VI Environmental monitoring - the Japanese case

VI.1 Co-operation with local public bodies

There are 61 environmental research related institutes and laboratories belonging to local governments at the prefectural level and in designated cities, employing about 2000 researchers (**Table VI-1-1**). If we look at researcher numbers by area, each area from the Hokkaido-Tohoku area to the Kyushu-Okinawa area (excepting metropolitan areas) has around 300 researchers. The distribution is well balanced. On the other hand, the Japanese government's Environmental Agency has two institutes and about 200 more researchers. This latter figure is about one tenth of the number of researcher employed by local governments. Therefore, it must be understood that researcher co-operation between government and local public organisations is extremely important when surveys of the distribution of harmful chemicals and/or continuous monitoring in Japan are conducted. For example, since 1974 the "Environmental Survey for Chemical Substances" has been conducted by co-operation of government and local public bodies. 752 chemical substances were investigated with 264 chemicals found in the environment by 1995. Of the chemicals detected, cautious essential chemicals (persistent chemicals and Class 1 Specified Chemical Substances based on the Chemical Substances Control Law etc.) which were judged to require continuous yearly monitoring are targeted for monitoring in water, sediment, and living things. In Japan, the Government regulates the sampling methods and analytical methods deemed suitable for target compounds, and is making efforts to build a monitoring network and maintain data reliability. Thus the results of the Government "fact-finding survey" gained in co-operation with local public bodies becomes information which is useful for environmental risk management and utilised to prevent health effect beforehand.

Table VI-1-1 Local institutes and researchers related to pollution / environmental issues (1995)

region	institutes	researchers
Tohoku, Hokkaido	10	250
Kanto Koshin-etsu	14	480
Chubu, Hokuriku	9	337
Kansai	8	299
Tyugoku, Shikoku	10	330
Kyushu, Okinawa	10	343
Total	61	2049
ref. Environmental Agency	2	211

VI.2 Facilities and instrumentation (Government and local public bodies)

Highly sensitive and accurate analytical instruments are necessary for the analysis of the chemicals designated in the priority list. In Japan, both common analytical instruments such as gas chromatography (GC) and large analytical instruments such as gas chromatography/mass spectrometer (GC/MS) are used at the same time to analyse multiple samples/multiple compounds. **Table VI-2-1** shows analytical facilities which are owned by local institutes. Seven institutes were chosen from 61 in whole Japan according to region, size, and researcher numbers. The analytical facility situation in Japan was estimated from this cohort of institutes. GC instruments can be allocated 4 - 7 researchers, High Performance Liquid Chromatography (HPLC) 10 -20, and Atomic Absorption Spectrometer (AAS) 8 - 12, and from such estimates it has been estimated that such instruments is to be found in each institute. At least one large instruments, such as GC/MS, which is indispensable for determination / quantitative analysis of large amount of harmful chemicals in the environment, is also found in each institute. The use of GC/MS is increasingly becoming a necessity, and in the future GC/MS it is expected to be as widespread as GC. ICP optical emission spectrometer and ICP/MS are rapidly becoming popular, and they will be found in every institute in the next several years. The Government is providing information and aid about which large instruments are desirable in the institutes of local public bodies.

Table VI-2-1 Main facility situation in the institutes of local public bodies (1996)

Institutes	A	B	C	D	E	F	G
Total stuff numbers	65	31	68	117	49	37	49
Researcher numbers	50 (19)	24	42	75	35	21	43
GC	8	6	20	13	7	6	11
GC/MS	1	2	6	7	6	2	6
HPLC	0	1	4	13	2	3	5
Ion Chromatography	1	1	2	1	1	2	2
AAS	4	2	2	3	5	3	2
Fluorescence Spectrophotometer	0	0	1	1	3	0	0
Infrared Spectrophotometer	0	0	1	1	1	0	1
Spectrophotometer	3	3	6	3	6	3	3
ICP Optical Emission Spectrometer	0	0	1	1	1	1	0
ICP/MS	0	1	1	1	1	0	1
Mercury Analyser	2	0	1	1	3	1	1
Element Analyser	0	1	2	0	1	0	0
Fluorescence X-ray Analyser?	0	1	1	1	1	1	0
NMR	0	0	0	0	0	0	0
Electron Microscope	0	0	1	2	0	0	2

note) Institute A has researchers in both hygienics and environmental research, ( ) shows the number of environment researchers.

VI. 3 Practical guidance and training systems

In Japan, an environmental survey of 1145 compounds in the new priority list based on a second general investigation of chemicals environmental safety has been conducted by Government in co-operation with local public bodies. Because of the targeting of large numbers of chemicals, the systematic training and upgrading of chemical analysis skills of teams of researchers and institutes had to be established. Several analytical training programs have been prepared in the Government and local public bodies. **Table VI-3-1** shows these training programs, which have been conducted by the Environmental Training Centre of the National Institute for Environmental Studies for the past three years. About 200 people per year, or 10 % of researchers in local public bodies, attended the training programs. The programs are prepared to meet the needs and levels of a wide range of participants, from the beginner to the advanced. Recently, programs covering the trace analysis of harmful chemicals using large instruments such as GC/MS or ICP optical emission spectrometer have been increasing. in addition, local public bodies also prepare training programs to train beginners and brush up the skills of the advanced.

Table VI-3-1 Training programs about environmental analysis conducted by the Environmental Training Centre of the National Institute for Environmental Studies

	program	target trainee	participant number		
			1993	1994	1995
1	instrumental analysis (general) (13 days)	Staff in charge of analytical methods related to pollution prevention with more than 1 years experience	43	47	42
2	general analysis (8 days)	Staff in charge of analytical methods related to pollution prevention with around 2 years experience	18	17	26
3	air quality analysis (13 days)	Staff in charge of analytical methods related to air quality or odour with more than 1 year experience	23	35	28
4	water quality analysis (13 days)	Staff in charge of analytical methods related to water quality, soil, or waste with more than 1 years experience	37	52	50
5	instrumental analysis (special) (3 courses, 5 days each)	Staff in charge of analytical methods related to pollution prevention with around 2 years experience			
6	theme analysis (3-4 courses, 5 days each)	Staff in charge of analytical methods related to pollution prevention	26	34	50
7	special analysis (21 days)	Staff in charge of analytical methods related to pollution prevention who have finished the Centre's analytical training courses or equivalent	1	1	1
8	environmental monitoring (water quality) (32 days)	Experienced management technicians in charge of water quality management in developing countries	11	10	10
total			189	224	247

Table VI-3-2 shows examples of local public body training schemes. Systems which provide and distribute new technology and information to the work place are well established. As mentioned above, local government and public bodies in Japan try to maintain reliability of data which are gained from environmental surveys of harmful chemicals.

Table VI-3-2 Examples of training of analytical technique in a local public body

	course	frequency (per person per year)	duration	contents
in-house	Training under-taken within research teams during normal, daily work routines	All the time	All the time	Team leader teaches group members to improve their techniques. Most important and efficient training.
	Academic paper reading and seminars	Several times	Regularly	By rotation group members charged with introducing key papers related to their research and giving seminars to share knowledge.
	Research report	Several times	As required	Report and discuss research progress and/or development.
	Training seminar reports	Several times	As required	Share information from seminars attended
	Practice lectures	Several times	A few days	Practice giving lecture to research group a few days before conference etc. Learn presentation methods and research problems.
External	Staff training at the training centre of local public bodies	0.5	A few days	Study the basic knowledge and general techniques needed by local public servants to conduct their work.
	Study program held by Government institutes	0.1	2 weeks to 2 months	Attend seminars about technique etc. held by Governmental institutes in order to develop and improve analytical skill and research ability.
	University research	< 0.1	1 year	Conduct specified research at university.
	Seminars	1 - 2	1 day	Learn latest technology by attending seminars held by analytical instrument companies.
	Conferences	2 - 3	2 - 3 days	Give presentation and exchange opinions at regular meetings and conferences of environment related academic societies.
	Study abroad	< 0.1	1 to 3 months	The researcher, after passing an examination to study abroad, undertakes research and training at an institute of choice
	Training on analytical instruments	0.2	1 week	Attend seminars held by instrument companies to learn operation and maintenance techniques for analytical instruments owned by researcher's institute.