

Arsenic Pollution in the Mekong Delta



The US Environment Protection Agency (USEPA) defines arsenic as a persistent, bio-accumulative, and toxic chemical having the ability to accumulate in the air, soil, and water. In 1961, the pollution of arsenic was first discovered in Taiwan, and later in Belgium, Netherland, Germany, Italy, Hungary, Portugal, The Philippines, Ghana, USA, Chile, Mexico, Argentina, and Thailand.

In 1992, the toxicity of arsenic was found as a disaster in West Bengal, India. Recently, the problem of arsenic in **Bangladesh has been more serious and affected more than 23 million people in 1997, and the number rose to almost 60 million in 2005.**

Where does arsenic come from?

Scientists conclude that the deposition of the arseno-pyrite deep in the ground for millions of years has been carried deep into the underground water and the river sources.

In industry, **arsenic is used as an alloy with other metals such as iron, copper, lead, mercury, nickel, and cobalt.** It is also used as an anti-bacterial solution to reat wood used as electrical poles. Pure arsenic is not toxic, but when it is combined with other chemical compounds to form arsenite (As^{3+}) and arsenate (As^{5+}), it becomes very dangerous.

Human absorption of arsenic usually takes place through water and food.

The deadly human disease is caused by the intake of animal meat, shrimps, and fish living in an environment contaminated with arsenic. Porcelain cooking ware fabricated in China may also cause disease due to presence of arsenic. The people in Bangladesh who have been using the water from the wells built by UNICEF for a quarter of a century, still do not know the disastrous presence of arsenic in the well water.

Until 1988, The National Arsenic Committee in Bangladesh was established in order to solve the problems involving more than 4000 affected villages. Even this country has the support of

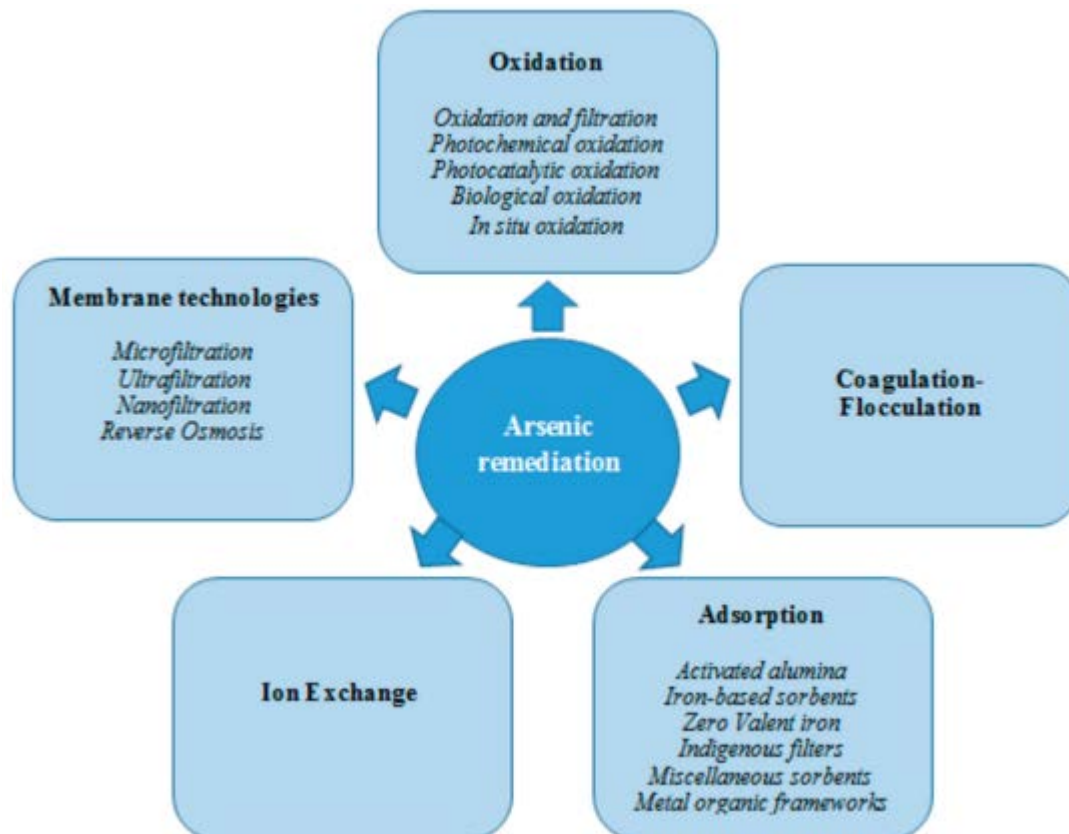


UNICEF, UNDP, UNEP, and WB, the arsenic problems still remain a calamity of the world nowadays.



The perspective of the pollution of arsenic in the water in Vietnam, particular at the Mekong Delta, has been a reality. The current problem is to look for ways to save the innocent Vietnamese from the danger which may affect millions of people as it has happened in Bangladesh.

Traditionally, the Vietnamese people who were living in the Mekong Delta have been using rain water for drinking and surface water for other daily usage. They also use borax to treat the presence of arsenic in the silt water. However, since 1980's, in order to prevent cholera, dysentery and other infection diseases in digestive tube that caused by the infected surface water, UNICEF supported and encouraged to the drilling of over 357,720 (1999) wells in the whole area of Mekong Delta, which brought the disaster of Bangladesh's drama to recur in Vietnam.



In order to avoid the problems Bangladesh has experienced for decades, Vietnam has better keep their traditional way of treating arsenic with borax and boil rain water before drinking. However, it would be better if the residents could afford to use modern technology such as the ultra violet system of sterilization to treat for potable water.

Red River Delta and Mekong region is made up of Quaternary sediments include clay, clay powder, powder sand, sand, grit and gravel, sometimes having been laterite clay lightweight goods. In 1998, UNICEF (UNICEF) has provided a grant to study the possibility of anti-pyrite alum to the Mekong Delta, but the results were not satisfactory and no evidence recorded about the presence of arsenic in water supplies of this region.

Currently, no study has been done to show the presence of arsenic in pyrite alum in two deltas on, along with no autopsy about the arsenic poisoning on people in Vietnam. But due to the chemical properties and the evidence tested in the world, acid sulfate is pyrite, most of them found traces of arsenic in pyrite with different concentrations.

Therefore, the list from arseno-pyrite was born. Also this particularity brought silt and sediment to the delta on the contract as well as the correlations in geology and soil texture in Bangladesh and Vietnam, arsenic pollution problem should be raised with more scientific certainty.

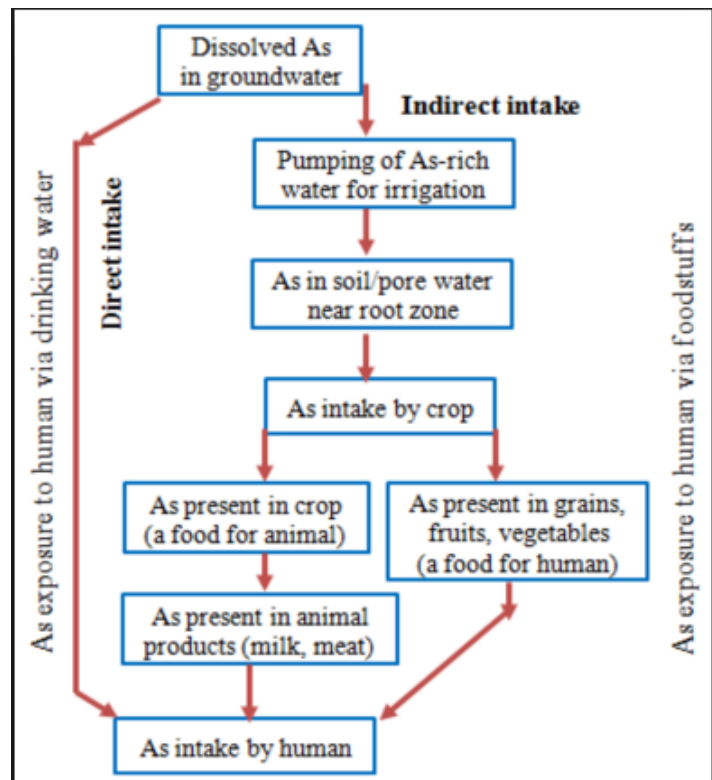
Arsenic Pollution in the Mekong Delta

The people of the Mekong Delta region has a habit of using rainwater for drinking and cooking, and surface water for daily activities. Using water from well isn't widely used here, and also, knowledge of arsenic pollution from groundwater is not aware in the mind of people of the region.

During high tide, they collect water from river and transfer to pottery container called "lu". Then, water is treated by alum like borax or sulfate and let it stand for about 24 hours before usage.

It is a simple and least expensive method of "purifying" arsenic in Mekong delta for the past generation. Technically speaking,

borax and salts of iron (II) to be used for conversion of arseno-pyrite ($As-FeS_2$) in the silt of the river water into arsenic metallic deposition in the bottom of container.





January 9, 2015: A new study on the occurrence of arsenic in groundwater and the exposure of local residents in the Mekong Delta of Vietnam was published in [Science of Total Environment](#). The study shows high level of arsenic (up to 1,000 ppb) in groundwater adjacent to the Mekong River. High arsenic was found particularly in reduced and low-saline groundwater. Arsenic content in nails collected from local residents was significantly correlated to As in drinking water ($R=0.56$, $p<0.001$). Survey data show that the ratio of arsenic in nail to arsenic in water varied among residents, reflecting differential arsenic bioaccumulation in specific exposed sub-populations. The paper is posted here [Arsenic exposure in Mekong Delta](#).

In the beginning of the 80s, the United Nations through UNESCO remarked that the population lived in this region has been affected of cholera, diarrhea, or dysentery etc. due to using untreated surface river water. In order to curb these above diseases, UNESCO advocates helping people to dig wells to get cleaner water and avoid bacterial disease. So far, there are over 357,720 (data collected in 1999 by Parker) active wells developed in the Mekong Delta region.

And this is a disaster, a new scenario of Bangladesh's happening in Vietnam.

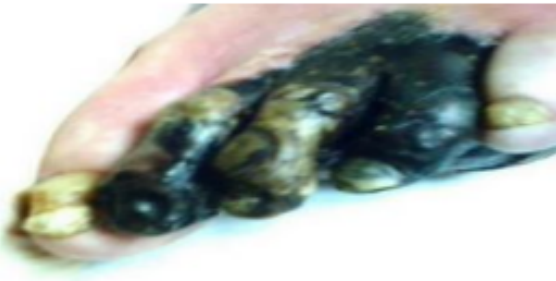


Image 1:

Blackfoot Disease from approximately ten years of drinking 50 $\mu\text{g}/\text{L}$ of arsenic contaminated groundwater

It is time for the UNICEF to reconsider their present program of drilling wells for a better and safer ways for Vietnam and other developing countries in the future.

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