WaQuAC-NET Newsletter

Water Quality Asian Cooperation Network

http://www.waquac.net/english/

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For Safe Water, Do Network.

Vol. 35 Contents

Technical Q&A

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

Q: What's kind of water contaminations inside distribution pipes and the countermeasures are there in Japan? (From Ms. C.K, Thailand)

A: Round-table discussion on the paper "Japanese cases of water contaminations in distribution pipes and the countermeasures"

Six answers were collected from the members who currently work or used to work for water utilities in Japan. Those answers were summarized as an article in the form of a round-table discussion here. This discussion was held anonymously as per interviewee's request. (the editorial responsibility is on Yamamoto).

Chair (Yamamoto): I appreciate these six water experts participated in today, all of you have experience especially for maintenance of distribution pipes. Let's start a discussion. Nowadays the risk of water contamination from leakage points of pipe is rare in Japan because the water pressure is controlled appropriately high and water is distributed for 24 hours. Then what is the cause of contamination these days? Please share your experience including past instances.

Mr. A: At *Z Waterworks Bureau,* cast iron pipes, ductile iron pipes without mortar lining and steel pipes (SGP) are still used as distribution pipes. Rusty water and turbid water by corrosion of pipe have been common issues even today. Normally it occurred sporadically by changing flow direction or water velocity inside pipes and sometimes, by shaking from a big earthquake, widely.

Mr. F: *U Waterworks Bureau* whose main sauce is surface water has added deep well water secondarily in expectation of increasing supplied water quantities. Only after few years, black and red water and rusty water occurred in distribution

pipelines near the wells. The water contaminations were caused by iron bacteria and adhesion of manganese oxide inside pipes or corrosion of pipes.

Mr. B: I have experienced a cross connection between water supply pipe and groundwater at a construction site at *R Waterworks Bureau.*

Mr. A: I had an experience that small alien substances flew out from taps when it took long interval between pipe laying and supplying water due to a large-scale land rezoning. That was caused by hardened joint lubricant of ductile iron pipes (DIP).

Mr. D: In case that steel pipes were used for water main pipe, coal tar was painted as water-proof coating on joints after welding. We had a case that pieces of coal tar flowed out from taps when pipes were washed before use. It was for the adhesive effect between steel and coal tar had been not enough because of cold season.

Mr. C: At *H Waterworks Bureau*, when pipes were washed out from fire hydrant after water suspension for the construction, sometimes, white particles which broke easily by hand were flew out. And they remained inside pipe even after rust was washed out completely by valve operation. It mostly occurred only in some specific areas, where DIP had been laid at the same period. We think that small fragments of "seal coat" which separated from the inner surface of pipes were precipitated at the bottom of the pipe, and they flowed out due to change of the flow velocity.

Mr. B: DIP has been used 100% for main distribution pipe since 1970's at our waterworks bureau. In 2000's, peeling of deteriorated "seal coat" became obvious.

Mr. E: Peeling of "seal coat" was also a cause of water contaminations inside water pipes in our waterworks bureau.

Ms. Chair: What is the "seal coat"?

Mr. E: Seal coat protects the mortar lining, which is usual lining method of DIP. The material is acrylic resin or vinyl chloride resin.

Ms. Chair: Does it mean DIP is coated double?

Mr. E: Yes, mortar lining enables preventing DIP from rusting. And sufficient quantity of water could be supplied permanently. However, after mortar lining, cracks occurred on mortar lining and PH rose quickly in the water supplied firstly. To solve these problems, seal coat was introduced as a coating of mortar lining. However, as Mr. B said, peeling of seal coat occurred because of aged deterioration. When white turbid water was supplied from the tap, there were many complaints from customers. Actually, it was not harmful but still, it was obviously a contamination. So, we needed to solve the problem.

Ms. Chair: As 4 of 6 participants said, I understand the seal coat is the cause of water contaminations inside distribution pipes in Japan nowadays. It is quite different from those in developing countries.

Mr. D: In India, PVC pipes and AC pipes were used as main distribution pipes and water leakage occurred often from the cruck and joint of pipes. In case that sewer pipes were buried near the water pipes, if the sewer pipe was broken, and water supply was intermittent, sewage would flow into distribution pipes easily. In Indonesia, pipe broken by construction accident was not informed to water utility and sometimes sewage flowed into distribution pipes. Water utility could know only after the customer complained.

Ms. Chair: Let's go back to the case in Japan. Please discuss the measures against water contaminations.

Mr. A: In our waterworks bureau, rusty water was washed out from fire-hydrant as an emergency response. And then pipes were replaced as a

permanent measures. In the case of the joint lubricant problem, I told before, *AQUAPIG* (http://aquapig.jp/) method were used for cleaning.

Mr. B: In *R Waterworks Bureau*, cleaning inside pipe was done by using sludge drainage pipe thoroughly. At the same time, we identified the location of the pipeline with a seal coat, using piping drawings. And then, we found some pipes which have seal coat peeling and the precipitation at bottoms of pipes by inside pipe investigation using a camera. There, we carried out the inside pipe cleaning, even without complaints from customers.

Mr. C: At our waterworks bureau, it's difficult to clean enough to wash all seal coat out. So, I think that only way to solve seal coat problem is pipe replacement. However, practically it is difficult to prioritize the seal coated pipes for replacement. Even if some pieces of seal coat flow out during pipe cleaning, we drain out most of the rust and then make slow down water velocity. After velocity gets constant, we finish the pipe cleaning. In the past, I remember, the measures using trap was done but it's found out not effective.

Mr. F: We gathered information from customers and investigated pipes. Then problematic area was identified. We carried out pipe replacement, pipe cleaning and introducing equipment to remove iron and manganese. We also cleaned the pipes using a machine.

Mr. E: In *H Waterworks Bureau*, pipe cleaning was done at night time using fire-hydrant or sludge drainage valves. Cleaning has been still continued at the area where old DIPs remain. The seal coat has improved to permeable acrylic resin which does not peel easily. The problem has not occurred on newer pipes.

Mr. D: For a reference, epoxy resin is used for waterproofing the steel pipe welded joint. Therefore, such peeling problem has not occurred.

Ms. Chair: It seems to take a long time to solve distribution pipe water contamination problem completely despite the efforts to solve it. How do you manage complaints from customers?

Mr. A: The staff of pipe maintenance manages case by case. When customer request, water quality is checked, and the result is explained by the staff of water quality. Water tariff is reduced in case that water for washing pipe was used after the customer meter.

Mr. B: We apologized customers and explained the cause of the problem. And then we clean the pipes.

Mr. E: We explain it's not harmful and we clean the pipes at night, especially around and upstream area of the pipes of the complaint as soon as possible.

Mr. F: We gather and analyze the information and questions from customers on water qualities (black water, rusty water) and water pressure problem. The data is used as basic information to conduct measures. Furthermore, we conduct "accountability" (explanation on the investigation progress, the countermeasure and so on) thoroughly.

Ms. Chair: I summarize today's discussion. We focused on water contaminations inside distribution pipes in Japan, especially for rusty water or oxidized manganese and fragments of peeled seal coat. Their causes are very different from ones of developing countries. The measures for the issues in Japan are mainly pipe cleaning or pipe replacement. For customer's complaints, there are lots of information based on the experience. I hope this discussion is useful for the questioner. Finally, I would like to express my appreciation to the people who are working at night to keep safe water. Thank you for your cooperation. (end)

Three MWA staffs participate in JWWA Conference on October 25-27, at Takamatsu

As part of technical cooperation with MWA (Thai Metropolitan Waterworks Authority), WaQuAC-Net has been supporting the participation of MWA staff in the JWWA Conference since 2014.

Two people, Ms. Sivilai and Ms. Chaweepan (Uan), participated in the JWWA Conference held in Takamatsu City in Kagawa prefecture from October 25th to 27th, 2017. This year, Mr. Varich who has been taking the Kanagawa Prefectural Overseas Technical Training Program, joined the conference. And then, participants from MWA became three people.

Ms. Uan presented at JWWA Conference on the theme *"Development of WSPs (Water Safety Plans) -Ensuring safe water to people living in the metropolitan area of Thailand-",* Ms. Sivilai who had presented 2 years ago, and Mr. Varich who participated the conference in the first time joined as cooperative researchers. Ms. Uan's presentation was the second in the English Session that began at 9 o'clock on October 27, and the moderator of this session was coincidentally Mr. Sasayama. Please see "Outline of the presentation", *the article shown next.*

(By Yamamoto)

English session room

Development of WSPs (Water Safety Plans)

-Ensuring Safe Water to People living in Metropolitan Area of Thailand-

1. Introduction

The Metropolitan Waterworks Authority (MWA) provides drinking-water services to over 10 million population in Bangkok and its vicinities. MWA has 4 water treatment plants (WTP) with production capacity about 5.9 million m^3/d. 70% of raw water is abstracted from Chao Praya River and 30% is from Mae Klong Dam. The waters are conveyed by gravity flow to WTPs via two artificial raw water canals respectively. During the past 5 years, Thailand has been affected by climate change. In 2011, the abnormal tropical storms caused Flood Crisis covering an area of Chao Praya River Basin. It was recognized as the most severe flood in fifty years in Thailand. MWA raw water canals were contaminated by low quality flood water. From 2013 to 2016, the effect of El Nino caused abnormal drought nationwide. Water sources became deteriorated and sea water intruded due to less water flow from upstream.

2. Purpose of WSPs development

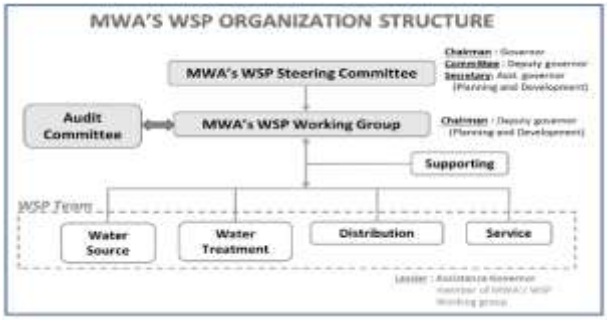
Flood Crisis in 2011 provoked further interest in the Water Safety Plan (WSP) concept to ensure the safety and acceptability of drinking water supply and bring back the customer's confidence. During the investigation for flood crisis in Bangkok, WHO expert strongly recommended MWA to implement WSP. Actually, MWA had already implied risk management practices into operational works since 2004 including monitoring, evaluation of risks, control measures and

periodic risk reassessment and control. Moreover, two of the WTPs, Samsen and Mahasawat are implementing "Hazard Analysis and Critical Control Point (HAACP)", of which the approach is quite consistent with many WSP concepts, but this management tool has not covered all processes of waterworks, from source to tap.

3. Projects for development of WSPs

1) Period of documentation during 2012-2014

An in-house training on WSP introduction was conducted with WHO and PUB-Singapore support. After that, MWA set up an in-house WSP working group in mid of 2012 to responsible for doing WSPs document. In 2013, MWA's Thai version or the first WSP manual was commissioned by Kasetsart University to develop MWA's WSP manual with the collaborative working from in-house HACCP team. This manual was used as guidelines for WSP implementation. In 2014, MWA restructured WSP working group as being guided by MWA's WSP manual. Hierarchy structure was set separately from MWA's organization chart.



A high-level steering committee chaired by the Governor, working group and committee for internal audit were also set up. The WSP teams consist of staffs from water sources, treatment plants, distribution and end-user service offices which responsible for manual reviewing and also annual budget preparing. Then the second edition of MWA's WSP manual was launched by MWA's own staffs.

2) Period of implementation during 2015-2016

Several improvements had done such as the construction of dikes along the canals and dual power sources to minimize risk from power failure. The chlorine booster stations were introduced to some certain points in the distribution network which were addressed as the risk of low residual chlorine in the monitoring systems. Moreover, a real- time water quality monitoring system had also developed with water quality data for more than 50 stations. Standard operating procedures (SOPs) were documented for all operation works. Under the collaboration between MWA and WHO/SEARO, Informal External Auditing process which is a part of WSP verification was done in October 2016. Aims of the audit are to review MWA's WSP program and the elements of its actual WSP. The result of audit showed that tap water was safe. There were many useful recommendations such as improving data analysis, WSP team capabilities building to develop and apply the WSP concept correctly, etc.

3) WSP continuing in 2017

From audit result, MWA found that the most important and urgent improvement is to communicate WSPs to all staff which is the starting point to others development. The training program was set into 3 levels; executive level, general staff, and WSP team to strengthen WSP work as it supports MWA's core business of delivering safe drinking water to its customers.

4. Conclusion

MWA continues implementing WSPs and reviewing it periodically. For ensuring the WSP, it must be up to date and can be working appropriately. We expect next external audit or internal audit, because the result will be better. However, there are many challenges to be achieved; expanding WSP to entire the system, improve the accuracy of risk assessment and controls, to begin with a consideration of reviewing the WSP concept that recommended MWA should take care also the consumers' plumbing, which is not owned or controlled by MWA. (end)

Self-Introduction from Indonesia

Mr. Fauzil Husni

Tirtanadi Water Work Company

My name is Mr. Fauzil Husni. I come from Indonesia. I was graduated from chemstry with bachelor degree and chemical engineering for master degree. I got married and have two cute sons. I have been working in Tirtanadi Water Work Company since 2007 and now be as a staff of water quality laboratory in there. My favorite hobbies are travellig and reading. Thus it may be a little relation to my work.

I have introduced my company with my colleague, Ms. Siti Zainab Lubis on WaQuAC-NET Newsletter vol.23 in January 2015. Now, I want to write recent issues. Due to population growth in our province, mainly Medan town, that's automatically caused increasing of water demand. Thus, we have also to improve and develop our serving to fulfill the demand. For that, we have to increase our capacity by building new water treatment unit and underground water use. As long as our service in water supply, there are some issues which now I face in my company and laboratory such us:

1. We need competence and ability in water treatment knowledge in making or looking for modern and newest water treatment technology which is simple, low cost and importantly able to produce qualified water.
2. There are several compulsory parameters we cannot test such as Selenium metal (Se) and Arsenic metal (As) because our instrument ability is limited to support the testing. In addition, with increasing intensity of service, we also need more efficient and newest methods for microbiological testing and both physical and chemical testing which are, of course, required simple and as cheap as possible.
3. We have to study and discuss the technique reducing water loss in water treatment process.
4. There are still very few opportunities for analysts to take some trainings which are very needed to improve the quality of our testing results. They need not only in-house training but also overseas training, especially which provide more modern and sophisticated technology. Therefore, I hope we take the training at Yokohama Waterworks Bureau. (end)

Mr. Fauzil Husni and his family

Please see a reference "Basic Data of Tirtanadi Water Work Company" in next page.

Reference: Basic Data of Tirtanadi Water Work Company, Sumatra, Indonesia

Coverage	73.16% of medan total population
Production capacity	5530L/sec (zone1)+493L/sec(zone2)=6,023L/sec=520,387m3/d
Connection	460,036
Total length of pipes	3,565,639m
Service hours	24 hours
NRW racio	25.74 %(zone1), 17.11%(zone2)
Water sources	Ground water, river water
Facilites	6 water treatment plants, 5 small water treatment plants, several wells
Average consumption	27m3/month/customer
Number of staff	2127
Staff/1000connections	4.62

Source: Ms.Siti Zainab Lubis and Mr. Fauzil Husni in December, 2014

The 9th Meeting of WaQuAC NET Kyushu

The 9th meeting was held in Fukuoka City on September 24 from 13:00 till 16:00 with the participation of Mr. Nakashima, Mr. Kagata, Mr. Oda, Ms. Yamamoto, and Mr. Toma who was OB of JICA Volunteer dispatched to Panama.

Firstly, Yamamoto made an explanation about activity and financial report of 2016, and activity plan of 2017. And all members reported their recent activities.

Mr. Nakashima; regrettable closed his liaison office in Cambodia established in 2008.

Mr. Oda; the grass-root project, which supports water supply in Fiji by Fukuoka Waterworks Bureau, was approved to continue. He appreciated that the support system within the Bureau to implement the project got in place, and expected the younger generation contributes more actively.

Mr. Kagata; talked about the Human Resources Development Project for Water Supply in Sudan, which he has been involved in since last year. It seems to be difficult to achieve good outcomes likely because small amount of JICA's inputs to the Project overwhelmingly different from ones in Asia, and the timing of facilities development and human resource development are not consistent, he said.

Mr. Toma; took over the family business after returning from Panama. Although he was away from international cooperation, he began volunteering education for the environment, and intended to do international cooperation activities gradually.

The after party was held in Tenjin which is the busiest in Fukuoka city. Mr. Akaishi, who could not attend the meeting due to his work for the Professional Engineer, also came to join, and the party got lively and exchanged a lot. (end)

(from left) Nakashima, Toma, Kagata, Akaishi, Yamamoto, Oda

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Self-Introduction of New Member

To Achieve SDGs, Work Closely!

Daisaku Shinohara
（JHA）

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It is a great pleasure for me to introduce myself to distinguished members of WaQuAC-NET.
I am Daisaku Shinohara, Secretary General, Japan Habitat Association "JHA".

At site of afforestration for reserving water resources in Laos. Mr. Shinohara (Right)

JHA, as a partner of UN-HABITAT, carries out projects to help people in need around the globe who suffer from worsening living conditions owing to conflict, disaster or poverty. UN-HABITAT and JHA develop sustainable cities and communities so that all people can live safely in good health and peace. UN-HABITAT and JHA perform—activities to improve infrastructure such as constructing houses, water supply, sewerage and electricity facilities for local communities, in which residents also play major roles in such construction. UN-Habitat and JHA, moreover, support the improvement of employment, economic growth, education, sanitation, and hygiene. They also support comprehensive human settlements and encourage residents to develop their communities by themselves without outside support and finance in future.

Water is essential to all living things. UN-HABITA and JHA have been executing projects "*Inochi no Mizu* (Water for Life) Project" to construct water supply facilities and improve water quality as well as preserve water resources. JHA has been implementing a project to preserve water resources by planting trees in Lunag Prabang, Lao P.D.R since 2012. JHA forested 162.26 ha in mountain areas as of March 2017, and is now carrying out similar projects in the provinces of Luang Prabang and Xiounyaburi. JHA's projects plant not only trees playing the role of water recharge but fruit trees for income generation for villagers to enable them to improve their living conditions while villagers' efforts to plant trees will go on, ensuring the projects' sustainability.
I believe that the most difficult challenge after completing a project is follow-up. It takes a long time to develop human resources to the extent that appropriate managers will be trained and appointed to assume responsibility for their projects. It is also necessary that appropriate systems will be established for continuous implementation of projects. Both managing training and system upkeep require financial resources, which local communities find not easy to offer.
The Sustainable Development Goals "SDGs" is a collection of 17 global goals established by the United Nations in September 2015. One of the Goals is "Clean Water and Sanitation" which

Construction of Water supply facility in a school（Kenya）

aims to ensure safe water and sanitation for all people around the globe. At the same time, water resources are adversely affected by the global climate change. It is extremely important and meaningful for as many individuals and organizations as possible will work closely together to achieve SDGs while preserving water resources. I feel greatly honored to join in this distinguished organization and am looking forward to learning from you all and contributing to the organization's objectives. Thank you very much. (end)

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Welcome back, Mr. Shimomura!

Toshiki Horie

A party to welcome Mr. Shimomura back to Japan was held in Shinjuku on Oct. 5th, 2017.

He was a chief advisor of the Capacity Development Project for Improvement of Management Ability of Water Supply Authorities (MaWaSU project) in Laos. There were nine participants including WaQuAC members and Mr. Khampasith who had been a counterpart of Mr. Shimomura during the project and stayed in Tokyo for the training. When looking back to five years ago, 2012, the farewell party for him was also held at Shinjuku. (Newsleter vol.15)

After completing the MaWaSU Project on enhancement of the management ability for the public waterworks in Laos, Mr. Shimomura came back to Japan on Aug. 2017. The details of his activities in Laos were described in the previous Newsletter vol.34. There, he recalled "I had carried out the project with being conscious my experience in Japan. Concretely, there was the similarity between (1) the situation of the time when Mr. Shimomura started working in the waterworks bureau in Japan and (2) the situation of Laos when started the technical project.

Basing on the knowledge of what had been applied in the waterworks bureau in Japan at that time, he made his initiatives on improving the work procedures by paper-based document and manual. It was feasible for local staffs to understand the principle and general rules of the work procedures.

Furthermore, I think the distinctive style of Mr. Shimomura was showed in not only working time but his after-five activities. It resulted to set up the close relationship as well as a strong sense of solidarity among the Japanese expert team, their Lao counterparts and staffs of waterworks in Laos.

Hearing a possibility of phase II project, I hope that Mr. Shimomura will take many new challenges, and share his achievements with WaQuAC-Net. (end)

From left: Horie, Igarashi, Morita, Umeyama, Khampasith, Sasayama, Shimomura, Ono, Yamamoto.
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Lecture on distribution pipe cleaning method at TSS

MWA Staff, Ms. Sivilai, Ms. Uan and Mr. Varich visited Kameido Branch of TSS Tokyo Water Co., Ltd. (TSS) to attend lectures on “TS distribution pipe inner surface cleaning method (TS method)” from 10:00 to 12:00 on October 30, 2017.

MWA is promoting their Water Safety Plan and trying to control water quality from water sources to taps. As a part of the activities, MWA staff asked WaQuAC-NET to give them an opportunity to learn countermeasures against water pollution in distribution pipeline in Japan. Mr. Arikawa, TSS kindly arranged these lectures for MWA Staffs. Mr. Sasaki and Ms. Yamamoto from WaQuAC-NET also joined. Mr. Arikawa, Mr. Honjo, Mr. Uematsu and Mr. Sato gave lectures on water quality improvement in distribution pipes of the Bureau of Waterworks, Tokyo Metropolitan Government.

The TS method was jointly developed by the Bureau of Waterworks, Tokyo Metropolitan Government, TSS and Kubota Corporation, and applied to practical use in 2005. (http://www.tssk.jp/eng/service/pipeline/02.html) A cleaning head with a hose is inserted into distribution pipeline from a fire hydrant and high-speed rotating brushes of the head clean the inner surface of pipes. Drainage containing pollutants is washed out from the fire hydrant through the hose.

The pollutants are manganese, water scale, deteriorated seal coat of DIP, etc. (Please see page 7, Q&A). The TS method is mainly applicable for pipe diameters 100mm ~ 200mm. It is possible to clean each 200 meters distance of the left side and the right side from the fire hydrant. Cleaning works are usually carried out from 23 o'clock at night to 6 o'clock in the morning by stopping water supply. The TS method is also effective for PVC pipes, so it can be utilized by MWA which has many PVC pipes.

(By Yamamoto, WaQuAC-Net)

From left, Sasaki, Yamamoto, Varich, Uan, Sivilai, Lecturers (Mr. Arikawa, Mr. Sato, Mr. Uematsu, Mr. Honjyo)

WaQuAC-Net Meeting in Takamatsu

Hiroshi Sasayama（JWWA）

Some WaQuAC-Net members attended the research conference 2017 by Japan Water Works Association at Takamatsu city, Kagawa prefecture. Then members had a meeting at a restaurant in the building where the conference was held on 26 October 2017. Two members, Ms. Sivilai and Ms. Uan, from Metropolitan Waterworks Authority (MWA), Thailand came for presentation at the conference. And one more participant from MWA was Mr. Varich. He has been attending a technical training course of Kanagawa prefecture at Yokohama. This WaQuAC-Net meeting was also a welcome party for them. 9 members joined and talked about a

lot of things.

The next day, 27 October, Ms. Uan had a nice presentation on MWA's experience of establishing its Water Safety Plans. The research conference 2018 will be held at Fukuoka city. We hope that we can have the same meeting there next year.

After finishing the conference, we visited Ritsurin-garden. It is a famous traditional garden well matched with a further view such as mountains. There are many good photo spots such as hills, a water fall, ponds, bridges, and cottages. At one cottage, we also enjoyed tea ceremony as the picture.

Tea ceremony

from left, Shimizu, Saiki, Nakanosono, Sivilai, Sasayama (behind Sivilai), Uan Yamamoto, Varich, Trang.

KONPIRA Shrine

Introduction of new members

- Mr. Daisaku Shinohara (Japan)
- Ms. Puangtong Wangdan (Thailand)
- Mr. Kan Shichijo (Japan)

We welcome new members anytime Please contact us

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Next Activity

January 26 WaQuAC-Net 2018 General Meeting
February 25-March 6 Dispatch Experts to Thailand, Cambodia
March 15 Newsletter vol.36 in Japanese