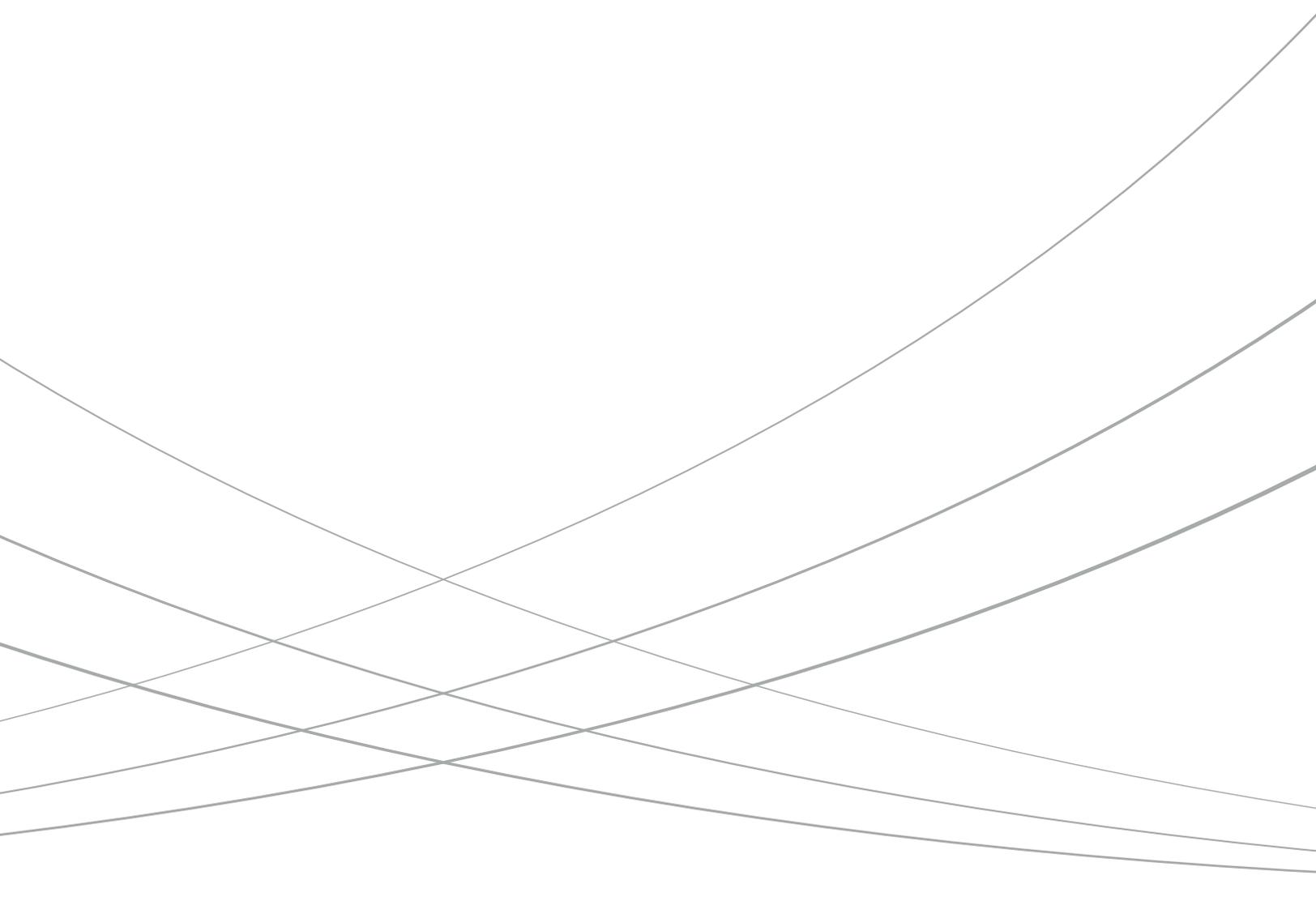


Monitoring and Management of POPs in Asia

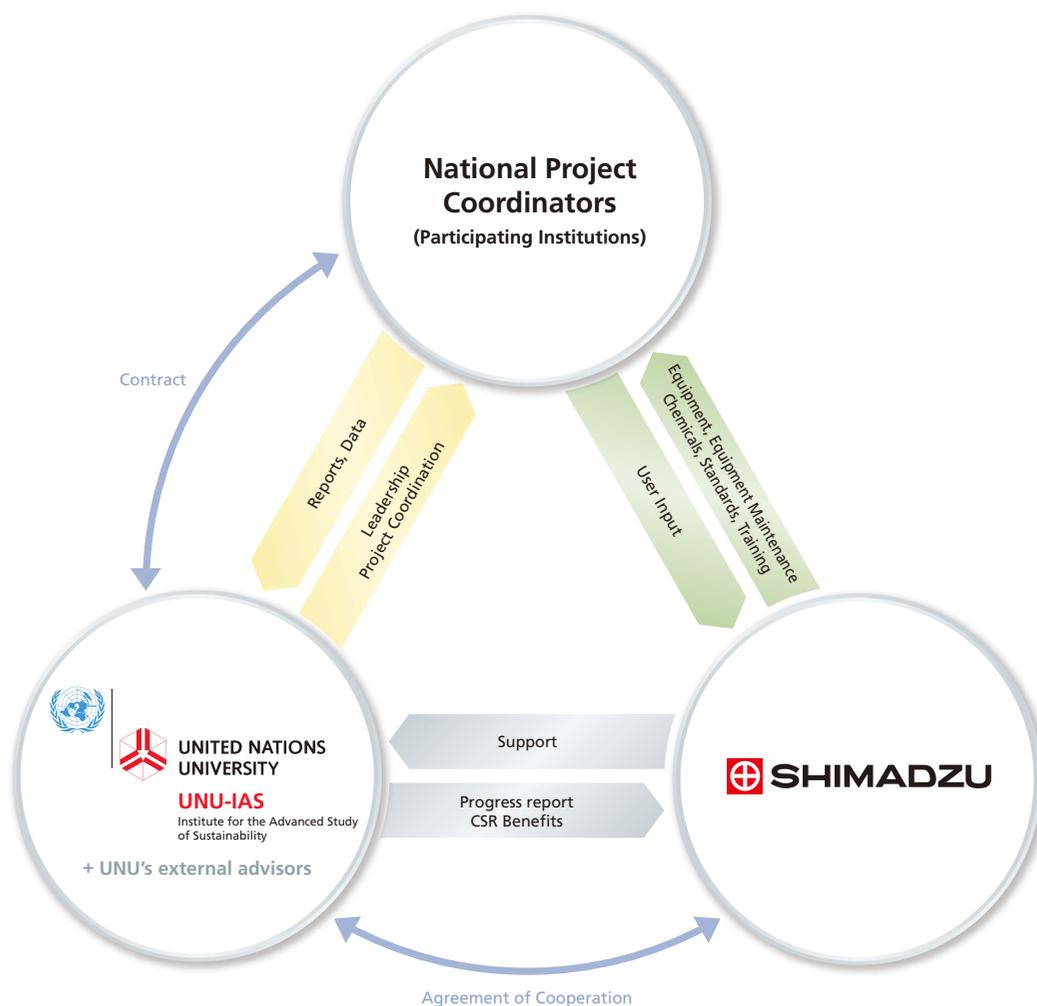
Monitoring of PFCs in Environmental Water in the Asian Region



UNU-IAS-Shimadzu Partnership Project

Environmental water contains a variety of elements, including those related to industrial and agricultural activity and urban waste. These pollutants do not have borders. In particular, Persistent Organic Pollutants or POPs can remain in water for a very long time and enter the food chain, posing a real risk to human and ecological health. In efforts to manage these pollutants in Asia, the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) and Shimadzu Corporation jointly established a capacity-building initiative that would provide

10 Asian countries with the analytical scientific knowledge and technology to monitor pollutants in the environment as well as develop global monitoring network in Asia. This joint project has been implemented since 1996 under the leadership of the UNU-IAS with a span of 20 years with six phases and its 6th phase was completed in 2015. In this phase, the focus has been on perfluorinated compounds (PFCs), mainly perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) monitoring in environmental water.



Structure and operation of the UNU-IAS-Shimadzu Project*

* Reference: Monitoring Pollution in Asia http://i.unu.edu/media/unu.edu/news/30930/POPs-Brochure_UNU-ISP2011.pdf

Participating National Project Coordinators



Country	Institution
China	China-Japan Friendship Center for Environmental Protection
India	Bharathidasan University
Indonesia	Environmental Management Center- PSARPEDAL
Korea	Korea Ocean Research & Development Institute (KORDI) Chonnam National University*
Malaysia	University of Malaya
Pakistan	Pakistan Council of Research in Water Resources (PCRWR)
Philippines	Natural Science Research Institute, University of the Philippines Diliman
Singapore	Department of Chemistry, National University of Singapore
Thailand	Environmental Research and Training Centre (ERTC)
Viet Nam	Viet Nam National University

(in alphabetical order)

Monitoring and Management of POPs in Asia

The Phase VI (2012-2015)

The 6th phase has been focused on monitoring PFCs, mainly PFOA and PFOS in environmental water. These chemicals are highly stable chemical compounds widely used as water repellents, oil repellents and coating agents. They do not decompose easily in the natural world due to their stability.

Reports of their detection in rivers, tap water, and food, as well as in the atmosphere and in human blood have led to concern about their effects on the human body. PFCs were added to the POPs group at the Stockholm Convention* in 2009.

* The Stockholm Convention is a global treaty designed to restrict the production and use of POPs in order to protect human health and the environment from these chemicals.

Objectives of the Phase VI

- 1 Build analytical capacity to analyze PFCs in environmental water samples;
- 2 Disseminate the project activities at academic and UN conferences;
- 3 Involve PFC manufacturers, users and the waste management sector in the project, and establishing local networks in the partner countries;
- 4 *Establish links with the Stockholm Convention Secretariat and relevant UN agencies and exchange information and knowledge on POPs monitoring programmes; and
- 5 *Produce the recommendation based on the project outcomes for implementing multilateral environmental agreements such as the Stockholm Convention.

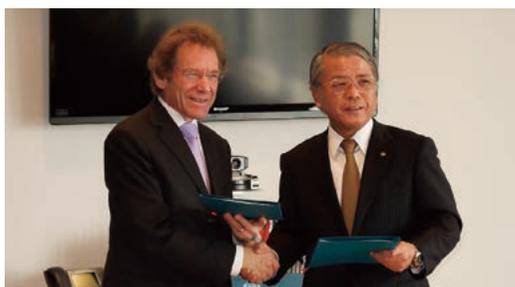
* The objective 4 and 5 are especially being focused by the UNU-IAS.

Project Outline of the Phase VI

Period	2012-2015
Target media	Environmental water
Target compounds	PFCs (perfluorinated compounds)
Target chemicals	PFOS/PFOA
Instrument	Shimadzu Nexera XR HPLC and LCMS-8040 triple quadrupole mass spectrometer
Method	ISO 25101: 2009, Water Quality - Determination of perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) - Method for unfiltered samples using solid phase extraction and liquid chromatography/mass spectrometry (2009).

Events held under the Phase VI

Date	Events	Place	Theme
12 November 2012	The sixth phase's agreement signed by UNU and Shimadzu	UNU Tokyo	Launch of Monitoring and Management of POPs in Asia
25-27 February 2013	International Training Workshop	Shimadzu Kyoto	Environmental analysis of PFCs in water by LC-MS/MS
February-March 2014	Installation of LC-MS/MS	Korea, China and Singapore	Facilitation of analytical equipment
March-April 2014	The first LC-MS/MS analysis session	Korea, Singapore	Analysis of environmental water
24-26 November 2014	International Conference of Asian Environmental Chemistry 2014 (ICAEC 2014)	Bangkok, Thailand	UNU-IAS Session: Achievements of the first half of the Phase VI
26 November 2014	Project Meeting	Bangkok, Thailand	
August 2015	The Second LC-MS/MS analysis session	China, Korea and Singapore	Analysis of environmental water
12-13 November 2015	Project Meeting	Shimadzu Asia Pacific, Singapore	Completion of Phase VI and Discussion on Phase VII



UNU Rector and Shimadzu President formalized the agreement for sixth phase.



Analytical Training Workshop



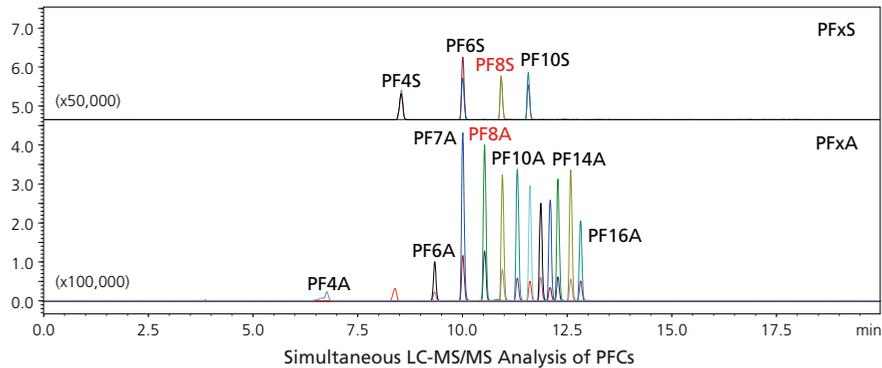
Sampling in a field



Poster presentation at ICAEC 2014

Shimadzu Application for PFOA/PFOS Analysis in Environmental Water

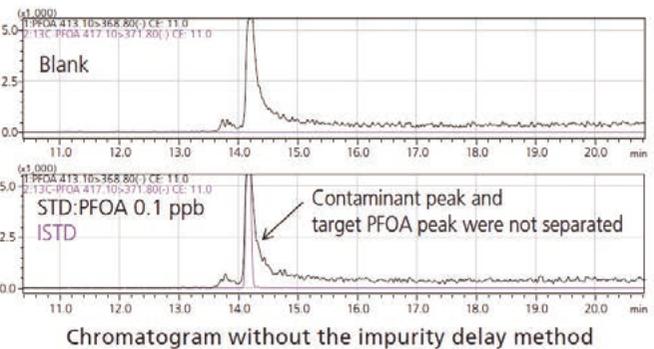
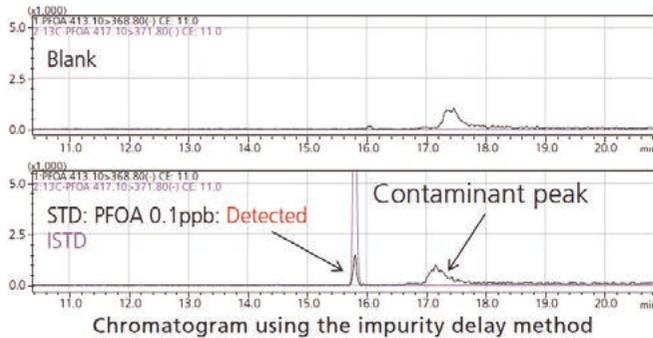
Simultaneous analysis of PFOA and PFOS in environmental water, in addition to the related compounds, can be performed by LC-MS/MS. The Shimadzu Ultra Fast LC-MS/MS series (UFMS series) enables trace-level analysis of environmental water.



Impurity Delay Method

For highly sensitive detection of PFOS/PFOA, it is necessary to remove background contamination that exists in the mobile phase or instrument components. Shimadzu has developed an application illustrating a method for reducing background noise in order to increase sensitivity of target PFOA/PFOS. In this method, a delay column (4.0mmI.D. x 35 mmL) was installed between a mixer and an autosampler to separate the impurity PFOA from the target PFOA in the sample.

For the Phase VI of UNU-IAS-Shimadzu Partnership Project, this impurity delay method was applied to samples of some countries for a performance check.



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LCMS-8050



LCMS-8040



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A newly developed UF-Qarray boosts ion intensity but suppresses noise. By improving the ion sampling device, the ion guide, and vacuum efficiency, Shimadzu has achieved an unprecedented sensitivity in LCMS.

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Shimadzu's proprietary technologies allow acquisition of up to 555 MRM channels per second, ultra-fast polarity switching, and ultra-fast scanning, all with high data quality.

UFscanning: Max. 30,000 u/sec

UFswitching: 5 msec



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