USER CHARGES FOR RURAL WATER SUPPLY IN THE PUNJAB

Contents

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A. BACKGROUND AND CONTEXT

1. THE DEMOGRAPHY OF RURAL PUNJAB

1.1 Fifty seven percent of Pakistan population lives in the Punjab in 1988 the rural population of province was estimated to be 39.4 million. The rural growth rate in the 5 year plan documents is shown as 1. 92 percent for the 1988 to 1993 period and further reduced to 1.42 percent in the 1993 to 1998 period. The overall population growth rate for the province averages 3.1 percent for the 1988 to 1993 period and the lower rural growth rate is the result of urbanization. 64 percent of the rural population lives in villages of more than 2000 people and only 14 percent in villages of less than 1000 people. These figures have a direct bearing on the development of not only, the technical aspects of rural water supply systems but also on the type of institutional arrangements required for delivery and revenue collection systems. These are discussed in Section B.

1.2 At present 64 percent of the rural population has access to improved water supply; 52 percent through the installation of hand pumps by the private sector in the sweet water zone, and 12 percent through the Public Health Engineering Department (PHED) schemes (see Table 1). Repairs and extensions to the existing PHED schemes would raise the latter figure to 15.4 percent. (In about 50 percent of the sweet water zone subsoil water is contaminated and as such current coverage in the sweet water zone should be taken as 26 percent and the total Punjab coverage at 38 percent which it is not).

1.3 Coverage is also not uniform throughout the Punjab. In four districts (Mianwali, Bhakkar, Gujranwala and Khanewal) coverage exceeds 90 percent, whereas in five other districts it is less than 30 percent (Rawalpindi, Bahawalpur, Bahawalnagar, Rahim Yar Khan and Rajanpur). Again, coverage varies according to village size. 70 percent of the large villages are already covered, whereas only 54 percent of the medium and smaller size villages have access to improved water supplies (see Table 2). Thus a total of 14.4 million persons in rural Punjab remain uncovered, 46.3 percent of this uncovered population lives in large villages, 32 percent in medium villages, and 21.7 lives in small village, although the small villages account for 34.6 percent of all un served villages (see Table 3).

1.4 Although rural water supply coverage is estimated at 64 percent, the drainage coverage is estimated at only 10 percent. This small coverage is responsible for the rapidly deteriorating environmental conditions in the rural areas of the Punjab and the increasing pollution of sweet water bodies. Rural water supply programmes have to be accompanied by effective drainage components (which they have not so far) if massive environmental degradation is

to be avoided.

1.5 The above statistics shows that given the increasing population, contamination of 50 percent of subsoil water sources in the sweet water zone ,a very low coverage in the smaller settlements and almost no cover for drainage. Punjab will require massive investments in the rural water supply sector if the situation is to be rectified. A look at the resource base and annual Development Programme (ADP) allocations will show us that these investments are not forth coming from their traditional sources.

2. RESOURCE AVAILBILITY

2. 1 At the macro level the resource position of the public sector has fallen substantially. Provincial deficits have increased considerably requiring grants-in-aid from the federal government. Thus, the ADP in the public sector has become dependent upon the flow of external resources .At the national level (ADP expenditure has fallen by more than 2 percent in real terms and the provincial development expenditure by 23 percent. In addition, there is continued pressure on public finances for debt servicing liabilities and the need for physical infrastructure has caused larger allocations to be made to the power, transport and communications, sector at the expense of the social sector (which include rural water supply). The Last 3 national budgets have also included an economy drive in current expenditures by government departments. This indicates that the ability of provincial line departments (including the ones that deliver rural water supply systems) to expand employment to undertake an increased number of schemes, will diminish substantially.

2.2 The above mentioned financial pressures have had a major effect on allocations made to the Punjab PHED arid Local government and Rural Development Department (the two departments that deal with water supply. Expenditure of rural water supply fell from Ps 1125.9 million in (1988-89) to Rs 940 million 1989-90. In real terms the PHED suffered a cut of about 18 percent and the LGRDD of 4.5 percent. The Punjab Strategic investment plan states that the resource position will not alter dramatically in the next few years and many even worsen. It states ‘‘It seems prudent to project real domestic sector availability at being more or less, constant at Rs 940 million (the 1989-90 allocation) into the foreseeable future at July 1989 prices’’ (see Tables 4,5 and 6) 0 and M costs

2.3 In addition, the allocation for operation and maintenance (0 and M) is increasing rapidly and has more than doubled in the Last 3 years. This is because of a failure to transfer 0 and M to the local government, and/or where

such a transfer takes place, user charges to keep the scheme operative cannot be collected and/or effectively used for a variety of reasons discussed in Section B .This trend is diverting an increasing amount of funds from development to non development expenditure, not only because 300 new water schemes are added every year to rural Punjab but also because of increasing 0 and M costs such as overheads, electricity charges, etc.(see table 7 and Chart 1).

THE NECESSITY FOR USER CHARGES

3. 1 Given Punjab's demographic growth, present rural water supply coverage, constraints in resource availability increasing O and M costs and community demands for service, alternative sources of finance ,not only for 0 and M but also for development ,are required. This requirement can be met through cost recovery, escalation in the level of user charges and improvements in revenue collection mechanisms.

ANALYSIS OF THE CURRENT SITUATION IN THE SECTOR IN THE PUNJAB

4. GOVERNMENT POLICY RELATED TO DEVELOPMENT, SERVICE LEVELS AND O AND M FOR RURAL WATER SUPPLY AND ITS PER CAPITA COSTS

4.1 Government policy divides Punjab into 3 districts zones. These are one: the sweet zones (areas that have sweet subsoil aquifers).Two: the brackish water zone (where subsoil aquifers are brackish but irrigation canal water is available .Three: the arid zone (where subsoil water is not easily and economically reached and there is no canal water).

4.2 The current policy regarding service levels and O and M is as follows:

a) In sweet water areas public supplies are no longer built. The private sector now caters to the needs of the population through hand pumps and electric motors on wells.

b) In brackish areas with canals irrigation and arid areas water supply systems are developed by filtering canal water and sinking tube wells where canal water is not available .For villages with a population of below 5000 stand pipes are provided , whereas for larger villages house connections are given.

c) After the PHED (the major developer of rural water supply schemes in the Punjab has developed a scheme. It operates it for 2 years. ‘After this

“demonstration period” the scheme is handed over to the local council for 0 and M for which the council is supposed to raise revenues from the community.

d) In almost all cases the government bears the full capital costs of public water supply systems.

Development and construction cost

4.3 The 1990 per capita costs of development for rural water schemes in the Punjab through house connections were:
a) Sweet water zone: tube well supply: Rs 450
b) Brackish water zone: filtered canal water: Rs 600
c) Arid zone: Rs 1200-1800

Stand pipe systems, as opposed to house connections, cost 10 to 20 percent less.
Costs to a household for a domestic connection in 1990 were, about Rs 580 (Rs 80 as fee for the PHED and Rs 500 for labor and materials for making the connection from the distribution line).

User charges and actual 0 and M costs

4.4 Users are supposed to pay Rs 5 per family per month for stand pipe systems. However, these payments are never collected as users wish to have house connections, are generally dissatisfied with the level of service and no serious attempt (for these reasons) is made to collect revenue.

4.5 For house connections there is a flat rate of Rs 10 to 25 per connection. There is no data regarding the rate of recovery but PHED believes that 60 percent of those connected do pay. Those who do not pay are served notices for disconnection but such disconnection seldom takes place.

4.6 The cost to PHED for 0 and M of piped water schemes it between Rs 20 to 30 per month per household (6.5 persons).

5. THE ACTORS IN THE RURAL WATER SUPPLY DRAMA: THEIR CONSTRAINTS AND POTENTIALS

5.1 The federal government is the critical policy making level of government for rural water supply as almost all funds for the sector are provided by it. Policies at the federal level are made by the Planning and Development Division (Physical Planning and Housing Section) of the Ministry of Planning and Development and are implemented by the provincial government.

5.2 At the provincial level a critical role is played by the Planning and Development Board (Punjab) which prepares the ADP of the province and the projects that fall with the ADP is also responsible for approval of these projects and their monitoring and implementation. Implementation of the projects is carried out by the PHED and LGRDD The later oversees municipal governments and executes the rural development programme in which small water supply schemes are sometimes included. These 2 departments are of special significance to the sector and the role they play needs to be looked in greater detail for a better understanding of the question of user charges.

5.3 The PHED

The PHED is part of the Physical Planning and Housing Department and is administratively placed under the secretary of Housing, Physical and Environmental Planning. It was created to provide water supply, sewerage and drainage to the Punjab urban areas. However, with the development of urban development authorities in the larger towns, 90 percent of PHED's current development funds are utilized in the rural areas. Initially it was merely seen as a planning and implementation agency but recently it has also taken over 0 and M functions as there are major difficulties in transferring completed schemes to local councils for 0 and M. In spite of a shift from urban to rural areas and from being a planning and implementation agency to a one that is responsible for 0 and M as well, the PHED structure remains as it was initially envisaged.

5.4 The PHED has highly developed engineering capabilities (for its structure see Chart 2) and has 2 directorates, one for planning and the other for administration and work .The chief engineers of both the directorates are placed in Lahore. The PHED handles over 15 percent of the total Punjab ADP which is its principal source of funds. In 1988-89, its funding for rural schemes increased to Rs 1125 million.

5.5 At present elected representatives at the local or provincial level initiate water schemes and forward them to the P and D for approval. Potential schemes are

sent to the PHED for feasibility engineering. The feasibility, along with cost estimates is then (depending on its cost) sent to the superintending Engineer, Chief Engineer or Secretary for approval. Once approved, detail design takes place, tenders are called and approved, and construction can begin.

5.6 By June 1988 PHED had completed 1043 rural water schemes .The PHED operates these schemes for 2 years and then it is supposed to hand them over to the local councils for O and M. Of the 1043 schemes completed by 1988, 760 were older than 2 years. However, only 350(45 percent) had been handed over (see Chart 3). In addition, only 83 percent of schemes older than 2 years were functioning of which most were schemes with house connections (see Table 8)

5.7 PHED constraints

From what has been described above the major constraints that PHED faces in developing appropriate water supply systems and their 0 and M are:

a) The PHED is located in the Ministry of Housing, Physical and Environmental. Planning and is more oriented to serve urban areas.

b) In the procedures adopted for identifying, planning and building rural water supply systems local communities play no role. In addition, the PHED does not have the proper inter-relationship with LGRDD that is required to compliment its mandate on rural development. Both these factors make subsequent 0 and M by local communities problematic.

c) The decision to initiate a water scheme is more often than not taken by a politician and not by the villagers wanting a water supply system and working and/or sacrificing to achieve it.

d) The time between the identification of a scheme, its detail design and commencement of construction is too small as it has to feed into ADP .This leads to most design work being done by rule of thumb.

e) There is no rural water supply master plan which the PHED follows and in its absence political pressures lead to many ad-hoc and uneconomical decisions.

f) There is no coordination of the sector with the health and education departments, both of which can play crucial role in the sector.

(g) PHED is not structured to function as an 0 and M organization. Although it does train staff for O and M purposes with the intention of handing them over to the community, the community when it takes over the scheme often sacks the staff so as to save on O AND M. Alternatively, the staff leaves as it prefers a more stable and formal job than the communities are capable or willing to offer.

5.8 LGRDD

LGRDD functions through its local government wing as the personnel department of local government bodies by providing them with staff and for supervising and coordinating the functions of local government (for LGRDD structure, see chart 4 and 5)

5.9 The mandate of the LGRDD is to carry out rural development, eradicate poverty and provide the basic necessities to the rural settlements. To this end it executes the Rural Works Programne (which is part of the ADP) and Special Development Projects and organizes Adult Education Programmes and monitors and supervises development schemes initiated by local government bodies and provides technical support to these schemes. It is also responsible for constructing primary schools, and basic health units for the Education and Health departments of the provincial government, and small buildings, such as training centre, for the programme of the Women Division.

5.10 The structure of the LGRDD is spread throughout the province down to the union council level. A director and engineer is present at all, the 8 divisional headquarters; an assistant director and assistant engineer at the 29 district headquarters; project managers and sub-engineers at the 359 markaz and a rural development worker (who acts as secretary to the union council) at all the 2392 union councils in the province.

5.11. Unlike the PHED, the LGRDD works with and through the communities. It operates a Matching Grant Scheme where small schemes are developed in which the government provides a matching grant of 50 percent against what a community can raise on its own (see Table 9). In addition, it also operates Small Village Level Schemes under which the union councils are planning and executing agencies. In these schemes the community pays 30 percent of the cost through cash, labor, material or land (see Table 10). Small water supply schemes have been constructed under these schemes. The LGRDD also carries out projects in which the communities do not contribute.

5.12 The LGRDD has a training institute at Lalamusa which has been operative since 1953 and has served successive rural development programs since then. So far it has trained 58,000 persons from government departments, community workers, councilors and staff of voluntary organization in technical, supervisory, managerial and extension work and other aspects of local government and rural development (see Table 11).

5.13 The ADP allocation for LGRDD was Rs 35 million for the year 1988-89 against a PHED allocation of Rs 1125 million for the same year. Of this 62 percent lapsed. In 1987-88 when the ADP allocation was Rs 190 million, communities contributed Rs 84 million through the Matching Grant Schemes and Small Village Level Schemes. The total rural development funds allocated to the LGRDD for 1989-90 were Rs 205 million, while its establishment expenditure for its 8173 member staff was Rs 182 million.

5.14 LGRDD constraints

LGRDD works with the communities. However, it is not involved in any way with the PHED schemes. One such involvement could be to ensure community participation to PHED schemes. In addition, there is no institutional arrangement within which LGRDD could assist communities with regard to water tariff collection, technical support and management of 0 and M and nor does it have the staff to do so.

5.15 The yearly lapsing of major allocations made to the LGRDD and the relationship between its development and administrative budgets show that technically it is a weak organization. One of the reasons for this is that its engineering staff is faced with providing multi-disciplinary services and as such do not possess specific skills. There are no post appointment training opportunities and the LGRDD academy does not have a technical capacity.

5.16 District councils

The district councils are the elected representative government at the district level. Each district councilor represents about 25,000 persons. Their mandate empowered them to provide, maintain, improve and manage water supply systems. In addition, the district councils are authorized to carry out development schemes of up to Rs 1,500,000. The engineering capability and capacity of the district councils is generally poor.

5.17 District councils raise their own revenue through various taxes and user charges. In addition, they receive grant—in- aid from the provincial government and the provincial ADP in their control (for District Council Revenues see Table 12).

5.18 Union councils

The union councils are the lower unit of local government comprising a village or a group of villages. Number of councilors in a union council cannot exceed 15 and represent 1,000 to 1,500 voting members (about 16,200 persons). Their mandate also empowers them to provide, maintain, improve and manage rural water supply systems. Their engineering and managerial capacity is very poor and in many remote councils, it is non-existent.

5.19 Union councils raise funds through local taxes (such as toll tax, birth, marriages etc.) and user charges (the later they seldom manage to collect). Their average yearly expenditure is Rs 58,000 which works out to Rs 3 per capita. A significant portion of their expenditure is financed through grant-in-aid from LGRDD (for Union Council Revenues see Table 13).

6. CONCLUSIONS

6.1 A number of conclusions can be drawn from the above description of the rural water supply sector in the Punjab which point to constraints in imposition/ effective collection of user charges. Some of the important conclusions are listed below.

a) The government policy is supply driven and not demand driven.

b) The policy has been developed entirely on technical and administrative grounds.

c) The user does not in any way bear the cost of development which is a disincentive to pay 0 and M charges.

d) Existing user tariffs are unrealistic as they are well below 0 and M costs.

e) Tariffs are not collected as there as there are no effective institutional arrangements for doing so.

f) The selection process for water supply schemes is entirely political in nature and is not related to a master plan or demand from the communities. This makes communities feel that it is the duty of government to provide service to them free of charge.

g) The PHED which develops the vast majority of water schemes is an engineering organization which does not have any links with the users and is in no way accountable to them or to the local councils who are supposed to takeover O and M functions.

h) The LGRDD, which has links with the communities, has small financial allocations limited technical and managerial expertise and capacity and no institutional links with the PHED.

i) There is an absence of skills with the Local councils (and of political will) for the collection of user charges and for 0 and M and an absence of an effective motivation and training programme to develop these skills.

j) There is no community involvement in identification planning and implementation of the schemes and no motivation programmes to develop it or space in the current procedures to accommodate it. In addition, there is no trained manpower even with the LGRDD to launch a motivation and organization programme related to the sector.

k) Communities are not willing to pay for community stand posts and wish to have house connections whereas PHED promotes stand pipes for- smaller villages so as to affect economy and hence increase coverage.

I) District and union councils at present do not have the financial, technical or managerial capacity to contribute effectively to sector needs.

m) Given the low level of service and poor performance of existing schemes it is unlikely that communities can trust government agencies.

6.2 There are also a number of strengths in the sector which can be built upon. These are listed below:

a) The PHED is an efficient engineering organization even if it is currently highly centralised and has no dealings with the community.

b) The LGRDD is organized right down to the union council level, has a training institute and is mandated to work through local communities.

c) Local communities are willing to contribute to development costs as has been demonstrated by the Matching Grant arid Small Village Level Schemes of the LGRDD, and to pay user charges as has been demonstrated by many of the house connection schemes.

C. FINDINGS OF WILLINGNESS TO PAY (WTP) SURVEYS FOR RURAL WATER SUPPLY FOR THE PUNJAB

7. WTP SURVEYS

Two comprehensive WTP surveys for rural water supply have been made in the last 4 years for the Punjab. Both were made in 1989. One was made by Wardrop Acres, Co-water international and NESPAK as part of the Strategic Investment Plan and Project Preparation for Rural water supply, Sanitation and Health; and the other by Mir Anjum Altaf and Haroon Jamal of the Applied Economic Research Centre (AERC) , University of Karachi, for the Infrastructure and Urban Development Department of the World Bank. The later survey is for more comprehensive and seeks to understand behavior pattern, tests out various hypothetical options, and seeks to understand economic viability of investment in rural water supplies. The findings of former survey are identical with those of the AERC survey. As such this report mainly draws upon the findings of the AERC survey.

8. FINDINGS IN THE SWEET WATER ZONE

8.1 Actual choice behavior

a) Choice behavior in villages without piped water.

- Traditional water supply sources such as village wells have been bricked over except in certain mosques.
- 100 percent houses have developed an improved water supply source in the form of a hand pump.
- 100 percent households had hand pumps.
- - 30 percent of households have installed electric motor on their hand pumps. This installation is being followed by the construction of overhead water (OHWT) and by indoor plumbing for the operation of a flush toilet and a shower.

b) Choice behavior in villages with piped water (this is rare as according to PHED policy no piped water schemes are to be built in the sweet water zone).

- 100 percent households had hand pumps.

- Traditional water supply sources have been bricked over except in certain mosques.
- 55 percent of households connected to the piped water scheme.
- 11 percent of the households in the village have electric motors.
- 7 percent of households who had domestic connections also had electric motor.

c) Reasons for the choice.

- The more affluent households install electric motors essentially to be able to operate a flush toilet and shower which is difficult, If not impossible, through hand pumps.
- Surveys show that houses that need more water to connect to the piped system.
- Households engaged in farming are less likely to connect to piped water systems.
- Wealth is not a determinant of the decision to connect to a piped scheme. This is perhaps because of its low installation and 0 and M cost.
- The theory that where manual labor (women and children) are available in the household for operating a pump, there is less likelihood of a household connection, is not true.
- Houses that are at the extremities of the system are less likely to connect as water pressure at the extremities (due to bad design or over extension) is very low and water supply erratic.
- Where distances from the distribution line to the house are long, there is a less likelihood of a connection. This is because the household has to pay the cost of such a connection and beyond a certain point the cost becomes comparable to that of an electric motor.
- Households that have electric motors are not less likely to connect to piped systems.

8.2 Costs of various options (1989 figures)

	Installation/ connections (in Rs 500)	O and M (in Rupees)
Piped system		
Hand pump	Electric motor	10
Electric motor Electric motor	600 — 1000 3500	5 — 8 22 — 30 (electricity)
OHWT	400—600	
Indoor plumbing (minimum)	400—600	

8.3 Analysis of WTP bids

a) 40 percent of connected households expressed dissatisfaction with the system with respect to reliability, insufficient pressure, and services of less than the specified period of supply.

b) 30 percent of households who had connected earlier to a piped water scheme that is no longer operable said they would not connect again whereas 16.7 percent of those who had not connected said they would still not connect.

c) 74 percent of houses in villages where a water scheme was scheduled to be installed said that they would connect as opposed to 75 percent in villages where no scheme was scheduled.

d) Mean bid of households likely to connect in the former villages was Rs 20 with only 4 out of 57 valid responses bidding over Rs 25.Mean bid of households likely to connect to the later villages was Rs 24 with 19 percent of the respondent bidding Rs 50 or more.

e) Households with electric motors are willing to pay Rs 7 more than the other for connections.

f) More affordable financial arrangements than the existing do not result in increasing the connection ratio.

g) Households in villages with water schemes were offered improved water systems (4 hours additional supply per day). Their responses were:

- No response: 10 percent.
- Houses willing to pay more than existing tariff: 50 percent.
- Mean bid: Rs14.
- Mean bid over houses likely to connect: Rs 19.5.
- Households who favour metered connections are willing to pay Rs 6 more than others and those with electric motors Rs 6 more than others.

h) Animals, in all the households that had them, used piped water for drinking and washing. The water consumed by this activity is not taken into consideration by the PHED when calculating water needs. This may be a reason for poor performance of the scheme and low pressure at the extremities.

9. FINDINGS IN THE BRACKISH WATER ZONE

9.1. Situation in the brackish water zone

There is no shortage of water in the brackish water zone but it has to be acquired from canals as the subsoil water is brackish due to salinity and water-logging. 54 percent households rely on sources other than their private hand pumps for drinking and cooking. Water from such sources is either fetched by household members or delivered for a charge by water carriers.

9.2 Actual behavior choice

a) 76 percent of all households connect to a piped water system.
b) 50 percent of all households in the area have motorized pumps as these can

lift water from greater depth where it is of comparatively better quality.
c) 33 (29 percent have water connections or wells) percent of households in villages with water supply schemes have electric motors as opposed to 62 percent in villages without water supply schemes.
d) Better educated and more affluent households connect to piped water systems.
e) Households located far from their homes and households with higher proportion of children are less likely to connect.
f) In villages without piped water 36 percent population relies on bass hand pumps. This falls to 21 percent in villages with water schemes.
g) People do not consider the existing piped water systems as dependable for indoor plumbing, showers and flush toilets and as such households continue to have electric motors.

9.3 Analysis of WTP bids

a) 66 percent of connected households expressed dissatisfaction with the system.

b) WTP for connection to a standard system:

- in a village where a scheme is scheduled;
  - willing to connect: 97 percent at above Rs 12 per month
  - mean bid : Rs 43
- in a village where no scheme is scheduled:
  - willing to connect: 90 percent at above Rs 12 per month
  - mean bid : Rs 40
- in village with existing water supply scheme;
  - connected : 75 percent
  - mean bid : Rs 16

c) Willingness to pay for an improved system (extra hours and more reliability) increases connections and tariffs.

- in a village where a scheme is scheduled
  - Willing to connect : 99 percent
  - Mean bid :Rs 58

- in a village where no scheme is scheduled
    - Willing to connect : 97 percent
    - Mean bid :Rs51
- in a village where a scheme exists
    - Willing to connect : 95 percent
    - Mean bid : Rs 33

d) Households who require more water and those who need to spend more time in fetching it from outside, bid higher.

e) Bids are related to household expenditure per capita. An increase of Rs 100 in the variable raises the bid by about Rs 2.

f) Households with animals are willing to pay about Rs 2 per animal per month more than others.

g) Houses not connected to a water supply system that exists in the village were offered a subsidy of 50 and 100 percent in connection costs and overheads. The result was:

- At 50 percent subsidy 47 percent were willing to connect and their mean bid was Rs 16,
- At 100 percent subsidy 63 percent were willing to connect and their mean bid was Rs21.

10. FINDINGS IN THE ARID ZONE

10.1 Situation in the arid zone

a) People in the arid zone rely on water from wells. Often these are far away from their homes and a lot of water related activity such as bathing, watering animals etc takes place at the well itself. Households spend up to 4.7 hours per day in water related activities as opposed to 4 hours per week in the brackish water zone. Most of this time is spent by women and children.

b) Water vendors are present in villages but only 5.7 percent use them as their cost to a household is Rs 100 to Rs 150 per month.

c) 24.4 percent of households have tried to develop a private source by digging a well. However, costs are high and at 20 to 25 yards depth water is insufficient and dries up in sunnier months.

10.2 Analysis of WYP bide

a) In villages without plane for installation of public water systems;
- 13 percent were not willing to connect to a stand post system. Those willing gave a Rs 35 per month mean bid.
- Stand post tariff is Rs 5 per month. However, 16 percent were not willing to pay at Rs 10 per month.
- The mean bid for a standard house connection was Rs 55.
- 2.5 percent of houses were not willing to connect to a house connection.

b) WTP for house connection in village where a scheme is scheduled;
- willing to connect : 78.6 percent
- mean bid : Rs 42

c) WTP for house connections in a village where a scheme exists
- connected : 95.7 percent
- mean bid : Rs 39

d) WTP for an improved water system (extra hours more reliability)
- in a village with an existing scheme;
  - willing to connect : 95 percent
  - mean bid :Rs 51
- in a village where a scheme is scheduled
  - willing to connect : 99.9 percent
  - mean bid :Rs59

II. ESTIMATED REVENUES AND COST RECOVERY POTENTIAL

(Paragraph 11. is an edited version of the text in the AERC Study on WTP)

11.1. In the sweet water zone

a) Provision of a standard piped water supply system in a village without any existing system but with experience of one:

- Connection frequencies:

The connection frequencies and revenue estimates are plotted in Chart 6. It can be seen that at the existing monthly tariff of Rs 10 the connection frequency would be 84 percent, if the service level was guaranteed. This is to be compared with the actual connection frequency of 69 percent (at Rs 10 per month) which prevailed when the piped water system was operational over five years ago. There are numerous indications that the system was poorly managed and it eventually fell into disuse. The impact of that history is demonstrated by the fact that even with a performance guarantee only 82.5 percent of the households which were previously connected indicated a willingness to restore their connections at the previous tariff rate of Rs 10 per month.

The plot of connection frequency against monthly tariff rates, lends credibility to the bids elicited through the willingness-to-pay method. Three reference makers could be used to interpret the plot. Below Rs 7.5 per month the connection frequency is very high (95 percent and above). This is as it should be since Rs 7.5 is the approximately monthly expenditure at the minimum acceptable service level, the manually operated private hand pump. At Rs 10 per month, the connection frequency is approximately 84 percent, which compares favorably with the actual frequency (69 percent) which prevailed at that rate. The increase in connection frequency is to be attributed to the fact that a performance guarantee was part of the package offered to respondents. Increased economic growth during the past five years could also be a contributing factor. At Rs 22.5 per month the connection frequency drops to 21 percent. This corresponds well with the response of the 26 percent households who have installed electric motors; monthly expenditure on electric motor-operated systems is around Rs 25 per month. At Rs 27.5 connection frequency becomes negligible at 7 percent, indicating the fact that the electric motor is the preferred option at this tariff rate.

- Monthly revenues:

The plot of revenue against monthly tariff (Chart 6) indicates that revenues would be maximized at a tariff rate of Rs 17.5 per month. Revenue yield would be Rs 1026 per 100 households of which 59 percent would be connected. At a tariff rate of Rs 12.5 per month the corresponding figures would be Rs 926 and 74 percent. (These figures are to be compared to the situation which existed when the piped system was operational, when the connection frequency was 69 percent, and the revenue Rs 690 per 100 households at a tariff rate of Rs 10 per month). Therefore, any tariff in the range of Rs 12.5 to Rs 17.5 per month should achieve the duel objectives of a reasonably high connection frequency and high cost recovery.

- Operation and maintenance costs:

The scheme was initiated during 1973-74 and completed in 1976. The system was designed for a population of 6800 at 15 gallons per capita per day and cost Rs 333,080 at approximately Rs 50 per capita. The annual operations and maintenance costs were computed to be Rs 10,516 as follows (annual 0 and M

costs work out to be 3.2 percent of capital costs, at the lower end of the 3 - 5 percent range used by the PHED):

i) Personnel (operator &. plumber valve man, watchman)	Rs 4.930	47 %
ii) Operations cost (electrical and mechanical)	Rs 2,717	26 %
iii) Annual repair	Rs 351	3%
iv) Contingencies (at 5 percent of ii + iii)	Rs 153	1 %
v) Depreciation	Rs 2,365	23%
	Rs10,516	100%

Using the figure for household size mentioned in the 1981 Census (6.7), the 0 and M cost (including depreciation) works out Rs 1 per household per month at the 100 percent connection rate assumed by the PHED. Even if a connection frequency of 50 percent is assumed, a tariff rate of Rs 2 per month would be sufficient to meet 0 and M costs. The tariff rate was set at Rs 6 per household per month in 1976.

Since 1976 costs have escalated rapidly. The capital cost per capita currently used for the design of tube well systems is Rs 300. Calculating 0 and M cost at the upper end rate of 5 percent of capital costs for a population of 10,000 would yield a figure of Rs 12.5 per household per month (the household size at present is 10), assuming universal coverage. If the connection frequency is 75 percent, the tariff rate that would ensure full recovery of 0 and M costs would rise to Rs 16.7 per household per month.

It should be kept in mind that the estimates obtained above are upper bounds. A look at the breakdown of 0 and M costs enumerated above shows that only 26 percent of the costs are due to the actual running of the system. The rest are fixed costs of which the largest proportion is due to personnel costs (47 percent). Therefore, with increasing population the 0 and M costs per household should decrease. If we compute annual 0 and M cost at the lower value of 3 percent of capital costs, the corresponding tariff rate for full recovery of 0 and M costs, at a 75 percent connection frequency, would be Rs 10 per household per month.

Rs 10 per household per month Is the existing tariff rate in the sweet water zone. In general, it seems that the tariff rates imposed by the PHED, which range from Rs 10 to Rs 25 per month in the Punjab, are calculated on the basis of recovery of 0 and M costs. In the light of the above, the tariff rates, connection frequencies and revenue estimates revealed by the WTP analysis for a village without an existing system but with experience of one, are quite close, if not within, the

range of economic sustainability.

b) Provision of a standard piped water system in villages without experience of such system:
Results from this type of village, where the bidding game could be considered hypothetical, are reasonably similar. Chart 7 shows the connection frequencies and estimated revenues at various possible tariff rates. The one significant difference in comparison to the village in (a), above, is the high connection frequencies (around 20 percent) at tariff rates beyond Rs 27.5 per month. This is due to the disproportionate amount of high bids indicated in this type of village as compared to the others.

Chart 7 shows that revenues would be maximized at a tariff of Rs 12.5 per household per month yielding a revenue of Rs 933 per 100 households of which 75 percent would be connected to the system. Again, this figure compares favorably with the tariff required for full recovery of 0 and M costs. Assuming a village population of 5,000,a household size of 9, Rs 300 per capita capital costs, 3 percent of capital costs as 0 and M costs per annum and a connection frequency of 75 percent, the tariff required for full recovery of 0 and M costs works out to be Rs 9 per household per month.

c) Provision of an improved system in villages with an existing piped water system:
Villages where a piped water supply was in operation, were offered the choice of an additional 4 hours of water supply per day from the existing system. Chart 8 shows the connection frequencies and revenues that would result at various tariff rates as revealed by the WTP bids.

The revenues would be maximized at a tariff of Rs 17.5 per month with a yield of Rs 693 per 100 households of which 40 percent would be connected. At a tariff of Rs 12.5 the corresponding figures would be Rs 599 and 48 percent (the existing revenue potential is Rs 550 per 100 households, the connection frequency being 55 percent at a tariff of Rs 10 per month).

It is noticeable that the connection frequencies, and therefore the revenue yields, are lower than at equivalent tariffs in the other type villages. This probably reflects the dissatisfaction with the performance of the existing system and the fact that an extra 4 hours of water from a poorly run system, suffering from low pressure in the pipes, is not very attractive to the respondents. This suggests that the emphasis ought to be on the delivery of the performance level promised to the customers.

d) Experiments with alternative financing options for household connections:

Table 14 presents the comparative connection frequencies and revenue estimates if either the standard option, or the flexible option alone, is offered to respondents in a village without an existing water scheme.

Suppose the PHED desires to recover the extra capital expenditure of Rs 500 per household incurred under the flexible financing option over a period of 5 years at an interest rate of 10 percent. The additional monthly payment would amount to Rs 10.5. Thus the effective tariff would be approximately Rs 21 per month.

The two options can now be compared at the existing tariff of Rs 10, 85 percent of the households would connect to the standard system yielding a monthly revenue of Rs 850 per 1,000 households. At a tariff of Rs 21 per month under the flexible option, 54 percent of the households would connect yielding a monthly revenue of Rs 1,134 per 100 households. Thus, the revenue yield would improve but the connection frequency would decline. The objective of the policy would not be served.

A variant of the policy would be to offer the flexible financing option only to the households who have not connected to the system at the existing tariff rates. The connection frequencies and revenue estimates resulting from such an offer to households in a village that has a scheme but to which they have not connected are shown in Table 15. At a tariff of Rs 21 per month, 24 percent of the households would connect to the system raising the overall connection rate to 66 percent (55 percent households connected at the existing tariff plus 24 percent of unconnected households connecting under the flexible financing arrangement). Thus, under the cost recovery conditions stipulated, the policy of offering both the standard and the flexible option in the same village would succeed in raising the connection rates to some extent.

The monthly revenue yield per 100 households under the above scenario would amount to Rs 781 (Rs 10 x 55 + Rs 21 x 11) This can be compared to the revenue yield if the existing system is improved in a village that has a scheme. Table 16 shows the connection frequencies and the revenue estimates. While the exact costs of providing an additional 4 hours of water per day are not known, we can suppose that the tariff would have to be raised to Rs 17.5 per month. At this tariff the connection frequency would be 40 percent and the monthly revenue yield per 100 households would be Rs 700. Thus, the connection rate would be considerably lower and the monthly revenue would be marginally less compared

to the flexible financing option.

11.2 In the brackish water zone

a) Costs of piped water systems:

Two types at piped water distribution systems are to be found in the brackish water zone: systems based on tube wells alongside canals and systems based on filtration of canal water itself. The capital and 0 and M costs of the two systems under various conditions are shown in Table 17.
The capital cost per capita of a tube well based system is Rs 300 while that of a canal water based system is Rs 500. Based on these figures the total capital costs of the systems can be computed for villages of approximately population 10,000.

The PHED estimates annual 0 and M costs to range from 3 percent to 5 percent of capital costs. In the case of the sweet water zone, the lower bound is more appropriate for large villages because of economies of scale, a large component of 0 and M costs being fixed in nature. Using the average household size in the sampled area (8.9) the monthly charges required to fully recover the 0 and M costs at various connection frequencies have been computed. For tube well, based systems these costs, even the upper bound estimates (at 5 percent of capital costs), are Rs 14.83 per household per month (assuming the prevalent 75 percent connection frequency) and are well within the achievable region. For canal water systems the corresponding value is Rs 24.71. However, at the more appropriate value of 3 percent of capital costs the latter figure drops to Rs 14.83, again a target which should be quite achievable given the existing tariff of Rs 12.

b) Provision of a standard piped water system:
The connection frequencies and revenue estimates pertaining to the provision of a standard piped water system at different monthly tariff rates are shown in Table 18. The connection frequencies for villages with water schemes, without water schemes but with previous experience of them, and for ones without experience are plotted in Chart 9. It can be seen that the frequencies for the latter 2 types are very similar and much higher than those for the former type. The plot suggests that there is no further need to distinguish between the 2 latter type villages. The corresponding plot of estimated revenues is shown in Chart 10.
If the target of 75 percent connections is to be maintained, it is clear that the monthly tariff cannot be increased beyond the existing rate of Rs 12. At this tariff a tube well based system is economically viable at the lower bound of 0 and M costs (Rs 8.9 per household per month) but not at the upper bound of Rs 14.83.

A canal water based system is not economically viable even at the lower bound (Rs 14.83).

c) Provision of an improved piped Water system:

The connection frequencies and revenue estimates, pertaining to the provision of an improved piped water system at different monthly tariff rates are plotted in Chart 11. Again, it can be noted that there is no need to distinguish between villages with previous experience of water systems and those which have not had them. The corresponding plot of estimated revenues is shown in Chart 12.

Again, if a lower bound of 75 percent connections is to be maintained, it can be seen that the tariff can be set in the range of Rs 16.5 to Rs 25 per month in a village with an existing scheme. Chart 12 shows that revenue would be maximized at Rs 25 per month. Thus a tariff of, say, Rs 20 per month would achieve both high connection frequencies and high revenue collections. If a village with a system is used as a reference, the feasible range for the monthly tariff could extend to Rs 35. While the exact costs of improving the piped water system are not known, it seems that at least the 0 and M costs could be fully recovered without causing households to disconnect from the system because of an unwillingness to pay increased tariff.

d) Comparison of standard and improved piped water system:

Since the village with existing water systems, provide the lower bounds on connection frequencies and estimated revenues, we can use their responses to compare the gains resulting from improving the existing piped water systems. Charts 13 and 14 show the connection frequencies and estimated revenues in a village with an existing water scheme, resulting from the provision of standard and improved systems.

It can be seen that the improved system completely dominates the standard system. The monthly tariff can be raised from Rs 12 to Rs 20 without the connection frequency dropping below 75 percent. The maximum estimated monthly revenues go up from Rs 935 per 100 households to Rs 1,693 per 100 households.

e) The response of unconnected households in villages with an operational piped water system:

Table 19 shows the response of unconnected households to the four options offered to them: the standard system, the standard system with two financing

arrangements, and the improved system. The connection frequencies and the estimated revenues are plotted in Charts 15 and 16.
It can be seen that the improved system dominates the other alternatives. Thus, there should be little doubt that improvements in the existing system have a greater payoff than offering special incentives to households who have not connected to existing systems in the brackish water zone.

11.3 In the arid zone

a) Costs of piped water systems:

The estimation of capital costs of piped water systems in the arid zone, based on a notional value of capital cost per capita did not prove very useful. This was so because the parameter is very sensitive to population size; thus whether the population is 1,000 or 2,000 (the typical range in the arid zone) makes a tremendous difference to the capital cost per capita.

The connection rate in the villages with existing water supply systems determined from the survey information is 95.7 percent (only 6 out of 140 houses surveyed were not connected by choice). Thus, one could expect 212 or 200 houses to be connected in a typical arid zone village.

Using the above data the average capital cost per capita in the arid zone works out to be Rs 838 and the monthly tariff required for full recovery of 0 and M costs varies between Rs27 to Rs29.

The existing monthly tariff for a standard PHED system with house connections in the arid zone is Rs 20.

b) Provision of a standard piped water system:

The connection frequencies and revenue estimates pertaining to the provision of a standard piped water system at different monthly tariff rates are shown in Table 20. The plots of connection frequencies and estimated revenues against monthly tariff are shown separately for villages with existing schemes, with experience of schemes but which are not functioning, and ones without any schemes, in Table 21, 22 and 23, respectively.

It can be noted from the plots that connection frequency is very sensitive to tariff beyond a certain threshold. This threshold occurs at Rs 25 per month in villages with schemes, at Rs 15 per month in villages with previous experience of schemes, and Rs 35 per month in villages without any schemes or experience of such schemes.

We can expect that a rise in tariff from Rs 20 to Rs 25 per month would not cause any lowering of connection frequency. If assumed that there was strategic underbidding in villages with existing systems and overbidding in villages without water systems, we can expect that a tariff rate of between Rs 25 and Rs 30 per month would result in connection rates ranging from 95 percent to 85 percent.

At these connection rates and tariffs, the estimated monthly revenue would be approximately Rs 2,500 per 100 households in the village. Using an average of 212 for the number of households in a typical village, the total monthly revenue generated would be Rs 5,300 which is in the same neighborhood as the monthly 0 and M requirement estimated from cost data (Rs 5,745).

It seems clear that tariffs can be raised to Rs 25 per month from the existing Rs 20 per month without any negative impact on connection rates. Tariff rates up to Rs 20 per month remain in the feasible range. Between Rs 25 to Rs 30 per month full recovery of 0 and M costs is possible. This would be even more certain with a very small increase in the number of households over the next few years (it should be kept in mind that the PHED designs systems using projected populations ten years from the date of approval of a scheme as their relevant population base).

c) Provision of an improved piped water system:

The connection frequencies and revenue estimates pertaining to the provision of an improved piped water system at different monthly tariff rates are shown in Table 21. The plots of connection frequencies and estimated revenues against monthly tariff are shown separately for villages with existing water systems and those without, in Charts 20 and 21, respectively.

It can be seen that the tariff threshold is Rs 35 per month. Beyond Rs 35 connection frequencies fall steeply from around 85 percent to around 65 percent, much too low a rate for the arid zone. At Rs 35 per month the monthly revenues generated, in a typical village of 212 households, would be approximately Rs 6,400.

At this moment we are not in a position to state the extent to which the 0 and M expenses would increase for the kind of improved system described earlier. However, the capital costs are certain to be significantly increased. This seems to suggest that at present, such radically improved systems are premature in the typical arid zone village. However, households in larger villages, with sufficient length of experience with standard piped water systems, might be willing to pay tariff rates that could make the policy of providing selective Improvements worth investigating.

12. CONCLUSIONS

12.1. Although policy makers conceive of water as an end product required for better health, drinking, cooking etc., in the Punjab (except for arid zones) people want water for water based amenities like flush toilets and showers. This demand cannot be fulfilled by stand posts and hand pumps.

12.2 People are willing to pay considerably higher installation and 0 and M costs than they do at present; provided service is reliable and efficient. This cost cannot only meet 0 and M expenditure but also subsidise development costs. This is obvious from the WTP bids and from private investments in hand pumps, electric motors and OHWTs. The AERC report states:

"The efforts by households to individually provide themselves with improved water services entail substantial expenditures in the aggregate. Table 23 presents an estimate of the actual amount of money currently being spent on private water provision in a typical village with a population of 5,000 people without a piped water supply in the brackish water zone. Assuming 62 percent of the households have a hand pump with an electric motor, and 38 percent have only a hand pump, households in such a village have already invested over Rs 1 million (in current value) for private hand pumps and electric motors. The 0 and M costs of the privately-provided water systems is estimated to be Rs 9,800 per month. The total monthly costs of the existing system are about Rs 23,900.

"Based on cost data from the PHED in the Punjab, a new piped water system for a village with a population of 5,000 would cost about Rs 1,800,000 including the cost of 100 percent of the households connecting to the distribution system. The monthly 0 and M costs of piped water systems are estimated to be about Rs 3,600 for a total monthly cost of Rs 19,800.

"Given the approximate nature of these estimates, the total cost of a piped distribution system is essentially the same as the amount households are already spending for hand pumps and electric motors. However, the estimated 0 and M cost of the privately-provided hand pumps and electric motors is over two and a half times the 0 and M cost of the piped water system. The estimates of the costs of the piped system assume that 100 percent of the households in the village are connected. The estimates of actual expenditures assume that 38 percent of the households only have a hand pump. In this sense the cost estimates are not comparable because the piped water system provides higher level of service for a greater number of people.

"It is in the above context that the willingness to pay for piped water ought to be evaluated. Once again we take a village of 5,000 people (562 households) in the brackish zone as an example. In such a village without piped water, the mean willingness-to- pay bid for monthly tariff for a standard piped water system with house connections was Rs 40 (this was in addition to the one-time costs of approximately Rs 600 required for connecting to the system). The summation of the households' willingness-to-pay bids yields a monthly total of Rs 22,500. This figure is essentially the same as the amount households are already spending on water (Rs 23,900). This correspondence increases the confidence, in the credibility of the willingness-to-pay bids.

"In practice, it is not possible to recover the entire willingness—to—pay amount because of the infeasibility of enforcing differential tariffs in the same village. The survey results indicate that in a village of the type being discussed. 76 percent of the households would connect to a standard pipe water system with house connections if the monthly tariff were set at Rs 25.In addition, they would bear the costs of connecting to the distribution line (Rs

500, approximately) and pay a connection on fee to the PHED Rs 80) - The estimated revenue based on these numbers is Rs 11,400 per month .If a piped water system is designed for 78 percent of the population, the total monthly cost to the PHED would amount to Rs 13, 400 (Re 10,500 capital , Rs 2, 900 O and M) . These estimates suggest that a very substantial proportion (85 percent) of the total cost of a public piped water system can be recovered under the conditions described above.

12.3 In the arid zone, because of higher development costs, it is not possible to recover capital costs but 0 and M costs can be recovered as connections in the arid zone are almost 100 per cent.

12.4 The WTP bids clearly establish that communities do not trust government schemes.

D. RECOMMENDATIONS

13. POLICY DIRECTIONS

13.1. Rural water supply policy should be demand and not supply driven. That means that the government should respond to a demand for a water scheme even if it comes from a sweet water area. Such a demand should be a

community demand and not something initiated by a ‘politician’’ or ‘‘notable’’ and procedures and processes for making this possible should be developed.

13.2 Pilot projects in various parts of Pakistan have shown that communities, if motivated and given technical and managerial support, can develop infrastructure, or part of it, at their own cost. The projects have also shown that they maintain and operate the infrastructure they develop themselves, and in the process of developing it acquire skills and other development aspirations that they then set about using for other development activity.

13.3 Given the amount people in the rural areas are willing to invest in water acquisition, policy should aim at tapping their resources for development and 0 and M of piped water schemes. Trust between government and communities, is not something that can be easily established in the current political and social climate of Pakistan. For this reason this lapping of resources and management of finances should be left to the communities as far as possible.

13. 4 In the design of schemes animals that will use piped water, when a scheme is developed, should be taken into consideration. In addition, additional 0 and M charges should be levied by the community on families that have animals.

13.5 The private sector has so far been involved only in development and 0 and M of water sources for individual households. The possibility of its involvement in development and/or 0 and M of pipe water systems should be studied and initiated.

14. POLICY FOR RURAL WATER SUPPLY

14.1 Government must make it very clear that it will not develop water supply systems at its own cost and will not carry out 0 and M of water supply systems.

14.2 Any village desirous of acquiring a water supply system will first form an organization in which 90 percent of all households are members. It will then apply to the LGRDD for an estimate. It will collect the total cost of the distribution system from its members plus 30 percent of the cost of the development of the source before work can begin. It has been observed in the Orangi Pilot Project in Karachi that communities manage to subsidies the investments of the poorer members of the community, when faced with either not having a scheme or doing so, and there is no reason to believe that they will not do it for rural water supply.

14.3 The development of the source and the placement of machinery related to it will be designed and supervised by the PHED who will bear 70 percent of its cost. This distribution system will be developed by the community (through whatever means it chooses) with the money it has collected. This will bring down government investment to a total of about 30 percent of its current Expenditure on rural water supply schemes.

14.4 LGRDD or NGOs will motivate the community to organize and raise money, and give technical support to the continuity.

14.5 On completion of the scheme the continuity will take over the 0 and M of the scheme.

14.6 The choice of whether communities wish to have electric motors or not should be left to them. Alternatively they can charge heavier consumers more depending or number of animals or household members. It will be the job of the LGRDD or NGO staff to explain the pros and cons of both these systems (or absence of them) to the community.

15. INSTITUTIONAL ARRANGEMENTS

15.1 LGRDD will have to learn how to motivate people to organize; collect money; apply to PHED for development of water source; employ contractors to lay the water supply system or do it themselves and to operate and maintain it; collect money for 0 and M to determine tariffs. For this, pilot projects will have to be established which will become training and demonstration areas for other LGRDD staff and for other areas in the province.

15.2 The people's organization will handle the money it collects itself. The 30 percent collected for the development of the water source will be released to PHED contractors at the later part of the source development by the community itself.

15.3 Training for PHED and LGRDD staff and local activists and technicians will initially take place at existing pilot projects and later on at developed sites. Special budgets will have to be set aside for this. The training institute at Lalamusa will also have to develop appropriate technical courses for LGRDD and PHED staff.

16. PRIVATE SECTOR INVOLVEMENT

16.1 Pilot projects for involving the private sector should be initiated. These can consist, to begin with, of offering the private sector the 0 and M of existing schemes with the rights of revenue collection.

16.2 If these projects are successful, new pilot projects, whereby the private sector can develop proper piped water schemes with revenue rights for cost recovery and 0 and M can be initiated. The government can give short term loans to the private sector for this purpose.

16.3 Communities that apply for piped water supply systems can then have a choice of working a PHED developed water source themselves or using the services of the private sector.

17. DRAINAGE

17.1 The same principles as developed above should be applied to drainage schemes. The PHED should develop the disposal points and treatment plants at government cost and the drainage system should be developed by the community at Its own cost with technical support from the upgraded LGRDD staff.

17.2 The possibility of village organization using the private sector for developing the drainage collection systems and of the private sector developing disposal points and treatment plants, and recovering their cost from the communities should also be initiated as pilot projects.

17.3 Training for LGRDD staff and for community activists will be provided for drainage schemes in the same manner as for water schemes.

18. TIME PERIOD REQUIRED FOR INTRODUCTION OF NEW POLICY

The new policy cannot be introduced overnight. It will require at least 5 years before it becomes fully operable. During this period it will have to be monitored closely; modifications in procedures and details will have to be made from feedback from the field; and relevant government departments will have to be restructured accordingly.

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