Alternatives

Safe Drinking Water for All

Imagination is more important than knowledge
—Albert Einstein

We received tremendous response to our call for '*Alternatives*' on access to fresh water. We could not accommodate all the discussions in the '*Alternatives*' section published yesterday. Some of the remaining write-ups are published hereunder, and others, we regret, may not be accommodated further due to space constraint.

Harvesting Rainwater in Bangladesh

by Dr Mahfuzul Haque

DURING my last couple of visits to the Maldives, I saw with great surprise, how an island nation in the midst of nowhere managing its scarce resources, like water for all purposes — from washing to drinking. Modern Maldivians import drinking water all the way from Singapore. They have desalination plants as well, which are petty expensive.

In order to thwart invasion of saline water, they tried to pump ground water from these coral islands. The water was dark and a bit smelly. It was mainly used for washing purposes. Maldivians have modernised the age-old indigenous practice of harvesting rainwater.

Techniques are very simple. They attach a water pipe with the roof. With the first monsoon shower, they wash the roof-top by allowing the water pipe to different outlets. During subsequent rains, they harvest all rainwater in an underground reservoir. This sweet water is used for drinking and washing purposes only.

In this way they store a plenty of sweet water minimizing the need of desalination plants. Every house in the Maldives has the in-built mechanism of harvesting rainwater.

In Bangladesh, when we have rain fall causing floods during monsoon, can't we collect the rainwater in reservoir for our bad days. In earlier days, we used to have plenty of large ponds [*Dighis*] to collect run off water. These ponds were a great source of income as they used to give dividends in the form of fisheries. In many parts of Bangladesh, old *zaminders* used to dig ponds for the benefit of their subjects. Today very few ponds are left for public use. Poor people's access to the "common property resources" has decreased a lot.

With the quantity, quality of water is also fast deteriorating. Arsenic is the latest menace. Increased presence of arsenic in tubewell water is causing serious illness. Villagers themselves are now confused. In earlier days, they were told to use tubewell water for drinking purposes. Now, after the spread of arsenic they are told not to use the water and rather advised to use river or pond water after due purification. Agro-chemicals and open air defecation play an important role in contaminating the waterbodies. As we move towards the use of more surface water, leaving scarce ground water, we are to sustainably harness this resource. More reservoirs, in the form of big ponds, limited use of agro-chemicals, promotion of Integrated Pest Management [IPM], health and hygiene education will help reduce increased dependence on ground water.

We are to act fast before it's too late. For irrigation, we are to depend more on surface water. Dependence on ground water has to be lessened. Something has to done rather quick. Better, why don't we ask the people, the water users' group, what do they think? Consultation process has to be a "bottom-up" one. People at the grass-roots are to be consulted on how do they intend to sustainably manage the scarce ground water resources. Let's understand the value of ground water and go for more surface and rain water.

The writer is Chief Instructor, Academy for Planning and Development

Containing Arsenic Contamination

An NGO Initiative

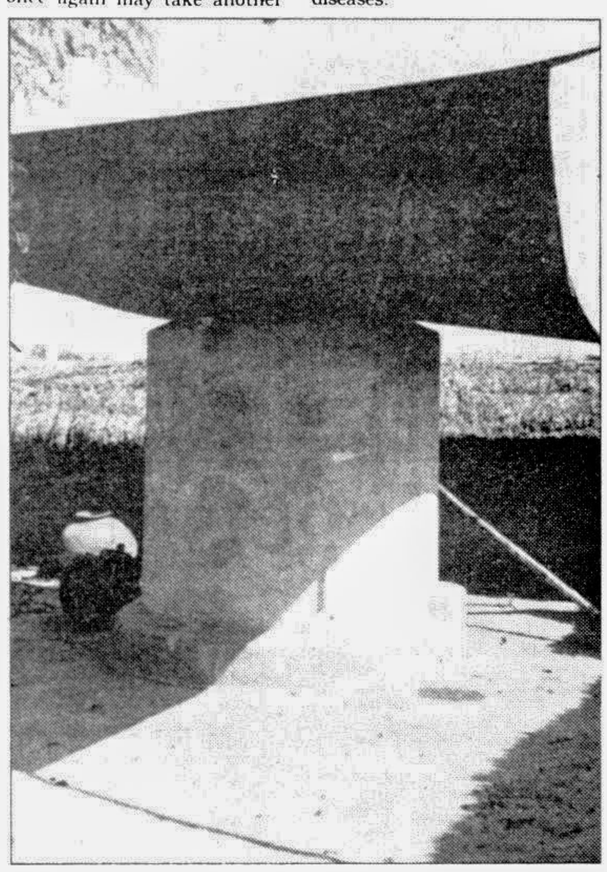
by Sanchia Nishat Chowdhury

NGO Forum's present initiatives in tackling the arsenic situation are immediate and temporary measures. It is also working with different, more permanent, surface water treatment methods, such as pond sand filtration system, rain-water harvesting, and others, which are safe from arsenic.

MORE than 90 per cent of the people of Bangladesh get their drinking water from the million plus tube-wells that were installed for the anti-diarrhoea campaign to reduce water borne diseases. Now several are dispensing arsenic laced water with the result that many people are no showing signs of arsenic related diseases. This situation has accelerated in the past two years to a degree such that currently 44 districts of the 64 in Bangladesh are affected by arsenic, and 220,000 people, as of June 1998, are supposedly at risk. Arsenic is a metalloid substance that is commonly found in ground water, and is being spread through the use of deep tube-wells, which have been targeted as the origin of chronic arseniasis. The shallow tube-well waters in some areas of Chandpur, Barisal, Jessore, and Kushtia are heavily contaminated with arsenic ranging from 0.01mg to 3.0 mg per litre. The waters of 56 per cent of tube-wells are above the World Health Organization maximum tolerable limit of 0.05 mg/1. In these areas, the intensely contaminated tube-wells have been sealed by the Department of Public Health Engineering without giving them an alternate safe drinking water facility.

Concerned organizations have, over the years, encouraged the use of pump technologies for safe ground water access. The rationale being this emphasis was that ground water was affordable, and close to the community. Groundwater was also safe from pollutants and biological contamination. However, the start of the Green Revolution in the 1970s, saw the demand for excessive amounts of water for agricultural use to feed the growing population. This, in turn, meant an increase in the installation of tube-wells, both power and hand driven, and enormous quantities of water were being drawn out from various underground sources. While the amount of water being lifted for drinking purposes is recharged naturally, the recent intensive pumping out of water for other uses has brought the underground arsenic into the tube-wells and pumps. Noted specialists have expressed their opinion regarding the cause and effect of the arsenic laced water being spread through the ground water, via tube-wells and pumps, emphasizing the severity of the contamination.

Since the threat of arsenic is still relatively new, the community is unaware of the arsenic situation and the threat it poses. They refuse to believe in the presence of arsenic, because most have not yet been afflicted with the symptoms of arseniasis. The only people cognizant of this vital information are at a loss what to do. A programme of information dissemination has yet to be undertaken, and steps to inform the people, and take measures to combat the situation, are only in the beginning stages. Those whose drinking supply have been tested and know of the arsenic contents turn a blind eye to it. While there is no substitute remedy available, the people have no choice but to drink the contaminated water. In most cases, there is no availability of safe water. Few eat fresh fruits and vegetables in the hope that the nutrition will lessen their susceptibility to arsenic diseases. But most of the poor folk in the villages cannot even utilize this measure. Until an alternate is suggested, the people will continue to drink arsenic laced water.



NGO Forum, in its principle role of advocating for safe water, is embroiled in the middle of this dynamic issue. It has been targeted as the country's chief patron of the NGOs dealing in water supply and sanitation. Its programme of encouraging the installation and use of tube-wells, and pumps for safe water which are dispensing the contaminated water, has come under public scrutiny. The Forum faces the dilemma of whether to seal off the tube-wells, thus exposing millions of people to the risks and hazards of diarrhoea from unsafe water, or to implement a system of purification, yet unknown, the technology for which may both be impractical and expensive for the rural masses. Over the past decade the people were taught not to drink pond water, which was very harmful and unsanitary. The installation and use of tube-wells were enforced. Habituating the people to drink tube-well water was the result of a long and arduous process, getting them to change once again may take another decade which would prove to be too long.

NGO Forum is attempting to deal with the situation, the best it can. It is supporting its partner NGOs in undertaking the biennial testing and inspection if its tube-wells, and where arsenic levels exceed the WHO safety levels of 0.05mg/1, the targeted tube-wells, are marked.

In addition, testing is also undertaken during the installation of new tube-wells, and where there is a probable risk of arsenic contamination, plans for installation are abandoned. Marking the tube-wells was a more viable alternative than a complete seal-off, for, while these wells cannot be used for drinking or cooking, they can be used for other purposes.

However, this also poses a problem. Almost 100 per cent use of tube-well water is for drinking and cooking purposes. These is little effect of telling the people not to use their chief source of water for internal use, while at the same time not being able to suggest the substitute. It is this search for substitute methods of obtaining water which is hindering the Forum and its partners' work.

In its role of familiarizing the rural folk with the arsenic situation, NGO Forum has incorporated arsenic issues in its regularly conducted training courses' agenda. These courses benefit not only the partner NGOs, but also the community people, and it is encouraged that these people further disseminate the information among the relevant persons. The training course provides valuable information about the arsenic compound, its spread, effects, and possible prevention. Problems arise because most arsenic symptoms are confused with malnutrition, and it is further true that most older people, 40 years and above, deficient in Vitamins A, C, and E are most susceptible to arsenic related diseases.

In most regions of the country, an effective combative programme has still to be undertaken. NGO Forum, declares that "the strategy of telling all the NGOs to seal off their tube-wells is too drastic a measure.

All the tube-wells are not supplying arsenic, and until an alternative is found, sealing off all the tube-wells is too extreme a step. There is still not widely accepted belief as to the root cause of arsenic pollution. There is even much doubt as to the currently publiszed information about the arsenic situation. Hence, so far, NGO Forum will abide by its stand of merely testing and marking the affected tube-wells, and at the same time, continue its research into the cause and solution of this situation."

NGO Forum's present initiatives in tackling the arsenic situation are immediate and temporary measures. It is also working with different, more permanent, surface water treatment methods, such as pond sand filtration system, rain-water harvesting, and others, which are safe from arsenic. These treatment methods are currently being undertaken in the coastal areas, and the areas heavily affected by arsenic.

The type of treatment required depends on the physical, chemical and biological characteristics of the raw water. Turbidity, fetidity, and pungency may be some of the physical characteristics of pond water, due to the decaying of excess organic matter, living algae and other microscopic organism. It may also contain other contaminants of air, water, and land. The pond sand filter is a very simple and low cost technology, which is appropriate for purifying pond water in the coastal belt. Filtration is a process of water purification in which water from a sedimentation tank is allowed to pass through a bed of filtering media, usually sand and khoa, and the filtrate is collected in a storage tank through an underdrain system. The filter media is very efficient in removing colour, odour, turbidity, Iron, and manganes. The PSF system ensures, that a) the filtered water will be safe to drink, b) the water will be clear and clean, c) the iron content will be at a minimum, d) the salinity will be minimal, e) the water will be palatable, and f) the water will be suitable for domestic use.

The rain-water harvesting system is also another viable alternative to the arsenic situation. Such rain water collection systems have been used since ancient times and evidence of roof catchment systems date back to early Roman times. The technology also has a long history in Asia, where rainwater collection practices can been traced back almost 2000 years in Thailand. The world's largest rainwater tank is probably the Yerebatan Sarayi in Istanbul Turkey. It measures 140m by 70m and has a capacity of 80,000 cubic meters. In Bangladesh, traditional rain water collection have been used in the coastal regions and Hill Tract areas from many years. People used large earthen pots to store rain water and use in the dry spells. The problems with ground and surface water supplies such as salinity, contamination, etc. have lead to the development of the rain water harvesting system. The two major components in a rain water harvesting system are the "catchment" and the "storage". Roof tops are most commonly used as the catchment. The rain water from C I sheet or thatched roof is collected into a suitable storage or tank by means of a gutter system. A gutter is a device to work as an inlet structure for collecting the water which runs off the sloped or horizontal roof surface. Conventional gutters are normally used along the length of the roof, and clamped to the edge with a wire rope. The rain water harvesting system is affordable, reliable and easily constructed. It provides water which is clean and of good quality.

Although NGO Forum plays an apex role in spreading the use of safe drinking water, and water supply, it should not be left alone in this field of maintaining the existing safe water coverage. All the sectoral organizations working in this capacity should be encouraged to contribute in ensuring safe water. It is imperative that immediate steps be taken to research into the causes of water pollution, and ways of alternate safe water technologies.

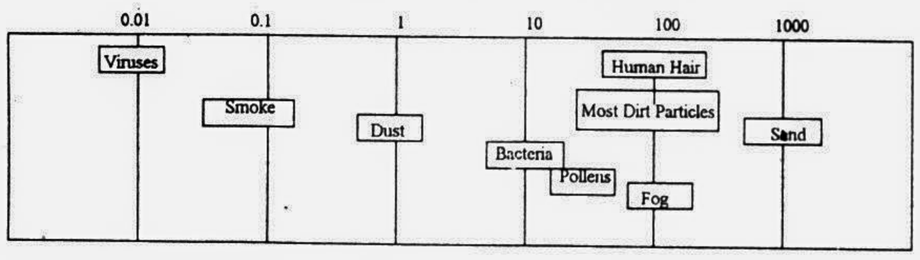
The writer works for NGO Forum for Safe Drinking Water Supply and Sanitation

How Much Our Water Filters are Safe?

by Sheikh Akhtarul Islam

THE market is flooded with various filters — some claim to remove arsenic, some claim to remove all pollutants and bacteria. In promoting its won system, the manufacturer has stretched the truth quite a bit! Arsenic scare is driving people to buy filter. Are they good to remove all those pollutants?

Relative Size of Particles in Microns
(A micron is one-million of a meter or 0.0004 inches)



One of the purpose of this write up is to give people enough accurate information so that they will not be misled by any claim. All pollutants come in various sizes : for example chart below gives relative size of particles.

Sediment filters come in many different sizes, from coarse to fine. They are rated by the particles they will trap. For example, a 5 micron filter will trap all particles that are 5 micron or bigger. A larger sediment filters are, used for tap water, of public water supply system (which is supposed to be filtered already), and usually come in three sizes 5, 10, and 20 micron. A 5 micron filter can give certain protection, but will clog quite often. Usually an additional pressure pump is needed for filtration through smaller micron system. A 20 micron filter will not clog and easy to maintain but will give reduced protection.

Some coarse sediment filters are specifically designed to remove large sand particles. These come in a variety of designs and sizes. But for most home applications, there are three types of sediment filters : a) wound string type b) foam based or c) pleated film type.

In pleated system, if water is dirty like that of ours, a coarser filter will be required, followed by second filter of finer sieving or an additional purification system to achieve desired protection. This type is generally used in homes because it has the larger hole but it's wet interior will support bacterial growth, and is extremely dangerous.

Carbon Filters

Carbon filters are used to remove certain pollutants from water. They are especially useful in removing pesticides, herbicides or bad smell that emits due to presence of sodium sulfide in water of shallow tube well. A good carbon filter will remove chlorine, and bad taste but it cannot remove bacteria or virus elements, or micro-biological pollutant which are so thin, will require special treatment. Virus of cryptosopdium or sporoformers type resist sanitation or boiling water even. These filters are not designed to remove nitrate, lead, sodium, asbestos, arsenic or host of other elements, let alone viruses. American National Standard Institute (ANSI) has, therefore, instructed that for Arsenic Removal, a Reverse Osmosis (RO) System must be linked with Carbon filter.

Bacteria and Virus Elimination

One of the greatest danger in our water is the presence of bacteria & viruses. This is the price we pay for being in a tropical country. Western nations cannot suffer from this, because of better sanitation, cold weather, good water supply system and awareness amongst people to maintain hygiene. Every year millions people suffer from gastro-intestinal diseases, typhoid. Hepatitis and others. This are invariably linked with drinking water.

Since virus grows on filter media, filters cannot be safe unless special treatment is associated with it. There are two methods which are generally employed.

i) Ozonisation ii) Ultra Violet Ray Treatment (UV Treatment)

Ozonisation can be ruled out as it is bulky, high tech. & expensive. The other method is the application of Ultra-Violet Ray. This is comparatively cheaper but with our erratic electric supply system, it can damage the tube easily and the replacement cost will be very high. Since filter is connected with running water, power failure for long time will hamper continuos supply. Any alternative method of storing in containers, whether sterilized or not, there is always a possibility of contamination at any time. This will defeat the whole purpose.

When you buy filter, check following points :

(1) Check pore size (micron size). European filters usually have bigger pore size to trap dust particles only, as their water is usually better in quality.

(2) What is the make of filters? Some of the materials help growth of bacteria, specially in pleated type.

(3) Does it have back washing system? How often you will have to clean the filters or replace it. What will be the replacement cost?

(4) Does it have carbon filters incorporated in it? If not, chlorine or sodium sulfide will not be cleaned, for which additional devices need to be fixed for cleaning other dangerous elements.

(5) For cleaning bacteria, what is the arrangement? If UV treatment is applied what is the safeguard for electric voltage fluctuation? What is the replacement cost? How often it needs to be changed?

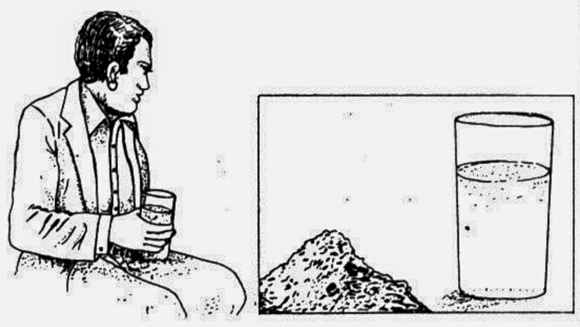
(6) If arsenic is present in water, what is the safeguard for it. Remember ordinary filtering method is not at all effective for arsenic removal.

(7) It is suggested that before filtering, water should be analyzed in laboratory and check it after fixation again for effectiveness. Water should also be checked at interval whether the filters are clocked or bacteria infested. ICDDR,B laboratory is most reliable laboratory for water testing but some of the other famous diagnostic laboratories have the facilities to check as well.

(There is a mountain in the water we drink. We can consume approximately 450 pounds of inorganic minerals from tap and well water in our lifetime. This could settle in our vitals organs like it did in grandma's kettle, causing all kinds of trouble. Purified water is the only answer to remove all impurities. Avoid drinking water with 'Total Dissolved Solids' (TDS) level exceeding 10 mg./liter other wise we are in for all lot of troubles.)

Pure water is a lifeline to good health and we all deserve it. You have the basic right to have access to it. *Drink pure water and be healthy.*

The author is an Advocate of the Supreme Court and a freelance writer on environmental issues.



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The next issue of '*Alternatives*' focuses on Public Toilet. Creative suggestions are invited from our esteemed readers.
— Editor

Our Drinking Water at Risk

by Siraj Ahmed

SOME of our tap water comes from ground water, found in natural underground rock formations. The rest comes from surface waters, including rivers, lakes and reservoirs. All these waters are polluted and life threatening now. These are virtually an environmental bomb shell with delayed action fuse, created by toxicological effects of synthetic chemicals, sewerage, untreated industrial waste and many others. A silent killer, we are not aware of it. Cancer, high blood pressure, typhoid, hepatities, lungs complicity, gastro-intestinal disease, central nervous system disorder, immature birth and numerous other diseases are linked directly with water.

How does ground water get polluted?

Fertilizers, industrial wastes and seepage from landfills contaminate our water, and water is once polluted cannot purify itself for up to hundred or even thousand of years unless proper purification is done.

Contaminants seep steadily into underground acquifer to eventually create hazards in drinking water supplies.

1. Burned storage tank, rust and metal factory waste.
2. Factory waste water seeps from unlined tank.
3. Solid waste dumped haphazardly
4. Rain water adds to the problem by dissolving exposed fertilizer, pesticides and human or animal waste from the field
5. Outside factors effecting ground water and steadily seeping into underground source.

Most common drinking water problem

During recent press reports, it was widely published that our water supply system had all kinds of pollution including, but not limited to,

Cryptosporidium	Primary Contaminants are:	Sporeformers
In water the parasite exists as an oocysts — a tough, encapsulated form that can resist many disinfectants. Once ingested, the oocysts lodge in the intestine and break open, and the organism multiplies. A person usually becomes ill about a week after infection with diarrhea and stomach cramps. Vulnerable people can even die from it.	1. Arsenic 2. Dead snake in WASA water 3. Cryptosporidium 4. Shigellas 5. Salmonella 6. E Coli Bacteria 7. Botulism 8. Industrial toxic waste 9. All kinds of deadly chemicals 10. Inorganic metal 11. Fluoride 12. Nitrate 13. Trihalomethane (THM)	A spore is a thick wall formation within the bacterial cell. It protects the bacteria against a hostile environment. A spore may survive boiling water for an hour or more. It also holds up well under freezing and may resist some sanitizing solutions.

How does surface water get polluted?

Nearly 90 per cent of rivers, lakes, coastal waters, though generally look clearer, are too polluted for fishing or swimming let alone drinking from it. Disease in fish was not a known factor a few decades ago, but is a common phenomena now-a-days. If this trend continues, we will not have any fish available in future. When water passes through any contaminants it picks up as a natural process and retain its in dissolved form.

We are heading for an ecological disaster and economic catastropy for our water being systemically polluted by dissolved inorganic or organic solids from industrial waste, unrestricted use of agricultural nitrate, pesticides, herbicides, insecticides and God knows what else. Total Dissolved Solids (TDS) in water is an indication of purity and we are not aware of it. Our health department is not monitoring and scientists are washing their hands off by attending seminars only.

What are potential health effects

All contaminants are health hazards. The degree of it 'depends on type of material dissolved in it.

Contaminant	Health Effect	Sources
Micro biological	Acute gastrointestinal illness dysentery, hepatitis, typhoid, cholera, hook worm, cryptoporidium etc	Human, animal and fecal matter.
Arsenic	Skin, Nervous system toxicity.	Geological
Lead	Kidney, Nervous system damages, highly toxic to Infant and pregnant women.	Leakage from lead plumbing and geological.
Fluoride	Skeleton damages, dental fluorisis.	Geological tooth paste.
Nitrate	Methemoglofinemia known as blue baby syndrome	Fertilizer, feed lots, sewage
Pesticide, Herbicides	Nervous system toxicity, Cancer risk.	Farming, horticulture.
Trihalomethane	Cancer risk	Chlorine by product
Radion	Cancer	Geological.

The list is endless, but what we are trying to do is to warn people of the risk involved in drinking untreated water. Think before you drink.

The writer is Managing Director of Alpine Fresh Water System Ltd