WaQuAC-NET Newsletter

Water Quality Asian Cooperation Network

Number 5

For Safe Water, Do Network.

WaQuAC-Net Mini-talk No.1

How is Arsenic Problem going on?

WaQuAC-Net Mini-talk No.1 was held in Tokyo on December First, 2009. The participants were 6 members. Speakers were Mr. OGATA Ryuji has worked for arsenic mitigation project in Bangladesh as a member of Asian Arsenic Network (AAN) which is one of Japanese NGO. Mr. SUGAWARA Shigeru working in JICWELS, (Japan International Corporation of Welfare Services) surveyed Cambodia last March. Mr. ARIMURA Gensuke working in "Water Supply Network Communication" wrote an arsenic issue for a magazine, "Water and water technology" last July. Other participants were Mr. HORIE, Ms. YARIUCH and Ms. YAMAMOTO.

Arsenic Contamination in Bangladesh

First of all, Mr. Ogata introduced present situation of arsenic contamination in Bangladesh. Arsenic in ground water was found in West Bengal, India in 1983 and it was found in Bangladesh in 1993. However, few mitigation activities had been conducted until around 1997. Bangladesh government, UNICEF, other donor agencies and NGOs have started activities against arsenic problem after that.

Among various mitigation activities, it seems that blanket tube wells screening made a significant impact on arsenic mitigation in Bangladesh. Five million tube wells out of ten millions tube wells in Bangladesh were examined by field kits and in 1.4 millions of them arsenic were detected over 0.05mg/L, standard value of drinking water in Bangladesh. At that time tube wells were painted red or green to show whether those are safe or not. Arsenic does not have specific smell or taste, and the symptoms of arsenicosis appear after a long time (five to ten years or more) of continuous drinking of arsenic contaminated water. Therefore the people without alternative water source often continue to drink the water from red painted tube wells.

These days, good field kits are locally available in Bangladesh and we can test the water of tube wells easily. Field kits of WAGTECH and HACH are popular in Bangladesh and those can be purchased at relatively cheap price. In the time of tube well screening activity, local young people were trained and examined tube wells in their villages. The accuracy of the result of field kits was not so bad. They also identified arsenicosis patients in the time of tube well screening but the activity was relatively difficult for the local young people because some medical knowledge was necessary to identify arsenicosis patients correctly. Finally they detected 38,000 arsenicosis patients but the number seems not so accurate due to the above mentioned reasons.

Table1 - Basic Data in Bangladesh

(Source: UNICEF, Oct 2009)

Estimated number of the tube wells	8,6000,000	100 %
Tube wells tested for arsenic	4,750,000	55 %
Tube wells marked green (safe)	3,300,000	39 %
Tube wells marked red (unsafe)	1,400,000	16 %

Actions taken by people to avoid arsenic contamination	
Using Arsenic free tube well water	55%
Using treated pond, canal or river water	21%
Using filtered water	5%
Using rain water tanks or sand filtered water	5%
No action	32%

Activities on exploring water source have been conducted by Bangladesh government, donor agencies and NGOs selecting respective areas. The largest number of alternative water source installed in Bangladesh is deep tube wells which use deeper confined aquifer (200m-300m) instead of shallow

arsenic contaminated aquifer. Deep tube wells are also the most popular option because the water quality is better and are familiar to the users who have used tube wells for a long time. However, deep tube wells are also contaminated in some areas even that the depth is more than 200m. Therefore water quality monitoring is indispensable for deep tube wells as well as other safe water options.

For using surface water, a number of Pond Sand Filter which purify pond water by roughing and slow sand filter have been installed though some of them are unused due to water shortage in dry season. Rain water harvesting has been tried as ultimate method of alternative safe water option but many of them are also unused due to the hygienic water quality and water shortage in dry season. The point how to sustain

Ms. KAMEGAI participated from Bangladesh

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Currently, I am working in Bangladesh as a team member of JICA technical assistance project, which targets improvement of water quality examination system. The main target of water quality issue is still Arsenic, but the project purpose is not only Arsenic, but also total water quality management for safety drinking water supply.

Background is that the people in Bangladesh had suffered from waterborne diseases by use of surface water and it resulted in high child mortality rate. To overcome such situation, international organization has moved forward on the development of ground water resources. Dissolved Arsenic has no color, no smell and no taste, so that no one took notice on the Arsenic presence in the ground water seemed clean. Therefore, the Arsenic problem has spread silently.

After the problem was realized in the world, many of donors and organization have been working for Arsenic mitigation project. Because Bangladesh is considered least less-developed country, the activities are watched by the world.

As Table 1 in body text, there are still so many wells which have never tested its water quality. In fact, the most urgent and important issue is to screen the existing wells water whether it is drinkable or not. On the other hand, it is also important the water quality management of newly installed well and establishment of water quality monitoring system.

Our project is conducted by Japanese experts and personnel of Water Quality Monitoring and Surveillance Circle in DPHE (Department of Public Health Engineering) to strengthen the capacity of water quality analysis and to establish water quality monitoring system.

Hereinafter, I would like to express my personal impression. It may be said that the current condition of Bangladesh is chaotic in all senses. I am coming here as a technical expert, but many of problems are not only technical but something different, such as poor management, political disturbance, unstable organization background and so on.

At present, the government starts consideration of change of value of Arsenic standard from 0.05 mg/l to 0.01 mg/l, without any consideration of practice perhaps. It must make big confusion on drinking water supply. Who can check again the well water quality? How can we determine such low concentration correctly?

Even though I am still hopeful that my C/P will build up their capacity and able to persuade logically the higher authority with the strong technical background.

(Ms. KAMEGAI Yasuko)

the safe water option in Bangladesh may be to identify what is the most suitable option for specific location and culture.

About the reason why ground water in Bangladesh is contaminated with arsenic, it is said that arsenic in alluvial sediments has been released in natural geochemical process. However, there are several hypothesis such as that arsenic was released in oxidization process of Arsenopyrite because of pumping ground water for irrigation or reduction process of iron oxyhydroxides. In Bangladesh, there is a possibility of arsenic contamination in supply water too if the source is ground water.

As Arsenic removal technology, there are AIRPs (Arsenic Iron Removal Plant) which use only aeration and sand and gravel filtration, Kanchan filters which use extra iron chips with aeration and sand filter, Alcan filters which use activated alumina and so on. However, proper maintenance such as replacement of filter media and/or water quality monitoring may be difficult in rural area in Bangladesh. Therefore, Bangladesh government recommends using arsenic removal technologies as a final option for the area where other alternative options using surface or ground water are not available.

Symptoms of arsenicosis appear as skin symptoms as melanosis and karatosis, edema, gangrene and cancer in serious cases. Some researchers say that there would be relation between protein intake and appearance of symptoms. In other word, arsenic problem could be also one of poverty issue that poor people cannot take sufficient nutritious food. Asia Arsenic Network (AAN), a Japanese NGO supports income generation of patient families because the cost for medicine and/or food can't be affordable for them if main breadwinner of a family becomes ill by arsenicosis. ❀

Continuing to send information

Mr. ARIMURA went to Bangladesh with the study team of Hokkaido University, Japan and surveyed arsenic pollution in 2001. Since then, he has focused this problem as journalist.

"In some case, I heard, nobody care the facilities assisted by Japan. There are no media sending the information to Japanese public continuously. A newspaper company also will not carry an news or article if other company has carried same issue.

When Mr. Yamamura came back to Japan from WHO headquarters in Geneva and asked me to publish an arsenic issue. I talked to Mr. Ishii who worked for Tokyo Metropolitan Waterworks Bureau (TMWWB) at that time.

And one project started supported by Ministry of Health, Labor and Welfare. It was to provide several atomic absorption spectrophotometers to Bangladesh. They had been used and no more used for renewal in TMWWB. At that time, Mr. Takaku was a JICA Expert in Bangladesh. He had held several seminars on arsenic issues with WHO and UNICEF.

Now we can use geographic information for arsenic pollution area effectively. I am surprised such a progress.

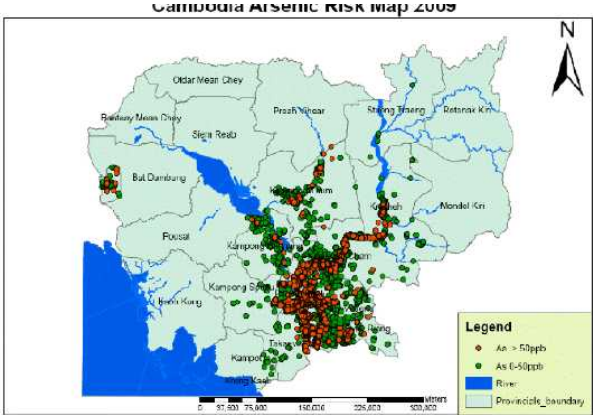

Figure 1 - Cambodia Arsenic Risk Map 2009
(Source: "Seminar report by Mr. SUENAGA", April 29, 2009)

Arsenic Pollution in Cambodia

Dr. SUGAWARA has worked for a training of water quality analysis by atomic absorption spectro-photometer with ICDDR, B (International Centre for

Diarrhoeal Disease Research, Bangladesh) as a staff of JICWELS since 2000. He has also joined to a survey to develop facilities using surface water instead of ground water contaminated by Arsenic in Bangladesh. He has long experience of trainings and survey related to arsenic pollution in Bangladesh.

"I have worked for arsenic issue in Cambodia since 2004 when I was dispatched as an expert of WHO. And at that time, arsenic issues have arisen. Survey by UNICEF identified the areas with high concentration of arsenic to some extent; however, victims of arsenic poisoning had not been identified yet. In 2008, NHK (a Japanese national broadcasting company) broadcasted images on tragic situation of the victims intoxicated by arsenic in Mekong Delta, Cambodia. This TV program called attentions very much in Japan, Cambodian government (Ministry of Rural Development, MRD) became sensitive to the sensational case and reactions made by the media.

When I visited to Cambodia for a survey of Ministry of Health, Labour and Welfare in March, 2009,. This study targeted southern area of Cambodia, and we found that 1,300 people are suspected to be having skin diseases intoxicated by arsenic according to information by the WHO office in Phnom Penh.

Many NGOs are working for mitigation of arsenic issue; however, the scale in Cambodia is not as large as in Bangladesh. Dr. Sugawara thinks that RDIC (Resource Development International Cambodia) is the most reliable NGO in Cambodia, who has long experiences in monitoring arsenic issue RDIC sells ceramic filter for arsenic removal by catalogue sales. Their selling way is quite unique, so to speak, customer friendly and centered as well as local-based way, and might promote BOP (Bottom of the Pyramid)

Japan should contribute to this field for mitigation of arsenic issue in Cambodia. I think. We have to start towards this challenge immediately also for using our long experiences, which we, international society spent and learned in Bangladesh on arsenic issues. We are never allowed to repeat an analogy such as a bad dream of Japanese "Minamata disease" again in Cambodia, which tells that necessary countermeasures had been suspended to take until the cause was identified. JICA has contributed to this issue in Bangladesh for long periods. I hope we can make use of these Japanese experiences, especially lessons learned, for mitigation of arsenic issues in Cambodia, first of all, focusing on supply of safe drinking water to people.

How can WaQuAC-Net do for arsenic issues !

Last April, Waquac-net received an e-mail written a poster belonged to a NGO and was going to Cambodia. But she heard there was arsenic pollution and asked us how to check it and whom to ask to check the water? I immediately sent this e-mail to Mr. SUGAWARA who just came back from Cambodia survey at that time. He quickly responded us with very useful information such as the list of universities and institutes which could analyze arsenic.

And last November, Waquac-net received again an email written by another poster her colleagues were going to Kolkata, India. But they were afraid of arsenic pollution in drinking water and ask us to send information of arsenic. We asked members to provide information. This request was spreaded from members to members or their friends. And various comments and opinions came to Waquac-net. These experiences were very interesting and we understood a power of the web-net. As Waquac-net activity, it will be important to collect the list of organizations can analyze arsenic in water accurately and to provide latest information to members or people through web-site

(by Yamamoto)

Set up of Kyushu Branch

～Dec. 15, 2009, Fukuoka, Japan～

Most of members in Fukuoka Pref. belong to private company. These members got together to set up Kyushu branch and to exchange among members through discussing possibilities on activities of the Kyushu Branch.

【Collecting information at site and sharing them in Japan】

Mr. Kagata: Through working in developing country, I knew many water supply utilities need supports of technical aspect and facilities. For example, I worked for a water supply utility in a province of Cambodia whose facilities have troubles for proper removal of iron, therefore iron is not removed appropriately.

Mr. Nakajima: I have visited Cambodia to catch small needs every three or four months. I received order of some consumables from provincial water supply recently. Cooperation with local trading agencies can contribute to raise the level of whole water supply sector of the country, I think

Mr. Yamashita: I have worked on CAD, drawing and mapping, etc, so I hope I can help activities of WaQuAC-NET in such a line of work.

Ms. Yamamoto: I welcome your supports because contacts with members in developing countries are basically made through e-mail or website. In addition, we set up a mailing list for Japanese member recently in order to share questions and answers readily.

【Small Businesses and WaQuAC-NET】

Mr. Akaishi：Developing countries are attractive for the small and medium-sized enterprise (SME). Some of them are waiting for their chance to enter the South-East Asia's market. The reality, though, is difficult to send staff abroad because it would cause trouble of domestic business, and brining up the next generation takes much time.

SMEs, especially in prefectures, are often offered jobs through personal connection, this make it more difficult for another staff to fill the place. If SMEs in similar business field can cooperate and work together, we can expand business.

Meeting of set up the Branch

Ms. Yamamoto：To realize that, I expect the WaQuAC-NET members of Kyushu Branch to cooperate among each other very much.

Mr. Kakegawa： I am in business concerning geological research and boring, also feel importance of personal relationship. I might give some helps such as well digging if I am informed difficulties raised in developing countries through such kind of relationship.

Mr. Nakajima： Talking to water supply utilities in developing country, a trouble of their huge facility has been left without being fixed nor replaced because of lack of their own fund, I found. Moreover, the spare parts of product made in Europe are also expensive, which pushes up operation cost. Taking this opportunity to replace facility into Japanese products, they will make maintenance easier. When I visit Cambodia, sometimes purchase Japanese product of domestic manufacturer to sell there.

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Question & Answer Corner

We welcome any opinions, and questions to this Q & A Corner. Please contact us.

Q: Could you advise me on applicability of chlorine dioxide for disinfection? (Questioner：Mr.M.NR)

A: Chlorine dioxide is not used in Japan because the by-products can be generated, and the control is also difficult.

Q：Recently, new product was introduced, that is Chlorine dioxide, ClO_2 (CLO2 Dioxid-S). Our company has used Cl_2 gas for disinfection and we are not familiar with ClO_2. But ClO_2 has so many advantages such as: 100% safe, not corrosive (can clean pipe, biofilm, fouling, and algae.), 100% disinfection, easy to apply, no big investment needed, 10 times more effective as a disinfectant than chlorine, easy to transport and store....etc. Based on your knowledge and experiences, could you give me some advises? Which one (chlorine or clorine dioxid-s) is more applicable for our company? (Mr. M.N.R, Cambodia)

A1：

A big waterworks bureau and a manufacturer once carried a practical study on ClO_2 about ten years ago. At that time, ClO_2 generation equipment was a type of chemical mixing at site.

Therefore, it had several problems such as difficulty of adjustment of mixing ratio, toxicity of chlorite and chlorate which is created as a by-product, and high explosive nature of some reagents used; only putting it on the desk in the dry conditions (only a little vibration) caused explosion.

Because of these reasons, ClO_2 has not been introduced positively for water supply in Japan.

After that, the study on toxicity of chlorate which is a final by-product has progressed. Based on the study, chlorate was introduced into the Water Quality Standard. And the opinion that ClO_2 should be used as disinfection for water supply became weaker and weaker.

Especially in high temperature countries, changing speed from ClO_2 to chlorite and chlorate must be very fast and ClO_2 is easily vaporized. Therefore, in my opinion, the control of ClO_2 is difficult. I also confirmed this point to a person who has used the facility of producing ClO_2.

There is a similar product, “Stabilized ClO_2”, but I cannot clarify its principle from the points of supply of chemicals, stability and pH control. And also I am worried about whether you can use it in the country remote from production factory.

Using chlorine gas has also reduced in Japan because of protection of worker safety and countermeasure for earthquake. Now we use sodium hypochlorite (85% of total disinfection), on-site generation of hypochlorite (10%) in Japan. The U.S. also tends to change from liquid chlorine and chlorine gas to hypochlorite from the point of safety of workers. In the case of use of hypochlorite produced by electrolysis, it is important to select salt as raw material and equipment.

You said that ClO_2 is 100% safe, but I can say that there are no any 100% safe disinfectant chemicals.

I cannot define the best method under the Cambodian conditions at this moment, but if there are supply system and capability of product quality control, using sodium hypochlorite is practically better. If not, producing hypochlorite by electrolysis might be the better way.

I also would like to know other's comments for selection of disinfectant.

(Dr, ASAMI Mari,
Chief of Water Quality Management Section, National Institute of Public Health, Ministry of Health, Labour and Welfare)

A2:

1. Advantage of chlorine dioxide

- Production of trihalomethanes is less than production by chlorine or hypochlorite.
- Stronger oxidizing agent than chlorine, and decompose organic matter better.
- It is said that CT value to inactivate bacteria is one tenth of CT value by chlorine.

2. Disadvantage of chlorine dioxide

- Decomposed by light easily.
- After decomposed, chlorite is produced.
- Chlorite is harmful to human health and difficult to reduce.
- Stored chlorine dioxide should be free from light.
- Chlorine dioxide generator might be suitable to use for drinking water treatment.
- Formaldehyde and acetaldehyde production is same as chlorine.

3. Recommendation

For the case that trihalomethane production is very high by chlorination, usage of chlorine dioxide is considered although ozonation is also a solution for the problem.

To introduce safer disinfection method than chlorine gas, sodium hypochlorite is easier to handle.

Of course, actual use is considered with their costs.
(Mr. SASAYAMA Hiroshi, Yokohama Waterworks Bureau)

(Continued from page 5)

Ms. Yamamoto: It is difficult for foreigners even to know which department to contact in Japanese manufacturer. Besides, Japanese manufacturers often do not respond nicely to such a kind of inquiry because sending and installation of spare parts costs a lot.

Mr. Nakashima: Additionally, in some case, it is not available to buy pare parts and consumables in small batch when making orders of from developing countries to Japanese manufacturers. If placing order from developing countries, it must cost about five times more than prices in Japan because of order only for dozen or expensive shipping cost. **These needs can be covered only by SME**, which can visit there lightly. SME can provide products in small batch and offer the price with only little bit additional charge; that is advantage of SME.

Mr. Akaishi: There are **a lot of interested Japanese citizens in developing country** as well. I join an NGO, where interested people in South-East Asia got together. If WaQuAC-NET can be spread like this occasion, supporters may increase. We might find the person who has new specialty or SME who hope to go into South-East Asia.

Ms. Yamamoto: **It is good idea to broaden the supporter base.** We hope to deliver our message for getting new supporters not only to people concerning water supply, but also ordinary Japanese people. (By Yariuchi)

Introduction of New Members

- ○Mr. Horie Toshiki (as of Jan. 2010)
- ○Mr. Yamashita Kiyonobu
- ○Mr. Sakurai Hajime
- ○Mr. Toma Kanji
- ○Mr. Imahashi Takayuki

We welcome new member any time. Please contact our office.

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Next Activity
Newsletter 6 "NGOs working on water issues"