

A Case Study in Water Pricing and Inter-Sector Water Markets

Emergency Water Summit in Kuala, Pakistan

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I. Introduction

“**T**he floodgates of the Kuala Dam have been open for two weeks your Excellency, but we still need more water,” Kuala’s mayor appealed to the Prime Minister over the phone. “I am worried. The people will riot if we do not supply water to the city soon.”

“I have notified the army that reinforcements may be needed in Kuala,” the Prime Minister responded. “And I have scheduled an emergency meeting for next week to deal with the water crisis. I have contacted a water analyst from the federal government to investigate the water shortage in the Kuala Basin. His name is Mr. Lall and he knows the importance of his task. Three cabinet ministers will use his report to propose solutions to the water crisis at the upcoming meeting. You have our full support, Mayor. Keep me posted,” the Prime Minister said as he hung up.

Kuala, a rapidly growing city of 1.3 million people, was in its fourth week of a water crisis during the dry season. The Kuala River, the water source for the region and city, was at an all-time low. As a result, the city’s water supply system was operating at barely half of capacity. Many of the shallow wells on which households and businesses depended to supplement the public piped water supply were going dry, unlike in earlier shortages. With two months of the dry season remaining, the Mayor was facing unprecedented pressure from an array of public and private interests to provide more water.

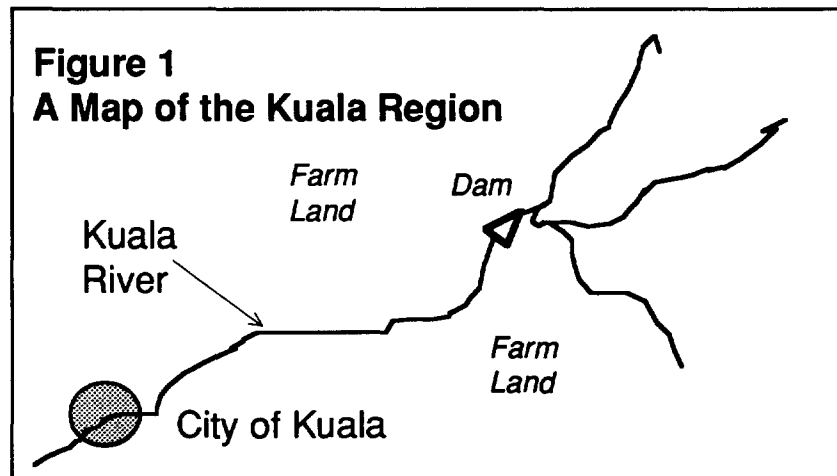
The government faces the difficult task of doling out the limited supply of water among competing sectors.

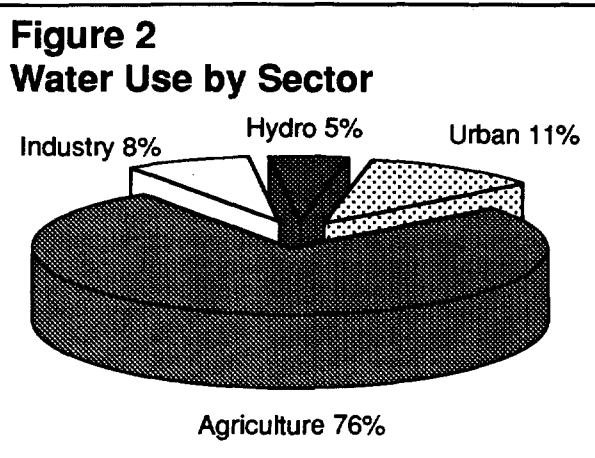
II. Mr. Lall's Report

Mr. Lall left the Prime Minister's office with a bad feeling. The young official had experienced this scenario before. The administration of a rapidly growing area suddenly realizes that water is running short. Now the government faces the difficult task of doling out the limited supply among competing sectors: agriculture, industry, and urban households. Mr. Lall's assignment was to determine how water from the Kuala River was being used by these sectors and at what cost to the government. Then he had to integrate this data into a comprehensive document of water use in the Kuala Basin in order to identify exactly where competition for water was most severe, and thus where water policy needed reformulating. This required interviewing various cabinet ministers and experts on the water policy in each sector. Below is a summary of the primary interviews and the policy documents that Mr. Lall acquired.

A. The Geologic Survey's 1992 Report on Water Use in the Kuala Basin

According to Pakistan's Geologic Survey, use of water from the Kuala River begins at the Kuala Dam, which provides flood control and hydroelectric power. From the Kuala Dam, the river travels through a long stretch of intensively cultivated agricultural land for which the government has invested heavily in irrigation projects. Finally, the river reaches Kuala itself with its heavy industrial and domestic demands for water. (See Figure 1.) The geologic survey estimates that agriculture consumes the lion's share of the region's water. (See Figure 2.)





The geologic survey's report notes that future water levels are likely to continue declining during the dry season due to deforestation in the river's headwaters and increased groundwater extraction. This means that the Kuala Dam's floodgates will be left open during the dry season, providing no energy for the city.

The geologic survey's report notes that future water levels are likely to continue declining.

B. National and Local Water Policy Documents

Mr. Lall found very few policy statements pertaining to water use, pricing, or water property rights in his search of the documentary record. There were two, however. One was in a national document issued during Pakistan's independence celebration; it stated:

A safe and free supply of water is the right of every Pakistani and it will be the responsibility of the government, through the Ministry of Water and Sanitation, to provide this entitlement to the people of Pakistan.
(p. 87, 1951)

The other document was found in the city by-laws of Kuala, having been placed there as a condition for receiving a World Bank loan intended to expand the capacity of Kuala's water system. It read:

Henceforth, users of the water system shall pay a flat rate of R.s. 15 per household and R.s. 40 per registered business each month for the use of a connection to the municipal water system of the City of Kuala. The provision of free water will continue only through public stand taps in those neighborhoods deemed needy by the Ministry of Water and Sanitation.
(Section 11, amendment 22, 1987)

Mr. Lall also discovered that, as with most of the subcontinent, water rights are riparian. A property owner, therefore, has the right to use any amount of ground water beneath his property and any surface water on or adjacent to his property.

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Water losses from leakage are estimated at 50 percent.

C. Interview with the Minister of Water and Sanitation: Mr. Sen

As Mr. Lall proceeded with his interviews, a sense of gloom engulfed him as he entered the office of Mr. Khan, the Minister of Water and Sanitation. An engineer by training, Mr. Khan stood at the center of this crisis. Mr. Lall already knew that the urban water system was in poor condition and operating under a huge debt from earlier loans.

"I warned them that we needed more capital to expand our storage capacity and upgrade our leaking system," said Mr. Khan. "I've done the best I can with my budget. Every year I ask for more funds, and every year I am told there is no more, that the city already operates with a financial deficit. What can I do? The city's population is growing at a rate of seven percent a year and households will use even more water as they become better off."

"To make things worse," he added, "losses from leakage are estimated at 50 percent. Because there are very few meters in the system — considering the expense — we can only guess how much is really lost. The lack of meters also makes it virtually impossible to detect illegal connections or breaks in the line."

Public service was extremely poor. Twenty-eight of the city's 45 free public stand taps were now inoperative. For connected households even during the wet season water service was unpredictable, lasting only four to eight hours a day. Another problem with the intermittent service was that without consistent water pressure in the pipes 'black water' often leaked in from outside, contaminating the clean water. As a result, people often complained about the color and taste of the water.

When asked to forecast both the demand for water and the cost of meeting that demand now and over the next ten years, Mr. Khan provided the figures given in Figure 3. Demand was expected to grow seven percent a year in all sectors but Hydro.

Mr. Khan went on to confirm that the government levies a flat rate charge on households and businesses with piped connections, but collection was difficult. Mr. Khan felt that most people could not afford to pay. Table 1 presents a breakdown of coverage and fees for the public water system as described by Mr. Khan. The operating and maintenance budget was R.s. 4.7 million per year. For a system expansion in 1988, the debt service was R.s. 3.2 per month.

Mr. Khan noted that he had received a great deal of pressure from businesses and the Minister of Economic Development. The unreliability of the public system led many of the businesses to dig wells, but many of these

dried up and pumping costs skyrocketed as the groundwater table continued to drop. The Minister of Economic Development warned that textile and light manufacturing firms, which needed water for rinsing and cooling purposes, have threatened to relocate if ample water is not soon made available. Mr. Khan conceded that he had shifted some water away from households to these industries after the Mayor had called to complain.

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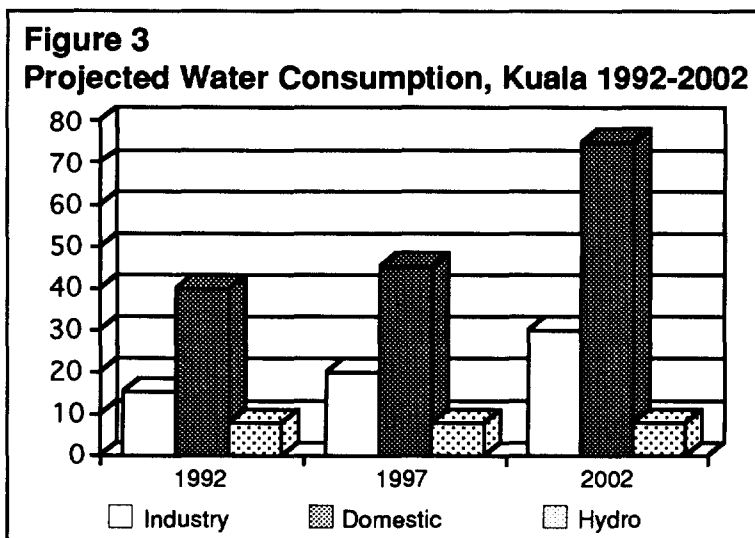


Table 1
Distribution of Municipal Water Supply

| Type of Service | % of water supply | Monthly Rate (In Rupees) |
|-----------------------|-------------------|--------------------------|
| Public stand post | 33 | Free |
| House connection | 45 | 15 |
| Industrial connection | 23 | 40 |

D. Interview with Researcher, Mr. Shah

Mr. Shah is an economist from Pakistan's Institute for Applied Economic Research and has conducted a number of studies on household and industrial water use in Kuala.

"It is a vicious cycle," Mr. Shah began. "There has been a steady increase in water vending in Kuala. As the quality of the public water service goes down, the number of water vendors goes up, and so does the price of vended water."

The poor have no choice but to buy water from vendors. Middle- and upper-income households also buy their cooking and drinking water from vendors.

Selling water is the fastest growing business in Kuala.

"The poor, especially those in squatter settlements, have no choice but to buy water from vendors," Mr. Shah continued. "They may take their wash down to the river, but they can only get cooking and drinking water from vendors. Likewise, middle- and upper-income households also buy their cooking and drinking water from vendors and rely on shallow wells and public connections to meet their bathing and washing needs. Millions of rupees are spent on vended water. Unfortunately for public health, as the price of vended water goes up the amount of water purchased for washing and bathing goes down."

Based on a recent household survey, Mr. Shah estimated that 65 percent of low-income households paid R.s. 35 per month for 180 liters of water per day. He estimated that 50 percent of the middle- and upper-income households paid R.s. 50 per month for about 230 liters of vended water per day. Mr. Lall was shocked at the prices compared to what the government was charging.

Mr. Shah also noted that 70 percent of the middle- and upper-income households invested an average of R.s. 15 per month for pumping operations and maintenance of their private wells. He pointed out that these figures do not include the initial capital costs of digging a well, purchasing a pump, or constructing the storage tanks that are commonly found on the roofs of these middle- and upper-income households.

Mr. Lall recalled the comment by the Minister of Water and Sanitation that the poor could not pay for water. Mr. Shah shook his head in disagreement. "The average low-income household," he said, "spends 5 percent of their income on vended water under normal conditions and upwards of 15 percent of their income during a crisis such as this. I have tried to tell the government but they will not listen. The Minister of Water and Sanitation knows he is not providing water to low-income households. They cannot do without water. Where does he think they will get it?"

Mr. Shah went on, "Selling water is the fastest growing business in Kuala right now. Tanker trucks bring it in from up the Kuala River and from neighboring regions. The tanker truck operators sell it to people with smaller trucks and push carts, who then transport it into the neighborhoods and sell it to households. If by chance a household has piped water four to six hours a day, *they* will sell their extra water to other households nearby."

He concluded, "However, expensive vended water does provide households in areas with poor public service — which is most of the city — with a reliable and convenient supply." Table 2 summarizes Mr. Shah's information on household expenditures in comparison with industrial expenditures for vended water.

Mr. Lall then asked whether any of the industries — notably textiles or light manufacturing — bought vended water. Mr. Shah explained that industry had developed a two-pronged strategy to deal with the water shortage. The first was to become more efficient, reducing the amount of

water required. For the textile manufacturer, this meant recycling water to use it in more than one rinse cycle. For light manufacturers, it meant replacing water cooling with air cooling where possible.

The second way was to drill deeper wells and to truck in the water needed. Both procedures, however, were becoming very expensive. Costs had risen 1 to 2 percent in the last 6 months. Mr. Shah estimated that the average textile firm paid R.s. 240 per 1,000 liters of water, while its light manufacturing counterpart paid R.s. 200 per 1,000 liters. The difference in price, he noted, was due to the fact that the textile industry needed higher quality water, and therefore relied on pumped ground water.

Table 2
Expenditure by (HH) Type on
Vended Water and Private Pumping

| <i>Type of Buyer</i> <i>30 day Expenditure</i> | <i>Price Per</i> <i>100 Liters (R.S.)</i> | <i># Liters Per Day</i> |
|---|--|-------------------------|
| Low-income HH R.s. 35 | .5 - .8 | 160 - 200 |
| Middle- & upper-income HH R.s. 50 | .6 - .8 | 220 - 240 |
| Industry R.s. 2,520 | .2 | 1,000 - 1,500 |

E. Interview with the Minister of Agriculture, Mr. Swarna

“Allah gave us water with which to grow food,” Mr. Swarna began. “That is why the government built and now maintains an elaborate system of irrigation canals in this region. Over 80 percent of our agriculture is irrigated. And we will need more water if we are to feed our people!”

Mr. Lall had often heard this proverb that water was a gift from Allah. He also knew that the Green Revolution had forced local governments to realize they had not been given *enough* water. Mr. Lall asked if the government charged farmers for canal construction and maintenance.

Mr. Swarna laughed, “Of course not. That would increase the price of food. In fact, the government subsidizes pumps and the electricity to run pumps in an effort to decrease the cost of irrigation. Farmers already pay quite a lot of money in pumping costs for water and in labor costs to maintain their irrigation ditches. They do not need any extra costs, especially since introducing new varieties of wheat that require more water.” Mr. Swarna expected agricultural consumption of water to grow 35 percent over the next ten years as more land is farmed, more subsidized pumps are distributed, and other water-intensive crops are planted.

Selling water for irrigation was not uncommon. A farmer or even a landless peasant with a good pump might indeed sell water to local farmers.

The hydrologic conditions responsible for the current water shortage are very likely to recur as demand increases.

"How much do the canals and subsidies cost the government?" Mr. Lall asked. Mr. Swarna replied that he did not know what canal construction had cost, but that service on the debt created by the canal construction was R.s. 7.1 million per year, while the maintenance cost was R.s. 650,000 per year. But, he complained, this latter sum was not adequate to keep all the canals functioning and every year he asks for more funds to do so. Subsidies for the irrigation pumps totaled R.s. 125,000 per year. He had no idea how much the electricity subsidies cost the tax payer. To find that out, he suggested that Mr. Lall consult the Ministry of Energy. (25 Rupees = \$1US.)

Selling water for irrigation was not uncommon, he contended. A farmer or even a landless peasant with a good pump might indeed sell water to local farmers. Yearly contracts were negotiated for the purchase of water by about 70 percent of all farmers. The price of water depended on the cost of energy, on aquifer conditions and on the extent to which the water seller had a monopoly. Mr. Swarna said that water costs are approximately 10 percent to 40 percent of the total crop value. Recent studies show that the cost of water per acre ranges from R.s. 135 to R.s. 700. Given an average farm size of 25 acres and an estimated 2,500 farms, total annual expenditure on irrigation ranges from R.s. 8.4 million to R.s. 43 million per year.

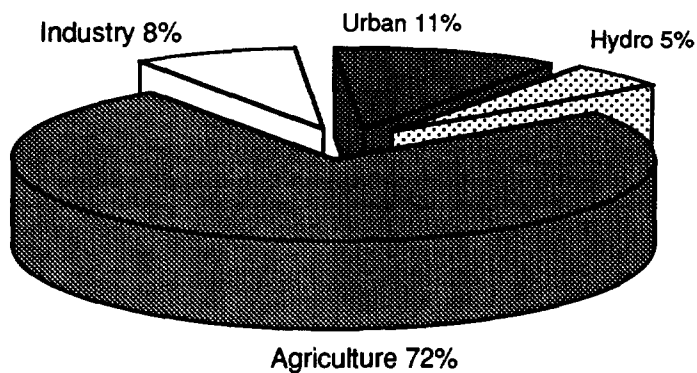
III. The Emergency Summit

It was on a hot afternoon that the 13 officials entered the conference room for their meeting. Aides rushed in and out, conferring on last minute details. The Prime Minister called the meeting to order. First on the agenda was Mr. Lall's presentation, after which the Ministers of Planning, Water and Sanitation, and Finance would present their plans to attack the water shortage.

A. The Executive Summary from Mr. Lall's Report

Water is a scarce commodity used by agriculture, industry, and the urban sector of the Kuala Region. Currently, most of the water in the Kuala River is used by agriculture, followed by industry, urban households, and hydroelectric power. The demand for water is expected to grow significantly over the next ten years. According to the Pakistan Geologic Survey, the hydrologic conditions responsible for the current water shortage are very likely to recur as demand increases. Figure 4 characterizes the relative water consumption and expected growth in demand for these four sectors.

Figure 4
Withdrawals from Kuala River



B. A Two-Fold Policy Problem

The municipal government cannot provide piped water for two reasons. First, the Ministry of Water and Sanitation lacks the financial resources. Government expenditure on the urban water system, including debt servicing, exceeds R.s. 84 million per year while cost-recovery is practically non-existent. Second, even if the water system could provide high quality service, the Kuala River itself lacks the water to meet the needs of the population. Instead of reaching the City of Kuala, water is diverted into the hundreds of irrigation canals constructed by the government to support agricultural production. As a result, industry is threatening to leave the city and hundreds of thousands of households are paying high prices to water vendors. The conclusion? Past policy is clearly responsible for part of the crisis, as shown in Box 1.

Box 1

Incorrect Implicit Assumptions of Past Government Policy:

- 1) Water resources in the Kuala region are inexhaustible, hence the opportunity cost of water is zero;
- 2) Water of sufficient quantity and quality can be made available at minimal cost to the budget;
- 3) Users of water cannot afford to pay for water.

Even if the water system could provide high quality service, the Kuala River itself lacks the water to meet the needs of the population.

The success of these new water policies will depend on outperforming, in cost and quality of service, the existing vending industry.

1. Financing Urban Water Supplies

Urban households and industry now pay water vendors more than the revenue required to operate public facilities. Household and industrial expenditures on urban water add up to R.s. 9 million per month, while the cost of operating the public water system is approximately R.s 7.9 million per month. (See Appendices I and II for a breakdown of subsidies and costs.) Why cannot the government capture some of this revenue?

In principle, the public provision of piped water for urban areas should cost less per unit than what is supplied privately. Such public activities benefit from decreased transportation cost and economies of scale. Another public advantage is that households commonly prefer the convenience and status of piped water. But clearly the public prefers the quality and reliability of vendors to the problems of the public system.

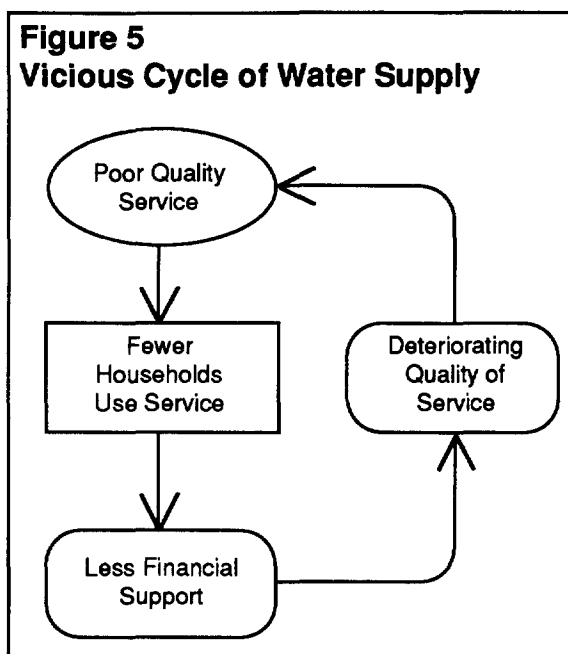
Figure 5 represents the vicious cycle of the public water system. It cannot provide adequate and reliable service, so consumers turn to vendors for water. Hence, fewer people use the system, and because there is no effective pricing policy there is no cost recovery, leaving no funds for maintaining and improving the system, which further deteriorates so that fewer consumers use it, and so on, in a self-feeding vicious cycle which costs Kuala dearly.

Based on these observations, I recommend that the members of the water summit employ a two-pronged strategy that will improve both the quality and the reliability of the current system and simultaneously improve cost recovery. (See Box 2.) Specifically, new policies should try to increase the number of users of the public system and to devise an effective pricing strategy. The success of these policies will depend on outperforming, in cost and quality of service, the existing vending industry.

Box 2

Guidelines for a Sustainable Water Supply *Principles for Setting Water Prices*

- 1) Meet the revenue needs of the system.
- 2) Provide incentives for efficient use of water and capital.
- 3) Distribute the cost of the system equitably.
- 4) Keep the rate structure simple enough to be understood and implemented.



2. The Sector Reallocation of Water in the Kuala Basin

For the public water system to improve its service, more water must be made available to the urban sector from the Kuala River. Mr. Lall's estimates show that agriculture uses over 72 percent of the river's water, while the marginal value of water in agricultural production is the lowest among all uses, as illustrated in Table 3, below.

**Table 3
Marginal Value of Water in Different Uses**

| Uses by Sector | Rupees per 1000 liters |
|---------------------|------------------------|
| Agriculture | 0.4 |
| Hydroelectric power | 0.9 |
| Industry | 2.0 |
| Domestic | 5.0-8.0 |
| Tourism | 8.0 |

It is therefore reasonable to expect that agriculture should share more of the Kuala River's water with the other sectors. However, farmers are among the poorest sector of the population and such reallocation is distributionally regressive. The members of the emergency water summit must, therefore, find an equitable and efficient way to transfer water between sectors, as shown in Box 3.

Box 3

Discussion Questions

Consider the following questions and prepare oral responses for the seminar.

- 1) Is water currently allocated appropriately between the agricultural, industrial, and urban sectors?
- 2) How should water be reallocated between the sectors to improve efficiency and reduce shortages?
- 3) What can the price that each sector is willing to pay tell us about the importance of water to that sector?
- 4) How can the municipal water system improve its financial position?
- 5) What should the government learn about its current and future pricing policy from the price of vended water?
- 6) Should farmers be charged more for water?
- 7) How can the water from the Kuala River be allocated more efficiently and fairly?

C. Return to the Water Summit: Three Proposals

The Prime Minister stated that Mr. Lall had identified the two essential policy issues which this meeting must address. They were: first, how to restore to health the city's capacity to deliver water, and; second, how to ensure the availability of water from the Kuala River for the city's needs. The Prime Minister agreed that fragmented water policy was partially to blame for this crisis. He realized that the crisis crossed many bureaucratic boundaries and affected nearly all of the Ministries. He, therefore, expected cooperation from everyone.

The Prime Minister then asked the Ministers of Planning, Water and Sanitation, and Finance to consider the five policy topics presented in Box 4 that he felt constituted key areas for reform. He noted that after each plan had been presented members of the meeting would be welcome to ask brief questions or make comments. After hearing the three plans, the Prime Minister and the Mayor invited the summit members to make recommendations.

Box 4 Policy Topics to be Addressed in Urban Water Policy

- 1) Water Pricing.
- 2) Methods of Financing.
- 3) The Appropriate Level of Service to Offer (house taps vs. public stand posts).
- 4) Government Policy toward Water Vending.
- 5) Methods for Inter-Sector Allocation.

The Prime Minister realized that the crisis affected nearly all of the Ministries. He, therefore, expected cooperation from everyone.

1. The Proposal of the Minister of Planning

The Minister of Planning was first to present his proposal, which is summarized in Box 5:

Box 5 The Proposal of the Minister of Planning

- 1) **Pricing:** Water prices should not be changed from the current flat rates.
- 2) **Water Vending:** All vending activities should be banned.
- 3) **Financing:** The system should be upgraded through increased taxes.
- 4) **Level of Service:** This should be determined by water engineers.
- 5) **Inter-Sector Allocation:** A quota system should cut water to the agricultural sector by one-third.

The Minister of Planning felt that banning vendors while simultaneously upgrading the system would restore its financial vigor.

Why should the government ban water vending when it offered a much-needed service that the government had failed to provide?

The Minister of Planning expressed dismay at the lack of payment by users of the water system. He blamed water vendors for the exodus from the public system. He felt that banning vendors while simultaneously upgrading the system would restore its financial vigor. The Minister doubted that people would return to the system if the rates were raised. Taxes, he argued, were an equitable way to raise funds for the new system. He agreed with Mr. Lall's assessment that a cut in the water supply given to agriculture would be required and felt that one-third would be appropriate.

There were only a few questions for the Minister of Planning. The Minister of Agriculture asked if the Minister of Planning had determined how much a one-third cut in water consumption would hurt agricultural production. The Planning Minister admitted he had not, but contended that agriculture nevertheless must give up some water to the urban poor. The Minister of Agriculture pointed out that there were many rural poor who would also be hurt by such a policy.

The second question came from Dr. Shah, the researcher. He asked why the government should ban water vending when it offered a much-needed service that the government had failed to provide? The Planning Minister responded by saying that the government must get its own house in order. The water vendors were competing with the government for desperately needed funds. The Prime Minister thanked the Minister of Planning and called upon the Minister of Water and Sanitation to speak next.

2. The Proposal of the Minister of Water and Sanitation

The plan of the Minister of Water and Sanitation is summarized in Box 6:

Box 6

Proposal by the Minister of Water and Sanitation

- 1) **Pricing:** Water prices should be set by average cost pricing via a single block rate.
- 2) **Water Vending:** The price of vended water should be regulated.
- 3) **Financing:** The system should be upgraded through increased debt and taxes.
- 4) **Level of Service:** The type of service should be primarily public stand posts.
- 5) **Inter-Sector Allocation:** No reallocation should occur. Instead, additional water should be piped to Kuala from another basin.

The Minister of Water and Sanitation argued that average cost pricing should be instituted to meet the financial needs of the new system so that the cost is born by the user. This would set the price at the average cost, which would be a flat monthly charge, thus avoiding the cost of installing meters. Prices would be no higher than those now paid to vendors for water which, he argued, should be regulated to prevent excesses.

The Minister of Water and Sanitation understood that water was absolutely essential to agriculture which, in turn, determined both local prosperity and low urban food prices. Therefore, he proposed building a pipeline that would meet the needs of the city during the dry season over the next decade without diverting water from agriculture. This would cost some R.s. 4-5 billion. As a gasp resounded through the room, the Minister admitted that it was very costly but argued that such a solution was inevitable: "Why put off the inevitable?" he asked.

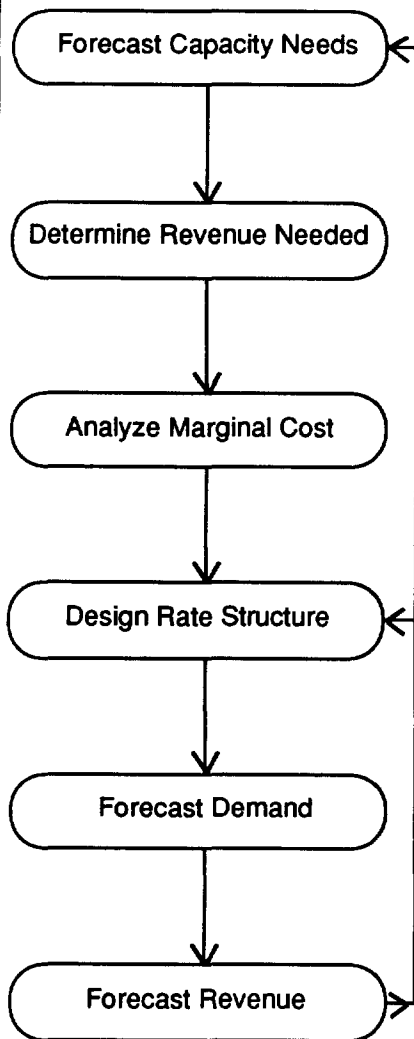
Many questions followed on the Minister's proposal. The Minister of Finance argued for postponing investment in a pipeline as long as possible. He pointed out that, "The longer we postpone investing, the more interest payments we avoid for the huge debt required. Postponing the pipeline even five years could save the government the cost of the pipeline in debt service payments." The Finance Minister then inquired about average cost pricing and metering. In the absence of meters households would not be charged for the water used. "Will this not be unfair to the poor who use less water per capita than do the rich? Would it not be wise to bear the cost of metering, since we are upgrading the system anyway?" The Minister of Water and Sanitation acknowledged that some poor households would indeed be overcharged while others were undercharged. He argued that though installing metering would represent a one-time cost of 15 percent of the operating budget, he was most concerned with the long-run cost of monitoring, billing, and replacing meters. "We lack the money to keep our present simple system running, let alone a more complicated one," he said. The Finance Minister responded that while he appreciated these complexities he also felt that without metering there would be no incentive to conserve water because users would not be facing the true cost.

The Mayor inquired, "What would happen after ten years if we build the pipeline? The city would then have a huge debt to pay off and we would be right back where we started, without enough water, right?" The Minister of Water and Sanitation acknowledged this possibility if demand for water continued to grow, but could find no cheaper alternatives. The final comment came from the Commander of Police, whose responsibility it would be to prevent water vendors from selling above the regulated price. He would, of course, perform his duty according to the Prime Minister's wishes, but he noted that given the number of vendors and the way in which water was being distributed, enforcing such regulations could be both very costly and only partially successful.

The Minister of Water and Sanitation proposed building a pipeline that would meet the needs of the city at a cost of R.s. 4-5 billion.

What would happen after ten years if we build the pipeline? The city would then have a huge debt to pay off and we would be right back where we started, without enough water.

**Figure 6
Water Rate
Determining Model**



3) The Proposal of The Minister of Finance

The Prime Minister then thanked the Minister of Water and Sanitation and requested the Minister of Finance to present the final proposal which is summarized in Box 7.

Box 7 Proposal by the Minister of Finance

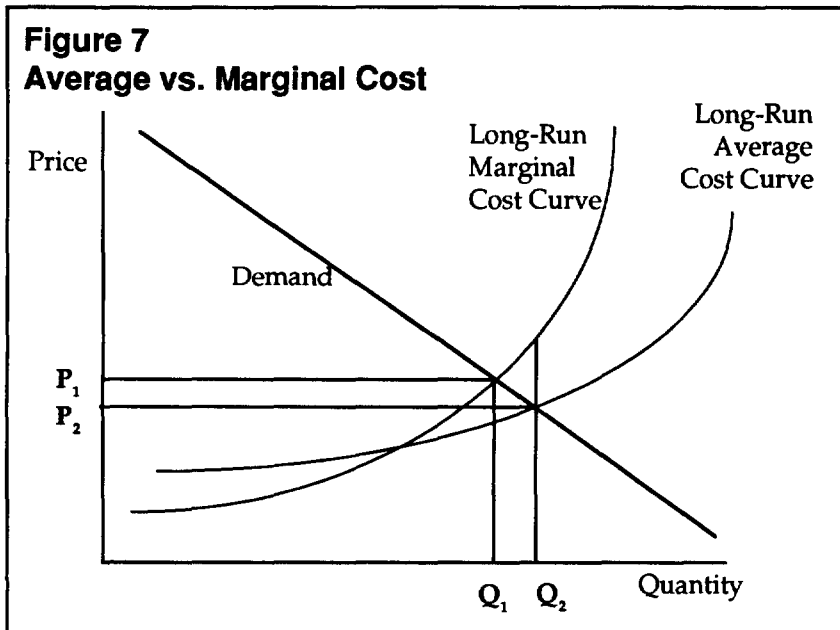
- 1) **Pricing:** Water prices should be set according to the long run marginal cost, using a progressive block tariff.
- 2) **Water Vending:** Vendors should be allowed to continue selling water.
- 3) **Financing:** User charges should cover at least operating and maintenance costs.
- 4) **Level of Service:** This should be determined by the household's willingness to cover the necessary cost of the service.
- 5) **Inter-Sector Allocation:** A water market should be developed so that water flows to each sector according to the benefit that sector receives.

The Minister of Finance began his proposal by presenting the Rate Determining Model shown in Figure 6. He argued that past government policy has focused too much on the supply expansion rather than on demand management. He said, "In the past we have sought to give everyone all the water they have asked for. Now we are short. We should consider policies that curb the demand for water. While conservation policies can help, the single most important issue is pricing policy. As price goes up, everyone — i.e., farmers, industry, households — uses less water and they use it more efficiently. And given the shortage we currently face, and those we are sure to face in the future, we must make sure water is used as efficiently as possible. Long-run marginal cost pricing will do this."

"It would ensure that consumers pay for the real cost of providing each liter. The graph in Figure 7 compares average cost pricing with long-run marginal cost pricing whose cost curve shows us that as more capacity is required the cost of providing it is more than previous expansions. Notice that when long-run marginal cost pricing is used, the cost of consuming a liter of water goes up as the cost of producing it rises. In this way people pay only for the water they use and at the price it costs to make it available to them. The triangle in the graph represents the cost not covered by average cost pricing. My proposal will, of course, require metering, but this is the only way that: 1) adequate revenue can be generated, 2) leaks in the system can be discovered and mended, and 3) water can be used judiciously."

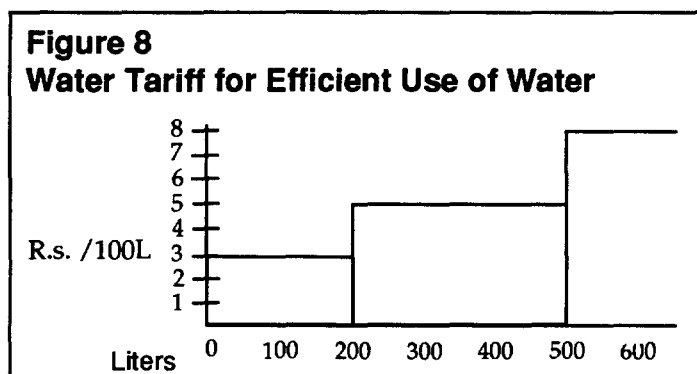
"To keep the tariff structure simple, there will be increasing price block tariffs, with only three blocks. Figure 8 presents a possible tariff structure. The first block contains 200 liters per day and is priced low to meet the basic

water needs of the poor. The second block contains the next 100 liters, for households using 200-300 liters per day — these household would pay a higher rate. Finally, the third tariff block sets a very high price for households using over 300 liters per day. This pricing system allows the basic needs of the community to be met, but discourages excessive and wasteful use of water. A similar block pricing system could be established for businesses, as shown in Figure 8.”



“Although it would be ideal, I do not expect water prices to cover past capital costs. We must balance equity with cost recovery. However, all the operating and maintenance (O&M) costs for every level of service should be covered by the revenues collected from present users. The figures presented by Mr. Lall show that people are already spending enough on water to cover our O&M costs. All we have to do to win back those households from the water vendors is to provide a reliable and adequate water supply. We can provide more water at cheaper prices than the vendors if we simultaneously upgrade the system and charge prices that allow us to cover the costs.”

All we have to do to win back those households from the water vendors is to provide a reliable and adequate water supply.



It is not only the urban users who must use water more efficiently. Farmers should bear the real cost of using water.

The government should create a market for the water in the Kuala River so that it will be properly valued.

“Fees should be charged for water from both public stand taps and household connections. We should require that all households who select piped connections be charged for the cost of capital as well as O&M, while users of public stand taps are charged for only their O&M cost. We should allow each household to decide which combination of service level and price is best for them. In this way, we can offer two levels of service to suit different household budgets and preferences.”

“It is not only the urban users who must use water more efficiently, which brings me to the issue of inter-sector allocation. Farmers should bear the real cost of using water. We worry about raising food prices, but is it not just as bad to raise taxes, as the two previous proposals have suggested? Someone has to pay to get us out of this crisis. My proposal is that he who uses the water pays for it; this is both more fair and more efficient.”

“The Kuala River is dry today because it was exploited by the agricultural, industrial, and urban users who did not realize water’s true value. I propose that the government create a market for the water in the Kuala River so that it will be properly valued. Creating such a market would require that property rights be assigned for the water. Given the existence of the Kuala Dam, these property rights could take the form of shares in the dam’s storage capacity. For example, each year when the dam fills during the rainy season, the capacity of its storage and inflow would be divided into shares. (A formula would be used, based on local hydrologic conditions.) When a share-owner wanted to consume a share, the managers — who act like bankers — would release that share down river to the share holder, delivering the owner one share.”

“The rights to capacity shares in the dam could be determined in one of two ways. First, the government could rely on equity, giving property rights to either poor farmers or to poor urban households, or both. These poor shareholders could then sell their shares to others who need water and are willing to pay. For example, a farmer who owns some extra shares would, instead of over-irrigating, sell those shares to urban households who will clearly pay quite a lot for them. A second method would be to simply auction them off to the highest bidder. Under this scenario, each water sector would organize itself into a kind of collective and estimate its water needs. The head of each collective could bid on the water that is needed as manifested in their willingness to pay for it. In this way, water will go to those who need it most and can pay the most. Allocating the revenues from such water auctions is another matter. We could use part of these revenues to maintain and improve the system and the balance to improve the living conditions of both the rural and urban poor..”

The Minister of the Environment now signalled her desire to speak and was recognized by the Prime Minister. She began, “I agree with my honorable colleague that water is wastefully used. Each year I am forced to deal with soils that are waterlogged due to over-irrigation by farmers. In the city, the wasteful use of water generates even more sewage, which pollutes

"Moreover, as you know Mr. Minister of Finance, each year I have asked for a small sum to rehabilitate and protect the watershed area of the Kuala River. This would provide greater quantities of water during the dry season, less severe floods during the wet season, and would decrease the municipal cost for Kuala of making river water fit to drink by lowering its concentrations of sediment. Each year you deny me those few thousand rupees that could have lessened the severity of this crisis. I recommend that, in whichever proposal is adopted, the watershed should be reforested and protected from deforestation. Long-term investment in the environment would have postponed this disaster!" (See Box 8.) The Minister of Finance agreed, apologized, and said that such a plan should be part of any proposal he would support.

Box 8

Environmental Issues in Water Policy

Problems Created By Subsidies

- 1) Water-logged and saline soils from over-irrigation.
- 2) Sedimentation of river due to polluted return water from irrigation.
- 3) Pesticide and herbicide poisoning of fish.
- 4) Increased waste water generation in Kuala, due to "free" water.

Water-related Environmental Investments

- 1) Reforest and protect the river's catchment to increase water quantity.
- 2) Expand and protect wetlands to increase water quality.
- 3) Monitor point and non-point source pollution affecting the river.

Other questions were raised by the Finance Minister's proposal. The Prime Minister asked, "How much would creating the institutions for such a market cost? Would it require some expertise and a considerable amount of labor?" The Minister of Finance said that he was not sure exactly how much it would cost the government to create the market. But he could state that it would probably cost less than the R.s. 97 million that the government now spends on over-supplying water to the agricultural, industrial, and urban sectors. He continued, "At the rising rate of consumption by these sectors we will soon have a water shortage even during the rainy season!" He suggested that a special council of economists, engineers, and administrators be convened by the Prime Minister to consider the costs and benefits of his proposal.

The Mayor then pointed out that while the Minister's proposal might resolve the long-run problems of the region he had not addressed any of the short-run concerns of the city. The Finance Minister responded that the short-run problems could be resolved if the government chose to price or tax the water currently being used wastefully in agriculture. Such a user fee would immediately make more water available for urban uses, as well as more revenues available. However, if this is considered distributionally regressive we can always return the revenues from irrigation water pricing back to farmers by lowering their taxes. What we are going after here is not the raising of revenues but the saving of water.

Whichever proposal is adopted, the watershed should be reforested and protected from deforestation. Long-term investment in the environment would have postponed this disaster!

At the rising rate of consumption by these sectors we will soon have a water shortage even during the rainy season!

The last question came from the Minister of Water and Sanitation and was addressed to the Finance Minister. "Why are you giving such importance to allowing households to determine their own level of service — this is not the traditional engineering approach." The Minister said that often households were, in fact, willing to pay for a household connection for reasons of convenience and social status. If the government charges the full cost for such a service both households and the government would be better off than if the cost of public stand taps was subsidized.

The Prime Minister thanked the Minister of Finance for his proposal, and then turned to the members of the summit. "You all have a copy of Mr. Lall's report and have heard the proposals of the three Ministers. I will retire to attend to other business, but I expect you to agree to a comprehensive, effective, and fair set of policies that will end this and future shortages. I will meet with you all again tomorrow at noon."

Discussion Questions

- 1) Which proposal, or combination of parts of the three proposals, would you support and why?
- 2) Which proposal deals best with the long-run aspects of the shortage?
- 3) Which proposal best secures the financial health of the water system?
- 4) What are the trade-offs between average cost and marginal cost pricing?
- 5) If you were an urban household, which proposal would you prefer?
- 6) Should water vending be regulated in any way?
- 7) Do you think it is realistic to create a water market as the Minister of Finance proposed?
- 8) Do you agree with the Minister of the Environment that investments in watershed protection are as important and necessary as the efficient use of water by consumers?
- 9) How could the market concept presented by the Minister of Finance be improved?
- 10) Are there other environmental and conservation measures that should be considered?

References and Suggested Readings

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Appendix I: Water Subsidies and Willingness to Pay for Water

Agricultural users have not had to pay for canal construction and maintenance and have enjoyed subsidized electricity and water pumps. The cost of supplying urban households and businesses has always been heavily subsidized. This availability of "free" water has encouraged wastefulness at a tremendous cost to the government and the taxpayer. Tables A-1(a) through A-1(c) show that the total government subsidy for water-related consumption exceeds R.s. 94 million yearly.

In agricultural areas, farmers are willing to pay R.s. 135-700 in irrigation cost per acre of wheat. In urban areas, Dr. Shah has shown that low-income households regularly pay over R.s. 50 per month for water. This averages to over R.s. 9 million monthly assuming a population of 1.4 million and an average household size of seven. The average textile and light manufacturing plant is currently paying R.s. 5040 monthly.

Appendix II: Supplementary Tables

Table A-1(a)
Private Expenditure on Water by Households and Businesses

| Type of Activity | Number | Cost per Unit/Month in Rupees | Aggregate Monthly Value in Millions (R.s.) |
|------------------|-------------|----------------------------------|--|
| Households | 1.4 million | 45 | 9 |
| Businesses | 200 | 5040 | 1 |

Total Monthly Expenditure: 10 million R.s.
Total Annual Expenditure: 120 million R.s.

Table A-1(b)
Public Cost of Water Supply

| Type of Cost | Monthly Average in Millions of Rupees |
|----------------|--|
| Operating Cost | 3.5 |
| Maintenance | 1.2 |
| Debt Service | 3.2 |
| Revenues | .9 |
| Net Urban | (7.0) |

Table A-1(c)
Agriculture: Water Cost and Expenditure

Farmers' Expenditures R.s. 137-700/Acre Crop

Government Costs Million Rupees per Year

| | |
|--------------------|---------|
| Pump Subsidies | .65 |
| Canal Maintenance | 2.5 |
| Canal Debt Service | 7.1 |
| Electric Subsidy | Unknown |

Net Agricultural (10.25)