MULTI-DONOR SUPPORT UNIT (MSU) AND
SUSTAINABLE DEVELOPMENT POLICY INSTITUTE (SDPI)

Handing Over of Water Supply Schemes to Communities in Northern Punjab

A Case for Collective Action

Handing Over of Water Supply Schemes to Communities in Northern Punjab, Pakistan:

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ACRONYMS

AJK	Azad Jammu and Kashmir
CBO	Community-Based Organisation
LG&RDD	Local Government and Rural Development Department
MSU	Multi-Donor Support Unit
NGO	Non-Government Organisations
NRSP	National Rural Support Programme
NWFP	North West Frontier Province
O & M	Operations and Maintenance
PHED	Public Health Engineering Department
SAP	Social Action Programme
SDO	Sub-Divisional Officer
SDPI	Sustainable Development Policy Institute
UC	Union Council
WCOM	Water Committee
WSS	Water Supply Scheme
WTP	Willingness to Pay

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EXECUTIVE SUMMARY

The Government of Punjab is transferring water supply schemes (WSSs) back to communities. The central objective of this study was to assess if these transfers are sustainable (communities self-managing the schemes and ensuring adequate supply of clean water for themselves), and if not, make recommendations to make the transfer sustainable.

Our findings are based on a sample of 50 schemes out of a list of 110 transferred schemes provided to us by the Physical Health Engineering Department (PHED). We collected information from PHED officials and field staff, water committee personnel, male and female user groups and households. Thus we have a very rich data base for our analysis and for our recommendations.

Perhaps our most significant finding is the enormous raw potential that we found exists in village communities for collective action. Beyond this, we found that water committees (WCOMs) played a very effective role in scheme management, even though they were often established spontaneously or, if at the urging of PHED field staff, with no formal managerial training. The presence of WCOMs in villages was positively and significantly associated with the financial viability of schemes, participation in and satisfaction with scheme management, and with scheme sustainability. Thus there is strong empirical support for the basic operational premise of the PHED (and, indeed, that of the Social Action Programme) that they should rely on WCOMs to manage schemes. This is particularly the case because we were able to show that alternatives like Union Council management or privatised management were not effective.

Our endorsement of PHED's basic premise does not mean that all is well. We found only 14 out of the 50 sample schemes to be sustainable. So what can the PHED do better to enhance its success rate? PHED field staff must get basic training in social observation and social mobilisation. Having undergone such training, they will be in a position to start a phased process of scheme transfer. The first step must be that of understanding the community's need for the WSS, and community politics and social dynamics. A bold approach is called for that goes beyond sitting in the drawing rooms of village influentials. Understanding the community should give them a good indicator of the likely success of the transfer. Having done that, the second step would be to assist as catalysts in the creation of WCOMs that are representational and can address community conflicts. The third step is training the WCOM in basic management skills such as accounts and tariff setting and ensuring transparency and accountability. So far, the transfer process has been a hasty one, and in many cases, particularly in Murree, community members were not even aware that it had occurred. A phased process with bonuses for PHED field staff for successful transfers would be more effective.

Our research also shows that the presence of an ex-PHED operator in the village enhanced the probability of scheme sustainability. This link is potentially very important and should be nurtured. The lack of spare parts and other supplies was mentioned by the management groups as being among the main problems they confront. The PHED should establish an assistance cell in

the district headquarters, and scheme operators should be allowed to borrow these tools with a deposit. This would also be an opportunity to provide technical advise to operators. The logistics of providing roughly equal access to these resources could be worked out by the PHED.

The other major problem that is, and will increasingly be, confronted by communities is the problem of major repair, rehabilitation and scheme extension as the population grows. Almost half the schemes are already ten years old, which means that the capital has already fully depreciated. Given rising costs, communities will confront large financial burdens, and a systematic method needs to be devised to meet replacement capital costs. We suggest a continued role for the PHED in major repair, rehabilitation and scheme extension based on provincial funds. This level of support for rural communities is essential on equity grounds, since urban communities take public provision of water for granted.

A less preferred alternative for major repair, rehabilitation and scheme extension is a PHED voluntary insurance scheme which will be funded by a part of the community tariff. The initial deposit could be made by the government to establish the schemes' credibility, and this could be repaid once community WSSs deposits begin. Alternatively, private sector insurance companies could be contacted on behalf of the WSSs. Participating communities will be entitled to both the funds and technical assistance for major repair, rehabilitation and extension.

Finally, even the sustainable schemes confronted the problems of default and malpractice, which is the bane of successful collective action. We found several examples of innovative enforcement which we have reported and which may be replicable. One of these techniques involved announcing the names of defaulters after the Friday sermon. The mosque was used in other cases as well to ensure management transparency by inviting all members to examine the books and ask questions. PHED field staff need to be a vehicle for systematically transmitting such knowledge in the transfer phase when WCOMs are being established.

Beyond that, as government officials, PHED field staff command much credibility and respect in the rural areas. They should be counted on, as a last resort, to intercede with the legal and administrative authorities to help WCOMs with enforcement problems. In most cases, the threat would be adequate. If WCOMs are registered as they should be, it should not be too difficult to declare destruction of collective property a criminal offence, and defaulting on water tariffs the equivalent of defaulting on electricity bills.

Given current practice, the transfer of WSSs to rural communities will undoubtedly turn into a nightmare for the rural poor. With training and incentives for PHED field staff and technical enforcement and resource support to transferred schemes, the Government may in future claim to have done right by its poor rural citizens.

BACKGROUND: THE RURAL WATER SUPPLY SECTOR[1]

The provision of rural water supply and sanitation services has primarily been the responsibility of the Public Health Engineering Department (PHED) since the early 1960s. To a lesser extent, the Local Government and Rural Development Department (LG&RDD) has also been involved in providing this service. While the PHED built mechanised systems, the LG&RDD schemes were non-mechanised, e.g. hand pump or gravity flow schemes.

As an agency, the PHED has very strong engineering skills. Its organisational structure includes a chief engineer at the provincial or zonal level, superintendent engineers (SEs) at the divisional or circle level supported by executive engineers (XENs) who are in charge of the district along with sub-divisional officers (SDOs), overseers and sub-engineers. The department has neither the orientation for community mobilisation, nor any staff to undertake this type of activity. It has an engineering orientation and acts purely as a provider of services. Their modus operandi has been to prepare technical feasibility reports and construct schemes with little involvement of communities in either the construction phase (e.g. in site selection or choice of technology) or during the operation and maintenance (O & M) phase.

The original mandate of the PHED was to construct water supply schemes (WSSs), operate them for two years, and then hand them over to the area Union Councils (UCs). During this initial two-year scheme operation, the PHED was supposed to train the UCs to operate and maintain the scheme. The UC is the lowest tier of government, and this procedure continued up to 1992, when the government reversed its decision and asked the PHED to take over the schemes once again. The rationale for this decision was the inability of the UCs to operate and maintain the schemes adequately which resulted in a large number of schemes being un-operational.

Simultaneously, by the late 1980s, there was a growing realisation that users' involvement in the planning, implementation and operation of a scheme was vital to its sustainability. This realisation led to another major strategic change in the RWSS sector in 1993-94 when the Social Action Programme (SAP) was introduced by the government. Under SAP a uniform policy was developed by each of the provincial and area governments that called for the involvement of user communities in the planning and implementation of schemes with total responsibility of operation and maintenance lying with the communities. This policy was notified and adopted by all provincial and area governments in 1993-94 and 1994-95.

[1] Mr Mir Naeemullah kindly contributed this background section.

1

INTRODUCTION

It has become apparent to the federal and provincial governments that they are over-extended, particularly in terms of fiscal responsibilities and staff commitments.[2] With this realisation, the Government of Punjab started a phased programme of handing over water supply schemes to village communities. The theory was that with community mobilisation and the subsequent establishment of village water committees, villagers would themselves assume financial and operational responsibilities for these schemes.[3]

In a nutshell, the terms of reference for the SDPI research team were as follows:[4]

1 To investigate if the hand-over was sustainable.
2 If the hand-over was sustainable, to investigate why this was the case?
3 If the hand-over was not sustainable, to investigate why not?
4 To make policy recommendations based on 2 and 3.

Implicit in the theory about community management (section 3), and the terms of reference cited above, is an investigation of the conditions under which collective action can succeed and the replicability of successful collective action.

Why should one care about water supply?[5] The most common diseases in Pakistan are water-borne. It is estimated that 60 per cent of infant deaths are due to infectious and parasitic diseases, most of them water-borne.[6] Therefore, the provision of safe drinking water would have a major favourable effect on health, health services would be less burdened and productivity would increase. Between 1988-93, 85 per cent of the urban population and 50 per cent of the rural population had access to safe drinking water. This compares favourably with the low human development country group performance in urban areas (79) but not in rural areas (62).[7]

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2 Rahimullah Yusufzai, "Villagers to Run Water Supply Schemes Under Government Guidance", *The News*, March 12, 1996, p. 3. This news item refers to the intention of the Government of NWFP which, like the Government of Punjab, is planning the transfer of such schemes.

3 Our position is that water supply, as a basic necessity, is the right of all citizens. Thus providing rural water supply for a fee is the state's responsibility. This responsibility is fulfilled in the urban areas, and divesting from this responsibility in the rural areas represents another example of urban bias [Lipton, (1977)]. However, given that the state at this moment is unable to fulfil this responsibility, we explore the next best option.

4 A more detailed account of the issues we undertook to investigate in this context are included as Appendix I.

5 This paragraph is drawn from chapter 3 of Banuri, Khan and Mahmood, eds. (1996).

6 IUCN (nd, p. 79).

7 UNDP, *Human Development Report 1995* (1995, p. 167).

This study has policy significance for several reasons. First, just in the province of Punjab, there are thousands of other rural water supply schemes that the government of Punjab would like to hand over to communities. This should have lessons for such transfers in the Punjab and, indeed, the rest of the country. Second, the lessons of this study could readily extend to other social sector provision such as education and health, since successful social infrastructure in the form of village committees can address many village needs.

Given the rudimentary social mobilisation the Public Health Engineering Department (PHED) is equipped to provide, the collective action we are investigating represents a baseline. The communities in our sample were called upon to act collectively to manage their water supply since the PHED was shedding this responsibility. Thus, what we observed was "untrained" collective action when the alternative was for everyone in the communities to fend for themselves. It would also be interesting to study the success of community management of water supply schemes (WSSs) where the latter were constructed with the assistance of development NGOs after the latter engaged in a sustained period of community mobilisation.

We focused on two kinds of WSSs. On hilly terrain, there are gravity schemes drawing water from springs. These are cheaper to maintain, but can also result in the exclusion of clusters of households. This problem is technically easier to handle in the plains where villagers pump up groundwater into a storage tank and then use a distribution network similar to that of the gravity schemes.

The conceptualisation of this study benefited a great deal from several studies, including Altaf, Haroon and Whittington (1992), MLGRD/UNICEF/UNDP/World Bank-RWSG-SA (1994), LGRDD-AJK/MSU (1995), Chuhan (1983), Srinivasan, Zafar and Minnatullah (1994), Morgan (1990), Kardar (1994), WHO/UNDP (1982), Pasha and McGarry (1989), Briscoe and Ferranti (1988), Davis and Garvey (1993) and Narayan (1995).

In section two, we describe our research method; in section three we present the theoretical framework; in section four we report findings based on the data sources reported below; and we end with a summary and recommendations section.

RESEARCH METHOD AND DATA SOURCES

A large sample of 50 schemes was randomly selected from the list of 110 handed over schemes provided to us by the PHED.[8] We had several sources of information, often on the same issue. First, each member of the four-member research team (two men and two women) wrote field reports each day at the end of the field trip on points 1-4 of the terms of reference mentioned in the introduction.[9] Second, we used a focus group method to interview the following groups:

1 Water committee office holders and the PHED officials accompanying us.
2 Female users.
3 Male users.

The questionnaires included mostly open-ended questions, but also solicited structured information we needed across the sample schemes. Several open-ended questions were converted into structured questions after five pre-tests, but many were left unaltered.

Third, we collected information on the transfer process from PHED officials at the head office, and formally interviewed those accompanying the field team in the various districts.

Fourth, after the pre-tests, we decided that information also needed to be collected at the household level on beneficiary satisfaction, problems and willingness to pay for service. We tested a brief household questionnaire on a fifth pre-test and used it with slight modifications to solicit information from about ten per cent of the households, interviewing both females and males.[10] All the data was re-checked prior to the analysis.

When presenting the findings, we distinguish between the management group (#1), the male and female groups (#s 2 & 3) and the household respondents.

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[8] For details about the sample selection procedure see Appendix II.

[9] The research team was highly qualified. All had earned masters locally, and one had earned a masters and another a diploma abroad.

[10] The household data were collected based on the availability of household members.

THEORETICAL FRAMEWORK

As stated earlier, our anticipation was that sustainable management of community water supply schemes depends on sustained collective action. Collective action theory provides a framework within which to study community management.[11] While the PHED is expected to bear a large part of the transaction costs of forming the water committees (WCOMs), once formed, in theory they could become a vehicle for other village collective self-financed projects or NGO or donor project assistance.[12] Indeed, the success of WCOMs in executing self-initiated projects could be viewed as an important measure of their maturity and sustainability. WCOMs, like other community organisations, could be expected to confront the "free-rider problem" and other conflicts concerning the sharing of the benefits of collective action. The ability to resolve such problems through dialogue is another important sign of the WCOMs' maturity.

Olson (1971, pp. 22-33) derives the condition under which collective action may be forthcoming in small groups.[13] In a nut-shell, he points out that the activity would occur if the benefit to any one individual exceeds the total project cost. Using this as our point of departure, but working with individual rather than total project costs, we investigate the conditions under which an optimal amount of collective activity could be forthcoming for a particular project, with a WSS in mind. The detailed derivation is reported in Appendix VIII.

The basic framework is one of equating benefits and costs of collective action in a particular activity such as a WSS. The benefits represent the individual utility or welfare from water use while the costs are the direct costs,

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[11] The collective action literature in economics is evolving as a subset of New Institutional Economics. Nabli and Nugent (1989, p. 1,335) define New Institutional Economics (NIE) as concerned with the determinants of institutions and their evolution over time, and also with evaluating their economic efficiency and distributional implications. Institutions are defined as a set of rules governing inter-/intra- individual/group relations (see also the definition of institutions by Uphoff (1986, p. 9)). While water committees certainly qualify as institutions by this definition, they are created or shaped in this case by the PHED acting as a catalytic agent. Bardhan (1989, p.1389) views NIE as concerned with the spontaneous evolution of institutions to deal with transaction costs and imperfect information. The lack of spontaneous evolution in some cases should not rule out the study of water committees or other community organisations within the broad NIE analytical umbrella or more specifically in the framework of collection action theory.

[12] As we report in the findings section, in practice these transaction costs for the PHED are negligible since PHED field staff do little beyond verbally urging the formation of WCOMs.

[13] Olson (1971, p 25) states that "the total benefit to the group [from the collective good] is a larger multiple of the cost of that good than the gains to the group are [a multiple] of the gains to the individual in question". This condition can be shown to mean that the activity would occur if the benefit to any one individual exceeds the total project cost. If this condition is satisfied, the free-rider problem is no longer an obstacle. This condition is less and less likely to be satisfied as the size of the community increases. Essentially, Olson then circumvents the free-rider problem.

i.e. water tariff and the indirect transaction costs of participating in the WCOM or more actively contributing to getting it to function. In the case of the functioning of a WCOM, one need only worry about the minimum threshold level of collective action and the conditions that generate sustainable WSSs rather than an optimum amount.

The conditions we derived in Appendix VIII suggest that collective action is likely to occur for projects where individual benefits are equal to individual costs, and when the benefits and costs are equal for all individuals. For a WSS, this is possible since the same tariff could be applied to all households and the tariff could be set so that the perceived benefit is equal to the tariff.[14] A tariff set too high results in beneficiary dissatisfaction and default, and one set too low results in inability to pay utility bills and maintain the project, i.e. financial non-sustainability. A well respected and credible WCOM providing good service results in community willingness to accept rate revisions to meet higher project costs (e.g. higher electricity bills) and even for building reserves for emergencies.

The big challenge is dealing with "free-riding", default, raiding, breakage, and uneven distribution. *Free riding* occurs when someone hooks an illegal connection to the mainline, *default* when there is non-payment for a legal connection, *raiding* when a suction pump is hooked to the mainline to siphon off more than one's fair share of water, *breakage* when the mainline in gravity schemes is broken to make a cattle pool, and *uneven distribution* in gravity schemes when profligate practices at some level (depending on the flow pressure) leave little water for other levels. These malpractices result in uneven benefits and costs across individuals, and indeed represent the challenge of collective action.

The theoretical framework we use is broad enough to accommodate the key variables that are relevant for analysing the sustainability of WSSs. For example, the degree of a community's "need" for water, or the lack of alternatives could be expected to raise the utility or benefits from the WSS, and hence galvanise communities to work together. The presence of ready alternatives could be expected to work in the opposite direction.

A good activist in the community reduces the transaction costs of collective activity, partly since they work voluntarily and get paid less than their social contribution. Similarly, a higher level of mean education in the community may reduce transaction costs. Difficult hilly terrain with little cultivable land, such as the ones in Murree, means a scattered population, more migration, a smaller pool of activists and hence higher transaction costs. A larger population may mean transaction costs rising more than proportionately to the population increase and hence less collective action.

Other things constant, collective action may be more likely in a more homogeneous community. As pointed out earlier, need could galvanise communities and make them mimic a homogeneous community. Thus the focus of our research is to investigate the conditions which reduce the transaction costs and enhance the benefits of collective action, and hence make it possible.

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[14] If individual utility functions vary a great deal, the condition derived as in the appendix is unlikely to be satisfied. Note that exclusion is possible in the case of the WSS unlike the case of purely public goods.

In a nutshell, we investigate two broad research issues. First, given that collective action is embodied in WCOMs, we investigate if they indeed lead to more successful scheme management and hence result in more beneficiary satisfaction. Second, we explore the determinants of successful collective action or scheme sustainability.

4

FINDINGS

A *Introduction*

To address policy, researchers need to distinguish between describing social reality and identifying variables that policy makers can use to attempt to change that reality. Therefore, we make a distinction between general variables that explain sustainability (or the lack thereof), and control or policy variables which we found to have a bearing on these issues. While the former need to be identified, it is the latter that we highlight and focus on in this report.

We also make a distinction between indicators of (non)sustainability and the much more difficult to identify causes of (non)sustainability. For example, indicators of the lack of collective action, and hence of the non-sustainability of a water scheme are easy to observe. These include no systematic collection of fees or maintenance of accounts, no systematic system of repair and maintenance and no cooperative system of water sharing. It is much harder to identify the causes of sustainability since they are not observable. The non-observable causes could include general causes such as culture, as well as specific causes such as the non-availability of abundant alternatives to the scheme water. Even more challenging is identifying causes of (non)sustainability that have a policy bearing, such as adverse site selection because the community was not taken into confidence, because its social dynamics were not taken into account or because inter-community linkages were ignored.

This section starts with village profiles of the schemes in the sample. We next characterise the process of scheme transfer. Following that, there is an overview representing the status of the 50 schemes in our sample to show how many were inoperative and how many were viewed by the field team as sustainable. Details about scheme management, community participation, collective action and beneficiary satisfaction available from the management group, user groups and household data are discussed in the sub-sections. Inoperative and sustainable schemes represent the two extremes, and a section is devoted to each in order to describe the causes behind schemes becoming inoperative and the determinants of sustainability. Since all but two of the 18 schemes in Murree were found to be only marginally operative and unsustainable, and since geographic and related socio-economic conditions in Murree differed from the plains, we have devoted a section to the Murree WSSs. We also devote a section to summarise additional insights forthcoming from the non-sustainable schemes. In the last section we discuss women's lack of involvement in WSSs.

B *Village Profiles*

Appendix III presents village profile details. Most of the villages in the sample were quite close to some town. The average distance is 10 km and the maximum 40 km. Again, almost all villages were quite well serviced by the road network. The average distance of half a kilometer is deceptive, since

almost four-fifths of the villages had a metal road going all the way up to the village. Just over half the villages had complete access to electricity. The mean access rate across the 50 villages was 85 per cent. Thus access to physical infrastructure was quite good.

About half the households in the sample had household connections. In fact, 28 of the 50 sample villages had no stand-posts. Of the remaining villages, about half had up to 10 stand-posts and half had more than 10. There were four users on average per stand-post which is not a high number. The bulk of the villages that have stand-posts (22) were in Murree (17). Three out of the five Jhelum villages in our sample also have stand-posts.

C *Scheme Transfer*

This section is based on the responses of ten PHED personnel. Normally a sub-engineer and a sub-divisional officer (SDO) were involved in the transfer process. Generally the sub-engineer was involved in the field work and the SDO would approve the transfer. The SDO could be involved in the field work also, and in certain cases, the transfer approval came from higher up on the hierarchical ladder such as from the executive engineer.

The sub-engineer field work was informal and could involve conversations with a village group which could include the ex-PHED operator and/or a lineman, village influentials and ordinary village members. The process was not formal, and generally no explicit written criteria exist explaining the transfer. An agreement is signed with community members who agree to become members of the village committee and funds, if any, and the capital are thereby transferred to the community. The process in most cases has been a very speedy one with very little community preparation for the transfer. No formal training is provided to the community to manage the scheme, although in one case "giving verbal instruction" was mentioned.

Field observation demonstrated that PHED did often initiate the notion of committee formation, and in several cases passed on the bill-books for tariff collection. In this regard, other than in Murree, a prior structure did exist in the form of tariff collection, which the new committee took over, and in the form of ex-PHED employees available for hiring by the community.

In four of the ten cases, the PHED's continued responsibility after the transfer was acknowledged in the form of technical assistance. In one case, the PHED bore the cost of engine repair. Most sub-engineer's felt (with one exception) that the PHED should continue to provide assistance, and mentioned technical and financial assistance and help in case of major breakdown as forms of such assistance. The respondents were virtually unanimous that the PHED does not have the capacity to provide such assistance, and the one exception mentioned that the PHED was only able to continue to provide technical assistance. Given this reality of a quick transfer with little groundwork or back-up support, it is amazing how much communities have managed on their own.

We cross-checked and supplemented some of these responses from PHED field staff with management group or user group responses. According to the management group, in two-thirds of the cases where a WCOM is present, a formal document was signed for the scheme transfer. In one-fifth of the schemes, the PHED retained some substantive involvement with the scheme.

For 35 schemes, the ex-PHED operator is still accessible. However, the services of these operators is only being utilised in 15 schemes.

For 36 out of the 50 schemes, the village male groups mentioned that they had been involved in the site selection of the scheme, and in 29 cases they felt that their views had been considered in the final decision. Roughly the same number of village male groups (35) acknowledged that their views had been solicited with regard to the transfer, but only 6 groups felt that their views had a bearing on the final decision vis-à-vis the transfer. Thus, it is clear from both the PHED and user group responses that while in a majority of cases the communities had been informed of the imminent transfer, enough efforts were not made to make them willing and able partners in the transfer process.

D *Sustainability Status, Management, Participation, Collective Action and Beneficiary Satisfaction.*

1 An overview of operational status and sustainability

The field reports indicate a dismal picture of the state of the handed over schemes. In table 1, we present an overview of the operational status and sustainability assessment of the schemes. Here sustainability is based on the overall impression of the field investigators and a scheme is considered sustainable when all four evaluators came away with a positive evaluation. Schemes were considered sustainable based on observable criteria such as financial viability (operating revenues exceeding operating cost), good maintenance, regular billing and good account keeping as well as non-observable criteria such as an impression that the community was pulling well together and managed to effectively resolve conflict. We have counted schemes as operational when some water is available in the distributional network at some time of the year.

Table 1. An overview of operational status and sustainability by district

District	Schemes studied	Operational	Sustainable
Jhelum	5	4	1
Chakwal	13	11	6
Attock	6	4	4
Rawalpindi	8	3	1
Murree	18	14	2
Total	50	36	14

Source Field team observations
Note 36 operational schemes means 14 are non-operational, and 14 sustainable schemes means 36 are non-sustainable Operational and sustainable add to the total number of schemes purely by coincidence since being operational is a necessary but not a sufficient condition for being sustainable

The table above clearly shows the very poor status of rural WSSs researched. Overall, only 14 out of the 50 sampled schemes could be considered sustainable. While 36 out of 50 schemes are listed as operational, this number is an overstatement since many of the Murree schemes counted as operational are only barely so. Given that only two out of the 18 Murree schemes can be considered as sustainable, many of those currently counted as

operational will not be for long. This is also the case because all the Murree schemes were handed over in 1994, and it is clear that, in most cases, they are barely functional and that too from sheer momentum.

This finding contradicts the generally held view that gravity schemes are more sustainable because there is no pumping cost. For this reason we devote a separate sub-section to analysing the Murree schemes.[15]

The most important variable in determining sustainability could be the management structure of the schemes. Fortunately, this is also a policy variable in the sense that the government could actually attempt to replicate appropriate management structures if it is established that they are not region-specific. In a report on this issue, Narayan (1995) demonstrated that "participation" was perhaps among the most effective forms of management. In Table 2 below, we summarise the vast diversity of management structures we confronted in the sample.

Table 2. Management structures by type and sustainability

Management type	Number	Number sustainable
Water committee	20	9
Water committee/CBO	2	0
Water committee/Union Council	3	1
Water committee/PHED	1	0
Community (ad hoc)	6	0
Community/activist	5	0
Activist/privatised	5	1
Activist/PHED	1	0
Union Council	2	0
Town committee	1	1
None/non-operative scheme	4	0
Total	50	14

Source Field team observations
Notes Water committee means that a nominated committee runs the schemes with varying degrees of participation and accountability
Water committee/CBO means that a local community-based organisation is running the scheme.
Water committee/Union Council means that union council members are on the water committee and run the scheme
Water committee/PHED means that the PHED is providing regular support to the water committee
Community (ad hoc) means that there is no systematic method of running the scheme. No employee is hired and repairs are individualised for personal problems and collections taken for community problems
Community/activist means that the community has hired an activist for repair and maintenance but is not participating otherwise
Activist/privatised means that the activist collects the tariff and his salary is determined by the operating surplus, i e what he can save after expenditures
While we identified 14 non-operative schemes in Table 1, four of these had no identifiable management structure

The point of this table is to show that while water committees were expected to be operating in all the schemes, in practice, only about half the schemes are being managed by water committees. The table above shows that the water schemes run exclusively by community-based water committees are

[15] Administratively, the Murree schemes are included in the district of Rawalpindi but the terrain and socio-economic conditions which have a critical bearing on sustainability are different.

the most sustainable.[16] Some observations on the alternative management structures are in order.

The activist model appears to be a viable option when there is no water committee. One option is for an activist (most likely an ex-PHED operator) to run the scheme (privatised mode) with a regular community tariff and pocket the operating surplus after covering the operating costs. We consider this model to be problematic for several reasons. Since the operator keeps the operating surplus, there is a dis-incentive for him to maintain the equipment properly. The operator has an incentive to scrimp on maintenance costs, and there is no accountability mechanism to stop this. It gives proprietary rights over community property to an individual, and these rights could be exploited. The abuse of such proprietary rights was evident from field observation which revealed that operators' families were exempt from tariffs.

The lack of community ownership that results from such management negates collective action, beyond the very rudimentary kind of paying a tariff. No mechanism is evolved for sanctions, for example against free riders, or for maintaining disaster reserves. There is also no incentive on the part of the community to invest in the scheme. Finally, the scheme is too dependent on one individual, and no mechanism is evolved to train other operators. The model where the operator is hired by the community does not create the same moral hazard problem, but still represents the same hands off approach on the part of the community.

Our findings reported later show that the Union Council is too broad a level of administration to manage a village scheme effectively, and three of the four schemes they were managing became inoperative. Also, Union Councils are political entities made up of members with political agendas. As we will indicate, managing water supply schemes works best as an apolitical, multi-partisan administrative exercise. Details about scheme management, community participation, collective action and beneficiary satisfaction were available from the management group, user groups and household data, and are discussed in the following sub-sections. The major focus of research here was exploring the impact of WCOMs on participation and beneficiary satisfaction.

2 Community participation.

The maintained hypothesis in this report is that participation of the community is critical to the successful management and sustainability of a WSS. We found that community involvement in scheme management was limited. About a third of the male groups claim they were involved in the preparatory meeting for committee formation. Similarly, about a third said that they are taken into confidence on major decisions such as default or rate revisions, and that these views had a bearing on the final decision. Only one-fourth of these groups claimed that their views were presented at committee meetings, and the same number claimed that the community owns the scheme.

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[16] More will be said about a model in which the water community and the PHED work together to manage water supply schemes in the recommendation section. Note that our different sources of information indicate different views about whether or not a water committee was functioning in a village. According to the management group, a WCOM was functioning in 21 villages, according to the male group in 19 and according to the female group in 24. We relied on field observation to construct Table 2.

Table 3. Community perception about scheme ownership by gender

Responses	Male group	Female group
Community	13	6
Committee	8	7
Notable	9	18
PHED/Govt	4	1
No one	11	9
Other	5	9
Total	50	50

Source: Male and female group data.

The table above presenting the village groups perception of scheme ownership by gender is revealing of a lack of a sense of participation in general and of women's participation in particular.

3 Management and collective action

According to the management group, the leadership of the WCOM was decided by village consensus in three-fifths of the cases, and in one-fifth by the committee itself. A bank account exists for 23 schemes, which is a joint account in almost all cases. Fifteen schemes maintain a surplus in the bank, while the treasure or operator retains these monies for 11 schemes.

About two-thirds of the schemes reported that they were eventually able to collect 90 per cent of the dues, while one-fifth reported that they managed to collect 100 per cent. Only six schemes never experienced a deficit. In two-fifths of the remaining cases, all households contributed to meet the deficit while in 14 cases a village notable contributed to meeting the deficit.

In just over half the cases, the dues were between Rs 20 and Rs 30 for household connections. Stand-post charges were in existence for only five schemes, and in four of these cases the rate was Rs 20 or below. Six schemes charged differentiated commercial rates based on the nature of establishment or use. Based on the tariff rates charged, one-fifth of the schemes were running an operating surplus, 24 made ends meet and 16 do not raise enough revenue to meet their operating costs. There is a significant association between the presence of a WCOM and financial sustainability.[17]

In only half the schemes for which a WCOM exists, the idea of forming the committee was initiated by the PHED. In half the remaining cases, it was decided by the villagers as a whole, and in the other half by a village notable. Management practices are very rudimentary. Just over a third of the committees met regularly and 12 per cent of them (six in all) kept regular minutes. There was a formal billing system in less than half the schemes (22), and just over half the schemes (26) maintain a register.

In only five schemes is there no regular contribution system, suggesting that communities have considerable raw potential to work together. However, for only four schemes has there been no default. Thus, it is also clear that the potential for collective action needs to be shaped via some basic training in

[17] This assertion is based on cross-tabulation related Chi-squared statistics. Also, the lambda statistic indicates that WCOMs results in a 29 percent decline in the error of predicting financial viability. With financial viability as the dependent variable, the predictive error decline is only 6 percent.

achieving more effective management of the WSS in particular and collective action in general. Currently, one fourth the default cases are dealt with via persuasion and an equivalent number of defaults are forgiven since the defaulter is acknowledged to be poor. Sanctions are attempted in a few cases. In three cases, committee members reported using fines, and in four cases disconnection.

Well cleaning was regularly done in only three cases, storage tank cleaning in about one-fifth, and tank chlorination in about one-third. There is a significant association of other aspects of scheme maintenance, such as greasing motors, pipe and pipe-joint repair and fixing blockages, which were done in just half the cases, and the presence of a WCOM.[18] The PHED personnel accompanying the field team were asked to rank the maintenance of the schemes on various criteria. These included maintenance of the motor, pump, mainline, distribution network, and storage tank. In addition, schemes were ranked for spring protection, condition of stand-posts, drainage and water availability in accordance with capacity. Only on maintenance of the motor and pump and water availability did 17 and 13 schemes rate as good or very good. On all other criteria, only a maximum of nine and generally far fewer, schemes managed a high rating. Most schemes for which observations were recorded rated medium or worse on most criteria (See Appendix IV for these ratings).

According to the management group, three-fourths of the schemes encountered major repair and scheme-extension. In one-fifth of the schemes, the villages handled this repair themselves while about a half relied on the market. The major hindrance mentioned to coping with repair work are lack of spare parts (32), suppliers (27), funds (26) and training (23). In addition to major repair, about three-fourths of the schemes have been extended and almost 90 per cent rehabilitated.[19] All but five of the schemes were relying on their own resources.

Rehabilitation and extension will be an ongoing issue for most of the transferred schemes. If one assumes a ten year life for the capital equipment, 51 of the 110 schemes have already fully depreciated on a straight line depreciation basis, i.e. were built in 1986 or before. Most of the newer schemes are in Murree, where, because of the terrain and the scheme designs, the depreciation is likely to be even more rapid. Thus one can foresee most schemes confronting major expenditures for repair, rehabilitation and extension as communities expand. The preferred method of dealing with such expenses seems to be to rely on community collections as the need arises. A contrast of what communities are actually paying and what they are willing to pay (Appendix V, Table 1) shows that there is some margin for building in a reserve amount in the tariffs charged in the Murree gravity schemes but not in the pump/well or tubewell schemes in the plains.

It was not surprising that the response from 43 of the 50 scheme managers was that the PHED should continue to assist them. About half wanted the

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[18] This conclusion is inferred from various Chi-squared statistics generated from cross-tabulations where WCOM was the independent variable. The lambda statistics indicated a significant reduction of the error of predicting whether or not these maintenance activities would take place from using WCOM as a predictor.

[19] The large number of extensions are reflective of increasing demand due to high population growth.

PHED to handle O & M, while a fifth wanted the PHED to take charge of major repair. Only in six cases was direct financial assistance brought up. We asked the same question of the village male group, and 48 out of the 50 groups responded that they should get some kind of government assistance. Over one-fifth of the groups (14) wanted the government responsible for O & M, nine for major breakdown, eight for the operator and once again only six for some kind of direct financial assistance.

A surprising male community group response was that none wanted the scheme to be run exclusively by the government. Four groups favoured joint management by the WCOM and the government, three-fifths favored them being run by village notables and a fifth by the WCOM. Only in two cases did the groups feel that they could manage the schemes on their own.

While many of the male community groups mentioned the problem of enforcement in general conversation, almost three-fourths (36) answered that there were no unacceptable practices or water-related conflicts in the community. Of the 14 that said there were, eight mentioned illegal house connections and three mentioned illegal connections to the main. However, three-fifths of the management groups responded that illegal practices, particularly of the kind mentioned above, were a problem. On this issue, we are more inclined to accept the response of the management groups who deal with the problem rather than that of the community groups who may be inclined to understate, or not be fully aware of, the extent of the problem. One-third of such illegal practices were not met with any action, in about one-fifth of such cases (6), the culprits were physically stopped, and in four cases complaints were filed with the magistrates. The management groups responded that the problem was resolved in one-half (17) of such cases.

Both the management group and male community groups acknowledged default as a major problem. Only four community groups and six management groups did not see this as a problem. According to both the management and the male community groups, in just over one-fourth of such cases (14), persuasion was the main method used to resolve this problem. About two-fifths (22) of the male community groups felt that this was an effective method, while (6) thought it was not, and the other 22 groups did not respond. In over one-fourth of all cases the management group stated that the defaulter was forgiven if too poor. Other action mentioned by the management group included disconnection in four cases and fines in three cases.

There was disagreement between the management group and male community group responses on the extent of other collective activity the villages engage in. The management groups claimed that 36 of the villages had other village organisations, and in nine-tenths of the cases these were described to be CBOs (community-based organisations). In only three cases were the WCOM viewed to be engaging in other collective activity. The male community groups responded that there were other village organisations in 21 villages. In 16 cases, these were described to be CBOs, in four cases an NGO-sponsored village organisation and a *masjid* committee in one case. In this case also, given the much higher educational attainment of the management group, we are inclined to view their response as more accurate.

4 Beneficiary satisfaction and the Social Action Programme

The male and female groups were questioned concerning their satisfaction with the current supply of water. Table 4 below provides a summary of these responses.

Table 4. Current beneficiary satisfaction with water supply

	Female group responses			Male group responses		
	Yes	No	Missing	Yes	No	Missing
For the amount you pay for water supply, are you satisfied with the						
quality of water?	25	4	21	29	5	16
quantity of water?	22	7	21	20	14	16
accessibility of water?	24	5	21	32	2	16

Source. User group data
Note Each row for both genders adds to 50
'Missing' represents the groups that were not paying for water supply (mostly Murree)

In all cases, 50 per cent or less of the female group respondents were satisfied with the current level of service. Male group respondents were more satisfied with the *quality* of water supply and less with its *quantity*. The dramatic, but not surprising, difference is the much higher male group satisfaction with accessibility, given that women bring home the water when house connections are not available.

The male and female groups were also queried concerning their perceptions about how the service changed after the scheme was transferred to the community.

Table 5. Beneficiary perceptions about water supply pre and post scheme transfer

	Female group responses			Male group responses		
	Improved	Declined	Same	Improved	Declined	Same
Since the scheme transfer to the community, what kind of change has there been in the						
quality of water?	3	7	40	3	3	44
quantity of water?	18	8	24	12	18	20

Source User group data

There seems agreement across the two groups with regards to the quality of water supply, and the majority of the groups felt there was little change. It is encouraging to note, however, that only eight female groups thought that the quantity of water supply had actually declined, while 18 groups thought it had increased. This perception was the reverse in the case of the male groups, but since women are the predominant users of water, we are inclined to view their responses as more accurate in this case.

Almost nine-tenths of the female and male groups that perceived their scheme to be managed by a water committee (24 and 19, respectively) were satisfied with the performance of the committee. Perceptions differed about whether the transfer was a good idea; 58 per cent of the female groups thought it was, but only 36 per cent of the male groups did so. This sentiment was

echoed in the household survey. Table 6 below on satisfaction with scheme management was constructed on the basis of household responses controlling for the presence or absence of a WCOM.

Table 6. Percentage satisfied with scheme management with and without WCOM

WCOM	Female respondents satisfied with management (%)	Male respondents satisfied with management (%)
present	66 9 (378)	71 7 (351)
not present	12 5 (38)	23.7 (101)

Source. Household data
Note Parentheses contain the number of respondents saying yes

We tested this finding more rigorously using a multivariate logit model with "inclusion in scheme management", and "satisfaction with scheme management" as dependent variables, and WCOM as the predictor variable of interest. The results are reported as Appendix V, Table I. The first important observation to make from this table is that the coefficients are very obviously different across districts. Indeed, they may well vary across villages although there were not enough observations to estimate at the village level. Thus, studies engaging in a high degree of aggregation without careful testing could be suspect.

The result reported in Appendix V, Table I show that the presence of a water committee has in almost all cases a positive and highly significant coefficient, and is the most important determinant of inclusion in scheme management.[20] The presence of a water committee is associated with an extremely high increase in the probability of inclusion in scheme management.[21]

The other variable that has a sizeable impact on "inclusion in scheme management" is the "date of scheme transfer". We recoded this into a categorical variable with the "date of transfer" as more or less than 24 months. The reason for doing this was to compare transfers that occurred before and after the Social Action Programme (SAP) period. The "date of transfer" as a categorical variable was positive and highly significant in two out of the three cases where it is introduced as a categorical variable. This suggests that the probability of being included in scheme management was much higher for schemes that were transferred prior to the SAP period. It would be simplistic to blame the SAP for the lower satisfaction with scheme management and lesser participation is scheme management. However, since "participation" is virtually a SAP byword, this finding should be of concern to SAP programmers.

[20] Attock is the exception. Since over 80 per cent of the 85 per cent respondents were from villages where there was a WCOM, there may not have been enough variation in this variable.
[21] The method of ascertaining the exact probability is to take the anti-log of the reported coefficients, subtract one from the answer and then multiply by 100 to convert into percentages.

Being included in scheme management is mildly sensitive to the income level of the respondent. Owning a TV (proxy for income and wealth) had a positive and significant coefficient in two out of the five districts but land ownership was not significant in any of the cases.[22]

Since women are not "included" in scheme management, we could only gauge the impact of a WCOM on their "satisfaction" with scheme management (Appendix V, Table II). Once again, for both male and female equations, the only two variables that are significant and have a large impact on the probability of being satisfied with scheme management are the presence of a water committee in the village and the date of transfer of the WSS. As in the case of "inclusion in scheme management", the presence of a water committee raises in a dramatic way the probability of being satisfied with scheme management. Again, in two out of the three districts where we can use "date of transfer" as a categorical variable, a transfer prior to the SAP period is associated with a much higher probability of satisfaction with scheme management. It is not surprising that the results of Appendix V Table II essentially mirror those of Appendix V Table I, because if user committees are resulting in more participation, it is also likely that they will result in more scheme satisfaction. Even so, demonstrating this result is useful, particularly since it enabled us to analyse and report on female responses.

A related issue to community satisfaction is willingness to pay (WTP). Since it is peripheral to our main focus (i.e. the benefits and determinants of collective action), we have reported our WTP analysis in Appendix VI. Our findings confirm those of Altaf et al. (1992), who claim that there is a WTP for services in rural Pakistan. We turn now to two key questions. Are there any identifiable commonalities among schemes that we found to be sustainable and among schemes that we found to be non-operative?

E *Why Sustainable?*

Few background characteristics distinguish schemes that are sustainable from those that are not. The size of the community in terms of the target population served is not a deciding factor since this varied from about five hundred to eight thousand. Also, the community education level varied widely across these schemes as did the general standard of living. One could guardedly say that communities that managed successful schemes were more likely to have a high or middle standard of living and have access to good or fair physical infrastructure. The more important and interesting causes of sustainability lie elsewhere, and indeed those reasons may well explain the better living standards and better infrastructure.

In ten of the 14 sustainable schemes, there were active water committees with paid employees.[23] The other significant indicators of sustainability in about half the cases included a regular billing system with operating revenue in excess of operating costs, good account keeping and obvious beneficiary satisfaction. In about a third of the cases there was a connection fee (ranging

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[22] Age and education were also for the most part insignificant.

[23] The one scheme managed by a town committee is excluded from this analysis since our focus is on rural water supply, and since this scheme's financial sustainability depended on the ability of the town committee to cross-subsidise it.

from Rs 100 to Rs 500), low or no default rates, sanctions on illegal connections and back-up equipment. It is important to keep in mind that performance is a relative concept.

While financial sustainability is the bottom line, it was surprising that on other indicators even these schemes did not do well. Very few were engaged in regular maintenance, storage tank cleaning, water disinfection (only one), and planning for scheme extension. More distressing, only two communities mentioned that the supply was adequate, and several remarked on the poor quality of the water available. About three-fifths of the sustainable schemes excluded households because of an inability to supply water to higher elevations. Even so, these schemes were on the whole functioning well and were viewed as sustainable by the field team.

The real question, of course, is what accounted for this sustainability? As we point out in the next section, the lack of need plays a critical role in explaining why schemes were inoperative or barely operative in the case of Murree. Need, due to the lack of viable alternatives, also appears to play a role in galvanising communities to work together for water supply.[24] Several factors appear to make the difference. First, forming the committee with representation duly given to each *biradri* (clan) was an important commonality in the sustainable schemes we investigated, particularly in Chakwal. Second, the support of the village notables for the committee helps. Third, the role of an activist, frequently retired service personnel, was critical to scheme success in at least half the successful cases.[25] Fourth, and more surprisingly, the *masjid* (mosque) as a social institution provided an important forum for successful scheme operation, particularly in Attock.[26]

Some of these hypotheses can be tested more rigorously using logistic regression and the management group/PHED data set. As stated earlier, we relied on field observations to identify the 14 sustainable schemes. Ten of these were also identified as being financially viable. However, since our focus was on long-term sustainability, it is possible to select a scheme as sustainable which in the short-term is not covering operating costs. The results are reported in Appendix V Table III.

As expected, need plays an important role in predicting sustainability. High need for water defined as "alternative supply not available throughout the year", is associated with a higher probability of a scheme being sustainable.[27]

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[24] This is, of course, not always the case and there are some cases of high need where the communities were not pulling together.

[25] We also found that teachers are often respected members of communities called upon to handle the accounts. In two cases, the *imam* of the *masjid* (mosque) was a very effective activist. The key role of activists in social mobilisation is now widely recognised in the participatory development literature.

[26] The mosque provided a platform for participation, accountability and enforcement. After Friday prayers, the community was encouraged to discuss issues related to the water scheme, ask questions and air complaints.

[27] We view the optimum amount of collective action as that necessary to make schemes sustainable, and hence sustainability is used as the dependent variable. This is preferable to using the presence or absence of a WCOM since the latter is neither a necessary nor a sufficient condition for scheme sustainability. It was obvious from looking at the data that *biradri* or clan was not a critical determinant of sustainability. This is because the most homogeneous communities were in Murree which, as we report later, were the most unsustainable. Many large communities in the plains comprised of several clans, but the

Once again, the most successful predictor of scheme sustainability is management by a WCOM. Our earlier multivariate regression on household data suggests that WCOM is a good proxy for participation. The other successful predictor of scheme sustainability is the presence of an ex-PHED operator in the village.[28]

Sustainable schemes are one extreme and inoperative schemes are the other. We turn our attention to such schemes in the next section.

F *Why Inoperative?*

Our investigation revealed a whole range of possible reasons which could account for the 14 schemes becoming inoperative. One should exclude the three cases where the spring died, the water turned brackish and the tubewell developed bore problems making the water muddy. The other cases include causes for which there is no evident policy response. Three of the five communities in Rawalpindi and seven overall exhibited political tensions. In about six of the cases, water from the scheme was not indispensable due to readily available alternatives, and in one of them it was obvious that the scheme was foisted on a community that did not want it.

However, other findings demonstrate a role for policy. Three of Rawalpindi's five failed schemes were badly designed in order to suit the interests of an influential. In six cases (all cases where a Union Council was involved), the community mistrusted the officials and suspected embezzlement. In one-fourth of the cases, the scheme appears to have been seriously handicapped, if not inadvertently made inoperative, due to an incompetent operator. In one case, the handicap resulted from the loss of an operator for whom there was no replacement. Finally, the lack of financial viability was critical in at least half the cases where revenues were not adequate to meet operating costs.

The lessons are obvious. As stated earlier, the Union Council is too broad a level of administration to effectively manage village schemes. This was particularly obvious in cases when the Union Council members did not belong to the village in question. Even when they did, they did not view themselves as accountable to villagers and created considerable ill will. The PHED needs to take communities into confidence when designing schemes. This was particularly the case for the failed Rawalpindi schemes where the design appeared to respond to the needs of particular influentials.[29]

While painstaking community work of the kind that will overcome political and clan rivalries is difficult and expensive, the PHED could easily provide basic training in operating the scheme, setting rates and maintaining

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successful ones managed to handle potential problems through a representational process. Our analysis did not indicate differences across districts.

[28] Murree had the most homogeneous populations in terms of the numbers of clans in the villages. However, only two of the 18 schemes in Murree were sustainable. Some of the sustainable schemes in the plains had up to ten different clans in the village. They managed to circumvent potential conflict by giving all clans representation on the committee, and having clan representatives responsible for collections from their clans or household clusters.

[29] In one case, the source was about five kilometers away from the village so that an influential's family in another village next to the source could get water. This made maintenance very difficult and raised electricity bills to prohibitive levels. In another case, a tubewell was installed on the farm of a landlord who was using scheme water for agriculture.

accounts. All communities could then be instructed to train back-ups for these core water scheme operating and management functions.

There are some special lessons derived from a deeper investigation of the Murree schemes.

G *Inoperative Schemes: The Case of Murree*

As indicated earlier, Murree needs special attention due to its topography. This contributed to the poor performance of its water supply schemes which, if operative, were in most cases barely functional. The indicators of non-sustainability are particularly evident in the lack of collective action. Repairs are individualised so that households assume responsibility for the household connections that serve them. Cooperative behavior in water-sharing or use is absent. In many cases, individuals on whose land the source is located adopt a proprietary attitude and contaminate the source by washing dishes and clothes. There is no systematic method for including new users, and households get illegal connections by paying a plumber. Worse scenarios yet are water diversions or individuals wantonly breaking pipes to make pools for their cattle.

Collective action is not completely absent. Those served by stand-posts may collectively pay to have them repaired, and a collection is often taken for a major repair (due to landslides or flooding) that affects the whole community. However, collection is invariably a slow and mistrustful process. Also, collective action does not extend very far. There is no systematic billing system in place for scheme maintenance, and so the distribution network - pipes, mainline, valves, collection and storage tanks - are invariably leaky and tanks are seldom cleaned or disinfected.

There are also many causes of this non-sustainability. Households are built singly or in clusters, and so the population is very scattered. This inevitably leads to a low level of interaction among villagers, and hence probably a weaker sense of community than in the plains. Since terrace farming can accommodate a limited labour force, most of the more educated and energetic population works outside the village, in the cities or abroad. Thus, at best they only spend the evenings or the weekends in the village. While the general level of education is not high by national standards, those who remain behind in the village have even lower mean educational attainment. Thus, the villages have a depleted stock of good activist material to draw on.

The terrain also means that it is difficult and expensive to lay underground pipes and so the pipes are exposed to breakage due to natural and human causes. The hilly terrain also provides a blessing, but not for collective action. Due to plentiful snow and rain, villagers generally have access to many springs. However, availability does decline in the summer months, and often women have to walk long distances in difficult circumstances to bring water home. Nonetheless, due to the ready availability of alternatives, the community is often not willing to impose on themselves the discipline of collective action.

While landslides and floods wreak havoc on exposed mainlines in hilly terrain and make maintenance very expensive for villagers, there are steps the PHED can take to enhance the probability of scheme sustainability. PHED

officials pointed out that communities have a dependence mentality which hinders collective self-management. However, the PHED bears a large share of the responsibility for this being the case. Many communities complained that the transfer of the scheme was a fait accompli imposed on them by the PHED and a few notables. The villagers were not even aware that the PHED was no longer responsible for the scheme, and still continued to identify it with the PHED. From a situation where they got free service (a tariff to cover diesel or electric charges is common in the plains), they were suddenly confronted with a situation in which they would have to pay for service delivery.

We do not think that the PHED is currently equipped to mobilise communities. However, the transfer should be much less precipitous. The community must be taken into confidence, and in a transitional phase urged to take on partial financial responsibility for scheme management. Getting them to contribute to the salary of the ex-PHED plumber would be a useful first step. Only when the community has gradually been weaned away from a state of dependence, can it be asked to assume complete managerial and financial responsibility for the scheme.

In hilly terrain, the tariff rate required to build up a reserve would be fairly high due to the regularity with which repairs are needed. If the PHED bears the initial expense of laying underground pipes, villagers would be saved from the continuous high repair bills. In the same vein, the PHED has often kept the collection tank low, uncovered and unprotected (from slides). One important reason for schemes becoming defunct is the debris that flows into the collection tank in the rainy season and blocks the flow of water. Once again the low lying and unfortified collection tanks, use of poor materials and incomplete schemes impose prohibitive costs on the communities.

There is a more subtle issue concerning scheme construction and transfer which concerns the social dynamic of communities. It is now generally accepted that to generate community involvement and ownership, communities need to be involved right from the inception of the scheme. If this were done in Murree, social rather than engineering criteria may have been more important in site selection and scheme construction. Due to engineering considerations, schemes cut across several *dhokes* or sub-village clusters. There is a likelihood that community cohesion could be forged in a particular *dhoke* and that they may therefore successfully manage a scheme. To expect this to occur across several *dhokes* is unrealistic given the labour patterns and scattered habitations mentioned earlier.[30]

As indicated above, most WSSs in Murree leave little room for hope. Fortunately, we did come across a counter-example of a sustainable scheme in Murree, and we have reported this in Appendix VII as case study #1. Need, or the lack of easily accessible alternative water sources, and a well-knit community contributed to successful collective action. We were also informed about a water scheme (not in our sample) rehabilitated by villagers on a self-help basis with community organisational and material support from the National Rural Support Programme (NRSP). There is also evidence that in

[30] Thus it is difficult to extend the collective action theoretical framework as applying to the schemes we observed in Murree, since in many cases there is no single identifiable community responsible for the scheme.

similar hilly terrain in rural Azad Jammu and Kashmir (AJK), careful motivational work accounts for the success of many WSSs.[31] Thus community organisation and collective action are possible even in Murree. The NRSP stated approach of working with the poor (those with the greatest need) and with cohesive communities would appear to be particularly effective in this area.

In the above sections we concentrated on the extremes, i.e. schemes that were inoperative or schemes that we considered to be sustainable. There are, however, a few cross-cutting issues, evident mostly from the analysis of non-sustainable schemes, which we summarise in the next section.

H *Insights From Non-Sustainable Schemes*

Once again, there is little one can explain from the background characteristics of the villages the schemes are situated in. While a large number of schemes were found to be non-sustainable, the positive side is that in most of these schemes there were signs of collective action. This collective action is not sufficient to sustain the schemes, but the fact that it is present on a noticeable scale without sustained community mobilisation to engender it is a good sign.

Perhaps one of the most pervasive problems is the lack of attention to basic hygiene. Even among sustainable schemes, as mentioned above, only a few regularly clean water tanks and disinfect the water.

A problem frequently confronted in the plains, even in well-managed schemes, was that a particular cluster of houses on a higher elevation were excluded from the scheme. While the technical difficulty and expense of providing universal coverage is no doubt substantive, not providing universal coverage divides the community, and adversely affects morale and the functioning of water committees.

Frequent problems cited by communities managing non-sustainable WSSs were the widespread practices of default, of illegal connections, and of putting suction pumps on the mainline, particularly by the affluent. This often resulted in infrequent and limited water supply for the rest of the community. There are some useful examples of successfully dealing with this free-rider problem, and of enforcing discipline on defaulters that can be drawn from the experience of the sustainable schemes. We have reported these in the recommendations chapter.

I *Women's involvement*

As shown in Table 3, compared to the men's groups, less than half the women's groups viewed the schemes as belonging to the community. None of the women's groups mentioned that they were involved in the transfer process in any way. Half of the women's groups reported that their views were communicated to the scheme management, and 90 per cent of them (45) felt satisfied with this level of involvement.

Women had no explicit role in all 50 schemes, and in only one scheme did they indicate a greater willingness to get involved. In general, they simply

[31] LGRDD-AJK and MSU (1995).

wanted water to be available in abundant quantity and of decent quality. This wish indicates that women are the major water users, and that in some cases they are expected to collect it under difficult circumstances. Even so, arranging for and managing water schemes is viewed by both women and men to be men's work. For cultural reasons, men have an incentive to make water available to their women as close to home as possible.

It is now widely accepted that water supply schemes that make water readily available should be accompanied by instruction on general hygiene in order to derive full benefits from the schemes. Yet only about a quarter of the male groups (12), and one-tenths (5) of the female groups mentioned having received such instruction. These are very low numbers and, given that the household spread effects of providing such instruction to females are likely to be higher, the targeting is also misconceived.

5

SUMMARY OF FINDINGS AND RECOMMENDATIONS

1 *Case for Water Committees*

The most significant finding of this study has been showing the importance of water committees (WCOMs) that have been established at the urging of PHED personnel or spontaneously by the communities. We also showed that alternative managerial modes such as privatisation, operator-run schemes or Union Council management were not successful.

We found that the existence of WCOMs are associated with greater financial viability and sounder maintenance of the WSSs. Further, they are associated with greater participation of the community, and a much higher probability of the community being satisfied with scheme management and sustainability. It is encouraging that they have been able to play such an important role, given the rudimentary or no training imparted to village groups by the PHED.

2 *Case for Social Mobilisation*

Our results show that the dividends to cultivating and nurturing WCOMs are likely to be very high. We assert that there will be high dividends to small amounts of social mobilisation because the communities are very receptive and there is evidence of much potential for collective action. In fact, without much instruction, communities are already engaged in self-management of a basic kind. Three-fourths of the schemes had engaged in major repair, rehabilitation or extension, and all but five communities relied on their own resources.

3 *Case for Careful Project and Site Selection*

A careful reading of our findings suggests that site selection and scheme transfer have much to do with need and social dynamics. To be oblivious of need when supplying water supply schemes is not sensible. Similarly, when the PHED encourages the building of social infrastructure, it must invest a little time in understanding what constitutes a community and whether it can be galvanised into successful collective action via sensible representational policies and the role of key institutions and activists. This need not take too much time. Villagers are forthcoming, and even in the course of one day's fieldwork, our field team was able to uncover much that was critical in the social dynamics of running particular schemes.

4 *Case for Phased Process for Scheme Transfer*

Judging from the responses of both the PHED personnel and the village groups, the transfer of the WSSs to the community has so far been a very hasty process. We recommend that schemes should be categorised (say into high,

medium and low success) based on informed probabilities of successful transfer. This assessment needs to be made by the PHED field staff based on the need for the scheme, the social dynamics of the village, the scheme design and the quality of the infrastructure being turned over. Social mobilisation and training of communities in the basic skills of managing WSSs is essential.

Given such training, the first step should be a sustainability assessment based on the community social dynamics. A realistic assessment needs to be done of community motivation to pull together, based on the real need for the WSS, the social group dynamics and the available leadership. Here the tendency of simply listening to village influentials who often have their own angles must be resisted. PHED field personnel bonuses could be tied to the numbers of successful transfers they are responsible for.

There will be little problem with WSSs that are deemed to have a high probability of successful transfer. It is the medium and low success categories in particular that PHED field staff must train. They need to ensure that a WCOM is established, that the committee has the support of the community who have a say in who represents them, and that all clans have representation in the committee. Also, they need to help establish transparency and accountability procedures, ensure that someone is acquainted with basic accounting and tariff setting, someone with repair and maintenance, and all with basic hygiene. The operator, linesman and accountant must immediately be instructed to train back-ups. To ensure all this will take time and cannot be a hasty process.

5 *Case for Training of PHED Staff*

PHED field staff have a role in training to become catalysts in the creation of WCOMs, but they also need some basic training for becoming sensitive social observers and social mobilisers. There are now organisations in the NGO sector that provide such skills. We feel strongly that the PHED should retain these functions of community observation and social mobilisation rather than contract them out to say development NGOs. This is because the government has much credibility in the rural areas which should be built upon. Also, only PHED staff possess the technical skills necessary for back-up support. Both social mobilisation and technical support skills should be embodied in the same person to build effective links with the village communities.

6 *Case for Continued Role of PHED*

a Technical support

Having ensured a promising transfer is an important step towards WSS sustainability, but the PHED must have a continued role. A large number of management groups identified the shortage of spare parts and basic tools as a problem with repair and maintenance. The PHED's district level offices could establish an assistance cell. Technical assistance should be provided on call, and the incentive to get it will be the tools available on providing a deposit. Operators should be introduced to and expected to maintain a liaison with this cell as part of the transfer proceedings. Our results also show that ex-PHED operators with links to the PHED are a very important resource for the village

as potential activists and individuals who embody technical knowledge. This role can be formalised by the PHED with ongoing training and back-stopping.

b Resources for back-stopping

The urban bias in infrastructure provision is nowhere more clearly evident that in the provision of water supply. Both urban and rural citizens pay taxes. However, while urban residents take the provision of water supply for granted, rural residents are being told to cater for themselves. Community self-help in operating WSSs and in other activities is a worthy goal in and of itself and is therefore endorsed by us on normative grounds. However, we discovered that at least in Jhelum and Attock, willingness to pay was close to what was actually being paid, leaving little margin for developing a reserve fund for replacement, major repair, rehabilitation or extension. Given the age of the existing schemes and population pressure, the demand for major repair, rehabilitation and extension will be very high in the near future. The state should continue to assume responsibility for these activities on both equity and humanitarian grounds.

This support for major repair, rehabilitation or extension could be institutionalised at the district level. The assistance cell at the district level could also entertain requests from WCOMs for major repair, rehabilitation or extension (which would create an additional incentive for the formation of WCOMs). Field officers would verify if the request is genuine and if it is not due to sloppy maintenance. Funds made available from provincial governments to the district assistance cell would be used for major repair, rehabilitation or extension.

A rotating committee of the chairmen of WCOMs could constitute a monitoring committee. One WCOM chairman from each Union Council could be elected by all chairmen at the union level to be part of this committee for a one-year period (re-election would not be allowed for five years). The task of this representative would be to familiarise themselves with all WSSs at the union level. These representatives would be invited annually to the district assistance cell where they could look at the relevant records and submit their report to the provincial PHED office.

7 *Case for an Insurance Fund as an Alternative*

We think that a formal role for the PHED in major repair, rehabilitation and extension is the preferred option. This could be tried on a trial basis for a three-year period. If the assistance cell is found to be ineffective, an insurance fund could be an alternative. There are economies in establishing an insurance fund at the district level. The PHED could establish such a fund, and schemes can be given the option of buying insurance by paying a nominal sum per user into the fund which would be reflected in the tariff premium. The actual rates can be established by taking actuarial advice, but all the relevant data are already available with the PHED.

Community payments for insurance could be facilitated by using the option of differentiated tariff structures (e.g. commercial vs non-commercial). Existing practice revealed several good examples of differentiated rate structures (Appendix VII, case study #4).

8 *Case for Enforcement Assistance*

Even successful schemes felt the need for the government to help with enforcement against malpractice or default. There are some examples from successful schemes which the PHED could replicate while engaging communities for the transfer. In the Kamrial scheme in Attock, a system of fines, court cases in the Assistant Commissioner's office and disconnection were used. They even successfully negotiated disconnecting supply to an MNA (Member National Assembly) who was illegally drawing water from the mainline. In the Dakhnair scheme in Attock, peer group pressure was used by terminating supply to all households until the defaulters paid up. The Dhalla scheme in Attock used peer group pressure by announcing the defaulters' names in the mosque after the Friday sermon (Appendix VII, case study #3). Finally, the sustainable schemes effectively managed to use representation of all clans on the water committees and made these members responsible for collections from their clans (see Appendix VII, case study #2). These alternative enforcement methods are innovative, and one or more of them should be replicable.[32]

If these methods do not work, the PHED assistance cell should be counted on, as a last resort, to throw the weight of the government behind the WCOMs. In Murree, there were cases of village water being diverted for private use by notables who were building summer recreational residences. Collective action to protect water rights is particularly called for in such situations but will not be forthcoming without organisational work. Without sustained community mobilisation, poorer villagers perceive themselves to be helpless in the face of the rich and powerful. Direct confrontation is not called for. The government must declare the destruction of collective property to be a criminal offence. A few successful public interest court cases would go a long way towards protecting communal rights, and the PHED has the moral responsibility as an organ of the government to take a lead.

9 ***Case for Providing Sound Infrastructure and Using Social Criteria in Scheme Construction***

We found Murree to be a special case, and here in particular the PHED shares much of the responsibility for the poor success of the transfer of WSSs to communities. Rectifying the shortcomings of their approach in future construction and transfers based on the recommendations made above are essential. In Murree, more than in other communities, the transfer must be a more phased process with the communities gradually assuming financial and managerial responsibility. This is because the Murree communities, with gravity schemes, were not paying any tariff prior to the transfer. Also, the infrastructure must be materially and technically sound to avoid burdening communities with expenses that they will not be able to sustain. Finally, perhaps even more than in the plains, much more thought must be given to the sociology of communities rather than developing schemes based purely on

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[32] In Murree, clan loyalty was perceived as a hindrance in enforcement. Many express their inability in asking for collections or in chiding members of the same clan. In this case, alternatives like public mosque announcements may work better.

engineering criteria. In the plains, new schemes should provide complete coverage to avoid community divisiveness.

Overall, our study has both bad news and good news to report. The bad news is that we have identified just 14 out of 50 schemes transferred to communities to be sustainable. The good news is that there is much raw potential for collective action in village communities. Beyond this, we find that water committees play a central role in making schemes sustainable. With training and some additional resources, PHED field staff can ensure a much higher success rate.

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APPENDIX I

RESEARCH ISSUES FOR RURAL COMMUNITY WATER SUPPLY SCHEME STUDY

The following kinds of issues were expected to assume importance:

a the nature of the scheme and process of transfer;
b socio-economic profile of the water committee members and non-members;
c relating *b* to water needs;
d participation of community in scheme construction;
e nature of community mobilisation and water committee formation;
f collective action and free-riding issues;
g nature of membership and community awareness of committee functioning;
h nature of decision making;
i dealing with conflict and mis-management;
j women as beneficiaries and involvement of women;
k analysis of inoperative schemes;
l analysis of committee's financial viability; this includes analysis of the rate structures in the context of:
    i trouble-shooting, repair and maintenance;
    ii expansion, rehabilitation and modification of capacity;
m water committee maturity scaling; in addition to some of the above, this will include:
    i regularity of meetings and attendance;
    ii maintenance of accounts and records;
    iii self-initiated actual and planned changes;
    iv clearly assigned tasks;
    v task performance and monitoring;
    vi use of social sanctions;
n analysis of community satisfaction before and after the transfer;
o analysis of "willingness to pay";
p linkage with government, donors, NGOs or other village CBOs;
q nature of training availed of/available.

APPENDIX II

SAMPLE SELECTION PROCEDURE

We started with the following frequency distribution of handed over schemes for four districts of Northern Punjab:

Rawalpindi	70
Jhelum	5
Chakwal	29
Attock	6
Total	110

Source definitions:

T/Well = Tubewells
P/Well = Pump and well
Spring = Gravity schemes based on a spring as a source

We had resources available to select 50 schemes, which represents a large sample size of 45 per cent. There were various possible stratifying factors including district, type of (water) source, date of completion, date of handing over, population served, number of connections, size of annual operating expenditures, and whether the scheme was operational. Of these, only district and source required special attention to ensure adequate regional and water source coverage. We were confident that a random selection otherwise would adequately capture the variation in the other potential stratifying variables.

To ensure adequate regional coverage we included all the schemes of Jhelum and Attock in the sample. For the two remaining districts, we stratified by source which results in a gravity or mechanical scheme. Excluding two schemes handed over in 1995 (too recent), and including the only two springs and one dam in Chakwal, we were left with selecting 36 schemes from the following:

Rawalpindi	
Springs	48
P/Wells	20
Chakwal	
P/Wells	26
Total	94

We decided on equal probability of selection within and across districts and across source. Dividing 36 by 94 represents a 38 per cent probability of selection for each of the remaining units. This meant a selection of 10 P/Wells

from Chakwal and 18 Springs and 8 P/Wells from Rawalpindi. The schemes were selected randomly.

The remaining schemes in Rawalpindi district (the most accessible to us), were stratified by source, and five schemes were randomly selected to give us three gravity and two mechanical schemes for the pre-tests.

In the first pre-test in the hilly Murree region of Rawalpindi district, we realised that schemes were not situated in cohesive village communities as in the plains but spanned several household clusters or *dhokes*. Our approach here was to select a *dhoke* that came closest to containing a sub-scheme or sector within its boundaries.

APPENDIX III: VILLAGE PROFILES

	Village	District	Dist. from town (km)	Households w/ electricity (%)	Dist. from metalled road (km)	# of households	# of households w/ connections	# of standposts	Average users per standposts	Scheme type
1	Sourasi Syedan	Murree	2	10	0	55	35	13	2	Spring/gravity
2	Chajjana	Murree	4	0	6	100	50	15	3	Spring/gravity
3	Danda, Panthi Kakri	Murree	1	100	4	40	0	11	2	Spring/gravity
4	Dhanda Part A	Murree	1	100	2	25	18	5	2	Spring/gravity
5	Bhamrote Syedan	Murree	1	0	0	65	0	12	3	Spring/gravity
6	Lower Aliot	Murree	0	100	0	260	200	25	5	Spring/gravity
7	Masoot	Murree	17	100	4	225	200	7	7	Spring/gravity
8	Phaprial	Murree	14	100	0	55	0	10	4	Spring/gravity
9	Upper and Lower Numb	Murree	10	100	0	45	33	0	0	Spring/gravity
10	Malot Dhondan	Murree	2	100	0	125	15	35	3	Spring/gravity
11	Phagwari, Dhala, Fatoot	Murree	1	100	0	45	25	10	2	Spring/gravity
12	Upper Masoot	Murree	1	100	1	30	30	0	0	Spring/gravity
13	Kotli Sattian	Murree	1	100	0	200	150	6	4	Spring/gravity
14	Nand Kot	Murree	15	8	0	67	30	15	3	Spring/gravity
15	Ausia Dewal	Murree	0	100	0	150	150	3	5	Spring/gravity
16	Hokra Dewal	Murree	15	100	3	65	23	42	4	Spring/gravity
17	Kiah Arnari Dhoke Salor	Murree	2	65	1	135	0	11	7	Spring/gravity
18	Plassi	Murree	5	0	3	38	18	5	3	Spring/gravity
19	Bhadian	Attock	18	80	0	500	90	0	0	Pump/well
20	Bohi Garh	Attock	16	95	-	400	380	0	0	Tubewell
21	Dakhnair	Attock	22	90	2	450	220	0	0	Pump/well
22	Tanda	Attock	12	100	0	225	165	-	0	Tubewell
23	Bai	Attock	3	70	1	350	231	0	-	Pump/well
24	Kamerial	Attock	35	97	0	1600	600	2	0	Pump/well
25	Bewal Kamal	Rawalpindi	0	100	0	300	235	0	0	Tubewell
26	Qazian	Rawalpindi	0	100	0	700	130	0	0	Pump/well
27	Chak Bali Khan	Rawalpindi	0	95	0	1500	300	0	0	Tubewell
28	Bhall	Rawalpindi	12	100	0	375	275	0	0	Pump/well
29	Dalial Mohra	Rawalpindi	7	98	0	400	0	0	0	Tubewell
30	Adhwal	Rawalpindi	12	100	0	1800	415	0	0	Tubewell
31	Mial	Rawalpindi	22	75	0	2000	207	0	0	Pump/well
32	Dallah	Rawalpindi	23	95	0	225	215	0	0	Pump/well
33	Murreed	Chakwal	12	100	0	3250	1000	0	0	Pump/well
34	Dhok Talian	Chakwal	9	100	0	150	108	0	0	Pump/well
35	Choa Saidan Shah	Chakwal	0	100	0	3500	944	0	0	Spring/gravity
36	Buchal Khurd	Chakwal	8	100	0	400	300	0	0	Pump/well
37	Dallah	Chakwal	40	97	0	500	125	0	0	Pump/well
38	Dhrab Pari	Chakwal	9	95	0	300	250	0	0	Pump/well
39	Jhatle	Chakwal	0	90	0	1500	600	0	0	Pump/well
40	Bal Kassar	Chakwal	0	100	0	800	700	7	-	Pump/well
41	Balshahan	Chakwal	12	98	0	1000	232	0	0	Pump/well
42	Khokhar Zer	Chakwal	17	70	0	1000	300	0	0	Pump/well
43	Dhori	Chakwal	9	95	0	450	216	0	0	Pump/well
44	Budhial	Chakwal	8	100	0	800	450	0	0	Pump/well
45	Kalyal	Chakwal	22	100	0	150	75	0	0	Pump/well
46	Jalalpur Sharif	Jhelum	0	95	0	1000	649	3	-	Tubewell
47	Haranpur	Jhelum	10	100	0	700	650	0	0	Tubewell
48	Pind Sawika	Jhelum	35	95	0	1750	90	15	9	Pump/well
49	Saghar	Jhelum	4	100	0	400	338	0	0	Pump/well
50	Ahmad Abad(Langher)	Jhelum	6	0	0	200	42	3	9	Tubewell

Source Management group/PHED data. *Note. '-' = not available*

APPENDIX IV

PHED PERSONNEL RATINGS OF WSSs

(percentages)

	Poor	Fair	Medium	Good	Very good	Scheme total
Free from contamination	20 (10)	12 (6)	30 (15)	12 (6)	-	37
Maintaining pump/motor	14 (7)	12 (6)	8 (4)	24 (12)	1 (5)	30
Maintaining main	16 (8)	12 (6)	16 (8)	14 (7)	-	29
Maintaining distribution work	10 (5)	14 (7)	28 (14)	18 (9)	5 (1)	36
Storage tank	16 (8)	12 (6)	16 (8)	14 (7)	-	29
Condition of stand posts	6 (3)	4 (2)	10 (5)	6 (3)	-	13
Spring protection	6 (3)	4 (2)	6 (3)	6 (3)	-	11
Drainage	4 (2)	10 (5)	8 (4)	4 (2)	-	13
Water availability	14 (7)	14 (7)	20 (10)	20 (10)	6 (3)	37

Source. Management group/PHED data
Note Parentheses contain number of schemes '-' = not available

APPENDIX V

MULTIVARIATE LOGIT ANALYSES OF PARTICIPATION, SCHEME SATISFACTION AND SUSTAINABILITY

Table 1: Determinants of participation (logistic regressions for male)
Dependent variable: "Do you feel included in scheme management?"

Districts	Attock	Chakwal	Jhelum	Rawalpindi	Murree
Constant	-1 828 (2 60)	-4 821* (30.90)	-6.87* (15.59)	-3 091** (5 73)	-2.014 (1 46)
Age	0 003 (0 20)	0 017*** (2 66)	0.006 (0 09)	0.015 (1 62)	0 021 (1 65)
Education	0 137*** (3.47)	0 311 (0.53)	0.010 (0 02)	-0.030 (0.32)	0 08 (1.35)
Landownership	0.006 (4.68)	0 001 (1 21)	0.003 (1.57)	0.003 (1 93)	-0 010 (2.21)
Own TV	-0 127 (0 05)	0 911* (8 24)	-0 634 (1 26)	0 728*** (3.14)	0.776 (2.01)
Management (WCON = 1)	-0 567 (0 003)	2 856* (52.59)	0 970# (2.51)	4 004* (13.06)	2.370* (12.36)
Date of scheme transfer (>24 months = 1)	0.74 (0 57)	1.371* (14.70)	0 046*@ (14 87)	5 151* (15 50)	0 022@ (0 09)
% Connect predications	62.4	79 4	81.4	74 1	68 18
n	85	282	113	158	110

Source Household data set
*Note *Significant at least at the 1 per cent level*
*** Significant at least at the 5 per cent level*
**** Significant at least at the 10 per cent level*
 # Significant at least at the 11 per cent level
@ when date of transfer was either all zeros or one, it was entered as a continuous variable

Table 2: Determinants of satisfaction with management (logistic regressions)
Dependent variable: "Are you satisfied with the scheme management?"

Districts	Attock		Chakwal		Jhelum		Rawalpindi		Murree	
Variables	F	M	F	M	F	M	F	M	F	M
Constant	9 988	-0 363	-2 13**	-1 179	-4 585*	-8 85*	-3 368**	-2 664*	-3 817	2 133
	(0.17)	(0 06)	(4.18)	(2 34)	(6 36)	(17 17)	(5.81)	(7.89)	(0 01)	(1 81)
Age	-0 30***	0 041	1 132	0.007	-0 015	-0 003	0 017	0 005	-0 004	-0 009
	(3 20)	(1.99)	(0 72)	(0.42)	(0 01)	(0.02)	(0.99)	(0.18)	(0 006)	(0 376)
Education	1 149*	-0 262	0 065	0 017	0.098	-0 081	0 063	-0 030	0 129	-0 148**
	(10 48)	(0 06)	(1 159)	(0 15)	(1.66)	(1.25)	(1.57)	(0 34)	(0.72)	(4 05)
Landownership	0 0008	0 0003	-0 0009	0 0007	-0 016**	0.0008	-0 002	0 0007	-0 069	-0 025**
	(0.10)	(0.008)	(0.34)	(0 50)	(4 13)	(0 84)	(1 20)	(0.23)	(1 87)	(4.90)
Own a TV	-0 781***	0 485	0 169	-0 266	0 291	0 306	-0 080	0 739***	0 453	-0.231
	(3 09)	(0 374)	(0.176)	(0.70)	(0.26)	(0 27)	(0.03)	(3 51)	(0.280)	(0 18)
Water Committee present	1 419*	1 198#	1 719*	2 112*	0.195	0 277	2 557**	1 716*	8 147	2 074*
(WCON = 1)	(10 48)	(2.54)	(6 03)	(46.50)	(0.32)	(0 18)	(4 77)	(6 78)	(0 05)	(14 19)
Date of scheme transfer	-8 478	-0 527	2 168*	0 714**	0 004*,@	0 071*,@	1 660*	3 577*	-0 289**,@	-0 055@
(>24 months = 1)	(0.12)	(0 21)	(27 59)	(5 01)	(9.40)	(19 63)	(10 42)	(20.70)	(5 63)	(0.64)
% of Correct Predictions	71 7	89 4	80 7	74 0	66 3	82 3	70.2	73 4	73 7	70 9
n	131	85	197	282	83	113	114	158	38	110

Source Household data set
Notes As in Table I

Table 3: Determinants of Scheme Sustainability
(Logistic regression; dependent variable = scheme sustainable, else = 0)

Regressions	Coefficients	Wald	Exp (B)
Constant	-4 42*	6 06	
Need for water (Low need = 1)	-3 133**	4 40	1.37
Ex-PHED operator in village	2 70***	3 46	14 86
Management (WCOM =1)	4 22*	7 51	67 77
Date of scheme transfer	0 02	1 62	1 02
Distance to metal road	0 32	0 37	1 37
% correct prediction	81		
n	47		

Source Management group/PHED data set For sustainability, field observations
Notes Significant at least at the 1 per cent level
** Significant at least at the 5 per cent level*
*** Significant at least at the 5 per cent level*
**** Significant at least at the 10 per cent level*

APPENDIX VI

ANALYSIS OF WILLINGNESS TO PAY

Willingness to pay (WTP) methodology is now quite well established, and the best known study ascertaining this for water in Pakistan was conducted by Altaf et al. (1992). The contingent valuation method (and qualifications concerning it) for rural household water supply has been succinctly presented by Briscoe et al. (1990, pp. 118-121), and involves a hypothetical bidding game. We solicited answers from individuals to the following question. If they are confronting problems, what would the WTP be for regular and reliable water supply? The responses to this question are tabulated below in Table 1.

Table 1. Mean actual tariff and rates WTP by district

District	Attock		Chakwal		Jhelum		Murree		Pindi	
Rate	F	M	F	M	F	M	F	M	F	M
Actual rate	21 4 (11 3)		19 7 (11 4)		25.7 (2.0)		3.6 (7 5)		10.3 (15.5)	
Rate WTP for steady supply	24.8 (17 5)	21 4 (11.3)	30.2 (46.8)	24 1 (9 1)	23.0 (10 9)	25.31 (13.8)	18 3 (19.0)	16.5 (13.9)	24 1 (12.0)	29.8 (8 8)
n	102	29	118	96	74	65	105	87	127	91

Source. Male household data set
Note: Parentheses contain standard deviations
M = Male, F = Female, n = sub-sample size for the WTP question.

The table confirms the generally held position that villagers are willing to pay for services. In Murree, where WSSs confront the most problems, villagers are willing to pay about four times (men) to five times (women) more than they are actually paying for reliable water supply. The higher rate women are willing to pay may reflect the arduous conditions women have to face in difficult hilly terrain to procure water when it is not readily available. In Rawalpindi, men indicated a WTP of about three times what they are actually paying, and women over twice the actual rate. Similarly, in Chakwal, women and men are willing to pay about Rs 10 and Rs 5 more than they are actually paying for reliable water supply. The actual rates in the other districts, Attock and Jhelum, are higher and the responses suggest they are close to the maximum villagers are willing to pay. Table 2 below reports the results of a regression analysis which included land ownership and owning a TV as a proxy for household income and wealth.

Table 2: Willingness to pay for reliable water supply (OLS Regressions)

District	Chakwal		Jhelum		Rawalpindi		Murree
Variable	F	M	F	M	F	M	M
Constant	20 86* (7.92)	27.26* (10 77)	26 44* (8 64)	26.20* 6 88	33 62* (7 90)	22 79* (5 57)	28 24* (4 99)
Age	0.005 (0 09)	-0 08 (2.14)	-0 10*** (1 88)	-0 05 (0.80)	-0.18** (2 19)	-0.05 (0 81)	-0.22** (2 26)
Education	-0.15 (0.82)	-0 12 (0 79)	0.67 0 25	0 16 (0.67)	0.43*** (1 71)	0 13 (0.49)	0 25 (0 67)
Landholding	0 006 (1.13)	-0 003 (1.42)	0 008 (0.52)	-0 003 (0.33)	0.005 (0.47)	-0 003 (0 41)	0 039 (1.20)
Own TV	2.99** (2.32)	2 70* (2 36)	5.33* (2 82)	2.30 (1 19)	2 00 (0.88)	3 55*** (1 69)	-1 41 (0.50)
Satisfied with management	2 63*** (1 79)		-0 08 (0.04)		-2 39 (1 09)		
Included in management		3 88* (3 46)		-4 45* (2.50)		7.00* (3.48)	-5 58** (-2.26)
R bar Sq	03	07	0.08	.07	0.07	0 09	0 12
F-Stat	2 05***	5.22**	2 00**	2 83**	2 66**	3 98*	3 97*
n	212	283	90	112	119	157	109

Notes Equations with insignificant F-Statistic, including Attock's, not reported

** Significant at least at the 1 per cent level*

*** Significant at least at the 5 per cent level*

**** Significant at least at the 10 per cent level*

While land was not found to be a successful predictor of WTP, owning a TV was a successful predictor in four out of seven cases. Those who own a TV are willing to pay Rs 3 to Rs 5.5 more than those who do not. Unlike Altaf et al., we did not find education to be a significant determinant of WTP. We found age to be negatively and significantly associated with WTP in three out of seven cases, although the magnitude of the coefficient was very small.

The variable of major interest for us was "included in scheme management".[33] Our prior was that participation would lead to a higher WTP. In Rawalpindi and Chakwal this is indeed the case, and those who feel included in scheme management are willing to pay Rs 4 and Rs 7 more than those who do not. At first it appears that the negative coefficients for Jhelum and Murree contradict the positive coefficients for Chakwal and Rawalpindi. However, since we discovered from field observation that there was virtually no management system in place in Murree and Jhelum, the significant negative association of WTP and "being involved in scheme participation" in these districts could have an alternative interpretation.[34] Perhaps those involved felt they were already making some non-monetary contribution while those not involved were willing to make up the difference monetarily. The one significant coefficient for Chakwal in the women equations indicates a higher WTP (Rs 2.5) among those satisfied with scheme management.

[33] Since only 3 out of 653 women respondents felt "included in management," we used the variable "satisfied with management" for them.

[34] One of the five Jhelum schemes had a WCOM, and this too was being run by the Union Council.

Appendix VII

Case studies

The field reports of three sustainable schemes have been synthesised and are presented below as case studies.

Case study #1 (Upper Masoot / Murree)

We picked this scheme because it was the only scheme in Murree identified as sustainable by the field team.

Source The source is the mainline of one of the pipes supplying Murree city which the PHED allowed the community to tap. Water is abundant and supply is continuous.

Background characteristics:

Education: Male/female literacy rates of approximately 50 per cent and 25 per cent respectively.
Standard of living: High
Physical infrastructure: Good
Economy: Based on jobs in cities and abroad, local business and terrace farming.

Management Water committee

Indicators of sustainability There is an active and efficient water committee that consists of ten members. Dues are systematically collected for repair and maintenance (Rs 20 per month), and accounts are well kept. The committee has hired an operator and valve man, and the latter regulates the supply of water and makes it available at pre-announced times. Maintenance is good, and no leaks are evident in the tank, mainline or distribution network. For major repairs, the community makes a contribution on a need basis. The tank is covered and bleaching powder is used regularly to disinfect the water supply. There is no default showing a high level of community cooperation. This is consistent with the beneficiaries indicating a high level of satisfaction with the scheme.

Causes of sustainability Alternative water supply is very inaccessible. This scarcity distinguishes this community from others in Murree. Another important difference is that this is a well identified community to which the scheme has been assigned. The notables work well with the rest of the community and solicited funding from legislators to build a bigger storage tank. The presence of two CBOs also shows the proclivity of the community towards collective action. In fact, they prefer to manage this scheme on their own, rather than have the PHED do it, to avoid delays and arbitrary payment solicitations.

Case study #2 (Bal Kassar, Chakwal)

This scheme was selected to show how equal clan representation on a committee can create clan harmony, and to show examples of innovative collective action.

Source Pump/well

Background characteristics:

Education: Male/female literacy rates of approximately 60 per cent and 30 per cent respectively.
Standard of living: High
Physical infrastructure: Good
Economy: Agriculture and non-farm jobs, particularly in the army.

Management: Water committee

Indicators of sustainability There is an active and efficient water committee that consists of equal members (two) of all clans appointed by consensus. Dues are systematically collected for repair and maintenance (Rs 20 per month) with the committee members ensuring collections from their own clans. There is a regular annual audit conducted which has to be verified by all members, suggesting a concern for transparency. Seven stand-posts are provided for those without yard connections free of charge, and the mosque and school are also supplied water free of charge. A higher charge is imposed for commercial use such as construction. A fixed fee of Rs 100 is charged for new connections. Default is rare. Payment is quarterly and there is a Rs 15 fine for anyone not paying within the first 45 days. The committee has hired three employees at Rs 2,000 per month to operate the scheme. There is a standby motor and a transformer for emergencies and beyond this, there are ample reserves. The committee recently invested in a generator to deal with load-shedding, and put Rs 100,000 in fixed deposit. Beneficiary satisfaction is high, particularly since the last management was by the Union Council, which was perceived as being inefficient and corrupt.

Causes of sustainability Alternative underground water supply has a bitter taste. The activist (the *imam* of the mosque) is well-liked and trusted. All clans are given equal representation and are working together. There is ample evidence of collective action. In 1991, with funds turned over to them from the PHED and a grant they procured, a larger underground storage tank was built on a self-help basis and a closer source was added to the scheme. In 1992, they signed a contract with Daewoo Corporation (working on the motor-way project) to supply the company's water needs in exchange for the latter providing half the operating costs. Daewoo also has the water laboratory tested on a regular basis (every three months).

Case study #3 (Tanda, Attock)

This scheme was selected to show how the mosque as a social institution is used to make the management of a WSS participatory and transparent.

Source: Tube well

Background characteristics:

Education: Male/female literacy rates of approximately 10 per cent and 2 per cent respectively.
Standard of living: Poor
Physical infrastructure: Good
Economy: Agriculture and non-farm jobs.

Management: Water committee

Indicators of sustainability There is an active five-member water committee composed of village notables (including an ex-PHED plumber). The committee, particularly the head of the committee, is very well-respected, and school teachers have volunteered their services to help manage and operate the scheme. Dues are systematically collected for repair and maintenance (Rs 30 per month), and there is no default. The teachers send the bills home with the children. Repair, maintenance and greasing are regular and all the necessary tools are kept at hand. A special collection is made for major repairs. The mainline and distribution network is underground, and there is no evidence of leakage. The accounts register is well maintained. New connections are provided, but individuals have to bear the cost of the pipes. The inherited equipment is in good condition, and the scheme was originally funded by UNICEF. Beneficiary satisfaction is very high.

Some problems Households at higher elevations are deprived of water from the scheme. The community felt that the PHED should cover major repairs.

Causes of sustainability The community is ethnically and religiously very homogeneous, and all members attend the same mosque. The influential members of the community are on the committee, and the head of the committee is in particular well regarded. All major issues are discussed after the Friday prayers, when individuals are encouraged to participate and raise questions. The tradition of collective action seems well established, and the surplus reserves are used for other projects with the approval of the community members.

Case study #4 (pre-test scheme, Karore, Murree)

This scheme was selected to illustrate the use of a differentiated tariff structure and sophisticated management practices.

Source: Spring

Background characteristics:

Education: Excellent
Standard of living: Good
Physical infrastructure: Very good
Economy: Agriculture and non-farm jobs.

Management: Water committee

Indicators of sustainability

1 Well functioning committee and scheme management

- *a* A committee with 17 members nominated by a set of households whom the members represent on the committee.
- *b* Members are responsible for billings and collections from their designated households and turn the money over to the secretary who deposits the money in a joint bank account.
- *c* Surplus over operating cost maintained for emergencies.
- *d* Regular meetings, with allowance for emergency meetings, of which minutes are maintained.
- *e* Very sophisticated rate structure which varies as follows:
  - *i* poor household (free)
  - *ii* regular household Rs 20
  - *iii* special charge for marriage Rs 100
  - *iv* funeral (free)
  - *v* small establishment Rs 30
  - *vi* poultry farm (single story) Rs 100
  - *vii* poultry farm (double story) Rs 200
- *f* No new house collections allowed and households have been threatened with legal action.
- *g* Appointment of a Board of eminent citizens to arbitrate disputes in case they arise. The Board has not yet been used.
- *h* More water time is given to those at the end of the line since the water pressure is lower.

2 Excellent maintenance

Four employees, two plumbers/linemen and two assistants/interns have been employed to monitor 10 kilometers of mainline, tank and the distribution system. Only one plumber at a time can take leave.

3 Initiatives

- *a* Had an additional tank built for storage which was leaky. They are having the matter looked into.
- *b* Connected an overflow pipe to the distribution main (good quality work) so that in the rainy season water is available for 24 hours.
- *c* Are exploring the possibility of water supply from an alternative source to increase availability. Laid the pipes with their own funds, and are trying to get pumps installed by the government activated.
- *d* Asked for the hand over to the community because they were confident they could do a better job on their own. The PHED staff were trying to maintain the scheme from far away with a paucity of

staff. They also felt that the plumbers would be more accountable if they were paid by the community, and that they would no longer be billed even if they did not receive water.

e Handled a major repair with a collection.

Causes of sustainability

1 The efforts of an *activist* who is the scion of a wealthy retired major. He is the president of the committee and puts in a great deal of time and effort to ensure that the scheme functions well. Aspiration for political office may be a motivation.

2 Need. Water is perceived as the highest need and galvanises individuals.

3 Education. Area has two high schools of which the community members are very proud. The general level of education is high.

4 All perceive themselves to be of one *biradri* (Dhanyal). Newcomers who adopt the ways of the community are viewed as belonging to the *biradri*. This homogeneity seems to help.

Appendix VIII

Deriving conditions for collective action in water supply

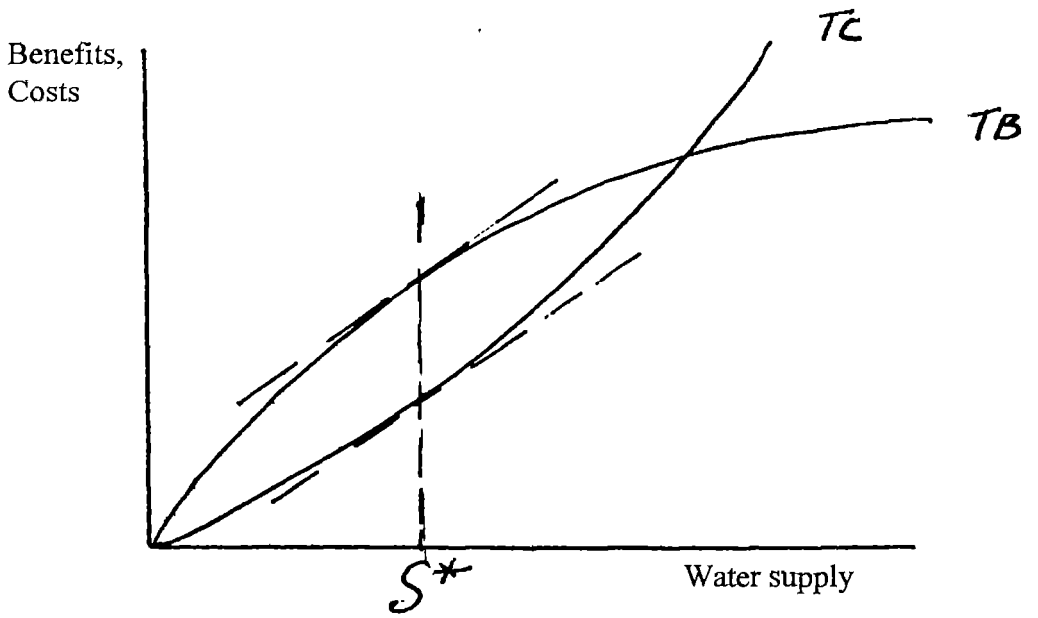
We start with a community welfare function which depends on benefits, variable costs and fixed costs. Benefits and variable costs are assumed to vary with collectively supplied water.

$$W=B(A)-C(A)-FC \text{-----} (1)$$

We assume that the PHED bore the fixed costs of the activity as was indeed the case. If the community acted as one individual, the first order condition for welfare maximisation would be

$$\frac{dB}{dA}=\frac{dVC}{dA} \text{-----} (2)$$

Assuming that the second order condition is satisfied, this could be graphed as follows:



The curve marked TB (total benefits) shows benefits increasing at a decreasing rate. This is due to diminishing marginal utility from additional water supply as less and less pressing needs are satisfied. The curve marked TC (total costs) shows costs first declining (possible scale economies) and then increasing. TC increase at an increasing rate as the community members on higher elevations are incorporated into the scheme. S^* represents the optimum amount of water supply the community opts for, where the marginal

benefits and marginal costs of collective activity are equalised.[35] S^* may exclude, as we observed in practice, supply to households at higher elevations due to the cost of pumping or for technical reasons on hilly terrain.

The question is: *Under what condition(s) would individual action on the part of community members result in the attainment of S^* or the optimum amount of community activity in supplying water?* By allowing both individual benefits and costs to vary, we derive the disaggregated condition for an optimum as follows:[36]

$$\sum_{i=1}^{n} b_i \frac{dB}{dA} = \sum_{i=1}^{n} c_i \frac{dVC}{dA} \quad \text{-----(3)}$$

So the answer to our question is reduced to finding the condition(s) under which (1) and (3) are the same. In equation (3), b_i and c_i represent individual weights or shares of the total benefits and costs. For (3) to equal (1) the following two conditions need to be satisfied:

1 b_i and c_i would have to be constant (the same for all members of the community);

2 b_i and c_i would need to be equal to each other. If these conditions hold, one can rewrite equation 3 as follows:

$$nb \frac{dB}{dA} = nc \frac{dVC}{dA} \quad \text{-----(4)}$$

Thus if conditions 1 and 2 are satisfied, equation (1) is equivalent to equation (3).

[35] This result is not sensitive to having a linear cost curve, or allowing group entry

[36] Note that this is where our analysis differs from Olson since we are not dealing with total project costs.

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