

The Karnataka Urban Water Sector Improvement Project
24x7 Water Supply is Achievable.
(Extract of the above field note-September 2010 taken from internet)

Field Note

Pilot projects in three cities of Karnataka have shown that a well-operated water supply system can deliver water supply 24 hours a day, seven days a week, in Indian cities, bringing an affordable, reliable service to urban households including the poorest.

Executive Summary

In 2003, the Government of India had posed this question at a workshop: “Is the essential goal of 24-hour water supply in urban India achievable?” At that time it was understood that none of the 5,161 urban local bodies in India were delivering 24x7 water supply.

This Field Note describes how, in the demonstration zones of three cities in Karnataka, it has proved possible to deliver continuous 24x7 water supply through individual household connections to all residents, including the poorest. This has been achieved with a 10 percent reduction in overall water consumed, whilst increasing the revenue billed by a factor of five, and increasing the revenue collected by a factor of almost seven.

Looking to the future, this Field Note also poses the question: “To what extent is it possible for 24x7 water supply to be scaled up to the majority of Indian cities and towns?”

Box 1: What is 24x7 water supply?

24x7 supply is achieved when water is delivered continuously to every consumer of the service 24 hours a day, every day of the year, through a transmission and distribution system that is continuously full and under positive pressure.

Preparing for 24x7 Supply

The Current Situation and Challenges of Intermittent Water Supply

The supply of water in Indian towns and cities may last for just one or two hours every day or every other day; it could be even less in certain locations. The water that is supplied is not potable, that is, it is not of sufficient quality to be drunk straight from the tap without exposing oneself to the risk of waterborne diseases and infections. The supply may be of insufficient pressure to flow directly from taps even at a ground floor level, let alone taps in rooms or apartments on the first or higher floors of buildings.

Poor water service levels have led to consumers adopting expensive coping strategies that include installing underground storage tanks, suction pumps on water mains or overhead tanks, boiling water or using household filters. Those without a connection have to queue at standposts, sometimes with belowground-level pipe outlets (pit taps) to access sufficient water pressure—with the additional burden of often not knowing when water may come.

Under intermittent service, when pumping stops and the pressure in the pipes drops, water that had been leaking out of faulty joints or holes can be sucked back in. This water could be polluted by wastewater seeping from toilets, septic tanks, domestic drains, and road drains. Intermittent water supply thus not only leads to the water provider delivering polluted water, it also leads to increased pumping costs, reduced lives of pipes and connections due to wide changes in pressure, and an inability to know how the network is operating as meters fail to operate effectively.

Despite low levels of service, the arguments against the idea of continuous 24x7 water have been strong: “We don’t have enough water in a water-scarce country to supply continuous water”; “It will cost too much when so many people are poor and tariffs are already too low”; “We have intermittent power supply so how can we expect to have continuous water supply?”; and “Our cities are growing too quickly to support continuous water”.

(The project was rolled out in five selected zones in three cities (Belgaum, Gulbarga, and the twin cities of Hubli-Dharwad) in northern Karnataka, with a total population of around 2 million people. The demonstration zones were selected such that they represent the socioeconomic mix of the city, with at least 10 percent of the city connections. The main objective was to prove that it is possible to deliver 24x7 continuous, clean water in India as well as to show that such an approach could work across a range of topographies and in a variety of housing areas and types.)

Making the Case for 24x7 Supply

As part of its strategy to address the challenges of intermittent water supply, the Government of Karnataka (GoK), with the assistance of Indian think tanks and the World Bank, proposed ‘demonstration projects’ in three cities in Karnataka, in 2003. Given the strong arguments against 24x7 supply, it was clear that developing a successful demonstration project would take not only technical skills but also significant communication and social skills. Strong leadership was an important requirement, especially at the government, political, and official levels; the support of decision makers in financing agencies, academic institutions, and engineering departments was also essential.

There were also strong arguments in favor of 24x7 supply. Based on evidence from other countries, it was clear that continuous water supply would deliver significant benefits (see Box 3).

Box 3: Benefits of 24x7 water supply

24x7 supply delivers better quality water for public health.

High levels of bacterial contamination are experienced in the first 10 minutes of repressurization of an intermittent system, in some cases persisting for up to 20 minutes. Maintaining full pressure removes that risk.

24x7 supply gives significantly better service to all consumers. Access to clean water with improved quantity, timing, and pressure, including effective service to supply pipe ‘tail ends’.

24x7 supply revolutionizes service to the poor.

Consumers can access more water for improved health and hygiene while saving time in queuing and carrying, and gainfully using the time thus saved for employment opportunities.

24x7 supply converts household coping costs into resources for the service provider.

Coping costs that consumers need to incur are reduced; they pay for a better service.

24x7 supply reduces the burden on water resources.

Continuous supply reduces water wastage arising from overflowing storage systems and open taps. It saves on stored household water that is discarded when new supply comes in. Because the network is renewed where needed, it also reduces losses arising from leaks in the old pipes.

24x7 supply delivers effective 'supply management' and 'demand management'.

Continuous supply makes possible the effective management of leakage through pressure management and flow measurement. Water conservation is also encouraged through metering and price signals via a volumetric tariff to consumers.

24x7 supply enables improved efficiency of service provision.

Operational efficiencies are achieved because of a reduced need for valvemmen, and a conversion of these jobs into more efficient ones of meter reading and customer care. It also makes possible the management of illegal connections.

Preparing the Project

In line with the GoK's 'Urban Drinking Water and Sanitation Policy Statement' (2003), the state cabinet and officials in the Karnataka Water supply Urban Infrastructure Development and Finance Corporation (KUIDFC) and Karnataka Water Supply and Sewerage Board (KWSSB) confirmed their commitment to be the first in India to demonstrate that 24x7 water supply is achievable.

The focus for this demonstration project—the Karnataka Urban Water Sector Improvement Project (KUWASIP)—were the three cities (all of which are municipal corporations) of Hubli-Dharwad, Belgaum, and Gulbarga in northern Karnataka, with a total population of around 2 million people. The main objective was to undertake capital maintenance on the distribution network to prove (to the public and to the institutions in the water sector) that it is possible to deliver 24x7 continuous, clean water in India. And also to prove that such a supply is affordable, that it can be sustained over time, that it does not require additional water resources to keep the pipes full, and that households, even poor households, are willing to pay a fair tariff for a consistently acceptable service.

An early decision was whether to use an entire town as a demonstration project or to use selected areas from a number of towns. It was decided to take segments of towns to demonstrate that the approach could work across a range of topographies and in a variety of housing areas and types. This was also designed to limit the risk of circumstances in one

town resulting in the cancellation of a project before there was an opportunity to demonstrate improved service delivery.

To ensure the best possible preparation for the demonstration project, the Government of Karnataka, through the KUIDFC, entered into a partnership with the World Bank, to access its expertise in project delivery, social intermediation, and communication, in addition to financing.

Different zones in Hubli-Dharwad, Belgaum, and Gulbarga, each representing about 10 percent of the population, were shortlisted by the technical consultants, Bristol Water Services. These areas could be isolated hydraulically and represented a cross-section of consumers and stakeholders, with no major industrial or commercial consumers. The consultants also estimated the costs of developing continuous water supply. From the shortlisted zones, five zones were selected by the city corporations in a consultative manner as demonstration zones. After a process of verification and revision between third party consultants, international operators, and senior advisors, the anticipated capital maintenance budget was revised upwards in stages from an initial value of Rs. 19.19 crore to a final figure of Rs. 42 crore to guarantee adequate financial resources.

Defining the Role of the Operator-Consultant

The program included the appointment of an operator consultant (OC) to manage implementation of the improvements and to operate the upgraded system for two years through a performance-based management contract. The proposal to use an experienced operator, necessarily private and with international links for this first demonstration project, was designed to make it easier to ensure that best practices were followed for pipe-laying and pipe-testing, and for subsequent water quantity monitoring and pressure management. Details of the contract process and remuneration are presented in Box 4.

The 24x7 demonstration project was part of a wider project for the state, which included significant funds for upgrading bulk water supply for all consumers in the selected towns, in addition to the setting up of a State Urban Water and Sanitation Council, which would be responsible for long-term oversight of water services in the state.

Box 4: The management contract

Award of contract

Seven international companies bid for the management contract. Veolia of France quoted the lowest financials, Rs. 22.4 crore, as the required Operator-Consultant (OC) remuneration and was selected. Its bid was 15 percent lower than the second bidder, and 31 percent lower than the third. The contract was signed on April 25, 2005, by six signatories—Karnataka Urban Infrastructure Development and Finance Corporation, Karnataka Urban Water Supply and Drainage Board, City Municipal Corporation of Belgaum, City Municipal Corporation of Gulbarga, Hubli-Dharwad Municipal Corporation, and the OC (Veolia).

Scope and structure

The OC's role was to deliver 24x7 water through a structured management and engineering reform plan and establish a customer billing center in the demonstration zones. Revenue for the services was to be collected by the municipal corporations based on tariffs set by urban local bodies using Government of Karnataka guidelines. Community participation was envisaged through nongovernmental organizations, along with provision for appropriate feedback mechanisms.

The 183-week contract was divided into three phases:

(A) Preparation of an Investment Plan for achieving the performance targets, which included development of a hydraulic model for the system, preparation of a rehabilitation plan, and estimating the cost of works involved.

(B) Implementation of the Investment Plan including preparation of contract documents, procurement, selection of subcontractors and rehabilitation of the system. Phases A and B were expected to be completed within 79 weeks.

(C) Operation and maintenance (O&M) of the rehabilitated 24x7 system for 104 weeks.

Remuneration

The OC's remuneration, separate from the capital expenditure requirement, was divided into two parts. 'Fixed remuneration' was equal to 60 percent of the total, to be paid to the OC in 15 equal quarterly installments from the start of the contract term until the end of the 42nd month. 'Performance remuneration' was to be paid to the OC in installments through the O&M period based on achievement of performance targets (see Box 5). Ten percent of all payments (both fixed and performance) was to be retained as retention money, to be released on the successful completion of the contract. The contract provided for a 'capital efficiency bonus' linked to savings in capital expenditure with 3.75 percent of the OC remuneration for savings up to 25 percent, and 10 percent of additional remuneration for capital expenditure savings higher than 25 percent.

Implementing 24x7 Supply

A Project Management Unit was established in the KUIDFC for coordinating project activities, including the social component of the project. A state-level committee for steering the project through its overall life-cycle was instituted by the GoK and the sector reform component of the project was driven and managed by the GoK's Urban Development Department. The design, procurement, construction, and supervision of the priority investments were handled by the Karnataka Urban Water Supply and Drainage Board (KUWSDB) which acted as an agent on behalf of the KUIDFC. For the demonstration projects, the selected OC acted as the agent on behalf of the urban local body (ULB) to deliver water services to the consumers. A Technical Auditor, reporting to the ULBs and the KUIDFC, oversaw the performance of the OC and implementation of priority investments.

Phase A: Preparation

The first task in the preparation phase was to determine the number of potential consumers and their likely demand for water, in addition to assessing the condition of the existing pipes, followed by hydraulic design of the new system. Fifteen weeks had been allotted to the OC for this task, and it was achieved with a short delay (an additional six weeks had been allowed for such flexibility).

“It was the most difficult stage as there was no information available. There were no bulk water meters, no household meters; nobody knew where the water was going. They were saying the losses could be 40 percent to 50 percent but that was simply a guesstimate.”

The OC took samples of the existing 15- to 20-year-old plastic PVC pipes and, having tested them in a laboratory, found that they would not be able to withstand higher pressures. It also found that many pipes had been installed at too shallow depth where they were being squeezed out of shape by traffic loading. There was a similar challenge with the house connections, with approximately one-third comprising cast iron ‘saddle connections’ fixed on to a PVC pipe or directly welded iron household connections on to cast iron pipes, all leaking or likely to leak once the mains would be pressurized.

Because of the performance risks (and bonus) that the OC was carrying and the very short time available to make decisions, the OC requested permission to replace the entire distribution network. This was seen by some observers as an unfair ‘shortcut’ and by others as ‘uneconomical and wasteful’. The original proposal by the consultants had assumed 62 percent asset replacement. However, because 24x7 supply means a significant reduction in peak flows, through hydraulic modeling the OC was able to determine that, by using 63 mm and 110 mm pipes (rather than the assumed standard of 150 mm), there could be a significant cost saving. With that saving the OC also committed to a higher quality of polyethylene pipe (PN10) than had been normal, again to protect against any deformation from the weight of traffic on the road above, and to ensure a long asset life.

The Final Investment Plan, agreed after addressing approximately 200 queries from stakeholders, was therefore for Rs. 21 crore , “astonishing everyone”, significantly less than the advisers’ final costing of Rs. 42 crore. The OC believes that had the performance targets, in particular for leakage, been less stringent and the preparatory phase longer, it would have been possible to incorporate more of the existing pipe network. However, the full replacement approach not only solved the challenge of leaking house connections, it also uncovered all illegal connections, and delivered appropriate capital maintenance of the distribution network to ensure that it remained fit for its intended purpose for the next generation. The total capital expenditure was Rs. 26.1 crore as at March 2009.

Phase B: Implementation

With KUIDFC approval of the Final Investment Plan, the OC was able to hydraulically isolate the demonstration zones, install an all new pipe network, including service connections, along with bulk and consumer metering, pressure management, and monitoring devices. A billing and customer service system was established along with a performance monitoring system.

For the key task of pipe renewal, the OC appointed a subcontractor, using World Bank procurement rules with regard to competitive tendering, to supply and lay the high quality, high density polyethylene (HDPE) pipes. A second subcontractor was appointed to supply and fix the meters and house connections. Bulk flow monitors and pressure management valves were similarly procured.

The government appointed Fichtner Consulting Engineers as technical auditors to establish baseline values for performance indicators, review the investment program submitted by the OC, certify the quality of construction, review O&M expenditure, and conduct annual audits of the OC's performance. One of its key roles was to monitor the hydro-testing of the new pipelines which the OC required of its subcontractor, a critical process that to date has been largely neglected in India. The 50 m and 100 m lengths of HDPE pipes are normally connected using the 'butt welding' technique, a relatively straightforward process but one which requires careful attention to ensure a leak-free joint. Early tests showed that some of the people involved were still learning the techniques as there were a number of failures. The OC commented: "I used to be with my contractor until 10 pm at night, I taught them to use the fusion system properly. I told them about polyethylene and I could tell them about the proper jointing technique—there was quality input by the Veolia team."

Similar attention to detail was required on the house connections. The ferrule connection, where the smaller house connection pipe is joined to the water main in the street, is often a source of leaks. The OC stipulated high quality electro-fusion ferrules, and similarly high quality imported brass water meters within a plastic meter box for protection, to ensure performance.

There were three bidders for the meter supply contract. "The lowest we did not approve, we gave it to the second lowest—we can't compromise on the measuring device even though the cost was 5 percent more. The market was not really yet open in India so we imported from Italy... we were really focused about the quality of meters so we developed a very strong specification." The OC believes that some flexibility in the procurement of subcontracts is vital to ensure quality and performance—selection by price alone cannot be accepted where agreed performance standards have to be delivered.

As per the contract, community communication was to be handled entirely by the ULBs and the KUIDFC through nongovernmental organizations (NGOs). However, the OC had to provide regular updates to the technical auditor, KUIDFC, KUWSDB, and the Corporation through monthly meetings and reports.

Phase C: Operations

Over a period of months, in 2006 and 2007, the new water distribution pipes were brought into service, new household connections were made, and the new system was brought into operation with full metering of bulk supply and household metering of all connections. The operations' period officially commenced in April 2008 in all three cities. "The first consumers received 24-hour supply three months early—and the pessimism in the consumers' minds was killed automatically, very fast." Households received continuous water supply at the

design pressure, water in taps inside their homes, even in third storey apartments, 24 hours a day, seven days a week. The roles and responsibilities of all the stakeholders across the three phases of the project are given in Table 2.

Table 2: Roles and responsibilities of stakeholders

Operator-Consultant	State agencies	Corporations
Phase A: Preparation		
Study the demonstration zones and develop a Final Investment Plan (FIP) to meet performance targets	KUIDFC: Overall project management including review of Investment Plans	Allow OC access to water distribution facilities
Phase B: Implementation		
<ul style="list-style-type: none"> • Take over O&M of demonstration zones • Implement FIP • Establish a customer service centre and billing system • Meter reading and issue of bills 	KUIDFC: <ul style="list-style-type: none"> • Overall project management including review of performance against targets • Project management of rehabilitation works • Social intermediation and communications 	<ul style="list-style-type: none"> • Hand over management and operations in demonstration zone to OC • Set tariffs • Depute staff to OC • Provide adequate bulk water supply
	KUWSDB: <ul style="list-style-type: none"> • Implement priority investments • Manage, operate, and maintain bulk water supply 	<ul style="list-style-type: none"> • Collection of bills and arrears • Disconnections and request for connections
Phase C: Operations		
O&M of demonstration zone to meet performance targets	Same as in Phase B	Same as in Phase B

The OC was also provided with some performance criteria that had to be fulfilled (see Box 5). In meeting these criteria, the OC has also prepared a good database on the improved water network (which is important for good operations), with data loggers used to record regular measurements and understand system performance.

Box 5: Performance criteria from the start of the operations and maintenance period

- 24x7 continuous pressurized water supply to every property, 100 percent metered, with emergency stoppages not exceeding 12 hours and not more than four emergency stoppages in any continuous 12 months.
- Maximum loss level in liters/connection/day/meter pressure of 25 by month 12, 23 by month 18, and 20 by the end of the O&M phase.

- Full computerization of the billing system with all meters to be read and billed monthly.
- 24x7 operation of a customer service desk with a required seven-day response time for new connections, 12-hour response time for complaints, resolution within 24 hours when dealing with issues of low pressure or poor water quality, 24-hour response time with seven-day resolution for other complaints, and reported surface leaks to be repaired within 24 hours.

The voice of Ellamma, a quarry worker and female head of her household, summarizes the impact on the poor, “Earlier I was waiting for water and could not go to work to earn a living. Now I go to work and the water is waiting.”

Water now came at a pressure which allowed middle-income households to fill their roof storage tanks (just in case) without any need to spend electricity on booster pumps. Pumps to suck water out of the mains became redundant. It is, however, reported that only about 30–40 percent of the ground-level sump tanks have been bypassed and left unused so far, even though householders were advised to do so. The water which came out of the pipes was now potable (additional chlorination facilities were built to ensure that the water was properly disinfected), so there was no value in allowing it to become polluted again through storage in underground house sumps. Potable water supply also made it possible to dispense with household treatment systems—though not all had done so.

A family that benefited from this project said: “The water supply is good, no problems now. It used to be once in three days. We moved here in 1987 when the water supply used to be continuous, then it gradually went off and became fully intermittent in about 2000—we think it was due to the expansion of the city. We paid Rs. 200 last month. We have five members in the household and we are also watering the garden plant pots. There is good enough pressure to fill the roof tank. We used to use electricity on the booster pump which we now save. We are still using Aquaguard. It costs Rs. 6,000 per unit, with the recharge element being Rs. 600 per year.” This family’s neighbor, across the street but outside the Belgaum demonstration zone, remarked: “We get water once in three days and it is not sufficient, so we are buying from tankers; the well... is only for the garden. We pay Rs. 200 for a tanker and buy twice per week (four flats in the building, about 22 people) and we are still paying Rs. 83 to the Corporation for water. How long until I am connected to 24x7?”

There are anecdotal reports that health has improved: “We don’t have so many illnesses as before”; “Earlier there were health problems with fever, colds, and coughs monthly, both the children and the older people, but now we don’t seem to be facing these problems”. It has also been reported that children are able to attend school more regularly, and that women do not have to wait in for the odd hours when water might, or might not, arrive, thereby enhancing their work opportunities.

Another challenge of returning the distribution system to proper operations is that there is no more need for the many valvemmen who previously had the task of distributing the intermittent water to the different zones by controlling the valves in the network. This challenge was anticipated and several valvemmen in each town were deputed to work with the OC to learn the

new requirements for continuous water supply management. It is reported that there was resistance from several of the ULB staff, unwilling to work with a private operator, which resulted in only a few of the deputed employees continuing to work with the OC.

The operations phase of the contract ended on March 31, 2010. Committed to maintaining the effectiveness of the demonstration zones, the state government tendered a two-year extension contract for operations, customer care, and maintenance. Veolia won the extension contract, “bidding very competitively”, since it was committed to ensuring the continuation of good performance—having brought this demonstration project into operation, the OC was very keen to stay in control to ensure its full success.

Box 6: Strategy to facilitate direct house connections

To facilitate service connections under the project, the Government of Karnataka instituted a policy that was adopted by the Operator-Consultant (OC). The salient points of this policy are:

- (a) In case of existing legal connections, 50 percent of capital cost invested out of project funds for house service connection to be recovered at Rs. 50 per month from the monthly bill.
- (b) For new connections, normal connection charges to be collected. Full capital cost to be recovered at Rs. 50 per month from the monthly bill.
- (c) Unauthorized connections will be disconnected if they do not apply for regularizing the connection. When people apply for regularizing their connections, the urban local body has to approve and tell the OC. Connection charges are to be collected in the same way as in (b) above.

For poor households which cannot afford individual connections, the alternative of a shared connection may be offered—provided a group of households decides to take one, and the group is able to designate one from amongst them to take responsibility for the safety of the meter, collection from users, payment to the Corporation, and so on.

The OC has implemented three types of connections in the project:

Type I: Single standalone tap in the front yard of the property.

Type II: Connection directly connected to internal plumbing of property.

Type III: Connection into the ground-level sump of the property.

Most house connections were Type I. Incidence of billing problems was greater in Types II and III connections.

Lessons Learned in Demonstrating 24x7 Supply

24x7 Water is Achievable

Reportedly, some of those who were most against the demonstration project, particularly since it involved a foreign operator, held out against the offered improvements. Initially one

ward in one town rejected the idea of improved water supply. Then it was just two streets that refused, and finally just one individual objected, until the normality of 24x7 continuous water supply and its benefits became too apparent. Then he, too, connected to the system.

The largest movement towards normality came from the lowest income households which had traditionally had to queue at distant standposts in the early hours of the morning, waiting for water to come. In the demonstration zones, standposts were included for vulnerable groups as part of the 'pro-poor policy' (see Box 7). However, the standposts were shut down because all poor households opted for household connections. This is one of the most important lessons from the project with respect to pro-poor advocacy arguments. This gave the poorest families immediate 24x7 access to water, without having to carry drinking water in buckets, removing a potential source of contamination. Continuous access also delivered hygiene benefits in facilitating hand washing before food preparation and meals, in addition to the convenience and dignity aspects.

With the parallel introduction of an increasing block tariff, low-income households could avoid payments to water carriers or neighbors while maintaining their monthly water bill at a relatively affordable minimum (and perhaps 50 percent of actual cost) of Rs. 48 (US\$1) per month for the minimum consumption of 8,000 liters (KL) per month at Rs. 6 per KL. For those who had been paying a water tax or cess of Rs. 1,000 per year, as part of their property tax (Rs. 83 per month), this meant an additional saving for a remarkably improved level of service.

The one group of consumers who continue to be unimpressed by this development is the group consisting of low-income cattle-owners, living on the periphery of the towns, who have become used to watering their stock for a fixed tariff. They had had to revert to using handpump groundwater for their cattle: "We were very comfortable with flat rates, it was far better. Now there is a minimum charge of Rs. 200, going up to a maximum of Rs. 600 to pay for water for our cattle. We are not comfortable with meter reading tariffs. Our livelihoods cannot afford to pay such high tariffs"; and "Why do we need 24x7?"

Box 7: KUWASIP: Pro-poor policy

- To provide concessions to urban poor in the matter of water supply.
- To identify the urban poor as those residing in houses measuring up to 600 square feet, built-up area, regardless of whether they live in or outside the slums.
- To waive the normal one-time connection deposit for such urban poor and to collect only the cost of providing meters (to be fixed by the municipal corporations themselves), to inculcate a sense of ownership.
- To fix a life-line supply of 8,000 liters per household per month for urban poor, at a concessional rate (to be fixed by the municipal corporations themselves).
- To simplify procedures, including forms, eliminating the need for sanctioned house plans, and such similar cumbersome documentation; any proof of residence such as ration cards and ID cards would be considered sufficient to provide a connection.

- To provide water free of charge through public kiosks/cisterns/borewells fitted with handpump to vulnerable sections such as nomads, destitute, homeless poor, coolies, beggars, and so on, who cannot afford to pay anything.
- To promote structured participation of nongovernmental, and community-based, organizations in organizing the vulnerable sections for managing free water supply through public kiosks.

24x7 Supply Brings the Promised Results

The results of the demonstration project are - The average 10 hours of supply per week (two hours every 15 days in one zone) has become continuous water 24x7. From a level of authorized connections estimated to be serving less than 50 percent of the population there is now 100 percent household connection coverage. There has been a five-fold increase in revenue billed and approximately a sevenfold increase in revenue collected. The ongoing bill collection efficiency is 80 percent across all five zones (in fact, it is as high as 99 percent in Hubli-Dharwad and Gulbarga, but the overall average is reduced by the limited 60 percent ratio from Belgaum where arguments over paying arrears from before the start of the project continue). There are functioning meters on all connections, which are all read and billed by the OC monthly.

There has been a reduction, around 10 percent, in the overall amount of water being supplied (noting that the original volume of water supplied was necessarily an estimate). This figure needs careful interpretation since, under the old systems, there were very high physical losses (as much as 35 l/c/d/m in Hubli), while under the new system there are significantly more household connections. Nevertheless, it is clear that the fear that continuous water supply would lead to an unsupportable demand on water resources, has proved to be unfounded in practice. In fact, the losses in the distribution system, a factor of the complete replacement of the network, have become as low as 0.5 liters per connection per day per meter head of pressure (l/c/d/m) in Gulbarga, dramatically lower than the 20 l/c/d/m specified in the performance contract.

Households are now consuming an average of 91 liters per person per day, which is sufficient to enable the maintenance of hygiene standards as well as meet most convenience needs. One quarter of connections are using the minimum consumption of 0–8 KL per month at a cost of Rs. 48.

An indirect economic value gained by the consumers is the increase in the property value ranging between 40–60 percent for the properties located in the demonstration zones when compared to the value in the adjacent localities.

One issue worth noting is with regard to the transition to volumetric tariffs. When operations started in the demonstration zones, consumers were given 'demonstration' bills based on actual measurement of volume of water consumed in order that they get a sense of costs and the need to moderate their usage patterns. During this period, and when formal volumetric tariffs were first introduced, there were concerns regarding high water bills. These were due to a range of factors such as faulty internal plumbing, backflow from sumps through old

service connections, and several families serviced by one connection. The OC had to undertake extensive customer engagement and interventions—such as inspection for leakages, closing of old connections, and advice on waste minimization—to address these complaints. Customer complaints have now settled at around 10 per 1,000 customers per month, the majority of which refer to concerns over limited leakage around the house tap, attributed mainly to children playing around the exposed external taps.

This experience demonstrated that when utilities convert to continuous water supply with volumetric tariffs, there will be a transition period during which the utility management need to carefully study and assess the consumption patterns and billed amounts, and prepare well for resolution of billing related complaints/issues.

Another challenge has been problems with single connections to apartment blocks where consumption for multiple apartments incurs the higher tariff banding. Consumers have taken the matter to Court in Bengaluru; it has been agreed that each apartment has to be treated as a single connection for increasing block tariff. This will result in reduced revenue.

24x7 water in the Karnataka demonstration project has delivered improved water quality and quantity to all urban consumers in the zones—with a reduction in coping costs and health burden, as well as improvement in school attendance and income generation opportunities. In particular, very low-income one-room households are selling their water tanks as they are no longer required.

The Rural and Urban Development Association Dharwad (RUDA), one of the supporting NGOs, have electricity bills for one household showing a decrease in electricity consumption from the intermittent to the continuous water supply system, leading to a monthly saving of Rs. 82.80 as the household water pumps are no longer required. RUDA also reported increased school attendance by girls and reduced cases of diarrhea and other water-related illnesses. This is a core health issue which has not been fully investigated and documented to date but is the target of future health studies, to be reported elsewhere. Box 8 presents a response to the changed situation by the people impacted by the project.

Box 8: Impact on the ground

This letter, received by the nongovernmental organization Rural and Urban Development Association Dharwad, shows how the project has benefited the people.

“Respected Sir/Madam

“We the people of [the] Ward are extremely happy with the inauguration of 24x7 water supply. It has been a great effort by Mrs. N. B. B. of Ward 9. She has given us all the information time and again.”The 24x7 water supply is functioning round the clock for 4 wards (for the time being). The 24x7 water supply is extremely good as we can save water and electricity as before this program there was a huge water scarcity and the people were forced to use water pumps to lift the water. Since the water is now available as high as 20 feet, it has eradicated the usage of water pumps, thus saving electricity. We like 24x7 water and we use water as much as we can and pay as per our usage. However, I would like to ask for much cheaper rate if possible.

“As per my knowledge, the administration should consider expanding the 24x7 water supply provision to all the respected wards of my beautiful city Dharwad.

“This will be a gift to all the people as they too are suffering with the water problem.

“Thanking the administration with all my heart and all the very best.

“Thanking you most sincerely,

A. A. M., Ward 9, Dharwad City.”

The Cost of 24x7 Water

The capital cost—of delivering an entirely renewed distribution network and the initial 22,450 new connections with functioning meters complete with flow and pressure management—was Rs. 11,635 per connection, that is, about Rs. 1,430 per person served (US\$25). The costs of the management contract to deliver this dramatically improved service were Rs. 9,980 per connection or Rs. 1,225 per person. There is an ongoing maintenance cost of Rs. 8 per household per month as against the traditional average of Rs. 24 per month per household incurred by the utilities due to the high cost of valve operations and repairs.

Clearly, these costs are determined by the conditions of the existing infrastructure. There are suggestions that the cost of capital maintenance to deliver 24x7 supply in other cities could be as low as Rs. 4,500 per connection, where the system is relatively new, or where older ductile iron pipes remain in relatively good state and where consumer meters do not have to be replaced.

The cost of KUIDFC’s SIC strategy (Figure 2) was originally estimated to be Rs. 2 crore. By March 2010 it was estimated that 95 percent had been spent, giving a cost per connection of Rs. 850.

The original ‘willingness to pay’ survey undertaken as part of the World Bank project appraisal process indicated that, on average, households would be willing to pay an extra Rs. 125 (US\$2.80) per connection per month for a 24x7 service (even though very few people believed such a service to be possible). With the system in place and working, the higher-income groups, who were taken by surprise at the high amount of water they were using and therefore by their monthly bills, successfully lobbied for a reduction in the new tariff structure. It could be argued that a significantly enhanced service has not delivered actual willingness to pay higher tariffs; it may, however, be that this has been a temporary reaction while consumers adjust to better water use practices.

Managing Change Implementation

There are important lessons to be learned from the implementation of the demonstration project with respect to the implementation timeframe, availability and access to quality pipes and equipment, management of the transition to volumetric billing, and social intermediation and communications.

There has to be a more realistic time frame for the investigation period if best use is to be made of the existing distribution network. There is a difficult balance to be achieved in assessing the condition of the existing pipes, particularly relative to hydraulic design and the quality of existing household connections. It can be a false economy to expect to use too high a proportion of the existing network but it is also uneconomical not to use what remains viable.

At present, there is only limited availability of quality pipes, valves, meters, and other necessary goods in the Indian market. Similarly, there is a lack of professional contractors in the delivery market. Operators who have taken on the performance risk require sufficient freedom in their procurement of goods and works (important in structuring the management contracts) to ensure the quality needed to deliver the desired outputs. Acceptance of lowest cost tenders may not always be of benefit.

There will be resistance from some consumers, as there will always be some losers from the change process, even when they are in the minority. Key resistance in the demonstration zones came from higher-income households who had to now pay more for the large amount of water they had traditionally been using. Changing to volumetric pricing is a necessary process in water-scarce areas which has to be managed effectively. The demonstration project had originally planned to continue charging according to the existing fixed rates for a transition period before changing over to volumetric rates, allowing households to see the comparison and adjust their consumption patterns, before having to pay according to the new tariff structure. In the pilot town where this plan was followed there has been a better acceptance of the new tariffs. This parallel process is a key part of successful implementation.

There is a complementary lesson relating to household plumbing and the subsequent losses when continuous pressurized water supply is introduced. Plumbing which has been installed to meet the needs of low-pressure household pumps and tanks is likely to leak when the change to a high-pressure system is made. Although households are responsible for their plumbing, it is good practice to assist them in the changeover process. This requires the parallel billing already referred to above, as well as advice and guidance to households about capital maintenance of their plumbing.

Box 9: Social Intermediation and Communications: Bridging the gap

In 2005, a World Bank supervision mission for KUWASIP advised the KUIDFC to set up appropriate mechanisms to plan and implement communication activities under the project. This was seen as a vital element for the success of the project. Consequently, in September 2005, the Empowered Committee of the Government of Karnataka, the highest level of decision-making authority for Externally Assisted Projects (EAPs) such as the KUWASIP, passed a decision to set up a Social Intermediation and Communication Strategy (SICS) Cell within the KUIDFC for this purpose.

The SICS Cell was mandated to develop the communications strategy and implement it for the project. It was decided that the Cell would have three key professional staff members and NGOs who would be appointed in the three pilot towns to undertake communication activities at the local, town level. A budget of Rs. 2 crore was allocated to the Cell for

communication activities (approximately 0.84 percent of the total project budget). The Cell, along with NGO partners, planned the communication activities to be undertaken on a six-monthly basis, taking into account the key communication needs of the project's stakeholders vis-à-vis the stage of implementation that the project was under. The communication activities were undertaken at two different levels: at the grassroots level with key stakeholders in the three pilot towns (undertaken by the NGOs selected for those towns); and with other stakeholders (either at the local or state level, depending on the need perception of the SICS Cell members) at the SICS Cell headquarters (in Hubli-Dharwad) or in Bengaluru (the state capital). Between August 2006 and July 2007, communication activities undertaken by the NGOs in the three cities primarily centered on:

- Conducting baseline surveys with demonstration zone residents to identify issues of concern related to the project.
- Facilitating the formation of street-level and ward-level water users committees (WUCs).
- Raising the awareness levels of the citizens in the demonstration zones about the project.
- Intensive interactions with demonstration zone residents (through street-level and ward-level committees) on issues such as responsible water usage and related project issues such as volumetric metering and tariffs.
- Water and its relation with health and hygiene factors and general orientation and awareness building programs with other stakeholders—elected representatives, media, teachers, CBOs, NGOs, and other key stakeholders through street plays, workshops, seminars, and so forth.

Between August 2007 and January 2009, as improved water systems became operational, communication activities focused on addressing stakeholders' specific concerns, such as metering, tariffs, and billing. Between August 2008 and January 2009, the communication activities focused on emphasizing the costs and benefits of volumetric metering (for the consumers in the demonstration zones), reinforcing messages related to tariffs, metering, and encouraging responsible water usage, facilitating behavior and attitudinal changes (for consumers) around the issue of tariff recovery.

The intensive nature of the communication activities undertaken in these three towns in the above-mentioned period is evident from the aggregate number of the activities undertaken which ranged from 736 (in Hubli-Dharwad) to 850 (in Belgaum). In the same period, the SICS Cell focused on conducting workshops for the ULB officials and staff of the Karnataka Urban Water Supply and Sanitation Board (KUWSSB), orientation workshops for media personnel (including site visits, press meets, and so on); development, printing, and distribution of IEC material; training of NGO staff, as well as workshops, seminars, conferences, and site visits with a range of other stakeholders.

What Would it Take to Scale up 24x7 Supply?

KUWASIP has been a pilot project which has necessarily been burdened with relatively high overhead costs. In particular, the OC fees, the SIC Strategy, and the high levels of capital maintenance. The challenge is now to scale up this demonstration project, not only to the

remaining parts of the three cities but to other urban centers in India. It is already clear that 24x7 water supply is the expected benchmark. In response to the success of the demonstration projects, the GoK has committed Rs. 735 crore to achieve full 24x7 supply for the three cities in the demonstration project, with Rs. 360 crore for Hubli alone. This will be a grant requiring a 10 percent contribution from the receiving ULBs and a 50 percent investment by the OC who comes on board. The extent to which private operators can take the risk of their capital and operating costs being recovered through revenue remains an open question.

There are other 24x7 projects under way around the country linked to public-private partnerships. For example, there has been a significant follow-on demonstration zone experiment in Nagpur, Maharashtra, with 8,000 households now receiving continuous water supply with the significant comment that “standposts are out, house connections for all, and the poor have been the first to pay”, with only 30 percent mains replacement necessary. There are detailed plans to address the needs of the entire city sooner rather than later, through some form of hybrid afterimage/lease requiring a 30 percent capital contribution from the operator. This is an arrangement which is likely to be more common than the management fee used under KUWASIP which was designed specifically to demonstrate 24x7 water supply.

There is a risk that the desire for reductions in costs when scaling up might lead to a reduction in quality, both in materials used and in implementation, particularly the social intermediation. One solution is to require longer post implementation operating periods to ensure quality, with a performance bonus dependent upon ongoing success. This presupposes that operators consultants-contractors will continue to be employed to scale up the 24x7 process. At this stage of the reform it is critical to maintain significant incentives for world class performance, whether private or public, international or Indian.

In the KUWASIP project, the OC has demonstrated the degree of implementation quality, attention to detail, and the knowledge and competence in normal network management that is required to be successful. It will be critical for the success of the scale up that similar standards are achieved elsewhere. This will require the ongoing level of incentives, work ethic, and reputation risk traditionally associated with the private sector, even while the public apprehensions associated with private sector participation gradually diminish by demonstration of improved service levels.

An additional element of the KUWASIP project relates to sector 23 reform and the establishment of a State Urban Water Council with responsibility for performance monitoring and economic regulation of prices. In the final analysis, a 24x7 system is primarily an O&M initiative. Appropriate mechanisms are therefore required to incentivize efficient operations and service provision. The national Service Level Benchmarks is one such performance monitoring framework; its use will make it possible to develop a ‘league table’ of cities achieving and sustaining 24x7 continuous water supply, as a further incentive.

Conclusion:

Mission Accomplished or Mission Commenced?

It was suggested at the beginning of this Field Note that 24x7 supply delivers better quality water for public health, gives significantly better service to all consumers, revolutionizes service to the poor, converts household coping costs into resources for the service provider, reduces the burden on water resources, and enables radically improved efficiency of service provision.

In addition to demonstrating these benefits, the KUWASIP project has indicated a number of additional aspects to consider in the context of urban water sector reform.

Asset Management Planning

The KUWASIP demonstration project was built around advocacy for 24x7 supply but it is apparent that this is also synonymous with capital maintenance, that is, investing in ongoing renewal and replacement. This has served to highlight a much neglected aspect of service provision in India.

Move towards Accountable and Sustainable Service Delivery

Intermittent water supply has been a necessary form of rationing, similar to any product which is, in effect, 'free at the point of delivery'. This rationing has tended to be inequitable and nontransparent. Providing an improved service leads to satisfied consumers who begin to act as 'customers', willing to pay water bills regularly. Ad hoc allocation of intermittent supplies is replaced with user charge-based consumption, aiming initially at recovery of operating and some capital maintenance expenditures.

Catalyst for Utility Reform

It is not possible to deliver 24x7 water without a significant change in the management approach to consumers, to billing, and to revenue collection. These shifts can be seen as a move towards a reformed utility which is viable in the long term as it becomes ever more consumer and commercially oriented. The Karnataka demonstration project has provided 'proof of concept'—24x7 continuous water supply is as feasible in India as it is in the rest of the world. It delivers significantly improved, and valued, services to consumers, particularly to the poor, with perceived direct health benefits, reduced impact on water resources and improved revenue generation. In the context of long-term capital investment, it is affordable. Based on the savings in operational expenditure, increase in revenues, and improved health benefits, the payback period on the capital maintenance investments is just two and-a-half years.

So 24x7 water is possible but it requires commitment at all levels and over the long term. The World Bank makes the point that there has been a 15- to 20-year involvement with their client in Karnataka which has enabled them both to make the commitment to this demonstration project.

At the time of writing, there have been 44 submissions to the Government of India's Jawaharlal Nehru National Urban Renewal Mission which include '24x7 proposals'. The National Urban Renewal Mission is a critical source of funding as service providers seek support for this step change in their performance. At the beginning of this decade, the question was asked: "Is 24x7 water supply achievable?" It is appropriate to affirm that 24x7 water has proved to be achievable whilst also acknowledging that so far there has only been a very limited demonstration. The 44 proposals are stronger evidence that there is life beyond this demonstration project. The extent of the scalability of the concept now has to be proved.

The final and key question therefore is not whether but rather: "When will 24x7 water supply become the norm for urban India?"