

# Drinking Water Costs in Pakistan

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Most westerners are thankful for incomes that keep the poverty of countries like Pakistan far beyond a distant horizon. They actually have reason to be even more thankful: that water costs are so low. They might be shocked like I was when I realised how expensive drinking water really is in poor countries.

If we think of costs in poor countries at all, we might remember a student telling us how cheap it was to go back-packing in India. It came as a shock, therefore, to find that the monthly cost of safe drinking water for a family in Pakistan can be 30 times more expensive per litre than it is in Perth. It does not take much more to realise that this is a major reason for poverty in both rural and urban Pakistan, and probably in many other developing countries.

Recent World Bank reviews of urban and rural poverty in countries like Pakistan hardly mention water supply costs except for indirect references, for example, that a hand pump installed in a village “provides significant positive benefits for women”.

As we shall show in this brief paper the cost for a family of 8 consuming only 10 litres of drinking water per day (five litres for drinking and five litres for food preparation, ablutions etc) can be \$60 - \$90 every month (Australian dollars, US\$0.78). In West Australia, a family pays around \$16 a month for five times as much water.

In Australia potable water is distributed to every household, at least in urban areas, by water supply utilities operating under tight and effective government regulation. In Pakistan's cities water is also delivered by water supply utilities but the householder cannot rely on its purity. The water has to be boiled and often filtered as well to make it safe to drink. Pumping or water cartage is necessary on frequent occasions, particularly in summer or in the more elevated parts of cities, when the water supply pressure is not sufficient to bring water to the house. On the fringes of the cities and rural areas many people have to carry their drinking water some distance from a hand pump or a well and then boil it to make it safe.



Water cartage in Karachi. The carter attaches the pump inlet to the water supply main at an inspection pit in a lower lying part of the city and fills his tank. Then he delivers the water to customers in apartments or higher districts of the city where the pressure is too low.

West Australians use the reticulated water supply for drinking, washing, laundry and even for watering their gardens. Not all the water has to be potable but it is cheaper to provide a single supply of potable water at the moment.

In a typical Pakistan village situation, even on the outskirts of major cities, the water supply network is often ineffective even if it has been installed. Residents (who may have built their houses without planning permission) often have to walk a considerable distance and carry water back to their houses.

We can calculate the cost of carrying water as an opportunity cost: the amount that could be earned in the corresponding time. A typical net earning rate for unskilled labour is around 2000 rupees (\$44) per month requiring a working week of approximately 30 hours. From this we can calculate an opportunity cost of about 16 rupees (\$0.36) per hour.

It typically takes an hour for a women to bring home two buckets of water (20 litres) allowing time to queue at a pump or well and to walk there and back. We could assume that 15% of the water will be lost through spillage. The cost of carting water in this way is about 950 rupees (\$21) per thousand litres.

In an urban situation it typically costs 400 rupees to have 700 litres of water delivered, not including the inconvenience of queuing at the water depot for an hour before dawn. In Islamabad the official rate is 100 rupees but it is necessary to pay extra to have the water delivered when you need it rather than a week later. There are variations. Wealthier households install pumps to extract water from the reticulated

supply or their own wells. They have extra storage tanks. All these incur additional costs: the tanks have to be cleaned regularly. Pumps decrease supply pressure for everyone else at the same time.

The water needs to be boiled to ensure it is safe to drink. The energy cost for boiling 20 litres of water in a typical domestic situation is around 5 rupees (\$0.11). Again there will be a time penalty. We assume either that a domestic helper is paid to do the work or that a person in the household does it for themselves incurring a similar opportunity cost. We assume that the time penalty is half an hour because the task only requires intermittent attention. However this time estimate also allows for water containers (e.g. drinking vessels and food containers, cooking implements) to be cleaned daily. The combined labour and energy cost is around 660 Rupees (\$15) per thousand litres.

Depending on whether water is carted or carried, the total cost for potable water is up to \$11 per month per person. Between six and eight people live in a typical household in Pakistan. For eight people, potable water would cost about 3900 Rupees (\$85) each month, more than the average household income of around 2500 Rupees (\$55) among poor families. Of course, most people can't afford to boil the water.



The urban fringe. Bara Kaur – a village within 20 minutes drive of central Islamabad, Pakistan where residents have electricity but no water supplies. Women and children tend cattle and goats to have enough food.

Most of the cost is accounted by the opportunity cost of household labour. Of course, this represents lost opportunity to earn money rather than actual expenditure. In Pakistan many would say “well, that’s what village women normally do!” Women supplement meagre household incomes by growing animals for food. If they did not have to spend so much time fetching and boiling water and cleaning they would be able to earn more, be less exhausted and able to think about basic health issues. When seen in these terms, it is not difficult to understand why poverty persists in an environment where the most basic commodity to support human life is so expensive in real terms.

What are the options for improving the situation?

Most poverty reduction efforts focus on governance, transparency, fostering growth of small private sector enterprises, and strengthening the health and education sectors. The failure of water supply utilities in Pakistan is certainly due, in part, to weak regulation, low productivity and certainly lack of education. Unfortunately it would take decades to rely on these measures to fix the current water distribution system in Pakistan cities, let alone rural water supplies.

An analysis of engineering factors reveals that the shortage of skilled tradespeople and weak engineering skills poses an almost insurmountable barrier to fixing the current water supply infrastructure.

Excess demand and poor maintenance combine to cause failure of the current water distribution systems. There are no water meters on household water supply connections. It is considered un-Islamic to charge people for water though it can be argued that it is reasonable for people to pay for the convenience of having water delivered automatically to their kitchens and bathrooms.

The only way to limit demand is by restricting supplies. Unfortunately when the supply is restricted the pressure in the pipes falls below the pressure of water outside the pipes. Water then leaks *into* the pipes, bringing biological contaminants, sometimes from broken sewerage lines nearby.

Maintenance costs are much higher than one would expect because of the very low productivity of engineering work in Pakistan. Although hourly labour rates are very low, skills that we would take for granted in any industrialised country are almost nonexistent and not available at any price. The result is appalling labour productivity. This means that maintenance costs are much higher than one would normally predict. Because the budget and trade skills are inadequate, the maintenance that gets done is low quality causing more long term damage to the existing infrastructure.

Fixing this problem requires water meters at every household to regulate demand and an intensive programme to create a skilled workforce. However, there is no sign currently that fixing water supplies is high on government priorities.

Even if the water distribution system could be fixed, the use of un-maintained unsealed rooftop storage tanks on every house still presents a major vulnerability to biological contamination. The Australian solution is reliable high pressure water supplies that eliminate the need for storage tanks. Implementing this in Pakistan would necessitate replacing the existing low pressure pipes and fittings in almost every household.

Intermediate and appropriate technology advocates have proposed several 'village-level' or 'household' alternatives. Agencies such as the Intermediate Technology Development Group have suggested many different solutions but these come with maintenance problems. Even home-made filters are not cheap, the owners require extensive education and motivation to perform the required cleaning, and alternative water supplies are needed during relatively frequent maintenance shutdowns.

The real challenge of installing village-level or household-level water treatment facilities is how to collect the money required for maintenance.

One promising solution for villages with electricity supplies is ultra violet sterilisation. Biological pathogens can be killed by intense ultraviolet radiation at an appropriate wavelength. There are many commercially available sterilisers currently available on the market at a cost of about \$400 for a unit capable of handling 8 litres per minute. A water bore (tube-well) with a hand pump for non-potable water and an electric pump, storage tank and ultra violet steriliser for potable water can cost around \$1250 to install. This should supply 100 people with 10 litres of drinking water per day each at a total cost of less than \$2.50 per thousand litres including four annual maintenance inspections by trained technicians, interest charges, electricity charges and depreciation. This corresponds to a monthly cost per person of about 32 Rupees (\$0.70), or about 250 Rupees per household.

The challenge, of course, is that poor households could not find the 250 Rupees per month even if they were asked to. Nor can a government abandon its existing water supply infrastructure. That is why we will have to rely on charitable foundations and non-government organisations to make the initial investments to convince others of the long-term benefits.

Building effective community organisations to take over the long term replacement and maintenance costs first requires a reliable working water supply system to generate sufficient community confidence.

In the task of defeating poverty in poor countries everywhere, we in the west need to understand that poverty is not just a matter of income. Basic commodities like fresh drinking water, even non-potable water, can be much more expensive than in industrialised countries. The main reasons lie in the failure of engineering systems to deliver, because of lack of understanding, underestimating real costs and skilled workers.