Newsletter

University of Malaya-Kyoto University Secretariat

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JSPS Asian Core Program
Research and Education Center for the Risk Based Asian Oriented Integrated Watershed Management

MINISTRY OF HIGHER EDUCATION

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15

THE LAST STEERING COMMITTEE MEETING OF JSPS ASIAN CORE PROGRAM

*The **10th Steering Committee Meeting (SCM10)** was held successfully at The University of Tokushima, Tokushima, Japan on 26 January 2016. Eight participants from Malaysia and 10 participants from Japan attended the meeting. The JSPS Asian Core Program officially ended on 31 March 2016.*

CONTENTS

徳島大学 The University of Tokushima

*a) **Assoc. Prof. Hiroshi Yamamoto** (left) introducing The University of Tokushima background before the meeting started. Next to him is the Dean of Faculty of Integrated Arts and Sciences.*

*b) **Prof. Nik Meriam** is giving a token of appreciation to the Dean of Faculty of Integrated Arts and Sciences, The University of Tokushima as host of the meeting.*

University of Malaya-Kyoto University Secretariat is an international bilateral collaboration under:

UNIVERSITY OF MALAYA — SUSTAINABILITY SCIENCE CLUSTER

JSPS Asian Core Program
10th Steering Committee Meeting (SCM10)

26 January 2016

The University of Tokushima, Tokushima, JAPAN

On 26 January 2016 (Tuesday), the 10th Japanese Society for the Promotion of Science Asian Core Program Steering Committee Meeting (SCM10) was held at The University of Tokushima, Tokushima, Japan. The JSPS Asian Core Program is an international collaboration between Japanese and Malaysian universities under the research theme of "Research and Education Centre for the Risk Based Asian Oriented Integrated Watershed Management." The JSPS-ACP Steering Committee Meeting is a bi-annual event, with Kyoto University taking turns to organize the meeting. A total of 18 participants (10 Japanese and 8 Malaysian delegates) comprising the coordinators and group leaders, researchers and administrators attended the meeting. The participants:

Participants of Malaysian side:
Prof. Nik Meriam Nik Sulaiman, Coordinator, UM
Prof. Zulkifli Yusop, Leader of Group 1, UTM
Prof. Md. Ghazaly Shaaban, Leader of Group 2, UM
Prof. Dato' Mazlin Mokhtar, Leader of Group 3, Deputy Vice-Chancellor (Research & Innovation), UKM
Prof. Datin. Azizan Baharuddin, Leader of Group 4, UM
Prof. Salmaan Hussain Inayat-Hussain, Member of Group 2 and 3, PETRONAS-UKM
Assoc. Prof. Noor Zalina Mahmood, Member of Group 4, UM
Mr. Azizi Abu Bakar, Research Officer, UM

Participants of Japanese side:
Prof. Yoshihisa Shimizu, Coordinator, KU
Prof. Minoru Yoneda, Leader of Group 3, KU
Assoc. Prof. Keisuke Sato, Member of Group 2 and 3,Ritsumeikan University
Assoc. Prof. Hiroshi Yamamoto, Member of Group 3 and 4, The University Tokushima
Dr. Tadao Mizuno, Member of Group2, KU
Dr. Nobumitsu Sakai, Member of Group 1, 3 and 4, KU
Dr. Siti Nurmaya Musa,Member of Group2, KU
Ms. Maneechot Luksanaree, Master's Student, Member of Group 2, KU
Ms. Satoko Handa, Director, Promotion of Science and Technology Division, KU
Ms. Yuka Yano, Administrative Officer, KU

Apologies:
Prof. Eiichi Nakakita, Leader of Group 1, KU
Prof. Masahisa Nakamura, Leader of Group 4, Shiga University

During the meeting, JSPS Asian Core Program Coordinators from Japan and Malaysia, Prof. Yoshihisa Shimizu and Prof. Nik Meriam Nik Sulaiman delivered their opening addresses with an overall summary of past activities until January 2016. Then, Group Leaders from both countries presented their group research progress. After a discussion on other matters, the meeting was concluded with a gift exchange ceremony and photography session. During our stay in Tokushima we had a technical visit at Tokushima Prefecture Disaster Center function to provide information on what to do in case of a natural disaster. During the tour we experienced earthquakes, strong winds and more via simulation, as well as learnt about what to do when a disaster occurs.

(a - f) *Photos taken after SCM10 (gift exchange ceremonies) at The University of Tokushima. The recipients in the photos are the Malaysian Coordinator and all four research group leaders.*
(g - h) *Sharing the moment at the Tokushima Prefecture Disaster Center (left) and all delegates are listening to a brief explanation by staff of Tokushima Relief Center (right).*

Field Survey in Selangor River Watershed and Technical Visit for the Understanding of Selangor Dam

March 2016

Selangor River Watershed, Selangor, MALAYSIA

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Introduction and Objectives

Natural organic matter (NOM) are the organic compounds that include the products in the environment such as proteins, carbohydrates, lipids, lignin, and so on. These cycle and dynamics of NOM in a watershed are very important since they affect the ecological system and water quality. Thus, watershed survey is necessary to understand the cycle and dynamics of NOM, and we investigated what is really going on in the Selangor River Watershed.

The objectives of this sampling are as follows:

(1) Investigating water quality of the Selangor River.
(2) Understanding what types of organic molecules are involved in the river.
(3) Comparing the molecular compounds of each sampling point.

In addition, the Sungai Selangor Dam is important to supply water to Selangor district and federal territory, Kuala Lumpur. It is, therefore, important to understand the operation system and the features of the dam, and it will be helpful to estimate a potential water supply and to make the plans for ensuring the available raw water in the future under the diverse activities of local communities of its down streams. Therefore, we have visited the dam and have discussed with the officers about the operations,

Results and Discussion

Water quality in the Selangor River

For water quality investigation, pH, Conductivity, $NO^{3-}N$, $NH^{3-}N$, PO_4^{3-}suspended solids (SS), and dissolved organic carbon (DOC) were measured. Samples were collected in three sampling points (Fig. 1). Point A is the upstream nearby the Selangor dam, point B is downstream of the Selangor River, and point C is its tributary. Collected water samples were filtered by GF/B filters (pore size: 1.0 µm). We are planning to measure their mass spectra by Orbitrap MS after a series of solid phase extractions.

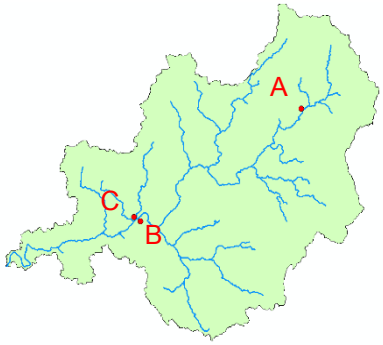

Fig. 1 Sampling points in the Selangor River Watershed

At point C, the concentration of SS (mg/L) was less than a half of that at point B. However, SS at point C clogged more in the filter than that at point B in the filtration procedure. It means that the characteristics of SS between points B and C are different. Therefore, further analysis of SS is required to elucidate their characteristics.

At point B, the concentration of SS was more than 25 times higher than that at point A, where the concentration of SS was 2.0 mg/L. However, the concentration of DOC is only 1.5 times higher than that at point A, where the concentration of DOC was 1.57 mgC/L. It means that SS does not strongly relate to DOC, and vise versa. The concentration of DOC at point C was 7-10 times higher than those at points A and B, although concentration of SS at point C was less than that of Point B. It is suggested that organic compounds at point C could be different from other two in terms of the concentration of DOC, the color of water, and the concentration of SS. To clarify these differences, we need to understand them in the molecular level, using mass spectrometer.

Fig. 3 shows the samples extracted by methanol after solid phase extraction for measuring mass spectra. These samples will be analyzed by Orbitrap MS, which has high resolution and high mass accuracy. Molecular formula could be estimated from m/z obtained from mass spectrum. Common or different components in three samples will be clarified by comparing these three samples.

Visiting the Sungai Selangor Water Supply Scheme Phase 3 (SSP3)

The Sungai Selangor Water Supply Scheme Phase 3 (SSP3) was constructed for stable water supply in Selangor district and Kuala Lumpur. It has been operated by SPLASH, the concessionaire under the Selangor State Government. In Selangor district and Kuala Lumpur, the trends of water demand has been going up as increasing commercial, domestic, and industrial water consumption.

Messages from Supervisor
(*Prof. Yoshihisa Shimizu*)

"For both graduate students, this is the first visit to the Selangor River and its watershed. One of the most important objectives of our Asian Core Program (ACP) is to educate and train the future generations for creating a better environment. I think that their visit to the real environment in Malaysia have buried very important and useful nuggets in the hearts of these two promising youngsters. I also strongly believe and expect that these nuggets, which might be tiny), will open in the future with many beautiful flowers. I would like to appreciate the help and cooperation obtained for their visits and sampling from our Malaysian colleagues; Prof. Nik, Assoc. Prof. Dr.

The Sungai Selangor dam

Fig. 2 Point A (Left): at upstream nearby the Selangor Dam, Point B (Center): at downstream, and Point C

The storage of the dam has a maximum capacity of 235 million cubic meters. The dam embankment is containing granite rock of 6.4 million cubic meters. It allows storage water to infiltrate to downstream of the dam. Sand of 0.62 million cubic meters is comprised of the fine filter material in the part of a thicker graded filter layer to transit between the clay and rock materials. In addition, the impermeable central core is composed of clay cores of 1.2 million cubic meters as meta-sedimentary and granitic rock obtained from the borrow pits shown in Fig. 4. The water is mainly stored in the dam during wet season, and it is utilized for water supply especially during the dry season by discharging the water into the Selangor River. The dam ensures enough water supplies, and the water is treated in the water treatment plants at Rasa and Bukit Badong. However, excess water during the wet season will be overflowing the flip bucket, which has a width of 30 m and a length of 230.54 m. It will be flowing into the chute spillway that the discharge capacity of the spillway of 3000 m^3/s (260,000 MLD) is more than the volume of water in the extreme floods. There is a plunge pool at the end of the spillway to dissipate water flow's energy for preventing erosion and turbulence. Moreover, for water release from the dam into the river, a diversion tunnel is used. It has twin discharge pipes of a diameter of 2.2 m. The water in the tunnel is coming from the draw-off tower that installed with flow measuring devices and flow regulating valves to control the amount of water.

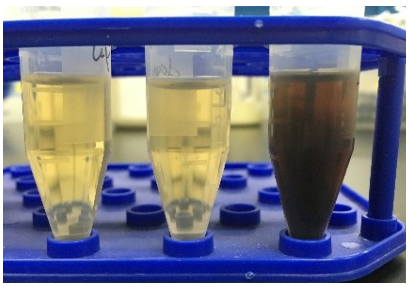

Fig. 3 Samples after solid phase extraction. Left; upstream, Center; downstream, and Right; tributary.

In a long-term water demand and supply project, SPLASH has installed on-line raw water monitoring stations to provide a warning of potential water quality and quantity. In addition, The Nation Water Resource Council has planned to implement the long term water supply, including federal territories of Kuala Lumpur and Putrajaya up to 2050 and increasing of population growth and industrialization; thus, the water demand will be possible to reach 9,000 MLD by 2050. Moreover, we have discussed the locations of water treatment plants in SSP2 that the plants use raw water from downstream of the Selangor River, and there collect the current water data and report to the dam for estimating water discharge from the dam. Therefore, we understood the operations between the dam and other water treatment plants related to the water levels in the river.

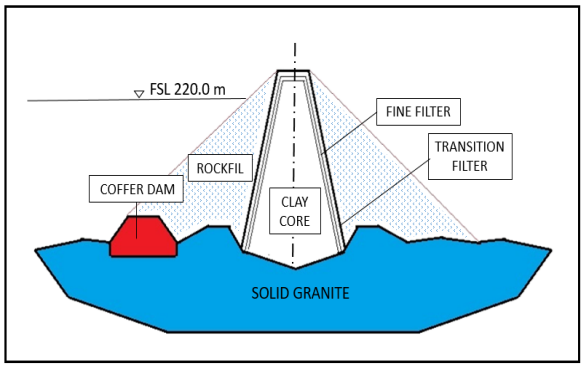

Fig. 4 Cross section of the Sungai Selangor dam

Conclusions

We found the potential of difference of organic compounds between mainstream of the Selangor River and its tributary inflowing from point C. We will analyse the mass spectrum to confirm these phenomena and to achieve the objectives 2 and 3. In addition, we have to collect more data on bacterial community and component of SS to grasp the cycle and dynamics of NOM in the Selangor River Watershed. After the dam visiting, we understood more information on the dam that the aim of the dam is to ensure the future sustainable water supply for the Selangor state and federal territory, Kuala Lumpur. Accordingly, the Selangor State Government invested to build the irrigation's technical facilities (the spillway, the draw-off tower, the diversion tunnel, etc.) to control the raw water in the dry season and wet season including the extreme cases. In addition, there has planned a long-term program in the future due to the activities increasing in Kuala Lumpur. Consequently, we think Integrated Watershed Modeling is an important strategy to protect against floods and droughts in a long-term plan.

Community Environment Health and Risk Profiling: Selected Case Studies

2013 - 2016

Selangor, MALAYSIA

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Introduction

In recent years there has been increasing concern regarding the effects of chemicals capable of altering hormonal function. Many of these so called endocrine disrupting chemicals (EDCs) are significant organic pollutants in the environment. An endocrine disrupting chemical was defined by the U.S. Environmental Protection Agency (EPA) (USEPA, 2012) as "an exogenous agent that interferes with synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-borne hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental process." Basically, EDCs are substances that interfere with the functioning of hormone systems in human and wildlife resulting in negative response of endocrine system. Due to the relative ease of dispersion of many of these chemicals in the general environment and also their persistent characteristics, many EDCs are also classified as persistent organic pollutants (POPs). The results of numerous environmental surveys on organic pollutants with reported endocrine-disrupting characteristics including pesticides, perflourinated chemical (PFCs), bisphenol and phthalate esters involving both biotic and abiotic components in the global environment have indicated that the contamination of the general environment by such chemicals may be significant. In addition to the physicochemical nature of the chemical, tropical climatic conditions and agricultural and industrial practices and policies play important roles in determining the fate and distribution of EDCs in the global environment. Klang Valley is the most developed state in Malaysia. With the increasing modernization process especially in healthcare and manufacturing industries has resulted in the introduction of potentially harmful chemicals such as EDCs into the environment. In this study, we assessed the level of PFCs, one of the EDCs of interest in both environmental and human samples in hope to provide necessary data for the development of health risk assessment of EDCs especially for population of Klang Valley.

Objectives

To assess environmental pollution of Perflourinated Chemical (PFCs) in Selangor and Langat River basin.
To develop a multimedia fate and transport model of PFCs in Selangor river basin.
To assess human health risk of PFCs by analysing human blood and urine samples.

Rationale

The findings of this research will be used to developed health risk assessment model. Consequently, this finding will also be able to increase awareness to population of Malaysia on the current level of contaminant exposure in Malaysia and its effect to human health risk. The finding will be applicable to nearby nation that shares the same environmental and industrial pattern with Malaysia. Furthermore, this finding also is expected to give the policy maker on how to act accordingly regarding the status of pollution in Malaysia.

Research Findings

Environmental Monitoring of PFCs in Selangor and Langat River basin.

Selangor and Langat rivers were chosen as the sampling location because these rivers receives effluents from industries and commercial activities, but also are used as a water intake source for water treatment plants. The analytical method developed in this study involves using both solid phase extraction (SPE) together with liquid chromatography coupled with mass spectrometry (LC-MS/MS). The PFCs concentrations in water samples from Langat and Selangor Rivers in the year 2013 are illustrated in Figure 1. A very high concentration of PFCs especially PFOA and PFOS were detected between sampling point number 3 to 5. Concentration as high as 375.6ng/L and 306.2ng/L were detected for PFOS and PFOA, respectively. The water appears to be blackish in color and smelly for a few kilometers along the river. This is from the fact that the area is filled with packaging, electronic and furniture industries which utilized the uses of PFCs. As for Point 25 in the Langat River, which is situated very close to the Langat River dam, the concentration of PFOA detected at that sampling point is considerably high. This is due to the recreational area that opened nearby the Congkak River, which is a tributary of Langat river. The use of PFCs related products by the public without proper disposal resulted in the high concentration of PFOA detected in sampling point 25. Concentration of PFOA seems to increase a bit (point 24) further down the stream where another camping site is situated. However the concentration of PFOA was found to decline significantly after that point.

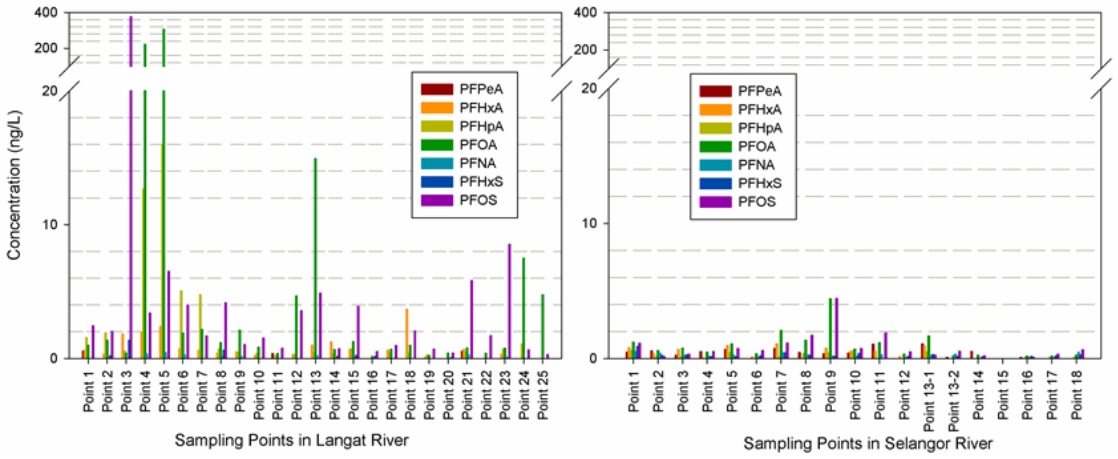
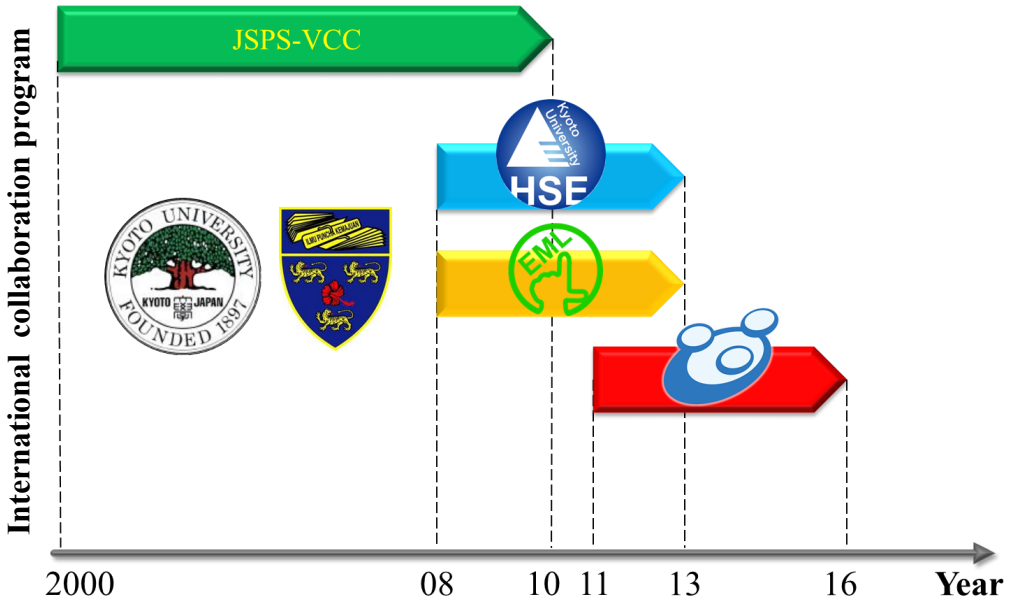


Figure 1: Concentration of Perfluorinated Chemicals (PFCs) at Selangor and Langat River (Year 2013).

This is totally different from the concentration of PFCs detected in sampling point 20 where another dam is located (Semenyih Dam). Apparently in this case, Tekala river recreational park situated next to the Semenyih Dam did not contribute to the PFCs pollution in the area. As for the sampling point number 21 to 23, both PFOA and PFOS were detected in this area, although the concentration of PFOA is barely noticeable. This area is heavily populated with housing area which may be the contributor to the presence of PFCs in the area. The unauthorized dumping site at sampling point 13 in Langat River resulted in high concentrations of PFOA and PFOS detected. Point 12 in Langat River is located close to the Kuala Lumpur International Airport. The uses of fire fighting foam (containing PFCs) mostly in the airport area from fire-fighting activities are one of the reasons such high concentration of PFOA and PFOS detected in that area. Another study also reported the same cases of fire fighting foam usage, although it is from an accidental released. Previous studies conducted on Langat River 3 years ago concluded that the greatest concentration of PFCs was detected on the eastern part of the river basin. However, the current study showed that the western area is more polluted compared to the eastern area . Furthermore, the overall current concentration of PFCs seems to decline significantly compared to 3 years ago (43,500ng/L to 375.6ng/L).

As for the Selangor River (Figure 1), the concentration of PFCs detected is very much low compared to Langat River. The highest concentration of PFCs detected in Selangor River is only at 4.4ng/L compared to the Langat River which is 375.6ng/L. The results are expected for the area around the Selangor River is less developed compared to the Langat River except at the sampling point number 9 where Rawang industrial area is situated. Note that sampling point 5 is the point where all the tributaries converge into main tributaries before entering the mainstream. This is the main reason for the significant increase of PFCs detected in sampling point 4 compared to the upper sampling point 6, which is due to the confluence of tributaries that contains a high concentration of PFCs at point 5 into the mainstream river towards point 4. However, concentration of PFCs in point 4 is lower than point 5 due to the dilution effect of larger volume of surface water in point 4 in the mainstream. At the upstream part (sampling point number 13-2 to 18), PFCs were also detected in this area, but the concentration is barely noticeable. With the exception of sampling point 15 and 17, the other sampling points are mostly populated with housing area which may be the major contributor to the presence of PFCs in the area. Although situated very close to the Selangor River dam, a trace of PFCs was detected at sampling point 15. As for the sampling point 17, a small cluster of manufacturing factories in this area may contribute to the considerable amount of PFCs detected at this point.

The highest concentration of PFCs detected in Selangor River is still among the lowest concentration detected in other studies such as in South Korea and Japan. However, concentration of PFCs detected in Langat River is among the highest. It is comparable to the PFCs detected in other countries such as Hanjiang River, China (568 ng/L). Previous monitoring conducted on Selangor River showed the same finding where the highest concentration of PFCs were detected between point 7 to 11. However, current studies showed considerable reduction of cumulative PFCs in most of the sampling points compared to last year. Sampling point number 9 showed the highest reduction of PFCs.



Programs and its duration under international collaboration between Kyoto University and University of Malaya

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