WaQuAC-NET Newsletter

Water Quality Asian Cooperation Network

Number 11 31 July, 2011

For Safe Water, Do Network.

WaQuAC-Net Mini-talk No. 5

Water Supply & Radioactive Contamination

On May 24th, 2011, the 5th meeting was held in Yotsuya, Tokyo. This time, Dr. Mari ASAMI (National Institute of Public Health) and Mr. Yukio KUDO (Japan Water Works Association) explained about response of Waterworks to nuclear incident. The attendants were Mr. Kurihara (Earth System Science), Mr. Tanaka (Nihon Health Industry co. and Japan Water Purifier Association), Mr. Watanabe (Goodman Co.), and the members of WaQuAC-NET; Mr. Sasaki, Mr. Wada (Yokohama City Waterworks Bureau), Mr. Shibazaki (NJS), Mr. Matsuo (Earth System Science), Mr. Sugawara (JICWELS), Mr. Nakanosono (Yokohama Water Co.), Mr. Mori (KISUI Water Treatment Design & Engineering, Inc.), Mr. Shimomura (Saitama City Waterworks Bureau), Mr. Arimura (Water supply Network News), Ms. Okoshi (E&Esolutions), Mr. Horie (Tokyo Metropolitan Univ.), and the organizer Ms. Yamamoto. A total 17 members gathered.

At first, Dr. Asami gave a mini-lecture about overview and problem of the radionuclides (hereinafter referred as RNs) in drinking water. Secondly, Mr. Kudo explained about basic knowledge of radioactivity in drinking water and response of the waterworks. After that, we conducted question-and-answer session. It took from 18:30 to 21:30.

■ [A overview of the radionuclides (RNs) in drinking water]

National Institute of Public Health (NIPH): Dr. Mari Asami

1. RNs in drinking water and Japanese governmental response after the nuclear accidents occurred.

After explosion at the Fukushima Nuclear Power Plant, RNs spread widely and RNs were detected in drinking water. The concentrations of RNs were changed rapidly. Since radioactive iodine was detected in the drinking water after explosion on March 16th, Ministry of Health Labor and Welfare (MHLW) issued a notice " Response of Waterworks for the Fukushima Nuclear Power Plants accident " on March 19th. It was a notice for directors of waterworks bureaus to direct countermeasures if RNs in tap water exceeded "The index of drinking water based on the indicator about the restriction of food intake (issued by the Nuclear Safety Commission of Japan) ". Moreover, MHLW issued a notice that use of tap water except drinking purpose made no significant impact on human health, and infants were recommended not to drink tap water over radioactive iodine of 100Bq[i]/kg, based on interim standard of food safety law on March 21th. In Iidate Village in Fukushima Prefecture, radioactive iodine detected in drinking water was 965Bq/kg that was three times higher than the indicator on the restriction of food intake. Therefore, Iidate Village issued officially restriction against drinking purpose of water for all residents. Tokyo Metropolitan Waterworks Bureau issued officially restriction

against drinking purpose of use for infants on March 23th, because radioactive iodine reached 210Bq/kg in the Kanamachi Water Treatment Plant. I heard that supermarkets and stores sold out of bottled water after 20 minutes of announcement. After one or some days, RNs in tap water had become lower than the indicator in most places. Finally, the restriction was deactivated in areas around Tokyo except a part of Fukushima. Now, tap water is safe level to drink. In addition, MHLW has released and updated concentration of radioactive materials in all area. You can see on HP.
http://www.mhlw.go.jp/english/topics/2011eq/index.html

2. Mechanism that RNs contaminated tap water

Possible mechanism that RNs contaminated tap water was shown as in **Figure 1.** RNs which were emitted by explosion or vapor discharge from Fukushima No.1 Plant were transferred by wind. After that, they fell onto the ground directly or by rain and contaminated water resources.

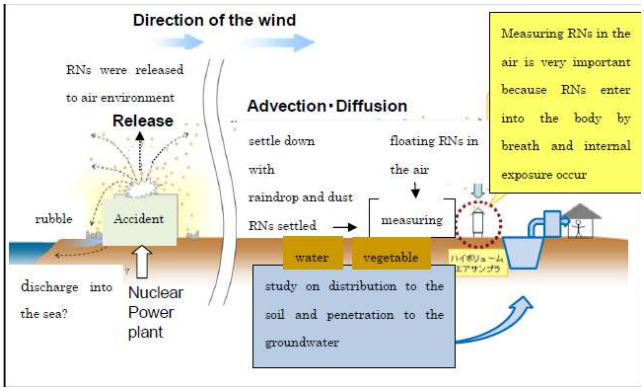

Figure 1: Mechanism that RNs contaminated tap water
Source :National Institute for Environmental Studies
http://www.nies.go.jp/index.html (Japanese only)
modified and translated by WaQuAC-NET

Main concerns of RNs in tap water were radioactive iodine and radioactive cesium. A conceptual diagram of radioactive iodine behavior is showed in **figure 2**. Radioactive iodine exists in the atmosphere possibly as three classifications; iodine attached to particles, organic iodine, and gaseous iodine. And they contaminated water resources like river by rain. Iodine attached to particles was possibly removed by coagulation, sedimentation and filtration with turbid. A part of organic iodine may be removed by activated carbon. Gaseous iodine dissolves into water body and changes the form to hypoiodous acid or iodide ion, which can be oxidized by hypochlorous acid or ozone in water treatment process. Finally, these are oxidized into organic iodine and iodate ion. The former one can be removed by activated carbon, but the latter one cannot be.

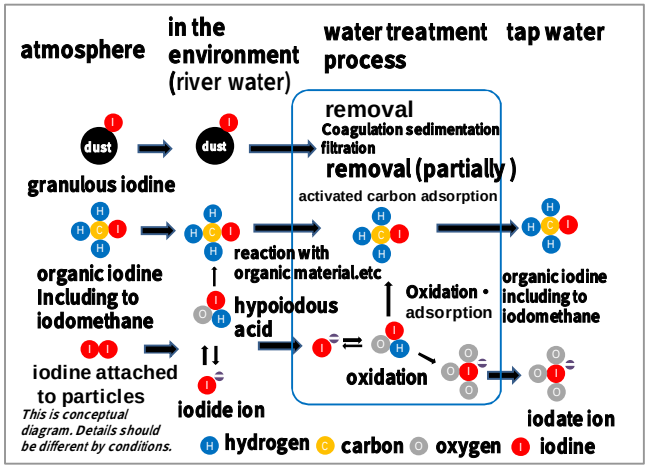

Figure 2: A conceptual diagram of radioactive iodine behavior

A conceptual diagram of radioactive cesium behavior is showed in **figure 3**. It is said that cesium is attached to particulate matter in water as well as air in environment. Therefore, cesium is removed by coagulation, sedimentation and filtration with turbid.

Detail: National Institute of public Health(NIPH)
http://www.niph.go.jp/soshiki/suido/pdf/h23radioactive/Review_Removal_capability_by_water_treatments.pdf
(Japanese)

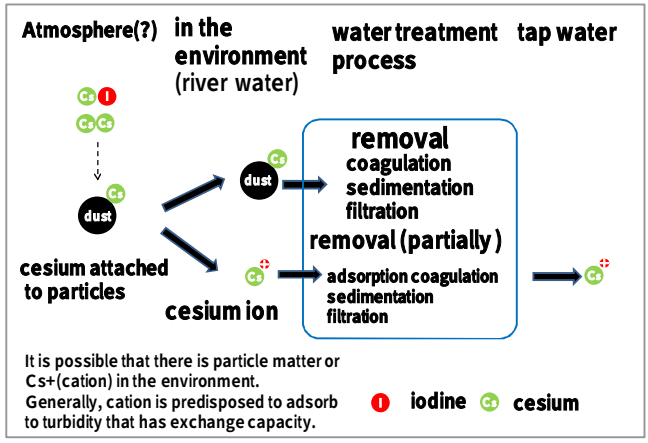

Figure 3 A conceptual diagram of behavior radioactive cesium

3. Removal performance of radionuclides

NIPH compiled a report on removal performance of RNs from past article, because of receiving numerous inquiries from waterworks bureaus. Outline of the removal performance of RNs in each water treatment process is summarized in **table 1**. The processes which have high removal rate of RNs are activated carbon, zeolite, ion exchange, and reverse osmosis.

NIPH conducted experiment for activated carbon because RNs removal performance varies a lot by conditions. Radioactive iodine was removed about 60% when chlorine was injected just before activated carbon treatment. (Experimental condition: injection ratio of activated carbon is 25mg/L, duration of contact is 30minutes, injection ratio of chlorine is 0.5mg/L. duration of contact is 10minutes)

NIPH reported that radioactive iodine was removed 30 to 40 percent at some water treatment plants in Fukushima Prefecture. At one treatment plant which has process of coagulation, sedimentation, sand filter and activated carbon treatment, the concentration of radioactive iodine was 3.0Bq/L before treatment and 2.0 Bq/L after treatment. Moreover, radioactive cesium was almost removed in coagulation sedimentation. Radioactive iodine and radioactive cesium have not been detected since May even it was raining.

4. Tentative indicators for RNs in food and water

Tentative indicators for RNs in food are shown in **table 2**. The items in red are indices concerning drinks. Index of radioactive iodine is 300Bq/kg. It is 100Bq/kg for infant, Index of radioactive cesium is 200Bq/kg.

Table 2: Tentative indicators for food of the radioactivity

nuclide	Index value of the restriction of intake(In case of the accident of the nuclea power plant) (Bq/kg)		For infant
Radioactivity iondine	Drinking water	300	
	Milk・Dairy product	300	100
	Vegitable (except root crop)	2000	
Radioactivity cesium	fishery product	200	
	Drinking water		
	Milk・Dairy product		
	Vegitable (except root crop)	500	
	cereal		
	meat,fish,egg,others		

※Nuclie of strontium is set about food intake.

The basic idea of the index for limiting food intake is based on standard of the radiation protection which is admonished by ICRP [ii] .(effective dose of radioactive cesium is 5mSv[iii]/year, thyroid gland equivalent dose of radioactive iodine is 50mSv/year; correspond to 2mSv/year of effective dose) and set up each food category in consideration of Japanese food intake.

Radioactive iodine index value were determined in three categories of intake (drinking water, milk/dairy product, vegetable) based on thyroid gland equivalent dose 50mSv/year. Index for limiting water and food consumption of each three category was decided that one third of the 50mSv/year was considered to intake food except three categories.

Detail: Japanese Nuclear Safety Commission
http://www.nsc.go.jp/shinsashishin/pdf/history/59-15.pdf
(Japanese)

Table 1: Outline of the removal performance of radioactivity in the each water treatment process

	Technology for water treatment of the waterworks			Technology for water treatment of the water cleaner or definitive condition				
Element	coagulating Sedimentation	Sand filtration (Rapid・Slow)	Micro filtration ultra filtration	activated carbon adsorption	Zeolite (heavy soil))	ion exchange	nanofiltration	reverse osmosis
iodine (I)	＋＋	＋＋	＊	＊～＋＋＋	＋＋	＋＋＋	＊	＋＋＋＋
Cesium (Cs)	＋＋	＋＋	＊＊	＋～＊＊	＋＋＋	＋＋＋	＊＊	＋＋＋＋

＋＝0～10%
＋＋＝10～40%
＋＋＋＝40%～70%
＋＋＋＋＝＞70%
＊　＝difficult to remove
＊＊＝possible to remove

The experiment was conducted by soluble element. so, it require a further testing.

Table3: Guidance levels for radioactive Iodine-131 in drinking water

Guideline name	Advised maximum levels for radioactive activity in water (Bq/L)	Approximate equivalent radiation exposure if consuming water at this activity level for a year
WHO Guidelines for Drinking-water Quality (1)	10	A New York - London flight
Japanese provisional (emergency) standard for adults (2)	300	One year's exposure to natural background radiation, or 10-15 chest X-rays
Japanese provisional (emergency) standard for infants (3)	100	
IAEA Operational Intervention Level for nuclear emergencies (4)	3000	Not applicable. The advised maximum level should be used only to trigger action in the early stages of the emergency

http://www.who.int/hac/crises/jpn/faqs/en/index8.html

5. Guideline of the radioactivity and danger to public health

Guidance levels for radioactive Iodine-131 in drinking water are showed in **table 3**.

The value of WHO Guidelines for Drinking-water Quality (1) is on the conservative side. Meanwhile numerical value of IAEA Operational Intervention Level for nuclear emergencies (4) is the early stages of the emergency at the international level. So, the value of Japanese provisional (emergency) standard for adults (2) is on safe side. And it is also determined safer level for infant. For example, if you walk on the station platform, you are made announcement by station staff that you should walk inside yellow line.

Table4: Annual death toll for every 100,000 people in Japan

cause of death	anual health effects (death toll)
cancer	250
suicide	24
traffic accident	9
fire	1.7
natural disaster	0.1
thyroid cancer death rate for infant(thyroid dose 100mSv of I-131)	0 - or a few／lifelong follow-up
cancer death rate (effective dose 1mSv of I-131)	0 - or a few／lifelong follow-up
lightning strike	0.002

Truth of radiology (NIPH, Ichiro Yamazaki)

It corresponds to WHO Guidelines for Drinking-water Quality (1). IAEA Operational Intervention Level for nuclear emergencies (4) is like that station staff high-handedly helps the person who is a drunk and walking with stagger on the edge of platform.

We had a lot of inquiries about tentative indicators for water after the nuclear accidents. And we explained guideline level and human impact of radioactivity. But it was difficult to convey precise information.

It is still unclear to explain human impact of low level radioactivity. One reason it is complicated is because Bq needs to convert to Sv, and coefficients are depending on age, RNs and route of exposure. Comparison of human risks is showed in **table 4.** Annual death for every 100,000 people in Japan. It may be said that thyroid cancer death rate for infant is extremely low.

6. Future tasks

It was very difficult to collect information, because nuclear accidents occurred right after the earthquake. To detect RNs in the tap water was beyond the scope of the assumption in the metropolitan areas. For the future, we have to continue to monitor RNs. Especially, we need instrument for determining each nuclide of low level RNs.

－Right after the nuclear accident, I was dispatched to MHLW and helped collection of data and establishing countermeasures. Finally, I could not attend the commencement ceremony of my child. It was certainly intensive two weeks of hard work.－

▲ Question and answer or comment

【Mr.Shibazaki】
Is there a connection between concentration of RNs in the tap water and that of the sewage sludge?

【Dr.Asami】 Since half life period of radioactive iodine is eight days, it is not problem after certain time. Radioactive cesium is removed in coagulation sedimentation process with turbidity. Therefore, sewage sludge and water treatment plant sludge contain a lot of radioactive cesium. It will be problem how to treat the final disposal which contains high concentration of radioactive cesium. Now sewage sludge over 100,000 Bq/kg must be stored.

【Ms.Yamamoto】
Who is responsible for storing such sludge?

【Dr.Asami】
Each municipality has to manage it, but Establishment of Nuclear Emergency Response Headquarters (ENERH) should determine its scheme. Ministry of the Environment decides scheme law of waste material. Ministry of Land, Infrastructure, Transport and Tourism and Ministry of Economy, Trade and Industry are engaged.

【Mr.Kudo】
Now there are many inquires about treatment of water treatment plant sludge from small organization. Many of them outsource the job of disposal of industrial waste. Some companies refuse the job because of RNs. It will be problem.

【Mr.Shimomura】

There are many inquiries from consumers of Saitama City Waterworks Bureau. The most frequent question was “Is it OK to drink tap water of indicator level?" It is said that human impact of radioactivity affect in the future. For that reason, many of inquiries were from mothers who have kids.

■【Response of Waterworks】Japan Water Works Association(JWWA): Mr. Yukio KUDO

JWWA made "Q&A about RNs for waterworks" at first after the nuclear accident.
The contents are as follows.1) Response of MHLW, 2) water quality indicator of the RNs, 3) removal of RNs in the water treatment, 4) measuring method, and 5) explication of the technical term.etc.

JWWA distributed this paper to all water-supply bodies. After that, we received many inquiries from water-supply bodies. And there were also many inquiries from citizen. The most frequent questions were "Is tap water really safe for drinking?" and "Can domestic water purifier remove RNs?" I answered that domestic water purifier could not remove RNs except reverse osmosis or ion exchange. But, it is better than nothing.
Now, powdered activated carbon is used to treat RNs in the water treatment plants.. Although it had been used continuously in right after the nuclear accident, it is used only after raining recently. Another day, the activated carbon association reported possibility of lack of activated carbon, because shipment of the activated carbon at May reached half amount of previous year consumption. It is expected the possibility to face the supply problem of qualified activated carbon for water treatment, so it is important issue to secure the supply. JWWA works as a pipeline between MHLW and water-supply bodies. So we convey data and notice of MHLW. We obtained measuring instrument for radioactivity to support small water-supply bodies which cannot measure radioactivity.

【Reference】
JWWA Question and answer radioactivity for waterworks
MHLW Question and answer
http://www.mhlw.go.jp/english/topics/2011eq/index.html

▲ Question and answer or comment

【Mr.Watanabe】

How do people treat tap water which might contain RNs?

【Dr.Asami】

As of May, radioactive iodine and radioactive cesium are not detected in tap water. Even if they are detected in raw water, they are very slightly. It is expected that RNs won't be detected in tap water unless extreme incident will happen. I think impact on human health is so little now. Nevertheless people who don't like to drink tap water have nothing else to do but drink other water.

【Ms.Yamamoto】

What do you think Mr. Tanaka? Can domestic water purifier do anything?

【Mr.Tanaka】

I am vice president of Japan Water Purifier Association. We had many inquiries when the news reported detection of RNs at Kanamachi Water Treatment Plant, Tokyo. We think domestic water

purifier with activated carbon cannot remove iodate ion which cannot be removed by the water treatment plant. Reverse osmosis and ion exchange can remove RNs technically, but we cannot state how long they can be used without practical field test. Now we tie up with NSF international (USA) and we are developing an implementation plan to do testing standards. In the United States many people think that all over the Japan is contaminated by radioactivity. But actually it is not true. Although we want to try field test, there is no tap water contaminated by radioactivity.

【Ms.Yamamoto】

How did you deal with that kind of problem in water treatment plant?

【Mr. Wada】

I had worked at a water treatment plant until this April. We have thrown powdered activated carbon in after raining in water source area. It was very difficult to judge amount of dosage of the powdered activated carbon according to the rainfall forecasting, while we have a criterion how much powdered activated carbon is dosed per amount of rainfall. And also we suffered from rolling blackouts. Because pump station on upstream of water treatment plant had not been supplied electricity, they use in-house power generation. But it was not sufficient to operate pump. As a result, we could only reserve water early in the morning.

【Dr. Asami】

We might be allowed to advise about adding powdered activated carbon, because there is a possibility that rainwater makes raw water contaminated. Now, there is very little RNs in raw water. From now, we consider that the activated carbon is used only as necessary.

【Mr. Arimura】

Are there any differences in quality of the powdered activated carbon?

【Mr. Kudo】

JWWA set down quality standard of activated carbon. So we don't limit area of production, if activated carbon satisfies the quality standard.

【Mr.Shibazaki】

Does differing raw materials of activated carbon affect removal rate of RNs?

【Dr. Asami】

Our results are limited at this moment, though they

have little difference.

【Mr.Tanaka】

Activated carbon which is used in Japan is two types. One is made of coal from China; another is made of coconut from Southeast Asia. I think that removal performance is different depending on condition of activation. So they don't make much difference by production area. But the condition will change due to shortage of supply, and it might cause change of quality of the activated carbon.

【Mr. Nakanosono】

If rolling blackouts will be conducted in summer season, fuel for generation becomes an issue in pump station.

【Mr. Mastuo】

Some water treatment plants have activated carbon absorbing tower. How often do they have to change the activated carbon?

【Dr. Asami】

It is becoming one of the agenda to be examined in the future. I have concerns about some activated carbon recycling companies reluctant to take a job, because activated carbon is contaminated by RNs.

【Mr. Kurihara】

I specialize in prevention of disaster in foreign country. This time I think the fragility was revealed in Japan's responses to emergencies.

【Ms. Okoshi】

I had looked at the news coverage of nuclear accident. I think tap water is not so problems. Today I heard Dr. Asami's lecture, and I can understand the situation. So I will study about that more.

【Mr. Sugawara】

Since trainees come from oversees, I would like to ask Dr. Asami to give a lecture for them.

【Mr. Mori】

I had good time. I will study about that more too.

■ **【Editor Note】**

After the lecture of Dr. Asami and Mr. Kudo, all participants gave a stream of questions. It showed a high interest in RNs in tap water. I think most of Japanese are interested in this time's topic of radioactivity in tap water.

After the nuclear accident, even tap water is contaminated by RNs. I always drink tap water in Tokyo. But after the nuclear accident, I didn't really want to drink tap water with RNs. Because I didn't have right knowledge about RNs, I had a distorted image of RNs. I have been confronted with the question that it is different between WHO's guideline of 10Bq/L and Japanese emergency indicator for water of 300Bq/L. Today Dr. Asami explained us about that. So, this is the first time I realized there is difference how to view the drinking water standard. And now I believe tap water is safer than I expected. As of June 2nd, radioactive iodine is not detected in Tokyo's tap water. I hope that Fukuhsima Nuclear Power Plant accident is cleared up soon. Now there are many nuclear power plants all over the world. I can't say for sure that nuclear

accident occurs. So, I think we should record information on data and response of waterworks. Of course, the most important thing is to prevent such a nuclear accident in the entire world.

Toshiki HORIE

[Technical term]

[i] Bq

The Becquerel (symbol Bq) is the SI-derived unit of radioactivity. One Bq is defined as activity of a quantity of radioactive material in which one nucleus decays per second.

[ii] ICRP (international commission on radiological protection)

The International Commission on Radiological Protection (ICRP) is an advisory body providing recommendations and guidance on radiation protection; it was founded in 1928 as the 'International X-ray and Radium Protection Committee€ 3‰ by the International Society of Radiology (ISR).. Then it was restructured to better take account of using radiation outside the medical area, and given its present name, in 1950. ICRP is a non-profit organization in the United Kingdom and currently has its scientific secretariat in Ottawa, Canada.

[iii] mSv

1/1000 of Sv. The sievert (symbol: Sv) is the International System of Units (SI) SI derived unit of dose equivalent radiation. It attempts to quantitatively evaluate biological effects of ionizing radiation as opposed to physical aspects, which are characterized by absorbed dose, measured in gray. It is named after Rolf Maximilian Sievert, a Swedish medical physicist renowned for work on radiation dosage measurement and research into biological effects of radiation

After the meeting (E-mail question & answer)

The meeting had lasted 3 hours. But we didn't have much time to discuss. We introduce exchange e-mail after the meeting.

[Mr. Shimomura]

As we don't have enough time, I would like to say two things as following.

1. Normal and emergency

Once I thought I could understand, but that doesn't sound right to me. I think emergency is short period of time, but there is no way to make our body stronger than before. In normal time, drinking water standard is on the safe side. So I think we should provide tap water with normal time standard, even if it is on the emergency. That's why we have to provide feeling of safety for consumer. Especially we treat RNs which effect makes impact in the future.

2. Monitoring at tap

The result of water analysis comes out in the following day. It means that the users can know test result after drinking. This fact undermines the credibility of tap water. So I think we should analyze water in raw water, purified water and tap, and waterworks disclose its concentration at each point and explain how the treatment process performs for removal of contaminant. Concentration of RNs in raw water can be monitored by use of quick analysis even if it can sacrifice accuracy. And, when the purified water exceeds normal drinking water standard of radioactivity iodine, we should announce officially restriction of water intake. Moreover, if purified water exceeds 300bq/L as radioactive iodine, we should announce officially water supply restriction. That is waterworks for citizen. Why don't we treat RNs in tap water as special? And we gave announce numerous values at the three points. In addition, we should announce officially numerical value of raw water immediately.

I think we should put a top priority to protect children from RNs and this is mothers' concern, because children cannot judge his situation. Now we are in emergency situation about RNs, and we have rule and regulations apparently. But we cannot unanimously confirm current regulations are safe for children. As a result, I guess waterworks staff made replies sounds apologetic. In my case, I replied to many mothers' inquiries. And I said "Please drink tap water and use for infant milk, because RNs in tap water is under tentative index. Even if you drink tap water over the tentative index, it does not immediately harm human health" But to be honest, I felt guilty for replying to lie. Therefore I make my children drink tap water and let him play outside without concerns about radiation exposure. I wonder it is really OK with them. I feel very responsible for about that. I should have created a safe environment that there are no RNs for them to the extent possible. What the hell am I doing do my children and consumer?

(25/05/2011)

【Dr. Asami】

I can understand your opinion. It is based on the premise that nuclear accident doesn't last long and government must tackle with special correspondence concerning nuclear accidents. It may difficult to fully accept this situation. I would like to explain with a simple example. Now all of us know that smoking is dangerous. Bans on smoking and the separation of smoking areas are currently being promoted in public facilities. One day an explosive accident occurs in the cigarettes factory and toxic components of cigarettes is coming out of the factory. So, the government asks inhabitants who live near the factory to escape a disaster from the cigarettes factory with a certain emergency indicator.

Government repeatedly announced "it is not immediately harm human health". I think this word is met with misunderstanding. The fact is following; when the restriction of water intake started, "If you drink the water for several days or weeks, it has no or very little impact on human health. But if you keep drinking, you will get closer to the values which possibly impact on human health. So, please take an alternate solution as soon as possible.

You have mentioned water supply restriction. But if we are on water supply restriction, we cannot even go toilet. It will be in a big trouble. At least, the concentration of RNs in tap water dropped down except a part of Fukushima, as a result, it is no problem that we continue to drink tap water at present. (27/05/2011)

【Ms. Kamegai】

Because I didn't attend the meeting, I only infer the atmosphere of the meeting by reading the report. I think what Mr. Shimomura wrote in the mail is close to the thought of general people. It is very difficult to let everyone know the risk management on basis of statistics. Besides, it is so hard to accept the risk consideration emotionally even if they understood it. However, the miserable incident makes all of us to start rethinking about the risk and cost, who had been lazy for considering deeply of probability of radiation contamination.

Japan is now struggling with the unknown risky field nobody faces before. We should draw on the technical solution and wisdom from this 'experiment' and convey it to the all over the world, even though we were not involved with our willingness.

Now, everyone becomes understood the lie of 100 % confidence of atomic power plant. In the same way, it is a chance to let users realize the fact that it is impossible the 100% safety of drinking water. It is my personal affair that I have just come back from Bangladesh. I feel so happy and thankful because I can eat fresh vegetables by washing with tap water. I am proud of waterworks in Japan, which provides the satisfactory quality of water more than enough for me. (14/06/2011)

【Overseas Report 1】 Water supply situation in Kingdom of Bhutan

☆Yasuyuki KITAHARA

1. Introduction

I was dispatched to Kingdom of Bhutan as Japan Overseas Cooperation Volunteer (JOCV). It has just past one year since I came here. And I would like to introduce my activities so far and water supply situation in this country.

Request from Bhutan to my activities are, 1) to propose the removal methods of lime component which is contained in the water source of south area, and 2) to propose the preventive measures against water pipes freezing. I belong to the Public Health Engineering Division / Department of Public Health / Ministry of Health in the capital city.

2. Water supply system in Bhutan

Most of area of Bhutan is surrounded by mountain. Therefore main water source is river water that flows from the mountain. This water source has some problems that water contains high turbidity during rainy season, on the other hand, quantity of water decreases during dry season.

In the rural area, there are no water purification facilities as far as I know.

Only big cities have the facilities. In some villages of the rural area, just simple intake facilities were installed and raw water is directly supplied to villages from there. Over the past 30 years, the government of Bhutan has been implementing the Rural Water Supply and Sanitation Project (RWSS) for achieving 100 % of water supply coverage with cooperation of UNICEF, WHO and Volunteers organizations of Netherlands, Denmark and so on.

Distribution reservoirs

.3. Water supply situation in the capital city, Thimphu

Central area of the capital city is approximately 3 to 4 km from east to west and 4 to 5 km from south to north. The city is surrounded by mountain so that water source is surface water that flows from the mountain. There are some water sources, though I have not confirmed.

The Capital, Thimphu

Water suspension happens very often in the city. I do not know the reasons. Water utility may service only limited time by area or water supply capacity may be insufficient toward to demand. People living in certain area can get tap water only 3 days in a week. Each house including apartment house has water tank, approximately 1 m3 of capacity, for keeping water and people get water from the tank to taps by gravity. People never clean the tank so that it seems inside of the tank is so dirty

Bhutan people also do not drink tap water directly. They might know that quality of tap water is no good. They drink boiled water because Bhutan people have a culture to drink tea basically. Bottled water and domestic water filter are being sold so that some people buy these water and/or filter (bottled water cost ¥40 per liter).

Above: Slow sand filtration facility (Granted by DANIDA)

Right: Messy installation of distribution pipes, service pipes and electric lines. Stuck rubbish is one of causes of flood in rainy season.

As to the way of water tariff collection, some houses have a water meter, and the others have not. I do not know the water tariff has initial charge and/or commodity charge. In an apartment house, water tariff for each room is calculated by dividing total volume of water by the number of rooms, therefore it is unfair for those who stay alone like me.

Materials like pipes and valves are imported from India mostly. Only HDPE pipes are national products. There are manufactures of HDPE pipe in Bhutan. Pipe sizes are 15mm to 200mm, various sizes. The machine and pressure-resistant test have been assisted by India.

Currently, In Bhutan, especially Thimphu, so many apartment houses are under the construction. A view of town has been changing year by year. Although I do not know about city plan and infrastructure which implemented by Thimphu city office, I think there are some problems about water supply, sewage and drain system.

Over the past decade, Thimphu has developed dramatically, but I think the speed of development is so rapid that infrastructure is unbalance. But Bhutan people might be satisfied with current town situation as to development･･･.(8 Jan, 2011)

Introduction of new member

☆ Daisuke SAKAMOTO

I had worked in Ghana as young water supply engineer about 2 years.
I had belonged to Ghana Guinea Worm Eradication Programme (GGWEP) which has being operated by Ministry of Health of Ghana (MoH) and The Cater Center (TCC). In Ghana, it was very shock for me when I saw the scene that a boy drank dam water directly (of course, contaminated water) which cows and goats also drank. In rural area in Northern Ghana, there were so many problems and challenges as to water supply and sanitation.

For example, small water supply systems (tap, tank, borehole with submersible pump) have been facing the financial problem for sustainable operation with large leakage volume. On the other hand, some people are forced to take their drinking water from dam because of hand pump breakdown due to lack of maintenance.

I have considered deeply as to the importance of safe water, the profound water world and sustainability of water supply systems through my activities in Ghana. Although I still do not have much experience and knowledge, I would like to keep working in the water supply and sanitation field to contribute for better future of water in the world.

【Overseas Report 2】
Entering the 2nd year of the project

☆Hiroshi SASAYAMA

Chief Advisor, The Project on Capacity Development for Urban Water Supply Utilities in the Central Region of Vietnam

Our project started in June 2010. One year has already passed. I show you outline of our activity in the first year of the project.

We had survey at 5 pilot water supply companies and grasped training needs for staff and condition of implementing Water Safety Plans (WSPs). According to the result of survey, we made training programs and plan of workshop for promoting handbooks. Until now, we held a training course on “customer service” and 3 workshops on “customer service”, “water treatment and water quality management” and “operation and maintenance of facility”.

Proceeding the project is not easy as most of international cooperation project. Difficulties of our project is caused by complicated relationship among counterpart organizations. They are ministry of construction (MOC), the training center for water sector in the central region (TC) and Thua Thien Hue water supply one state member company (HueWACO). We, Japanese side, discuss outline of project activity with MOC at Hanoi and detailed activity with TC and HueWACO at Hue.

Group work of a training course

We consider that close cooperation between TC and HueWACO is important and necessary to establish effective training program and workshop. Background and experience of counterparts of each organization are quite different. It is a reason why they cannot work together easily. JICA experts should work as glue to make them closer. In the passed one year, 14 JICA experts worked with counterparts of each organization and tried shortening distance between TC and HueWACO. Now they can discuss project activity in each field as an usual job and exchange opinions with different view points. It is the biggest progress of the project.

I found another reason of difficulty. It is the problem of communication. Most of TC counterparts came from Hanoi while all the HueWACO counterparts were born in Thua Thien Hue province. Actually their speaking are quite different in some expression and words. They asked to confirm another’s speaking many times at the beginning of the project. I got a joke as “When a man arrived at Hanoi from Hue, he talked with Hanoi people but people could not catch his speaking. Then the Hue man tried to speak English then he could talk with Hanoi people completely.” Now I doubt that it is not only a joke.

Workshop for promoting handbook

For construction of PC tank in SEA

☆Hiroshi YOKOYAMA
(hy Concrete Technical Office)
E-mail；hycon-yokoyama@fk2.so-net.ne.jp

I have worked for newly starting overseas projects in a company dealing pre-stressed concrete (PC) tank, bridges. As working for the project, I have chances to visit some cities including Hanoi, Vietnam; and have saw there some similar sceneries to Japanese one in 1950's, and developing situations of infrastructure, and found there are many potential markets where we can contribute based on our experiences. Particularly, on PC water tank, we have increased its sales rapidly from 1957 in Japan in accordance with increase of water supply coverage is. Our technology would be useful in the countries of low water coverage and expected to develop water supply system. Since we could not find little cases of installation of PC tank in Southeast Asia in records, we are not sure necessity of PC tank.

In this January I had chance to get to know with senior officer of a water utility of Sebu, Philippines through seminar organized by JICA. Then I visited there to present technical explanation in April, and in May we visited water supply utilities in Ho Chi Minh, Vietnam and Phnom Penh, Cambodia. All of these three utilities have plan to construct new distribution reservoir for smooth and energy-saving distribution system. I am happy that all persons I met are so interested in PC tank.

Technical explanation; Sebu, Philipines

I newly established overseas office recently in order to contribute technically for constructing PC tank overseas. In the last one month, It was quite fortunate that we could get information on project for construction of PC tank, thanking to many people's cooperation. We have installed 8,000 unit of PC tank in Japan. From now we will work for examining cost considering local situations so that we could spread PC tank to the Southeast Asia.

Construction field of new water treatment plant In Phnom Penh

Introduction of New Members

○ Mr. Shunsuke TANAKA (Japan)

We welcome new member any time. Please contact us

WaQuAC-NET Newsletter No.11
Issued on 31 July, 2011
Topic: Water Supply & Radioactive Contamination

WaQuAC-Net Office
waquac_net@yahoo.co.jp (Yariuchi)
URL: http://www.waquac.net

Next Activity

- Mini-talk on technology for developing countries in October
- Newsletter No.12 in November

Question & Answer Corner

We welcome any Opinions and questions to this Q&A corner!

Q: I want to know "Air scouring method" for cleaning the old distribution main and household pipe. (Mr. K.S. Thailand)

A-1) I have never implemented air scouring for cleaning old pipe but I have experience of cleaning pipes by scraper or high pressure water. These methods are implemented before pipe rehabilitation works.

I found a theory of air scouring method through Inter net, which as follows.

"When water is not moving in a household pipe, the tap holds static water pressure. However, compressed air is put into the household pipe, pressure energy is accumulated in the pipe. Once closed taps are opened, this energy is changed to speed energy. This high pressure becomes pressure wave in the pipe and then air bubbles move with very high speed in the pipe .At the moment, the high frequency is generated and slime, scale and so on which adhered to the inside of pipe are peeled. Then finally these substances are discharged with water. This method can cover wide cleaning range by one time implementation and also remove oil substances without adhering of oil on the surface of the pipe."

(Answered by Mr. IDE Mashuji, Yokohama City Water Works Bureau)

A-2) Q & A for Cleaning household pipe

(Source: web site of Nisshou Industry Co., Ltd.)

1) Does this method damage the pipe?

a-1) This method gives no damage to the pipe because of less than 5 kg/cm2 of compressed air pressure. And also this method is very safe compared to polishing and chemical cleaning.

3) How much does it cost?

a-3) This method is cheaper than pipe replacement. The price has been set depending on water meter size, number of taps, and floor level as following table;

Meter size	# of Taps (Less than)	Floor level (Up to)	Standard Price
13mm	5	First floor	¥30,000
20mm	10	Second floor	¥40,000
25mm	20	Second floor	¥50,000

(USD 1= approximately ¥83)

A-3) In our company, we are offering cleaning pipes of buildings and houses. it is possible to remove slime and so on by putting air with ozone water into the pipe. For removing rust, we implement pretreatment by a sandblast and a scraper brush, then clearing and lining the pipe. In this case, water pressure put into the pipe will be controlled less than 0.4 Mpa, and also compressed air will be controlled depending on pipe materials and old pipe condition because this method works like a cleaning by water hammer. Approximately 1.0PPM ozone water will be used for the effective sterilization, odor removal and slime elimination. For more information, please contact our company.

(Mr. Eiji NAKASHIMA 、Nakami Japan Co.,Ltd.
Email:nakami_japan@festa.ocn.ne.jp)