



## Environment

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## Water Community



# Solution Exchange for the Water Community Discussion Summary

## *Strategy for Improving Urban Water Supply – Issue 4-Is 24/7 Water Supply Critical to Protecting Water Quality and Public Health?*

Compiled by [Nitya Jacob](#), Resource Person, [Sunetra Lala](#), Research Associate, and [Shweta Tyagi](#), Consultant

Issue Date: 16 December 2009

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From [David Foster](#), Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad  
Posted 7 May 2009

The quality of service in urban water supply in most Indian cities remains low, notwithstanding high subsidies and major investments in this sector. Leakage rates are high, most of the poor are not even connected to the water lines, and the rate of water borne disease is among the highest in the world. Furthermore, despite high subsidies, when coping costs are included (household pumps, storage, and treatment, as well as lost time), the real cost to the consumer for this water is often higher than in other Asian countries that offer significantly better service.

To overcome these problems many organizations have sought to increase the water supply available through water tankers and public stand posts. Others have focussed on Point of Use (POU) in-home treatment systems or sought to develop self-sustaining water kiosk systems where residents can purchase 10 litre containers of water at a nominal price.

### **The discussion process**

The pros and cons of a 24/7 water supply were discussed at the Water Community's Annual Forum held on 23-25 July 2008 (for more details please visit [http://www.solutionexchange-un.net.in/environment/resource/annual\\_forum\\_2008.pdf](http://www.solutionexchange-un.net.in/environment/resource/annual_forum_2008.pdf); PDF, Size: 600KB) and it was felt that the discussion should be taken up by the Community. The rich debates on the other issues have already covered the following topics:

1. "24/7 water supply requires too much water, encourages waste and would not be sustainable for most Indian cities." (You can read the interim summary at <http://www.solutionexchange-un.net.in/environment/cr/res-16020901.doc>; DOC, Size: 96KB)
2. "24/7 water is too expensive for India. The poor can't afford it and the rich don't need it." (You can read the interim summary at <http://www.solutionexchange-un.net.in/environment/cr/res-12030901.doc>; DOC, Size: 92KB)
3. "24/7 Water is Inequitable and Unfair to the poor." (You can read the interim summary at <http://www.solutionexchange-un.net.in/environment/cr/res-27030901.doc>; DOC, Size: 82KB)

We are now moving onto the fourth topic. We look forward to your inputs.

#### **Issue # 4: "Is 24/7 Water Supply Critical to Protecting Water Quality and Public Health?"**

**Background:** Rationing limited water resources by hours per day has long been attempted by cities throughout the world as a means of providing equitable allocation to both the rich and poor in urban areas. This approach, however, does not take into account the fact that higher income people have far more capacity to cope with intermittent supply in terms of in-home storage, pumping and treatment. Further, as households cope with limited supplies by installing suction pumps, this creates negative pressure within the water mains and draws in contaminated surface water and raw sewage through the myriad leaks in the water mains. As a consequence, even water that has been thoroughly treated at the municipal treatment plant will become contaminated during distribution. Finally, water stored in home containers is often subject to further contamination by vermin and improper handling.

Against this background, I request Community members to share their inputs on the following questions:

- What water quality and health effects are most commonly associated with intermittent water supply and who suffers the most?
- If local water boards properly treat water before sending it through the distribution system, why does that water become unsafe to drink?
- If there is water in the mains for only 4 hours per day, what is most likely in those same water mains during the remaining 20 hours of the day?

The results of this discussion will feed into the on-going policy debate at the Administrative Staff College of India and help us to develop a framework on continuously pressurized water supply for cities.

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#### **Responses were received, with thanks, from**

1. [Veena Srinivasan](#), Stanford University, USA ([Response 1](#)) ([Response 2](#))
2. [Kalyan Paul](#), Pan Himalayan Grassroots Development Foundation, Ranikhet
3. [Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi ([Response 1](#)) ([Response 2](#))
4. [Arun Jindal](#), Society for Sustainable Development, Karauli, Rajasthan
5. [Depinder Kapur](#), WASH Forum, New Delhi
6. [Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi
7. [Binukumar G.S.](#), Institute for Resource Analysis and Policy, Hyderabad
8. David Foster, Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad ([Response 1](#)) ([Response 2](#)) ([Response 3](#))
9. [Muhammad Jahangir](#), Fresh Water Action Network-South Asia (FANSA), Islamabad
10. [R. K. Srinivasan](#), Centre for Science and Environment (CSE), New Delhi
11. [Suman Swarup](#), Independent Consultant, New Delhi
12. [Dipankar Patnaik](#), Oxfam India, Lucknow
13. [G. Bhaskara Rao](#), APMAS, Hyderabad
14. [Rupa Mukerji](#), Intercooperation, Hyderabad
15. M. S. R. Murthy, Department of Population Studies, Sri Venkateswara University, Tirupati ([Response 1](#)) ([Response 2](#))
16. [Ramesh Jalan](#), United Nations Development Programme (UNDP), New Delhi

17. [Saurabh Singh](#), Inner Voice Foundation, Ballia
18. [Dharitri Patnaik](#), WaterHealth India, Secunderabad
19. [Jasveen Jairath](#), Water Sector Professional, Hyderabad
20. [Arunabha Majumder](#), Jadavpur University, Kolkata \*

\* *Offline Contribution*

*Further contributions are welcome!*

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[Summary of Responses](#)

[Related Resources](#)

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## Summary of Responses

In this concluding part of the discussion on the Strategy for Improving Urban Water Supply, the focus was on how 24X7 water supply is critical for public health and water quality. There is a debatable link between continuous water supply and health, even though the poor are not connected to the municipal water supply. Thus, while 24X7 water supply may mean better health for those connected to the water network, it may not have any effect on the health of people living in slums or unauthorized colonies. Until there is universal access to the municipal water supply system, there are unlikely to be any major public health benefits of 24X7 water supply.

The low pressure in the water supply system during the times there is no water supply sucks in dirty water or sewage that causes sickness at the users' end. This is especially true when the water mains or supply pipes pass through drains or near leaky sewers. This has happened in Hyderabad, and the city water board officials have admitted that sewage enters and contaminates the drinking water lines. As a result, 12 people died and 200 were hospitalized. This proves that when there is no water in the mains, they are likely to be filled with contaminated water or sewage.

One way to ameliorate the health effects of poor quality water is to provide households with a dual water supply system. This would help provide treated water only for drinking and cooking, and water of somewhat lower quality for other purposes. Some cooperative housing societies in Delhi supply drinking water in containers, while they provide water for other uses through the taps. In other cases, one pipeline carries the direct municipal supply, while another brings water from an overhead tank filled either from a tubewell or other source. This kind of differential supply would safeguard health, while ensuring continuous water supply. Dual plumbing needs some visioning on the part of planners, builders and residents.

The poor, though, may not be able to afford this kind of dual supply and often bear the brunt of water contamination. The solution is to test the quality of water in the taps, and also reduce pipeline leakages. The first will ensure quality; the second will keep out contaminants and reduce leakages when water is supplied round the clock. Another solution from Tirupati entails providing 20 litres of drinking water at Rs 5 to the poor; this can be expanded to other areas also. No amount of treatment at the municipal treatment plant can address contamination while water in transit, or even at the household level. The rich can afford household water storage and treatment through commercial means, but the poor cannot.

Reducing leakages from a 24X7 water supply system is critical, and this came up in this part of the discussion as well. Given the current state of urban water supply systems, where up to half

the water supplied from the water treatment plants, does not reach consumers, a 24X7 water supply system will increase the wastage of water manifold. Thus, the improvement of the distribution system by replacement, repair and renovation is imperative. This can work out much cheaper than replacing the entire water supply system. Further, it is easier to remove water supply pipes from drains (where they run through open drains) and repair leaking valves to prevent suction of contaminated water.

In Delhi, for example, there is large scale pilferage of water, categorized as leakage; here, the Delhi Jal Board suggested continuous water supply as a remedy for a problem that does not exist in the first place. If it only brought the pilferage down to 5-10 per cent, it would be able to provide continuous pressurized water supply. If these conditions are met, a continuous water supply system would keep out contaminated water from the system and also ensure the provision of drinking quality. Reducing leakages and pilfering would improve revenue collections for the municipality and offset the cost of repairs.

In many Indian cities, municipalities have realized providing household connections is cheaper than providing water through tankers or standposts. Cost recovery is also better. The poor opt for household connections on account of the time saved in collecting water, as compared to collecting water from public standposts or tankers. The poor also appreciate the savings in health costs from better water supply.

Domestic water accounts for less than 10 per cent of all water consumed. Increasing this even modestly can easily help cities maintain 24X7 water supply. Water consumption is likely to rise in the short term after commencing 24X7 supply, but will later drop as people get used to the new system.

Even though 24X7 is seen as an ideal situation that can provide quality water and control the health impacts of intermittent supply, there are many preconditions for its success. Foremost is reducing leakages to reduce the amount of water needed. Another is effective and telescopic metering to ensure financial viability of the scheme. Third is connecting the poor to the system so they benefit from improved water supply; this has implications for land tenure in cities. Finally, dual plumbing can help make the system more effective by separating water for drinking and water for other domestic uses.

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## Related Resources

### *Recommended Documentation*

**Hidden Cost of Free Technologies** (from David Foster, Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad; [response 2](#))

Article; India Water Portal;

Available at <http://www.indiawaterportal.org/post/2198>;

*Discusses the hidden cost involved behind providing 'free water' and why household connections are usually a much better way to provide water than public stand posts*

From [Dharitri Patnaik](#), WaterHealth India, Secunderabad

### **Leading the Blue Revolution**

Paper; WaterHealth India Pvt Ltd; March 2009;

Available at <http://www.solutionexchange-un.net.in/environment/cr/res07050901.pdf> (PDF; Size: 656KB)

*Highlights how WaterHealth India has created a blue revolution in Andhra Pradesh by providing safe drinking water supply in the rural areas of the state*

#### **For Donors**

Paper; WaterHealth India Pvt Ltd; March 2009;

Available at <http://www.solutionexchange-un.net.in/environment/cr/res07050902.pdf> (PDF; Size: 164KB)

*Explains the water purification flow process used by WaterHealth by which it has been ensuring drinking water supply to critical areas*

From [Shweta Tyagi](#), Consultant

#### **WaterGEMS Powers Design of Breakthrough 24-by-7 Water System in India**

Case study; Bentley Systems; October 2008;

Available at <http://ftp2.bentley.com/dist/collateral/Web/Haestad/MJP-DesignWaterSystem-0908-s.pdf> (PDF; Size: 388KB)

*A study on a water supply project in Badlapur, Maharashtra, discusses how 8 wards have been converted to 24/7 water supply system by hydraulically isolating operational zones*

#### **Will India ever get 24/7 water supply?**

Article; by Sahana Singh; Asian Water and Wastewater; July 2007;

Available at <http://sahanasingh.wordpress.com/2007/07/17/will-india-ever-get-247-water-supply/>

*Highlights the urgent need to upgrade urban infrastructure services in India in order to make 24/7 water supply a reality*

### **Recommended Organizations and Programmes**

#### **Pan Himalayan Grassroots Development Foundation, Uttarakhand** (from [Kalyan Paul](#))

Almora District, Ranikhet 263645, Uttarakhand; Tel: 91-59-66221516, 66222298; [apaul@grassrootsindia.com](mailto:apaul@grassrootsindia.com); <http://www.grassrootsindia.com/drinkingwater.html>

*Involved in spearheading community managed drinking water systems in the central and western Himalayas and devising strategies for improving water supply*

#### **WaterHealth India (WHIN), Andhra Pradesh** (from [Dharitri Patnaik](#))

No. 206, Ashoka MyHome Chambers, 1-8-301, S. P. Road, Secunderabad 500003, Andhra Pradesh; Tel: 91-40-67011709; Fax: 91-40-67011710; [infoindia@waterhealth.com](mailto:infoindia@waterhealth.com); <http://www.waterhealth.com/water-solutions/>

*Has initiated projects to create access to sustainable,, safe water supply to many people at affordable prices*

From [Shweta Tyagi](#), Consultant

#### **Mott MacDonald, Maharashtra**

44 Dr. R. G. Thadani Marg, Worli, Mumbai 400018, Maharashtra; Tel: 91-22-39810100; Fax: 91-22-24950539; [mumbai@mottmac-india.com](mailto:mumbai@mottmac-india.com); <http://www.mottmac.in/projects/waterandenvironment/demandmanagement/>

*Has been working on projects related to water and environment, and has been actively involved in the Mumbai-IV Urban Water Supply project*

#### **Maharashtra Jeevan Pradhikaran, Maharashtra**

Express Towers, 4th floor, Nariman point, Mumbai 400021 Maharashtra; Tel: 91-22-22025354, 22835247; [mstmj7@gmail.com](mailto:mstmj7@gmail.com); [http://www.mahajeevan.com/Program/24x7/247\\_Badlapur.htm](http://www.mahajeevan.com/Program/24x7/247_Badlapur.htm)

*Has worked to transform its intermittent water supply to Badlapur city, Maharashtra to continuously pressurised 24x7 water supply*

**Bentley Systems India Pvt. Ltd., New Delhi**

203, Okhla Industrial Estate, Phase-III, New Delhi 110020; Tel: 91-11-41614122; Fax: 91-11-41614128; <http://www.bentley.com/en-US/Solutions/Water+and+Wastewater/Case+Studies>

*Provides comprehensive software solutions for infrastructure development, also includes integrated solution for wastewater and potable water supply*

***Recommended Portals and Information Bases***

**India Environment Portal, Centre for Science and Environment, New Delhi** *(from Shweta Tyagi, Consultant)*

<http://www.indiaenvironmentportal.org.in/taxonomy/term/2150>; Tel: 91-11-29955124; Fax: 91-11-299-5870; [cse@cseindia.org](mailto:cse@cseindia.org)

*A portal on environmental issues initiated by Centre for Science and Environment, has a lot of useful resources on water supply both in the urban and rural context*

***Related Consolidated Replies***

**Strategy for Improving Urban Drinking Water Supply: Issue 1 - 24/7 Water Supply is Wasteful, from David Foster, Administrative Staff College of India, Hyderabad. Water Community, Solution Exchange India,**

Issued 17/09/09. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-16020901.pdf> (PDF, Size: 184KB)

*Seeks inputs regarding whether a 24/7 water supply encourages people to conserve water and if a well-managed continuously pressurized water supply system requires more water*

**Strategy for Improving Urban Drinking Water Supply: Issue 2 - 24/7 Water Supply is too Expensive, from David Foster, Administrative Staff College of India, Hyderabad. Water Community, Solution Exchange India,**

Issued 01/12/09. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-02030901.pdf> (PDF, Size: 202KB)

*Seeks inputs regarding whether a 24/7 water is too expensive for India - the poor can't afford it and the rich don't need it*

**Strategy for Improving Urban Drinking Water Supply: Issue 3 - 24/7 Water is Inequitable and Unfair to the Poor, from David Foster, Administrative Staff College of India, Hyderabad. Water Community, Solution Exchange India,**

Issued 03/12/09. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-27030901.pdf> (PDF, Size: 127KB)

*Seeks inputs regarding whether 24/7 water supply is inequitable and who will benefit from a 24/7 and fully metered water supply*

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**Responses in Full**

**[Veena Srinivasan](#), Stanford University, USA** *(response 1)*

I think David has mostly answered the questions in the background provided, i.e. negative pressure causes contaminated water/sewage to seep into distribution pipes rendering the quality unsafe for consumption, and intermittency benefits the rich who can afford the coping mechanisms and POU treatment.

So instead, I would like to respond with another question. Given that drinking/cooking water comprises only 5-10% of the total water consumed in a household, if we had to redesign urban water systems from scratch, without being constrained by dominant engineering/economic paradigms on the need for centralized control of water resources, pricing and quality, would we still pick the exact same design? Is it always most efficient/cost-effective/fair to centrally treat 100% of the water to potable water quality? Would different system designs work in different circumstances - dual plumbing, dual mains, street-level treatment, universal POU, anything? If so, what and under what conditions?

I have seen this argument of technological/infrastructure path-dependence come up in discussions, but without specific examples, and was wondering if there were some interesting thoughts in this community.

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**[Kalyan Paul](#), Pan Himalayan Grassroots Development Foundation, Ranikhet**

We have been involved with spearheading community managed drinking water systems in the central and western Himalayas for almost two decades and recently the Government of Uttarakhand has asked our organization to assist similar processes in hundreds of problem-villages.

Essentially, whether it is a village scenario or an urban set up, the main factor to resolve is the choice of technology. And, for this purpose, it would perhaps be a good idea to study urban water supply systems in some of the western European nations. Take Salzburg or Berlin or Neuchatel or Berne as an example. And, while doing so, let us not take the usual path of grudging these places to be small with minuscule populations. Our densely populated cities in India also need to be viewed as smaller boroughs, just like the existing divisions of the municipal councils.

Across our country, we have been blindly looking at surface flows and then trying to pump that water and treat it minimally for domestic supplies. Instead we could actually remove our blinds and look deeper and learn the latest ways of river bank infiltration technology. This would not only provide access to enhanced quantities of water, but also require minimal treatment, as nature would have ensured quality to a large extent.

It is amazing to watch water supply systems in Austria where the engineers feel it is absurd to treat water! And, they have managed to provide sufficient quantities of clean potable water on a daily basis. The fact is we need to realize that we need to be a learning-curve and then plan, design and implement decent water supply systems.

Of course, history may well say that in ancient India we knew about large scale water supply systems, but the point is that contemporary India needs to learn about appropriate urban water supply systems.

Hope these issues lead to some degree of contemplation, leading to building bridges with water engineers and town planners. If 50% of Indians are to live in urban areas within the next decade, then time is of essence as much as appropriate technology.

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**[Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi (response 1)**

Upon perusal of the details, it is a definitive assessment that a lot of importance is given to water for cooking, use in the kitchen, washing clothes, baths, toilet flushing, and then some lower-end

uses like washing hard floors, horticulture, and others. The order of purity is also the same; there could also be some others which can be slotted in. There are many housing societies in Delhi (a group of 100 to 300 flats) which have potable water lines in the houses, and some earlier ones have put up a kiosk (out-sourced) in the society to supply potable water to residents which is filled up in containers and used for consumption.

All these cost extra depending on the purity, reliability, and other factors. A similar situation also prevails with power security, the residents depending on the need, have gen-sets powered by diesel, kerosene, inverters, and others. In this case too the housing societies have their own gen-sets to supply power for lights, fans, etc.

All these are emerging urban services, and each facility comes in with extra costs for residents.

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**[Arun Jindal](#), Society for Sustainable Development, Karauli, Rajasthan**

In my opinion the quality of water is much worse in intermittent water supply than in continuous pressurized supply. In such cases wastewater from open drain leaks into the drinking water pipeline. Diarrhea and other water born diseases are prevalent because of stagnant water. The quality of water in the pipe line deteriorates and is not usable after a 20 hour period. It is more so in small and medium town.

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**[Depinder Kapur](#), WASH Forum, New Delhi**

The question has been placed in a manner that there can be no negative answers. Benefits of 24x7 water supply in terms of health outcomes are obvious. Yes there are health benefits of fully loaded water supply lines.

The question is - is this possible in the Indian context or not?

First, the question(s) is/are if this is feasible in terms of what financial cost for upgradation of existing urban water supply infrastructure? What are the estimates of investment needed to fix the current leaking lines? In Delhi and other cities we seek water mains being dug out every other year at the same point and work undertaken for many months. What is the cost of improving the current water supply infrastructure to provide for 24X7 water carrying capacity for Delhi?

Secondly, we are aware that as high as 30 to 50% of urban populations live in slums and settlements with no connectivity to water supply from the central utility. Hence the question that 24X7 will benefit in health outcomes is answered - that there will not be any incremental health benefits. What are the estimates of providing 24x7 water to the 1100 officially recognized slums of Delhi and 1900 unauthorised colonies of Delhi in terms of additional water supply infrastructure to cope with 24x7 supplies?

Thirdly, as the experience of the Delhi 24x7 water supply pilot project 2 years ago had shown, there are no clear estimates of water used and water lost. Different agencies have different estimates. Hence there is a lot of potential for going in for 24X7 water supply with incentives for the service provider or privatization for 24x7 supply to fix up and receive incentives that are not there on the ground to begin with. What are the estimates therefore of the reduction or saving in water lost for a city like Delhi? The larger question that was well raised by Parivartan for 24x7 pilot project for Delhi was that there is a large scale pilfering of water in Delhi that is categorized is leakage and 24X7 suggested as a solution to a problem that does not exist in the first place.

Hence while leaking pipes is part of the problem there is the problem of no clear estimates for improving leakages.

The issue therefore is not whether there will be improved health outcomes of 24x7, surely there will be. But at what cost and will it benefit the majority of the poor?

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**[Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi**

I would like to urge members to reconsider the sustainability conditions for 24/7 water supply to meet increasing demands for increasing multi-skyscraper laden habitats and call for ecological audit at all stages to ensure that 24x7 water supply remains an ecologically safe and socially equitable option with recharged aquifers, rainwater harvesting infrastructures especially in the metropolitan cities. Considering the peak oil production scenarios and in order to reduce the emission of green house gases, it is critical to ensure that petro-modern ecologically unsustainable habitats do not expand.

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**[Binukumar G.S.](#), Institute for Resource Analysis and Policy, Hyderabad**

Health, hygiene and sanitation are very much related to water availability. However, it does not mean that if there is adequate water that may bring proper sanitation and health. It is an attitudinal issue as well. Hence it is important to discuss the availability or duration of water supply and its impact on water quality and health.

In an urban community the elites are very lucky to have their own water storage tanks or facilities. Mostly the poor class is suffering. The recent issue in Hyderabad is very critical. The death toll has now reached 12 and more than 100 people are in hospitals. Unfortunately these people belong to the poor class. The problem occurred due to the contamination of sewerage into the water supply lines. For more than one month this issue was prevailing and consumers informed the authorities and they did not solve the problem with adequate attention. The Metro water board officials say that during non supply hours sewerage water leaks into the drinking water supply lines and it leads to contamination. That means even after treatment, the quality of the water supply cannot be ensured.

I think it may be a good practice to test the quality of water in the end taps and in adjacent taps before supplying water to the households. Most probably the water meters and non leaking supply lines will help to store water in water pipes to avoid contamination from sewerage lines and others and supply water for 24 hours. That may be a solution to avoid contamination and a way to ensure public health.

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**[David Foster](#), Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad (response 1)**

The latest calamity in the Bholakpur section of Hyderabad where 12 people have already died and 200 been hospitalized because of raw sewage being sucked into the water lines is a tragic reminder of the consequences of poorly managed water supply. [Binukumar](#), from the Institute of Resource Analysis and Policy in Hyderabad, has rightly pointed out that the poor suffered most from this tragic situation. I simply want to emphasize that this was an accident waiting to happen and that it is very likely to happen any time we combine intermittent supply with old leaky pipes. Odds are that it will happen more frequently in poor communities but it can really happen anywhere and anytime. As you recall, one of the key issues raised at the beginning of

this 4<sup>th</sup> and final topic on 24/7 water was: *"If there is water in the mains for only 4 hours per day, what is most likely in those same water mains during the remaining 20 hours of the day?"*

I believe that we now all know the answer to that question: The other 20 hours per day, those same water mains are likely to be filled with contaminated water and quite possibly raw sewage. Unfortunately, no amount of treatment or testing at the municipal treatment plant will prevent such an occurrence. This water likely became contaminated, as it does in most Indian cities, during distribution. Any system that pumps water intermittently for a few hours each day will tend to suck in the near by contaminated surface water and even raw sewage (whenever the water is turned off) through the myriad of small leaks that exist in all our systems. While it is true that the higher income people can reduce the risk of such contamination through in-home storage and treatment, the cost of such in-home coping systems are inevitably more expensive than a properly managed 24/7 municipal system. Frankly, one of the most important advantages of a continuously pressurized (24/7) system is not the added convenience but the fact that the continuous pressure does not allow for contaminated water to enter the system.

[Depinder Kapur](#), from the WASH Forum in New Delhi, also recognizes the value of continuously pressurized (24/7) water as a means to protect the health of the citizens but raises a very important question regarding the cost of such a system. As we discussed Cost at some length during the first few weeks of this discussion, I will only briefly review the main points here but invite the readers to revert back to our earlier discussion. While the exact cost of developing and maintaining 24/7 supply for all will vary from one city to the next, the one thing that is clear is that by far the most expensive water system is the one which seeks to perpetuate an old and leaky system of pipes which fails to provide adequate service to the citizens. These leaky intermittent supply systems only appear to be less expensive because we often fail to understand and account for the real costs such as:

- The real cost of water that leaks out during distribution, often 40 to 50% or more,
- The additional cost of the power to pump the water that only leaks out,
- The cost to the home owner who must cope with inadequate service by installing in-home storage tanks, pumps and treatment systems, (all to compensate for the poor service), and
- The cost to the poor of having to spend hours each day getting water from public stand posts and tankers because they have no household connections.

Depinder also raises a very legitimate question regarding the 30 to 50% of the population who live in urban slums and are not connected to the water lines. He is absolutely right that improving the service for the rich while leaving these people without connections would be most unfair. Fortunately, the city of Vijayawada and many other cities in Andhra Pradesh and elsewhere in India are now learning that providing household connections is actually less expensive both for the city and for the BPL population than providing "free" water through public stand posts or tankers. When these families were given the choice of "free" water at a public stand post or having a household connection that required a monthly water bill, in almost every case even the BPL families chose to have household connections because they recognized the value of their own time. Furthermore, the cities now get additional revenue for the water they provide and in most cases they also see a reduction in illegal connections whenever they make it easier for citizens to obtain legal connections.

Additional evidence proving that properly managed 24/7 water supply is affordable and feasible comes from the fact that Phnom Penh, Cambodia as well as many cities in Africa already have adopted 24/7 supply precisely because it is more efficient. These cities, like New Delhi, also previously had serious problems with theft and leakage. At this time we have seen no evidence that Indian cities are less capable of reform than are their Asian and African counterparts. In addition, while many are legitimately concerned that India is too poor to afford 24/7 water

supply, I will suggest that one of the reasons that many in India are poor is precisely because the current intermittent supply systems are too expensive.

[Muhammad Mukhtar Alam](#), from the Centre For Ecological Audit, Social Inclusion and Governance, New Delhi; although not disputing the health benefits of 24/7 water, also raises important concerns regarding the sustainability of a 24/7 system. In this case he is primarily concerned about the ecological impacts. Those of you who have followed this discussion from the beginning, however, know that while the typical intermittent supply system in India loses 40 to 50% of the water during distribution; a properly managed continuously pressurized 24/7 system often requires less water not more. We have repeatedly given examples of cities in Europe and Asia that provide safe sustainable and affordable 24/7 supply with only 150 LPCD (liters per capita per day) while many cities in India produce far more water per capita only to waste it through poor management and provide only 4 hours (or less) per day. In addition, we have also previously given examples of why 24/7 supply actually reduces the total energy requirements because most homes would no longer require pumps in the home to provide adequate service. Achieving efficient service, however, does require: leak detection and repair, working meters and appropriate tariffs, efficient billing and collection, as well as good governance and public awareness. When properly managed a 24/7 system can be expected to be significantly more ecologically sustainable than they typical intermittent supply system.

[Arun Jindal](#), from the Society for Sustainable Development, Karauli, Rajasthan; has also observed that water quality associated with intermittent supply is significantly worse and the incidence of diarrhea significantly higher when water is supplied intermittently because contaminated water is frequently sucked into the water supply system.

[Veena Srinivasan](#), from Stanford University in the U.S., has raised an important question, dealing with the possibility of having two separate water supply lines, one for potable water, and one for non-potable. Unfortunately, most cities have found that the cost of installing and maintaining two separate water lines far exceeds the cost of having to install and maintain only one line even though they do have to treat a larger quantity of water. We would be interested to know if Veena can help us identify any city in the U.S. or elsewhere that has found dual water lines to be a practical solution.

[Kalyan Paul](#), from the Pan Himalyan Grassroots Development Foundation, raises yet another idea for dealing with water contamination. Kalyan points out that many Austrian and German cities are able to obtain pure water from mountain areas with no additional treatment required. While this may be true even in some mountain areas of India, not only are many of our cities in India far removed from these pristine mountain water sources but the problem that confronts us is more often the need to keep the water pure while it is being distributed. Unfortunately, even water from the purest Himalayan stream will likely become contaminated if it is subjected to the problems of intermittent supply, leaky pipes and poor maintenance.

Interestingly, in a separate comment regarding the Himalayan region from Prem Mahant, there were also concerns relating to problems of high silt content from some Himalayan streams after heavy rains. In this latter case I would suggest that consideration be given to the use of the "Uttranchal Coop" a device developed in Dehradun which obtains water from beneath the stream bed and minimizes the problems of silting and surface contamination.

Finally, in a note from [Ajit Seshadri](#), from the Vigyan Vijay Foundation, New Delhi comes the comment that many housing societies in Delhi provide additional services (for an additional cost) including gen sets, potable water, etc. to assist residents in coping with the fact that the capital city does not currently provide these services in a reliable fashion. While it is admirable that some societies are now providing these services, this still seems like an inefficient duplication of

services that could be provided by the Delhi itself and in fact are provided in most other capitals in Asia.

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**[Veena Srinivasan](#), Stanford University, USA (response 2)**

No, I cannot provide examples of cities which have two sets of pipes because of course there aren't any - but that wasn't my suggestion. Dual plumbing is not the same as having two sets of piped mains. In-building dual plumbing is something that is fairly common (sort of) in buildings in India.

From sketching plumbing in buildings in Indian cities (in the course of household surveys) I found that many buildings maintain a separate set of pipes from the overhead tank to kitchens and bathrooms. It is not inconceivable to think of end-of-pipe treatment for the in-building pipes connecting the kitchens. I have only seen a hand full of buildings (in peri-urban Chennai) with full-scale dual-plumbing and it was perfectly economical for those particular builders to adopt that strategy.

Right now the only two options being discussed are 24/7 or intermittency with poor quality. I am just trying to point out there may be other alternatives. While this particular solution doesn't address the problem of water quality to the poor, other end-of-pipe/street/distribution-station level solutions may be.

I don't disagree with the rest of the points in favour of 24/7.

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**[Muhammad Jahangir](#), Fresh Water Action Network-South Asia (FANSA), Islamabad**

Asking for 24/7 water supplies in South Asia is asking for too much particularly at places where the provider can hardly supply water for 2 hours a day. However, this could be supplemented by having metered supply which can be implemented at some place. Billing could also be transformed into a slab system and could be higher after a minimum use level of 30 litres/person/day for an average five member family.

To me quality concerns could be addressed by having filtration plants (treatment) in the city and hand carrying of drinking water for the family. Again this solution is not without hiccups, as our experience reveals in Pakistan. This is being done under clean drinking water for all (CDWA). If you agree we could use these learnings from here.

Changing water pipes and supplying clean water at the consumer end is a far cry. Especially in big cities with congested area, it will necessitate changing several thousand kilometres of water supply lines. By the time we change the last point the starting point pipes will have gone old.

Another point of mixing dirty water which has been overlooked is the distribution valve at the start of every street connection. This is used to open/close water supply for the street. These valves mostly leak from the spindle due to faulty packing, the chamber fills with dirty water, which is sucked and released at the start and stop of an intermittent supply. Care on the gland packing of these valves is likely to solve half of the problem.

I should be pleased to elaborate any point if need be. Thanks for this lively, much needed discussion.

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**[R. K. Srinivasan](#), Centre for Science and Environment (CSE), New Delhi**

In Delhi there is a dual pipeline system - one for fresh water supply and the other for 'raw' water (treated sewage from the Okhla STP) which is supplied for horticulture purposes in the NDMC area and a few other localities in Delhi. The first dual water supply system in the city was introduced by the DDA in Dwarka and Bakarwala. Such a system also existed in some parts of Lutyens' Delhi for years, but it was never meant to be a solution to address water shortages. This was set up as the Yamuna got polluted and the 'raw' water used for horticulture purpose in Lodhi garden has an odour.

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**David Foster, Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad (response 2)**

Muhammad Jahangir from the Fresh Water Action Network - South Asia (FANSA), Islamabad, has raised some serious concerns regarding the feasibility of providing 24/7 service in South Asia. As he correctly says, it is not simply a matter of turning on the water 24 hours per day but miles of pipelines would have to be repaired and in many cases replaced in order for continuously pressurized (24/7) service to be provided. What he fails to mention, however, is that repair and good maintenance (including 24/7) service is actually far less expensive than perpetuating a system of leaky pipes that daily waste and contaminate millions of gallons of water.

While many readers are frightened of the cost of such repair, for some reason those same readers seem to ignore the high daily cost of postponing those repairs. Not only is 50% or more of the water often being lost due to the current sad state of water in India and in Pakistan but most of the power being used to pump that water is being wasted as well.

Furthermore, I have also had the opportunity to visit water distribution systems in both India and Pakistan and I assure you that the current water supply problems in both countries are far more serious (and expensive) than mere "hiccups". While it is true that the system of city run filtration plants and allowing people to "hand carry" the treated water to their homes in Pakistan can provide safe clean water (as do many similar kiosk systems in India), if we put any reasonable value on the time of the people involved it soon becomes obvious that hand carrying of water is far too expensive (even for the poor).

Yes, it is true that there is a lot that India and Pakistan can learn a lot from each other in this area and yes it is true that Pakistan has developed some efficient treatment systems. What now needs to be done is to begin seriously evaluating alternative delivery systems as well. Based on our experience at ASCI as well as the experience of the Asia Development Bank and Water and Sanitation Program for South Asia, the most efficient means of providing safe, sustainable and affordable water is through a system of well managed continuously pressurized (24/7) pipes complete with effective demand management (including meters, appropriate tariffs and efficient billing and collection).

I would be very pleased to visit Pakistan again and to review any financial data shows hand carry systems to be less expensive than well managed piped systems but I would also encourage any readers who fear that piped water is too expensive for the poor to check out the following web site regarding the "Hidden Cost of Free Water": <http://www.indiawaterportal.org/blog/2008/02/09/on-the-hidden-cost-of-free-water/>

Finally, please understand that I am not suggesting that converting a city from intermittent supply (a few hours per day) to 24/7 supply. What I am saying is that based on thorough study of the situation in cities throughout Asia (including countries from Pakistan to Indonesia) is that a well managed 24/7 system is both safer and cheaper and requires no more water than the typical 2 hour per day system. If, however, anyone of our readers can identify for me a safe sustainable affordable system providing intermittent supply please let me know and I will try to visit it as

soon as possible. In the meantime, however, I respectfully suggest that the often heard claims about "24/7 water being too expensive for South Asia" just don't hold water."

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**Suman Swarup, Independent Consultant, New Delhi**

Improvement of the distribution system by replacement, repair, and renovation of old worn out water pipes in a time bound manner is imperative, and has been deferred in most cities, including Delhi, for years. Improvements in water quality and 24/7 water supply do not seem possible until we squarely accept the need for this. For too long only some patchwork has been done in this regard. Serious investment through public-private partnership in improving the distribution networks is called for. This investment, although huge, will lead to reduction in expenditure in other areas such as health environment, saving of water resources and for homeowners and other users.

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**David Foster, Centre for Energy, Environment, Urban Governance and Infrastructure, Administrative Staff College of India, Hyderabad (response 3)**

I would like to thank [Veena Srinivasan](#) and I am sorry for having misunderstood your suggestion. I think that you are right to be on the lookout for alternatives and in many special cases they do make sense. In some situations it can be efficient to have a separate pipe system to carry "gray water" to be used for watering gardens or washing cars. In other situations people may have storage tanks for rainwater harvesting.

What we are trying to avoid, however, are those situations where cities engage in false economies by failing to provide adequate service (including quality, quantity, hours of supply and pressure) only to pass far greater costs on to the consumer by forcing those consumers to adopt expensive coping strategies (including in-house storage, pumps, and treatment systems). In almost every case, for example, end of pipe treatment at millions of private households cost far more than proper treatment and maintenance by the municipal water system.

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**Dipankar Patnaik, Oxfam India, Lucknow**

While I second the suggestion of dual plumbing- I have to admit that such activities need some visioning on the part of our builders and the residents. Having lived in Chennai for a long time I am aware of the dual plumbing scenario. We used to get drinking water from the Corporation and the water for other chores was attained either through borewells or through hired tankers. The paucity of drinking water (availability and quality) in many areas forces people in Chennai to resort to such measures. So much so, that many apartments have separate sumps for drinking and other water storage.

Adding to the discussion and the need for effective distribution of safe water for drinking it would be prudent to stress on a source containment of the water, which is the end user takes it upon him/her to safeguard the water. While not negating the efforts of the government in providing us with better quality of water, it would be unwise to leave the onus entirely on our public authorities. Hence, it would be good to invest in dual plumbing for residential townships and housing societies.

Given the welfare nature of the government initiatives and the speed of delivery, we are looking at a future where most of the housing at affordable rates would either be developed by property developers or the government. In such a scenario it would be wise for the residents to employ dual systems of piping to enhance source containment and monitor quality at the end user level.

The rest of the individual houses can follow with good awareness drives and effective enforcement of laws.

Pressurized systems call for strong monitoring systems which although not so expensive these days are still monitored by us in the end. Allowing the entire responsibility to rest with the authorities is like shying away from the reality and the need for better governance and accountability. Water is the elixir of life for all and the sooner we start planning for its effective management the better.

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### **G. Bhaskara Rao, APMAS, Hyderabad**

I am sorry for not contributing to this very important discussion earlier. I feel that the supply of water in adequate quantities is essential. In the absence of such supply the consumers would resort to expensive coping strategies. It is sheer wastage of national resources like water, electricity and human health and time. In these coping mechanisms, the poor pay a heavy price in terms of time and health and get poorer service. 24/7 supply is conceptually easy to ensure equitable distribution of water. Thanks to David Foster for initiating this discussion.

In terms of water requirement, there should not be any problem. I do not have the latest figures but I recall a few years old macro data on water resources. Out of the total harvested/used water in the country less than 10% is supplied for domestic use. It can easily be increased to more. I am aware of the competing demands on water. With that knowledge I am stating that water supply could be increased for domestic use without any adverse effect on other sectors. My information also suggests that we are not supplying the prescribed quantity of water per family. To sum up, we have to allocate more water for domestic use in order to supply the prescribed level water. I feel that the quantity of water would be sufficient to maintain 24/7 supply. 24/7 supplies also reduce the operational cost of the service provider, as they can remove an army of field workers, who are employed to turn on and turn off the sluices in different locations.

However, there are significant operational problems. I agree with David Foster that the quality of infrastructure needs to be improved whether we introduce 24/7 or not. But I will disagree with David's point that with 24/7 supplies, we need relatively smaller infrastructure. One simple reason is that with 24/7 supply the water consumption would go up at least in the short run. Secondly in the present 'intermittence supply' system the entire pipe network is not just used for few hours a day and left unused for the rest of the day. In fact over 70% of pipe network carry water 24 hours a day in a city like Hyderabad. Only different locations/colonies are supplied water for different time periods. Within each location, different streets are supplied water at different periods. This staggered supply of water enables the service provider to maintain pressure for each location at least for sometime, even though the total quantity of the water supplied is significantly less than the required quantity. In fact 24/7 supply requires larger infrastructure and complex design. I feel the investment required for 24/7 is not too large. With proper management, such investment can be 'financially viable' (as in Paris cited by David Foster). The economic and social benefits of 24/7 supplies warrants state subsidy as well.

Regarding the health issue, just by maintaining the pressures, we can not ensure the quality of water. Water gets contaminated if contacted with impurities. Groundwater gets contaminated when the impurities leach into it, not because of vacuums in it. What is required is quality infrastructure to ensure the quality of the water supplied.

Regarding dual pipelines, an expert told me long ago, that gray water spoils pipes quickly. It is cheap to supply treated water. When the household get two types of water, they always tend to use the better quality of water for as many purposes as possible.

In Hyderabad, some apartments have the provision of two pipes. One for municipality water and another for bore water. The municipality water pipe is normally not in use because the municipal water never reaches the apartments. The building management has to pump the water to separate overhead tank and supply to the apartments. The overhead tank maintenance is a big issue. Normally there would not be enough municipal water to maintain 24/7 supply from overhead tank. If there is such a supply, households tend to use that water for many other purposes as well. What I have seen in Hyderabad is that households, that have 24/7 bore water supply from overhead tanks collect municipal water from the ground level taps and use it for drinking and cooking. If we are so conscious about drinking water it may be better to supply drinking water through bottles as currently being done in many places.

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**Rupa Mukerji, Intercooperation, Hyderabad**

I have worked in Bangalore under a donor assisted water supply and environmental sanitation master plan project and realized that while a 24/7 supply is an attractive technical solution, until access issues are sorted out it will not lead to public health benefits. The middle and upper income households have already invested in dual piping, plumbing and household purification devices, which are sunk costs. The poor lack access to the network, space, and resources to invest in any of these.

For universal access to clean drinking water we need locally suited pragmatic solutions – access to chlorination or other low cost purification options at the consumer end rather than at the supply end, which is unreliable and prone to much contamination – if not in the pipes then in collection and handling. Distribution of chlorine tablets is anathema to utilities or donors as it indicates failure of a piped system but in the reality of Asian cities may actually be a solution that works. Every pan shop (kiosk) could become a public health agent replenishing water purification kits (a chlorinating sipper/ tablets) of any person or household. Being cheap and freely available, it will prevent the growth of an underground market. However, there are also big stakes in large engineering works. Choosing a second best option requires political courage.

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**M. S. R. Murthy, Department of Population Studies, Sri Venkateswara University, Tirupati (response 1)**

I visited Gannavaram near Vijayawada, Andhra Pradesh which has a water purification plant, promoted by a politician philanthropist. Here, twenty litres of purified water costs Rs.1.50 after an initial payment of Rs. 150. Another additional 20 liters costs Rs. 5. This is a novel scheme. One has to study such schemes to be able to implement them in other cities.

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**Ramesh Jalan, United Nations Development Programme (UNDP), New Delhi**

It will be very interesting and important to obtain further techno-economic details on the process being used for water purification in Gannavaram, Andhra Pradesh where 20 liters of purified water only costs Rs. 1.50. It is indeed a novel scheme. I request [M.S.R. Murthy](#) to provide further details about the same.

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**Ajit Seshadri, The Vigyan Vijay Foundation, New Delhi (response 2)**

It is very encouraging to note that potable water is available at an affordable cost. However, the cost mechanism was not explained clearly by M. S. R. Murthy and I request him to provide more details regarding the costing methodology and the working mechanism for the system.

Certain rural areas which do not have access to electricity but are otherwise rich in water resources and such areas can process the same to offer affordable potable water using Solar PV-powered Aqua-guard type processes. If more cost is affordable, then these areas can also consider RO Systems (the rejected water to be used for lower-end uses) which work on solar-powered systems. Rural areas will draw more benefits from renewable energy technologies which can provide them affordable power for pressing needs, and improve the quality of life.

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**M.S.R. Murthy, Department of Population Studies, Sri Venkateswara University, Tirupati** (*response 2*)

The water purifying plant in Gannavarm Town near Vijayawada has been conceived by the present local MLA, Dasari Balavardhana Rao (his firm Vijay Electricals) in association with Satyam Computers, and the Naandi Foundation. Initially microorganism free water is supplied at Rs.1.50 per 20 literes. They are planning to supply RO water at Rs.5 for 20 liters. I will provide more details soon.

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**Saurabh Singh, Inner Voice Foundation, Ballia**

I request M.S.R. Murthy to please provide us with information regarding any kind of contamination at the water purifying plant near Vijayawada.

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**Dharitri Patnaik, WaterHealth India, Secunderabad**

The example given by M.S.R. Murthy about the water purification plant in Gannavaram, Andhra Pradesh has been installed by WaterHealth India and is in operation since May 2007. WaterHealth operates and maintains these systems. I have attached information about WaterHealth. For more information please read <http://www.solutionexchange-un.net.in/environment/cr/res07050901.pdf> (PDF; Size: 656KB); <http://www.solutionexchange-un.net.in/environment/cr/res07050902.pdf> (PDF; Size: 164KB), and <http://www.solutionexchange-un.net.in/environment/cr/res07050903.ppt> (PPT; Size: 2.18MB)

WaterHealth India (WHIN) is a 100% subsidiary of WaterHealth Inc. WaterHealth India works with its network of technology and business partners for development, deployment, and maintenance of cost-effective water treatment solutions to customers/partners that can provide people with potable drinking water meeting international WHO standards at an affordable price. WaterHealth Centres (WHCs) are distributed, decentralized facilities for purifying water, and are quick, easy, and inexpensive to set up. WaterHealth India builds, operates, services, and maintains the WHC's and monitors quality for sustained supply of drinking water. WaterHealth India is presently operational in Andhra Pradesh, Gujarat and Maharashtra with installations in over 230 villages (WHCs) and another 100 under construction. WHIN owns water quality labs which test water samples from WHCs regularly. WaterHealth India's product portfolio includes products that can be used for treating specific type of contamination that are prevalent in various parts of India including fluoride, TDS, etc.

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**Jasveen Jairath, Water Sector Professional, Hyderabad**

I have the following remarks on the availability of financial resources: it is a question of priorities. If much larger amounts are made available for flyovers/raised metros/larger irrigation projects with holes for leakages, etc a smaller amount for replacement of pipes can certainly be made possible. I feel this issue should be delinked from 24/7 supply. Whichever position we take, no one can justify perpetuation of old dilapidated pipes and money can be and should be found for

this by the state. The scarcity of financial resources is a political argument that is often offered by the bureaucracy to hide its inefficiency and corruption.

Depinder's second point is highly pertinent - if make a plea for 24/7 on the basis of potential health benefits, how do we justify investing in a system that is beyond the reach of those who suffer maximum from water borne diseases? Who can demonstrate the health benefits of 24/7 water and where are the plans for slums to access 24/7 water? It amounts to using the poverty predicament of those at the bottom to legitimize investment in infrastructure that will be beyond the reach of those in whose name it was undertaken. It is time we unpackaged these arguments.

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**[Arunabha Majumder](#), Jadavpur University, Kolkata \***

In intermittent water supply, there is risk of supply of contaminated water at certain consumer points. Mostly the the supplied water through the consumers taps are bacteriologically contaminated. The risk of receiving bacteriologically contaminated water is more during initial 15 minutes of water supply. So one may avoid drawing water from a direct supply tap for drinking during initial 15 minutes of supply. In intermittent water supply there is risk of diarrhoea, dysentery, gastro-entries, infective hep. A, inf. hep. E, etc. Water quality monitoring and surveillance programme need to be undertaken to minimise the risk of contamination of water supply. In addition water safety plan need to be drawn to keep the water supply system free from threat of contamination.

\* *Offline Contribution*

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***Many thanks to all who contributed to this query!***

*If you have further information to share on this topic, please send it to Solution Exchange for the Water Community in India at [se-wes@solutionexchange-un.net.in](mailto:se-wes@solutionexchange-un.net.in) with the subject heading "Re: [se-watr] Query: Strategy for Improving Urban Water Supply – Is 24/7 Water Supply Critical to Protecting Water Quality and Public Health?. Additional Reply."*

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