of households by size of land holding, as a good indicator of the distribution of benefits. The figures indicate that the benefits from tubewell and lining schemes were not distributed equally. Just a quarter of households had very small farms; and it can be estimated, approximately, that 18% of the benefits went to the 8% of farmers with farms of over 18 acres. At some individual schemes the disproportion was greater. There were two tubewell schemes and two lining schemes where two or three households farmed more than 25 acres each.

Table 3.18 Land Farmed by Scheme Type

	Pipe	Tube Well	Karez	Lining	All
Farm Area - Kanals Per Household:					
Before CPI	26.4	60.2	13.4	59.1	51.9
N	152	141	37	360	736
After CPI	29.3	60.8	14.0	61.1	53.1
N	157	141	40	363	754
Distribution By Size of Farm - % of Households (After CPI):					
< 2 Acres	47.8	24.1	85.0	26.2	33.7
2.01 – 4 Acres	29.9	22.7	10.0	18.5	22.1
4.01 – 6 Acres	7.0	17.0	0.0	16.3	13.1
6.01 – 8 Acres	4.5	9.9	2.5	7.7	7.2
8.01 – 10 Acres	1.9	9.2	2.5	8.3	6.6
10.01 – 18 Acres	8.2	9.2	0.0	18.1	10.7
> 18 Acres	0.6	7.8	0.0	9.1	6.6

It might be expected that CO members would have more land than non-members. Although correct, the different was slight – some 3 to 4 kanals per household. The difference was largest on tubewell schemes: some 20 kanals per household. On channel lining schemes, by contrast, the non-member average was fractionally higher than members.

3.4.5 Field by Field Analysis

To assess how the CPI had affected farmers' situation, they were asked to report their last year's cropping, field by field, and then to describe how their crops had changed since the CPI was constructed. First they were asked the basic characteristics of the fields, set out in Table 3.19. The following points can be highlighted.

- Households reported between two and three fields each, except at Karez CPIs where the average was less than two.
- Field sizes at tubewell and lining schemes were twice those at pipe and Karez schemes.
- Almost all fields were owned, with barely 5% sharecropped or rented.
- 90% of fields were within the CPI area.
- Over 90% of fields were irrigated in both Kharif and Rabi seasons, although the proportion was lower at tubewell schemes where only two third were irrigated in the Kharif.

Table 3.19 Field Characteristics

	Pipe	Tube Well	Karez	Lining	All
Number of Households (N)	157	141	40	363	754
Number of Fields (N)	411	322	62	986	1,899
Fields Per HHD	2.6	2.3	1.6	2.7	2.5
Average Field Size – Kanal	11.19	26.64	9.03	22.48	21.08
Per Cent Owned	96.1	95.0	98.4	93.7	94.6
Per Cent in CPI area	88.3	79.2	100.0	90.4	87.9
Per Cent of land Irrigated					
Kharif	86.1	66.2	100.0	98.0	93.6
Rabi	92.5	85.1	95.2	98.8	94.8

Table 3.20 summarises current cropping patterns by scheme type. It shows how almost all land was double cropped at all scheme types. At most schemes some 10% was fallowed in the Kharif season and as little as 3% in the Rabi. Piped schemes were one exception with nearly 20% fallow in the Kharif. At Karez schemes 13% was fallow in Rabi and only 2% in karif. Wheat was the dominant Rabi crop at all schemes, followed by fodder. Patterns were more varied in the Kharif. The most important crops were as follows:

Piped Schemes – Vegetables and maize

Tubewells – Cotton

Karez – Rice and tree crops (dates, etc)

Lining – Fodder, cotton and sugarcane

Table 3.20 Cropping Patterns By Scheme Type – 2009/10

	Pipe	Tube Well	Karez	Lining	All
Number of Households (N)	157	141	40	363	754
Kharif Cropping – Percent of Fields:					
Fallow	19.1	8.3	1.6	9.7	11.9
Fodder	6.8	12.3	11.3	23.9	17.1
Cotton	2.2	27.4	0.0	16.7	14.6
Maize	18.8	8.0	0.0	6.6	9.8
Rice	5.1	8.6	33.9	9.3	9.3
Vegetables	22.0	5.8	8.1	2.8	8.0
Sugarcane	0.0	8.6	0.0	11.8	7.7
Bajra	3.4	4.0	0.0	6.7	5.4
Nuts, Fruit	8.0	2.5	45.2	2.7	5.0
Mung	8.0	0.3	0.0	2.2	2.9
Jowar	1.0	5.8	0.0	1.2	2.0
Total area (Kanal)	3,995	7,557	548	20,878	36,684
Area Per HHD (Kanal)	25.4	53.6	13.7	57.5	48.7
Rabi Cropping – Percent of Fields					
Fallow	8.5	2.8	12.9	2.9	4.4
Wheat	55.6	72.9	45.2	56.7	59.4
Fodder	16.4	12.0	12.9	19.4	17.1
Vegetables	13.8	2.5	11.3	6.6	7.6
Sugarcane	0.0	7.4	0.0	4.5	3.6
Nuts, Fruit	2.4	0.0	0.0	3.1	2.1
Chana	0.0	0.0	0.0	3.3	1.8
Total area (Kanal)	4,511	8,435	528	21,691	39,269
Area Per HHD (Kanal)	28.7	59.8	13.2	59.8	52.1

Almost all the land was irrigated in both seasons. In the Kharif 4% of cropped fields were reported not to be irrigated: mostly maize, jowar and bajra at Piped and Tubewell schemes. In the Rabi it was nearly 5% of cropped fields, almost all of it wheat at Piped and Tubewell schemes.

A key objective of the survey was to identify how the CPI had changed the way households managed their farms. The first step was to identify how much additional land had been brought under irrigation. To do this households were asked to say which of the fields within the scheme command area had not been irrigated before the CPI. Table 3.21 presents a summary. As

expected, at the channel lining schemes only 7% of fields were newly irrigated. At the other schemes, it was between 30 and 40%. In area terms, this meant that 40% of the irrigated area at Pipe and Karez schemes was additional as the result of the CPI[4]. At Tubewell and Lining schemes it was 17% and 7% respectively.

Farmers were also asked to state what crops were grown in each field before and after the construction of the CPI. The same table analyses this data to show how the CPI has affected cropping patterns. The following conclusions can be drawn:

Pipe Schemes – The fallow area in both seasons has fallen by around two thirds. In Kharif over 40% of land was fallow before the CPI, falling to 16% after. In Kharif most of the additional cropped land has gone into fodder and vegetables. In Rabi, most went to wheat followed by fodder and vegetables.

Karez Schemes – Fallow areas have fallen. Most of the additional land has gone to rice in the Kharif and wheat in Rabi.

Tubewell and Channel Lining Schemes – Changes were relatively minor although fallow areas did fall.

Table 3.21 Changes in Field Irrigation Status and Cropping Post CPI

	Pipe		Tube Well		Karez		Lining		All	
N – Households	157		141		40		363		754	
Proportion of Fields Irrigated Before the CPI:										
% of Fields	62.7		66.5		72.6		93.5		80.3	
Incremental Area:										
% of Area	41.0%		16.4%		39.1%		6.6%		13.9%	
Kharif Cropping – Percent of Fields By Crop:										
	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI
Fallow	42.7	15.6	6.8	5.6	14.5	3.2	11.6	7.8	19.1	9.3
Fodder	6.6	6.1	9.3	10.6	9.7	11.3	23.5	23.3	16.2	16.4
Cotton	1.9	2.2	23.3	26.7	0.0	0.0	14.0	14.4	13.2	13.3
Maize	7.8	17.3	5.9	5.9	0.0	0.0	6.7	6.4	6.8	8.8
Rice	1.0	4.6	7.5	7.1	24.2	33.9	6.2	8.5	6.0	8.6
Vegetables	6.6	20.4	1.6	4.0	6.4	8.1	1.8	2.4	3.2	7.1
Sugarcane	0.0	0.0	5.3	7.5	0.0	0.0	11.8	10.2	7.2	6.7
Rabi Cropping – Percent of Fields By Crop:										
	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI	Pre CPI	Post CPI
Fallow	24.8	8.0	3.7	2.2	24.2	11.3	5.7	2.5	10.6	3.9
Wheat	42.3	49.9	60.2	57.5	38.7	46.8	50.5	52.6	50.1	52.9
Fodder	11.2	14.6	10.2	10.9	12.9	12.9	17.2	18.0	14.2	15.6
Vegetables	7.3	11.9	0.9	1.6	6.4	11.3	5.2	5.8	4.9	6.6
Sugarcane	0.0	0.0	4.0	6.5	0.0	0.0	3.7	4.0	2.6	3.2

Farmers also reported their estimated yields (in maund per acre) for the different crops before and after the completion of the CPI. Table 3.22 summarises the results for the six principal Kharif crops and three principal Rabi crops.

4 It should be noted that Karez extension and rehabilitation schemes are lumped together. Most of the additional area is the result of the extension schemes.

It is important to note that not all the change in yield, or indeed any of it, is necessarily attributable to the impact of the CPI. Changes in market prices for produce and agricultural inputs and many other factors may be dominant. This is underlined by the fact that average reported yields for two crops – cotton and rice – actually fell post CPI. Those apart, most crops showed increases of between 30 and 40 percent. However, high variability means that only one of the nine results is statistically significant, that for wheat.

Table 3.22 Comparison of Yields Pre and Post CPI

Crops	N	Maund/ Acre	% Change	SD	Significance
		Kharif Crops:			
Cotton: Pre CPI Post CPI	237 238	91.0 87.8	- 3.52	312.906 133.178	ns
Fodder: Pre CPI Post CPI	269 263	204.9 275.1	34.27	435.379 615.435	ns
Vegetables: Pre CPI Post CPI	60 59	26.8 37.7	40.44	45.156 60.610	ns
Maize: Pre CPI Post CPI	112 112	42.2 59.1	39.91	73.526 100.801	ns
Rice: Pre CPI Post CPI	110 110	125.8 118.1	- 6.17	317.47 181.311	ns
Sugarcane: Pre CPI Post CPI	89 89	1,094 1,417	29.47	1427.597 1596.200	ns
Rabi Crops:					
Wheat: Pre CPI Post CPI	893 901	65.1 90.2	38.52	121.085 171.863	99%
Fodder: Pre CPI Post CPI	249 249	165.1 214.4	29.82	315.195 382.404	ns
Vegetables: Pre CPI Post CPI	89 90	30.5 44.0	44.32	67.489 94.211	ns

Respondents were asked if they had any land in the CPI command area which they had not irrigated. 41 households (5%) said that they had, an average of 20 kanals each: about half the overall average household holding. The principal reasons given were lack of water (23/41) and regaining fertility (12/41). Two cases of waterlogging/salinity were reported.

3.4.6 Beneficiary Perceptions

Respondents were asked a series of questions about how the CPI had affected their production and other aspects of their livelihoods.

'How did the CPI affect agricultural production?'

CROPS – 95% reported as 'increased'.

VEGETABLES – 35% are growing vegetables, of which 92% reported as 'increased'.

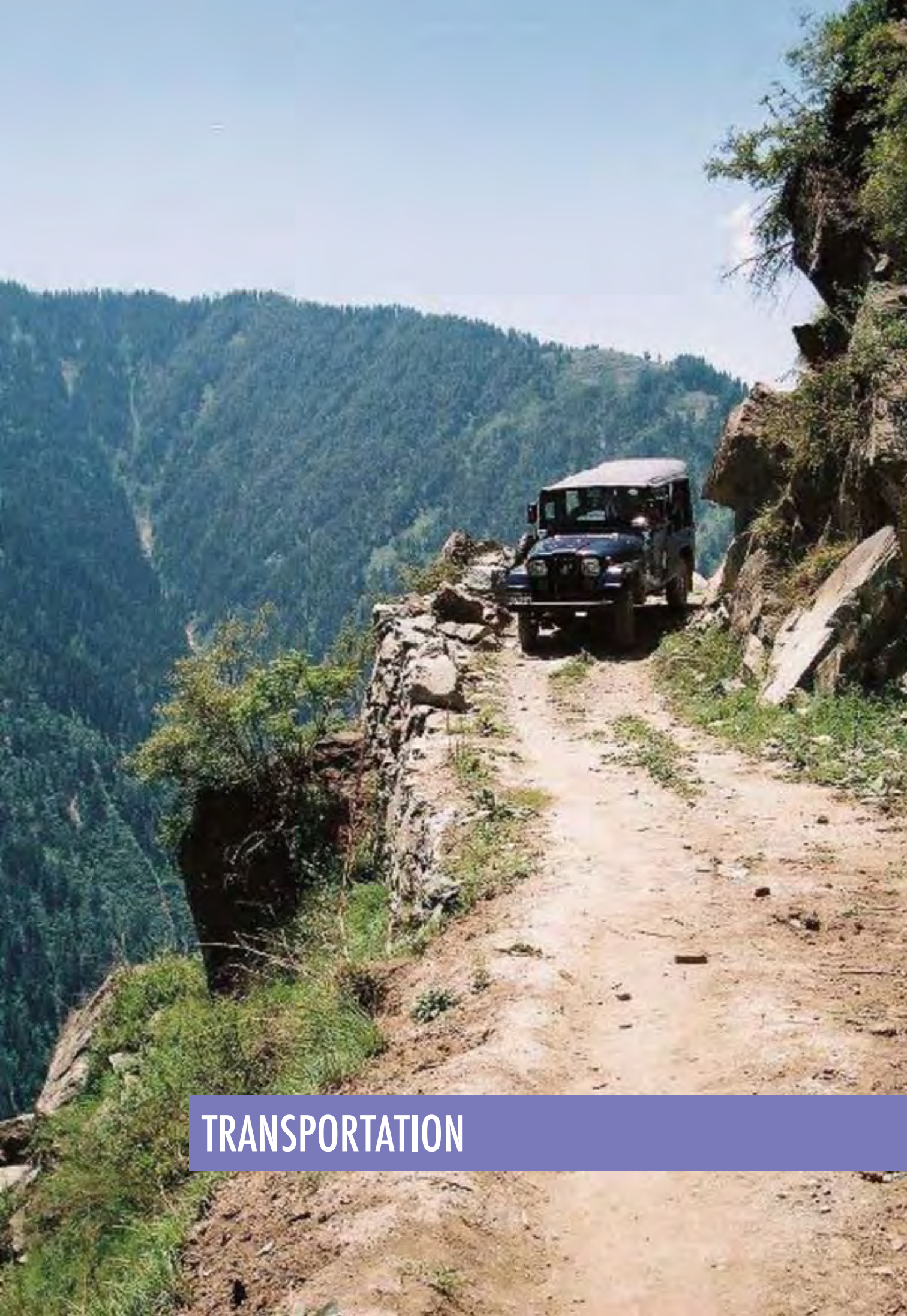
FRUITS – 29% are growing fruit, of which 90% reported as 'increased'.

TREES – 54% are growing trees, of which 90% reported as 'increased'. (Note: There is a probable overlap between 'trees' and 'fruit' trees.)

Table 3.23 summarises responses to the question 'Is there any change observed in the human assets (given in table 3.23) due to the CPI?' It covers five aspects of household livelihoods. Three quarters report 'large benefits' to farm revenue, and two thirds to food availability. Almost all the rest report some benefits. As might be expected, responses on housing, women's free time and children's free time are less positive, with about a third of households reporting 'no benefits', and five percent reporting a negative effect on women's free time, suggesting that the CPI has contributed to increased economic activity but this has come at the cost of some increase in the workload for women and children.

Table 3.23 Proportion of Households Reporting Different Levels of CPI Benefits - %

Level of Benefits	Farm Revenue	Food Availability	Housing	Women's Free Time	Children's Free Time
Large	74.5	62.7	31.3	16.0	22.3
Some	22.8	31.2	34.1	37.7	36.6
None	2.1	5.2	32.5	35.3	32.8
Negative	0.1	0.0	0.0	5.2	2.3
Don't Know	0.4	0.9	2.1	5.8	6.1



TRANSPORTATION

4 TRANSPORTATION

4.1 Overview

Table 4.1, gives a description of the transportation category in terms of RSP projects, beneficiaries, and costs.

Table 4.1 RSP-Wise Transportation Schemes as of June 2009

	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Grand Total
Projects	643	4	932	607	58	243	71	2558
Beneficiary Hhds	27,670	220	113,290	119,673	3,538	20,491	5,517	290,399
Beneficiary Hhds / Scheme	62.0	55.0	121.6	197.2	61.0	84.3	77.7	123
Cost/per scheme	486,351	698,008	368,119	296,772	230,527	390,669	343,727	379,770
CO contribution (%)	23.7	20.0	20.4	20.7	20.7	19.6	19.1	20.7

Source: Data received from RSPs'

The category can be stratified into ten subtypes, namely, bridge, bridge (cantilever), bridge (foot), causeway, culvert, link road, pony track, super passage, trail path/foot tracks, and village track. Table 4.2 shows the distribution by type. It shows that link roads account for 72.5% of all transportation schemes. It was decided, therefore, to concentrate the survey on link roads. Culverts and causeways are broadly similar, so they were included in the selection of schemes to be surveyed. They account for 13.5% and 1.5% of all schemes, respectively.

Table 4.2 RSP-Wise Transportation Schemes by Type

PROJECT SUBTYPE	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Grand Total
Bridge	8.1	0.0	15.0	0.7	13.8	0.4	8.5	8.2
Bridge (Cantilever)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Bridge (Foot)	2.5	0.0	0.0	0.0	0.0	1.2	0.0	0.7
Causeway	0.0	0.0	3.5	0.0	0.0	2.5	0.0	1.5
Culvert	0.0	0.0	16.4	17.8	75.9	2.1	49.3	13.5
Link Road	79.5	100.0	63.3	81.5	10.3	90.1	42.3	72.5
Pony Track	9.2	0.0	0.0	0.0	0.0	0.0	0.0	2.3
Super Passage	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Trail Path/Foot Tracks	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.6
Village Track	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Data received from RSPs'

A description of the link road subtype is given in the table below in terms of projects, beneficiaries, and costs.

Table 4.3 RSP-Wise Link road Schemes

Link Road	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Grand Total
Link roads	511	4	590	495	6	219	30	1855
Beneficiary House-holds	23,415	220	82,364	104,309	335	18,540	2,285	231,468
Beneficiary Hhds/ Scheme	65.2	55.0	139.6	210.7	55.8	84.7	76.2	135.9
Cost/per scheme	498,091	698,008	468,003	330,470	511,284	381,312	640,661	432,785
CO contribution (%)	22.4	20.0	19.8	20.3	21.7	19.0	18.7	21.5

4.2 Technical Assessment

As for the other categories of CPI, the Technical Assessment was based on a review of RSP records and the survey team engineer's assessment of scheme condition.

4.2.1 Scheme Specification

The engineer's as-built in comparison with the specifications shown in the RSP records looked at seventeen parameters i.e. length, width, thickness, and material of link roads, culverts, and causeways, as well as the length, top width, bottom width, height, and material of the retaining wall. The match was assessed on a scale of 'Exact', Equivalent', 'Partial', 'No Match' and 'Not Existing'.

Not all surveyed schemes had all components. Culverts applied to 27.5% (11 of 40) schemes. Causeways applied to 10% (4 of 40) schemes. Retaining walls applied to 42.5% (17 of 41) schemes.

The assessment showed that that RSP link roads schemes were largely built to specification. For all seventeen parameters the only reported categories were Exact and/or Equivalent, with only one exception i.e. width was classified as Partial for 1 link road scheme.

In addition to this, Table 4.4 shows details of link roads and corresponding retaining walls, culverts, and causeways expressed in terms of averages of selected parameters. Length is expressed in feet only for retaining walls and thickness is expressed in feet only for link roads. Figures concerning the distribution of the parameters are stated below.

Table 4.4 Details of Link Roads

	Length (m)	Height (ft)	Width (ft)	Top Width (ft)	Bottom Width (ft)	Thickness (ft)
Link Road	1589.7		10.5			1.6
Retaining Wall	270.8	5.2		1.6	2.9	
Culvert	4.2		7.8			4.5
Causeway	82.4		13.4			6.8

- Table 4.4 shows that on average the link roads in the sample are about 1.5 kilometres long. However, the average tends to conceal quite substantial as well as insignificant schemes. The most substantial link roads are 10.6, 6.3, 6, 4.5, and 4.1 kilometres long. On the other hand, 5 link roads are below half a kilometre. The roads are 111, 150, 223, 378, and 382 metres long. If these 10 schemes are excluded, then the remaining link roads are on average 1.3 kilometres long. Moreover, both averages conceal that a majority of schemes i.e. 62.5% (25 of 40) are in fact less than a kilometre long.

- For 2 link road schemes, retaining walls are particularly substantial i.e. 1450 and 800 feet long, the latter of which coincides with the longest link road. Moreover, the lengths of retaining walls display a variety of values, ranging from 15-500 feet once the two largest figures are excluded.
- Culverts also show a variety of lengths. The range is 1-7.3 metres.
- The average length for causeways is completely biased by a single extreme value i.e. 390 metres. The other schemes range from 3-8.23 metres.

Detail of materials used for link roads and corresponding retaining walls, culverts, and causeways is given in Table 4.5. The figures are in percentages.

Table 4.5 Details of Materials Used (%) for Link Roads

	Brick Paving	Stone Paving	PCC	Shingle	RCC Box	RCC Pipe	Others
Link Road	44.0	22.0	5.0	22.0			7.0
Retaining Wall		88					12
Culvert					36	45.5	18.5
Causeway		20	80				

4.2.2 Scheme Cost and Construction

As shown in Table 4.6, the link road CPIs surveyed were built throughout the period 2000 to 2008, with the exception of 2003. There was a concentration of schemes between 2005 and 2007: 60% of the total.

Table 4.6 Link Road Schemes – Year of Completion

Year	Frequency	Percent
2001	6	15.0
2002	3	7.5
2004	5	12.5
2005	7	17.5
2006	11	27.5
2007	6	15.0
2008	2	5.0
Total	40	100.0

Table 4.7 summarises details of the costs of link road CPIs. It has not been possible to take out the impact of Inflation that is present due to schemes being built in various years preceding the survey as noted above. As expected, materials form the largest constituent of total cost. Moreover, unskilled labour, which entails potential employment for the community, forms a significant one-fifth of the total cost.

Table 4.7 Average Total Costs Per Link Road – PKR

Number of schemes (N)	39
Average Costs	631,380
Standard Deviation	525,005
Minimum	75,100
Maximum	2,436,819
% Makeup of Costs:	
Material	56.8
Equipment	3.4
Skilled labour	12.0
Unskilled labour	21.4
Others	6.4

Table 4.8 gives the incidence and averages of community contributions to the CPI, and its constituents. COs made contributions to all schemes barring one. The contributions were primarily in the form of labour, most frequently skilled labour. Equipment was contributed at only a minority of schemes. In addition to this, it is pertinent to note that 7.5% (3 of 40) of COs contributed less than 20% of total cost, which is below the RSP norm.

Table 4.8 Community Contributions to Link Road Schemes

	N	Average Contribution (PkR)	Standard Deviation
Material	14	85,959	115,636
Equipment	5	17,870	19,842
Skilled Labour	33	60,135	72,275
Unskilled Labour	28	95,677	115,818
Others	3	8,822	6,793
Total	39	158,144	168,211

Survey engineers were asked to investigate how well the CPIs had been implemented in terms of adherence to the planned timeline and budget. 7.5% of the schemes were not completed within the approved timeline, all of which were reportedly delayed by a 'delay in disbursement', the reasons for which are not available. 100% of the schemes were completed within the approved costs.

4.2.3 Utilisation and Condition

As for all CPIs surveyed, utilisation is defined as follows:

- Full utilisation: Used by over 70% of targeted beneficiary households
- Partial utilisation: Used by over 40-70% targeted beneficiary of households
- Limited utilisation: Used by over 10-40% targeted beneficiary of households
- No utilisation: Unused for 3 months prior to the survey

The condition of the link road, which is also suggestive of the degree to which it has been maintained, was measured by classifying each scheme according to the categories described below. These categories have been derived from the World Bank's 'core measures' regarding rural transportation[5] .

5 http://siteresources.worldbank.org/INTTRM/Resources/031208rd_tr_coremeasures.xls

- Good condition: Paved roads, largely free of defects, requiring only routine maintenance and surface treatment & Unpaved roads which need only routine grading and localised repairs
- Regular condition: Paved roads with defects and weakened structural resistance. They require resurfacing but - without the need to destroy the existing pavement & Unpaved roads, which require grading and additional new gravel, plus drainage repair in some places
- Poor condition: (Paved or unpaved) Barely functional and un-maintainable without substantial rehabilitation

Table 4.9 below cross-tabulates these categories of utilisation and condition, hence showing the standing of a scheme with regards to both variables. It is evident from the table that no road is of poor condition and hence well-maintained. Only a single scheme is partially utilised. Hence the general picture of RSP link roads is that of fully utilised roads of good or regular condition.

Table 4.9 Link Road Utilisation and Condition

		Condition				
		Good		Regular		
		Paved	Unpaved	Paved	Unpaved	Total
Utilisation	Full	21	6	9	3	39
	Partial	1	0	0	0	1
Total		22	6	9	3	40

4.3 Institutional Assessment

The Community Questionnaire, completed in a focus group discussion with CO members, focussed on institutional aspects of CPI implementation and management. Groups were also asked to report on the number of beneficiaries and give their assessment of the CPI's impact.

4.3.1 RSP Technical Support

Focus groups were asked about the number of schemes visited and the average number of visits made by the SO, engineer, and any other during the planning/design/survey and construction phases of the scheme, and after completion of the scheme. Findings are summarised in Table 4.10. It clearly shows that SOs provided support by visiting all schemes till they were completed and most schemes after completion. A majority of their visits typically occurred during construction. Engineers followed a similar pattern, with the exception of 1 scheme that was not visited by an engineer at all. Others visited an unexpectedly high number of schemes, especially after completion. It is not known what this was for.

Table 4.10 Visits by SO, Engineer, and Any Other

	Planning/Design/Survey			Construction			After Completion		
Visitors	N	Average visits	SD	N	Average visits	SD	N	Average visits	SD
SO	40	6.3	4.3	40	17.4	14.5	37	8.7	11.9
Engineer	39	5.1	3.0	39	20.9	11.1	39	5.4	4.9
Any Other	5	2.8	4.0	6	2.1	1.4	12	1.6	1.1

4.3.2 CPI Management

Standard RSP practice is that COs should form three committees to manage a CPI: an Implementation Committee, a Finance/Audit Committee and an Operation and Maintenance Committee. The survey recorded how many schemes had these committees and the following aspects of their operation:

- Committee membership
- Participation in their formation
- Training received
- CO members satisfaction or not with the committees' work

Implementation and Audit Committees were formed for all schemes surveyed. However, for 2 schemes Operation and Maintenance Committees were not formed.

Implementation Committees are typically the largest, with 4.6 members on average. Audit and Operation and Maintenance Committees have 3.3 members on average. However, Table 4.11 shows that there is a wide range in committee sizes, from the RSP recommended minimum of two up to one scheme which had an implementation committee of 20 members. For more than 8 members committee there is a possibility of confusing the committee with whole CO membership. However, the minimum of two was the commonest committee size: between 30 and 45% of all schemes.

Table 4.11 Membership of Link Road Management Committees

		Number of Committee Members											
Committee Type		2	3	4	5	6	7	8	9	10	11	14	20
Implementation	N	12	7	9	2	3	3			1	1	1	1
	%	30.0	17.5	22.5	5.0	7.5	7.5			2.5	2.5	2.5	2.5
Audit	N	18	8	7	2	2	2	1					
	%	45.0	20.0	17.5	5.0	5.0	5.0	2.5					
Operation and	N	16	1	7	8	2	3		1				
Maintenance	%	42.1	2.6	18.4	21.1	5.3	7.9		2.6				

A high level of participation in the formation of these committees was also observed. All or most CO members were involved in the formation of 90% of Implementation Committees and 92.5% of Audit and Operation and Maintenance Committees.

Regarding function-specific training, a high proportion of each type of committee did not receive it i.e. 42.5% of Implementation Committees, 47.5% of Operation and Maintenance Committees, and 52.5% of Audit Committees.

Without exception, all or most CO members were satisfied with the performance of the management committees.

In the focus group discussion, the survey sought information on CO members participation in the planning, implementation and operation of the scheme. The groups were also asked about how money for the CO contribution was collected. Table 4.12 shows that 'all CO members' was the most frequently reported category for all stages. RSP engineers or SOs were involved mostly in the planning stage. The category 'Anyone else' is prominent in the identification stage. This is possibly in part representative of non-member beneficiaries.

Table 4.12 Participation in need identification, planning, implementation and O&M

Who participated in:	Need identification		Planning & Designing		Implementation		O&M	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Only CO/VO office bearers	3	7.5	5	12.5	10	25.0	12	30.0
All CO members	27	67.5	21	52.5	28	70.0	25	62.5
Mostly done by RSP Engineer/SO			12	30.0				
Anyone else	10	25.0	2	5.0	2	5.0	3	7.5
Total	40	100.0	40	100.0	40	100.0	40	100.0

4.3.3 Scheme Construction

Focus groups were also asked whether they contributed to the construction of the CPI, and if so, what contributions were made. The groups were also asked how money for the CO contribution is collected.

Contributions to construction were not made for 5% (2 of 40) schemes. However, as shown in Table 4.13, when contributions are made, CO members tend to make cash, labour, and in kind contributions to about twice as many schemes as other beneficiaries do. However, when other beneficiaries do make contributions, they on average exceed CO members in cash contributions, and match them in labour and in kind contributions.

Table 4.13 Contributions to Construction

Type of contribution	CO Members			Other Beneficiaries			Externals		
	N	Average	SD	N	Average	SD	N	Average	SD
Cash (PkR)	31	57,624	40651.7	16	87,125	165634.6	2	18,500	16263.4
Labour days	33	257	215.7	14	213	216.2	1	1	
In kind (PkR)	26	134,869	230180.9	13	13,623	14200.2	1	20,000	

For 55.3% of schemes monetary contributions are collected on the basis of 'ability to pay'. The second most frequent basis is 'equal share', which accounts for 36.8% of schemes. The remaining 7.9% is accounted for proportional to 'share of benefits'.

4.3.4 Scheme Operation and Maintenance

Focus groups were asked to report how the scheme had operated over the last 12 months and describe how they managed operating costs.

Seven link roads were reported to have been out of operation for between one and four months during the last year. The principal reason was bad weather (rainfall, snow fall and flooding) or, in one case, landslides.

No link road had regular operational costs.

RSPs' advise COs to establish a Maintenance Fund, and contribute a percentage of the fund costs to set the fund up. The survey sought information on how these funds are operating?

Table 4.14 shows combinations of how many CO members and other beneficiaries contribute to maintenance of link road schemes. It clearly shows that CO members did not contribute to the maintenance of one-fourth of the schemes. Nonetheless, when CO members do contribute, mostly all or most of them do so. In contrast, other beneficiaries have not contributed to the maintenance of 60% of schemes. Incidentally, other beneficiaries did not contribute to the schemes to which CO members did not contribute. This implies that CO members only fail to contribute to schemes for which no maintenance work has been done.

Table 4.14 Who Contributes to Maintenance

		CO members				
		All	Most	Some	None	Total
Other beneficiaries	All	4	0	0	0	4
	Most	5	1	0	0	6
	Some	2	3	1	0	6
	None	10	6	4	4	24
Total		21	10	5	4	40

Table 4.15 juxtaposes how COs collect contributions to maintenance with how these are distributed. It shows that COs often collect contributions 'when needed' as opposed 'regular charges'. Distributions of these funds typically take place on the basis of 'ability to pay'. About one-half of the COs collect contributions 'when needed' and distribute these on the basis of 'ability to pay'.

Table 4.15 Collection and Distribution of Contributions to Maintenance

		How COs collect money for maintenance		
		Regular charges	When needed	Total
How maintenance contributions are shared	Equal	2	7	9
	Ability to pay	7	19	26
	Proportional to use/ benefits	0	1	1
	Others	0	4	4
Total		9	31	40

62.5% (25 of 40) link road schemes have maintenance funds. Among these only 48% use the maintenance fund. Put simply, a mere 32.5% of COs keep and use the maintenance fund.

A possible explanation for this trend may lie in the method for collecting monetary contributions as posited by Table 4.16 below. Those COs that have a maintenance fund but do not make use of it have a tendency to collect money for maintenance when required as opposed regular charges. On the other hand, COs that have a maintenance fund and use it are equally divided in their method of collection. From this it can be inferred that collection of monetary contributions as and when required de-incentives the use of the maintenance fund as a channel for distributing the funds. The average amount of a maintenance fund is PKR 13,955.

Table 4.16 Method of Collecting Maintenance Funds and Whether Maintenance Funds are Used or Not

		How COs collects money for maintenance		
		Regular charges	When needed	Total
Maintenance fund used	Yes	6	6	12
	No	2	11	13
	Total	8	17	25

4.3.5 Scheme Benefits and Impact

Focus groups were asked to say how many households are currently using the link road as a primary source. Table 4.17 shows the average number of targeted, primary, and secondary beneficiaries. It suggests that on average primary beneficiaries have exceeded targeted beneficiaries. However, paired-sample t-tests suggest that this change is not statistically significant. P value is 0.6.

Table 4.17 Scheme Beneficiaries

Beneficiary Hhds	N	Average	Standard Deviation
Targeted household	40	139.4	158.9
Using Link Road a primary route	40	148.9	164.9
Using Link Road as secondary route	12	191.1	292.4

In order to estimate the contribution the CPI has made to improving beneficiary access, focus groups were also asked to say if there was a 'pre-existing route' to the community, and whether it satisfied the following two conditions:

1. A four-wheeler can pass through without using four-wheel-drive.
2. Condition 1 is satisfied for all months, except for interruptions of less than 2 weeks due to severe weather.

They were then were asked whether the CPI satisfies the same two conditions or not. (A weakness in this line of questioning is that it does not yield any information regarding a route that does not satisfy the first condition.)

If the second condition is satisfied, the route is termed by the World Bank[6] as an all-season-road, which is the posited to be the minimum requirement for adequate access to a transportation system. Such access is deemed important to reducing isolation, which is positively related to poverty.

The responses showed that 30% of CPIs were preceded by a route. 7.5% of CPIs were preceded by routes that only satisfied condition 1, while 5% of routes satisfied both conditions. In other words, for 5% of schemes (i.e. 2 CPIs), users already possessed adequate access to a transportation system.

85% of CPIs delivered access to all-season-roads. All pre-existing routes that satisfied only satisfied condition 1 were turned into all-season roads. The same holds true for pre-existing routes that did not satisfy either of the conditions. This implies that 25% of the all-season-roads delivered were improved or rehabilitated pre-existing routes.

2.5% of CPIs only satisfied condition 1, whereas the remaining 7.5% of CPIs did not satisfy either of the conditions.

4.4 Household Questionnaire

At each surveyed Link Road CPI, 10 households were selected for individual interviews. This section presents the analysis of this part of the survey. With a target of 400 household interviews, 401 were completed.

6 http://siteresources.worldbank.org/INTTRANSPORT/Resources/336291-1227561426235/5611053-1229359963828/tp_10_web.pdf

Beneficiaries of link road schemes were asked about the structure of their household (i.e. the number of males and females of adult and child ages in the household), and regarding whether the household is a member of the CO or not.

Accordingly, household structure is given in Table 4.18 .

Table 4.18 Household Structure of Link Road Beneficiaries

Characteristic	N	Mean	SD
Total Household	401	8.8	4.6
Adult Male	398	2.3	1.5
Adult Female	399	2.4	1.5
Male Children (<18)	328	2.1	1.7
Female Children (<18)	308	1.9	1.8

In addition to this, 61% of beneficiaries are CO members and the remaining 39% are non-member beneficiaries.

4.4.1 Scheme Participation

Beneficiaries were asked about their participation in planning the CPI and their contributions to its construction and maintenance. Data regarding contributions to maintenance are limited to the 12 months preceding the survey.

Table 4.19, summarises the results regarding participation in the planning of link roads. It clearly shows that almost all CO members participated in planning as compared to about one-third of the non-member beneficiaries. Another discrepancy exists between males and females, with only a marginal proportion of the latter being participating.

Table 4.19 Participation in Planning of Link Road Schemes

	All Beneficiaries	CO Members	Non Members
% HHDs Participating in the Planning:	69.8	92.7	34.0
Only Male	96.4	97.4	92.5
Only Female	2.5	1.3	7.5
Both Jointly	1.1	1.3	0.0

Regarding contribution to the construction of link roads, three quarters of all beneficiaries contributed, of which almost all CO members contributed i.e. 94.7%, whereas only about one-half i.e. 45% of non-member beneficiaries contribute.

Of those who did contribute, 58% of beneficiaries contributed labour, which exceeds cash contributions that were made by 49% of beneficiaries.

52% of CO members contributed in cash whereas only 39% of non-member beneficiaries contributed. However, 57% of CO members contribute in labour, which is not substantially lower from the proportion of non-member beneficiaries who contribute i.e. 60.5%.

Member households also contribute more than twice as many labour days. CO members contribute 38 labour days on average as compared to 15.4 labour days by non-members. However, the

difference in cash contributions between the two classes of beneficiaries is not substantial. CO members on average contribute PKR 2545 where non-member contribute PKR 2010.

Regarding contribution to the maintenance of link roads, far fewer COs and non-member beneficiaries contribute to maintenance as compared to construction. 27.5% of total beneficiaries, 37.1% of CO members, and 7.7% of non-member beneficiaries contribute. Of the few who contribute, less than one-twentieth contribute in cash and less than one-third contribute in labour. Average contributions are PKR 589 and 6.5 labour days.

4.4.2 Household Satisfaction

Interviewees were asked a range of questions about how they rated the CPI. The results suggest high levels of satisfaction. The only area of concern is the risk of closure, which was raised by more than one-third of CO member beneficiaries. Reasons for non-satisfaction were not reported.

Table 4.20 Beneficiary Satisfaction with Link Road Schemes

		Member	Non-member
How do you rate the performance of the project committees?	Good	77.6	73.1
	Okay	16.3	19.9
	Poor	3.3	3.8
	Don't know	2.9	3.2
How do you rate the performance of RSP support?	Good	78.4	74.4
	Okay	19.2	20.5
	Poor	1.2	2.6
	Don't know	1.2	2.6
Is the CPI functional at present?	Yes	98.0	93.6
	No	1.2	1.3
	Don't know	0.8	5.1
Is the CPI safe from the risk of closure?	Yes	65.3	87.2
	No	34.7	12.8
Are you satisfied with the performance of the CPI?	Yes	94.7	94.9
	No	5.3	5.1

4.4.3 Mode of Travel

To understand how the new link road has affected their access, beneficiaries were asked about how they travelled to selected facilities and services before the CPI and how they made the same trips at the time of the survey. Table 4.21 shows the results, and identifies how respondent households have changed their mode of travel since the link road was built.

Table 4.21 Percentage Change in Mode of Travel after the Link Road

Services		Not applicable	On foot only	Bicycle/ Animal	Public Transport	Motor Cycle	4 Wheel Motor Vehicle	Other
Drinking water source	After	60.1	37.2	2.2				0.5
	Before	58.9	38.7	2				0.5
	Change	1.2	-1.5	0.2				
General store	After	0.2	74.3	5.5	10	6	3.2	0.7
	Before	0.7	85.5	4.5	4.5	2	1.7	1
	Change	-0.5	-11.2	1	5.5	4	1.5	-0.3
Public transport access point	After	1	68.5	15	0.7	9.5	2.7	2.5
	Before	1.5	82.3	8.5	0.2	3.2	2.2	2
	Change	-0.5	-13.8	6.5	0.5	6.3	0.5	0.5
Nearest boys' school	After		82.5	9.5	3.2	1.2	2.2	1.1
	Before		86.5	7.7	2	1.2	1.5	1
	Change		-4	1.8	1.2		0.7	0.1
Nearest girls' school	After	6.5	75.8	8.7	5	1.2	2	0.7
	Before	6.2	78.8	7.2	3.5	1.5	2	0.7
	Change	0.3	-3	1.5	1.5	-0.3		
Health clinic/Hospital	After	0.7	27.4	11.2	37.2	10.5	9.7	3.2
	Before	1.2	48.4	8.2	28.2	3	8	3
	Change	-0.5	-21	3	9	7.5	1.7	0.2
Separate family planning services	After	24.7	26.9	8.7	27.9	5.2	6	0.5
	Before	25.4	34.7	6.7	25.7	2		
	Change	-0.7	-7.8	2	2.2	3.2		
Nearest tehsil administration	After		9.2	7.2	58.1	13.5	11.2	0.7
	Before	0.2	28.2	5.2	51.1	5.2	9.5	0.5
	Change		-19	2	7	8.3	1.7	0.2

The table shows that there has been a decline in on-foot travel and a corresponding increase in vehicular travel: in the majority of cases public transport or a motorcycle. Chi square tests for independence were conducted to evaluate the impact of link roads on on-foot travel for the different locations, and only in the case of drinking water source was the decrease statistically not significant ($p<0.7$).

Nonetheless, on-foot travel remains the largest category in absolute terms in relation to accessing drinking water, travelling to the general store, public transport access point, and boys' and girls' schools. In contrast, it is not the category with the highest frequency in relation to the health clinic or hospital, separate family planning service, and Tehsil administration, even though it was the category with the highest frequency prior to the link road for health clinic or hospital and separate family planning service. Hence it can be inferred that the predominance of on-foot travel, where it persists, is a function of proximity to the facility under consideration. In turn, it is suggested that the change in favour of vehicular travel associated with the development of the link roads becomes more amplified the more distant the location under consideration. In other words, the magnitude of link road's impact on vehicular travel is stronger in relation to relatively distant facilities.

Motor vehicles are steadily becoming more common in Pakistan. It was not possible, in the scope of this survey, to check how much of the change in transport patterns is directly attributable to the construction of the link road and how much to a general increase the availability of motor transport.

4.4.4 Time Saved

Interviewees were asked how much time (measured in minutes) it took to travel from the household to selected facilities prior to the CPI and how much time it currently takes. Table 4.22 below gives averages of the time it took prior to the CPI and after the CPI to travel to the selected facilities, as well as an average of the change in time used. Paired-sample t-tests were conducted to evaluate the impact of link road schemes on time used to reach each facility. There was a statistically significant decrease in time used to reach each facility. P value was <.001 for each facility.

Table 4.22 Changes in Travel Times

Destination	Before link road		After link road		Change in time used	
	Average	Std Dev'n	Average	Std Dev'n	Average	Std Dev'n
Water source	11.6	23	8.7	16.6	8.4	16.2
General store	46.4	64.5	27.6	51.6	27.5	51.6
'Bus Stop'	47.3	48.6	28.7	32.7	2.7	1.3
Boys' school	30.5	23.6	19.5	17.4	19.5	17.4
Girls' school	31.3	30.9	18.9	20	18.4	17.7
Clinic/Hospital	69.8	56	47	42	22.7	32
Family planning service	40.7	42.2	26.9	32.5	26.7	32.4
Tehsil administration	104.4	77.6	72.3	59.7	72.2	59.7

Regarding the magnitude of impact, eta squared for each facility is listed below. The effect is large (eta squared<0.14) relating to all facilities barring drinking water source, for which it is between small and a moderate effect (0.01<eta squared<0.06). It is pertinent to note that the reduction in travel time is not simply due to an increase in vehicular travel, but as suggested below, it is also due to how link roads have facilitated on-foot travel.

- Drinking water source: 0.05
- General store: 0.26
- Public transport access point: 0.28
- Nearest boys' school: 0.38
- Nearest girls' school: 0.19
- Health clinic/Hospital: 0.34
- Separate family planning services: 0.33
- Nearest tehsil administration: 0.44

Moreover, the average conceals the distribution of changes in time used. Consequently, this is in part addressed by Table 4.23 .

Table 4.23 Distribution of Change in Time Used

	Minimum	Maximum	Percentiles		
			25	50	75
Drinking water source	0	120	0	0	10
General store	0	390	10	10	25
Public transport access point	0	7	2	2	3
Nearest boys' school	2	120	10	15	27.5
Nearest girls' school	0	120	5	15	20
Health Clinic/Hospital	0	428	0	20	30
Separate family planning services	0	200	0	20	35
Nearest tehsil administration	5.	360	30	60	90

In addition to this, the percentage of respondents who did not experience any time savings is listed below for the different facilities. It suggests that the proportion of these respondents is negligible barring drinking water source, separate family planning services, and the nearest girl's school.

- Drinking water source: 60%
- General store: 0.5%
- Public transport access point: 1%
- Nearest girls' school: 6.2%
- Health clinic/Hospital: 0.7%
- Separate family planning services: 25%

4.4.5 Impact

Interviewees were asked whether increased mobility due to link road schemes had in turn allowed for certain benefits i.e. increased income, increased sales of farm output, reduced cost of farm inputs, improved girls' and boy's education, and increased leisure for women and children. Table 4.24 summarises household responses. It shows that most respondents have reported benefits. This is particularly the case for household income and the related aspects of farm output and cost of farm input. Negative effects are negligible, except for the case of women's leisure. This, in turn, is possibly a consequence of increase economic activity caused by the link road schemes.

Table 4.24 Scheme Impacts

	Large benefits	Some benefits	No benefit	Negative effect	Don't know
Household income	63.6	22.7	12.5		1.2
Sales of farm output	50.9	30.7	12.5		6.0
Cost of farm input	34.9	42.6	14.5		8.0
Girls' education	37.2	30.9	25.7		6.2
Boys' education	39.7	33.4	21.2	0.2	5.5
Women's leisure	18.5	37.4	30.2	3.7	10.2
Children's leisure	15.7	41.4	30.9	0.2	11.7

SANITATION & STREET PAVEMENT

5 SANITATION AND STREET PAVEMENT

5.1 Overview

RSP sanitation and street pavement schemes include 20 subtypes, from street pavement and drainage to communal latrines and washing areas. However, there are only significant numbers in two categories: street pavement and drainage (51% of all sanitation and pavement CPIs) and LT & WT (25%). For the former there is no data available for AKRSP. Table 5.1 below gives a description of this category in terms of projects, beneficiaries, and costs.

Table 5.1 RSP- Sanitation and Street Pavement Schemes

	AKRSP	BRSP	NRSP	PRSP	SRSO	SRSP	TRDP	Grand Total
Number of street pavement and drainage schemes	20	14	917	883	174	432	928	3,368
Beneficiary House-holds	928	878	186,236	108,296	8,290	48,387	17,141	370,156
HHDs/Scheme	58	63	203	122	47	112	18	109
Cost/per scheme	132,191	428,739	517,245	283,526	408,750	573,336	37,017	322,586
CO contribution (%)	20.3	22.0	22.5	19.6	20.2	18.4	20.4	20.6

For the survey it was decided to concentrate on the largest of these, i.e. the Street Pavement and Drainage (SP&D) category. A description of the chosen street pavement and drainage schemes is given in the Table 5.2 below in terms of projects, beneficiaries, and costs. (AKRSP and TRDP have not pavement and drainage CPIs.)

Table 5.2 Street Pavement and Drainage Schemes

	BRSP	NRSP	PRSP	SRSO	SRSP	Grand Total
Projects	9	697	614	44	355	1719
Beneficiary households	365	159,883	79,331	2,668	38,395	280,642
Beneficiary Hhds/scheme	40.6	229.4	129.4	60.6	108.1	163.3
Cost/ scheme	441,812	532,207	316,110	556,790	486,651	445,769
CO contribution (%)	22	23.2	20	19.5	18	20.8

5.2 Technical Assessment

The comparison with the specifications shown in the RSP records looked at the match between Design and Actual in terms of eleven parameters: i.e. length, width, thickness, and material of foundations and soling, as well as the length, width, and material of side drains.

As with the other categories surveyed, the majority of schemes were assessed to be an exact match or equivalent. On a minority of schemes certain parameters soling and side drains had not been built to specification. However, no scheme was less than an Exact or Equivalent match for more than one parameter. Soling length and width were reported to be a partial match on 4 of 41 schemes and non match on two schemes. The length of side drains was partial for one scheme and no match

for another. Moreover, width of side drains was partial for a single scheme.

In addition, Table 5.3 shows details of different components of street pavement and drainage schemes expressed in terms of selected parameters. The length of foundations and drains is in feet and the width of side drains is in inches. Information concerning the distribution of the length of different components, a key parameter, is given subsequently.

Table 5.3 Details of Street Pavement and Drainage Schemes

	N	Average Length (ft)	Average Width (ft)	Average Thickness (inch)
Soling	41	505.4	10.9	4.4
Foundations	29	1961.7	11.3	4.7
Side Drains	41	1504.8	6.9	

- Regarding soling, there are no outliers. Nonetheless, the average does conceal a variety of values ranging from 91 metres to 1.7 kilometres.
- 29.3% of schemes do not have foundations. There are no outliers among schemes that have foundations although the average tends to conceal a range of value starting from 356 to 5487 feet.
- With reference to side drains, 2 schemes have no length although other parameters are reported to have value. This is either suggestive of an error in measurement or the absence of drains. Nonetheless, when these 2 schemes are not counted, the average length of drains increases to 1582 feet or 482.2 metres. There are also 3 outliers i.e. 4200, 5300, and 6000 feet. Once these are removed, the average falls to 1283.2 feet or 391.1 metres.

5.2.1 Scheme Cost and Construction

The SP&D schemes surveyed had been built between 2002 and 2007, with a concentration in the second half of the period, with the result that a majority of the schemes surveyed were relatively new: 2005 or later.

Table 5.4 summarises the total costs for the survey schemes. It has not been possible to take out the impact of Inflation that is present due to schemes being b uilt in various years. Materials form an unexpectedly large constituent of total cost, which implies low expenditure on the other constituents. This includes unskilled labour, which entails potential employment for the community. It forms less than one-tenth of the total cost.

Table 5.4 Average Total Costs Per Street Pavement and Drainage Scheme – PKR

N	41
Average Total Costs	513,851
Standard Deviation	261,759
Minimum	58,986
Maximum	1,002,647
% Makeup of Cost:	
Material	80.0
Equipment	0.1
Skilled labour	11.1
Unskilled labour	8.2
Others	0.6

Table 5.5 gives the incidence and averages of total community contribution and its constituents. Community members made contributions to all schemes. Contributions have come in the form of labour, both skilled and unskilled and material. Equipment was provided for only a minority of schemes. In addition to this, it is pertinent to note that 24.4% (10 of 41) COs contributed less than 20% of total cost, which is below the RSP norm.

Table 5.5 Community Contributions to Street Pavement and Drainage Scheme

	N	Average Contribution – PkR	Standard Deviation
Material	22	118,731	76251.7
Equipment	5	614	322.5
Skilled Labour	24	48,586	37772.8
Unskilled Labour	21	54,970	43926.1
Others	0		
Total	41	120,380	69008.1

Survey engineers were asked to investigate how well the CPIs had been implemented in terms of adherence to the planned timeline and budget. Most schemes were completed on time and budget, but 12.2% and 4.9% of the schemes were completed with a delay of less than and more than a year, respectively. The cause for delay with the highest frequency was conflict over the scheme, accounting for 7.3% of the completed schemes. 'Delay in disbursement', the reasons behind which are unknown, and unspecified 'Others' separately account for 4.9% of schemes. 100% of the schemes were completed within the approved costs.

5.2.2 Utilisation and Condition

Utilisation refers to the percentage of targeted households using a scheme. To measure this, the engineer classified each scheme according to the categories described below.

- Full utilisation: Used by over 70% of the targeted households
- Partial utilisation: Used by over 40-70% of the targeted households
- Limited utilisation: Used by over 10-40% of the targeted households
- No utilisation: Unused for 3 months prior to the survey

The condition of the link road, which is also suggestive of the degree to which it has been maintained, was measured by classifying each scheme according to the categories described below. The categories are similar to those applied for link roads.

- Good condition: Paved street, largely free of defects, requiring only routine maintenance and surface treatment & Unpaved street which need only routine grading and localised repairs.

- Regular condition: Paved street with defects and weakened structural resistance. They require resurfacing but without the need to destroy the existing pavement & Unpaved streets, which require grading and additional new gravel, plus drainage repair in some places.

- Poor condition: Barely functional and un-maintainable without substantial rehabilitation.

All schemes were reported to be fully utilised and 31 of the 41 were in good condition. A further 8 were in regular condition with just 2 in poor condition.

5.3 Institutional Assessment

The Community Questionnaire, completed in a focus group discussion with CO members, focussed on institutional aspects of CPI implementation and management. It also reported on numbers of beneficiaries and the group's assessment of the scheme's impact.

5.3.1 RSP Technical Support

Focus groups were asked about the average number of visits made by the SO, engineer, and any other during the planning/design/survey and construction phases of the scheme, and after completion of the scheme. Findings are summarised by Table 5.6 below. Engineers and SOs follow an identical pattern prior to completion. They typically provide support by visiting all schemes till their completed and afterwards. Their visits reach their peak after and during construction. Visits made by those other than SOs and Engineers i.e. 'Others' tend to rise with the three phases, becoming particularly significant after completion.

Table 5.6 Visits by SO, Engineer, and Any Other

	Planning/Design/Survey			Construction			After Completion		
Visitors	N	Average	SD	N	Average	SD	N	Average	SD
SO	41	6.2	4.6	41	16	20.2	41	11.5	20.7
Engineer	41	5.7	4.4	41	27.5	22.9	41	5	3.7
Any Other	11	4.7	6.4	16	2.6	2.8	22	1.4	0.7

5.3.2 CPI Management

Standard RSP practice is that COs should form three committees to manage a CPI: an Implementation Committee, a Finance/Audit Committee and an Operation and Maintenance Committee. The survey recorded how many schemes had these committees and the following aspects of their operation:

- Committee membership
- Participation in their formation
- Training received
- CO members satisfaction or not with the committees' work

Implementation and Audit Committees were not formed for a single scheme only. On the other hand, Operation and Maintenance Committees were not formed in 3 schemes. For 1 scheme no committees were made. There is little difference in the average size of committees: Implementation Committees 3.6 members, Maintenance Committees 3.3, and Audit Committees 2.7. However the frequency analysis in Table 5.7 shows there is a wide range in committee size, from the RSP minimum of 2 up to 15. The minimum of two is the most common number: at between 40 and 55% of CPIs. In two cases the committee members were reported 11 and 15 this may be a measurement error of counting the CO members as a committee.

Table 5.7 Number of Members for Committees Formed

Committee Type		Number of Committee Members										
		2	3	4	5	6	7	8	9	10	11	15
Implementation	N	17	11	3	4	3		1			1	1
	%	41.5	26.8	7.3	9.8	7.3		2.4			2.4	2.4
Audit	N	22	13	2		3						
	%	55.0	32.5	5.0		7.5						
Operation and Maintenance	N	17	10	2	4	3	1		1			
	%	44.7	26.3	5.3	10.5	7.9	2.6		2.6			

Nevertheless, a high level of participation in the formation of these committees was reported. All or most CO members were involved in the formation of 90% of Implementation Committees and 92.5% of Audit and Operation and Maintenance Committees. RSPs' offer function specific training to the committees managing CPIs. A relatively high proportion did not receive such training: 24.4% of Implementation Committees and 22.2% of Audit and Operation and Maintenance Committees.

With the exception of a single committee per committee type, all or most CO members were satisfied with the performance of committees.

In the focus group discussion, the survey sought information on CO members participation in the planning, implementation and operation of the scheme. The groups were also asked about how money for the CO contribution was collected. Table 5.8 shows that all CO members was the most frequently reported category for all stages except for the planning stage, where it is missing. It is useful to note that the predominance of this category, leave alone its absence, is an exception to the trend evident in all other schemes i.e. DWSS, irrigation, and link roads. Planning was done either by CO leaders or RSP engineers/SOs. 'Anyone else' is a prominent in every stage exception for planning, which is also contradictory to the trend observed for other schemes. This category is assumed to be in part representative of non-member beneficiaries.

Table 5.8 Participation of community members in need identification, planning, implementation and O&M

	Need identification		Planning and design		Implementation		O&M	
Who participated in:	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Only CO/VO office bearers	7	17.1	23	56.1	3	7.3	2	4.9
All CO members	26	63.4			32	78.0	23	56.1
Mostly done by RSP Engineer/SO			16	39.0			1	2.4
Anyone else	8	19.5	2	4.9	6	14.6	15	36.6
Total	41	100	41	100.0	41	100.0	41	100.0

5.3.3 Construction

Focus groups were also asked whether the CO contributed to the construction of the CPI, and if so, what contributions were made. The groups were also asked how money for the CO contribution is collected.

The results are shown in Table 5.9. CO members have contributed cash to all schemes, whereas other beneficiaries are less frequent in their cash contributions. CO members also exceed non-

member beneficiaries in average cash contributions. However, with respect to labour contributions, there is greater parity between incidence and size of contributions between the two classes of beneficiaries. Externals, which are not specified, contribute to a marginal number of schemes and only in cash, but their average contributions tend to by and large exceed those of CO members and other beneficiaries.

Table 5.9 Contributions to Construction

		N	Average	Standard Deviation
CO Members	Cash	41	50,534.5	34917.4
	Labour days	29	244.5	235.1
	In kind	24	18,091.6	17393.2
Other Beneficiaries	Cash	24	32,020	28455.3
	Labour days	21	236.2	232.7
	In kind	12	14,741.6	21751.9
Externals	Cash	5	130,243.6	155797.1
	Labour days	0		
	In kind	0		

Cash contributions were predominantly made on the basis of 'ability to pay': at 82.9% (34 of 41) schemes. Other bases are 'equal share' and 'share of benefits', which account for 12.2% (5 of 41) and 4.9% (2 of 41) schemes.

5.3.4 Scheme Maintenance

Focus groups were asked to report on how the scheme had operated over the last 12 months and how they manage maintenance costs. Only three schemes had been disrupted, for one or two months. One was damaged by traffic and another by sewage from blocked drains.

RSPs' advise COs to establish a Maintenance Fund, and contribute a percentage of the fund costs to set the fund up. The survey sought information on how these funds are operating. There was only one scheme where beneficiaries were reported not to contribute to the cost of maintenance. All or most of CO members contribute at 36 out of 41 schemes, and all or most of non-member beneficiaries at 19 schemes.

At most schemes contributions are collected 'when needed', with beneficiaries contributing according to their 'ability to pay' (17 CPIs). Of the 13 schemes which make a 'regular maintenance charge', more than half also charge on 'ability to pay'.

70.7% (29 of 41) COs have a maintenance fund, but 16 of the 29 have not used it. With the result that only 39% of all COs have maintenance funds that are used.

5.3.5 Beneficiaries

Focus groups were asked to say how many households are currently using the street pavement and drainage scheme as a primary source. This is not the clearest definition for a form of infrastructure which serves all the houses along the section of street which has been paved. It is also difficult to see how a beneficiary can use the street as a 'secondary source'. Subject to those qualifications, Table 5.10 shows the average number of targeted, primary, and secondary beneficiaries. It shows that all schemes have primary beneficiaries while about one-half have secondary beneficiaries as well. It also suggests that on average primary beneficiaries have exceeded targeted beneficiaries.

Table 5.10

	N	Average	Standard deviation
Targeted beneficiaries	41	208.8	270.6
Beneficiaries using the CPI as a primary source	41	313.9	582.3
Beneficiaries using the CPI as a secondary source	17	154	244.6

However, paired-sample t-tests suggest that this change is not statistically significant. P value is 0.2.

5.4 Household Questionnaire

As for the other CPIs, the survey was designed so that 10 randomly selected beneficiary households would be interviewed at each SP&D scheme, giving a target of 410 household questionnaires. In the field, 409 questionnaires were completed.

5.4.1 Household Structure

Table 5.11 Household Structure of Street Pavement and Drainage Beneficiaries

Characteristic	N	Mean	SD
Total Household	409	7.7	3.6
Adult Male	405	2.2	1.3
Adult Female	407	2.2	1.2
Male Children (<18)	313	2.2	1.3
Female Children (<18)	290	2.1	1.2

Unlike the other categories of CPI, more non-member beneficiary households were interviewed than CO-member households: 55.3% of households against 44.7%.

Table 5.12 summarises beneficiary participation in planning the SP&D CPIs. Almost all CO members participated in the planning. On the other hand, only about one-third of the non-member beneficiaries were involved. There was some female participation, as high as 16% of CO member households, if joint participation with their husbands is included. Even for non-member households it was just over 10%.

Table 5.12 Participations in Planning Street Pavement and Drainage Schemes

	All Beneficiaries HHDs	CO member HHDs	Non-Member HHDs
% of hhds participated in Planning	58.7	93.4	30.5
Only Male	85.4	83.6	88.9
Only Female	10.4	11.7	7.2
Both jointly	4.2	4.7	2.9

The respondents of the household survey were also asked about their contribution in the construction of the street payment and drainage scheme. In summary a higher proportion of CO members contribute to construction, as compared to non-member beneficiaries. A higher proportion of CO members contribute in cash than in labour, while the opposite is true for non-members. Contributing CO members give some 20% more per household in cash and twice as many labour days than contributing non-member beneficiaries.

With regard to construction, overall 58.4% of total beneficiaries, 79.2% of CO members, and 41.6% of non-member beneficiaries made contributions.

Of those who contributed, 64.4% contributed in cash and 38% contributed in labour. 71% of CO members contributed in cash and 40% of CO members contributed in labour. 54% of non-member beneficiaries contributed in cash and 35% of non-member beneficiaries contributed in labour. Put simply, among those who contributed, a higher proportion of CO members relative to non-member beneficiaries was reported, a theme that is also relevant to both cash and labour contributions.

On average PKR 1927.5 and 13.7 labour days were contributed. Regarding average cash contributions, the difference between the two classes of beneficiaries is not substantial. CO member and non-member beneficiaries contributed PKR 2033 and PKR 1714. However, CO members contributed 16.5 days, which is twice as much as what non-member beneficiaries contributed.

A similar analysis of contributions to the maintenance of SP&D shows that very few households do contribute: less than one-tenth. Among those who do contribute, most contribute in cash, less than PkR 100 per household on average.

5.4.2 Household Satisfaction

Interviewees were asked a range of questions about how they rated the CPI. The results suggest high levels of satisfaction irrespective of the question asked. Reasons for non-satisfaction were not reported.

Table 5.13. Beneficiary satisfaction with SP&D schemes

		Member	Non-member
How do you rate the performance of the project committees?	Good	75.4	75.7
	Okay	14.2	14.2
	Poor	3.3	2.2
	Don't know	7.1	8.0
How do you rate the performance of RSP support?	Good	89.6	85.8
	Okay	8.2	11.9
	Poor	1.6	1.8
	Don't know	0.5	0.4
Is the CPI functional at present?	Yes	96.2	97.8
	No	3.3	0.9
	Don't know	0.5	1.3
Is the CPI safe from the risk of closure?	Yes	93.4	92.0
	No	6.6	8.0
Are you satisfied with the performance of the CPI?	Yes	92.3	94.7
	No	7.7	5.3

5.4.3 Disposal of Waste Water and Waste Material

Potential benefits of street pavement and drainage are improved amenity and reductions in disease, both of which are difficult to measure. In order to capture an indication of the potential benefits, households were asked about whether the CPI had changed the way they disposed of waste water and waste material.

Tables 5.14, 5.15 and 5.16, summarise the results for three kinds of waste water: dishwashing, laundry and roof water. The results are very consistent. Where before some 70% threw their water into the street, the same percentage now have their waste water piped to the CPI drain.

Table 5.14 Disposal of Water from Dishwashing Before and After the CPI

		What happens to water from dishwashing after the CPI				Total
		Pipe to drain	Throw in drain	Throw in street	Others	
What happened to water from dishwashing before the CPI	Pipe to drain	17	0	1	0	18
	Throw in drain	32	16	0	0	48
	Throw in street	190	71	17	1	279
	Others	36	7	0	13	56
	Total	275	94	18	14	401

Table 5.15 Disposal of Water from Laundry Before and After the CPI

		What happens to water from laundry after the CPI				Total
		Pipe to drain	Throw in drain	Throw in street	Others	
What happened to water from laundry before the CPI	Pipe to drain	17	0	3	0	20
	Throw in drain	41	13	0	0	54
	Throw in street	149	71	17	0	237
	Others	27	5	0	14	46
	Total	234	89	20	14	357

Table 5.16 Disposal of Water from Roof Before and After the CPI

		What happens to the water from roof after the CPI			Total
		Pipe to drain	To drain	Others	
What happened to the water from roof before the CPI	To drain	26	4	0	30
	In street	242	114	0	356
	Others	14	1	8	23
	Total	282	119	8	409

Changes, if any, in attitudes towards cleanliness, which lead to enhanced amenity have been measured through changes is methods of rubbish disposal, cleaning of streets and drains.

With regard to the method of disposing rubbish, 'throwing in street' has more than halved and rubbish collection has doubled.

Table 5.17 Disposal of Rubbish before and after the CPI

		What does the household do with rubbish after the CPI				
		Collected	Throw in Street	Take to Dump	Others	Total
What did the household do with rubbish after the CPI	Collected	27	0	5	0	32
	Throw in Street	35	45	20	0	100
	Take to Dump	0	0	270	1	271
	Others	0	1	1	4	6
	Total	62	46	296	5	409

There was a trend of households cleaning the street prior to the SP&D scheme, and this trend has persisted afterwards.

Table 5.18 Street Cleaning before and after the CPI

		Does anyone clean the street prior to CPI				
		Household	Hired	Others	Not Appli-cable	Total
Did anyone clean the street prior to CPI	Household	339	10	1	1	351
	Hired	4	4	0	0	8
	Others	34	0	2	0	36
	Not Appli-cable	11	0	0	3	14
	Total	388	14	3	4	409

Table 5.19 shows that most CPI drains are kept clean by beneficiary households, which is indicative of enhanced amenity.

Table 5.19 Who Cleans CPI Drains

		Who Cleans the CPI drains					
		None	Beneficiary Household	Project Committee	Not Appli-cable	Others	Total
Who Cleans Drains	None	1	5	0	0	0	6
	Beneficiary House-hold	1	5	0	0	0	6
	Project Committee	1	0	0	2	0	3
	Not Applicable	31	330	14	14	3	392
	Others	0	1	0	0	1	2
	Total	34	341	14	16	4	409

However, regarding the disposal of waste from Water Closets (WCs), cesspits are still used and the increase in sewers is only marginal. This is so although 60% of respondents use currently opposed to 39% prior to the SP&D scheme.

Table 5.20 Disposal of Waste from WCs before and after the CPI

		What happens to waste from WCs after the CPI			
		Cesspit	Sewer	Others	Total
What happened to waste from WCs before the CPI	Cesspit	139	2	10	151
	Others	0	0	7	7
	Total	139	2	17	158

5.4.4 Perceptions of CPI Impact

Interviewees were asked whether the street pavement and drainage scheme had improved women and children's health. The results are given in Table 5.21. It shows that two-thirds of households perceive large benefits and a further 16% perceive some benefit.

Table 5.21 Scheme Impacts

	Women's health	Children's health
Large benefit	66.7	64.1
Some benefit	16.4	17.4
No benefit	5.9	6.6
Negative effect	0.2	0.2
Don't know	10.8	11.7

SYNTHESIS OF THE RESULTS

6 SYNTHESIS OF THE RESULTS

This chapter brings together the analysis of the four different scheme types. It does three things: a) compares the survey results across the different categories; b) analyses the CPI impacts; and c) makes some tentative estimates of costs and benefits.

The chapter is organised according to the three parts of the survey: the Technical Assessment carried out by the survey engineers; the Institutional Assessment based on a Focus Group discussion with CO members; and, the Beneficiary Assessment from interviews with 10 beneficiary households at each CPI surveyed.

The final sections of the chapter draw this data together to describe the benefits delivered by the CPIs and compare them with the reported costs.

6.1 Technical Assessment

The Technical Assessment started with a review of RSP records for each scheme surveyed. From there, survey engineers were required to compare the scheme 'as-built' with the original design, and report on its condition and use.

6.1.1 DWSS

The survey covered 79 drinking water schemes: 27 gravity, 12 mechanised, 19 dug well and 21 DWS reservoirs[7]. However, the Technical Assessment revealed problems with this classification. There were significant variations within the four groups. The most important was the fact that many schemes provided reticulation, a distribution network to standpipes or house taps. This applied to four fifths of gravity schemes and a third of reservoir and mechanised schemes. The benefits of a scheme with reticulation are different in both scale and nature from one without. DWS Reservoir schemes formed two distinct groups. Six were rainwater collection reservoirs but the remaining 15 were fed from canals or rivers. Here too, the benefits are likely to differ widely between the groups, if only because rainwater reservoirs typically only hold water for a few months. A last complication was that a minority of CPIs were not complete new schemes. Instead they were to rehabilitate or extend existing schemes. It is difficult to allocate scheme benefits between the original infrastructure and rehabilitation.

Summary specifications of the four groups of DWS schemes are given below.

Gravity (27) – Average pipe length (26): 1.5 km, average distribution line length (21): 1.6 km, average tank volume (6): 54,773 liters

Mechanised (12) – Average pipe length (11): 0.4 km, average distribution line length (4): 0.3 km, average tank volume (6): 134438.2 liters, average motor capacity (12): 7.6

Dug well (19) – Average depth (18): 53 m, average tank volume (7): 8123.5 liters

DWS Reservoir (21) – Average pipe length (11): 0.5 km, average channel length (9): 11.7 m, average

7 One hand pump scheme misclassified as mechanised was excluded from the analysis.

distribution line length (7): 0.5 km, average tank volume (6): 266517 liters

Survey Engineers reported that almost all DWSS CPIs had been built as planned. Only a small minority showed small variations between what was designed and what was built. A majority of schemes had also been completed on time and on budget. However, a fifth of gravity and dug well schemes were late, most commonly because of delays over disbursement. There were cost overruns at a minority of mechanised, dug well and reservoir schemes.

At PkR 500,000 per CPI, RSP records showed that gravity schemes were the most expensive, followed by mechanised and reservoir schemes (PkR 300,000) and dug well schemes (PkR 135,000). Material was the most significant cost for all types of scheme, between 60% and 82%. Unskilled labour, a potential source of employment for the community was relatively low: between 7% and 14%.

Under different programmes, RSPs' have asked communities to contribute 20% or even 30% of the cost. However, records for the survey showed a significant proportion of schemes which contributed less.

Of 79 DWSS CPIs, 49 were assessed to be in good condition: 62%. Six were in 'poor' condition and seven 'non-operational'. 62 schemes (78%) were assessed as 'fully utilised', including three of those in 'poor condition'. Conversely, there was one gravity scheme which was in good condition but not utilised.

6.1.2 Irrigation

The irrigation part of the survey covered 80 schemes, half of which were to be channel/pipe schemes and half water course lining. As for the DWSS, CPI descriptions were not sufficiently specific and the sample had to be re-classified into four groups: water channel lining (37 CPIs), conveyance (18 pipe and 2 channel), tubewell with pump (15) and Karez (4). Of the remainder, one was a dug well, apparently without a pump, and three others could not be specified clearly. Summary specifications of the four groups were as follows:

Pipe schemes (18) – Average length > 0.5 km, pipe diameter 10 – 15 cm

Channels (2) – 1 at 900 metres long, 1 at more than 3 km

Tubewells (15) - Depth between 50 and 100 metres, pumps 20 to 30 hp

Karez (4) – 2 rehabilitated over 700 metres, 2 extended by < 200 metres

Water Channel Lining – Average of 962 metres lined

Almost all CPIs were found to have been built as planned. However, two schemes showed significant variations on key parameters such as length and depth of the wells. 10% of schemes were not completed on time, in four cases because of conflict in the area and in two because of delays in fund disbursement. Only two schemes overran the budget.

At an average cost of PkR 633,000, irrigation schemes were similar in size to DWSS. However, there was a wide range. One pipe water scheme cost PkR 8 million. If that scheme is excluded, pipe/channel schemes were still the most expensive, at PkR 688,000. Water channel lining CPIs also cost over half a million rupees. Tubewell and Karez schemes were much cheaper, at PkR 380,000 and 221,000 respectively. The mix of costs was also similar to DWSS, with over 50% on material and only 12% on unskilled labour, although water channel lining schemes did slightly better with 18% of expenditure going on unskilled labour.

Community contributions ranged from 30% on water channel lining CPIs to only 14% on piped schemes. On the most expensive PkR 8 million scheme the community only contributed 5%. The low figure for piped schemes parallels that for DWSS, where contributions were markedly lower on gravity schemes, it may indicate a tendency to contribute less in the hilly regions where these schemes predominate: mainly SRSP and AKRSP. Most commmunities (69/78) contributed labour and materials (62/78). About half also contributed skilled labour.

Almost all schemes were assessed as fully utilised but 20% were in less than good condition. Tube well CPIs were the most affected: two not operational (13% if TWs) and 3 in 'poor condition'.

6.1.3 Link Roads

40 Link Road CPIs were surveyed. There were fewer problems over classification here, although not all the link roads had culverts, causeways and retaining walls.

With just one minor exception, all the CPIs were assessed to have been built fully to specification. 100% were built within budget and only 7.5% were not completed on time, because of delays in disbursement.

Summary specifications of link roads are given below.

Table 6.1 Specifications of Link Roads

	Length (m)	Height (ft)	Width (ft)	Top Width (ft)	Bottom Width (ft)	Thickness (ft)
Link Road	1589.7		10.5			1.6
Retaining Wall	270.8	5.2		1.6	2.9	
Culvert	4.2		7.8			4.5
Causeway	82.4		13.4			6.8

- The average conceal that a majority of schemes i.e. 62.5% (25 of 40) are in fact less than a kilometre long.
- For 2 link road schemes, retaining walls are particularly substantial i.e. 1450 and 800 feet long.
- The average length for causeways is completely biased by a single extreme value i.e. 390 metres. The other schemes range from 3-8.23 metres.

At PkR 631,000, the average cost of a link road CPI was quite similar to that for DWSS and irrigation schemes. However, like those schemes the range was wide: from PkR 75,000 to PkR 2.4 million. As might be expected, unskilled labour was a higher proportion of costs on roads CPIs, but still only 21% of the total. As for the other categories, over 50% was spent on material.

On average, communities contributed well over 25% of the cost and only three contributed less than 20%. Most communities contributed both skilled and unskilled labour.

Only one road CPI was assessed as less than fully utilised and only 12 were in 'regular' as opposed to good condition. There were no roads that were not operational.

6.1.4 Street Pavement and Drainage

41 Street Pavement and Drainage CPIs were surveyed. They were all of similar design: a brick paved or soled street, with side drains for rain and household water. As with the other categories, almost all schemes were assessed to have been built to specification. Some aspects were not fully met on six schemes: 15%.

Summary specifications of street pavement and drainage schemes are given below.

Table 6.2 Specifications of Street Pavement and Drainage Schemes

	N	Average Length (ft)	Average Width (ft)	Average Thickness (inch)
Soling	41	505.4	10.9	4.4
Foundations	29	1961.7	11.3	4.7
Side Drains	41	1504.8	6.9	

- With reference to side drains, 2 schemes have no length although other parameters are reported to have value. This is either suggestive of an error in measurement or the absence of drains. Nonetheless, when these 2 schemes are not counted, the average length of drains increases to 1582 feet or 482.2 metres. There are also 3 outliers i.e. 4200, 5300, and 6000 feet. Once these are removed, the average falls to 1283.2 feet or 391.1 metres.

100% of SP&D CPIs were completed on budget but 17% were not completed on time. 5% were delayed over a year. Conflict over the scheme was the commonest cause of delay, followed by delays in disbursement. Unlike drinking water and irrigation schemes, it is not easy to see why SP&D schemes should be prone to conflict, unless it was about money or the allocation of work opportunities.

The average cost of an SP&D scheme was, at PkR 514,000, quite similar to the other categories, but with a wide range: from PkR 59,000 to PkR 1.0 million. The material component of the cost was high, 80%, and the unskilled labour component low at 8%.

All 41 schemes were reported to be fully utilised and 31 in good condition. Of the remaining 10, only two were classed as 'barely functional, and unmaintainable with substantial rehabilitation'.

6.2 Institutional Assessment

The Institutional Assessment was based on a Focus Group discussion with CO office holders and members. This concentrated on institutional aspects of CPI implementation and management. The groups were also asked about beneficiary numbers and their assessment of the CPI's impact.

6.2.1 DWSS

The survey revealed the high level of support the RSPs' provide to COs implementing CPIs. Social Organisers made more than 5 visits to each CO during the planning phase and RSP engineers between 2 and 5 visits. During the construction phase the figures rose to 11 visits for SOs. For engineers it was between 15 and 18 at the more complex gravity and mechanised CPIs but even at the simpler dug wells the average was 10 visits.

Some two thirds of COs had formed the recommended implementation, audit and O&M committees but nearly 20% did not have any committees. Overall, there were most implementation committees and fewest O&M committees. Dug well CPIs had the fewest committees by some way. Most implementation committees had 4 members but typically audit and O&M committees had only two. RSPs' provide specific training for CPI management committees and just less than three quarters of the most important implementation committees had received the training.

Focus groups at a majority of COs which had a committee (56/64) reported that all CO members had participated in appointing the committee. A similar majority reported that CO members were satisfied with the committees' work. Only at one DWS reservoir scheme were CO members not satisfied at all.

The groups were asked how the CO had raised its contribution to the CPI. Four groups reported that they had not made any contribution. Those apart, just over half reported that member shares in the contribution were based on 'ability to pay' as opposed to the alternative equal share per member. On gravity schemes, the largest number of schemes contributed labour followed by cash. For dug wells the position was reversed. Overall, however, most COs contributed both cash and labour. Most, if not all, CPIs were expected to serve people outside the CO. At about a third of schemes, these other beneficiaries made a contribution, in some cases a substantial one.

RSPs' advise COs to establish a maintenance fund and contribute a portion of the CPI budget to that fund. However, only 61% of DWSS COs have such a fund and barely a third of those actually use it. On average, each fund has only PkR 12,000 ($150 say). COs at a majority of schemes only collect money for maintenance when it is needed. Overall, it can be concluded that COs take an ad hoc approach to maintaining their CPIs, although gravity schemes are something of an exception. Just over half of this charge a regular maintenance fee, 21 out of 27 have a maintenance fund and, at PkR 18,000, these funds are about one and a half times larger than the overall average.

The average of the target number of beneficiary households in the RSP records for the 41 schemes surveyed was 61.3. The average of the focus groups estimates of current 'primary beneficiaries' was almost exactly the same: 61.6. This conceals increases of about 10%, on average, at gravity and mechanised schemes offset by a 35% decrease at dug well schemes. However, none of the differences were statistically significant.

6.2.2 Irrigation

Focus group discussions at irrigation CPIs produced similar results to DWSS. RSP SOs and engineers made even more visits to each scheme: 8 and 6 respectively during planning, and 14 and 21 during construction. Support was particularly intensive at water channel lining CPIs.

More irrigation CPIs had the full complement of management committees: over 90% compared with two thirds for DWSS. Nevertheless, 10% of Pipe and Channel Lining schemes had no committees. Only half of the committees had been given function specific training by the RSP.

Average committee membership was around 3, but there was a high proportion with only the minimum two members, for example over 50% of implementation committees on channel lining schemes. However, three quarters of COs reported that all members had taken part in appointing the committee. At the other extreme, 5% reported that it had been done by the CO leadership. This was more common on pipe and channel lining schemes. There were no COs where the focus group reported dissatisfaction with the committees' work.

The groups were asked to say who had taken part in the different stages of implementing the CPI: needs identification, planning, implementation and O&M. At all four stages, about a quarter replied that it was only the CO office bearers. At three stages, just over 50% said that it was 'all the CO members'. During the planning stage, however, nearly 40% said that it had been done 'mostly by the RSP Engineer/SO'.

The focus group at one irrigation CPI reported that the CO had not contributed to the CPI. For the remainder, nearly 60% collected contributions according to the beneficiary's share of benefits from the scheme. This was most common on Tube Well and Channel Lining schemes. Cash contributions were made at 88% of schemes, but labour contributions were also made at two thirds and in-kind contributions at 40%. Unlike DWSS, beneficiaries who were not members of the CO contributed at over half the irrigation schemes. Averaged over all 80 schemes, non-members contributed over 30% of the total cash contribution but less than 10% of the labour contribution.

Groups at over a quarter of irrigation schemes reported that their irrigation CPI had been non-operational for between 1 and 12 months during the last year, five of them for 6 months or more and one for the whole 12 month period. The reasons varied from damage by snow or floods to conflict and mechanical problems. At three tube well schemes, there were alternative water sources available and at three channel lining schemes there was no water at source, i.e. in the main canal.

Nearly half the groups reported that they had no operating costs, the responses from those who did were difficult to interpret. Only mechanically pumped tubewells would be expected to have fuel costs but 11 pipe schemes and six channel lining schemes also reported fuel costs. Relatively few COs used their formal O&M committee to make decisions about how to collect money for operating costs. Among a range of options, 'all beneficiaries' was the commonest. Operations appeared to have been outsourced to contractors or tubewell owners at 10% of schemes.

Responses on scheme maintenance were similar to those for DWSS. Although 57 COs had a fund, five had no money in them and the average balance for the remainder was between PkR 10,000 and 20,000. Only 38% of COs have and use their fund. Among a range of combinations, the commonest was to collect money for maintenance when it was needed, and for beneficiaries to contribute 'proportional to benefit'.

On average, the focus groups reported a modest increase in the number of primary beneficiaries from the scheme, compared to the number planned when the CPI was built: from 54 households to 62. This difference was not statistically significant. Asked why households were not using the CPI as their primary source, 14 COs reported that it was because they had an alternative source of water.

Groups at 28% of irrigation CPIs reported problems at the time of interview. 19 schemes needed repairs and four had insufficient water.

6.2.3 Link Roads

RSP support to link road CPIs was as intensive as at the other schemes: over five visits per CPI by the SO and five by the engineer during planning, and 17 and 20 respectively during construction.

The standard structure of three CPI management committees was followed at almost all schemes, apart from two schemes which did not have an O&M committee. As for the other categories, committees averaged between three and four members but the minimum of two was by far the commonest size: at between 30 and 45% of schemes. Less than 60% of committees had received function-specific training. Without exception, all or most CO members were satisfied with the performance of the committees.

Two of 40 focus groups reported that they had not contributed to the CPI. Those apart, most COs contributed cash, labour and slightly less frequently in-kind. Non CO member beneficiaries contributed at about 40% of schemes. Where they did, their contributions in labour as well as cash equalled the average for CO members. As with the other schemes, 'ability to pay' was the most frequent arrangement for collecting contributions, at just over half of all link road CPIs, followed by 'equal shares' at 40%.

Seven of the 40 roads had been out of operation for between one and four months in the last 12, mostly because of bad weather. Beneficiaries do not contribute to maintenance at four CPIs and non-CO beneficiaries contribute at less than half of CPIs. As for the other types of CPI, the majority only collect money for maintenance when it is needed and 'ability to pay' is the commonest option for assessing how much individuals should pay. Responses on maintenance funds were also similar; only 30% of COs had and used their maintenance fund and the average fund balance was PkR 14,000.

On average, focus group estimates of the number of primary beneficiaries was 6% higher than the target number set when the CPI was built: 149 households compared to 139. However, the difference was not statistically significant.

To give an indication of the before/after situation, the groups were asked to say whether the community had motorable, all season access before the link road was built and whether they have it now. There was a pre-existing route at 30% of CPIs, but only small proportion were fully motorable and just two were all-season. 85% of CPIs were reported to meet both the motorability and all-season conditions. At the other extreme, there were three schemes (7.5%) which met neither condition, implying that the CPI had made no real improvement in the situation.

6.2.4 Street Pavement and Drainage

The intensity of RSP support to SP&D CPIs was similar to other classes. At 27, the number of engineer visits during construction was the highest of any scheme type.

Almost all COs established a full set of three CPI management committees. As for the other schemes, between 40 and 55% of the committees only had the minimum two members. However, 90% of focus groups reported that 'all CO members' had participated in the appointment of committee members. Over 75% of committees had been given function-specific training, rather higher than on other types of CPI. With one exception, all groups reported that CO members were satisfied with committee performance.

COs contributed to all the CPIs. CO members contributed cash at 100% of schemes, labour at 71% and in-kind at 51%. Non member beneficiaries contributed at just over half the schemes, predominantly both cash and labour. Cash contributions were less than the CO member average but labour contributions were the same. Individual contributions were assessed on 'ability to pay' at a large majority of schemes: 83%. Outsiders made substantial contributions, well above the CO member average, at five CPIs.

As with the other scheme types, most COs collect money for maintenance when they need it and assess charges on 'ability to pay'. Although 70% of COs have a maintenance fund, only 39% use it.

The average of focus group estimates of primary beneficiaries was 314, a 50% increase on the planned target set when the CPIs were built. However this result was not statistically significant.

6.3 Beneficiary Assessment

At each survey CPI, 10 beneficiary households were interviewed about their involvement in the CPI and the effect it had had on their lives and livelihoods.

6.3.1 Household Characteristics and Participation in the CPI

By way of background, households were asked about their structure. They were also asked about their individual participation in the CPI. Table 6.1 summarises the results by CPI type.

In most respects the table shows a consistent pattern across all schemes. In almost all cases more than 90% of CO members participated in planning the CPI and contributed to it. The exception was SP&D, where a fifth of CO members did not contribute. Where non-members were only a quarter of the beneficiaries, about half of them were involved in the planning and as many as 68% contributed. However, where there was a larger proportion of non-members (39 to 55%), the number involved in planning dropped to a third, although 40% contributed. Both member and non-member participation in CPI maintenance dropped sharply.

Table 6.3 Household Characteristics by CPI Type

Household Structure	DWSS	Irrigation	Link Roads	Street P&D
		All Households:		
Adult				
	2.1	2.55	2.3	2.2
Male	2.1	2.49	2.4	2.2
Female				
Child	2.0	2.11	2.1	2.2
Male	2.0	2.01	1.9	2.1
Female	8.2	9.2	8.8	7.7
Household Size				
CO Membership:				
% Not CO Members	25%	25%	39%	55.3
Participation in CPI:				
Involved in Planning:				
CO Members	95%	96%	93%	93%
Non Members	50%	51%	34%	30%
% Females Involved			2.5%	
Contributed to CPI:				
CO Members	91%	94%	95%	79%
Non Members	53%	68%	46%	42%
Av. Contribution:				
Cash PkR	2,100	5,491	2,445	1,927
Labour days	32	28	33	14
Contribute to Maintenance:				
CO Members	33%	40%	37%	< 10%
Non Members	19%	19%	8%	"

6.3.2 Household Satisfaction

Interviewees were asked a range of questions about how they rated the CPI. The results are given for each type of CPI.

Irrigation Schemes:

- Responses to questions concerning satisfaction with project committees, RSP support, functioning, change in water losses, risk of closure and overall satisfaction reflect a solid vote of confidence in the RSP CPIs. For the small group who were not satisfied with the scheme, the main reasons given were irregular and insufficient water supplies.
- Only 13 households reporting problems during construction, half came from two Pipe schemes which had problems raising funds and completing the CPI.
- 11% of households reported current problems with the CPI. At Karez schemes it was 28% and at Pipe schemes, 19%. These relatively high levels of reported problems do not entirely agree with the very high levels of expressed satisfaction. Almost all the households reporting current problems cited maintenance as the main issue. There was just one complaint about the way water is distributed.

DWSS Schemes:

- Except for dug well schemes, a majority of beneficiaries were satisfied with the performance of project committees. Most users of dug well schemes are unaware of project committees.
- Across all schemes types, most respondents found RSP support to be either 'Good' or 'Okay' although the proportion is lower for dug well and DWS reservoir schemes, and regarding the former, the proportion of respondents reporting 'Poor' significantly high at 12%.
- A vast majority of users were satisfied with the functioning of the scheme at the time of the interview. Concerns were raised by one-third of DWS reservoir beneficiaries as the question is biased against seasonal schemes.
- A majority of respondents reported a decrease in water losses i.e. with the exception of dug well schemes. One-half of dug well users reported no change.
- Risk of closure was reported for about one-fifth of interviewees. However, the proportion rises to about one-fourth for gravity and mechanised schemes.
- Across all scheme types, about one-tenth of users are not satisfied with the performance of the CPI. The reasons for not being satisfied are irregular or insufficient water supply, raising concerns about water quantity. Only for mechanised schemes has the category 'Too expensive' been reported.

Link Road Schemes: The results suggest high levels of satisfaction. The only area of concern is the risk of closure, which was raised by more than one-third of CO member beneficiaries.

Street Pavement and Drainage Schemes: The results suggest high levels of satisfaction irrespective of the question asked.

6.3.3 The Impact of DWSS CPIs

To understand the impact of drinking water CPIs, households were asked where they got their water before the CPI was built and where they are getting it now. For gravity and mechanised schemes, almost all the households interviewed are using the CPI: 98% and 90% respectively. However, at dug well and reservoir schemes nearly a third are not using the CPI.

Reticulation or distribution seems to be the critical factor. On gravity and mechanised CPIs, the majority of beneficiary households are now getting their water either piped into the house itself or into their yard: 89% for gravity and 57% for mechanised schemes. Before the CPI, they had used dug wells, unprotected springs or surface water. [8] The contrast is with dug well CPIs, which may have provided a new water source closer to the house but did not change the type of water source. The situation on DWS Reservoirs was more complicated, even confused. There are significant groups of beneficiaries, classified as users of the CPI, who now depend on dug wells, surface water or even the uncertain category of 'other'. On the other hand, there are also reservoir schemes which provide piped water. About 40% of reservoir beneficiaries are now using water piped to their house yard or, more commonly, to a public standpipe.

A reduction in the effort needed to fetch water is the major expected benefit from DWSS schemes. Households were asked who fetched water before the CPI and who fetches it now. The results for gravity and mechanised schemes were similar. Pre-CPI water was 'mainly fetched' by adult women: 88% of gravity households and 63% of mechanised. These figures have now dropped to 50% and 38% respectively; principally because 40% of households now have water piped to the dwelling, so it no longer has to be fetched. This underlines the fact that women are the principal beneficiaries of drinking water schemes which include a distribution network.

8 The definition of surface water included lakes, rivers and canals, as well as standing water.

The pattern at dug well schemes was quite different. Pre-CPI, only 38% of households depended 'mainly' on adult women. This proportion has now risen slightly to 42%, perhaps because the new dug wells are closer making it easier for women to do the collection. More importantly, about half of all household share the job of collecting water 'equally' between men and women or between all household members both pre and post CPI.

Reservoirs made no difference to the dependence on women: at around 56% of households pre and post-CPI.

Households were also asked how long it took to fetch water pre- and post-CPI. In the pre situation, the average at all types of DWSS was between 65 and 75 minutes. (This probably indicates some saying 'one hour' and some saying 'one and half hours'). For gravity and mechanised schemes, these times dropped substantially, to less than two minutes and 8.5 minutes respectively. The reported time savings at dug well and reservoir schemes were also substantial, with a post CPI average time of around 35 minutes.

Easier access to water would be expected to increase consumption. In developing countries, the UN guideline is that 20 – 30 litres per capita are needed to meet basic human needs. Interviewee estimates of consumption must be treated with caution, depending not just on accurate recall but also on an ability to judge the volume of the containers used to fetch water. That said, average reported consumption across all groups of schemes was almost exactly equal to the lower end of the UN scale: 20 litres per capita. Only on mechanised schemes was the figure slightly higher: 26 litres. This result is surprising. It would be expected that consumption on schemes where water is piped to the house would be substantially higher. If accurate, it also means that a large proportion of households consume much less than the guideline figure.

Better health is another expected benefit of DWSS. Households were asked if any member had been ill in the last three months. 12% reported diarrhoea and 6% each of gastric disease and typhoid. The incidence of diarrhoea was slightly lower at gravity CPIs but there was no difference between mechanised and dug well schemes, despite the former having a more protected water source and piped distribution. Reservoirs might be expected to be the least healthy but they fell in the middle of the range.

The last section of the household questionnaire sought the interviewees' own perceptions of the impact of the CPI in terms of four indicators: women's health; women's free time; children's health; and children's free time. There was a clear pattern of strongly positive responses on gravity and mechanised schemes, and less enthusiasm on reservoir, and especially, dug well schemes. On women's free time, for example, over three quarters perceived 'large benefits' at gravity CPIs, and over two-thirds at mechanised ones. Only just over a third of households felt the same at dug well and reservoir schemes. Of the four indicators, women's free time scored highest followed by women's health.

6.3.4 The Impact of Irrigation CPIs

The benefits of irrigation can take several forms: converting barren land to farm land; converting rainfed land to irrigation and, as a result, a change to more profitable crops increased yields; increased crop intensity, ie two or even three crops a year instead of one; and more efficient water use and consequent cost savings

To understand the impact of the RSP CPIs, beneficiary households were asked to report on how they had used their land prior to its construction and how they are using it now.

The average farm was 52 kanals: around 60 kanals on tubewell and channel lining schemes; 26 on

pipe schemes and 13 on Karez. 15% of households reported changes in the total farm area. Four (of 754) are farming less land post-CPI and 109 are farming more, with a net increase per household 16 kanals (2 acres). It is quite possible that this was the result of changes in family circumstances and not attributable to the CPI. Even if it is attributable, the overall impact is small: 1.13 kanal per household or 2%.

The averages conceal wide distributions in farm sizes. 33% of households have less than 16 kanal (2 acres) and 69% have less than 48 kanal. However, on tubewell and channel lining schemes, 8 to 9% have more than 144 kanal (18 acres). On these schemes it can be estimated that 18% of the benefits went to the 8% of households with large farms. CO members have slightly larger farms than non-members but the average difference is not large: 3 to 4 kanals per household.

Almost all the land was owned, not rented or sharecropped, and 90% was reported to be in the CPI command area and irrigated in both Kharif and Rabi seasons.

Overall, households reported that 14% of their land now had irrigation but did not have it prior to the CPI. The proportion was highest on pipe schemes (41%) and Karez (39%). On channel lining schemes it was only 7%. Cropping patterns changed as a result of the extra irrigation. On pipe schemes fallow areas fell in both seasons by around two thirds: in Kharif from 40% of the total area to 16%. Most of this Kharif land went to fodder and vegetables. On Karez fallow areas also fell, with more rice grown in Kharif and more wheat in Rabi. The changes at tubewell and lining schemes were relatively minor although fallow areas did fall.

Farmers also reported their estimated yields pre and post-CPI. May change for many reasons, market prices, input costs etc, which have nothing to do with the CPI. With that qualification, yields for most crops were estimated to have increased by between 30 and 40 percent. The exceptions were cotton and rice, for which yields fell. However, only one result, the increase for wheat, was statistically significant.

A small proportion (5%) reported that they had land inside the CPI area which was not irrigated, about 20 kanals per household. The main reasons were lack of water (3%) and 'regaining fertility', i.e. fallowing.

Asked their perceptions of the CPI's effect on their production and livelihoods, 90% reported that crop production had increased. Three quarters reported a large impact on household revenue and two thirds on food availability. For housing, women's free time and children's free time, opinion was evenly split between 'large', 'some' and 'no' benefits from the CPI. 5% even saw a negative effect on women's free time, and 2% on children's free time.

6.3.5 The Impact of Link Road CPIs

To understand the impact of link roads, households were asked to say how they used to travel to key facilities and services before the new link was built and how they travel now. Overall there was a general shift away from travel on foot and towards wheeled transport: mainly bicycles, public transport and motor cycles. For nearby facilities, such as the general store and the nearest boys school, over three quarters travelled on-foot both pre- and post-CPI, but the proportion did fall. For facilities which are further away and visited less frequently, vehicle transport was more commonly used even pre-CPI, but there was a much bigger shift in this direction post-CPI. The following five services illustrate the pattern:

The final column in the table shows the average time saved reported by households that has resulted from the CPI and changes in the mode of travel, and from any other changes such as other road improvements.

Table 6.4 Mode of Travel – Pre and Post-CPI

	% On Foot		Post-CPI			
	Pre-CPI	Post-CPI	% Bicycle/ Animal	% Public Transport	% Motor Cycle	Av Time Saved - Mins
General Store	85.5	74.3	5.5	10.0	6.0	27.5
Boys School	86.5	82.5	9.5	3.2	1.2	19.5
Clinic/Hospital	48.4	27.4	11.2	37.2	10.5	23.7
Tehsil HQ	28.2	9.2	7.2	58.1	13.5	72.2

Household perceptions of the link roads were positive. Two thirds reported 'large benefits' to household income and about half to sales of farm produce. Most also saw at least some benefits to farm input costs, and boys and girls education. As with most other categories of CPI, fewest households saw benefits to Women's Free Time: 30% 'no benefit' and 4% 'negative effect'.

6.3.6 The Impact of Street Pavement & Drainage CPIs

There are few clear indicators of the impact of SP&D schemes. The disposal of dirty water is one of the clearest. Of 410 households, nearly 70% used to through their dishwashing and laundry water into the street before the CPI was built. With the new scheme built, almost all households either have piped drainage out of the house (70%) or can throw their water into a drain. For the majority, rainwater off the house roof is also directed into the drains.

Although 11% responded 'don't know' to the question, two thirds of households reported large benefits to women's and children's health.

Moreover, changes, if any, in attitudes towards cleanliness, which lead to enhanced amenity have been measured through changes is methods of rubbish disposal, cleaning of streets and drains. With regard to the method of disposing rubbish, 'throwing in street' has more than halved and rubbish collection has doubled. There was a trend of households cleaning the street prior to the SP&D scheme, and this trend has persisted afterwards. However, regarding the disposal of waste from Water Closets (WCs), cesspits are still used and the increase in sewers is only marginal.

Regarding perceived impact, interviewees were asked whether the street pavement and drainage scheme had improved women and children's health. Two-thirds of households perceive large benefits and a further 16% perceive some benefit. The remaining reported the category 'Don't know'.

COST-BENEFIT ESTIMATIONS

7 COST-BENEFIT ESTIMATIONS

The survey results have shown considerable diversity within categories, even within sub-categories. This makes it impossible to develop an analysis of costs and benefits overall. Instead, this chapter uses some simplified models for each sub-category to provide some indicative estimates.

The cost per beneficiary household is an essential starting point for an analysis of costs versus benefits. Table 7.1 presents an analysis of the RSP portfolio in the four categories of CPI included in the survey.

Table 7.1 Beneficiaries and Cost Per Beneficiary at RSP CPIs

CPI Categories	No of CPIs	Hhds Per CPI	Cost per CPI (PkR)	Cost Per Hhd (PkR)
TRANSPORT				
1. Link Roads	1,675	135	432,785	3,206
DRINKING WATER				
2. DWSS (Mech./Gravity)	1,542	55	388,958	7,072
3. Reservoir and Dug well	736	48	194,258	4,047
IRRIGATION				
4. Conveyance (Channel/Pipe/ Karez)	724	68	543,695	7,996
5. Lining of Water Courses	3,261	50	410,573	8,211
SANITATION				
6. Street Pavement & Drainage	1,719	163	445,769	2,735
Total	9,657	87	410,733	4,721

The table shows that although the average cost per CPI is similar across most categories, the cost per beneficiary household ranges from PkR 2,700 to over 8,000. Road and street paving schemes cost least per beneficiary. Irrigation schemes cost the most.

Table 7.2 presents the equivalent data from the survey. The table shows the following points:

At the overall level, in terms of beneficiary numbers and cost per beneficiary, the survey results are broadly in line with the averages across all RSP CPIs in each category. This gives confidence that the survey is a representative sample of the whole.

The exception is Irrigation where the survey cost per beneficiary of PkR 11,000 is nearly 40% higher than the RSP average. This is partly because of one pipe irrigation scheme which cost PkR 8 million. However, even if that is excluded the cost per beneficiary household is still PkR 10,000, compared with the RSP average of PkR 8,000.

With high costs and low beneficiary numbers, tubewell irrigation schemes come out particularly expensive at 15,000 per target beneficiary. Irrigation tubewells are one of two categories where beneficiary numbers reported in the survey (as primary users of the CPI) are much less than the target: barely 50%. The result is a cost of PkR 29,000 per user household.

It is important to note a significant hidden, or overhead cost which is not included in the above

figures: the RSPs" own costs. The survey showed that CPIs take a high level of support: as much as 30 or 40 SO and engineer visits. If that is costed at PkR 4,000 a visit, it equates to at least 10% of the total CPI cost, in some cases as much as 30%. This not considered further in what follows, but it should be born in mind. A full economic analysis would need to take it into account.

Table 7.2 Beneficiaries and Cost Per Beneficiary and Survey CPIs

	N	Av Cost per CPI	Target Beneficiaries	Primary Users	Cost per Target	Cost per Primary User
DWSS						
Gravity	26	520,307	60.7	68.6	8,572	7,585
Mechanised	11	362,520	82	89.5	4,421	4,051
Dug Well	11	134,629	52.8	34.8	2,550	3,869
DWS Reservoir	19	318,208	57.6	59.5	5,524	5,348
Overall	67	373,770	62	63.9	6,027	5,849
IRRIGATION						
Pipe	18	1,107,154	63.6	73.7	17,408	15,022
Tube Well	15	383,555	25.2	13.1	15,220	29,199
Karez	4	221,765	61	84.5	3,635	2,624
Lining	36	568,514	63.9	71.1	8,897	7,995
Overall	79	633,273	53.8	57.7	11,771	10,973
LINK ROAD	39	631,380	139.4	148.9	4,529	4,240
STREET PAVEMENT & DRAINAGE	41	513,851	208.8	313.9	2,461	1,637

7.1 DWSS

Two simplified models of DWSS scheme are considered. The first is for a relatively expensive scheme which includes reticulation, i.e. distribution to the house compound (DWSS 1). This is taken to be most representative of the Gravity and Mechanised schemes. The second model is for a more basic CPI which provides a traditional water source from which the household still has to fetch the water (DWSS 2). The Dug Well CPI is the typical case of this model.

For both models, the principal benefit comes from the time or labour effort saved in fetching the water. It would be expected that a better water supply would also yield additional benefit in the form of increased consumption. The survey evidence did not seem to support this, with little difference in the amounts consumed at schemes with and without reticulation. It is not necessarily true that more convenient water is also healthier water. Survey respondents certainly considered better health as an important benefit on Gravity and Mechanised schemes. And there was a clear difference in this perception between the DWSS 1 class of schemes (Gravity and Mechanised) and the DWSS 2 class. However, valuing health benefits is a complex exercise and the data is not strong enough to justify the effort. For these reasons, the analysis only takes account of time saved.

In the analysis, Time Saved is valued at the Nominal Female Wage in Agriculture for 2006/07, i.e. PkR 1,644 per month or PkR 54.8 per day. 2006/07 is taken as the approximate average of the date the CPI's were constructed, to minimise the distortion caused by inflation.[9]

9 Source: Pakistan's Wage Structure, Dr Mohamed Irfan, December 2008, PIDE, Islamabad

Table 7.3 Estimates for Cost-Benefit Analysis – DWSS

ESTIMATED PARAMETER	DWSS 1		DWSS 2		Note
CPI Cost – PkR	473,400		250,900		1
	High Case	Low Case	High Case	Low Case	
Beneficiary Hhds (Primary Users)	74.8	52.4	50.4	35.2	1
Time Saved Per Hdd					
Minutes Per Trip	65.4	65.4	36.4	36.4	
Trips Per Day	6.2	4.0	6.2	4.0	
Hours Per Day	6.8	4.4	3.8	2.4	
Av. Days Using	365	200	365	200	1
Days Saved Per Year (8 Hr)	310	110	173	61	2
Value of Time Saved Per Year					
Total Days Saved	23,188	5,764	8,718	2,147	
Female Wage	54.8	27.4	54.8	27.4	
Value (PkR)	1,270,702	157,934	477,746	58,833	3
Annual Operating Cost (PkR)	47,340	47,340	25,090	25,090	4
Net Annual Benefit (PkR)	1,223,362	110,594	452,656	33,743	

Notes:

1. *CPI Cost, Beneficiary Hhds and Minutes per Trip are weighted averages of Gravity/Mechanised for DWSS 1 and Dug Well/Reservoir for DWSS 2.*
2. *Trips per day are average hhd consumption (22.7 x 8.2 litres = 186 litres)/30 litres per trip. See Table 2.26.*
3. *Total Days Saved = Beneficiary Hhds x Days Per Year*
4. *Operating Cost estimated at 10% of CPI cost*
5. *Low Case adjustments are: Beneficiary Hhds x 70%; Female Wage x 50%*

The High Case in the table is based on the averages recorded in the survey. These results are strongly positive for both classes of scheme. They would indicate that the cost of the CPI is paid back in barely five months for DWSS 1. However, this should be considered as a High Case, because there are some important qualifications to consider:

Survey estimates of beneficiary numbers come from focus group discussions, not direct measurement. An element of over-estimation is probable. Added to which the statistical margin of error is high. For this reason alone, the real figures may be as much as 30% lower (or higher).

Estimates of water consumption, and hence the number of trips per day, are quite imprecise.

The calculation assumes, improbably, that 100% of beneficiaries use the CPI 100% of the time.

The opportunity cost for family labour is likely to be well below the market wage used in the calculation.

To take account of these qualifications, the Low Case estimate reflects adjustments to the survey estimates. It can be noted how relatively small reductions in the different parameters add up to a very substantial reduction in the Net Annual Benefit.

Nevertheless, the Low Case still indicates that the cost of an average DWSS 1 CPI would be repaid in less than five years. For a DWSS 2 CPI it would be over seven years. A simple discounted cash flow analysis over 10 years shows an Internal Rate of Return of 19% for the DWSS 1 Low Case. For the

DWSS 2 Low Case it is 6%.

On this very indicative basis, the investment case for DWSS seems to be strong, at least for those schemes which include reticulation (DWSS 1). Even on the Low Case, the benefits are so large they might indicate that beneficiaries should make a greater contribution than the standard RSP 20%. By comparison, on the Low Case, the economic return from schemes without reticulation (DWSS 2) is quite marginal.

7.2 Irrigation

The benefits of improved irrigation facilities can take three different forms:
An increase in the irrigated area
Greater cropping intensity: i.e. less land left fallow and more cropped in each season
Higher yields giving greater crop Gross Margins (GM)

Table 7.4, analyses how the first and second of these changes have affected the average farm household at the four different classes of irrigation scheme. The analysis is based on data from Tables 3.18 and 3.22 in Chapter 3. For each crop the incremental area comes partly from the increase in the total farm area, and partly from a reduction in the proportion of land fallowed in each season. For example, on piped schemes the average farm area increased by 2.9 kanal, Post CPI. And the area left fallow in the Kharif fell, from 43% Pre CPI to 16% Post. This gave a total increase in the Kharif cropped area of 9.6 kanal. Gross Margin estimates in the table are taken from 2000 data for Medium Farms averaged across Pakistan as a whole. [10]

Table 7.5, analyses the impact on the average farm household of increased yields leading to higher crop Gross Margins (GM). It must be borne in mind, as discussed in Chapter 3, that almost none of the reported increases in yields were statistically significant. Subject to that qualification, the table estimates the net increase in the gross margin for each of the six principal Kharif crops and the four principal Rabi crops. Increased production must be accompanied by increased costs, such that the percentage increase in GM is always substantially less than the percentage increase in Yield. In the table it is assumed that GM will be raised by 25% of the percentage yield increase: i.e. a 40% higher yield gives a 10% higher GM.

The last table in this section, Table 7.6, brings these household estimates together to calculate Cost Benefit estimates for Irrigation CPIs. For three of the categories, the analysis is positive showing repayment periods of between two and five years. The simplified Discounted Cash Flow (DCF) analysis shows rates of returns between 14% (Channel Lining Low Case) and 49% (Karez High Case). Provided the estimates are accurate, the investment case for these classes of scheme is strong.

Tubewell CPIs are a significant exception. Even on the High Case estimated incremental net revenues barely cover operating costs. On the Low Case, the schemes make an operating loss. This result is particularly significant because operating costs are likely to be highest on Tubewell schemes. (As throughout, operating costs have been taken as 10% of the capital cost.) Until these figures have been checked and ways found to substantially improve tubewell scheme performance, RSPs' should not continue to invest in this class of CPI.

It is important to note that there is only one reason for the poor results of the Tubewell CPIs: a low number of targetted beneficiaries, and an even lower number of actual beneficiaries. On a per household basis, the incremental production is as good as it is on Channel Lining schemes and nearly double that on Karez. There are just not enough households to cover the investment cost of the scheme.

10 S. Ahmed & R.P. Martini, May 2000 – Agricultural Policy Analysis in Pakistan, Centre for Management and Economic Research, LUMS (Appendix D)

Table 7.4 Estimated Impact on Household Production of Changes in Cropped Areas

ESTIMATED PARAMETER	Pipe	Tube Well	Karez	Lining
Farm Area Per Hhd – Kanal:				
Before CPI	26.4	60.2	13.4	59.1
After CPI	29.3	60.8	14	61.1
Incremental	2.9	0.6	0.6	2.0
Incremental Production Per Hhd:				
KHARIF:				
Maize – Kanal	3.01	0.04	0.00	-0.05
Gross Margin PkR	479	6	0	- 8
Rice – Kanal	1.08	- 0.20	1.50	0.40
Gross Margin PkR	196	- 36	272	73
Vegetables – Kanal	4.23	1.47	0.28	0.40
Gross Margin PkR	3,179	1,103	207	302
Other Crops – Kanal	1.27	-0.02	0.32	3.33
Gross Margin PkR	175	- 2	43	458
RABI:				
Wheat – Kanal	3.45	- 1.28	1.37	2.29
Gross Margin	261	- 97	103	173
Fodder – Kanal	1.32	0.49	0.08	0.83
Gross Margin	677	249	40	427
Vegetables – Kanal	1.56	0.43	0.72	0.47
Gross Margin	1,171	324	544	353
Other Crops – Kanal	0.77	1.85	0.09	0.24
Gross Margin	106	255	13	34
HOUSEHOLD TOTAL:				
Area – Kharif	9.60	1.29	2.10	4.09
Rabi	7.10	1.49	2.26	3.84
Total – Kanal	16.71	2.78	4.36	7.93
Gross Margin – Kharif	4,029	1,070	523	826
Rabi	2,214	731	699	987
Total – PkR	6,243	1,801	1,223	1,813

Table 7.5 Estimated Impact on Household Production of Changes in Yields

ESTIMATED PARAMETER	Pipe	Tube Well	Karez	Lining
Farm Area Per Hhd – Kanal	29.3	60.8	14	61.1
Main Crop Area % - KHARIF:				
Fodder	6.8	12.3	11.3	23.9
Cotton	2.2	27.4	0	16.7
Maize	18.8	8	0	6.6
Rice	5.1	8.6	33.9	9.3
Vegetables	22	5.8	8.1	2.8
Sugarcane	0	8.6	0	11.8
RABI:				
Wheat	55.6	72.9	45.2	56.7
Fodder	16.4	12	12.9	19.4
Vegetables	13.8	2.5	11.3	6.6

ESTIMATED PARAMETER	Pipe	Tube Well	Karez	Lining
Incremental GM PkR – KHARIF:				
Fodder	24.35	91.38	19.33	178.44
Cotton	-0.97	-25.09	0.00	-15.37
Maize	87.46	77.22	0.00	64.02
Rice	-4.18	-14.62	-13.27	-15.89
Vegetables	489.18	267.61	86.06	129.83
Sugarcane	0.00	115.86	0.00	159.75
Sub-total	595.83	512.37	92.12	500.79
Incremental GM PkR – RABI:				
Wheat	118.44	322.26	46.01	251.88
Fodder	183.59	278.76	69.00	452.88
Vegetables	336.29	126.42	131.57	335.39
Sub-total	638.32	727.43	246.58	1040.15
Total	1,234	1,240	339	1,541

Table 7.6 Estimates for Cost-Benefit Analysis – Irrigation CPIs

ESTIMATED PARAMETER	Pipe	Tube Well	Karez	Lining
CPI Cost – PkR	1,107,154	383,555	221,765	568,514
Beneficiary Hhds (Primary Users):				
High Case	73.7	13.1	84.5	71.1
Low Case	51.6	9.2	59.2	49.8
INCREMENTAL HOUSEHOLD GROSS MARGIN:				
From increased Cropped Areas	6,243	1,801	1,223	1,813
From increased Yields	1,234	1,240	339	1,541
Total	7,477	3,041	1,562	3,354
CPI Total Incremental GM:				
High Case	551,055	39,837	131,989	238,469
Low Case	385,813	27,977	92,470	167,029
Annual Operating Cost	- 110,715	- 38,356	- 22,177	- 56,851
Net Annual Benefit:				
High Case	440,340	1,481	109,912	181,618
Low Case	275,098	- 10,379	70,293	110,178

7.3 Link Roads

As for DWSS, time saved is the principal expected benefit from any road investment. Most other benefits, in terms of better access and mobility, all spring from the reduction in travel time: a shorter time to make the various trips a household must make as it goes about its business. The important exception is the reduction in the cost of motor transport, in terms of lower fuel consumption and wear and tear, which spring from an improved road. Unfortunately the survey did not capture data on this aspect.

Table 7.7 sets out the assumptions used to put a value on the time savings springing from a link road, starting from the Average Minutes Saved recorded in the survey. (See Table 4.22) The survey did not record the number of trips a household makes to the various destinations, so indicative estimates are used.

Table 7.7 Estimated Average Household Time Saved from a Link Road

DESTINATION	Average Minutes Saved	Estimated Trips Per Year	Adult Hours Saved	Child Hours Saved
Water source	8.4	1200	168.0	
General store	27.5	52	23.8	
'Bus Stop'	2.7	52	2.3	
Boys' school	19.5	150		48.8
Girls' school	18.4	150		46.0
Clinic/Hospital	23.7	20	1.2	
Family planning service	26.7	5	2.2	
Tehsil administration	72.2	10	12.0	
TOTAL			209.5	94.8

The next table puts a value on these time savings and compares them to the average cost of a Link Road CPI. Adult time is valued at the Nominal wage in Agriculture for 2006/07 (male and female): PkR 3,174 per month or PkR 105.8 a day. Children's time is arbitrarily valued at one tenth of that. As before, High and Low Cases are presented: the High based on the above figures and the Low with the following adjustments:

Beneficiary numbers reduced by 30%, to offset optimistic reporting and high variability in survey results. Adult family wage reduced by 50%, on basis that the opportunity cost of family labour is likely to be significantly lower than the rural market wage recorded in national statistics. An additional travel cost or 'fare', of PkR 500 per houshold. This is to take account of the fact that a significant proportion of the time savings reported are the result of a shift to motor transport. This is key factor about which there is no data and which is difficult to estimate. This is because a new road can have two opposing effects. The first is to reduce the cost of existing motor transport, as noted above. The second is to encourage traffic to shift from foot or animal transport to motor vehicles, with an increase in the cost of fuel etc as a result. To explain this, the figure used in the table might be the result of the following changes to a household's annual travel by motor vehicle:

	Before CPI	After CPI
Trips	3	10
'Fare' – PkR	100	80
Total Annual Spend- PkR	300	800
Net Incremental 'Fare' - PkR		500

Table 7.8 Estimates for Cost-Benefit Analysis – Link Roads

ESTIMATED PARAMETER		Link Roads	
CPI Cost – PkR		631,380	
		High Case	Low Case
Beneficiary Hhds (Primary Users)		148.9	104.2
Value of Hhd Time Saved / Year:			
Adult Days			26.2
Adult Wage[11]		26.2	52.9
Value		105.8	1,386.0
Child Hours		2,772.0	11.8
Child Wage		11.8	10.6
Value		10.6	125.1
Total		125.1	1,511.1
Minus	Fares etc	2,897.1	- 500.0
Net Total			1,011.1
Value of Time Saved Per Year:		431,378	105,357
Annual Operating Cost		- 63,138	- 63,138
Net Annual Benefit		368,240	42,219

Notes: 1. *Value of Time Saved = Value of Hhd Time Saved x Beneficiary Hhds*
2. *Operating Cost estimated at 10% of CPI cost*
3. *Low Case adjustments are: Beneficiary Hhds x 70%; Adult Wage x 50%*

On these figures, the High Case payback period for a Link Road is under two years. For the Low Case it is 14 years. The large difference shows how sensitive the analysis is to the starting assumptions.

It must be noted that the positive result is highly dependent on the value attributed to time saved fetching water. This contributes three quarters of the estimated Value of Hhd Time Saved. Without it, Link Road CPIs would not be economically justifiable. There is a clear case for saying that a DWSS CPI with reticulation to the houses is a substantially better investment than a Link Road. In other words, the analysis is very largely dependent on the accuracy of the estimate of the time saved collecting water and the assumption about the number of trips to fetch water.

For these reasons, any future surveys of RSP road investments should emphasise the collection of data on the numbers of trips, changes in motor vehicle and other 'fares', as well as more accurate estimates of Time Saved.

The importance of these caveats is underlined by the difference between the discounted cash analysis of the High and Low Cases. The High Cases shows an IRR of 58%, but the Low turns negative: - 7%.

11 Based on the Monthly Nominal Wage in Agriculture 2006/07 of PkR 3,174. Appendix Table 1 in Pakistan's Wage Structure, Dr Mohamed Irfan, December 2008, PIDE, Islamabad

7.4 Street Pavement & Drainage

Street Pavement and Drainage CPIs might be expected to provide benefits in three forms:

Health benefits resulting from better drainage and the elimination of standing water and rubbish. (Although it should be noted that rubbish will only be eliminated if there is some form of waste collection service. The benefit really comes from the service, not from the street pavement.)

Limited time savings from being able to walk on pavement.

Time savings from the fact that household waste water is piped from the house and does not have to be thrown in the street. (Here it should be noted that a large part of this benefit is attributable to the private investment in putting drainage pipes into the house, not to the public investment in SP&D.)

Amenity: the general sense of well-being that results from living in a clean and well-built environment. There is literature to suggest that this sense of amenity generates further benefits in reductions in petty crime such as vandalism and littering.

Capital Cost Per SP&D CPI	513,851 PkR	
Annual Net Benefit Required to Yield 10%	85,000	
PLUS Annual Operating/Maintenance Cost [13]	51,385	
Total Annual IncomE Required	136,385	
	High Case	Low Case
Average No Beneficiary Households	314	220
Required Benefit Per Household - PkR	434	620
Daily Family Wage – PkR	105.8	52.9
Equivalent in Time Saved Per Hhd - Days	4.1	11.7

None of these benefits are easy to measure or quantify. The survey results do not provide any practical measures that can be used for a Cost Benefit Analysis.[12]

However, it is possible to reverse the analysis process to give an indication of the level of benefits which would be necessary to justify an SP&D CPI. If it is assumed that a CPI should yield an Internal Rate of Return, nominal and unadjusted for inflation, of 10% to justify the investment, then the Benefit Per Household needed to meet that target can be calculated as follows:

The analysis shows that a relative small amount of time saved per household is enough to justify an SP&D CPI: between 4 and 12 days a year, or between 5 and 15 minutes a day.

The only caveat on this concerns the critical parameter: the estimated number of beneficiary households. If, as is reasonable, it is assumed that the majority of benefits go to families whose houses are beside the paved street and drains, the figure of 314 beneficiary household would imply an average scheme length of nearly a kilometre based on the following calculation:

12 Techniques such as contingent valuation can be used to measure the value beneficiaries put on this class of benefits, but the results are often ambiguous and difficult to interpret. It was decided not to include them in the RSPN survey.

13 As throughout estimated at 10% of the Capital Cost.

1. Continuous housing on both sides of the street gives a total frontage of:

   314 / 2 = 157 houses

2. With an average frontage per house of 8 metres this gives a street length of:

   157 * 6 = 942 metres

This is substantially more than the length recorded in the survey.

7.5 Conclusion

Regarding benefits from time saved the High case suggests positive results for both DWSS1 and DWSS2 schemes, with the cost of the former being paid back in barely 5 months. The Low case suggests that cost of DWSS1 and DWSS2 would be paid back in less than 5 years and over 7 years. The investment in DWSS1 in particular seems to be strong, making a case for COs to contribute more than 20% of total cost.

For 3 principal irrigation schemes i.e. excluding Tubewell schemes, the analysis is positive showing repayment period of between 2-5 years. Even the High case results for Tubewell schemes suggest that incremental net revenues barely cover operating costs. The reason behind this is a low number of targeted beneficiaries and an even lower number of actual beneficiaries. Unless a way is found to substantial improve this scheme type, RSP should not continue to invest in it.

With reference to time saved via link road schemes, the cost of scheme is paid back in 2 years according to the High case and 14 years according to the Low case. This suggests that DWSS1 is a far better investment than a link road scheme.

The analysis for SP&D schemes shows that a small amount of time saved per household is enough to justify investment i.e. between 4 and 12 days a year, or between 5 and 15 minutes a day.

ANNEXURE

Annex : Methodology

A. Impact Assessment Approach

Measuring the long-term impact of community infrastructure projects in terms of changes in socio-economic welfare indicators (e.g. income, livelihoods, health, education, etc) is a complex process demanding data collection pre- and post-project for the treatment group as well as for the control group. It would be normal to allow four or five years between the baseline survey and the impact survey. Moreover, finding a matching control group is a challenging task, given limited commonalities between any two sets of rural households, hence making the double or single difference methods non-plausible due to high time and cost implications.

However, to measure the overall impact of the RSPs' holistic programmes, RSPN has conducted sample-based baseline surveys tracking changes in household socio-economic and welfare indicators for selected RSP districts in 2006. The first round of baseline surveys has been completed for 16 districts in a phased manner from 2006-08. RSPN has conducted follow up surveys for 5 districts of Sindh, and the process will be followed for other districts using the double-difference method of impact assessment. The surveys however do not differentiate the sector-wise impact of the various RSPs" programmes.

In 2008, the RSPN impact evaluation conducted by a team put together by HTSPE and commissioned by DFID, identified some of the above points as constraints for impact assessment in the immediate future. The evaluation recommended for the RSPs' to focus on the direct and immediate impacts for determining the impact of the RSP services (including CPIs). They suggested the following simple process to measure the direct benefits:

Service Impact = Number of Beneficiary Households x Direct Benefit per Household

Valuing the Direct Benefit per Household (DBH) depends on the types of CPIs provided. Using this approach the aggregate impact will be estimated by first measuring the direct benefits accrued to a typical household from a CPI subtype and then multiplying it by the average number of households benefited by an average CPI of that subtype.

The estimation of direct benefits and the numbers of beneficiary households (BH) will be made through a sample survey using the Before and After (the CPI) approach. Taking the example of providing a drinking water supply scheme, the benefits are likely to be composed of two main elements both of which can be measured and valued without difficulty, e.g. time consumed before and after the project, and quality of water before and after the project.

B. Assessment Indicators

The study assesses the design, condition and functionality of the selected schemes against the original design of the project as well as the project outputs, beneficiaries and benefits accrued to the beneficiary households. It also assesses the extent of community participation in the CPI schemes, operation and maintenance mechanisms, and sustainability of the project benefits.

	Indicators	Data Source
1.	Description Location (District-CO level) Component wise specification of the project (size, volume, quantity etc) Component wise costs of the project (RSP share, CO share) Dates (initiation, completion)	CPI Records from FU
2.	Map Closest alternative sources, households, important places	Engineering map (if available) drawing of map with Key informants (CO leaders)
3.	Community Participation Management and Maintenance mechanisms (project committees) Operation and maintaining activities Community participation and contribution (cash, labor etc) Criteria of contribution (equal share, ability to pay etc)	CO records, FU records CO records, CO leader
4.	Physical Condition/Operation and Maintenance Design appropriateness Components/Dimensions Functionality Quality Technical support (SO, Engineer visits)	CPI Records/Physical Assessment/Photographs
5.	Beneficiaries No of muhallas, no of beneficiaries Type/purpose of use Quantity of use	Key Informants (CO, community leaders)
6.	Direct and Indirect Benefits Benefits at the household level Accessibility Regularity/Reliability Affordability Quality Equity	Household Survey (with 10 randomly selected households) and Focus Group Discussions
7.	Impacts Education Health Economic Wellbeing Social Wellbeing	
8.	Issues/Challenges Identification of issues/challenges before and after the scheme	

C. Survey Instruments

The survey used a mixed-method approach involving (i) a technical assessment survey of the 241 sample projects selected for the household survey; (ii) focus group discussions with each of the 241 community organization responsible for implementation of the project and (iii) a household survey from the 2400 randomly selected beneficiary households.

The survey instruments were revised after pilot testing and comments received from RSPs' and M&E advisor. The pilot testing was conducted in District Khusab and Jehlum, of NRSP from August 10-20. The survey questionnaires were tested at 19 schemes including, 6 irrigation, 7 drinking water supply, 4 link roads and 2 street payment and drainage schemes.

The community questionnaire had five sections: (a) scheme description; (b) scheme management and implementation; (c) scheme operation and maintenance; (d) scheme use (e) scheme benefits, and (f) problems and conflicts.

The technical assessment instrument had five sections: (a) scheme description; (b) scheme costs; (c) scheme design and actual specification (d) over all assessment of the project design (functionality, maintenance of the scheme, adherence to the approved timeline, adherence to the approved costs) (e) scheme map with identifying the beneficiary households. The technical assessment was conducted by engineers/sub-engineers.

The household questionnaire had 6 sections: (a) household identification demography; (b) participation and contribution of the household in the CPI; (c) household satisfaction with the CPI performance and RSP support; (d) use of the CPI schemes (e) opinion of the respondent on the CPI impacts (f) household poverty status though poverty scorecard.

The household questionnaire data was gathered from a male adult households member from the selected households except for the respondents of the Drinking Water Supply Scheme, which was collected from an adult female member of the selected households.

To facilitate enumerators to better understand the questions asked, the third party data collection firm translated the community questionnaires and household questionnaires in to Urdu; however the technical assessment questionnaire were not translated in Urdu because the technical terms were considered to be easy to understand in English. Special care was taken during translation to avoid any ambiguity or confusion. The translated instruments were further refined during training session when participants gave their input on sentence structuring. The Final Questionnaire's were having combination of both English & Urdu, and the field team found that this method was very helpful during enumeration.

D. Sampling methodology

Although the RSPs' have been implementing CPIs since 1982, the time series data shows that activity received a boost in the decade beginning 1999 through additional, sustained investment made by PPAF (supported by the World Bank and Government of Pakistan). Due to a small number of schemes that the RSPs' had undertaken by 1999 (7% of the cumulative number of CPIs completed as of June 2009), in this survey we have focused on the schemes implemented during the period 2000-2007 except for the selected sample schemes in the earthquake effected districts where we have selected only the schemes completed in 2006-2007. The reason for taking 2007 as the cut off year is to allow for an adequate time lag between the schemes' completion and its assessment.

Across the RSPs', a large range of CPIs have been implemented depending on the community- and site-specific requirements. Studying the CPI universe, we found 10 sub types of communication schemes, 21 sub types of drinking water supply schemes, 41 sub types of irrigation schemes, and 13 types of sanitation schemes, aside from over 31 sub types classified as other schemes. In view of the survey's overall purpose, which is to provide an objective assessment of the RSPs' CPIs, and considering the budgetary and time limitations, we have opted to limit our study to only those sub-types that have the most significant number of schemes.

Stage 1: Selection of Major CPI Categories

Accordingly, we first selected the four major categories of the RSP CPIs: i) Communication and Transportation, ii) Drinking Water Supply, iii) Irrigation, and iv) Sanitation and Street Pavement, while dropping the category Others, which includes a large variety of schemes, most of which do not have a significant number of schemes and demand a separate set of survey instruments. Albeit an important category, the Micro-hydels of AKRSP were dropped as their impact have been well studied and established, and an additional impact survey may not be of much significance.

Stage 2: Selection of CPI Sub-Types

In the second stage, within each of the four selected categories we looked up for the sub-types with most significant number of schemes. We found that under drinking water supply, the highest number of schemes was that of Hand-pumps (45%), Drinking Water Supply Schemes (16%), Dug Wells/Reservoirs (30%). After discussions with colleagues at RSPs', we decided to drop the third sub-type, since the Hand-pumps are low cost, normally household based, and involve limited community action in the implementation, operations and maintenance stages. If needed, the Hand-pumps may be studied separately with respect to the investment and returns in different geographical and ecological regions of the country.

Similarly, under irrigation we found that two most significant sub-types are the Irrigation Channels (19%) and the Lining of Water Courses (51%), under transportation the most significant sub-type is Link Roads (69%), and under sanitation the most significant sub type is Sanitation and Street Pavement (70%). This process allowed us to select six most significant types of CPIs implemented by the RSPs'.

Stage 3: Selection of Sample CPIs and Households

In the third stage, for each identified sub-category we took a sample of 40 schemes (30 is the minimum sample required for statistical analysis) through a two stage sampling process. Given the logistical and financial constraints, in the first stage we selected 29 districts with a significant number of schemes for that sub-type. In the second stage, we have used the cumulative number of beneficiary households in a geographic ordered list of projects within the sector and then with a random start and sampling interval selected the projects to be enumerated.

For each selected scheme, using stratified systematic random sampling techniques the survey team

14 The sample size for the households survey is determined though standard statistical formula given Gilroy (2001): n = (z*CV/X)2. With 95% confidence level, 10 percent precision level and 100 coefficient of variation in the variable interest (here beneficiary households) the sample size is turnout to be 384 households. Given the chances of 96 percent response rates (based on our previous survey experience) the sample size is over sampled to 400 households for each category of CPI schemes.

selected 10 beneficiary households .

a. Procedures for the selection of sample household with household listing data or with beneficiary household up to 50 (which ever is applied)

List of beneficiary households, available in the CPI records were updated in consultation with community member in the group interview. The updated list was ordered in geographic order and using systematic random sampling technique with a random start select 10 household for the household interview.

b. Procedures for selection of sample household without household listing data or beneficiary household More than 50 households

If the numbers of beneficiary are more than 50 households and the CO records do not have any listing and/or the households are spread in different Hamlets/Muhalls/Neighbourhood/Villages or scattered locations then the following procedures were used:

Step 1:

Identified and list all the beneficiary Hamlets/Muhalls/Neighbourhood/Villages. Obtain as reliable as possible, an estimate of the number of beneficiary households of the scheme in each Hamlets/ Muhalls/Neighbourhoods /Villages in consultation with the available community members.

Step 2:

Randomly selected the 10 household from the identified Hamlets/Muhalls/Neighbourhoods /Villages in proportion to the number of beneficiary households in each Hamlets/Muhalls/Neighbourhood/ Village.

In this manner, the survey was supposed to collect data from 240 schemes and 2,400 beneficiary households. However, in the field the survey team ended up collected data from 241 schemes and households. As happens in most of the larges scale survey a total of 24 (10%) of the originally selected schemes could not be surveyed for reasons of non-availability of required beneficiaries, unpleasant weather and Law & Order situation in the sample sites. These schemes were replaced with similar type of project shadow sample list.

Table 1: Sampling Size and distribution

	Population			Sample	
Categories of CPI Schemes	# of Projects	Average # of House-holds	Average Scheme Cost (Rs)	# of Projects	# of House-holds
1. Link Roads	1,675	135	432,785	40	400
2. Drinking Water Supply	1,542	55	388,958	40	400
3. Reservoir and Dug well	736	48	194,258	40	400
4. Irrigation Channels (includes pipe irrigation and Karez)	724	68	543,695	40	400
5. Lining of Water Courses	3,261	50	410,573	40	400
6. Street Pavement and Drainage	1,719	163	445,769	40	400
Total	9,657	87	410,733	240	2,400

E. Data Collection

The data collection was outsourced to a third party consulting firm through a competitive biding process. The Data Collection and Entry Survey required data collection through Group Interviews, Household Questionnaires and Technical Assessments of Community Physical Infrastructure Schemes. Based upon the requirements of the survey the consulting firm formed 7 survey teams representing all Pakistan geographically. Each team consists of a survey team leader, a sub-engineer enumerator, a male enumerator and a female enumerator. Selection of field teams was based upon their qualification, experience, language and commitment & interest to research. While hiring the field team the efforts were made to hire local persons belonging to Baluchistan, Gilgit, NWFP, Punjab and Sindh, who had the advantage of knowing Local languages and field situations for effective implementation of the field survey.

A four-days training session was organized by the consulting firm at Islamabad. All participants were trained on a same location to ensure uniformity upon various technical terms and to reduce variation from the collected data.

The first three days included an overview of the exercise and the objective of the survey, familiarization to the questionnaire through explaining each question of the questionnaire, interviewing techniques and the nature of potential problems arising in field surveys and the fourth-day of the training included practice exercise and review of their performance through practice exercises. Following the training of enumerators, 7 field teams were constituted and rolled out in the field for the data collection. The team was supported by a project manager, deputy project manager, project coordinator and data manager, who had previous experience in the field data supervision, quality control, and coordination and quality data management. The project manager was responsible for overall supervision and quality control, the deputy manger was responsible for technical assistance and field monitoring of the data collection. The project coordinator was responsible to coordinate with RSPs' and RSPN and the data manager was responsible for Preparation of data entry file, data editing, coding, entry, data cleaning, soft data security and tabulation of data sets.

Each field team was sent to seven different location in Punjab, Sindh, NWFP, Balochistan and Gigit Baltistan, where the data collection started simultenously.. Each field team on average conducted the field survey at 2 schemes per day followed by a de-briefing session with the field supervisor.

The collection of data for the survey started in Nov 02, 2009 and was completed in November 27, 2009.

F. Data Entry, Cleaning, and Analysis

For data entry, formats were developed in Census and Survey Processing System (CSpro) in a simplified and user friendly way. For the potential wrong entries and data cleaning, possible checks and filters were also placed for most of the questions. Two data entry operators were hired and familiarised with the questionnaire and were briefed about the objective of the survey. After the completion of data entry in CSpro, the data was transferred to Statistical Package for Social Science (SPSS) for data cleaning and further data analysis.

During data entries following accuracy checks were carried out.

- check the first 10 records entered;
- check a random 10% of all records; and
- Run summary frequencies and clean the data.

G. Quality Control

Efforts were made to minimise the measurement error and facilitate quality data collection. The questionnaire for the community and household survey was simplified and translated in Urdu, so that the enumerators could easily understand the questions and reduce enumeration problems and errors. The field enumerators and supervisors was selected on the basis of their experience and provided with extensive in house and on the field practical training. The core research team (from RSPN) remained present during the training session to ensure better understanding of the data collection instruments by the field team. The supervisors also conducted a debriefing and sessions with the enumerators in the evening which helped improve the quality of data collected.

The consulting team deputy manager visited 10 percent of the total locations randomly. The deputy project manager supervised and monitored the field activities.

The RSPN M&E team members also visited and monitored ACP field activities randomly in the first week of the data collection. Some issues raised about sample selection and logistical issues were resolved in the initial stages.

On completion of data collection, all the filled-in questionnaires were duly edited and coded at consulting firm's main office Islamabad by the consulting firms core team and the field team. To reduce errors in data punching data-entry formats with built in consistence checks were developed in CsPro, after the data entry a through data cleaning process was carried out with hundred percent print check, and consistency check on selected data files. The analysis methodology and analysis tables were shared with the International M&E Advisor, and according to his comments the analysis tables were re-generated.

Rural Support Programmes

The RSPs' aim is to reduce poverty and improve the quality of life of the rural poor by harnessing the potential of people to manage their own development, through their own institutions.

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