

**Kingdom of Thailand
Pollution Control Department, MONRE
Department of Industrial Works, MOI
Industrial Estate Authority of Thailand, MOI**

**Technical cooperation on
The Development of Basic Schemes for PRTR
System in the Kingdom of Thailand
Final Report**

March 2016

Japan International Cooperation Agency (JICA)

**SOWA CONSULTANTS INC.
EX Research Institute Ltd,**

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Abbreviation

Abbreviation	English
C/P	Counterpart
DAC	Development Assistance Committee, OECD
DEQP	Department of Environmental Quality Promotion, MONRE
DIW	Department of Industrial Works, MOI
DOA	Department of Agriculture, MOAC
EMCC	Environmental Monitoring & Control Center
ERTC	Environmental Research and Training Centre, DEQP
FAQ	Frequently Asked Questions
FTI	The Federation of Thai Industries
GOT	Government of Thailand
HAPs	Hazardous Air Pollutants
IEAT	Industrial Estate Authority of Thailand
JCC	Joint Coordinating Committee
JET	JICA Expert Team
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KPI	Key Performance Indicators
M/M	Minutes of Meeting or Man-month (unit of manpower)
MOAC	Ministry of Agriculture and Cooperatives
MOI	Ministry of Industry
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NPS	Non-Point Sources
OECD	The Organization for Economic Co-operation and Development
PCD	Pollution Control Department, MONRE
PDM	Project Design Matrix
PIO	Provincial Industry Office, MOI
PO	Plan of Operations
PONRE	Provincial Office of Natural Resources and Environment, MONRE
PRTR	Pollutant Release and Transfer Register

Abbreviation	English
PTT	PTT Public Company Limited (formerly the Petroleum Authority of Thailand)
R/D	Record of Discussions
REO	Regional Environmental Office, MONRE
SCG	Siam Cement Group
SHE	Safety, Health, Environment
TAIA	Thai Automotive Industry Association
TER	Terminal Evaluation Report
TF	Task Force
THB	Thai Baht
UAE	United Analyst and Engineering Consultant Co., Ltd.
VOCs	Volatile Organic Compounds

List of Table

Table No.	Table Title
1	Output 1: “Basic design of PRTR system in Thailand is established.”
2	Output 2: “Emission reporting scheme of industry is developed.”
3	Output 3: “Capacity of estimation of emission and transfer for point source is strengthened.”
4	Output 4: “Capacity of emission estimation for non-point source is strengthened.”
5	Output 5: “Importance of use of PRTR data including initial assessment is understood.”
6	Output 6: “Implementation structure of risk communication is developed in the pilot area.”
7	Evaluation of the achievement of each Output by the stakeholders
8	Local subcontractor
9	Dispatch of Expert team
10	The P/O of expert team in 1st year.
11	The P/O of expert team in 2nd year.
12	The P/O of expert team in 3rd year.
13	The list of the participants in 1st Training in Japan (17 Jul. 2012 - 26 Jul. 2012)
14	Training periods and objectives in the first study tour
15	The list of the participants in 2nd Training in Japan (22 Oct. 2013 - 2 Nov. 2013)
16	Training periods and objectives in the second study tour
17	The details of Local cost in 1st year
18	The details of Local cost in 2nd year
19	The details of Local cost in 3rd year (as of December 2015)

1. General

1.1 Project Outline

- Title of the project

The Development of Basic Schemes for PRTR System in Kingdom of Thailand

- Overall Goal

Model of PRTR system for Thailand is established

- Project Purpose

Capacity of PCD, DIW and IEAT's staff for implementation of PRTR pilot project is strengthened

- Project period

5 years (March 6th, 2011 – March 5th, 2016) Extension was proposed and approved in 2014.

- Implementing agency

Pollution Control Department, Ministry of Natural Resources and Environment

Department of Industrial Works, Ministry of Industry

Industrial Estate Authority of Thailand, Ministry of Industry

- Outputs

(Output 6 noted below was approved at Joint Coordination Committee meeting held on July 12, 2013.)

1. Basic design of PRTR system in Thailand is established

2. Emission reporting scheme of industry is developed

3. Capacity of estimation of emission and transfer for point source is strengthened.

4. Capacity of emission estimation for non-point source is strengthened.

5. Importance of use of PRTR data including initial assessment is understood

6. Implementation structure of risk communication is developed in the pilot area.

- Activities of the Project

(Activity of the project noted below was approved at Joint Coordination Committee meeting held on July 12, 2013.)

Activity for output 1

- 1-1. Formulation of basic strategy
- 1-2. Organizational set up inside government and with other stakeholders
- 1-3. Development of project work plan
- 1-4. Development of criteria for target substance selection
- 1-5. Draft target substance list and revision
- 1-6. Draft basic design of PRTR system
- 1-7. Development of PRTR database and Web site
- 1-8. Draft pilot project implementation plan and set up organization
- 1-9. Organizing awareness raising and training workshop for pilot project
- 1-10. Collection of data and disclosure for pilot project
- 1-11. Organizing risk communication meeting for pilot project
- 1-12. Obtaining feedback from stakeholders for pilot project
- 1-13. Final design of PRTR system and prepare action plan
- 1-14. Preparation of final report of output 1

Activity for output 2

- 2-1. Collection of available data for preparing point source definition
- 2-2. Development of point source definition (reporting thresholds)
- 2-3. Development of reporting form
- 2-4. identifying reporting procedure from point sources
- 2-5. Listing of candidate point sources and sending reporting form to them
- 2-6. Collecting reports from point sources
- 2-7. Verification of point source data
- 2-8. Compilation of point source data
- 2-9. Revision of point source definition and reporting form
- 2-10. Preparation of final report of output 2

Activity for output 3

- 3-1. Establishment of task forces on development of release estimation manuals for specific industries
- 3-2. Development of draft release estimation manuals for specific industries
- 3-3. Conducting model studies for industries for which release estimation manuals are not prepared
- 3-4. Organizing workshop on point source release estimation for governmental officials and relevant agencies

- 3-5. Organizing workshop on point source release estimation for factories/facilities
- 3-6. Organizing consultation for factories/facilities to estimate releases by site visit
- 3-7. Responding to questions (via phone, e-mail) on release estimation from factories/facilities and preparing FAQs
- 3-8. Revision of release estimation manuals for specific industries
- 3-9. Preparation of final report of output 3

Activity for output 4

- 4-1. Establishment of basic idea for estimation of emissions from non-point sources (NPS)
- 4-2. Survey of availability of activity data and emission factors (EFs) necessary to estimate
- 4-3. Selection of target categories and target chemicals for NPS and responsible bodies to estimate
- 4-4. Validation of data used for estimation; activity data and EF
- 4-5. Establishment of estimation method in each target category
- 4-6. Preparation for drafts of estimation manuals
- 4-7. Collection such data used for estimation as activity data and EF
- 4-8. Estimation of emission amounts from NPS at pilot project area and Compilation of disclosed data
- 4-9. Collection of information, data necessary for revising estimation manuals and revision of estimation manuals
- 4-10. Implementation of workshop for estimation of emissions from non-point sources for government officials and relevant agencies
- 4-11. Preparation of final report of output 4

Activity for output 5

- 5-1. Introduction of domestic and overseas case studies on use of PRTR data including initial assessment of exposure risk to target substances
- 5-2. Utilization and possible development of model or tools for uses of PRTR data e.g. concentration estimating model
- 5-3. Implementation of case studies for use of PRTR data including initial assessment
- 5-4. Training for use of PRTR data including initial assessment for both government and private sectors
- 5-5. Preparation of final report of output 5

Activity for output 6

- 6-1. Development of basic strategy for promoting risk communication
- 6-2. Organizational set up inside government and with other stakeholders for promoting risk communication
- 6-3. Awareness raisings for risk communication importance for relevant agencies, relevant local governments and participating companies.
- 6-4. Development of training curriculum for facilitator and pilot project implementation of training course
- 6-5. Review of facilitator training course and follow-up for trainee
- 6-6. Development of the Handbook for risk communication
- 6-7. Planning the registration system of chemical advisor for supporting risk communication.
- 6-8. Development of the implementation plan, and pilot project organization of risk communication meeting with community people of Rayong
- 6-9. Preparation of final report of output 6

● Project area

Major activities of the project will be at Bangkok and surrounding area where the office of the implementing agencies are located. In addition, activities will be at area selected for pilot project.

2. Project Outputs

The status of achievements of the Project Outputs and their indicators as designated in PDM₂ is shown as follows.

Table 1 Output 1: “Basic design of PRTR system in Thailand is established.”

Verifiable Indicators	Achievements
1.1 Draft of basic design of PRTR system is developed.	<ul style="list-style-type: none"> - Basic survey was implemented and target chemical substances were listed in 2011. - Basic design of PRTR system was drafted in the 4th C/P meeting on 27 February 2012. - The element of basic PRTR system was designed in 2013. - A pilot project was implemented in 2013 and the data obtained in it were compiled in 2014. - The design was revised for nationwide application in 2015. - From above, <u>this indicator is achieved.</u>

In consideration of the achievement of Indicator 1.1, Output 1 has already been achieved.

Table 2 Output 2: “Emission reporting scheme of industry is developed.”

Verifiable Indicators	Achievements
2.1 By draft of reporting form and system, point source data of pilot area is collected, arranged and compiled from more than 7 categories of point sources.	<ul style="list-style-type: none"> - In the beginning of the Project, existing reporting systems were reviewed. It was found that DIW is implementing a reporting system of conventional pollutants nationwide. - After target substances were listed, basic approach to define point sources were formulated in 2011. - Target business categories were selected and threshold sizes were defined. - An online report system was developed, and data validation protocol was drafted, and initial training was provided by March 2014. - All point source data was validated and compiled by March 2015. - From above, <u>this indicator is achieved.</u>

In consideration of the achievement of Indicator 2.1, Output 2 has already been achieved.

Table 3 Output 3: “Capacity of estimation of emission and transfer for point source is strengthened.”

Verifiable Indicators	Achievements
3.1 Consultation for point source estimation is carried out for more than 7 categories of point sources.	<ul style="list-style-type: none"> - Estimation manuals for three industry sectors were completed as draft final version by March 2013. This was translated into Thai in 2013. - On-site coaching for estimation and reporting was provided for over 20 factories by JET and C/P team in the chemical and automotive sectors in 2014. - From above, <u>this indicator is achieved.</u>

In consideration of the achievement of Indicator 3.1, Output 3 has already been achieved.

Table 4 Output 4: “Capacity of emission estimation for non-point source is strengthened.”

Verifiable Indicators	Achievements
4.1 Emission of non-point source for pilot area is estimated in more than 5 target categories.	<ul style="list-style-type: none"> - Business categories were selected for the work of the initial period. - Estimation method for non-point sources was summarized in early 2013. - All data collection activities were completed and emission from non-point sources were estimated in 2014. - All the data were compiled in 2015. - From above, <u>this indicator is achieved.</u>

In consideration of the achievement of Indicator 4.1, Output 4 has already been achieved.

Table 5 Output 5: “Importance of use of PRTR data including initial assessment is understood.”

Verifiable Indicators	Achievements
5.1 Use of the PRTR data is positively considered.	<ul style="list-style-type: none"> - Current situation on use of air dispersion model was studied in 2012. - A Japanese guide book of PRTR data and risk assessment for business operators prepared by the Ministry of Economy, Trade and Industry (METI) of Japan was translated as a reference document for the Output in 2013. - Basic rule of PRTR data utilization was discussed among C/P in 2014. - A training workshop was organized for PRTR data utilization

Verifiable Indicators	Achievements
	and air modeling in 2014. - From above, <u>this indicator is achieved</u> .

In consideration of the achievement of Indicator 5.1, Output 5 has already been achieved.

Table 6 Output 6: “Implementation structure of risk communication is developed in the pilot area.”

Verifiable Indicators	Achievements
6.1 Risk communication plan or operational guideline is prepared.	<ul style="list-style-type: none"> - To develop human resources for adequate risk communication of chemical substances in Thailand, implementation of a training program for risk communication is set as a goal for this year. For this purpose, a Task Force to develop training program of risk communication was established by Thai specialists in toxicology, exposure assessment, risk assessment and risk communication in 2011. - Workshops for government officers were organized twice in Bangkok for PCD, DIW and IEAT and once in Rayong for IEAT. Policy to promote risk communication was discussed, and the basic paper was drafted in 2012. - All the risk communication meetings were completed with success by September 2015. - From above, <u>this indicator is achieved</u>.

In consideration of the achievement of Indicator 6.1, Output 6 has already been achieved.

In 2015, a feedback survey was performed. The stakeholders were listed from those who joined in the seminars of the Project and separated into 3 groups: „government“, „private sector“ and „citizen/public“. The stakeholders were asked to evaluate the achievement of each Output by 5 scales of 5 (very good), 4 (good), 3(moderate), 2 (less than moderate), to 1 (bad). The results are shown in Table 1.

Table 7 Evaluation of the achievement of each Output by the stakeholders

Outputs	Evaluation (Average)			
	Government	Private sector	Citizen/Public	Total
Number of stakeholders	77	120	44	241
Output 1	4.01	3.63	4.03	3.81
Output 2	3.67	3.39	3.70	3.54
Output 3	3.68	3.40	3.68	3.54
Output 4	3.50	3.09	3.73	3.33
Output 5	3.68	3.42	3.76	3.57
Output 6	3.56	3.21	3.65	3.40

It can be seen from Table 1 that the stakeholders are satisfied with the achievement of the Outputs in moderate to good level.

Activities	2011												2012												2013												2014												2015												2016																																																																										
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3																																																																										
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4. Project Inputs

4.1 Japanese side

(1) Dispatch of experts

6 experts have been dispatched: The total quantity of the dispatch is 77.74M/M as of March 2016. Some of the experts worked in Japan as well. With regard to the details, see "4 Dispatch of Expert Team".

(2) Training in Japan

The Japanese side held two study tours to Japan. The first study tour was held from 17 July 2012 to 26 July 2012 for 18 trainees. The objectives were as follows:

- To learn the PRTR system in Japan, namely its policy, technical and implementation matters;
- To exchange views and opinions with Japanese authorities, researchers and industry;
- To utilize the knowledge and experience from study tour in design and implementation of PRTR system in Thailand.

The second study tour was held from 22 October 2013 to 2 November 2013, in which 31 trainees participated. The topics dealt with in the training were as follows:

- Risk communication;
- PRTR data management;
- Practice of the private sector in Japan.

The participants and the contents in the two trainings are listed in "5 Participants in Training in Japan."

(3) Local costs

JICA bore local operational costs such as local assistants, vehicle costs, rental fees, consumables, communication costs, printing costs and others. With regard to the details, see "6 Local cost".

(4) Machinery, Equipment and Materials

Not specific.

(5) Local subcontractor

Local subcontractor in the project is shown below in Table 8

Table 8 Local subcontractor

dd/mm/yy	Local subcontract	Local subcontractor	Payment
20/Mar/2012	Basic survey on collecting information of chemical substances	Thailand Environment Institute (TEI)	2,600,000yen
20/Mar/2012	Development of PRTR web database	Geomatics Technology Ltd.	1,400,000yen
25/Sep/2012	Data Survey of Statistics and Emission Factors to Estimate Emissions from Non-Point Sources	Thailand Environment Institute Foundation (TEI)	1,000,000yen
31/Aug/2014	The Estimation of Traffic Data in Rayong Province	U.D.Asia	4,999,998yen
10/Oct/2014	Project on the Supporting of Estimation and Reporting of Industrial Factory under the PRTR Program	United Analyst and Engineering Consultant Co., Ltd. (UAE)	4,211,949yen

(6) Meetings, Seminars and Workshops

The Project held a variety of meetings, trainings and workshops on specific topics. They are listed in Annex 1.

4.2 Thai side

1. Assignment of project members

The Thai side assigned 43 persons including administrators to the Project. The project members are listed in Annex2.

2. Office space and meeting room

The Thai side has provided office space including furniture, telephone, fax, internet, meeting room.

3. Local costs

The Thai side bore local costs designated in the Minutes of Meeting (M/M) and other necessary expenses for the activities. For example PCD allocated budgets of 0.5, 0.3, 2.0, 0.5, 0.5 and 0.2 million THB for fiscal year 2011 -2016 respectively.

4. Others

Release estimation manuals for industries except „refinery“, „chemical/ petrochemical“ and „automotive and auto part“ have been formulated by the Thai side, entrusted to Thai local consultants. The total costs for them were about 10 million THB.

5. Dispatch of Expert Team

Dispatch of Expert team as of March 2016 is shown as follows.

Table 9 Dispatch of Expert team

As of March 2016

Name	Field of charge	Dispatched period (M/M) ^{*1,*2}			
		1st year	2nd year	3rd - 5th year	Total
Mr. Munehiro FUKUDA	Leader / PRTR system / Chemical Management / Non-point Source Estimation ³	4.97	7.07	21.70	33.74
Mr. Makoto TAKAHASHI	Sub-Leader / Point Source Reporting / Point Source Estimation / Non-point Source Estimation 2	4.00	4.00	9.03	17.03
Mr. Yoshiharu SHIRANE	Non-point Source Estimation 1	2.50	1.60	9.67	14.67
Mr. Kazuhiko TEZUKA	Social Consideration / Risk Communication ¹	2.50	2.50	3.00	8.00
Mr. Akira NAKAMURA	Social Consideration / Risk Communication 2	0.50	0.00	1.00	1.50
Mr. Shinya HASHIMOTO	Social Consideration / Risk Communication 3	0.00	0.00	2.80	2.80
Total		14.47	16.07	47.20	77.74

*1 The dispatched period includes domestic works in Japan and works at self-expenses.

*2 1st year: March 2011 - March 2012, 2nd year: April 2012 - April 2013, 3rd year: May 2013 - March 2016

The P/O of expert team is shown as follows.

Table 10 The P/O of expert team in 1st year.

	Fields of charge	Name of Expert	1st year															M/M		
			2011															Total		
			2	3	4	5	6	7	8	9	10	11	12	1	2	3	Thai	Japan	Own Expe	
W o r k i n T h a i a n d	Leader/PRTR System/Chemical Management	Mr. Munehiro FUKUDA	3/6	4/2		6/5	7/2	9/1	9/30			1/8	2/1	2/22	3/2	4.3		0.47		
	Sub-Leader/Point Source Estimation 1 /Point Source Reporting	Mr. Makoto TAKAHASHI				6/5	7/2	8/7	9/24			1/3	2/14			4.0				
	Point Source Estimation2/Non-point Source Estimation	Mr. Yoshiharu SHIRANE			4/19	5/13		7/26	8/24			1/16	2/4			2.5				
	Social Consideration/Risk Communication1	Mr. Kazuhiko TEZUKA				6/5	7/2		9/11	10/8			1/15	2/2		2.5				
	Social Consideration/Risk Communication2	Mr. Akira NAKAMURA							9/15	9/29						0.5				
															13.8					
W o r k i n J a p a n	Leader/PRTR System/Chemical Management	Mr. Munehiro FUKUDA	2/2/26														0.2			
																	0.2			
Report			△					△						△						
			IC/R					P/R (1)					P/R (2)							
															13.8	0.2	0.47			
															Total					
															14.0					


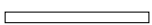

 Work in Thai
  Work in Japan
  Own Expe

Table 11 The P/O of expert team in 2nd year.

Fields of charge		Name of Expert	2nd year											M/M											
			2011											Total											
			4	5	6	7	8	9	10	11	12	1	2	3	Thai	Japan	Own Expe								
W o r k i n T h a i a n d	Leader/PRTR System/Chemical Management/Non-point Source Estimation3	Mr. Munhiero FUKUDA	5/9 5/26	6/1	7/4	8/14	10/13	11/14	12/28	1/9	3/9	18	22	61	45	31 (29)	5.9		0.97						
	Sub-Leader/Point Source Estimation1/Point Source Reporting/Non-point Source Estimation2	Mr. Makoto TAKAHASHI	5/13	6/25	8/5	9/1	10/14	11/29								45	28	47				4.0			
	Non-point Source Estimation1	Mr. Yoshiharu SHIRANE					9/19	10/18	12/12	12/2	1/13	2/9							30	17	28	2.5			
	Social Consideration/Risk Communication1	Mr. Kazuhiko TEZUKA		6/3	6/3	8/5	9/1	9/30	10/18								28	28	19				2.5		
	Social Consideration/Risk Communication2	Mr. Akira NAKAMURA																							
											14.9														
w o r k i n J a p a n	Leader/PRTR System/Chemical Management/Non-point Source Estimation3	Mr. Munhiero FUKUDA	5/6	5/8												3								0.2	
																								0.2	
	Report							△								IC/R									
											Thai	Japan	Own Expe												
											14.9	0.2	0.97												
											Total														
											15.1														
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Work in Thai</p> </div> <div style="text-align: center;"> <p>Work in Japan</p> </div> <div style="text-align: center;"> <p>Own Expe</p> </div> </div>																									

6. Participants in Training in Japan

The Japan side held two study tours to Japan. The first study tour was held from 17 July 2012 to 26 July 2012 for 18 trainees.

The participants in the first training are listed as follows.

Table 13 The list of the participants in 1st Training in Japan (17 Jul. 2012 - 26 Jul. 2012)

Executive team

No.	Name	Position	Organization
1	Mr. Chumpon Cheewaprapanunt	Deputy Director General	DIW
2	Mr. Mongkol Pruekwatana	Bureau Director	Bureau of Industrial Water and Environmental Technology, DIW
3	Mr. Rangsarn Pinthong	Bureau Director	Waste and Hazardous Substances Management Bureau, PCD
4	Dr. Anuphan Ittharatana	Bureau Director	Water Quality Management Bureau, Pollution Control Department
5	Ms. Cattleya Silaratana	Director	Environmental Department, IEAT

Working team

No.	Name	Position	Organization
1	Mr. Decha Pimpisut	Director of Air Pollution Division	DIW
2	Mr. Chairat Liangsupong	Director of Water Pollution Division	DIW
3	Mr. Naratip Lauhatirananda	Scientist, Senior Professional Level	DIW
4	Mr. Santi Sittilerdpisan	Computer Technical Officer, Senior Professional Level	DIW
5	Mr. Sira Chancherd	Scientist, Senior Professional Level	DIW

6	Mr. Aram Bhandhuwana	Environmental Professional level	Waste and Hazardous Substance Management Bureau, PCD
7	Ms. Nawanuch Thongpan	Environmental Professional level	Waste and Hazardous Substance Management Bureau, PCD
8	Ms. Wundee Aieophuket	Environmental Professional level	Planning and Evaluation Division, PCD
9	Ms. Jarinporn Tippamongkol	Environmental Professional level	Environmental quality and laboratory, PCD
10	Ms. Orrawan Manoonwong	Environmental Professional level	Industrial Air Pollution Division, PCD
11	Ms. Nalinee Kanchanamai	Engineer Level 8	Industrial Estate and Port Management Department, IEAT
12	Ms. Krissadaporn Boonyoo	Scientist Level 8	Environment Sector, IEAT
13	Ms. Jariya Sukhapan	Scientist level 8	Environment Sector, IEAT

Training periods and objectives in the first study tour are as follows.

Table 14 Training periods and objectives in the first study tour

Day	Time	Training Objectives	Training Place
17.July Tue	Arriving at Tokyo		
18.July Wed	9:30~12:00	Briefing.	Yokohama National University
	14:30~16:30	Details of PRTR system and recent trend in Japan.	
19.July Tur	10:00~12:00	Approach of PRTR system in painting industry.	National Institute for Environmental Studies
	15:00~17:00	Global trend of PRTR system. Utilization and risk evaluation of PRTR data.	
20.July	10:00~12:00	Approach of risk	Saitama prefectural

Fri		communication in Saitama	government
	14:00~15:30	Estimated Releases Outside Notification of PRTR in Japan	JICA Tokyo
	16:00~17:30	Approach of risk communication in Japan	JICA Tokyo
23.July Mon	9:30~12:00	Briefing	JICA Tokyo
	14:00~16:00	Part and approach of PRTR system of METI	METI
24.July Tue	10:00~12:00	Roll, approach and case of data utilization of PRTR system of NITE	JICA Tokyo
	12:00~12:30	Part and approach of PRTR system of MOE	METI
25.July Wed	10:00~13:30	Presentation. Closing ceremony	JICA HQ
26.July Thu	Arriving at Thai		

The second study tour was held from 22October 2013 to 2 November 2013, in which 31 trainees participated.

The participants in the second training are listed as follow.

Table 15 The list of the participants in 2nd Training in Japan (22 Oct. 2013 - 2 Nov. 2013)

No.	Name	Position/Organization	Class
1	Mr. Wichien Jungrungruang	Director-General, PCD	Executive
2	Ms. Jongjit Niranathmateekul	Director, PCD	Executive
3	Mr. Suwan Nanthasarut	Director, PCD	Executive
4	Mr. Decha Pimpisut	Director of Air Pollution Division, DIW	Executive
5	Ms. Noparat Chaibundit	Computer Technical Officer, DIW	Executive

6	Ms. Somchint Pilouk	Deputy Governor, IEAT	Executive
7	Mr. Tada Soontonpan	Director, IEAT	Executive
8	Ms. Teeraporn Wiriwutikorn	Director of Hazardous Substance Division, PCD	Working
9	Mr. Chayawee Wangcharoenrung	Environmental, PCD	Working
10	Mr. Ittipol Pawarmart	Environmental Officer, PCD	Working
11	Ms. Suteera Wisukul	Environmental, PCD	Working
12	Ms. Sirakarn Leungsakul	Senior Engineer, DIW	Working
13	Mr. Parinya Maneewong	Scientist, Professional Level, DIW	Working
14	Ms. Pranomporn Lokkamlue	Computer Technical Officer, DIW	Working
15	Ms. Suwalak Yaonoon	Scientist, Practitioner Level, DIW	Working
16	Mr. Peeradon Monpakdee	Scientist, Practitioner Level, DIW	Working
17	Ms. Jariya Sukhapan	Scientist, Level 8, IEAT	Working
18	Mr. Apichart Sektheera	Scientist, Level 8, IEAT	Working
19	Mr. Assarin Laosirilurchakai	Engineer Level 9, IEAT	Working
20	Ms. Issariya Sangcharoen	Scientist, Level 7, IEAT	Working
21	Ms. Juraisri Chaisri	Scientist, Level 7, IEAT	Working
22	Mr. Tawatsak Kerdmanee	Scientist, Level 7, IEAT	Working
23	Ms. Utchalee Namvong	Agricultural Scientist, Department of Agriculture,	Working

		MOAC	
24	Mr. Nopporn Jarongkiat	Plan and Policy Analyst, Office of Transport and Traffic Policy and Planning, MOT	Working
25	Mr. Apipong Sadthapong	Environmental, Rayong PONRE	Working
26	Mr. Rewat Jeeramaneemai	Engineer, Rayong PIO	Working
27	Mr. Worachai Puwistikul	SHE Operation Manager, SCG Chemicals	Private
28	Ms. Nanthawan Rooblao	Environmental Engineer, Thai Polyethylene	Private
29	Ms. Jinjutha Srijhon	Environmental Management, Rayong Olefins	Private
30	Ms. Patchawee Kultangwattan	SHE Operation Manager, Thai Plastic and Chemicals	Private
31	Ms. Somchit Nilthanom	SHE Operation Manager, PTT Global Chemical	Private

Training periods and objectives in the second study tour are as follows.

Table 16 Training periods and objectives in the second study tour

Day	Time	Training Objectives	Training Place
22.Oct Tue	Arriving at Tokyo		
23.Oct Wed	2 hours	Briefing.	JICA Tokyo
	2 hours	Approach of chemical substance in Saitama prefecture.	

24.Oct Tur	6 hours	Approach of environmental communication, environmental learning, research and survey of Center for Environmental Science in Saitama.	Center for Environmental Science in Saitama
25.Oct Fri	2 hours	Approach of risk communication by private sector.	JICA Tokyo
	2 hours	Estimated Releases Outside Notification of PRTR from agriculture and moving body in Japan	
27.Oct Sun	Executive member arriving at Tokyo		
28.Oct Mon	2 hours	Briefing for Executive	JICA Tokyo
	6 hours	Collecting and management for PRTR data by NITE	National Institute of Technology and Evaluation (NITE)
29.Oct Tue		Courtesy call on JICA	JICA HQ
30.Oct Wed	6 hours	Approach of PRTR and risk communication by businesses.	Ube Industries
31.Oct Tur	2 hours	Approach of environmental management and measures in Eco Town.	Eco Town Center in Kita Kyushu.
31.Oct Tur	2.5 hours	Case study of risk communication in PCB treatment facilities.	Kita Kyushu office of Japan Environmental Storage & Safety Corporation(JESCO)
1.Nov Fri	Evaluation meeting		
2.Nov Sat	Arriving at Thai		

7. Local cost

JICA bore local operational costs such as local assistants, vehicle costs, rental fees, consumables, communication costs, and others. The details of the each year are shown as follows.

Table 17 The details of Local cost in 1st year

Items	Contract (JPY)	Revised (JPY)	Achieved (x1,000 JPY)	Remarks
General employment fees	502,200	Nothing	1,250	Assistants increased and temporally consultants hired.
Vehicle costs	1,471,985	Nothing	317	Nothing
Consumables	0	Nothing	226	Some consumables needed for establishing the local office.
Reporting fees	682,920	Nothing	1,138	Inception report, Progress report, final report and interpretation.
Miscellaneous expenses	0	1,612,872	1,372	Nothing

Table 18 The details of Local cost in 2nd year

Items	Contract (JPY)	Achieved (x1,000 JPY)	Remarks
General employment fees	1,599,684	1,661	Assistants increased and temporally consultants hired.
Vehicle costs	921,610	493	Nothing
Consumables	50,000	137	Cartridge ink, PC cable, wireless route, printer, CD cover, CD-ROM
Communication fees	10,000	5	Nothing
Reporting fees	660,250	683	Nothing
Miscellaneous expenses	837,232	677	Nothing

Table 19 The details of Local cost in 3rd year (as of December 2015)

Items	Contract (JPY)	Revised (JPY)	Achieved (x1,000 JPY) <as of March 2016>	Remarks
General employment fees	6,066,480	9,260,720	10,357 <10,905>	Assistants increased and temporally consultants hired.
Vehicle costs	2,936,640	3,767,400	2,075 <2,103>	Nothing
Rent	772,800	Nothing	258	Nothing
Consumables	1,278,900	1,388,900	1,160	Nothing
Communication fees	24,000	36,000	69	Number of sending EMS to meeting participants increased.
Reporting fees	1,768,815	1,858,915	808 <1,064>	Nothing
Miscellaneous expenses	3,972,200	4,832,200	3,987	Nothing

The number of Achieved of The details of Local cost in 3 year is anticipated.

8. Lesson learned on implementing of project.

Lesson learned on implementing of project is shown as follows.

1. Organizational matter

1.1. Involvement of related organizations

At the initiation of the project, it took about one and a half years for involving DIW in the Project. The involvement of an important organization was of higher priority than the rapid start of the Project. It was a correct judgment to involve DIW (and further IEAT) in the Project, partly because the PRTR system is closely related to the industrial sector, and partly because this involvement would generalize the PRTR system in Thailand: it has become not only regulations but also a tool they can use for management. It is quite clear that DIW and IEAT have played a great role in the Project and contributed very much to the achievement of the Outputs and the Project Purpose.

1.2. Set up of official Task Forces

The Project established seven Task Forces (TFs). Three of them were established under the name of the Director General of DIW, one by the Director General of DEQP, and the other under PRTR sub-committee of PCD. Because of this system, C/P members' activities in the Project became part of their regular task during the project period. Accordingly, the results of their activities are easily formalized and reflected in the future policies of the government.

2. Technical matter

2.1. Step by step approach

In order to assure the practical applicability, the design was based on step by step approach avoiding too complicated feature from the beginning. In terms of number of target substances, type of business as point source, field and substance to be covered for non-point source were carefully designed. Once the system is successfully implemented, then additional feature can be considered.

2.2. Project design based on objective criteria

The Project set objective criteria and thresholds of target industries, substances to be reported, and the size of factories that have to report on substances they use, etc. For example, the selection of target chemical substances is based on the level of chemical presence in environment which is related to human exposure with thresholds of 100 t/year

for carcinogen and 1,000 t/year for non-carcinogen.

2.3. Fair coverage of all sources

During the project period, the private sector was requested to cooperate with the Project. It is quite clear that the chemical / petrochemical, automobile and refining industries deal with more chemical substances than others. However, the Project targeted other industries as well as these three to ensure equity among industries both from all emission sources, point and non-point. The private sector would not have cooperated if this equity had not been ensured: they reported the information on chemical substances they deal with.

3. Operational matter

3.1. Involvement of the stakeholders from initial design stage

All stakeholders were involved in very early stage. For example, twice a year NGO consultation meetings were held from the beginning till the completion of the project. To prepare the industry specific estimation manuals, representatives from the business sector were invited as member of task force. To design the risk communication, various academic experts as well as many local authorities in Rayong were invited as member of task forces. Such involvement ensured the acceptability of the system as observed in feedback survey after pilot.

3.2. Promotion of dialogue among stakeholders

The project placed importance on risk communication as process of dialogue among the stakeholders. For this purpose, two type of specialists, human resource, were designed and developed. One is communication facilitator who promotes constructive dialogue in the meeting and another is chemical adviser who provides technical knowledge in easy to understand wording.

3.3. Sufficient manpower inputs

C/P members are always fully occupied both technical issues under the project activities and their routine works. Even without any external technical cooperation project, they have plenty of regular work. No matter how well-trained, they would not have enough time to implement project activities if a JICA project simply requests them to do so. This Project hired three assistants; they have been allocated to PCD, DIW and IEAT, and not only helped the JICA experts but also performed administrative functions associated with the Project activities. This enabled the C/P members in each implementing organization to focus on technical matters.

3.4. Transparency

The Project has disclosed all information on its implementation process. Progress reports were issued twice a year, the main part of which was completely disclosed to the public. This contributed to building reliance among JET, C/P members and other stakeholders. PCD gives information on the PRTR system to the public, and IEAT discloses the data that are monitored and collected to EMCC, which are shown on website.

9. PDM used for project.

Project Design Matrix

Ver1.1 (8/July/2010)

Project Name: The Development of Basic Schemes for PRTR system

Duration of Project: 3 years

Target Group: PCD (Pollution Control Department), DIW(Department of Industrial Works)

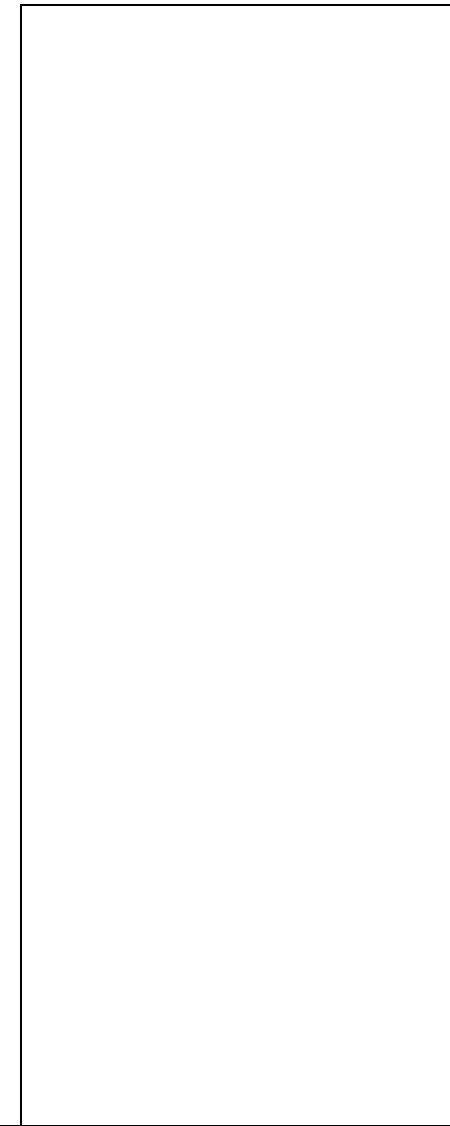
Target Area: Whole of Thailand

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Model of PRTR System for Thailand is established.	1. By PRTR system, annual emission report by chemical substances are publicized.	1.Report of inventory estimation result	
Project Purpose Capacity of PCD and DIW's staff for implementation of PRTR pilot project is strengthened .	1. Emission estimation result of pilot area is completed.	1. Pilot project evaluation report, emission estimation manual	Present national policy and environment regulation in Thailand is maintained and improved
	2. Emission estimation manuals for point and non-point source are publicized.	2. Pilot project evaluation report, participants list of awareness rising seminar	
	3. PCD's staff can lecture about PRTR system and chemical substance management.	3. TOR, Pilot project evaluation report, experts report	
	4. Implementation plan is prepared to establish law of PRTR system.	4. Implementation plan of PRTR system, experts report	
Outputs 1. Basic design of PRTR system in Thailand is established.	1-1. Action plan of pilot project is developed.	1-1.Pilot project evaluation report, draft PRTR system, experts report	In pilot area, cooperation of state government, local government, factory and industry association is maintained.
	1-2. Basic design of PRTR system is	1-3. Action plan of pilot project, pilot project	

	developed.	evaluation report
2. Emission reporting scheme of industry is developed.	2-1. Draft of reporting form and scheme for industry is developed.	2-1. Reporting form, draft of reporting system
	2-2. Industry data of pilot area is collected and arranged using result of 2-1.	2-2. Application result of reporting system, pilot project evaluation report
3. Capacity of estimation of emission and transfer for point source is strengthened.	3-1. Emission estimation manual (draft ,revised) for point source emission is prepared.	3-1. Emission estimation manual, experts report
	3-2. Emission of target industry for pilot area is estimated.	3-2. Estimation emission result of pilot city , experts report
4. Capacity of emission estimation for non-point source is strengthened.	4-1. Emission estimation manual (draft, revised) for non-point source emission is prepared.	4-1. Emission estimation manual, experts report
	4-2. Emission of non-point source for pilot area is estimated.	4-2. Estimation emission result of pilot city, experts report
5. Importance of use of PRTR data including initial assessment is understood	5-1. Case study of initial assessment is implemented by applicable models.	5-1. Risk assessment report, experts report
	5-2. At workshop and seminar, PCD's staff can make presentations for case study of initial assessment.	5-2. Experts report
6. Importance of risk communication is understood	6-1. By stakeholders such as PCD, DIW and person of factories,	6-1. Workshop report, experts report

	workshop of risk communication is implemented.	
Activities of the Project	1.Japanese Side	Important Assumption
1-1.Preparation of basic design (basic investigation, sample investigation, selection of target chemical substance / industrial category, for implementation of pilot project, report of the implementation plan of the pilot project) 1-2.Information gathering for the project 1-3.Preparation of action plan for the project 1-4.Preparation of basic design for PRTR system 1-5.Implementation of the pilot project 1-6.Preparation of implementation plan for promotion of PRTR system 1-7.Preparation and presentation of final seminar 1-8.Preparation of summary report of output1 2-1.Selection of target industry and size of industry for point source 2-2.Development of preliminary reporting form and reporting scheme 2-3.Awareness raising seminar for reporting form and reporting scheme 2-4.Reporting form by mail 2-5.Application of reporting scheme for pilot area(s) 2-6.Collection and arrangement of reporting data 2-7.Decision of the way of official announcement 2-8.Development of reporting form and draft reporting scheme in order to apply PRTR for whole of Thailand 2-9.Preparation of summary report of output2	(1)Japanese Experts Chief advisor/PRTR system, reporting scheme for point source emission, emission estimation for point source, emission estimation for non-point source, initial assessment, risk communication and chemical substance management etc. (2)Training Training course in Japan and other Countries (3)Local Cost Local costs for experts' activities (4)Machinery, Equipment and Materials Database of PRTR system 2. Thai Side (1)Counterpart personnel including administrator (2)Office space, meeting room (3)Local costs (see Minutes of Meeting)	1. PCD and DIW's staff in relevant fields to Japanese experts will be assigned according to the current Operation Plan. 2. Budget for PCD and DIW is allocated enough to keep activities of PCD and DIW.

- 3-1. Preparation of draft estimation manual for point source emission
- 3-2. Strengthening of Capacity for emission estimation of point source for government officials and relevant agencies
- 3-3. Strengthening of Capacity for estimation manual by workshop for government officials and relevant agencies
- 3-4. Collection and arrangement of reporting data, and development of database
- 3-5. Estimation of point source emission for pilot area
- 3-6. Revised emission estimation manual for point source
- 3-7. Workshop of factory for strengthened Capacity of estimation emission
- 3-8. Preparation of summary report of output3
- 4-1. Selection of estimation category for non-point source emission
- 4-2. Collection of basic information of emission factors and activity data e.g. traffic volume, paint statistics, agriculture statistics
- 4-3. Preparation of draft emission estimation manual for non-point source
- 4-4. Strengthening of Capacity for estimation of non-point source for government officials and relevant agencies
- 4-5. Estimation of non-point source emission for pilot area
- 4-6. Revised estimation emission manual for non-point source
- 4-7. Implementation of estimation emission workshop for non-point source for government



<p>officials and relevant agencies</p> <p>4-8. Preparation of summary report of output4</p> <p>5-1. Introduction of domestic and overseas case studies on use of PRTR data including initial assessment</p> <p>5-2. Utilization and possible development of model or tools for uses of PRTR data e.g. concentration model</p> <p>5-3. Implementation of case studies for use of PRTR data including initial assessment for target factory / industry</p> <p>5-4. Model training for use of PRTR data including initial assessment for both government and private sectors</p> <p>5-5. Preparation of summary report of output 5</p> <p>6-1. Strengthening of Capacity for risk communication method for government officials and relevant agencies</p> <p>6-2. Implementation of risk communication workshop for relevant agencies, relevant local governments and participating companies</p> <p>6-3. Preparation of summary report of output6</p>		
		Precondition

Project Design Matrix(PDM)

Version 2.1
Date: 15February 2013

Project Name: The Development of Basic Schemes for PRTR system in Thailand

Duration of the Project: 4 years (March 2011 - March 2016)

Target Group: PCD (Pollution Control Department), DIW (Department of Industrial Works), IEAT (Industrial Estate Authority of Thailand) Target Area: Rayong Province

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal			
Model of PRTR System for Thailand is established.	1) PRTR system is described in the legal documents of Thai government.		
Project Purpose			
Capacity of PCD, DIW and IEAT's staff for implementation of PRTR pilot project is strengthened.	1) Draft PRTR system in Thailand is approved by the PRTR sub-committee by the end of the project. 2) Estimation manuals are approved by the respective taskforce.	1) Minute of meeting of the PRTR sub-committee 2) Minute of meeting of the task force	Present national policy and environment regulation in Thailand is maintained and improved.
Outputs			
1. Basic design of PRTR system in Thailand is established.	1) Draft of basic design of PRTR system is developed.	- Draft of basic design of PRTR	In pilot area, cooperation of state government, local government, factory and industry association is maintained.
2. Emission reporting scheme of industry is developed.	1) By draft of reporting form and system, point source data of pilot area is collected, arranged and compiled from more than 7 categories of point sources.	- Emission report of point sources	
3. Capacity of estimation of emission and transfer for point source is strengthened.	1) Consultation for point source estimation is carried out for more than 7 categories of point sources.	- Consultation report	

4. Capacity of emission estimation for non-point source is strengthened.	1) Emission of non-point source for pilot area is estimated in more than 5 target categories.	- Emission report of non-point sources	
5. Importance of use of PRTR data including initial assessment is understood.	1) Use of the PRTR data is positively considered.	- Minutes of meetings of CP meeting or JCC or PRTR sub-committee	
6. Implementation structure of risk communication is developed in the pilot area.	1) Risk communication plan or operational guideline is prepared.	- Progress report	
Activities	Inputs		External conditions
1-1. Formulation of basic strategy 1-2. Organizational set up inside government and with other stakeholders 1-3. Development of project work plan 1-4. Development of criteria for target substance selection 1-5. Draft target substance list and revision 1-6. Draft basic design of PRTR system 1-7. Development of PRTR database and Web site 1-8. Draft pilot implementation plan and set up organization 1-9. Organizing awareness raising and training workshop for pilot 1-10. Collection of data and disclosure for pilot 1-11. Organizing risk communication	1. Japanese Side (1) Japanese Experts ① Leader / PRTR System / Chemical Management / Non-point Source Estimation 3 ② Sub-Leader / Point Source Reporting / Point Source Estimation / Non-point Source Estimation 2 ③ Non-point Source Estimation 1 ④ Social Consideration / Risk Communication ⑤ Social Consideration / Risk Communication 2 (2) Training Training course in Japan (3) Local cost Local costs for experts' activities (4) Machinery, Equipment and Materials Software of PRTR database system 2. Thai Side (1) Counterpart personnel including administrator (2) Office space, meeting room (3) Local costs (see Minutes of Meeting)		1. PCD, DIW and IEAT's staff in relevant fields to Japanese experts will be assigned according to the current Operation Plan 2. Budget for PCD, DIW and IEAT is allocated enough to keep activities of PCD, DIW and IEAT.

<p>meeting for pilot</p> <p>1-12 Obtaining feedback from stakeholders for pilot</p> <p>1-13 Final design of PRTR system and prepare action plan</p> <p>1-14 Preparation of final report of output 1</p>	
<p>2-1 Collection of available data for preparing point source definition</p> <p>2-2 Development of point source definition (reporting thresholds)</p> <p>2-3 Development of reporting form</p> <p>2-4 Identifying reporting procedure from point sources</p> <p>2-5 Listing of candidate point sources and sending reporting form to them</p> <p>2-6 Collecting reports from point sources</p> <p>2-7 Verification of point source data</p> <p>2-8 Compilation of point source data</p> <p>2-9 Revision of point source definition and reporting form</p> <p>2-10 Preparation of final report of output 2</p>	
<p>3-1 Establishment of task forces on development of release estimation manuals for specific</p>	

<p>industries</p> <p>3-2 Development of draft release estimation manuals for specific industries</p> <p>3-3 Conducting model studies for industries for which release estimation manuals are not prepared</p> <p>3-4 Organizing workshop on point source release estimation for governmental officials and relevant agencies</p> <p>3-5 Organizing workshop on point source release estimation for factories/facilities</p> <p>3-6 Organizing consultation for factories/facilities to estimate releases by site visit</p> <p>3-7 Responding to questions (via phone, e-mail) on release estimation from factories/facilities and preparing FAQs</p> <p>3-8 Revision of release estimation manuals for specific industries</p> <p>3-9 Preparation of final report of output 3</p>		
<p>4-1 Establishment of basic idea for estimation of emissions from non-point sources(NPS)</p>		

<p>4-2 Survey of availability of activity data and emission factors (EFs) necessary to estimate</p> <p>4-3 Selection of target categories and target chemicals for NPS and responsible bodies to estimate</p> <p>4-4 Validation of data used for estimation; activity data and EF</p> <p>4-5 Establishment of estimation method in each target category</p> <p>4-6 Preparation for drafts of estimation manuals</p> <p>4-7 Collection such data used for estimation as activity data and EF</p> <p>4-8 Estimation of emission amounts from NPS at pilot area and Compilation of disclosed data</p> <p>4-9 Collection of information, data necessary for revising estimation manuals and revision of estimation manuals</p> <p>4-10 Implementation of workshop for estimation of emissions from non-point sources for government officials and relevant agencies</p> <p>4-11 Preparation of final report of output 4</p>		
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<p>5-1 Introduction of domestic and overseas case studies on use of PRTR data including initial assessment of exposure risk to target substances</p> <p>5-2 Utilization and possible development of model or tools for uses of PRTR data e.g. concentration estimating model</p> <p>5-3 Implementation of case studies for use of PRTR data including initial assessment</p> <p>5-4 Training for use of PRTR data including initial assessment for both government and private sectors</p> <p>5-5 Preparation of final report of output 5</p>		Pre-conditions
<p>6-1 Development of basic strategy for promoting risk communication</p> <p>6-2 Organizational set up inside government and with other stakeholders for promoting risk communication</p> <p>6-3 Awareness raisings for risk communication importance for relevant agencies, relevant local governments and participating companies.</p> <p>6-4 Development of training</p>		

<p>curriculum for facilitator and pilot implementation of training course</p> <p>6-5 Review of facilitator training course and follow-up for trainee</p> <p>6-6 Development of the Handbook for risk communication</p> <p>6-7 Planning the registration system of chemical advisor for supporting risk communication.</p> <p>6-9 Development of the implementation plan, and pilot organization of risk communication meeting with community people of Rayong</p> <p>6-10 Preparation of final report of output 6</p>		
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10. The records of JCC

Minutes of Meeting

**The 1st/2011 Meeting of the Joint Coordinating Committee on
the Development of Basic Schemes for PRTR System in the Kingdom of Thailand
(JCC–JICA PRTR 1st/2011 Meeting)
25th March 2011, Meeting room 301, Pollution Control Department**

Present

Co-Chairs

Mr. Supat Wangwongwatana, Director General of PCD

Mr. Chumpon Cheewaprapanunt, Deputy Director General of DIW,
(Representing Director General of DIW)

Members

1) Thai side

- Pollution Control Department (PCD)

Mr. Wijarn Simachaya, Deputy Director General of PCD

Mr. Rangsan Pinthong, Director of Waste and Hazardous Substance Management Bureau
(co-project assistant, secretariat)

Ms. Pornpimon Chareonsong, Director of Hazardous Substance Division (co project assistant)

Mr. Aram Bhandhuwana, Environmentalist, Professional Level, Hazardous Substance Division

Mr. Patarapol Tularak Environmentalist, Professional Level, Hazardous Waste Division

Mr. Khomkrit Khunkon Environmentalist, Hazardous Substance Division

- Department of Industrial Works (DIW)

Mrs. Srichant Uthayopas Director of Water Technology and Industrial Pollution
Management Bureau

Mr. Naratip Lauhatirananda Scientist, Senior Professional level, Hazardous Substance Bureau

Mr. Santi Sittilerdpisan, Computer Technical Office, Senior Professional level

Mr. Sira Chanched, Scientist, Professional level

Ms. Jariya Sukhapan Scientist, Professional level

- Department of Agriculture (DOA)

Mrs. Pinya Chulintorn, Scientist, Special Professional level

Ms. Wipa Thangnipon, Scientist, Special Professional level

- Department of Highways (DOH)

Mr. Surajit Thipayakesorn, Director of Office of Environment and Public Involvement

- Office of Transport and Traffic Policy and Planning (OTP)

Mr. Niran Ketkaew, Chief of Transport Safety Management Sub Division, Transport Safety Planning Bureau

- Thailand International Development Cooperation Agency (TICA)

Ms. Charintip Yosthasan, Development Cooperation Officer

- Industrial Estate Authority of Thailand (IEAT)

Mr. Manit Inmek, Director of Industrial Estate and Port Office Directing Department
(Representing Deputy Governor of IEAT)

2) Japanese side

- JICA Experts

Mr. Munehiro Fukuda, Team Leader

Ms. Sutthiporn Phannachet, Project Assistant

- JICA Thailand Office

Mr. Togo Uchida, Representative

Ms. Jamaree Yamklinfung, Senior Program Officer

Ms. Natjaree Leelathanapipat, Program Officer

3) Observer

- Embassy of Japan in Thailand

Mr. Yukihiro Kaneko, First Secretary

Absent

Representative from Department of Local Administration (DLA)

The meeting started at 09.50 hrs.

1. Opening of the meeting

Mr. Supat Wangwongwatana, Director General of PCD as a co-chair, welcomed Mr. Fukuda, the expert of the PRTR project, and expressed his condolences for the situation of earthquake and tsunami in Japan. He recognized that people all over the world admire and are impressed by the calm and orderly reaction of Japanese people on settling the situation after the earthquake. He also expressed his gratitude towards JICA and Japanese Government in supporting PCD and DIW to conduct the PRTR Project and hoped that Thailand will set up a sustainable PRTR system in the future.

Mr. Chumpon Cheewaprapanunt, Deputy Director General of DIW, on behalf of the Director General of DIW as a co-chair of the meeting, gave his condolences to the people of Japan suffering from the catastrophe and hope that Japan will get better recovering soon. He mentioned that PRTR

system is very important to Thailand and many sectors requested government to set up PRTR system, and to put effort to disclose information to the public.

Mr. Yukihiro Kaneko, First Secretary, Embassy of Japan in Thailand, thanked Thai government and Thai people on behalf of Japanese Government and Japanese people for the heartfelt condolence and kindness support to Japan after the earthquake and tsunami on March 11, 2011. He mentioned that Japan is trying very hard to settle down and to set everything back to normal and he insured that Japan will recover very soon because Thailand and people all over the world give their support to Japan.

Mr. Togo Ucida, JICA Thailand Office, informed that JICA Head Quarter had selected Mr. Munehiro Fukuda, who has extensive knowledge and experience working with PCD, as a Team leader for the project. However; a representative from JICA Head Quarter was not able to join the meeting according to the situation in Japan. He hoped that the utilizing experience from Japan will create a sustainable PRTR system for Thailand in the future.

Mr. Munehiro Fukuda, expressed thank you for all Thai people for the warmth for the situation in Japan. He was glad to come back to Thailand for working in this project and committed himself to make this project successfully within 4 years. He also mentioned that he would like to see the PRTR implementation for Thailand.

Mr. Supat excused the meeting due to an urgent meeting with the Permanent Secretary of MNRE and he will returned back shortly. He asked Mr. Wijarn, Deputy Director General of PCD, to be a co-chair while he was absent.

Mr. Wijarn introduced himself and asked JCC members and attendees to introduce themselves.

2. Report

2.1 Background of the JICA-PRTR Project

Mr. Rangsan Pinthong, Director of Waste and Hazardous Substance Management Bureau, PCD, presented an overview of PRTR system, background of the project as well as an overview of the project which covered such time frame, goal, output, main activities, pilot area, and counterparts of the project.

Mr. Wijarn mentioned that many sectors are interested in PRTR because it can be a tool for disclosing the data on chemical production and release from difference sources to the public. The establishment of PRTR system can support several national plans such as the 11th National Economic and Social Development Plan, Five-year pollutant Management Plan (2012-2016), Environmental Quality Management Plan, and especially National Strategic Plan on Chemical Management.

Mr. Niran Ketkaew raised the questions whether to include only pollutants or other chemical substances for the target chemicals in PRTR, and also whether the pollutants released from the vehicles in chemical transportation are included.

Mr. Wijarn informed that, since the target list of chemical is still under the drafting process, at the present it could not be confirmed whether the list will consist of only pollutants or other chemical substances as well. Once, list of the target chemical is finalized then their emission source can be identified.

Mr. Chumpon supported this view that firstly we have to identify the target substances which, consequently, are going to point out the target emission sources. Since there will be numerous target emission sources, the establishment of JCC is important for further cooperation.

Ms. Wipa Thangnipon raised the issue on the involvement of local community. Considering the issue on non-point source, she mentioned that the local authority or the community leader might have to take an important role on the distribution of chemical data to the community.

Mr. Wijarn responded that one crucial issue of the PRTR is data disclosure to the public. The local community should learn how to understand the data interpretation and, especially for the local authority, in order to communicate the risk on chemical substances to the public. Nevertheless, in this project, there is also the important issue on related to risk communication regarding how to communicate and create right understanding about chemical risk among local people.

Mr. Chumpon and Mr. Aram emphasized that the emission source is identified by the target chemicals under PRTR. In the case of non-point source, the governmental agency will be responsible for emission estimation.

Mr. Surajit would like to know the final outcome of the PRTR Project.

Mr. Supat informed the meeting that PRTR Implementation will become the database of released and transferred pollutants and chemicals to all environmental media. The amount and proportion of emission from difference sources in area based – nationwide and local level are the major component of the system. Therefore, PRTR database will be useful in planning and making policy for future environmental management.

3. Decision/Discussion

3.1 Inception Report/Work Plan for PRTR Project

Mr. Fukuda, JICA expert, presented the overview of the project of the development of basic schemes for PRTR system in the Kingdom of Thailand. The component of project consists of six main activities and expected to be finished within 4-year period. This project has started from March 2011 to February 2015. The activities in the first and second year (2011-2012) were related to the preparation phase for the pilot project to be further implemented in the third year, 2013. Finally, the fourth year, the phase for questionnaire survey, summary, and evaluation will be developed.

Mr. Wijarn gave his comment on the work plan and suggested some elements should be revised.

Agreed points

- The meeting overall agreed on scope of the work plan and activities for project implementation and approved the content of Inception report as proposed by JICA expert.
- JICA expert will make a revision on some minor changes according to comments from the meeting.
- JICA expert will revise the chart of related organizations.

3.2 Proposed an additional co-project manager for counterpart members

JICA expert proposed Mr. Verapong Chaiperm, Deputy Governor of IEAT, to participate in the project as a co-project manager. He informed the meeting that Mr. Verapong is responsible for five industrial estates in Rayong Province. In addition, JICA expert and JICA Thailand Office had consulted with him on this proposal and he had no objection. However, an official letter from PCD or DIW is needed.

Agreed points

- Agreed to invite Mr. Verapong Chaiperm, Deputy Governor of IEAT, as an additional co-project manager of JICA-PRTR Project.
- PCD will submit the invitation letter to IEAT regarding the issue.

3.3 Roles and responsibilities of the counterpart and relevant agencies

Mr. Rangsan asked the meeting to consider the lists of main and supporting agencies for the implementation of JICA-PRTR project. The list had been previously discussed in the 1st/2011 Meeting of the JICA-PRTR Counterpart held on March 17th, 2011. JICA experts, PCD and DIW counterparts responded to the request from Office of Transport and Traffic Policy and Planning (OTP) and Department of Highway (DOHwy), concerning their activities and roles in supporting this project. The meeting agreed that OTP, DOHwy as well as Department of Land Transport should be able to provide some statistical data for estimation of the release from mobile source.

Agreed Point

The meeting agreed on the responsibilities as shown in the following table.

Output	Main agencies	Supporting agencies
1. Basic design of PRTR system in Thailand is established.	PCD	DIW, IEAT, FDA, Customs Department
2. Emission reporting scheme of industry is developed.	DIW, IEAT	PCD, FTI

3. Capacity of estimation of emission and transfer for point source is strengthened.	DIW, IEAT	PCD, FTI
4. Capacity of emission estimation for non-point source is strengthened.	PCD	DIW, OTP, DOA, DOEB, DOHlth, , DOHwy, DLT, etc
5. Importance of use of PRTR data including initial assessment is understood.	PCD, DIW, IEAT	TMD, Rayong Province
6. Importance of risk communication is understood.	PCD	DIW, IEAT, DEQP and NGOs

Note

DEQP	Department of Environmental Quality Promotion
DIW	Department of Industrial Works
DLT	Department of Land Transport
DOA	Department of Agriculture
DOEB	Department of Energy Business, Ministry of Energy
DOHlth	Department of Health
DOHwy	Department of Highway
FTI	The Federation of Thai Industries
IEAT	Industrial Estate Authority of Thailand
NGO	Non-Government Organization
OTP	Office of Transport and Traffic Policy and Planning
PCD	Pollution Control Department
TMD	Thai Meteorological Department

3.4 Press Conference

Mr. Rangsan informed that JICA Thailand Office requested for Thai counterpart to convey a press conference to promote the JICA-PRTR Project. According to the 1st/2011 Meeting of the JICA-PRTR Counterpart on March 17th, 2011, the meeting agreed to organize a press conference as well as a seminar on the same day, in June 2011. The meeting had discussed in further detail on date, venue, the number of participants, and funding. Mr. Supat offered the meeting that PCD will organize the event.

Agreed points:

- Agreed to organize a press conference during a seminar at a hotel in Bangkok with a tentative date during the last two weeks of June 2011. Approximately, 100 audiences are expected to be participated in the event.
- PCD will organize the press conference as well as seminar.
- Executives of PCD, DIW, IEAT and representative from Japanese Government will attend the press conference.

4. Other business

4.1 Compiling information of chemical substances by Thai sub-contractor

Mr. Fukuda, JICA expert team leader, informed that Thailand Environment Institute (TEI) had been selected as a subcontractor for compiling the production, import/export, and utilization data of chemical substances. The data compiling is expected to be done within June 2011.

The meeting was adjourned at 12.30 hrs.

reported by Mr. Aram Bhandhuwanna , Mr. Khomkrit Khunkon, Ms.Suthiporn Phannachet

edited by Ms. Pornpimon Chareonsong

Minutes of Meeting
The 2nd -1/2012 Meeting of the Joint Coordinating Committee on
the Development of Basic Schemes for PRTR System in the Kingdom of Thailand
(The 2nd JCC–JICA PRTR Meeting)
22nd May 2012, Meeting room 301, Pollution Control Department

Present

Co-Chairs

Ms. SuneePiyapanpong	Deputy Director General of PCD
Mr. MongkolPruekwatana	Director of Industrial Waste and Environmental Technology Bureau, Department of Industrial Works (Representing Co-Chairperson of DIW)

Members

1) Thai side

- Pollution Control Department (PCD)

Mr. Rangsan Pinthong	Director of Waste and Hazardous Substance Management Bureau (co-project assistant, secretariat)
Ms. Pornpimon Chareonsong	Director of Hazardous Substance Division (co project assistant)
Ms. Wandee Aieophuket	Environmentalist, Professional level, Planning and Evaluation Division
Mr. Aram Bhandhuwana	Environmentalist, Professional Level, Hazardous Substance Division
Mr. Patarapol Tularak	Environmentalist, Professional Level, Hazardous Substance Division
Ms. Orawan Manoonwong	Environmentalist, Professional Level, Industrial Air Pollution Division
Mr. Ittipol Paw-armart	Environmentalist, Professional Level, Automotive Air Pollution Division
Ms. Kessinee Unapamnak	Environmentalist, Professional Level,
Mr. Kulaputt Srisukh	Environmentalist, Practitioner Level, Industrial Wastewater Division
Ms. Jarinporn Tippamongkol	Environmentalist, Professional Level, Environmental Quality and Laboratory Division
Mr. Khomkrit Khunkon	Environmentalist, Hazardous Substance Division

- Department of Industrial Works (DIW)

- | | |
|---|--|
| Mr. Decha Pimpisut | Director of Air Pollution Division, Industrial Waste and Environmental Technology Bureau |
| Mr. Chairat Liangsupong | Director of Water Pollution Division, Industrial Waste and Environmental Technology Bureau |
| - Department of Agriculture (DOA) | |
| Ms. Nunchana Luetrakool | Director of Agricultural Production Science Research and Development Office |
| - Department of Local Administration (DLA) | |
| Mr. Kukiat Nimmium | Director Bureau of Environmental Management and Public Participation Promotion |
| - Office of Transport and Traffic Policy and Planning (OTP) | |
| Ms. Puttamon Ratajeen | Chief of Sustainable Transport Sub Division, Transport Safety Planning Bureau |
| - Thailand International Development Cooperation Agency (TICA) | |
| Ms. Somsuan Howe | Development Cooperation Officer, Professional Level |
| Ms. Porntip Jaisan | Development Cooperation Officer, Professional Level |
| Ms. Chanakarn Satienccharukarn | Development Cooperation Officer, Professional Level |
| - Industrial Estate Authority of Thailand (IEAT) | |
| Ms. Jariya Sukhapan | Engineer, Level 8 |
| Ms. NichamonIw-sakul | Scientist |

2) Japanese side

- JICA Expert Team

- | | |
|--------------------------|-------------------|
| Mr. Munehiro Fukuda | Team Leader |
| Mr. Makoto Takahashi | JICA Expert |
| Ms. Kanok-on Petchdee | Project Assistant |
| Ms. SutthipornPhannachet | Project Assistant |

- JICA Thailand Office

- | | |
|------------------------------|------------------------|
| Mr. Tomoyuki KAWABATA | Senior Representative |
| Mr. Fumiya MISAKA | Representative |
| Ms. Jamaree Yamklinfung | Senior Program Officer |
| Ms. Natjaree Leelathanapipat | Program Officer |

3) Observer

- Embassy of Japan in Thailand

- | | |
|---------------------|-----------------|
| Mr. Yukihiko KANEKO | First Secretary |
|---------------------|-----------------|

Absent

Representative from Department of Highways (DOH)

The meeting started at 13.50 hrs.

1. Opening of the meeting

Ms. Sunee Piyapanpong, Deputy Director of PCD as a co-chair, greeted the floor and welcomed all participants to the 1st meeting of Joint Coordinating Committee in 2012 – the JICA-PRTR project's second year. Ms. Sunee would co-chair the meeting as Director General of PCD. Mr. Wichien Jungrungruang was unavailable due to other business.

Mr. Mongkol Pruekwatana, Director of Industrial Waste and Environmental Technology Bureau, DIW, as a co-chair, also greeted the floor. Due to an unavailability of Director General of DIW Mr. Prapatwanapitak and Deputy Director General Mr. Chumpon Cheewaprapanunt, Mr. Mongkol would co-chair the 1st/2012 JCC meeting.

2. Approval of the Minute of the 1st/2011 Meeting of the JCC on 25th March 2011

Mr. Rangsan, Director of Waste and Hazardous Substance Management Bureau, concluded and reported to the meeting members on the 1st/2011 Meeting of the JCC on 25th March 2011. The minute was read and overall approved by the participants.

3. Report

3.1 Report of the 1st year Progress

Mr. Rangsan reported the summary of progress made during the JICA-PRTR Project's first year, March 2011 – March 2012, to the meeting members.

Ms. Pornpimon informed that despite some obstacles during the deluge at the end of 2011, the JICA-PRTR Project had achieved the goals as planned except the first year's study tour to Japan, which was postponed to July 2012. Ms. Pornpimon further informed that the 1st Risk Communication Training Course was implemented during 23-25 January, 2012, in Rayong. The training curriculum was designed by the task force, established under Department of Environmental Quality Promotion (DEQP), in collaboration with a JICA expert and Environmental Research and Training Center (ERTC).

Mr. Fukuda informed the details of the training and the feedback which over 80% of participants satisfied with the course. He added that, in June, there will be a follow-up survey for the risk communication participants after attended the training course. In addition, the sustainability of risk communication training course, it has to be sustained and organized routinely. However; Mr. Fukuda proposed that it should be under the responsible of DEQP. Mr. Fukuda gave an explanation

on the first's year major issues and problems which will be emphasized in the project's second year. The major issues included 1) strengthening of non-factory emission estimation and non-point source activity, 2) implementation mechanism for pilot project, 3) fuel composition under EURO4, and 4) continuation of risk communication training.

3.2 Planning of the 2nd year

Mr. Rangsan presented the second year plan of JICA-PRTR Project giving the details of each output, the major work, upcoming seminars and workshops, and also briefly explained on the study tour in Japan.

Mr. Aram informed that the 2nd year plan had been revised in accordance to the Japanese fiscal year and explained each revision points to the meeting members. The updates made are the minor adjustment which doesn't cause a significant effect on the implementation of the project in a hold picture.

Mr. Fukuda and Mr. Aram gave information on the non-point source activity in 2012 that data availability survey for non-point source was newly added in the work plan in order to make a precise reference for non-point source data collection preparing for the pilot project. Data availability survey will be carried out by a local sub-contractor provided by JICA.

Mr. Decha added, besides the additional non-point source data availability survey, another change in the annual work plan is the rescheduling of study tour in Japan to be carried out in the 2nd year (2012) – instead of the 1st year -- and the 3rd year (2013).

Mr. Fukuda gave information on the provision of four local sub-contractors from JICA as revised in the work plan and explained that the four subcontracts are for 1) import, export, production, and storage chemical data survey, 2) PRTR Website and database development, 3) Non-point source data availability survey, and 4) supporting the factory in emission estimation during the pilot project.

Ms. Jariya commented on the list of industrial estate/ land/zone/park to be invited for the next JICA-PRTR Seminar that the list well covers all of industrial sector in Rayong. Ms. Jariya further informed the Eastern Industrial Estate had changed the name to Hemaraj Eastern Industrial Estate (Map Ta Phut).

4. Discussion/ Decision

4.1 Setting up a Task Force for Estimation the Emission from Non-Point Source under PRTR

Mr. Rangsan explained the basic concept of non-point source, the background and necessity of establishing the task force for non-point source. As the definition, non-point source cover vast variety of activities which JICA expert had considered and proposed 5 categories, including target chemicals of each categories, to be focused on in establishment of PRTR system in Thailand. The 5 categories are 1) mobile sources, 2) agriculture, 3) construction including civil engineering, 4) households, and 5) small business in target categories. Mr. Rangsan further presented the proposed composition of task force members to be discussed by the floor of JCC.

Ms. Pornpimon and Mr. Decha both agreed and proposed that the task force, which had been already set up under the PRTR sub-committee of the national pollution control commission, could be as well established as a task force for the non-point source release estimation. The existing task force also holds a formal and reliable status.

Mr. Fukuda commented that the proposed task force for non-point source should be initially set up under the JICA-PRTR Project which might make it less formal but more flexible in gathering an information/data ready for the upcoming pilot project. Nevertheless, the mechanism of task force for non-point source release estimation shall be upgraded and sustained after the project. In addition, Mr. Fukuda explained that many organizations involved in the task force will benefit in a good coverage of the data availability for non-point source.

Ms. Sunee proposed an existing task force under the PRTR sub-committee cover the work for non-point source release estimation due to many organizations had already been involved as a member. The members of task force for non-point source can be adjustable within the existing task force or invite other organizations to join if needed. Therefore, setting up a new task force for non-point source might not be necessary.

Mr. Fukuda proposed to hold an informal preliminary meeting for establishment of non-point source, inviting all related organizations – both inside and outside the existing task force under PRTR sub-committee -- to discuss on the data availability for non-point source release estimation. The members of task force members would be decided after the preliminary meeting.

Agreed Points

The task force for non-point source will be set up from the members of the existing task force under the PRTR sub-committee which is consisted of many organizations covering both point

source and non-point source. Other related organizations outside the existing task force will also be invited to join in order to fulfill the data requirement for non-point source release estimation.

4.2 Revised Project Design Matrix

Ms. Pornpimon informed the meeting members about the revision of Project Design Matrix (PDM) which included Industrial Estate Authority of Thailand (IEAT) in the document as the third counterpart of the JICA-PRTR Project. Although at present IEAT had been involving in the project, there are only PCD and DIW mentioned in the previous PDM. JICA head quarter had pointed out the issue and suggested for the revision of the PDM document.

The members from Thai side questioned whether the MOU and Record of Discussion of the project had to be revised and to hold the signing ceremony again. For Thai side, in the case of revision of PDM document, it is not necessary to re-sign the MOU and R/D.

Agreed Points

The meeting members agreed in overall to include Industrial Estate Authority of Thailand (IEAT) in the Project Design Matrix as a counterpart of the JICA-PRTR Project.

The meeting was adjourned at 15.30 hrs.

Recorded by Ms. Suthiporn Phannachet

Minutes of Meeting
The 3rd Meeting of the Joint Coordinating Committee on the
Development of Basic Schemes for PRTR System in the Kingdom of Thailand
(The 3rd JCC-JICA PRTR Meeting)
12th July 2013, Meeting room 202, Pollution Control Department

Present

Co-Chairs

Ms. Somchint Pilouk	Deputy General (Service and Environment) of IEAT
Mr. Mongkol Pruekwatana	Director of Industrial Water and Environment Technology Bureau of DIW

Members

1) Thai side

- Pollution Control Department (PCD)

Mr. Aram Bhandhuwanna	Environmentalist, Professional level, Hazardous Substance Division
Mr. Ittipol Paw-armart	Environmentalist, Professional level, Automotive Air Pollution Division
Ms. Wundee Aieophuket	Environmentalist, Professional level, Planning and Evaluation Division
Mr. Chayawee Wangcharoenrung	Environmentalist, Professional level, Industrial Wastewater Division
Mr. Phunsak Teramongkon	Director of Industrial Air Pollution Division
Mr. Khomkrit Khunkon	Environmentalist, Hazardous Substance Division

- Department of Industrial Works (DIW)

Mr. Decha Pimpisit	Scientist, Expert Level
Mr. Naratip Lauhatirananda	Scientist, Senior Professional Level
Mr. Santi Sittilerdpisan	Director of Information technology support and service unit, Factory information center, Department of Industrial Works
Ms. Sirakarn Leungsakul	Engineer, Senior Professional level
Mr. Parinya Maneewong	Scientist, Professional level

- Industrial Estate Authority of Thailand (IEAT)

Ms. Jariya Sukhapan	Scientist Level 8
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- Department of Agriculture (DOA)

Mrs. Nunchana Luetrakool	Director Agricultural Production Sciences Research
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And Development Office

- Thailand International Development Cooperation Agency (TICA)

Ms. Somsuan Howe Development Cooperation Officer, Professional Level

Ms. Patchara Kosiwaranont Development Cooperation Officer, Professional Level

- Office of Transport and Traffic Policy and Planning (OTP)

Ms. Malee Uabharadorn Chief of Sustainable Transport Promotion Division

Mr. Nopporn Jaroongkiat Plan and Policy Analyst, Professional Level, Office of Transport and Traffic Policy and Planning (OTP)

2) Japanese side

- JICA Expert Team

Mr. Munehiro FUKUDA Team Leader

Ms. Saowalak Maliwan Project Assistant

Ms. Bongkot Charoensak Project Assistant

- JICA Thailand Office

Mr. Fumiya MISAKA Representative

3) Observer

- Embassy of Japan in Thailand

Mr. Yukihiko KANEKO First Secretary

The meeting started at 13:30 hrs.

Summary

1. Opening of the meeting

Ms. Somchint Pilouk, Deputy General of IEAT as a co-chair, greeted the floor and welcomed the participants to the 3rd meeting of Joint Coordinating Committee in 2013 – the JICA PRTR project's third year.

2. Approval of the Minutes of the 2nd Meeting of the JCC on May 22nd, 2012

Mr. Aram concluded and reported to the meeting members on the minutes of the 2nd meeting (2nd/2012) of the JCC on May 22nd, 2012. The minutes were read and overall approved by the participants.

3. Report Issues

3.1 JICA-PRTR Progress of the JICA-PRTR project

Mr. Aram informed the meeting members about the progress of the JICA-PRTR project. Considering the 6 outputs in the implementation plan, some activities have been completed such as, selection criteria for target chemical and list target chemical, point source and non-point source definition, reporting criteria, reporting form and release estimation manual for specific industries point source.

3.2 Pilot Implementation plan and its progress

Mr. Aram informed the meeting members about the Pilot Implementation Plan and its progress as follows:

Phase I: Awareness raising to all stakeholders

During August 2012- March 2013, 16 awareness-raising activities had been organized, with total number of participants of more than 900, 600 of which are from private sectors

Phase II: Estimation training and reporting method for Point-sources

Training for estimation and reporting was planned to be organized in July –August 2013 to cover industrial and non-industrial point sources.

Phase III: Implementation and support to point sources

Phase IIII: Implementation support

Phase IV: Reporting and compilation

Phase V: Feedback

Mr. Fukuda further informed the meeting members with detailed implementation and the progress of the project. The awareness-raising workshops and seminars were already organized and the training workshops for release estimation are going to be organized. Also, various surveys were made or going to be made regarding small factories, hospitals, universities, pesticide, traffic, household, etc. After the data compilation, the data will be disclosed and communicated to the public.

Ms. Malee asked a question on estimation method of Non-Point Source whether why Non-point sources are not invited to the estimation workshops.

Mr.Aram and Mr. Decha described that as Non-Point Source estimation is performed by governmental sector, no estimation method for Non-point Source need to be described or trained.

Ms. Malee further asked question whether the scope of Non-point Sources as defined in the plan actually cover all the important and related Non-point sources.

Mr. Ittipol confirmed that the scope of Non-point Sources as defined in the plan has already covered every important and related Non-Point sources.

3.3 Mid-term Evaluation of the JICA-PRTR Project

JICA Mid-term review was carried out during December 12th-24th, 2012 and the report was acknowledged by the 5th Counterpart meeting on December 25th, 2012. The overall progress of the project was acknowledged and approved. However, some recommendations were made to PCD, DIW and IEAT and such recommendations were taken into consideration and implemented by each responsible body.

4. Discussion/Decision

4.1 Revised Project Design Matrix: PDM

Mr. Fukuda explained how Project Design Matrix (PDM) could be an indicator of project's goal achievement. The table showed concrete measurement of project's goal achievement, for instance, the establishment of Model of PRTR system was indicated by publication of PRTR annual emission report. The PDM needed to be revised from time to time and as the current PDM was prepared before the project eventually started. Thus, there are some contents in the PDM which are not up to date and are not practical.

Mr. Fukuda proposed the following changes to be made to the PDM:

- 1) IEAT is added to the Target Group
- 2) Change in Output 1: from "Basic Design of PRTR system in Thailand is established" to "Draft Basic Design of PRTR system in Thailand is established"
- 3) Change in Output 6: from "Importance of risk communication is understood" to "Implementation structure of risk communication system is developed in the pilot area"
- 4) Change in Indicator for overall goal: from "Law of PRTR system is established for whole of Thailand" to "PRTR system is described in the legal documents of Thailand government"
- 5) Indicators for project purpose were made clearer and easier to verify.

Ms. Malee suggested that apart from adding IEAT to target group, we should also add other organizations to the counterpart, for instance, Rayong Provincial Office.

Mr. Aram briefly explained the working system and the roles of counterpart member, giving information that PCD, DIW and IEAT are three main responsible bodies under PRTR project, while other organizations, such as Rayong Provincial Office is included in the project as working groups or task force.

Ms. Somchint, the Chair, also explained that Target Group is defined under the management of the project as responsible bodies who take a leading role in driving the project

Mr. Fukuda added that although it is not mentioned in the PDM, but the involvement of Rayong Provincial organizations is already included.

Ms. Malee agreed that we continue having three organizations as counterpart members.

Mr. Aram continued with explaining the meeting members about changes being made in the PDM.

Ms. Malee also raised another point about the change made in Indicator for overall goal: from “Law of PRTR system is established for whole of Thailand” to “PRTR system is described in the legal documents of Thailand government”. Ms. Malee asked about the direction of issuing such legal document, and what hierarchy of such legal document is, for instance, would the legal document be in the format of a notification, regulation or directives and the what is the scope of responsibility of the issuing bodies.

Mr. Aram explained that issuing law would be a very complicated process which takes a long time to finish. Thus, the wording “law” was changed to “legal document” in order that the effectiveness of PRTR implementation would be validated. The changed term was for the purpose of flexibility and practicality in enforcement. Plus, the Development of Basic Schemes for PRTR System in the Kingdom of Thailand is a pilot project, the data from the pilot need to be complied in order to see the whole picture before any plan on issuing any legal document could be made.

Mr.Phunsak Teramongkon, Director of Industrial Air Pollution Division raised a question about Change in Output 1: from “Basic Design of PRTR system in Thailand is established” to “Draft Basic Design of PRTR system in Thailand is established” whether the term “Draft” in the revised version would lower the effectiveness of the Basic Design or not.

Mr. Fukuda explained that the change in wording is mainly for the flexibility, to avoid any argument to be made in the future.

Agreed Points

The Meeting approved the revised PDM as proposed by Mr.Aram. However, Ms. Somchint, the Chair requested an additional explanatory note on the term “legal document” on PDM to be made.

4.2 Revised 3rd Year of Work Plan (Plan of Operation: PO)

Mr. Fukuda presented to the Meeting 6 outputs according to the Plan of Operation (PO) as follows:

- 1) Plan on Basic Design of PRTR system in Thailand
- 2) Plan on Emission Reporting
- 3) Plan on Capacity of Emission Estimation for Point Sources
- 4) Plan on Capacity of Emission Estimation for Non-Point Sources: several surveys with the subcontractors were made.
- 5) Plan on Importance of use of PRTR data including initial assessment is understood

6) Plan on Risk Communication: Pilot implementation plan on risk communication is being discussed and the risk communication handbook is being developed.

Ms.Malee asked a question on the definition and scope of Risk as described in Output 6, about Risk Communication.

Mr.Aram explained the definition of Risk Communication as a method in presenting and communicating PRTR data to the public in a correct manner.

Mr.Chayawee added that risk under PRTR project is not an emergency case, but information on a long-term exposure of chemical substances communicated to the public in order that people have enough information in making decision.

Ms.Jariya further added that in risk communication, two experts need to be trained or registered in order to communicate PRTR data in a correct manner and the training sessions were organized earlier.

Agreed Points

The Meeting approved the revised PO as proposed by Mr. Aram.

4.3 Revised Component of Counterpart Member

Mr.Aram presented to the meeting members that there are three main organizations in Thailand working under PRTR project: Department of Industrial Work (DIW), Industrial Estate Authority of Thailand (IEAT) and Pollution Control Department (PCD). The list of counterpart member as of 2011 comprises of 4 positions: 1)Co-Project Director 2) Co-Project Manager 3)Project Assistant 4)Counterpart members from 3 organizations. However, there are members in every position from PCD and DIW, whereas there are only two representatives from IEAT, Deputy Governor as a Co-Project Manager and Staff from relevant bureau as Counterpart members. Thus, the Secretariat proposed to the meeting to add Deputy Governor from IEAT as Co-Project Manager

Agreed Points

The meeting approved the proposed component of the counterpart member of the JICA-PRTR project.

5. Other issues

Mr.Aram, informed the meeting members about the upcoming event, the Third PRTR Seminar, to be organized in collaboration DIW, IEAT and PCD on July 17th, 2013 at Century Park Hotel. The purpose of the seminar is to inform about the progress of the PRTR project and to receive any comment or feedback from the participants on PRTR project.

The meeting was adjourned at 16.00 hrs.

Recorded by

Ms. Bongkot Charoensak

Record of Meeting
The 4th JCC-JICA PRTR

Time 09.30 – 12.30 on 27th November 2015, Room 202 at Pollution Control Department.

Date: November 27, 2015

Present

Co-Chairs

- | | |
|---------------------------|---|
| 1. Ms.Somchint Pilouk | Deputy Governor (Service and Environment) of IEAT |
| 2. Mr.Suwan Nunthasarut | Deputy Director General of PCD |
| 3. Mrs.On-anong Songkitti | Director of Water Technology and Industrial Pollution
Management Bureau of DIW |

Members

Thai side

Pollution control department (PCD)

- | | |
|------------------------------|---|
| 1. Ms.Teeraporn Wiriwutikorn | Director of Hazardous Substance Division |
| 2.Mr.Aram Bhandhuwanna | Environmentalist, Senior Professional level, Hazardous
SubstanceDivision |
| 3. Mr.Ittipol Paw-armart | Environmentalist, Professional level, Automotive Air
Pollution Division |
| 4.Ms.Orrawan Manoonwong | Environmentalist, Professional level, Industrial Air
Pollution Division |
| 5.Ms.Jarinporn Tippamongkol | Environmentalist, Senior Professional level,
Environmental Quality and Laboratory Division |
| 6.Ms.Natchanok Pala-en | Environmentalist, Professional level, Automotive Air
Pollution Division |
| 7.Ms.Pornpimol Punmetharith | Environmentalist, Senior Professional level, Planning
and Evaluation Division |
| 8.Ms.Suppaluk Pinyatanabud | Environmentalist, Hazardous Substance Division |

Department of Industrial Works (DIW)

- | | |
|--------------------------|----------------------------------|
| 1.Ms.Sirakarn Leungsakul | Director, Air Pollution Division |
| 2. Mr.Parinya Maneewong | Scientist, Professional level |

Industrial Estate Authority of Thailand (IEAT)

- | | |
|-----------------------|--|
| 1. Ms.Jariya Sukhapan | Director of Sustainable Development Division |
|-----------------------|--|

Department of Agriculture (DOA)

1. Mrs.Pakasinee Klaimala Scientist, Senior Professional level

Office of Transport and Traffic Policy and Planning (OTP)

1. Mr.Nopporn Jaroongkiat Plan and Policy Analyst, Professional Level

Thailand International Cooperation Agency (TICA)

1. Ms.Patchara Kosiwaranont Development Cooperation Officer Professional Level

2. Ms.Donhatai Jirasing Development Cooperation Officer

Japanese side**JICA Evaluation Team**

1. Mr.Yutaka Fukase Director, Environmental Management Team 1, Global Environment Department, JICA
2. Mr.Toru Taguchi Deputy Director, Environmental Management Team 1 Global Environment Department, JICA
3. Mr.Tadashi Osawa Staff for International Technology, Chemical Risk Assessment Office, Chemicals Management Policy Division, Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry.
4. Mr.Motoo Kaneko Section Chief, Environmental Health and safety Division, Environmental Health Department, Ministry of the Environment
5. Mr.Makoto Tanaka Senior Consultant, ICONS Incorporation

JICA Thailand Office

1. Ms.Masako Tarumi Representative, JICA
2. Ms.Jamaree Yamklinfung Senior Program Officer, JICA Thailand Office

JICA Expert team

- 1.Mr.Munehiro Fukuda JICA Expert.
- 2.Mr.Naomasa Fukuda JICA Expert Support
- 3.Ms.Tidarat Majjupa Project Assistant PRTR-JICA
- 4.Ms.Jiraporn Rengkhuankhwai Project Assistant PRTR-JICA
- 5.Ms.Jirawan Deeraksa Project Assistant PRTR-JICA

Embassy of Japan in Thailand

1.Mr.Satoshi Yoshida

Second Secretary and Deputy Permanent
Representation to ESCAP

The meeting started at 09.30 am

Summary

1. Open of the meeting

Ms.Somchint Pilouk, Deputy Governor of IEAT as a co-chair, greeted the floor and welcomed the participants to the 4th meeting of JCC-JICA PRTR.

Mr.Suwan, Deputy Director General, PCD, as a co-chair, greeted the floor and informed that Director General of PCD, Mr.Wijarn Simachaya was unavailable due to other business and assigned him as a co-chair of a meeting.

Mrs.On-anong Songkitti, Director of Water Technology and Industrial Pollution Management Bureau of DIW, as a co-chair, also greeted the floor. Due to an unavailability of Director General of DIW and Deputy Director General, Mrs.On-anong would co-chair the meeting.

2. Approval of the Minutes of the 3rd Meeting of the JCC on 12 July 2013

Ms.Teeraporn reported the minutes of the 3rd meeting (12 July 2013) to the meeting, the minutes was read and approved.

Agreed Points

The meeting approved the minutes of the 3rd meeting.

3. Discussion/Approval Issue

3.1 Terminal Evaluation of the JICA-PRTR Project

Mr. Fukase (JICA) informed about a mission to conduct a terminal evaluation of the JICA PRTR project.

Mr.Tanaka (JICA) presented Terminal Evaluation of the JICA- PRTR Project titles consist of

- Objective of the Evaluation
- Method of the Evaluation: the project is evaluated following the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact and Sustainability).
- Methodology
- Outline of the Project

- Achievement of the Project: outputs all 6 output are achieved, project purpose is likely to be achieved, overall goal is likely to be achieved if the PRTR system is made more practical and the project effects are disseminated to other provinces.
- Implementation Progress
- Evaluation by the five criteria
 - The relevance is high
 - The effectiveness is high
 - The efficiency is high
 - Several positive impacts are seen
 - The sustainability is moderate because
 - Policy and institutional: high
 - Organizational: having concern about manpower especially local staff.
 - Technical: high
 - Financial: small concern about financials capacity of PCD.
- Recommendations
 1. The Thai side is recommended to maintain the working team even after the Project ends in March 2016, which has been formed in the Project.
 2. JICA is recommended to keep in touch with counterpart members by, e.g. a follow – up program.
 3. GOT should secure enough manpower as its local staff. If impossible, it is recommended as the second best way to ensure technical transfers in the case of personnel turnovers. GOT should secure opportunities for the successors to learn how to do their new tasks from the predecessors.
 4. Local organizations such as PONRE and PIO are recommended to develop their capacities in risk communication under the support of the HQs of MONRE and MOI.
 5. The Thai side is recommended to use the PRTR data books, and to discuss how to use the data.
- Lessons Learned

Mr.Suwan (Co chair, PCD) commented that the recommendation no. 4 should be included Regional Environment Office (REO) as one of recommended organizations needed to develop capacity in risk communication under the support of the HQs of MONRE.

Ms. Jariya (IEAT) informed IEAT will continue the PRTR reporting system in Map Ta Phut Industrial Estate area and also have plan in 2017 and the budget for PRTR project 2017

was already proposed for expansion of PRTR system in to other provinces, at least the industrial estates in Chonburi and Samutprakarn province.

Mr.Suwan (Co chair, PCD) explained that PCD contribute the budget approximately 500,000 Baht/year for the PRTR project. Therefore he could not agree with sustainability concern on PCD financial aspect. JICA evaluation team noted Mr.Suwan's point and will revise evaluation on this matter.

Mr.Fukuda (Expert) mentioned that if some people think a pilot in Rayong was not enough to justify PRTR in other area as Rayong is only for Petrochemical industry, we shall provide the argument for that we did pilot in Rayong province not only at Map Ta Phut complex, but we cover whole Rayong and cover 7 industrial sectors as well as non – point source. In fact, we got a lot of report from Eastern seaboard, Amata city industrial estate which have automotive industries. The pilot doesn't have only chemical industries at Map Ta Phut area.

Ms.Somchint (Co-chair, IEAT) suggested the PRTR should be publicized for awareness raising not only in pilot area but also other areas. For example, PRTR can be used for Eco Industrial Town project in northern area because it will make people trust in Industrial Operations.

Ms.Sirakarn (DIW) mentioned PCD, DIW and IEAT have requested for the support from JICA for follow up PRTR project, so the PRTR reporting system can be continue in Rayong. Ms.Jariya informed that IEAT also would like to extend PRTR project to industrial estates in Chonburi and Samutprakarn provinces; DIW have the same idea for this part. Thai side will use their own budget so the budget from JICA will be contributed for follow up pilot project in Rayong and the budget from IEAT and DIW will be contribute for PRTR in extended areas (Chonburi and Samutprakarn) for promoting and raising PRTR awareness of the industries and also helping industry to be able to report by themselves. For this it requires a lot of manpower from DIW, IEAT and PCD in continuing 2 years PRTR pilot, and then we will be ready to commence the second phase and also initiate the legislation process. This is not simply expanding the area but to gather more practice and to be familiarize with PRTR system before implement it as a regulation. We need more information and experience from Chonburi and Samutprakarn provinces. For the second phase we particularly need the technical support from JICA expert, not the budget. This is why Thai side will request support from JICA to continue the second phase.

Mr.Aram (PCD) mentioned that PCD will cooperate with DIW and IEAT for PRTR implementation in the other provinces. In addition, PCD, DIW and IEAT submitted the proposal for follow up PRTR project lasted week and will formulate draft proposal of the second phase

of PRTR project and it is expected to submit to JICA in August 2016 and looked forward to hear a positive response from JICA.

Mr. Fukase (JICA) explained that he did not have authority for approval a project proposal. However, he had to report JICA Headquarter for consideration about the request for follow up cooperation and second phase JICA-PRTR project from Thai side.

Mr.Aram (PCD) asked this meeting to acknowledge the result of the evaluation.

Resolution

The meeting acknowledges the matter in JICA terminal evaluation report, and JICA will send a Minute of Meeting with the report for signatures.

4.Report/ Discussion Issue

4.1 Brief report of the progress

4.1.1 Result of feedback survey

Mr.Fukuda(Expert) explained the questionnaire survey of PRTR pilot implementation consisted of 11 main questions area as follows;1) Objectives of PRTR system 2) Target substances 3) Point source definition 4) Non-point source coverage 5) Estimation methods and works 6) Reporting system 7) Data disclosure 8) Risk communication meeting 9) Audit & review 10) Implementation mechanism 11) Outputs (Evaluation of the project)

Two seminars, at Bangkok and Rayong were organized to report the PRTR pilot activities and to obtain feedback using the questionnaire. In addition, the questionnaires were sent to the industrial facilities that made PRTR report under the pilot implementation.

Total of 241 stakeholders responded the questionnaires, (86 questionnaires from the 4th seminar, 85 questionnaires from the 5th seminar and 70 questionnaires from factories). In conclusion, many stakeholders agreed with the basic design of PRTR in the pilot activities. The question “should PRTR be regulated by law” had high agreement (95.35% from public, 90.01% from Government and 69.75% from private sector). Also other questions such as “what agency should lead the role in non-point source estimation such as agriculture, household and mobile source”, all group answered the other related agencies should lead the role in non-point source estimation.

Ms.Sirakarn (DIW) noted that for question with regard to “amount of chemical handled criteria (1 ton/year)”, “the non-point source to be covered by PRTR pilot project” and “the estimation manual prepared by PCD, DIW or IEAT” got positive result, but the percentage are lower than other questions. So during implementing in extended area of PRTR, we have to aware about these issues. For the estimation manual, DIW has revised with support from JICA expert and will propose it in the meeting next time.

Mr.Suwan (Co chair, PCD) had the same opinion with Ms.Sirakarn.

Resolution

The meeting acknowledges.

4.2 Next Step

4.2.1 Institutional Arrangement

Mr.Fukuda(Expert) presented the proposal of institutional set up for PRTR implementation and explained to make PRTR sustainable in Thailand, it is recommended to formalize the institutional arrangement to implement PRTR so that budget and manpower requirement, primarily for non-point source estimation, data management and risk communication activity, can be assured. Proposed set up also reflect the comment from feedback survey regarding implementation mechanism.

Proposal

1. Principle implementation agency

Pollution Control Department, Responsible for:

- Overall implementation of PRTR coordination among the stakeholders.
- Overall for non-point source and collection, compilation of all PRTR data.
- Point source from hospital, school and bulk gasoline terminal and non-DIW registered waste management facility.
- Data disclosure and risk communication, periodical review and update of PRTR.

2. Co-Implementation agencies:

Department of Industrial Work, Ministry of Industry: Responsible for point source and non-point source in industrial section

Industrial Estate Authority of Thailand: Responsible for point source within Industrial Estate.

3. Supporting agencies

Ministry of Transport: Responsible for non-point source estimation of mobile source.

Ministry of Agriculture: Responsible for non-point source estimation of agriculture.

Ministry of Energy: Responsible for non-point source estimation of gas station.

Ministry of Public Health: Responsible for non-point source estimation of hospital.

Thailand Paint Manufacturer's Association (TPMA): Responsible for non-point source estimation of paint/construction.

4. Local agencies

- Provincial government, Provincial Natural Resources and Environment Office, Provincial Industrial Office, Regional Environment Office and Provincial Public Health Office shall cooperate in all area of PRTR implementation with PCD, DIW and IEAT.

- Provincial Natural Resources and Environment Office shall take leading role in implementation of risk communication activity.

Mr.Nopporn (OTP) agreed and explained that currently the officer in each agency have to do it by responsibility but authority and budget are not enough. One way is sign MOU to make it clear of authority.

Ms.Teeraporn (PCD) clarified that today the proposal is for acknowledgement. The secretary (PCD) will propose it to the meeting of PRTR's Subcommittee, and then propose to Pollution Control Committee, National Environment Board and the cabinet respectively.

Ms.Somchint (Co chair, IEAT) had the same opinion with Mr.Nopporn.

Resolution

The meeting acknowledges

4.2.2 Continuation of Pilot in Rayong

Ms.Teeraporn (PCD) informed the meeting background and progress of the continuation of Pilot in Rayong. According to the 8th Meeting of Counterpart of the Project on 15 October 2015, PCD, DIW and IEAT agreed to request JICA for a continuation implementing PRTR at Rayong Province. Currently, the Follow-up proposal for JICA PRTR Project is submitted to JICA Thailand Office.

Ms. Jamaree (JICA) informed that at the moment JICA is considering the proposal and has to discuss with the counterpart of the project about the appropriate time to start of follow-up (March or April 2016).

Resolution

The meeting acknowledges.

4.2.3 Revision of Environmental Act

Ms.Teeraporn (PCD) informed about revision of Environmental Act, Pollution Control Department (PCD) have concerned and revised the National the Enhancement and Conservation of National Environmental Quality Act B.E. 2535 (Environmental Act) in order to make sustainable of PRTR system in Thailand.

The revision of the Environmental Act has been submitted to the Permanent Secretary of MONRE for consideration.

Resolution

The meeting acknowledges

4.2.4 PRTR Regulations under Factory Act

Ms. Sirakarn (DIW) informed that at the moment Department of Industrial Works (DIW) considers issuing regulations for PRTR reporting from industrial source but the issuing regulations will be delayed until to 2019 because more information from extended pilot in Chonburi and Samutprakarn and other provinces of the second phase is needed.

Resolution

The meeting acknowledges.

4.2.5 Eco Industrial Town program

Ms. Sirakarn (DIW) presented background and progress of Eco Industrial Town program, DIW promote Eco Industrial Town in 15 provinces. One of the objectives and key indicator is to reduce pollution emission. PRTR system will help industries aware of their pollution emission and the information will serve as a baseline for emission reduction planning.

DIW is planning to include PRTR concept and risk communication to the Eco Industrial Town Project in Chonburi and Samutprakarn.

Ms.Somchint (Co chair, IEAT) added that the Eco Industrial Town Project is cooperation between DIW and IEAT. DIW will be responsible for all provinces and IEAT will be responsible for provinces that have industrial estate.

Mr.Aram (PCD) informed that PCD will cooperate with IEAT and DIW in the Eco Industrial Town Project for the activities of non–point source release estimation.

Resolution

The meeting acknowledges

5. Other Issues (if any)

Ms.Teeraporn (PCD) informed that PCD cooperated with DIW and IEAT are going to organize the 6th PRTR seminar on 27th January, 2016 at Century Park hotel in Bangkok.

Resolution

The meeting acknowledges

Ms.Somchint (Co chair, IEAT) said thank you to the meeting members for participating in the meeting and giving opinions that had many good points for future activities and closed the meeting.

The meeting adjourned at 12.30 p.m.

Recorded by Ms. Tidarat Majjupa

11. Annexes

- 11.1 Annex 1 : List of Seminars and Workshops
- 11.2 Annex 2 : List of Counterpart Personnel in Thailand
- 11.3 Annex 3 : Final Proposal Basic elements of PRTR system design in Thailand
- 11.4 Annex 4 : Implementation plan for PRTR system in Thailand

11.1. Annex 1 : List of Seminars and Workshop

Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 1st Year
(March 2011 - October 2011)

Date	Meeting/Seminar/Workshop	Participants											Total
		Government sector							Other sectors				
		CP			Non-CP				Academic Sector	Private sector	NGOs		
PCD	DIW	IEAT	PCD	DIW	IEAT	ERTC	Others						
March, 2011													
3/17/2011	The 1 st JICA-PRTR Project Counterpart Meeting	6	9	1	-	2	2	-	-	-	-	-	20
3/18/2011	Meeting with Greenpeace	1	-	-	1	-	-	-	-	-	-	2	4
3/25/2011	The 1 st Meeting of Joint Coordinating Committee (JCC) at PCD office.	6	6	1	1	-	-	-	6	-	-	-	20
3/28/2011	Visiting Rayong Provincial Office	1	2	-	-	1	-	-	9	-	-	-	13
3/29/2011	Meeting with Planning Analysis and Evaluation Division (IT section)	1	-	-	1	-	-	-	-	-	-	-	2
3/29/2011	Meeting with ERTC	1	-	-	-	-	-	4	-	-	-	-	5
3/31/2011	Meeting with FTI	1	2	-	-	-	-	-	-	-	14	-	17
April, 2011													
4/21/2011	The 1 st PCD-CP Meeting on Non-Point Source	10	-	-	5	-	-	-	-	-	-	-	15
May, 2011													
2011/4/5	DIW&IEAT Initial Meeting on Non-Point Source	-	8	-	-	3	1	-	-	-	-	-	12
2011/6/5	The 2 nd PCD-CP Meeting on Non-Point Source	10	-	-	3	-	-	-	-	-	-	-	13
2011/11/5	The 1 st PCD-Task Force Meeting on Non-Point Source	4	-	-	-	-	-	-	-	-	-	-	4
June, 2011													
2011/6/6	The 2 nd JICA-PRTR Project Counterpart Meeting	5	8	1	-	-	-	-	-	-	-	-	14
2011/8/6	Meeting with ERTC	1	-	-	-	-	-	9	-	-	-	-	10
6/15/2011	The 1 st NGOs Meeting	4	2	-	2	-	1	2	-	-	-	6	17
6/16/2011	Pre-Meeting of Task Force for Risk Communication Training	2	-	-	-	-	-	6	1	4	3	-	16
6/23/2011	Clarification Meeting on Developing the Release Estimation Manuals with FTI	1	2	-	-	1	-	-	-	-	12	-	16
6/28/2011	Seminar and Press Conference on JICA-PRTR Project	8	4	-	16	7	1	-	24	10	29	6	105
6/29/2011	Candidate List of Task Force Meeting on Developing of Risk Communication Training Course	1	2	-	1	-	1	8	1	4	2	1	21
August, 2011													
2011/3/8	The 2 nd PCD-Task Force Meeting on Non-Point Source	4	-	-	-	-	-	-	-	-	-	-	4
2011/10/8	Visiting Department of Agriculture (DOA)	1	-	-	-	-	-	-	1	-	-	-	2
8/17/2011	Visiting Furniture Factories in Rayong	-	1	-	-	1	-	-	-	-	2	-	4
8/18/2011	Meeting with Thai Automotive Industry Association (TAA)	1	-	-	-	-	-	-	1	-	3	-	5
September, 2011													
2011/9/9	Developing the Release Estimation Manual for the Refinery Industry	1	3	-	-	1	-	-	-	2	5	-	12
9/20/2011	The 3 rd JICA-PRTR Project Counterpart Meeting	13	6	-	3	1	1	-	-	-	-	-	24
9/21/2011	Developing the Release Estimation Manual for Chemical and Petrochemical Industry	-	4	-	-	3	-	-	-	2	14	-	23
9/22/2011	The 1 st Task Force Meeting on Developing the Release Estimation Manual for the Refinery Industry	1	3	-	-	7	-	-	-	1	5	-	17
9/23/2011	The 1 st Task Force Meeting on Developing of Risk Communication Training Course	1	-	-	1	-	2	9	1	4	1	1	20
October, 2011													
2011/6/10	Workshop on Developing of Risk Communication Training Course	1	-	-	3	1	2	11	13	7	2	4	44
2011/6/10	The 2 nd Task Force Meeting on Developing of Risk Communication Training Course	-	-	-	2	1	1	12	3	5	1	1	26
Total		86	62	3	39	29	12	61	60	39	93	21	505

Note: 1. FTI Officers are counted as private sector
2. This record is not counted as JICA officers, JICA Experts, Project Assistant, Reporter, and Interpreter
3. Embassy of Japan officer and Thailand International Development Cooperation Agency (TICA) officers are counted as others government

**Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 2nd Year
(January 2012 - December 2012)**

Date	Meeting/Seminar/Workshop	Participants											Total
		Government sector							Other sectors				
		CP			Non-CP				Academic Sector	Private sector	NGOs		
PCD	DIW	IEAT	PCD	DIW	IEAT	ERTC	Others						
January, 2012													
1/18/2012	The 3 rd Task Force Meeting on Developing of Risk Communication Training Course	1	-	-	1	1	-	4	1	4	-	1	13
1/23-25/2012	Chemical Risk Communication Training under PRTR project	1	-	-	2	-	2	-	24	6	11	5	51
1/27/2012	The 3 rd PCD-Task Force Meeting on Non-Point Source	6	-	-	-	-	-	-	-	-	-	-	6
1/30/2012	The 2 nd Task Force Meeting on Developing of Release Estimation Manual for Refinery Industry	-	3	-	-	1	-	-	-	1	7	-	12
1/30/2012	The 1 st Task Force Meeting on Developing of Release Estimation Manual for the Chemical and Petrochemical Industry	-	2	-	-	2	-	-	-	-	18	-	22
1/31/2012	The 4 th Task Force Meeting on Developing of Risk Communication Training Course	-	-	-	1	1	-	7	2	4	1	-	16
February, 2012													
2/27/2012	The 4 th JICA-PRTR Project Counterpart Meeting	9	4	-	2	1	3	-	-	-	-	-	19
March, 2012													
2012/6/3	JCC seminar for PRTR	-	-	-	-	-	-	-	-	-	150	-	150
3/13/2012	The 2 nd NGO meeting	6	-	1	7	-	1	-	-	7	4	-	26
May, 2012													
5/22/2012	The 1 st /2012 Meeting of Joint Coordinating Committee (JCC) at PCD office	10	3	-	2	-	2	-	7	-	-	-	24
5/29/2012	Preliminary Meeting for Developing of Release Estimation Manual for Automotive and Auto Parts Industry	-	2	-	1	1	-	-	-	-	12	-	16
June, 2012													
6/13/2012	The 3 rd Task Force Meeting on Developing of Release Estimation Manual for Refinery Industry	-	3	-	2	1	-	-	-	2	8	-	16
6/14/2012	The 2 nd Task Force Meeting on Developing of Release Estimation Manual for the Chemical/Petrochemical Industry	1	2	-	-	1	-	-	-	1	18	-	23
6/21/2012	Risk Communication Training for Facilitator (Day 1)	8	-	1	16	-	2	-	-	1	-	-	28
6/22/2012	Risk Communication Training for Facilitator (Day 2)	2	-	-	19	-	-	-	-	3	-	-	24
6/25/2012	Meeting on Non-Point Source Estimation at Policy and Planning Bureau, Ministry of Public Health	1	-	-	-	-	-	-	3	-	-	-	4
6/26/2012	Preliminary Meeting on Pilot Project and Non-Point Source Data Collection with Rayong Local Governmental Organizations	1	-	-	-	-	-	-	13	-	-	2	16
July, 2012													
2012/3/7	Meeting on Non-Point Source Estimation at Nopparat Rajathanee Hospital	1	-	-	-	-	-	-	7	-	-	-	8
2012/3/7	Meeting on Non-Point Source Estimation at Thai Crop Protection Association	1	-	-	-	-	-	-	-	-	2	-	3
7/27/2012	The 1 st Task Force Meeting on Developing of Release Estimation Manual for Automotive and Auto Part Industry	1	3	-	-	3	-	-	-	1	9	-	17
August, 2012													
8/17/2012	PRTR Workshop for the Staffs of Industrial Park/Land/Zone	1	1	-	-	2	-	-	-	-	37	-	41
8/27/2012	Follow-Up Workshop on Risk Communication Training (Bangkok)	-	-	-	1	-	1	6	-	1	-	3	12
8/28/2012	The 2 nd Task Force Meeting on Developing of Release Estimation Manual for Automotive and Auto Part Industry	1	3	-	2	-	-	-	-	1	12	-	19
8/28/2012	PRTR Workshop for the Staffs of Industrial Estate Authority of Thailand	1	-	2	-	-	33	-	-	1	-	-	37
8/29/2012	Follow-Up Workshop on Risk Communication Training (Rayong)	-	-	-	-	-	-	3	13	1	1	1	19
September, 2012													
2012/7/9	PRTR Workshop for Local Government and Municipalities	2	-	-	-	-	-	-	33	1	-	-	36
2012/12/9	Meeting with Meeting with the Verification and Laboratory Analysis	-	-	-	-	-	-	-	-	-	7	-	7
9/26/2012	The 3 rd NGOs dialogue meeting	3	-	-	1	-	-	-	-	-	-	6	10
October, 2012													
2012/11/10	Meeting with Rayong Industry office, FTI Rayong, and Rayong Chamber of Commerce	-	1	-	2	-	-	-	10	-	-	-	13
2012/5/10	The Second Seminar on "The Development of Basic Schemes for PRTR System in the Kingdom of Thailand"	5	7	1	9	3	4	2	14	11	63	6	125
2012/10/10	Preliminary Meeting for Establishing the Task Force for Promoting Risk Communication under "the Development of Basic Schemes for PRTR System in the Kingdom of Thailand"	2	2	1	-	-	1	-	-	-	-	-	6
10/24/2012	The Discussion meeting on PRTR Database	2	2	1	1	-	-	-	-	-	-	-	6
November, 2012													
11/19/2012	The 1 st PRTR Workshop for the Industrial Sector in Map Ta Phut Industrial Estate (Rayong) <i>Site 1</i>	-	-	2	-	-	1	-	-	-	33	-	36
11/20/2012	The 1 st PRTR Workshop for the Industrial Sector in Eastern Industrial Estate, Asia Industrial Estate, Padaeng Industrial Estate, RIL Industrial Estate, Map Ta Phut Port	-	-	2	-	-	4	-	-	-	48	-	54
11/21/2012	The 3 rd Task Force Meeting on Developing of Release Estimation Manual for the Chemical/Petrochemical Industry	-	3	1	1	4	-	-	-	1	9	-	19
11/21/2012	The 3 rd Task Force Meeting on Developing of Release Estimation Manual for Automotive and Auto Part Industry	-	-	1	1	3	-	-	-	1	8	-	14
11/22/2012	The 1 st PRTR Workshop for the Industrial Sector in Amata City Industrial Estate	-	-	1	-	-	3	-	-	-	43	-	47
11/23/2012	The 4 th Task Force Meeting on Developing of Release Estimation Manual for Refinery Industry	-	1	1	1	2	-	-	-	1	10	-	16
December, 2012													
2012/3/12	The 1 st PRTR Workshop for the Industrial Sector in Eastern Seaboard Industrial Estate (Rayong) <i>Site 1</i>	-	-	2	-	-	3	-	-	-	30	-	35
2012/4/12	The 1 st PRTR Workshop for the Industrial Sector in Eastern Seaboard Industrial Estate (Rayong) <i>Site 2</i>	-	-	2	-	-	2	-	-	-	33	-	37
2012/4/12	The 1 st PRTR Workshop for the Industrial Sector in Eastern Seaboard Industrial Estate (Rayong) and Hinara Eastern Seaboard Industrial Estate <i>Site 2</i>	-	-	2	-	-	2	-	-	-	13	-	17
2012/6/12	Japanese Chamber of Commerce seminar	-	-	-	-	-	-	2	-	-	132	-	134
12/13/2012	Preliminary Meeting on PRTR Workshop with MapTa Phut Municipality	-	1	-	-	-	-	5	-	-	-	-	6
12/25/2012	The 5 th JICA-PRTR Project Counterpart Meeting	9	7	3	2	-	2	-	4	-	-	-	27
Total		75	50	24	70	30	66	22	138	49	719	24	1267

Note: 1. FTI Officers are counted as private sector
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3. Embassy of Japan officer and Thailand International Development Cooperation Agency (TICA) officers are counted as others government

**Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 3rd Year
(January 2013 - December 2013)**

Date	Meeting/Seminar/Workshop	Participants												Total
		Government sector						Other sectors						
		CP			Non-CP			Academic Sector			Private sector			
PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC	Others	Academic Sector	Private sector	NGOs			
January, 2013														
1/15/2013	The 1 st PRTR Seminar for factory in Industrial Park/Land/Cluster(Zone), Rayong Province		2	1					1			43	47	
1/15/2013	The 1 st PRTR Seminar for factory in Siam Eastern Industrial Park and G.K. Land Industrial Zone, Rayong Province		3	1								32	36	
1/31/2013	The 1 st PRTR Seminar for factory outside of complex in Rayong Province		2	1								126	129	
February, 2013														
2013/8/2	The 4 th NGOs Meeting	4			1	1						9	15	
3/19/2013	The 1 st PRTR Seminar for stakeholders, Rayong Province	2	1	1	2				38			103	147	
2/27/2013	Seminar kick off project ; small factory survey by DIW subcontract		4						2			58	64	
2/27/2013	Seminar kick off project; PRTR database development by DIW subcontract		4						2			50	56	
March, 2013														
3/19/2013	PRTR Project Workshop at Star Hotel in Rayong	2	1	1	2				38			103	147	
July, 2013													0	
7/01/2013	Seminar on awareness raising for manual development of 5 factory categories			11				6	30			38	85	
7/12/2013	The 1 st 2013 Meeting of Joint Coordinating Committee (JCC) at PCD office.	6	6	1	1				6				20	
7/17/2013	The Third PRTR Seminar	9	3	3	8	1		1	19	20	102	15	181	
7/18/2013	Seminar project closed ; small factory survey by DIW subcontract		4									54	58	
7/30/2013	Training workshop on the emission calculation for Automotive/Auto Part for private sector (1st) at Esternseaboard Industrial Estate in Rayong	1	1	2				3				31	38	
August, 2013														
8/8/2013	Training workshop on the PRTR release estimation for Chemical/Petrochemical for private sector at Maptaput Industrial Estate in Rayong		1	1			6					89	97	
8/9/2013	Training workshop on PRTR release estimation for Refinery for private sector at Maptaput Industrial Estate in Rayong			1				1				28	30	
8/14/2013	Training workshop on PRTR release estimation for Automotive/Auto Part for private sector (2nd) at Siam Industrial Park in Rayong	1	1	1								30	33	
8/15/2013	Training workshop on PRTR release estimation for Automotive/Auto Part for private sector (3rd) at Siam Industrial Park in Rayong	1	1	1		1						33	37	
September, 2013														
2013/12/9	Seminar project closed; PRTR database development by DIW subcontract		3						2			52	57	
9/17/2013	Training workshop on PRTR release estimation for Chemical/Petrochemical and Automotive/Auto Part for private sector at Star Hotel in Rayong	3	1	1			2	5				110	122	
October, 2013														
10/04/2013	PRTR Seminar by Japanese Chamber of Commerce											98	98	
November, 2013														
11/14/2013	Seminar on study results on non-point sources project at Rayong City Hotel (IEAT subcontract to Mahidol university)	1		5				3	60	36	6		111	
11/19/2013	Meeting with Aluminium Industry FTI Club at Best Western Suwanabhun Airport Hotel		1							20			21	
11/26/2013	Meeting with Thailand Iron and Steel Industry FTI Club at FTI office		2							30			32	
11/28/2013	Meeting with Rubber-Based Industry FTI Club at Swiss Le Concorde Hotel			1						20			21	
December, 2013														
12/4/2013	Annual Meeting with Thai Paint Manufacturer Association at Montien Riverside Hotel	4								70			74	
12/16/2013	Meeting with Thai Machinery Cluster FTI Club at FTI offic		1		1					20			22	
12/17/2013	Meeting with Agricultural Machinery Manufacturers Industry FTI Club at Sam Sen Villa		1							20			21	
12/21/2013	Meeting with Electrical Electronics and Allied Industry FTI Club at FTI meeting room 1		1							20			21	
12/24/2013	The 6 th JICA-PRTR Project Counterpart Meeting	10	5	4	2	4	1						26	
Total		44	49	37	17	6	10	19	0	198	256	1186	24	1846

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**Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 4th Year
(January 2014 - July 2014)**

MM/DD/YY	Meeting/Seminar/Workshop	Participants											Total
		Government sector						Other sectors					
		CP			Non-CP			Academic Sector	Private sector	NGOs			
PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC	Others					
Jan, 2014													
1/21/2014	Meeting with Furniture FTI club at FTI office	1										20	21
1/24/2014	Training workshop on PRTR release estimation for Hospital, Bulk Gas Terminal, School and Waste Management Facility at Rayong City Hotel, Rayong (by PCD)	3	1		2	1	1			4		36	48
1/28/2014	Seminar on PRTR release estimation for 5 Categories (factory): Wood, Plastic, Metal, Rubber and Electrical at Rarong City Hotel, Rayong (by IEAT subcontract to UAE)			15						12		22	49
February, 2014													
02/21/2014	Knowledge mananment workshop on PRTR in Thailand for IEAT staff at IEAT head office			26									26
March, 2014													
03/07/2014	Meeting on PRTR reporting on EMCC database for factories in Maptaphut complex (MTP, Port, RIL, Padaeng, Asia, Hemaraj Maptaphut) at 13.00-16.00 at MTP office			1			4					81	86
03/24/2014	Small consultation meeting on Mobile source Estimation with chemical FTI club at 13.00-16.00 at MTP office	2										11	13
03/25/2014	6th NGOs meeting at 13.00-16.00 at PCD office											3	3
03/31/2014	Meeting on PRTR reporting on EMCC database for factories in Eastern Seaboard, Hemaraj (Eastern seaboard and Amatacity) at 13.00-16.00 at Pattana Golf Club in Rayong			1			3					139	143
April, 2014													0
04/23/2014	Training workshop for wood categories at 8.30-12.00 at Ketsara1 meeting room, Star Hotel in Rayong		1								4	22	27
04/23/2014	Training workshop for rubber categories at 13.00-16.30 at Ketsara1 meeting room, Star Hotel in Rayong		1								4	25	30
04/24/2014	Training workshop for plastic categories at 08.30-12.00 at Ketsara1 meeting room, Star Hotel in Rayong		1				2				4	25	32
04/24/2014	Training workshop for metal categories at 13.00-16.30 at Ketsara1 meeting room, Star Hotel in Rayong		1								4	62	67
04/25/2014	Training workshop for electronics categories at 8.30-12.00 at Ketsara1 meeting room, Star Hotel in Rayong		1	1			1				4	11	18
May, 2014													
05/27/2014	Plant management committee meeting on PRTR Risk communication in pilot implementation in Rayong												0
05/27/2014	Training workshop on Automotive categories in Easternseaboard and Amatacity at 13.00-16.30 at Easternseaboard Industrial Estate in Rayong			2	1							19	22
June, 2014													
06/12/2014	The 7 th JICA-PRTR Project Counterpart Meeting.	8	6	7	1		1						23
July, 2014													
07/8/2014	Seminar on Thai Paint Manufacturing Association's role in PRTR at 9.00-12.00, Centrara Grand Ladphao Hotel in Bangkok	3	1						2			69	75
07/16/2014	Consultation meeting with IRPC Community Centre on Awareness Raising Campaign in IRPC area at 13.30-14.00, IRPC community centre office, Rayong											3	3
07/16/2014	Consultation meeting with Community Partnership Association on Awareness Raising Campaign in Map Ta Phut Area at 14.30-15.30, Rayong											2	2
07/16/2014	Consultation meeting with Community people (Ms Sutheera Pongsa) on Awareness Raising Campaign in Map Ta Phut Area at 14.30-15.30, Rayong	3							1				4
07/17/2014	Consultation meeting with Map Ta Phut Municipality on Awareness Raising Campaign in Map Ta Phut Area at 9.00-10.00, Map Ta Phut Municipality Office, Rayong	3							3				6
07/17/2014	Consultation meeting with Map Ta Phut Industrial Estate on Awareness Raising Campaign in Map Ta Phut Area at 10.30-11.30, Map Ta Phut Industrial Estate Office, Rayong	3		1									4
07/17/2014	Task Force Risk Communication Meeting at 13.30-16.30, Map Ta Phut Industrial Estate Office in Rayong	3	1	2					5	1	3		15
07/17/2014	Consultation meeting with Community people (Mr. Surasith Challap) on Awareness Raising Campaign in Pluakdang Area at 17.30-18.30, Rayong	3							3				6
07/21/2014	Consultation meeting with Tasith municipality on Awareness Raising Campaign in Pluakdang Area at 09.00-09.30, Tasith municipality Office, Rayong								1				1
07/21/2014	Consultation meeting with Nongrai Municipality on Awareness Raising Campaign in Pluakdang Area at 11.30-12.00, Nongrai Municipality Office, Rayong								1				1
07/21/2014	Consultation meeting with Map Yang Pom Municipality on Awareness Raising Campaign in Pluakdang Area at 14.00 - 15.00, Map Yang Pom Municipality Office, Rayong								2				2
07/21/2014	Consultation meeting with IRPC Community Centre on Awareness Raising Campaign in Pluakdang Area at 17.30-18.30, IRPC Community Centre Office, Rayong											1	1
07/22/2014	Consultation meeting with La Han Municipality on Awareness Raising Campaign in Pluakdang Area at 09.30- 10.00, La Han Municipality Office, Rayong								1				1
07/22/2014	Consultation meeting with Num Koo Municipality on Awareness Raising Campaign in Pluakdang Area at 11.00- 12.00, Num Koo Municipality Office, Rayong								2				2
07/22/2014	Consultation meeting with Pluakdang Municipality on Awareness Raising Campaign in Pluakdang Area at 13.00 -14.00, Pluakdang Municipality Office, Rayong								3				3

Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 4th Year
(August 2014 - December 2014)

MM/DD/YY	Meeting/Seminar/Workshop	Participants												Total
		Government sector						Non-CP			Other sectors			
		CP			Non-CP			Academic Sector	Private sector	NGOs				
PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC	Others						
August, 2014														
08/13/2014	Awareness Raising Seminar on PRTR Project in Rayong for Village Health Volunteers at 10.00-12.00. Map Ta Phut Municipality Office, Rayong	2							131				133	
08/15/2014	Validation Workshop for PRTR report under IEAT system at 9.30-16.00, the meeting room 208 at IEAT head office			9									9	
08/20/2014	Meeting with Automotive club of Federation of Thailand Industries (FTI) on updated progress for pilot implementation at 9.00-10.00, FTI office		1									20	21	
08/21/2014	Meeting with Auto-parts club of Federation of Thailand Industries on Updated progress for pilot implementation in Rayong at 13.00-13.30, FTI office			1								40	41	
08/28/2014	Awareness Raising Seminar on PRTR Project in Rayong for community leader at MTP area at 09.00 - 12.00 am, Map Ta Phut Municipality Office, Rayong	1		1	2				64				68	
September, 2014														
09/05/2014	Awareness Raising Campaign on PRTR project in Rayong for teacher and public health at 09.00- 12.00 am, Map Ta Phut IEAT, Rayong.	1			8		3		27		1		40	
09/11/2014	Awareness Raising Campaign on PRTR project in Rayong for community leader at 09.00- 12.00 am, Plaukdang municipality.	2			1		3		30				36	
09/12/2014	Awareness Raising Campaign on PRTR project in Rayong for teacher and public health at 09.00- 12.00 am, IRPC community center.	2	1		11	3			44		1		62	
October, 2014														
10/1/2014	Consultation to provide chemical advisor at 2.00 - 4.00 pm, Mahidol University Faculty of Public Health	1									2		3	
10/13/2014	Internal Meeting of PRTR Air Dispersion Modelling Result at 10.00 am - 4.00 pm, Map Ta Phut Industrial Estate Office.	1	2	6									9	
10/13/2014	Consultation with key person at 9.00 - 10.00 am, Provincial General Educational Office of Rayong.										2		2	
10/17/2014	Consultation with key person at 9.00 - 11.30 am, Map Ta Phut municipality.								3				3	
10/17/2014	Consultation with key person at 1.00 - 2.00 pm, Larhan Sub district Administrative Office (SAO).								1				1	
November, 2014														
11/12/2014	Task Force Risk Communication Meeting at 13.30-16.30, Map Ta Phut Industrial Estate Office in Rayong.	1		2	5		1		4	1	1		15	
11/21/2014	Counterpart Consultation PRTR data Meeting at 10.00 -12.00 am, PCD office.	5	2	3	3								13	
11/19/2014	Consultation with Key person at 9.00 - 11.00 am, at Larhan Sub district Administrative Office (SAO).								4				4	
11/19/2014	Consultation with key person at 1.00 - 2.00 pm, Map Ta Phut municipality.								3				3	
December, 2014														
12/1/2014	Consultation PRTR data with Industry sector at 1.00 - 4.00 pm, Map Ta phut Industrial Estate office.			2								57	59	
12/2/2014	Consultation PRTR data with Industry sector at 9.00 -11.00 am,Stare Hotel.		2									31	33	
2014/3/12	Consultation PRTR data with industry sector at 09.30 - 11.00 am, Plaukdang Industrial Estate.			1								22	23	
2014/12/12	Consultation PRTR data with NGO at 2.00 - 4.00 pm, PCD office.											5	5	
Total		48	22	81	34	4	6	13	0	351	26	724	8	1317
Note: 1. FTI Officers are counted as private sector 2. This record is not counted as JICA officers, JICA Experts, Project Assistant, Reporter, and Interpreter 3. Embassy of Japan officer and Thailand International Development Cooperation Agency (TICA) officers are counted as others government														

**Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 5th Year
(January 2015 - November 2015)**

MM/DD/YY	Meeting/Seminar/Workshop	Participants											Total	
		Government sector							Other sectors					
		CP			Non-CP				Academic Sector	Private sector	NGOs			
PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC	Others						
January, 2015														
01/27/2015	Facilitator training at 9.00 am. -16.00 pm. at ROHED Center.	1	1	1					16	2	4		25	
01/28/2015	Facilitator training at 9.00 am. -16.00 pm. at ROHED Center.	1	1	1			1		18	2	2		26	
01/29/2015	Facilitator training at 9.00 am. -16.00 pm. at ROHED Center.	1	1						20	2	3		27	
01/30/2015	Risk Communication at 13.30 -15.00 pm. at ERTC office.							3					3	
February, 2015														
02/27/2015	Risk Communication Meeting at 13.00 -16.00 pm. at MTP office.	3		5					46	1	9		64	
March, 2015														
03/13/2015	Risk Communication Meeting at 13.00 -16.00 pm. at IRPC Community Center.	3	1						6	30	5		45	
03/19/2015	Japanese Chamber of Commerce seminar at 13.00 -16.00 pm. at Landmark hotel.										61		61	
03/20/2015	Risk Communication Meeting at 10.00 -11.30 pm. at Map Ta Phut Municipality.	2							364	1			367	
03/27/2015	Risk Communication Meeting at 09.00 -12.00 pm. at MTP Office.	6		1			2		26	19	1		55	
April, 2015														
04/03/2015	Risk Communication Meeting at 09.00 -12.00 pm. At Pluak Daeng Sub District Administration Organization.	4	1						37	29	3		74	
June, 2015														
11/06/2015	The 4 th Seminar on "The Development of Basic Schemes for PRTR System in The Kingdom of Thailand" at 8.30-17.00, Maruay Garden Hotel in Bangkok.	11	4	4	19	1		1	1	42	5	19	2	109
24/06/2015	Task Force Risk Communication Meeting at 13.30-15.30, Map Ta Phut Industrial Estate Office in Rayong.	1	1	2					7					11
25/06/2015	The 5 th Seminar on "The Development of Basic Schemes for PRTR System in The Kingdom of Thailand" at 8.30-17.00, Golden City Rayong Hotel in Rayong.	3	2	3	3		1	1		71		30	1	115
29/06/2015	The 1 st Capacity Building Workshop Under Cooperation for Creating Maptaptaphut Eco Industrial Town Between The City of Kitakyushu, Japan and The Industrial Estate Authority of Thailand at 9.00-12.00, Kameo Grand Hotel in Rayong.			10								46		56
October, 2015														
15/10/2015	The 8 th JICA-PRTR Project Counterpart Meeting	14	6	3	1									24
November, 2015														
27/11/2015	The 1 st 2015 Meeting of Joint Coordinating Committee (JCC) at 09.30 am. - 12.30 pm. at PCD office.	7	3	2	2				5					19
Total		57	21	32	25	1	2	4	4	658	91	183	3	1081

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3. Embassy of Japan officer and Thailand International Development Cooperation Agency (TICA) officers are counted as others government

Summary of Meeting/Seminar/Workshop Participants during the JICA-PRTR Project's 5th Year
(January 2016 - February 2016)

MM/DD/YY	Meeting/Seminar/Workshop	Participants											Total	
		Government sector								Other sectors				
		CP			Non-CP					Academic Sector	Private sector	NGOs		
		PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC					Others
January, 2016														
27/01/2016	The 6 th Seminar on "The Development of Basic Schemes for PRTR System in The Kingdom of Thailand" at 8.30-17.00, Century Park Hotel in Bangkok.	8	3	2	29	3	1	3		21	9	38	8	125
February, 2016														
23/02/2016	Japanese Chamber of Commerce seminar									67				67
Total		8	3	2	29	3	1	3	0	88	9	38	8	192

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3. Embassy of Japan officer and Thailand International Development Cooperation Agency (TICA) officers are counted as others government

Total of Meeting/Seminar/Workshop's Participants during the JICA-PRTR Project
(March 2011 - February 2016)

Participants of Meeting/Seminar/Workshop	Participants											Total	
	Government sector								Other sectors				
	CP			Non-CP					Academic Sector	Private sector	NGOs		
	PCD	DIW	IEAT	PCD	DIW	PIO	IE	ERTC					Others
Total	318	207	179	214	73	19	117	87	1493	470	2943	88	6208

**11.2. Annex 2 : List of Counterpart Personnel in
Thailand**

(1) C/P members

No.	Name	Organization	Project Position
1	Mr. Wijam Simachaya	Director General of PCD, MONRE	Co-Project Director
2	Mr.Pasu Lohanchun	Director General of DIW, MOI	Co-Project Director
3	Mr. Veerapong Chaiperm	Governor of IEAT	Co-Project Director
4	Ms. Sunee Piyapanpong	Deputy Director General of PCD, MONRE	Co-Project Manager
5	Mr. Mongkol Pruekwatana	Deputy Director-General of DIW	Co-Project Manager
6	Ms. Somchint Pilouk	Deputy Governor of IEAT	Co-Project Manager
7	Mr.Anuphan Ittharatana	Director of Waste and Hazardous Substance Management Bureau / PCD	Project Assistant
8	Ms. Teeraporn Wiriwutikorn	Director of Hazardous Substance Division / PCD	Project Assistant
9	Mr. Decha Pimpisut	Acting Scientist, Expert Level, Industrial Environment Research and Development Bureau / DIW	Project Assistant
10	Mr.Manit Inmek	Director of Environment Department / IEAT	Project Assistant
11	Ms. Jongjit Niranathmateekul	Deputy Director-General of PCD	C/P
12	Mr. Janejob Suksod	Director of Environmental Quality and Laboratory Division / PCD	C/P
13	Mr. Phunsak Teramongkon	Director of Industrial Air Pollution Division / PCD	C/P
14	Ms. Kessinee Unapumnuk	Environmentalist, Professional level, Industrial Air Pollution Division / PCD	C/P
15	Ms. Orrawan Manoonwong	Environmentalist, Professional level, Industrial Air Pollution Division / PCD	C/P
16	Mr. Chayawee Wangcharoenrung	Director of Industrial Wastewater Division / PCD	C/P
17	Mr. Ittipol Paw-armart	Environmentalist, Professional level, Automotive Air Pollution Division / PCD	C/P
18	Ms. Natchanok Pala-en	Environmentalist, Professional Level, Automotive Air Pollution Division / PCD	C/P
19	Ms. Siwaporn Rungsiyanon	Environmentalist, Professional level, Automotive Air Pollution Division / PCD	C/P
20	Mr. Aram Bhandhuwana	Environmentalist, Senior Professional level, Hazardous Substance Division / PCD	C/P
21	Ms. Wundee Aieophuket	Environmentalist, Professional level, Planning and Evaluation Division / PCD	C/P
22	Ms. Jarinporn Tippamongkol	Environmentalist, Professional level, Environmental Quality and Laboratory Division/ PCD	C/P
23	Mr.Panya Warapetcharayut	Automotive Air Pollution Division, Air Quality and Noise Management / PCD	C/P
24	Ms. Suteera Wiseskul	Planning Analysis and Evaluation Division / PCD	C/P
25	Ms.Nuch Kuhasawan	Environmental Quality and Laboratory Division / PCD	C/P
26	Ms. Onanong Songkitti	Director of Water Technology and Industrial Pollution Management Bureau / DIW	C/P
27	Ms. Unchalee Yingtaweessittikul	Director of Water Pollution Division / DIW	C/P
28	Mr.Naratip Lauhatirananda	Scientist, Senior Professional level / DIW	C/P
29	Mr. Santi Sittilerdpisan	Computer Technical Office, Senior Professional level / DIW	C/P
30	Mr. Sira Chancherd	Scientist, Professional level / DIW	C/P
31	Dr. Sirakarn Leungsakul	Director of Air Pollution Division / DIW	C/P
32	Mr.Parinya Maneewong	Scientist, Professional level / DIW	C/P
33	Ms.Jariya Sukhapan	Director of Sustainable Development Division / IEAT	C/P
34	Ms.Tipjinda Chairerk	Environmental and Safety Division / IEAT	C/P
35	Ms.Suwalee Lakpanitsiri	Environment Department / IEAT	C/P
36	Ms.Supattra Yeamsoun	Environment Department / IEAT	C/P
37	Mr.Thanarat Thanasoomboon	Information Technology / IEAT	C/P
38	Mr.Tada Soontonpan	Director of Hemaraj Eastern Industrial Estate (Map Ta Put) IEAT	C/P

39	Ms.Juraisri Chaisri	State Enterprise, Scientist 7 / IEAT	C/P
40	Ms. Issariya Sangcharoen	Scientist 7 / IEAT	C/P
41	Mr.Assarin Laosirilurchakai	Engineer 8 / IEAT	C/P
42	Mr.Tawatsak Kerdmanee	Technician 7 / IEAT	C/P
43	Mr.Apichart Sektheera	Engineer 8 / IEAT	C/P

(2) Task Force for Risk Communication Promotion under PRTR project

No.	Task Force	Name	Organization
1	Chair of the Task Force	Mr. Arthit Laieddee	Rayong Provincial Office of Natural Resources and Environment
2	member	Mr. Surachai Suksawas	Rayong Provincial Office
3	member	Mr. Puttikon Wichaidit	Industrial Office of Rayong Province
4	member	Ms. Supawadee Komolkanjanakul	Rayong Provincial Health Office
5	member	Dr. Nalinee Sripaung	Occupational Health and Environment Development Center of Rayong Province Bureau of Occupational and Environmental Diseases, Department of Disease Control
6	member	Mr. Nawat Tosak	Rayong Provincial Office for Local Administration
7	member	Mr. Danai Bawornkiattikul	Faculty of Public Health, Burapha University
8	member		Office of the Basic Education Commission of Thailand
9	member	Mr. Veerapon Puangpitayavut	The Federation of Thai Industry, Rayong Chapter
10	member	Mr. Suwan Nantasarat	Regional Environmental Office 13
11	member		Bureau of Social Economic and Public Participation Development Department of Local Administration
12	member	Dr. Wanna Laowakul	Environmental Research and Training Centre, Department of Environmental Quality
13	member	Ms. Wichitra Sriwanich	Department of Industrial Works
14	member	Mr. Tawatsak Kerdmanee	Industrial Estate Authority of Thailand (Hemaraj Eastern Industrial Estate (Map Ta Phut))
15	member		Thailand Environmental Institute
16	member	Mr. Hashimoto Shinya	JICA
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**11.3. Annex 3 : Final Proposal Basic elements of PRTR
system design in Thailand**

Final Proposal
Basic elements of PRTR
system design in Thailand

February 2016

Pollution Control Department
Department of Industrial Works
Industrial Estate Authority of Thailand

Background

JICA project for “THE DEVELOPMENT OF BASIC SCHEMES FOR PRTR SYSTEM IN KINGDOM OF THAILAND” has been implemented since March 2011. Highlight of the project was implementation of pilot PRTR in Rayong province. The project had prepared the basic design of PRTR for the pilot implementation and field tested the applicability of PRTR design. All release and transfer of target substances in year 2013 at Rayong province was estimated, reported, compiled and disclosed to public in pilot implementation.

At the end of the pilot PRTR, feedback survey was implemented to collect the response from all stakeholders. 241 replies were obtained for extensive questionnaires related to detail design of PRTR system. The result of such survey revealed that basic design of the pilot PRTR was well accepted by all sector of stakeholders. (Separate report of feedback survey was attached in ANNEX of project final report)

At the same time, PRTR pilot will continued even after the completion of JICA project to further test the system in other provinces and keep momentum of the industry practice at Rayong till the legislation of PRTR achieved. Under the situation, **it is not advised to make major change of PRTR design at this stage to avoid the confusion of continuous pilot. Therefore this final proposal maintains the basic design of pilot PRTR while the element for review /update was described as recommendation.**

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1. Policy objectives

Overall objective of PRTR system in Thailand is to manage the risk of chemical substance in environment through;

- 1) To provide common information platform for constructive dialogue among the stakeholders.
- 2) Collection of scientific data of chemical substances emission and transfer for better policy formulation by the government
- 3) Promotion of voluntary reduction of chemical substance by industry
- 4) Providing information of chemical substances in environment from both point source and non-point source to the public.

2. Target substances

107 substances and pollutants as listed in the attachment. Selection process and reason for selection was also given in the attachment.

Note:

- 1) 104 substances in the list are to be reported by the industrial and other point sources and to be estimated for non-point source by the government.
- 2) Two pollutants, namely SO_x and NO_x, are under separate reporting requirement by the Ministry of Industry and thus excluded for reporting by the industrial sources. However they shall be included in the PRTR system and emission data shall be disclosed to the public. Due to their large amounts, they shall be separately reported from other substances.
- 3) Chemical substance group, namely, Dioxin and Furan, shall be included in PRTR system in future, but not immediately for target of the pilot project in 2013. This is due to the large uncertainty of their emission character at this stage in Thailand. They shall be included once reliable measurement data of them in Thailand become available and uncertainty of their emission characters (emission source and emission factor) is reduced to acceptable range. Please also refer to the section of target activities.
- 4) All elemental substance (mostly heavy metal) shall be treated and computed for element basis, not the compound basis. For example, Zinc oxide shall be computed for the weight of Zinc not for Zinc oxide.

Recommendation

Though it is not in the list, Mercury (Hg) and its environmental condition is of concern for many stakeholders. Preliminary study showed there is no source who handled more than 1ton/year of Mercury. On the other hand, Thailand is going to ratify international Mercury convention soon, and then the government is going to prepare Mercury inventory in environment on periodical basis. It is recommended that such data of Mercury shall be included or linked to PRTR data disclosure web site so that public also secures the access for Mercury data.

3. Target activities

3.1. Point Source

List of target business/industry as well as flow chart for point source definitions are attached. Selection process and reason for selection was also given in attachment.

Recommendation

1) Following shall be added in point source at the next review/update.

Category	Reason
Cat. No. 5 Paper & Paper products, Printing, Publishing, Allied products	The Industrial category utilize relatively large amount of chemicals, though not included in pilot as not many facility in pilot area of Rayong
Cat. No. 3 Textile, Wearing apparel, Leather products & Footwear.	The Industrial category utilize relatively large amount of chemicals, though not included in pilot as not many facility in pilot area of Rayong
Power plant	Many stakeholders considered as important point source.

2) Following shall be removed from point source at the next review/update.

Category	Reason
Cat. No. 4 Wood and furniture	In pilot, it was found the Industrial category does not utilize large amount of chemicals.
School/University	In pilot, it was found the category does

Category	Reason
	not utilize large amount of chemicals. Should be considered only as non-point source.
Hospital	In pilot, it was found the category does not utilize large amount of chemicals. Should be considered only as non-point source.

- 3) Threshold of handling amount can be considered to increase to 10 ton/year, but only after next review.
- 4) Threshold can be considered to change depending on hazardous of substances, but only after next review.
- 5) As for target activities of combustion product (i.e., Dioxin and Furan, NOx, and SOx), it shall follow the MONRE regulation for those substance. Since it is difficult to grasp all combustion sources and emitted pollutants or chemicals, the following option would be considered to clarify the combustion sources and parameters for PRTR reporting. To estimate and report amounts of release to air of PRTR substances from the combustion sources industrial emission standards of which are set in followings.

http://www.pcd.go.th/info_serv/en_reg_std_airsnd03.html#s9 (emission standard of point sources) and Factory act.

Dioxin and Furan:

- Municipal waste incinerator
- Infected waste incinerator
- Hazardous waste incinerator
- Boiler and Furnace using waste oil as fuel

SOx and NOx

- Power plant (new and existing)
- Municipal waste incinerator
- Infected waste incinerator
- Portland cement plant
- Industrial source

- Boiler and Furnace
 - ✧ Fuel Oil
 - ✧ Coal
 - ✧ Biomass
 - ✧ Other Fuel
- Any sources (For NOx)
- Steel industry

3.2. Non-point Source

Following activities shall be covered in PRTR

- Mobile source
- Agriculture
- Construction and paint
- Household
- SMEs
- School/University
- Hospital
- Gas station

Basic policy to select target business/activity for non-point source is attached.

4. Data reporting

4.1. Data to be reported

- For business as point sources

Main data:

Annual emission and transfer amount (in kg/year unit) of listed chemical substances

and pollutants for following five exits.

- 1) Emission to Air
- 2) Emission to Water
- 3) Emission to Soil
- 4) Transfer to Waste
- 5) Transfer to Sewage

Supporting data:

- 1) Amount of chemical handled (in kg/year unit) or indication of its approximate level

- 2) Estimation method used for reporting and original data used for estimation.
- 3) Locality data of the source including coordinate data

Report format (draft) is attached.

- For business not as point sources

For that business which meets all requirements for point source definition but not for the criteria of chemical amounts handled, it shall report the statement of chemical amount handled for each target substances.

Report /statement format (draft) is attached/

Note: Definition of “~~amount~~ of chemical handled”

- 1) Basic data to be used shall be accounting data.
- 2) For the chemical produced “~~amount~~ of chemical handled” is amount of chemical produced.
- 3) For the chemical used, “~~amount~~ of chemical handled” shall be calculated as follows.

“~~Amount~~ of chemical purchased” + “~~amount~~ of stock at the end of previous year”
 “~~amount~~ of stock at the end of current year”

4.2. Estimation of emission/transfer data

Estimation shall follow one of the below listed manual.

- 1) Industry specific estimation manual for point source
 - Oil refinery
 - Chemical/Petrochemical industry
 - Transport machinery industry
- 2) Activity specific estimation manual for non-point source
 - Mobile source
 - Agriculture
 - Construction
 - Household
 - Industry outside of target category
- 3) General estimation manual
- 4) Estimation method employed in model projects for industry of following products

- Wood & Wood products, Furniture & Fixture
- Rubber products
- Plastic products
- Basic metal products, Fabricated products
- Electrical machinery and supplies

4.3. Responsibility for data reporting/ validation / compilation

Pollution Control Department shall take overall responsibility of all PRTR data reporting/validation/compilation.

Department of Industrial Works shall take overall responsibility of PRTR data from point sources, while individual factory under target category shall make individual PRTR report.

Pollution Control Department shall take overall responsibility of PRTR data from non-point sources, including collection of various activity data, estimation based on method in manual, validation and compilation. More detail responsibilities of each organization are as follows.

Item	Responsible organization
Report from industry as point sources within IEAT	IEAT
Report from industry as point sources outside of IEAT	DIW
Report from non-industry as point sources	PCD
Non-point source estimation of Industry not defined as point sources	DIW
Non-point source estimation from mobile sources	PCD
Non-point source estimation from other business (agriculture, construction, etc.)	PCD
Non-point source estimation from household sources	PCD

Means of data reporting shall be direct internet on-line submission.

Validation of reported data shall be done according to data validation protocol attached.

4.4. Flow and mechanism of data reporting

1) Point source

For the target industry in one of the industrial estate, PRTR data shall be first reported to the office of each industrial estate. Then the data for whole estate shall be reported to Department of Industrial Works.

For the target industry outside of the industrial estate, the data shall be reported to Department of Industrial Works.

2) Non-point source

Pollution Control Department shall collect the activity data / statistics necessary to estimate the target activity for non-point source in cooperation with the agencies concerned as described in institutional arrangement as attached. The collection work can be sub-contracted to the consultant organization after specify the TOR.

4.5. Time frame for reporting

Data period for PRTR data shall be 1 calendar year between **January – December**.

Point source as well as non-point source data shall be estimated/reported, validated and compiled for disclosure to public by September in each calendar year (within 9 months after the end of data period).

4.6. Industry report audit

Recommendation:

Audit program for industry report shall be introduced even before the next periodical review. Audit shall be for randomly sampled facility. However initial stage can be done with volunteer facility. Target number for audit will be around 5 % of total.

Focus of audit is to detect /prevent fatal reporting rather than technical accuracy. Basic item for audit is estimation method and base data from accounting book (i.e., production volume or handling amount).

5. Data management and storage

5.1. Data base

PRTR data shall be stored both at Pollution Control Department and at Department of Industrial Works. While Pollution Control Department shall be responsible to build and maintain the data base from non-point source, Department of Industrial Works shall be responsible to build and maintain the data base from point source. Once the data from the previous years was build/updated, the each data base shall be shared by both departments.

5.2. Data processing and management

Utilization of PRTR data shall follow the rule noted below.

PRTR data can be utilized for

- 1) Policy making such as
 - To identify the chemical substance(s) needed more attention for monitoring and control/reduction measure.
 - To identify the source category (ies) needed more attention for monitoring and control/reduction measure.
 - To identify the area(s) needed more attention for monitoring and control/reduction measure.

- 2) Promote voluntary reduction/management measure by private sector by
 - Monitoring the yearly change and reduction trend by each source category(ies)
 - Recognizing the factory with good reduction/management performance from yearly change and encourage the factory

- 3) Risk assessment of the area by following step
 - Set exposure scenario of the chemical substance and the area
 - Run simulation model to estimate the concentration level at receptor site
 - Do risk assessment

4) Risk communication

PRTR data should NOT be utilized to punish and control specific / individual factory(ies) or to inspect specific / individual factory(ies)

6. Data disclosure to public

Data disclosure to public shall be implemented with step by step approach. Following data may be disclosed to public.

- Toxicological feature of each chemical substance reported. (separated for chemical substance and pollutants)
- Emission/transfer data of each substance from point source by province/district level in the form of graph and table. Pollutants (SO_x, NO_x) shall be presented in separately.
- Emission/transfer data of each substance from non-point source by province/district level in the form of graph and table. Pollutants (SO_x, NO_x) shall be presented in separately.
- Pie chart showing share of contribution for each substances by different source
- Ambient air concentration map by air modeling for selected substances. .

Note: Data of “amount of chemical handled” will NOT be disclosed.

Taking the situation of acceptance by the society into consideration, disclosure of the data can be advanced, and as final goal, individual data shall be completely disclosed in future. The matter shall be considered in every periodical review.

Means of data disclosure will be as follows.

- 1) By WEB site
- 2) By individual risk communication meeting
- 3) By information leaflet and publication such as PRTR data book

7. Confidentiality issues

The industry may have confidential data related to PRTR. In such a case, letter for confidentiality application shall be submitted to protect their data from public disclosure. However such letter can be submitted only if the matter related to proprietary secrete of the business.

Pollution Control Department, Department of Industrial Works and Industrial Estate Authority of Thailand shall set up confidentiality committee to evaluate the application according to the rule set for this purpose. If approved,

the data will be excluded from the public disclosure.

8. Periodical review

Recommendation:

As the use of chemical substances may change by the time, PRTR system shall be subject to periodical review to add, delete, and/or change the target chemical, target business and activity, etc.. It is proposed to set the review in every 5 years or longer.

Note: There were many feedback responses to periodical review mechanism. Some of them suggested shorter interval for review. In case of Japan, review process, including latest data collection of chemical substances itself takes more than 1 and half years. Also one of the important data interpretation is to observe annual change or trend of increase/decrease of chemical release and transfer. If the system change frequently, it is not easy to observe such trend. Therefore it is not practical to review in short interval.

9. Application to SMEs

Reporting obligation to SMEs shall be considered as realistic as possible for implementation. However the emission estimate of those sectors where majority of factory is SMEs (such as automobile repair shops) but represents significant chemical use should not be ignored and should be estimated as non-point source.

10. Geographical matters

Recommendation:

Geographical unit for PRTR shall be on provincial base. Immediate application of PRTR to whole nation base may not be recommended. Implementation of PRTR requires significant manpower and cost at government side. Especially, information disclosure and risk communication needs considerable effort and care at local government side. Therefore it is suggested to secure the commitment of local authority before implementing PRTR in new province. Without involvement of local authority, successful PRTR implementation will be difficult.

11. Risk communication

Risk communication is essential part of PRTR data utilization and promotion of dialogue among the stakeholders. To facilitate the better communication, following measure shall be taken. (Separate policy paper for risk communication is attached for more detail description.)

11.1. Provision of human resources

Under PRTR, two categories of specialists were expected to play an important role in risk communication. They are risk communication facilitator (~~Facilitator~~) and Chemical adviser. They are expected to attend, as neutral persons, the risk communication meeting where PRTR data is reported to public. They are to be paid for their technical service by honorarium.

1) Communication facilitator

Facilitator is expected to facilitate the constructive dialogue, but not to lead the discussion nor make direction, decide about the matters. Facilitator shall have the training as described below section.

2) Chemical adviser

Chemical adviser is expected to provide easy to understand explanation for matter asked by the meeting participants or facilitator, but not to lead the discussion nor make direction, decide about the matters. As knowledge required for chemical advisers is more than those provided in short training. Therefore chemical adviser shall be selected from experts who have been working in the chemical risk and toxicology.

11.2. Organization of facilitator training

Recommendation:

DEQP/ERTC will implement the periodical training course for risk communication facilitator. Target of training are officer from central/local government, municipalities, community leader, NGO, school teacher, hospital staff and industry people. Aim of the training is to provide skill and knowledge required to make basic interpretation of PRTR data and communicate them with ordinal people in society. The trained person will serve as facilitator. DEQP/ERTC shall maintain the registration of such facilitator, and upon request from the risk communication organizer, nominate the appropriate persons.

11.3. Registration system of chemical adviser

Recommendation:

Registration of chemical adviser shall be developed at neutral organization such as University.

General qualification for chemical adviser is as follows.

- Age over 35.
- Professional experience in chemistry and health related work over 15 years.
- Matured personality
- Ability to communicate with people of different background.
- Ability to explain technical term in easy wording.

Specific knowledge required are as follows.

Knowledge of chemistry and health effect in general are required. Risk assessment methodology including hazard characterization, exposure assessment, risk assessment shall be well understood. In particular, difference in occupational exposure level (high concentration – 8 hours exposure to healthy adult) effect and ambient standard level (low concentration – lifetime exposure to general public) shall be clearly understood.

In addition, knowledge and understanding of following terms are required.

- MSDS /SDS, Acute toxicity and chronic toxicity.
- Cancer risk and Non cancer risk, IARC classification.
- RfC, RfD, NOAEL, LOAEL.
- Slope factor, Dose-response relation, with/without threshold.
- Uncertainty in risk estimate, UF, Unit Risk.
- Exposure scenario, Diffusion modeling.

11.4. Arrangement for risk communication meeting

1) Organizer

Risk communication meeting can be organized in any stakeholders such as local government and municipalities, industry, NGO, public health office or central government. To organize the meeting, they shall consult with PCD, DIW or IEAT to utilize PRTR data book and get technical support. Also they shall get

nomination for facilitator and chemical adviser from registration system.

Organizer is responsible to provide honorarium to facilitator and chemical adviser.

2) Target group selection

Selection of target group is depends on organizer. It is recommended that community leader, school teacher and public health volunteer are primary target for the meeting.

3) Process for awareness raising

It is recommended to organize preliminary meeting with the target group before the risk communication meeting. It is too voluminous to provide the knowledge of PRTR system itself and its data for interpretation at one meeting. Preliminary meeting shall focus on providing basic knowledge of PRTR system and inform what they can expect in the next risk communication meeting.

4) Material

Pollution Control Department shall provide necessary information material for risk communication meeting.

ATTACHMENT

1. PRTR Target Substance List

List of target substances for PRTR

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
1	Propylene Oxide	75-56-9	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
2	Vinyl Chloride	75-01-4	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
3	Dichloroethane, 1,2-	107-06-2	HS Act class 3-4, Carcinogen data on US EPA and over 100 ton/year.
4	Acrylonitrile	107-13-1	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
5	Ethylene Oxide	75-21-8	HS Act class 4, Carcinogen data on US EPA and over 100 ton/year.
6	Bis(2-ethylhexyl)phthalate	117-81-7	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
7	Methylene Chloride	75-09-2	HS Act class 1, Carcinogen data on US EPA and over 100 ton/year.
8	Naphthalene	91-20-3	HS Act class 2, Carcinogen data on US EPA and over 100 ton/year.
9	Ethyl Acrylate	140-88-5	HS Act class 2, Carcinogen data on US EPA and over 100 ton/year.
10	Methyl tert-Butyl Ether (MTBE)	1634-04-4	Carcinogen data on US EPA and over 100 ton/year.
11	Trinitrotoluene, 2,4,6-	118-96-7	Carcinogen data on US EPA and over 100 ton/year.
12	Trichloroethylene	79-01-6	HS Act class 1, Carcinogen data on US EPA and over 100 ton/year.
13	Atrazine	1912-24-9	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
14	Bromo-2-chloroethane, 1-	107-04-0	Carcinogen data on US EPA and over 100 ton/year.
15	Tetrachloroethylene	127-18-4	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
16	Cromium and its componds		HS Act class 3, Carcinogen data on US EPA as Cr(VI) and over 100 ton/year.
17	Nickel and its compounds		Carcinogen data as NiCl2 on US EPA and over 100 ton/year.
18	Isophorone	78-59-1	Carcinogen data on US EPA and over 100 ton/year.
19	Dichlorobenzene, 1,4-	106-46-7	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
20	Hexachlorocyclohexane	319-86-8	Carcinogen data on US EPA and over 100 ton/year.
21	Captan	133-06-2	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
22	Acrylamide	79-06-1	HS Act class 2, Carcinogen data on US EPA and over 100 ton/year.
23	Dichlorvos	62-73-7	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
24	Formaldehyde	50-00-0	HS Act class 2, Carcinogen data on US EPA and over 100 ton/year.
25	Chloroacetaldehyde, 2-	107-20-0	Carcinogen data on US EPA and over 100 ton/year.
26	Benzyl Chloride	100-44-7	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
27	Chlorothalonil	1897-45-6	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.
28	Hydroquinone	123-31-9	HS Act class 3, Carcinogen data on US EPA and over 100 ton/year.

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
29	Arsenic and its compounds		HS Act class 3, Carcinogen data on US EPA as Arsenic and approx.80 ton/year. Expert judgment.
30	Chloroform (trichloromethane)	67-66-3	HS Act class 3-4, Carcinogen data on US EPA and approx.80 ton/year. Expert judgment.
31	1,3-Butadiene	106-99-0	HS Act class 3, Carcinogen data on US EPA and frequent detection in monitoring
32	Benzene	71-43-2	HS Act class 3, Carcinogen data on US EPA and frequent detection in monitoring
33	Acetaldehyde	75-07-0	Carcinogen data on US EPA and frequent detection in monitoring
34	Methanol	67-56-1	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
35	Ethylene Glycol	107-21-1	Quantitative toxic data on US EPA and over 1000 ton/year
36	Propylene	115-07-1	Quantitative toxic data on US EPA and over 1000 ton/year
37	Zinc and its compounds		Quantitative toxic data on US EPA and over 1000 ton/year
38	Bisphenol A	80-05-7	Quantitative toxic data on US EPA and over 1000 ton/year
39	Lead and Compounds	7439-92-1	Quantitative toxic data on US EPA and over 1000 ton/year
40	Phenol	108-95-2	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
41	Methyl Methacrylate	80-62-6	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
42	Styrene	100-42-5	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
43	Phthalic Anhydride	85-44-9	Quantitative toxic data on US EPA and over 1000 ton/year
44	Xylenes		Quantitative toxic data on US EPA and over 1000 ton/year

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
	Xylene, P-	106-42-3	
	Xylene, Mixture	1330-20-7	
45	Phosphoric Acid	7664-38-2	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
46	Vinyl Acetate	108-05-4	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
47	Ethyl Acetate	141-78-6	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
48	Isopropyl alcohol	67-63-0	Quantitative toxic data on US EPA and over 1000 ton/year
49	Acrylic Acid	79-10-7	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
50	Methyl Ethyl Ketone (2-Butanone)	78-93-3	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
51	Paraquat Dichloride	1910-42-5	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
52	Cyclohexanone	108-94-1	Quantitative toxic data on US EPA and over 1000 ton/year
53	Tin and its compounds		Quantitative toxic data on US EPA and over 1000 ton/year
54	Pentane, n-	109-66-0	Quantitative toxic data on US EPA and over 1000 ton/year
55	Epichlorohydrin	106-89-8	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
56	Acetone	67-64-1	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
57	Propylene Glycol	57-55-6	Quantitative toxic data on US EPA and over 1000 ton/year
58	Ethylene Glycol Monobutyl Ether	111-76-2	HS Act class 1, Quantitative toxic data on US EPA and over 1000

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
			ton/year
59	Formic Acid	64-18-6	Quantitative toxic data on US EPA and over 1000 ton/year
60	Hexane, N-	110-54-3	Quantitative toxic data on US EPA and over 1000 ton/year
61	Isobutyl Alcohol	78-83-1	Quantitative toxic data on US EPA and over 1000 ton/year
62	Hexanedioic Acid	124-04-9	Quantitative toxic data on US EPA and over 1000 ton/year
63	Trimethylbenzene, 1,2,4-	95-63-6	Quantitative toxic data on US EPA and over 1000 ton/year
64	Methylenediphenyl Diisocyanate	101-68-8	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
65	Maleic Anhydride	108-31-6	Quantitative toxic data on US EPA and over 1000 ton/year
66	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
67	Furfural	98-01-1	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
68	Molybdenum and its compounds		Quantitative toxic data on US EPA and over 1000 ton/year
69	Diethylene Glycol Monobutyl Ether	112-34-5	Quantitative toxic data on US EPA and over 1000 ton/year
70	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
71	Methyl Acrylate	96-33-3	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
72	Ametryn	834-12-8	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
73	Hydrogen Fluoride	7664-39-3	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
74	Chloroacetic Acid	79-11-8	Quantitative toxic data on US EPA and over 1000 ton/year
75	Methyl Acetate	79-20-9	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
76	Sodium Cyanide	143-33-9	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
77	Chlorpyrifos	2921-88-2	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
78	Pyrene	129-00-0	HS Act class 1, Quantitative toxic data on US EPA and over 1000 ton/year
79	Carbon Disulfide	75-15-0	HS Act class 2, Quantitative toxic data on US EPA and over 1000 ton/year
80	Antimony and its compounds		Quantitative toxic data on US EPA and over 1000 ton/year
81	Propanil	709-98-8	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
82	Trimethylbenzene, 1,3,5-	108-67-8	Quantitative toxic data on US EPA and over 1000 ton/year
83	Tebuthiuron	34014-18-1	HS Act class 3, Quantitative toxic data on US EPA and over 1000 ton/year
84	Toluene	108-88-3	HS Act class 3, Quantitative toxic data on US EPA and frequent detection in monitoring
85	2,4-D-BUTYL	94-80-4	HS Act class 3 and over 1000 ton/year
86	sodium chlorate	7775-09-9	HS Act class 3-4 and over 1000 ton/year
87	Polyethylene glycol nonylphenyl ether	9016-45-9	HS Act class 3 and over 1000 ton/year
88	GLYPHOSATE-ISOPROPYLAMMONIUM	38641-94-0	HS Act class 3 and over 1000 ton/year

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
89	PROTHIOCARB	19622-08-3	HS Act class 3 and over 1000 ton/year
90	DIALIFOS(DIALIFOR)	10311-84-9	HS Act class 3 and over 1000 ton/year
91	Boron and its compounds		HS Act class 3 and over 1000 ton/year
92	Phosphorus pentoxide and other	1314-56-3	HS Act class 3 and over 1000 ton/year
93	DITHIOPYR	97886-45-8	HS Act class 3 and over 1000 ton/year
94	Manganese and its compounds		HS Act class 1 and over 1000 ton/year
95	2,4-D-BUTOTYL	1929-73-3	HS Act class 3 and over 1000 ton/year
96	Potassium chlorate	3811-04-9	HS Act class 3 and over 1000 ton/year
97	Ryania	15662-33-6	HS Act class 3 and over 1000 ton/year
98	Copper and soluble salts		HS Act class 3 and over 1000 ton/year
99	PROPIONICACID	79-09-4	HS Act class 3 and over 1000 ton/year
100	2, 4-D-DIMETHYLAMMONIUM	2008-39-1	HS Act class 3 and over 1000 ton/year
101	IMAZAQUIN-AMMONIUM	81335-47-9	HS Act class 3 and over 1000 ton/year
102	BUTACHLOR	23184-66-9	HS Act class 3 and over 1000 ton/year
103	1-(p-METHOXYPHENYL)-2-METHYL -1,3- PROPANEDIOL-METHYLENE ETHER	5689-72-5	HS Act class 3 and over 1000 ton/year
104	Cadmium and its compounds	7440-43-9	HS Act class 3, 4 and over 1000 ton/year
105	SOx		To be included in data disclosure to public. Not required for industry reporting as regulation already exist for reporting.

No.	Name of Chemical	CAS Registry Number (CAS No.)	Note : Reason for selection
106	NOx		To be included in data disclosure to public. Not required for industry reporting as regulation already exist for reporting.
107	Dioxin and Furan		To be included in the system when the reliable data become available for their emission status and factors. Not included for the pilot project.

2. Target substance selection criteria and flow

Selection of target chemical substances

First List

1. Summary

As first step of PRTR system design, works on selecting target chemical substances were under implementation. Basic idea for selection criteria was discussed and agreed in the previous CP meeting in June, 2011. Following such selection criteria, initial list of substances to be considered for candidates are prepared, though there are need to follow up various aspect of the selection work. The list is now presented in the CP meeting for consideration and discussion. Primary reason to present the list at this stage is not to approve/finalize the list but to move the project into next step, i.e., selection of target business and activity, as well as point source and non-point source definition, as next step can't be started unless target chemical substances are listed. Therefore tentative approval of the list to start considering the target business is sought at this meeting.

After follow up of the selection work with possible modification, the updated list will be presented next year.

2. Criteria for selection

As found in the review of other countries for PRTR, selection of the chemicals shall be based both on toxicity and anticipated level of presence in environment (exposure).

Toxicity of chemical substance can be evaluated by referring to existing data base in various countries and agencies. There is no need to find such data inside Thailand as the data is not Thailand specific.

On the other hand, anticipated level of presence in environment (exposure) shall be considered and evaluated for Thailand specific situation. For this purpose, production, import and export data of chemical substances shall be compiled and used to evaluate the level of presence of each substance. Some substances may not be in the data of production and import, but in environment due to the formation as by-product of combustion process. Presence of such substances shall be evaluated by the environmental monitoring data.

3. Selection flow

3.1. Regulatory survey

Before the startup of the current JICA project, PCD (WHSMB) has reviewed all existing regulation related to chemical substances and compiled the extensive list of chemical substances (993 substances) as candidate for PRTR target substances.

3.2. Chemical substance basic survey and preliminary screening

Collection of the production data and compilation of them with import, export data were done under the subcontract from the JICA project budget to Thailand Environmental Institute. The work

started in late March and was completed in July. The report provided data of over 3,000 substances for import, export and production during four years period of 2007-2010. During the process, all substances were identified by CAS No., instead of HS code given in the custom house for import/export database. Then all matching and comparison with various databases are done primarily using CAS No.

Although hard work was done, production data still missing some as few factories/enterprises refused to submit such production data.

Preliminary screening was done to remove the non-specific substance (such as sand, gravel, salt, tar. etc.) and to remove those substances the amount (Production + Import – Export) of four years is less than 10 ton. These preliminary screenings provided the list of 1,056 substances.

As for agricultural chemicals, DOA (Department of Agriculture) provided the data of active ingredient (AI). Many of the custom data for agricultural chemical are for total volume of the product and real volume of the specific chemical substances (pesticide) is only some portion of them. Therefore as long as the data of AI is available, data from custom house were replaced with AI value from DOA.

3.3. Database for hazard/toxicity data and substance list

The list of screened substance (1,056) were compared and matched with following data base and list.

3.3.1. US EPA IRIS (550 substances)

IRIS (Integrated Risk Information System) is US EPA's a human health assessment program that evaluates risk information on effects that may result from exposure to environmental contaminants. IRIS database contains information for more than 550 chemical substances containing information on human health effects that may result from exposure to various substances in the environment. IRIS is used as one of primary database for comparison.

<http://www.epa.gov/IRIS/>

3.3.2. US EPA Screening table (704 substances)

"Regional Screening Levels for Chemical Contaminants at Superfund Sites" were developed to be used for soil/ground contamination problem. The data of screening table are from various source including EPA's IRIS, The Agency for Toxic Substances and Disease Registry (ATSDR) minimal risk levels (MRLs), The California Environmental Protection Agency (OEHHA) Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels (RELS) ,and so on. The table compiled extensive data for toxicity in soil, air and water (RfC, RfD, Carcinogen for Screening Level value at 10⁻⁶ risk level) as well as physical and chemical character of the substance hence it is useful to compare various substances at once. The table is also use as

primary database for comparison. Carcinogen mark of the table were used as initial evaluation if the substance is carcinogen or not, as, in general, US EPA's carcinogen category covers more substances in proactive way than IARC and thus is on safe side.

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/

3.3.3. IARC carcinogen group list (433 substances (carcinogen + probable +possible))

International Agency for Research on Cancer reviewed and classified the chemical substance in following group.

Group 1	Carcinogenic to humans	107 agents
Group 2A	Probably carcinogenic to humans	59
Group 2B	Possibly carcinogenic to humans	267
Group 3	Not classifiable as to its carcinogenicity to humans	508
Group 4	Probably not carcinogenic to humans	1

The list is used to compare with the list of chemical substance selected from the primary database of US EPA IRIS, screening table and regulatory survey list, and confirm the carcinogen.

<http://monographs.iarc.fr/ENG/Classification/index.php>

3.3.4. Japanese list of PRTR substances (435 substances)

Japanese PRTR system revised its target chemical in 2010 and now 435 substances are in the list. The list is used to compare with the list of chemical substance selected from the primary database of US EPA IRIS and screening table.

<http://www.env.go.jp/en/chemi/prtr/substances/table.html>

3.4. Substance matching and candidate substance selection

Initial matching was done between 1,056 substances from basic survey and US EPA IRIS and screening value table. As a result 248 substances matched. Out of 248, 67 substances are marked as carcinogen, while 181 substances are not. All hazard/toxicity data from US EPA for those 258 substances are added to the data file for review.

Rests of 808 substances were then compared with the list of 993 substances from regulatory survey. As a result, 201 substances were matched.

Then trend of import /production was reviewed for each substance and those substances import /production volume for the last two years (2009 and 2010) are zero, were removed from the list. They are mainly banned agricultural chemicals and not required to place them in PRTR list. 15 substances out of the list of 67 carcinogen, 23 substances out of 181 non carcinogens and 34

substances out of list 201 substance matched with regulatory survey were removed from the list accordingly.

3.5. Exposure threshold

Threshold value for 400 ton / four years (2007-2010) = average of 100ton/year for carcinogen substance, and 4,000 ton/four year (2007-2010) = average of 1,000 ton/year for non-carcinogen substances were tentatively set for the selection.

Japanese PRTR system listed the chemical substance with known hazard/toxic character at more than 100 ton/year production and import. Basis of this value is that substance over 100ton/year are tend to be detected in environment more frequently. Therefore applying this 100 ton/year for carcinogen substance may be justified. On the other hand, OECD define high volume chemical as more than 1000 ton/year of production in one country. This threshold was applied for non-carcinogen substances and those substances under regulatory survey without detail toxic data.

As a result, total of 113 substances, i.e., 30 substances in carcinogen category, 59 substances in non-carcinogen category and 24 substances from regulatory survey were selected. 24 substances from regulatory survey had no matching with IACR carcinogen classification and thus can be considered non carcinogen.

Volume wise, selected substance by exposure threshold represents the following percentage volume of category total.

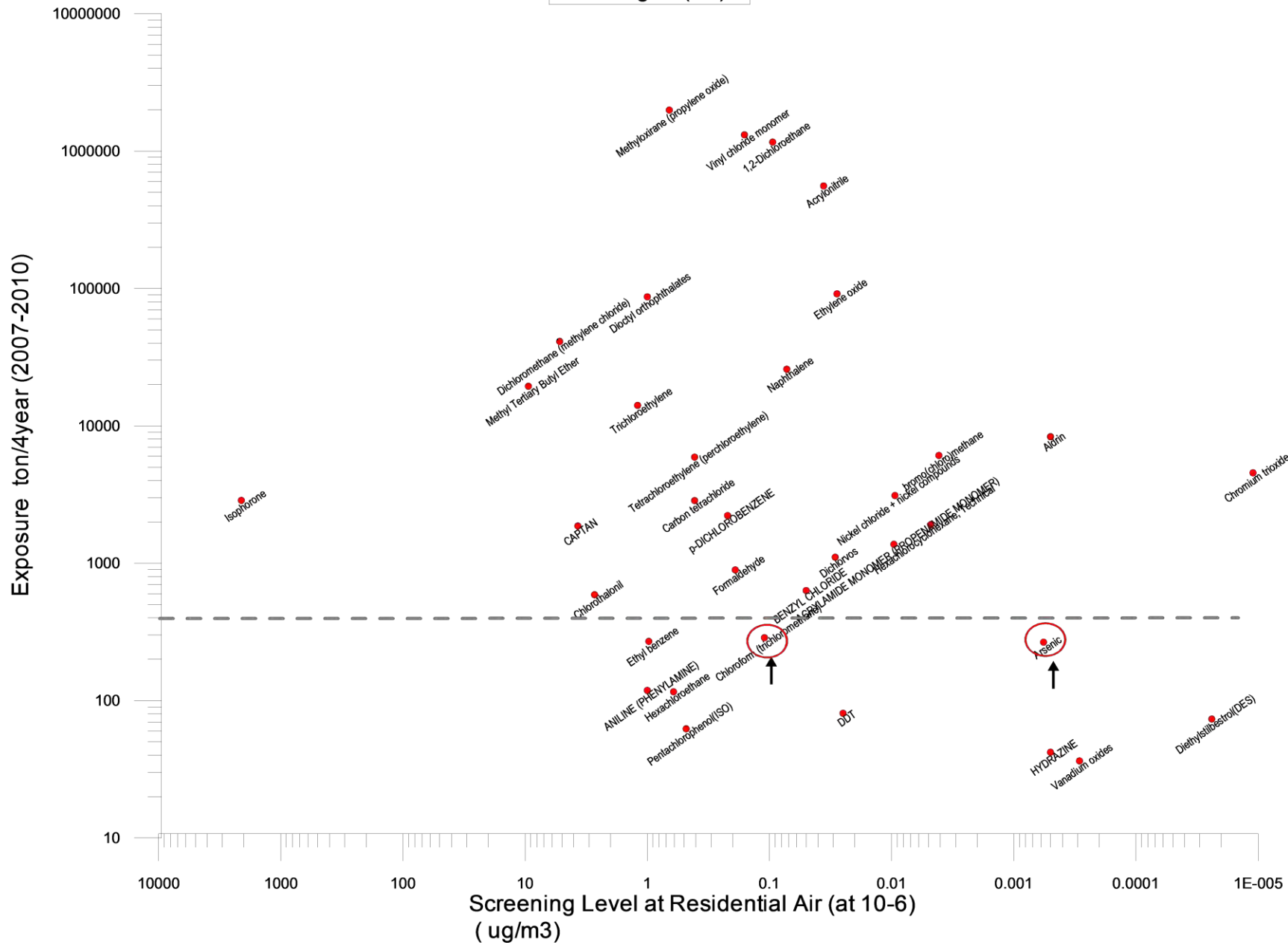
Carcinogen	99.9%
Non Carcinogen	99.3%
Regulatory survey (non-carcinogen)	96.9%

3.6. Exposure versus Hazard/Toxicity consideration

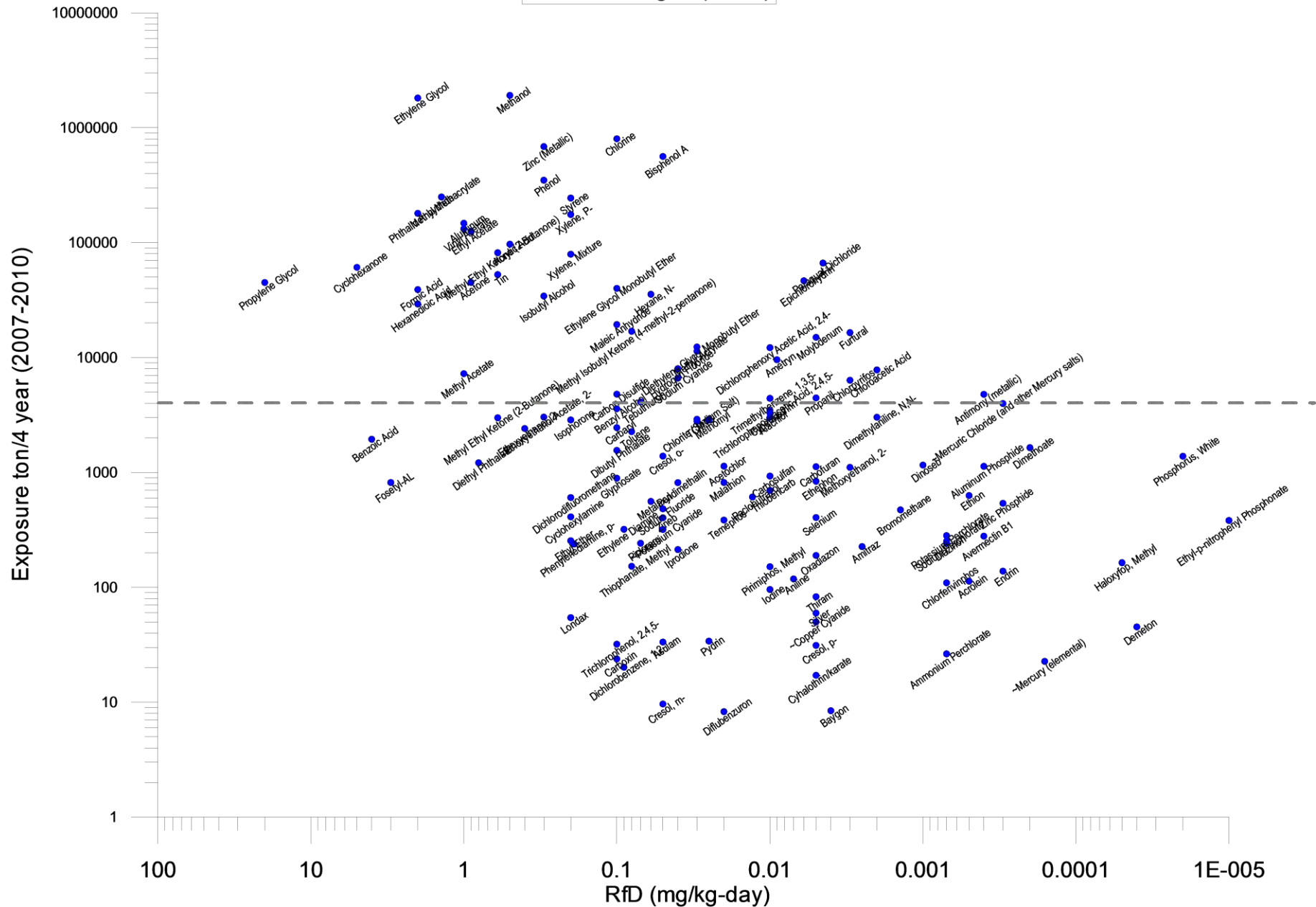
For those substances, detail toxicity data are available, their exposure and toxicity data were plotted to visualize the relation. Toxicity data used are RfD for oral intake, RfC for inhalation both for non-carcinogen substances, and screening value (at risk level of 10^{-6}) for residential air and tap water for carcinogen substances.

Resulting plots are shown as figure 1, 2, 3 and 4.

Carcinogen (Air)



Non Carcinogen (water)



Based on the figure and expert judgment, following adjustments are proposed for the list.

- Removal of ordinary acid/base, and substance with low persistency in environment to affect the human health.
6 substances were removed. : Ammonia, Chlorine, Hydrogen chloride, Sulfuric acid, Nitric acid and Sodium Hydroxide.
- Addition of Arsenic, Chloroform in carcinogen category. Both are just below exposure threshold. Arsenic is well known pollutants causing existing problem, and Chloroform are frequently detected in monitoring.
- Removal of Tetrafluoroethane, 1,1,1,2- and Chlorodifluoromethane from non-carcinogen category. They can be removed due to low RfC value. Acetone also shows similar level of RfC but shows higher RfD thus retained.

4. Consideration of air monitoring data

In spite of frequent detection during the air monitoring, some substances are not included in the current list of selected substances. Following four substances are proposed to be included in the list.

Benzene, 1,3-Butadien, Acetaldehyde, Toluene

5. Target chemical listing

Attached is the proposed list of 113 target chemicals. Of which,

35 carcinogen substances with detail toxicity data

54 non carcinogen substances with detail toxicity data

24 non carcinogen substances without detail toxicity data

6. Issues and follow up

- 24 substances from regulatory survey still do not have toxicity data for detail evaluation. These should be searched and compiled.
- Heavy metal shall be further studied for its salt and compounds. This shall be considered for more detail.
- Current list is limited to individual chemical substances. Inclusion or exclusion of pollutants (such as SO_x, NO_x, COD) shall be discussed based on merit/demerit.
- Target business and activity shall be studied based on the proposed list of substances.

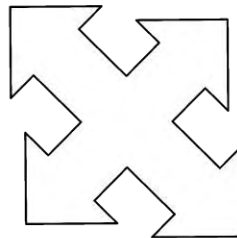
Selection process of first list of target substances

Exposure data

Production, Import, Export for 2007-2010 (1056 substances)*

Air monitoring data

67 substances carcinogen from US EPA data



181 substance non carcinogen from US EPA data

Hazard data

US EPA IRIS (550 substances)

US EPA SL table (704 substances)

Regulatory survey (993 substances)**

201 substances from regulatory survey

Substances with no import/production in 2009-2010 were removed.

Threshold is 1000 ton/year for non carcinogen, 100 ton/year for carcinogen.

Expert judgement: Remove HCl, H₂SO₃, HNO₃, Cl, NH₄, NaOH and furuolocarbons. Add Benzene, 1,3-Butadien, Acetaldehyde, Toluene, Arsenic and Chloroform.

35 Carcinogen

54 Non carcinogen with toxic data

24 Non carcinogen without toxic data

* Custom data from import and export are collected and questionnaire survey for chemical industry was done for production data for 2007 -2010 peiroad. Total of 3307 substnaces were listed first. Then no specfic substance (such as sand) as well as those vo

** All substances in Thai national regulation, international agreement and PCD pollutant watch list are listed.

Revision of Target substance list for PRTR (as of 20 Feb. 2, 2012)

Revision/update based on suggested action from the counterpart meeting in Sept 2011 and from various stakeholders.

No.	Point suggested	Consideration	Current Conclusion
1	Investigation at Customs Department for substance under Hazardous Substance Act, Class 4	<p>Discussion was held with Customs Department and following facts were found.</p> <p>Aldrin: There was no import of Aldrin as pure chemical during 2007-2009. Under the mixture product, there was some record of import during 2007-2009. However there is no import in 2010.</p> <p>Carbon tetrachloride: There was no import as pure chemical during 2007-2009. Under the mixture product, there was some record of import during 2007-2009. However it may contain no carbon tetrachloride.</p> <p>Malachite green chloride: HS code indicated for the substance is not really the Malachite Green Chloride. It may be wrong conversion of HS code and CAS no.</p> <p>Case by case investigation of mixture product for Aldrin and Carbon tetrachloride is planned to make sure the real situation.</p>	<p>Aldrin, Carbon tetrachloride and Malachite Green Chloride will be removed from the list.</p>
2	Monitoring data other	Following pollutants were	No addition of substance to

No.	Point suggested	Consideration	Current Conclusion
	than air also shall be studied	<p>detected in monitoring.</p> <p>Arsenic, Iron, Nickel, Manganese, Lead, Selenium, Dichloromethane, 1,2-Dichloroethane, Carbon Tetrachloride, Vinyl Chloride</p> <p>Pollutants other than Iron and Selenium (both are lower toxicity) are already included in the target list.</p>	the list. Carbon tetrachloride was detected, but may be removed from the list as there is no new input
3	Pollutants to be included in the list	Internal discussion within PCD and JICA expert team was held and <u>following pollutants were selected for inclusion to PRTR with following condition.</u>	<p>SOx, NOx : To be included in PRTR data system, but no reporting requirement for industry as there is already reporting obligation by existing regulation. Using the data from such existing reporting system, the emission data shall be compiled. Not considered for non-point source.</p> <p>Dioxin, Furan: To be included in PRTR data system, but estimation shall start only after few years later when reliable measurement data in Thailand become available. Will not be included in pilot project.</p>
4	Mercury and Cadmium to be considered.	<p>-Import data of mercury sulfate, especially its mixture product, was discussed with Customs Department. Case by case investigation is under planning.</p> <p>-Inclusion/exclusion of mercury depends on the result of investigation.</p> <p>-Though no pure Cadmium</p>	For the time being, Mercury is not included in the list Cadmium to be included.

No.	Point suggested	Consideration	Current Conclusion
		is imported, its compounds has sufficient amount of import to justify for inclusion.	
5	Heavy metal shall be renamed and grouped		Antimony, Arsenic, Boron, Chromium, Manganese, Molybdenum, Tin and Zinc were recompiled and named as its metal and its compound” (e.g. , Chromium and Its compounds). Copper is renamed as Copper and its soluble salt”
6	Xylene to be grouped.		Xylene (mixture) and Xylene (-p) is grouped as Xylenes ”.
7	Aluminum and DICHLOROFLUOROETHANE (HCFC-141) to be removed.	Aluminum is the third abundant elements, representing 8%, in the earth crust, next to Oxygen and Silica. Considering human health impact, Industrial release of Aluminum should not have significant impact. HCFC-141 has RfC at 4,270mg/m3 and is low toxicity to human.	Aluminum and DICHLOROFLUOROETHANE (HCFC-141) are removed.

Summary Table of revision

Substance added

	No. (from 113 as of Sept. 2011)	Name of Chemical	CAS Registry Number (CAS No.)	Note: Reason for add to the list
		Cadmium and its compounds	7440-43-9	Though no import as pure cadmium, its compound imported over 1000 ton /year.

Substance removed

	No. (from 113 as of Sept. 2011)	Name of Chemical	CAS Registry Number (CAS No.)	Note: Reason for removal
	14	Aldrin	309-00-2	Checked at the Customs Department and no more import
	20	Carbon Tetrachloride	56-23-5	Checked at the Customs Department and no more import
	113	Malachite green chloride	569-64-2	Checked at the Customs Department and no more import
	48	Aluminum	7429-90-5	Low toxicity to human health
	110	DICHLOROFLUOROETHANE (HCFC-141)	25167-88-8	Low toxicity to human health

Substance renamed and grouped

	No. (from 113 as of Sept. 2011)	Name of Chemical	CAS Registry Number (CAS No.)	
Old name	17	Chromium(VI)	1333-82-0 or 18540-29-9	
Old name	77	Chromium, Total	7440-47-3	
New name		Chromium and its compounds		
Old name	46	Xylene, P-	106-42-3	
Old name	54	Xylene, Mixture	1330-20-7	
New name		Xylenes		
Old name	96	Orthoboric acid	10043-35-3	
Old name	109	BORAX PENTAHYDRATE	11130-12-4	
Old name	112	Sodium tetraborate	1330-43-4	
New name		Boron and its compounds		
	Old name			
Old name	39	Zinc (Metallic)	7440-66-6	
Old name	101	Zinc oxide	1314-13-2	
New name		Zinc and its compounds		

Substance renamed

	No. (from 113 as of Sept. 2011)	Name of Chemical	CAS Registry Number (CAS No.)	
Old name	18	Nickel Soluble Salts	7718-54-9 or 7440-02-0	
New Name		Nickel and its compounds		
Old name	31	Arsenic	7440-38-2	
New Name		Arsenic and its compounds		
Old name	57	Tin	7440-31-5	
New Name		Tin and its compounds		
Old name	72	Molybdenum	7439-98-7	
New Name		Molybdenum and its compounds		
Old name	85	Antimony (metallic)	7440-36-0	
New Name		Antimony and its compounds		
Old name	99	Manganese dioxide	1313-13-9	
New Name		Manganese and its compounds		
Old name	104	Copper sulfate	7758-98-7	
New Name		Copper and its water soluble salts		

3. Report form

แบบรายงานข้อมูลการปลดปล่อยและเคลื่อนย้ายมลพิษจากแหล่งกำเนิดที่มีการถือครองสารเคมีเป้าหมาย

ส่วนที่ 1 ข้อมูลทั่วไป

ชื่อโรงงาน.....สถานประกอบการ/...

หมายเลขทะเบียนสถานประกอบการ/เลขทะเบียนโรงงาน.....ลักษณะการประกอบกิจการ.....

ที่ตั้ง เลขที่.....ถนน.....ซอย/ตรอก.....หมู่ที่.....

แขวง.....จังหวัด.....อำเภอ/เขต.....ตำบล/.....รหัสไปรษณีย์.....

เขตการปกครอง.....(อบต./เทศบาล)

พื้นที่ลุ่มน้ำ.....

พิกัดตำแหน่งที่ตั้งสถานประกอบการ ละติจูดN ลองจิจูดE

หรือพิกัด UTM (WGS84) X..... Y..... โชน.....

ผู้ประสานงาน.....ตำแหน่ง.....

โทรศัพท์.....โทรสาร.....Email address.....

ระบุปีที่ประเมิน ตามรอบปีปฏิทิน นับตั้งแต่)1 ม.ค.- 31 ธ.....(ค.

ส่วนที่ 2 ตารางสรุปข้อมูลปริมาณการถือครอง การปลดปล่อยและการเคลื่อนย้ายมลพิษ

ส่วนที่ตาราง 1/2สรุปข้อมูลปริมาณการถือครอง การปลดปล่อยและเคลื่อนย้ายมลพิษ ปริมาณสารเคมี) ≥ 1 ตัน(ปี/

ลำดับที่	ชื่อสารเคมี	CAS No.	PRTR No.	ปริมาณการถือครอง*	ปริมาณสารเคมี (ปี/กก)		
					การปลดปล่อย	การเคลื่อนย้าย	ปริมาณรวม

หมายเหตุ * ปริมาณการถือครอง ก. เท่ากับหรือมากกว่า 1 – 10 ตันปี/ ข. มากกว่า 10 – 100 ตันปี/

ค. มากกว่า 100 – ปี/ตัน 500 ง. มากกว่า - 5001,000 ตันปี/ .จ. มากกว่า 1,000 ตันปี/

ส่วนที่ตาราง 2/2สรุปข้อมูลปริมาณการถือครองสารเคมี ปริมาณสารเคมี) < 1 ตัน(ปี/

ลำดับที่	ชื่อสารเคมี	CAS No.	PRTR No.	ปริมาณการถือครอง (กก./ปี)

ข้าพเจ้าขอรับรองว่าข้อมูลข้างต้นเป็นจริงทุกประการ

ลงชื่อ.....

ลงชื่อ.....

(.....)

(.....)

ตำแหน่ง.....

ตำแหน่ง.....

ผู้รายงาน

ผู้มีอำนาจลงนาม/ผู้ประกอบการโรงงาน

วันที่.....ศ.พ.....เดือน.....

วันที่.....ศ.พ.....เดือน.....

ส่วนที่ 3 แบบรายงานข้อมูลการปลดปล่อยและเคลื่อนย้ายมลพิษ (แยกสายสารเคมี)		
ข้อมูลสารเคมีที่มีปริมาณถือครอง ≥ 1 ตัน 1) ปี/สารเคมี 1/รายงาน(
ชื่อโรงงาน.....สถานประกอบการ/ หมายเลขทะเบียนสถานประกอบการ(เลขทะเบียนโรงงาน) PRTR ลำดับที่.....ชื่อสารเคมี.....CAS Number.....		
ปริมาณการปลดปล่อยสู่อากาศปี/กิโลกรัม.....	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)	
ปริมาณการปลดปล่อยสู่น้ำปี/กิโลกรัม..... ระบุแหล่งรองรับ <input type="checkbox"/> ท่อน้ำทิ้งสาธารณะ <input type="checkbox"/> แม่น้ำ/ลำคลอง <input type="checkbox"/> สระเสาะบ่/บึง/หนอง/ <input type="checkbox"/> ทะเล	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)	
ปริมาณการปลดปล่อยสู่ดินและน้ำใต้ดินปี/กิโลกรัม.....	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)	
รวมปริมาณการปลดปล่อยปี/กิโลกรัม.....		
ปริมาณการเคลื่อนย้ายของเสียออกนอกสถานประกอบการ <input type="checkbox"/> ฝังกลบ <input type="checkbox"/> เผาทำลาย	ปี/กิโลกรัม.....	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)
ปริมาณการเคลื่อนย้ายน้ำเสียออกนอกสถานประกอบการ	ปี/กิโลกรัม.....	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)
รวมปริมาณการเคลื่อนย้ายปี/มกิโลกรัม.....		
ปริมาณการบำบัดกำจัด/ภายในสถานประกอบการ <input type="checkbox"/> ฝังกลบ) Landfill (<input type="checkbox"/> กองเก็บบนดิน (Surface Impoundment) <input type="checkbox"/> อื่นๆ(ระบุ)	ปี/กิโลกรัม.....	<input type="checkbox"/> สัมประสิทธิ์การปลดปล่อย (Emission Factor) <input type="checkbox"/> สมดุลมวล (Mass Balance) <input type="checkbox"/> การคำนวณทางวิศวกรรม (Engineering Calculation) <input type="checkbox"/> การตรวจวัดโดยตรง (Direct Measurement)
รวมปริมาณการบำบัดปี/กิโลกรัม.....กำจัดภายในสถานประกอบการ/		
ข้าพเจ้าขอรับรองว่าข้อมูลข้างต้นเป็นจริงทุกประการ		
ลงชื่อ..... (.....) ตำแหน่ง..... ผู้รายงาน	ลงชื่อ..... (.....) ตำแหน่ง..... ผู้มีอำนาจลงนาม/ผู้ประกอบการโรงงาน	
วันที่.....ศ.พ.....เดือน.....	วันที่.....ศ.พ.....เดือน.....	

แบบรายงานข้อมูลการปลดปล่อยและเคลื่อนย้ายมลพิษจากสถานประกอบการบำบัดกำจัดของเสีย/

ส่วนที่ 1 ข้อมูลทั่วไป

ชื่อโรงงาน.....สถานประกอบการ/.....
 หมายเลขทะเบียนสถานประกอบการ.....(เลขทะเบียนโรงงาน).....ลักษณะการประกอบกิจการ.....
 ที่ตั้ง เลขที่.....ถนน.....ซอย/ตรอก.....หมู่ที่.....
 แขวง.....จังหวัด.....อำเภอ/เขต.....ตำบล/.....รหัสไปรษณีย์.....
 เขตการปกครอง.....(อบต/เทศบาล)
 พิกัดตำแหน่งที่ตั้งสถานประกอบการ ละติจูด.....N ลองจิจูด.....E
 หรือพิกัด UTM (WGS84) X..... Y..... โชน.....
 ผู้ประสานงาน.....ตำแหน่ง.....
 โทรศัพท์.....โทรสาร.....Email address.....
 ปี พ.ศ.ที่เริ่มปฏิบัติงานนับตั้งแต่ที่ประเมิน .ศ. 1 ม .ค.- 31 ธ.....(ค.

ส่วนที่ 2 ประเภทของโรงงาน/สถานประกอบการบำบัด/กำจัดของเสีย

ลำดับประเภทโรงงาน	ประกอบกิจการ ทำเครื่องหมาย) <input checked="" type="checkbox"/> ระบุกิจการ(
101	ระบบบำบัดน้ำเสีย <input type="checkbox"/>
	โรงงานปรับปรุงคุณภาพของเสียรวม (Central Waste Treatment Plant)
	เตาเผาของเสีย <input type="checkbox"/>
105	ระบบบำบัดของเสียรวม/ระบบปรับเสถียร <input type="checkbox"/>
106	โรงงานประกอบกิจการเกี่ยวกับการคัดแยกหรือฝังกลบสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว <input type="checkbox"/>
-	โรงงานรีไซเคิล <input type="checkbox"/>
-	เตาเผามูลฝอย <input type="checkbox"/>
-	เตาเผามูลฝอยติดเชื้อ <input type="checkbox"/>

ข้าพเจ้าขอรับรองว่าข้อมูลข้างต้นเป็นจริงทุกประการ

ลงชื่อ.....ลงชื่อ.....
 (.....)(.....)
 ตำแหน่ง.....ตำแหน่ง.....
 ผู้รายงาน ผู้มีอำนาจลงนาม/ผู้ประกอบการ
 วันที่.....ศ.พ.....เดือน..... วันที่.....ศ.พ.....เดือน.....

ส่วนที่ แบบรายงานข้อมูลการปลดปล่อยมลพิษ 3 ของโรงงาน/สถานประกอบการ บำบัดกำจัดของเสีย/

การปลดปล่อยสู่อากาศ

ลำดับที่	ชื่อสารเคมี	PRTR No.	ปริมาณการปลดปล่อยสู่อากาศ (กก./ปี)	วิธีการประเมินการปลดปล่อย
1	Antimony and its compounds (as Sb)	7		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
2	Arsenic and its compounds (as As)	8		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
3	Cadmium and its compounds (as Cd)	18		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
4	Chromium and its compounds (as Cr)	26		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
5	Copper and soluble salts (as Cu)	27		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
6	Formaldehyde	45		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
7	Hydrogen fluoride	52		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
8	Lead and its compounds (as Pb)	58		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
9	Manganese and its compounds	60		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
10	Nickel and its compounds (as Ni)	73		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
11	Sodium Cyanide (as Cyanide)	91		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
12	Xylenes	103		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
13	SO ₂	105		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
14	NO _x	106		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
15	Dioxin and Furan	107		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ

การปลดปล่อยสู่น้ำ

ลำดับที่	ชื่อสารเคมี	PRTR No.	ปริมาณการปลดปล่อยสู่น้ำ (กก./ปี)	วิธีการประเมินการปลดปล่อย
1	Antimony and its compounds (as Sb)	7		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
2	Arsenic and its compounds (as As)	8		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
3	Cadmium and its compounds (as Cd)	18		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
4	Chromium and its compounds (as Cr)	26		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
5	Copper and soluble salts (as Cu)	27		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
6	Formaldehyde	45		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
7	Lead and its compounds (as Pb)	58		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
8	Manganese and its compounds (as Mn)	60		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
9	Nickel and its compounds (as Ni)	73		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
10	Sodium Cyanide (as Cyanide)	91		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
11	Xylenes	103		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
12	Zinc and its compounds (as Zn)	104		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
13	SO ₂	105		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
14	NO _x	106		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ
15	Dioxins and Furans	107		<input type="checkbox"/> การตรวจวัดโดยตรง <input type="checkbox"/> วิธีการอื่นๆ

หมายเหตุ วิธีการอื่นๆ หมายถึง วิธีสัมประสิทธิ์การปลดปล่อย หรือ สมดุลมวล หรือ การคำนวณทางวิศวกรรม

ข้าพเจ้าขอรับรองว่าข้อมูลข้างต้นเป็นจริงทุกประการ

ลงชื่อ.....

ลงชื่อ.....

(.....)

.....)(.....)

ตำแหน่ง.....

ตำแหน่ง.....

ผู้รายงาน

ผู้มีอำนาจลงนาม/ผู้ประกอบกิจการ

วันที่.....ศ.พ.....เดือน.....

วันที่.....ศ.พ.....เดือน.....

4. Point source definition

Proposal for Point Source Definition (Reporting Thresholds) for PRTR system in Thailand

JICA-PCD-DIW PRTR project

1. Background

Point source definition is one of the key elements to implement a PRTR system and important to identify which companies/factories shall report their releases and transfers. As for point source definition, as same as selection of target chemicals, other countries' definitions should be referred to and the "step-by-step" approach should be taken for the first step of PRTR implementation in Thai.

2. Review of point source definition in other countries

Point source definition for PRTR of the three countries, namely Japan, the US, EU and Australia are briefly reviewed as follows.

Table 1. Point Source Definition in Australia, EU, Japan and the US

Criteria	Japan	US	EU(E-PRTR)	Australia
No. of employees	21 employees or more	10 employees or more	None	None
Amount of chemicals handled	- 1 ton/year or more - CMR (carcinogens, mutagens and	Non PBT -Producing (include import) and Processing; 25,000 pounds/year (about 11.4ton/year)	None	Category1: (Substance that are typical presented in material used for production) 10 ton/year

Criteria	Japan	US	EU(E-PRTR)	Australia
	<p>substances toxic to reproduction);</p> <p>0.5 ton/year or more</p>	<p>-Using; 10,000 pounds/year (about 4.5ton/year)</p> <p>PBTs (Persistent, Bio accumulative and Toxic);</p> <p>-100 pounds/year (about 45kg/year)</p> <p>- Specially persistent and bio accumulative;</p> <p>10 pounds/year (about 4.5kg)</p> <p>- dioxin and dioxin like compound 0.1 gram</p>		<p>Category1a (Total VOC): 25 ton/year</p> <p>Category1b (mercury and compounds): 5 kg/year</p>
Amount of chemicals released	None	None	Emission thresholds for each chemical are set. (See Annex I)	Total nitrogen (emission to water, sewage): 15 ton/year Total phosphate (emission to water, sewage): 3 ton/year

Criteria	Japan	US	EU(E-PRTR)	Australia
Type of business	1. Metal mining 2. Crude petroleum and natural gas production 3. Manufacturing 4. Production, transmission and distribution of electricity 5. Manufacture of gas 6. Heat supply 7. Sewerage 8. Railway transport 9. Warehousing 10. Petroleum wholesale trade 11. Iron scrap wholesale trade 12. Automobile wholesale trade 13. Fuel stores 14. Laundries	1. Manufacturing 2. Metal Mining 3. Coal Mining 4. Electricity 5. Hazardous waste treatment 6. Chemical and chemical products wholesale 7. Petroleum wholesale 8. Solvent recovery 9. Governmental service	1. energy production and processing of metals 3. mineral industry 4. chemical industry 5. waste and waste water management 6. paper and wood production and processing 7. intensive livestock production and aquaculture 8. animal and	Facilities exceeding the reporting thresholds, excluding the following type of facilities: a) a mobile emission source (for example, an aircraft in flight or a ship at sea) operating outside the boundaries of a facility b) a petroleum retailing facility engaged in the retail sale of fuels c) a dry cleaning facility employing less than 20 persons d) a scrap metal handling facility trading in metal that is not engaged in the reprocessing of batteries or the

Criteria	Japan	US	EU(E-PRTR)	Australia
	<p>15. Photographic studios</p> <p>16. Automobile maintenance services</p> <p>17. Machinery repair shops</p> <p>18. Commodity inspection services</p> <p>19. Surveyor certification</p> <p>20. Domestic waste disposal business</p> <p>21. Industrial waste disposal business</p> <p>22. Medical and other health service</p> <p>23. Institution of higher</p>		<p>vegetable products from the food and beverage sector, and</p> <p>9. other activities.</p>	<p>smelting of metal, and</p> <p>e) a facility, or those parts of a facility, solely engaged in agricultural production including the growing of trees, aquaculture, horticulture or livestock raising unless it is engaged in the processing of agricultural produce or in intensive livestock production (for example, a piggery or a cattle feedlot).</p>

Criteria	Japan	US	EU(E-PRTR)	Australia
	<p>education</p> <p>24. Research institute for natural sciences</p> <p>(*) Governmental services are classified based on the type of business they are doing</p>			
Others	<p>1. Buildings, structures and other facilities specified in the Mine Safety Act</p> <p>2. Sewage disposal facility</p> <p>3. General or industrial waste disposal facilities specified in the Waste Disposal and Public</p>		<p>Capacity thresholds for each industrial activity are set. (See Annex I)</p>	<p>Category 2a (common product of combustion or thermal process eg. CO, PAHs, SO₂, etc.):</p> <ul style="list-style-type: none"> - burn 400 ton/year or more of fuel/waste - burn 1 ton/hour or more of fuel/waste <p>Category 2b (common product of combustion or other thermal processes and include</p>

Criteria	Japan	US	EU(E-PRTR)	Australia
	<p>Cleansing Law</p> <p>4. Facilities specified in the Law Concerning Special Measures against Dioxins</p>			<p>metals and compound emitted when fuels esp. coal and oil are burn e.g. Dioxins, As, Cd, Cr, Pb, etc.):</p> <ul style="list-style-type: none"> - burn 2,000 ton/year or more of fuel/waste - consume 60,000 MWh or more electrical energy other than for lighting or motive purpose - or have a maximum potential power consumption related at 20 MW or more for other than lighting or motive purpose in a year

3. Basic concept for point source definition (proposed)

Point source definition shall be a combination of 1) Size of Business, 2) Type of Business and 3) Amount of Chemicals Handled similar to Japanese and the US system.

A proposed concept for each element is as follows.

1) Size of Business

Small companies shall be excluded.

2) Type of Business

Types of business using certain amounts of chemicals in whole Thailand shall be selected. In addition, those major in Rayong might be selected as a first step for the pilot project.

3) Amount of Chemicals Handled (Produced (including as a by-product), Used or Stored)

A threshold for amount of chemicals handled shall be set so that factories handling chemicals exceeding certain amounts shall report releases and transfers data.

4. Data Used for defining the Point Source

To analyze chemical use amount and No. of factory, the chemical use data in 2004 conducted by DIW and the factory data in Rayong registered to DIW can be used. As for the chemical use data, data for the first list of target chemical substances (113 chemicals) proposed at the last C/P meeting in September is extracted.

DIW Factory Codes, listed in Annex II, and 20 Categories can be useful to select types of business as shown in the following Table 2. Combining some DIW Categories manufacturing similar type of products and separating some Factory Codes engaged in different type of process from their category for convenience, the chemical use data and the factory data in Rayong are compiled, but target types of business shall be identified by using DIW's 20 Categories.

Table 2. Category of Factory

Cat. No.	DIW's Categ.	Category name	DIW's 20 Categories	DIW Factory Code
1	1	Basic agro-industry ¹	1	1,2,9,21
2	2/3	Food ² /Beverage ³	2	4-8, 10-15, 92
			3	16-20, 90
3	4/5	Textile, Wearing apparel ⁴ /Leather products & Footwear ⁵	4	22-28, 98
			5	29-33, 93
4	6/7	Wood & Wood products ⁶ /Furniture & Fixture ⁷	6	34-36
			7	37, 83, 96
5	8/9	Paper & Paper products ⁸ /Printing, Publishing, Allied products ⁹	8	38-40
			9	41

Cat. No.	DIW's Categ.	Category name	DIW's 20 Categories	DIW Factory Code
6	10/11	Chemical & Chemical products ¹⁰ /Petroleum products ¹¹	10	42-48
			11	49-50, 89
7	12	Rubber products ¹²	12	51, 52
8	13	Plastic products ¹³	13	53
9	14.1	Non-metallic products, factories related to rock, gravel, sand, or soil for construction ¹⁴	14	3
10	14.2	Non-metallic products, excluding No.14.1	14	54-58
11	15/16	Basic metal products ¹⁵ /Fabricated products ¹⁶	15	59-60
			16	61-64, 104
12	17	Machinery ¹⁷	17	65-70
13	18	Electrical machinery and supplies ¹⁸	18	71-74, 81, 94, 107
14	19.1	Transport equipment, excluding No.19.2 ¹⁹	19	75-80, 100
15	19.2	Transport equipment, factories engaged in servicing ¹⁹	19	95
16	20.1	Other manufacturing industry, factories related to waste ²⁰	20	101, 105, 106
17	20.2	Other manufacturing industry, factories related to power plant ²⁰	20	88
18	20.3	Other manufacturing industry, excluding Nos. 20.1 and 20.2	20	82, 84-87, 91, 97, 99, 103

Note 1: Combined DIW Categories for the analysis:

Cat.	Category name	Reason for combining
2/3	Food/ Beverages	Both products are related to eating or drinking items.
4/5	Textile, Wearing apparel/Leather products & Footwear	Both products are related to wearing items.
6/7	Wood & Wood products/ Furniture & Fixture	Both products are related to households made of wood.
8/9	Paper & Paper products/Printing, Publishing, Allied products	Both products are related to paper.
10/11	Chemical & Chemical products/Petroleum products	Both products are related to chemical.
15/16	Basic metal products/Fabricated products	Both products are related to metal.

Note 2: Separated DIW Codes for the analysis

Cat.	Category name	Reason for separating
14	14.1 Non-metallic products, factories related to rock, gravel, sand, or soil for construction	Factories categorized as 14.1 excavate rock, gravel, sand, or soil. So, this kind of work is different from manufacturing non-metallic products such as a cement product.
	14.2 Non-metallic products, excluding No.14.1	
19	19.1 Transport equipment, excluding No.19.2	Factories categorized as 19.2 are a kind of car repair shops. So, this kind of work is different from

Cat.		Category name	Reason for separating
	19.2	Transport equipment, factories engaged in servicing	manufacturing automobiles, auto parts and etc.
20	20.1	Other manufacturing industry, factories related to waste	Other manufacturing industry originally includes various types of business. Out of this, factories categorized as 20.1 are engaged in waste management and factories categorized as 20.2 generate electricity. They are much different from other types of business.
	20.2	Other manufacturing industry, factories related to power plant	
	20.3	Other manufacturing industry, excluding Nos. 20.1 and 20.2	

5. Consideration of the Point Source Definition

5-1 Factory

1) Size of Business

As for the size of business, "Factory Type" would be referred to, and Type 1 and 2 factories can be excluded as small factories.

Table 3. Factory Type

Factory Type	Capability
Type 1	<20 HP or <20 Employees
Type 2	21-50 HP or 21-50 Employees
Type 3	>50 HP or >50 Employees

2) Type of Business

For the purpose of selecting Type of Business for pilot implementation of PRTR, following two aspects shall be considered. In the future, all types of business, i.e. 107 types of factory will be included as point sources.

1) Amount of chemical use

To cover the large share of the emission/transfer of chemical, type of business using large amount of chemical shall be selected.

2) Number and size of factory

To obtain generalized lesson from the pilot project, type of business with large number of factory shall be selected. However type of business with large share of small factory shall not be selected.

As for the chemical use data in 2004, we should note that most of factories submitting their chemical use amount are categorized in Type 3. A Factory-Type-wise analysis cannot be done at this moment. (See Table 4)

81 out of 113 chemicals are available. (See Table 5)

2)-1 Considering chemical use amounts

Factories related to chemical & chemical products, and petroleum products (Cat. No. 6) share 99.6% in chemical use amount. (See Table 6)

Cat. No. 6 Chemical & Chemical products, Petroleum products

Considering other types of business, factories related to the following businesses share 98.7% in chemical use amount excluding factories categorized No. 6.

(See Table 6)

Cat. No. 5	Paper & Paper products, Printing, Publishing, Allied products
Cat. No. 14	Transport equipment, excluding No.15
Cat. No. 3	Textile, Wearing apparel, Leather products & Footwear
Cat. No. 2	Food, Beverage
Cat. No. 4	Wood & Wood products, Furniture & Fixture
Cat. No. 11	Basic metal products, Fabricated products
Cat. No. 13	Electrical machinery and supplies
Cat. No. 1	Basic agro-industry
Cat. No. 8	Plastic products
Cat. No. 7	Rubber products

2)-2 Considering number and size of factory

On the other hand, numbers of factories related to the following businesses in Rayong are less than 50, and the sum of them shares less than 10% of the total number of factories. (See Table 7)

Cat. No. 15	Transport equipment, factories engaged in servicing
Cat. No. 5	Paper & Paper products, Printing, Publishing, Allied products
Cat. No. 18	Other manufacturing industry, excluding Nos. 16 and 17
Cat. No. 3	Textile, Wearing apparel, Leather products & Footwear
Cat. No. 17	Other manufacturing industry, factories related to power plant

In addition, considering the size of factories in Rayong, ratios of small factories (No. of employees are less than 20) are relatively higher in the following businesses.

(See Table 8 and 9)

- | | |
|-------------|--|
| Cat. No. 1 | Basic agro-industry |
| Cat. No. 2 | Food, Beverage |
| Cat. No. 9 | Non-metallic products, factories related to rock, gravel, sand, or soil for construction |
| Cat. No. 10 | Non-metallic products, excluding No.9 |
| Cat. No. 15 | Transport equipment, factories engaged in servicing |
| Cat. No. 16 | Other manufacturing industry, factories related to waste |

So, it might be considered to exclude types of business mentioned in above from 11 categories mentioned in -2)-1"; the following 7 categories might be targeted.

- | | |
|-------------|--|
| Cat. No. 6 | Chemical & Chemical products, Petroleum products |
| Cat. No. 14 | Transport equipment, excluding No.15 |
| Cat. No. 4 | Wood & Wood products, Furniture & Fixture |
| Cat. No. 11 | Basic metal products, Fabricated products |
| Cat. No. 13 | Electrical machinery and supplies |
| Cat. No. 8 | Plastic products |
| Cat. No. 7 | Rubber products |

Table 4. Summary of chemical use data conducted by DIW in 2004

Cat. No.	Category name	DIW Code	No. of Factories					Total amount of chemicals used (t or kL)					Average amount of chemicals used (t or kL/factory)				
			A					B					B/A				
			Type 1	Type 2	Type 3	(blank)	total	Type 1	Type 2	Type 3	(blank)	total	Type 1	Type 2	Type 3	(blank)	total
1	Basic agro-industry	1,2,9,21			8		8			1,484.0		1,484.0			185.5		185.5
2	Food, Beverage	4-8, 10-20, 90, 92			96		96			4,695.2		4,695.2			48.9		48.9
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98			122		122			10,308.7		10,308.7			84.5		84.5
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96			177		177			3,653.1		3,653.1			20.6		20.6
5	Paper & Paper products, Printing, Publishing, Allied products	38-41			90		90			54,395.3		54,395.3			604.4		604.4
6	Chemical & Chemical products, Petroleum products	42-50, 89			1902	5	1907			32,460,936.8	865.0	32,461,801.8			17,066.7	173.0	17,022.4
7	Rubber products	51, 52		1	41		42	30.0		917.1		947.1	30.0		22.4		22.6
8	Plastic products	53		5	61		66	107.0		1,156.3		1,263.3	21.4		19.0		19.1
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3															
10	Non-metallic products, excluding No.9	54-58			6		6			805.5		805.5			134.2		134.2
11	Basic metal products, Fabricated products	59-64, 104	1	9	438		448	0.1	0.3	2,169.7		2,170.1	0.1	0.0	5.0		4.8
12	Machinery	65-70			15		15			145.7		145.7			9.7		9.7
13	Electrical machinery and supplies	71-74, 81, 94, 107			110		110			2,047.2		2,047.2			18.6		18.6
14	Transport equipment, excluding No.15	75-80, 100			228		228			40,103.6		40,103.6			175.9		175.9
15	Transport equipment, factories engaged in servicing	95															
16	Other manufacturing industry, factories related to waste	101, 105, 106			4		4			60.0		60.0			15.0		15.0
17	Other manufacturing industry, factories related to power plant	88			2		2			48.1		48.1			24.1		24.1
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103			32		32			482.8		482.8			15.1		15.1
total			1	15	3332	5	3353	0.1	137.3	32,583,409.0	865.0	32,584,411.4	0.1	51.4	18,449.6	173.0	18,405.5

Table 5. Chemical use amounts of each listed chemical

No.	Name of Chemical	CAS No.	No. of Factories	Total amount of chemicals used (t or kL)	Average amount of chemicals used (t or kL/factory)
1	Propylene Oxide	75-56-9	4	12,592.0	3,148.0
2	Vinyl Chloride	75-01-4	7	732,446.2	104,635.2
3	Dichloroethane, 1,2-	107-06-2	5	966,000.0	193,200.0
4	Acrylonitrile	107-13-1	12	78,155.9	6,513.0
5	Ethylene Oxide	75-21-8	3	758.8	252.9
6	Bis(2-ethylhexyl)phthalate	117-81-7	77	17,852.8	231.9
7	Methylene Chloride	75-09-2	55	33,556.9	610.1
9	Ethyl Acrylate	140-88-5	4	129.0	32.3
10	Methyl tert-Butyl Ether (MTBE)	1634-04-4	3	153,400.0	51,133.3
12	Trichloroethylene	79-01-6	17	791.3	46.5
13	Atrazine	1912-24-9	12	475.0	39.6
16	Tetrachloroethylene	127-18-4	6	72.0	12.0
17	Chromium(VI)	1333-82-0 or 18540-29-9	162	6,046.2	37.3
18	Nickel Soluble Salts	7718-54-9 or 7440-02-0	212	377.1	1.8
19	Isophorone	78-59-1	5	141.2	28.2
21	Dichlorobenzene, 1,4-	106-46-7	1	3.0	3.0
23	Captan	133-06-2	2	155.0	77.5
24	Acrylamide	79-06-1	8	61.1	7.6
25	Dichlorvos	62-73-7	4	30.8	7.7
26	Formaldehyde	50-00-0	51	30,823.3	604.4
29	Chlorothalonil	1897-45-6	2	98.7	49.4
30	Hydroquinone	123-31-9	3	1.3	0.4
31	Arsenic	7440-38-2	4	8.0	2.0
33	Butadien, 1,3-	106-99-0	2	5,626.0	2,813.0
34	Benzene	71-43-2	6	6,270.6	1,045.1
36	Methanol	67-56-1	246	113,371.4	460.9
37	Ethylene Glycol	107-21-1	104	429,378.2	4,128.6
38	Propylene	115-07-1	7	2,390,970.3	341,567.2
39	Zinc (Metallic)	7440-66-6	189	33,882.4	179.3
40	Bisphenol A	80-05-7	7	90,318.4	12,902.6
41	~Lead and Compounds	7439-92-1	31	929.7	30.0
42	Phenol	108-95-2	25	10,933.2	437.3
43	Methyl Methacrylate	80-62-6	11	4,461.0	405.5
44	Styrene	100-42-5	33	22,842,644.6	692,201.4
45	Phthalic Anhydride	85-44-9	15	17,126.4	1,141.8
47	Phosphoric Acid	7664-38-2	82	1,955.0	23.8
48	Aluminum	7429-90-5	185	138,676.1	749.6
49	Vinyl Acetate	108-05-4	19	16,739.5	881.0
50	Ethyl Acetate	141-78-6	129	20,812.0	161.3
51	Isopropanol	67-63-0	118	45,006.5	381.4
52	Acrylic Acid	79-10-7	10	450.0	45.0
53	Methyl Ethyl Ketone (2-Butanone)	78-93-3	127	14,500.8	114.2
54	Xylene, Mixture	1330-20-7	179	857,330.2	4,789.6
55	Paraquat Dichloride	1910-42-5	1	10.0	10.0
56	Cyclohexanone	108-94-1	42	610.8	14.5

Table 5. Chemical use amounts of each listed chemical (Continued)

No.	Name of Chemical	CAS No.	No. of Factories	Total amount of chemicals used (t or kL)	Average amount of chemicals used (t or kL/factory)
57	Tin	7440-31-5	5	0.2	0.0
58	Pentane, n-	109-66-0	4	20,051.5	5,012.9
59	Epichlorohydrin	106-89-8	2	9,502.0	4,751.0
60	Acetone	67-64-1	168	58,913.2	350.7
61	Propylene Glycol	57-55-6	12	991.1	82.6
62	Ethylene Glycol Monobutyl Ether	111-76-2	53	4,797.3	90.5
63	Formic Acid	64-18-6	47	1,420.6	30.2
64	Hexane, N-	110-54-3	69	3,255,767.4	47,185.0
65	Isobutyl Alcohol	78-83-1	56	2,027.0	36.2
66	Hexanedioic Acid	124-04-9	8	1,290.6	161.3
68	Methylenediphenyl Diisocyanate	101-68-8	3	1,240.0	413.3
69	Maleic Anhydride	108-31-6	6	673.3	112.2
70	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	64	3,654.3	57.1
73	Diethylene Glycol Monobutyl Ether	112-34-5	2	2.2	1.1
74	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	5	50.6	10.1
75	Methyl Acrylate	96-33-3	4	49.2	12.3
76	Ametryn	834-12-8	1	70.7	70.7
80	Methyl Acetate	79-20-9	1	0.1	0.1
81	~Sodium Cyanide	143-33-9	72	74.1	1.0
82	Chlorpyrifos	2921-88-2	1	10.0	10.0
84	Carbon Disulfide	75-15-0	1	21,912.0	21,912.0
86	Propanil	709-98-8	6	464.5	77.4
89	Toluene	108-88-3	205	109,271.9	533.0
90	2,4-D-Butyl	94-80-4	6	225.8	37.6
91	Sodium chlorate	7775-09-9	2	0.4	0.2
92	Polyethylene glycol nonylphenyl ether	9016-45-9	9	109.4	12.2
93	Glyphosate-isopropylammonium	38641-94-0	1	341.0	341.0
96	Boron		188	4,298.5	22.9
97	Phosphorus pentoxide and other	1314-56-3	1	1.0	1.0
99	Manganese		14	1,106.2	79.0
102	Potassium chlorate	3811-04-9	7	6.2	0.9
104	Copper		93	9,532.0	102.5
105	Propion acid	79-09-4	1	10.0	10.0
108	Butachlor	23184-66-9	3	56.9	19.0
110	HCFC-141	25167-88-8	5	508.8	101.8
113	Malachite green chloride	569-64-2	1	2.6	2.6
total			3,353	32,584,411	9,718.0

Table 6. Ratio of chemical use amounts in each factory category

Cat. No.	Category name	DIW Code	Total amount of chemicals used (t or kL)				
			total	%	Cumulative %	% excluding Cat. No.6	Cumulative % excluding Cat. No.6
6	Chemical & Chemical products, Petroleum products	42-50, 89	32,461,801.8	99.6%	99.6%		
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	54,395.3	0.17%	99.8%	44.4%	44.4%
14	Transport equipment, excluding No.15	75-80, 100	40,103.6	0.12%	99.9%	32.7%	77.1%
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	10,308.7	0.032%	99.9%	8.4%	85.5%
2	Food, Beverage	4-8, 10-20, 90, 92	4,695.2	0.014%	99.96%	3.8%	89.3%
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	3,653.1	0.011%	99.97%	3.0%	92.3%
11	Basic metal products, Fabricated products	59-64, 104	2,170.1	0.0067%	99.98%	1.8%	94.1%
13	Electrical machinery and supplies	71-74, 81, 94, 107	2,047.2	0.0063%	99.98%	1.7%	95.7%
1	Basic agro-industry	1,2,9,21	1,484.0	0.0046%	99.99%	1.2%	96.9%
8	Plastic products	53	1,263.3	0.0039%	99.99%	1.0%	98.0%
7	Rubber products	51, 52	947.1	0.0029%	99.995%	0.77%	98.7%
10	Non-metallic products, excluding No.9	54-58	805.5	0.0025%	99.998%	0.66%	99.4%
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	482.8	0.0015%	99.999%	0.39%	99.8%
12	Machinery	65-70	145.7	0.00045%	99.9997%	0.12%	99.9%
16	Other manufacturing industry, factories related to waste	101, 105, 106	60.0	0.00018%	99.9999%	0.049%	99.96%
17	Other manufacturing industry, factories related to power plant	88	48.1	0.00015%	100%	0.039%	100%
total			32,584,411.4	100%			

Table 7. No. of Factories in Rayong under DIW Registration

Cat. No.	Category name	DIW Code	size of employee					size of HP					Type of Factory				
			≤20	21-50	>50	(blank)	Total	≤20	21-50	>50	(blank)	Total	Type 1	Type 2	Type 3	(blank)	Total
1	Basic agro-industry	1,2,9,21	233	11	5		249	211	11	27		249	211	11	27		249
2	Food, Beverage	4-8, 10-20, 90, 92	105	26	28	4	163	20	24	115	4	163	19	23	117	4	163
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	3	4	17	4	28	1		23	4	28		1	23	4	28
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	75	40	51	1	167	7	29	130	1	167	7	28	131	1	167
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	15	11	12	2	40	1	8	29	2	40		7	31	2	40
6	Chemical & Chemical products, Petroleum products	42-50, 89	57	52	88	37	234	22	5	170	37	234	6	9	182	37	234
7	Rubber products	51, 52	27	22	45	2	96		5	89	2	96		5	89	2	96
8	Plastic products	53	59	37	45	9	150	3	7	131	9	150		8	133	9	150
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3	76	4			80		1	79		80		1	79		80
10	Non-metallic products, excluding No.9	54-58	73	8	15	1	97	9	10	77	1	97	8	10	78	1	97
11	Basic metal products, Fabricated products	59-64, 104	112	65	92	21	290	2	33	234	21	290	1	33	235	21	290
12	Machinery	65-70	49	24	33	16	122		18	88	16	122		18	88	16	122
13	Electrical machinery and supplies	71-74, 81, 94, 107	17	19	36	11	83	4	8	60	11	83		10	62	11	83
14	Transport equipment, excluding No.15	75-80, 100	36	18	86	39	179	8	9	123	39	179	3	11	126	39	179
15	Transport equipment, factories engaged in servicing	95	36	8	3	1	48	2	27	18	1	48	2	27	18	1	48
16	Other manufacturing industry, factories related to waste	101, 105, 106	110	16	6		132	11	37	84		132	10	38	84		132
17	Other manufacturing industry, factories related to power plant	88	4	8	5	5	22	2		15	5	22		1	16	5	22
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	19	3	8	5	35	9	7	14	5	35	9	7	14	5	35
Total			1106	376	575	158	2215	312	239	1506	158	2215	276	248	1533	158	2215

Table 8. Ratio of Factories in Rayong under DIW Registration

Cat. No.	Category name	DIW Code	size of employee					size of HP					Type of Factory				
			≤20	21-50	>50	(blank)	Total	≤20	21-50	>50	(blank)	Total	Type 1	Type 2	Type 3	(blank)	Total
1	Basic agro-industry	1,2,9,21	93.6%	4.4%	2.0%		100%	84.7%	4.4%	10.8%		100%	84.7%	4.4%	10.8%		100%
2	Food, Beverage	4-8, 10-20, 90, 92	64.4%	16.0%	17.2%	2.5%	100%	12.3%	14.7%	70.6%	2.5%	100%	11.7%	14.1%	71.8%	2.5%	100%
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	10.7%	14.3%	60.7%	14.3%	100%	3.6%		82.1%	14.3%	100%		3.6%	82.1%	14.3%	100%
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	44.9%	24.0%	30.5%	0.6%	100%	4.2%	17.4%	77.8%	0.6%	100%	4.2%	16.8%	78.4%	0.6%	100%
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	37.5%	27.5%	30.0%	5.0%	100%	2.5%	20.0%	72.5%	5.0%	100%		17.5%	77.5%	5.0%	100%
6	Chemical & Chemical products, Petroleum products	42-50, 89	24.4%	22.2%	37.6%	15.8%	100%	9.4%	2.1%	72.6%	15.8%	100%	2.6%	3.8%	77.8%	15.8%	100%
7	Rubber products	51, 52	28.1%	22.9%	46.9%	2.1%	100%		5.2%	92.7%	2.1%	100%		5.2%	92.7%	2.1%	100%
8	Plastic products	53	39.3%	24.7%	30.0%	6.0%	100%	2.0%	4.7%	87.3%	6.0%	100%		5.3%	88.7%	6.0%	100%
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3	95.0%	5.0%			100%		1.3%	98.8%		100%		1.3%	98.8%		100%
10	Non-metallic products, excluding No.9	54-58	75.3%	8.2%	15.5%	1.0%	100%	9.3%	10.3%	79.4%	1.0%	100%	8.2%	10.3%	80.4%	1.0%	100%
11	Basic metal products, Fabricated products	59-64, 104	38.6%	22.4%	31.7%	7.2%	100%	0.7%	11.4%	80.7%	7.2%	100%	0.3%	11.4%	81.0%	7.2%	100%
12	Machinery	65-70	40.2%	19.7%	27.0%	13.1%	100%		14.8%	72.1%	13.1%	100%		14.8%	72.1%	13.1%	100%
13	Electrical machinery and supplies	71-74, 81, 94, 107	20.5%	22.9%	43.4%	13.3%	100%	4.8%	9.6%	72.3%	13.3%	100%		12.0%	74.7%	13.3%	100%
14	Transport equipment, excluding No.15	75-80, 100	20.1%	10.1%	48.0%	21.8%	100%	4.5%	5.0%	68.7%	21.8%	100%	1.7%	6.1%	70.4%	21.8%	100%
15	Transport equipment, factories engaged in servicing	95	75.0%	16.7%	6.3%	2.1%	100%	4.2%	56.3%	37.5%	2.1%	100%	4.2%	56.3%	37.5%	2.1%	100%
16	Other manufacturing industry, factories related to waste	101, 105, 106	83.3%	12.1%	4.5%		100%	8.3%	28.0%	63.6%		100%	7.6%	28.8%	63.6%		100%
17	Other manufacturing industry, factories related to power plant	88	18.2%	36.4%	22.7%	22.7%	100%	9.1%		68.2%	22.7%	100%		4.5%	72.7%	22.7%	100%
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	54.3%	8.6%	22.9%	14.3%	100%	25.7%	20.0%	40.0%	14.3%	100%	25.7%	20.0%	40.0%	14.3%	100%
Total			49.9%	17.0%	26.0%	7.1%	100%	14.1%	10.8%	68.0%	7.1%	100%	12.5%	11.2%	69.2%	7.1%	100%

Table 9. Ratio of No. of Factory in Rayong

Cat. No.	Category name	DIW Code	size of employee					size of HP					Type of Factory						
			≤20	21-50	>50	(blank)	Total	≤20	21-50	>50	(blank)	Total	Type 1	Type 2	Type 3	(blank)	Total	%	Cumulative %
11	Basic metal products, Fabricated products	59-64, 104	112	65	92	21	290	2	33	234	21	290	1	33	235	21	290	13.1%	13.1%
1	Basic agro-industry	1,2,9,21	233	11	5		249	211	11	27		249	211	11	27		249	11.2%	24.3%
6	Chemical & Chemical products, Petroleum products	42-50, 89	57	52	88	37	234	22	5	170	37	234	6	9	182	37	234	10.6%	34.9%
14	Transport equipment, excluding No.15	75-80, 100	36	18	86	39	179	8	9	123	39	179	3	11	126	39	179	8.1%	43.0%
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	75	40	51	1	167	7	29	130	1	167	7	28	131	1	167	7.5%	50.5%
2	Food, Beverage	4-8, 10-20, 90, 92	105	26	28	4	163	20	24	115	4	163	19	23	117	4	163	7.4%	57.9%
8	Plastic products	53	59	37	45	9	150	3	7	131	9	150		8	133	9	150	6.8%	64.7%
16	Other manufacturing industry, factories related to waste	101, 105, 106	110	16	6		132	11	37	84		132	10	38	84		132	6.0%	70.6%
12	Machinery	65-70	49	24	33	16	122		18	88	16	122		18	88	16	122	5.5%	76.1%
10	Non-metallic products, excluding No.9	54-58	73	8	15	1	97	9	10	77	1	97	8	10	78	1	97	4.4%	80.5%
7	Rubber products	51, 52	27	22	45	2	96		5	89	2	96		5	89	2	96	4.3%	84.8%
13	Electrical machinery and supplies	71-74, 81, 94, 107	17	19	36	11	83	4	8	60	11	83		10	62	11	83	3.7%	88.6%
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3	76	4			80		1	79		80		1	79		80	3.6%	92.2%
15	Transport equipment, factories engaged in servicing	95	36	8	3	1	48	2	27	18	1	48	2	27	18	1	48	2.2%	94.4%
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	15	11	12	2	40	1	8	29	2	40		7	31	2	40	1.8%	96.2%
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	19	3	8	5	35	9	7	14	5	35	9	7	14	5	35	1.6%	97.7%
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	3	4	17	4	28	1		23	4	28		1	23	4	28	1.3%	99.0%
17	Other manufacturing industry, factories related to power plant	88	4	8	5	5	22	2		15	5	22		1	16	5	22	1.0%	100%
Total			1106	376	575	158	2215	312	239	1506	158	2215	276	248	1533	158	2215	100.0%	

3) Amount of Chemical Handled

Categorizing factories based on their chemical use amounts, factories using 1t/chemical or more cover more than 60% of No. of factories. (See Table 10)

For a reference, in case of the first Japanese PRTR pilot project in 1997, 60% to 75% is considered as the target cover ratio of No. of factories. Also, no other country sets below 1 ton/chemical as the threshold excluding special chemicals such as CMRs, PBTs and so on. For the first pilot implementation of PRTR in Thailand, 1 ton/chemical shall be used for all substance to keep the system relatively simple.

So, 1 t would be reasonably considered as the reporting threshold for the amount of chemicals handled.

Table 10. Cover ratio of No. of Factories in each factory category

Cat. No.	Category name	DIW Code	Cover Ratio of No. of Factories							
			in factories using a chemical exceeding the following amount							
			≥0.5t	≥1t	≥5t	≥10t	≥50t	≥100t	≥500t	≥1000t
1	Basic agro-industry	1,2,9,21	87.5%	87.5%	75.0%	75.0%	62.5%	50.0%	12.5%	0%
2	Food, Beverage	4-8, 10-20, 90, 92	61.5%	55.2%	38.5%	28.1%	15.6%	11.5%	4.2%	0%
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	82.0%	73.8%	52.5%	37.7%	19.7%	14.8%	4.1%	2.5%
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	58.2%	50.8%	35.6%	29.4%	13.0%	7.9%	0%	0%
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	92.2%	91.1%	78.9%	70.0%	41.1%	32.2%	14.4%	7.8%
6	Chemical & Chemical products, Petroleum products	42-50, 89	83.3%	77.6%	58.8%	48.6%	27.9%	20.7%	10.9%	8.6%
7	Rubber products	51, 52	81.0%	73.8%	47.6%	31.0%	9.5%	7.1%	0%	0%
8	Plastic products	53	77.3%	72.7%	31.8%	27.3%	10.6%	6.1%	0%	0%
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3								
10	Non-metallic products, excluding No.9	54-58	50.0%	50.0%	33.3%	33.3%	33.3%	33.3%	0%	0%
11	Basic metal products, Fabricated products	59-64, 104	46.4%	31.9%	8.0%	5.4%	1.8%	1.1%	0%	0%
12	Machinery	65-70	86.7%	86.7%	33.3%	20.0%	6.7%	0%	0%	0%
13	Electrical machinery and supplies	71-74, 81, 94, 107	61.8%	50.0%	25.5%	19.1%	8.2%	4.5%	0%	0%
14	Transport equipment, excluding No.15	75-80, 100	48.7%	34.6%	16.7%	9.2%	1.8%	1.8%	1.8%	1.3%
15	Transport equipment, factories engaged in servicing	95								
16	Other manufacturing industry, factories related to waste	101, 105, 106	100.0%	100.0%	100.0%	100.0%	0%	0%	0%	0%
17	Other manufacturing industry, factories related to power plant	88	100.0%	100.0%	100.0%	100.0%	0%	0%	0%	0%
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	53.1%	34.4%	15.6%	15.6%	12.5%	6.3%	0%	0%
total			68.4%	60.6%	40.7%	32.1%	15.4%	10.0%	2.3%	0.5%

Table 11. Cover ratio of Chemical Use Amount in each factory category

Cat. No.	Category name	DIW Code	Cover Ratio of Chemical Use Amount in factories using a chemical exceeding the following amount							
			≥0.5t	≥1t	≥5t	≥10t	≥50t	≥100t	≥500t	≥1000t
1	Basic agro-industry	1,2,9,21	99.999%	99.999%	99.9%	99.9%	97.4%	92.6%	37.1%	0%
2	Food, Beverage	4-8, 10-20, 90, 92	99.9%	99.8%	99.1%	97.4%	93.1%	87.1%	53.2%	0%
3	Textile, Wearing apparel, Leather products & Footwear	22-33, 93, 98	99.96%	99.9%	99.4%	98.2%	93.1%	88.6%	65.8%	53.2%
4	Wood & Wood products, Furniture & Fixture	34-37, 83, 96	99.6%	99.4%	97.7%	95.4%	79.0%	64.1%	0%	0%
5	Paper & Paper products, Printing, Publishing, Allied products	38-41	99.999%	99.997%	99.9%	99.8%	98.8%	97.7%	89.7%	83.2%
6	Chemical & Chemical products, Petroleum products	42-50, 89	99.9998%	99.9996%	99.997%	99.99%	99.96%	99.9%	99.8%	99.7%
7	Rubber products	51, 52	99.8%	99.5%	96.6%	91.5%	72.0%	65.4%	0%	0%
8	Plastic products	53	99.7%	99.5%	93.8%	92.3%	71.6%	50.8%	0%	0%
9	Non-metallic products, factories related to rock, gravel, sand, or soil for construction	3								
10	Non-metallic products, excluding No.9	54-58	99.9%	99.9%	99.7%	99.7%	99.7%	99.7%	0%	0%
11	Basic metal products, Fabricated products	59-64, 104	98.4%	96.4%	87.5%	83.8%	70.5%	60.8%	0%	0%
12	Machinery	65-70	99.9%	99.9%	86.5%	75.8%	34.3%	0%	0%	0%
13	Electrical machinery and supplies	71-74, 81, 94, 107	99.8%	99.3%	95.9%	93.4%	78.4%	65.3%	0%	0%
14	Transport equipment, excluding No.15	75-80, 100	99.96%	99.9%	99.7%	99.4%	98.6%	98.6%	98.6%	96.8%
15	Transport equipment, factories engaged in servicing	95								
16	Other manufacturing industry, factories related to waste	101, 105, 106	100%	100%	100%	100%	0%	0%	0%	0%
17	Other manufacturing industry, factories related to power plant	88	100%	100%	100%	100%	0%	0%	0%	0%
18	Other manufacturing industry, excluding Nos. 16 and 17	82, 84-87, 91, 97, 99, 103	99.5%	98.7%	96.8%	96.8%	92.7%	69.6%	0%	0%
total			99.9996%	99.999%	99.99%	99.99%	99.9%	99.9%	99.7%	99.6%

5-2 Non-Factory Business

1) Type of Non-Factory Business

As for the non-factory business, point sources defined under MNRE can be referred to. Table 12 shows a summary of the non-factory business definition under MNRE. From the list, categories which may use few amounts of target chemical substances in a facility or unit can be excluded, but facilities related to waste disposal/management can be considered separately in the next section 5-3. From this point of view, categories related to housing, households, offices or similar activities and one's main pollutants of which are not chemical substances such as BOD, Total Nitrogen and etc. can be excluded; Condominium, Hotels, Dormitories, Massage parlors, Government offices, Department stores, Fresh food markets, Restaurants, Housing estate, Pig farm and Aquaculture.

So, non-factory businesses using chemical substances would be targeted as follows;

- Hospitals
- Schools, Colleges, Universities, or Institutes
- Gas station
- Bulk Gasoline Terminals

Out of four businesses mentioned above, it may be difficult for gas stations to estimate releases because most of them may not have technical staff in their stations. So, gas stations can be excluded from point sources.

Table 12. Non-factory Business Definition under MNRE

Type of standard	Type of business		No. of businesses in Rayong (2006)	Size category			
				Large <-	-> Small		
Effluent	Buildings	Condominium	1	500 units or more	From 100 to not greater than 500 units	Less than 100 units	
		Hotels	3	200 rooms or more	From 60 to not greater than 200 rooms	Less than 60 rooms	
		Dormitories	25	250 rooms or more	From 50 to not greater than 250 rooms	From 10 to not greater than 50 rooms	
		Massage parlors (or equivalent)	2	5,000 m2 or more	From 1,000 to not greater than 5,000 m2		
		Hospitals	11	30 beds or more	From 10 to not greater than 30 beds		
		Schools, Colleges, Universities, or Institutes	278	25,000 m2 or more	From 5,000 to not greater than 25,000 m2		
		Government offices, State enterprises, International agencies, Banks, and Office Buildings	68	55,000 m2 or more	From 10,000 to not greater than 55,000 m2	From 5,000 to not greater than 10,000 m2	
		Department stores	7	25,000 m2 or more	From 5,000 to not greater than 25,000 m2		
		Fresh food markets	27	2,500 m2 or more	From 1,500 to not greater than 2,500 m2	From 1,000 to not greater than 1,500 m2	From 500 to not greater than 1,000 m2
		Restaurants and food shops or food centers	40	2,500 m2 or more	From 500 to not greater than 2,500 m2	From 250 to not greater than 500 m2	From 100 to not greater than 250 m2
		Housing Estate	8	more than 500 units	100 units but not more than 500		
		Pig Farm	54	more than 600 Livestock Unit (LU, 1LU = 500 kg)	60 - 600 LU	6 - 60 LU	
		Gas Station	235				
Coastal Aquaculture	0						
Brackish Aquaculture	0						
Inland Aquaculture	0						
Type of standard	Type of business		No. of businesses in Rayong (2006)	Size category			
				Large <-	-> Small		
Emission	Municipal Waste Incinerators		0	more than 50 ton/day	1-50 ton/day		
	Infected Waste Incinerators		7				
	Bulk Gasoline Terminals		16				
	Crematory		9				

2) Size of Business

As for the size of business, some businesses have size categories under MNRE definition, and then the largest size category for each business would be targeted. It is because the largest size (Factory Type 3) is targeted for factories.

For businesses without size categories, two options can be considered;

- Option 1: All sizes of facility would be targeted; this means no threshold.
- Option 2: No. of employees can be used as a threshold.

Setting the threshold as “50 or more employees” which is the same number as Factory Type 3 may be too large since most of non-factory businesses listed in 1) have small numbers of employees. So, if No. of employees is set as the threshold, the number should be lower than 50; e.g. 21 employees or more which is the same number as Factory Type 2.

The pros and cons of Option 1 and 2 is as follows,

- Option 1: All sources can be covered, but No. of candidates for PRTR reporting may be too many and it may be difficult not only for small businesses to report PRTR data but also for governmental agencies to make them understand the PRTR system.

- Option 2: A reasonable size of business can be covered, but there is a possibility that data from sources large in emission but small in business will be missed. It may be difficult to identify targets for PRTR reporting, because, unlike the factories, no system for them to register No. of employees is available.

Considering the pros and cons mentioned above, Option 1 would be better in order for both the government side and the business side to avoid any confusion regarding differences between MNRE definition and PRTR definition.

Table 13 shows the summary of the thresholds regarding size of business for non-factory businesses.

Table 13. Thresholds for Non-factory Businesses

Type of Business	Thresholds (Size of Business)
Hospitals	30 beds or more
Schools, Colleges, Universities, or Institutes	25,000 m ² or more
Bulk gasoline terminals	All sizes

3) Amounts of Chemicals Handled

This threshold should be the same as the one for factories; 1 t/chemical or more would be the threshold.

5-3 Waste Disposal/Management Business

1) Type of Business and Target Chemical Substances to Be Reported

Waste disposal/management businesses do not use chemical substances intentionally, but emit some chemical substances through or after the treatments. So, definitions for these businesses should be considered separately from ones handling chemical substances mentioned in the previous sections; 5-1 for factories and 5-2 for non-factory businesses.

As for factories, only hazardous waste treatment facility with DIW codes 101, 105 and 106 would be targeted (non-hazardous waste businesses are not required to report).

On the other hand, for non-factory businesses, municipal waste incinerators and infectious waste incinerators and crematory would be considered.

In addition, target chemical substances to be reported from these businesses should be considered, because it is difficult to ask them to identify, monitor and report 107 target chemical substances released from their processes. So, as a first step, only target chemical substances listed under the regulations under MOI or MNRE should be reported by these businesses.

Tables 14-1 to 14-3 show summaries of target chemical substances under the regulations under MOI or MNRE.

In Table 14-3, Crematory is not required to report any target chemical substances under MNRE, and then this can be excluded at this moment.

Table 14-1. Target chemical substances for Hazardous Waste Disposal/Management Business (Factory: Air Emission)

DIW Code	Category		Sb	As	Cu	Pb	Xylene	SO2	NOx	Dioxin/ Furan
101	Central waste treatment plant	Central waste water treatment								
		Central waste incinerator	/	/	/	/	/	/	/	/
		Physical-chemical treatment	/	/	/	/	/	/	/	/
105	Factories related to sorting or landfilling of industrial wastes		/	/	/	/	/	/	/	/
106	Factories engaged in recycling of industrial wastes or used industrial products		/	/	/	/	/	/	/	/

Table 14-2. Target chemical substances for Hazardous Waste Disposal/Management Business (Factory: Release to Water)

DIW Code	Category		Cd	Pb	As	Cr	Ni	Cu	Zn	Mn	Cyanide	Form- aldehyde
101	Central waste treatment plant	Central waste water treatment	/	/	/	/	/	/	/	/	/	/
		Central waste incinerator										
		Physical-chemical treatment										
105	Factories related to sorting or landfilling of industrial wastes		/	/	/	/	/	/	/	/	/	/
106	Factories engaged in recycling of industrial wastes or used industrial products		/	/	/	/	/	/	/	/	/	/

Table 14-3. Target chemical substances for Waste Disposal/Management Business (Non-Factory: Air Emission)

Category	Cd	Pb	HF	SO2	NOx	Dioxin (PCDD/Fs)
Municipal Waste Incinerators				/	/	/
Infectious Waste Incinerators	/	/	/	/	/	/
Crematory (*)						

(*) Crematory is required to report opacity under MNRE regulation.

2) Size of Business

As for the size of business, Factory Type 3 can be referred to for factories (DIW Codes 101, 105 and 106) as same as factories handling target chemical substances. In addition, DIW Code 106 has the reporting threshold as 50 ton/day under DIW regulation. So, this also can be considered.

As for non-factory businesses, MNRE definition can be used for Municipal waste incinerators, but there is no threshold for Infectious waste incinerators, and then, similar to the thresholds mentioned in 2) of 5-2, all sizes of facility would be targeted.

Table 15 shows the summary of the thresholds regarding size of business for waste disposal/management businesses.

Table 15. Thresholds for Waste disposal/management Businesses

Type of Business		Thresholds (Size of Business)
Factory		
DIW code 101	Central waste treatment plant	Factory Type 3
105	Factories related to sorting or landfilling of industrial wastes	Factory Type 3
106	Factories engaged in recycling of industrial wastes or used industrial products	Factory Type 3 & 50 ton/day or more
Non-Factory		
Municipal waste incinerators		50 ton/day or more
Infectious waste incinerators		All sizes–

3) Amounts of Chemical Handled

This threshold cannot be set because waste disposal/management businesses do not use chemical substances intentionally.

6. Proposal

Summarizing Section 5, the following elements are proposed as the final draft of point source definition.

Table 16-1. Summary of the Proposal on the Point Source Definition: Factory & Non-factory Handling Target Chemical Substances

Factory	Type of Business			Size of Business
	Cat. No.	Category name	DIW Factory Code	
Factory	4	Wood & Wood products, Furniture & Fixture	34-37, 83,96	Type 3 (> 50 employees or > 50 HP)
	6	Chemical & Chemical products, Petroleum products	42-50, 89	
	7	Rubber products	51, 52	
	8	Plastic products	53	
	11	Basic metal products, Fabricated products	59-64, 104	
	13	Electrical machinery and supplies	71-74, 81, 94, 107	
	14	Transport equipment, excluding No.15	75-80, 100	
	Non-factory	Type of Business/Category name		
	Hospitals		30 beds or more	
	Schools, Colleges, Universities, or Institutes		25,000 m2 or more	
	Bulk gasoline terminals		All sizes–	
Amounts of Chemical Handled	1t/yr or more			

Table 16-2. Summary of the Proposal on the Point Source Definition:
Waste Disposal/Management Business

	Type of Business		Size of Business
	Category name	DIW Factory Code	
Factory	Central waste treatment plant	101	Type 3 (> 50 employees or > 50 HP)
	Factories related to sorting or landfilling of industrial wastes	105	
	Factories engaged in recycling of industrial wastes or used industrial products	106	Type 3 & 50 ton/day
Non-factory	Type of Business/Category name		Size of Business
	Municipal waste incinerators		50 ton/day or more
	Infectious waste incinerators		All sizes—
Amounts of Chemical Handled	None: Only target chemical substances regulated under MOI or MNRE shall be reported. (See Tables 14-1 to 14-3)		

Annex I Examples of thresholds for industrial activities and amounts of chemical released in E-PRTR¹

Activities

No	Activity	Capacity threshold
2.	Production and processing of metals	
(a)	Metal ore (including sulphide ore) roasting or sintering installations	*
(b)	Installations for the production of pig iron or steel (primary or secondary melting) including continuous casting	With a capacity of 2,5 tonnes per hour
(c)	Installations for the processing of ferrous metals: (i) Hot-rolling mills (ii) Smitheries with hammers (iii) Application of protective fused metal coats	With a capacity of 20 tonnes of crude steel per hour With an energy of 50 kilojoules per hammer, where the calorific power used exceeds 20 MW With an input of 2 tonnes of crude steel per hour
(d)	Ferrous metal foundries	With a production capacity of 20 tonnes per day
(e)	Installations: (i) For the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes (ii) For the smelting, including the alloying, of non-ferrous metals, including recovered products (refining, foundry casting, etc.)	* With a melting capacity of 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals
(f)	Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process	Where the volume of the treatment vats equals 30 m ³

Note: An asterisk (*) indicates that no capacity threshold is applicable (all facilities are subject to reporting).

¹ REGULATION (EC) No 166/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC

Pollutants

No	CAS No.	Pollutant (1)	Threshold for releases		
			to air kg/year	to water kg/year	to land kg/year
62	71-43-2	Benzene	1 000	200(as BTEX) (11)	200(as BTEX) (11)
63		Brominated diphenylethers(PBDE) (12)	- (2)	1	1
64		Nonylphenol and Nonylphenol ethoxylates (NP/NPEs)	- (2)	1	1
65	100-41-4	Ethyl benzene	- (2)	200(as BTEX) (11)	200(as BTEX) (11)
66	75-21-8	Ethylene oxide	1 000	10	10
67	34123-59-6	Isoproturon	- (2)	1	1
68	91-20-3	Naphthalene	100	10	10
69		Organotin compounds(as total Sn)	- (2)	50	50
70	117-81-7	Di-(2-ethyl hexyl)phthalate (DEHP)	10	1	1
71	108-95-2	Phenols (as total C) (13)	- (2)	20	20

Note: (1) Unless otherwise specified any pollutant specified in Annex II shall be reported as the total mass of that pollutant or, where the pollutant is a group of substances, as the total mass of the group.

(2) A hyphen (—) indicates that the parameter and medium in question do not trigger a reporting requirement.

(11) Single pollutants are to be reported if the threshold for BTEX (the sum parameter of benzene, toluene, ethyl benzene, xylenes) is exceeded

(12) Total mass of the following brominated diphenylethers: penta-BDE, octa-BDE and deca-BDE.

(13) Total mass of phenol and simple substituted phenols expressed as total carbon.

Annex II DIW Factory Code

The classification is based on the Ministerial Regulation 1992 (B.E. 2535) issued pursuant to the Factory Act 1992 (B.E. 2535)

1. Factories engaged in tea or tobacco preservation
2. Factories engaged in other agricultural produce
3. Factories related to rock, gravel, sand, or soil for construction
4. Factories related to animals other than aquatic animals
5. Factories related to milk and dairy products
6. Factories related to aquatic animals
7. Factories related to oil from plants or animals or animal fats
8. Factories related to vegetables, plant and fruits
9. Factories related to plant seeds or plant bulbs
10. Factories related to food from flour
11. Factories related to sugar made from sugar cane, beech, stevia or other sweetening plants
12. Factories related to tea, coffee, cocoa, chocolate or sweets
13. Factories related to food seasoning or food ingredients
14. Factory engaged in ice making, ice cutting, ice sawing, ice crushing or ice grinding
15. Factories engaged in animal feeds
16. Distilleries or liquor blending houses
17. Factories producing ethyl alcohol (excluded production from extracted sulfide for pulp mill)
18. Factories making liquor from fruits or other types of wine (excluded those related to malt and beer as per Factory Type 19)
19. Factories engaged in production of malts or beers
20. Factories making non-alcoholic drinks or soft drinks
21. Factories related to tobacco, compressed tobacco, pipe tobacco, chewing tobacco or snuff
22. Factories related to textiles, yarn, or fiber (excluded asbestos)
23. Factories related to textile products (excluded apparel)
24. Factories weaving fabric, lace or apparel with yarn or fiber, or bleaching and dyeing or finishing of fabric, lace or apparel woven with yarn or fiber
25. Factories making garments or carpets by means of weaving, intertwining,

embroidering, or interlacing (excluded those made of rubber or plastic which are not linoleums)

26. Factories related to ropes, meshes, fishnets, seines
27. Factories related to non-woven or non-knitted products
28. Factories related to apparel (excluded shoes)
29. Factories fermenting, eviscerating, roasting, pulverizing or grinding, tanning, polishing and finishing, embossing or paint-coating of animal hides
30. Factories combing, cleaning, bleaching, dyeing, polishing or dressing of fur
31. Factories making carpets or utensils from leather or fur
32. Factories manufacturing products or parts of products (excluded apparel or shoes)
33. Factories producing shoes or parts of shoes (which are not made of wood, skimmed block rubber, extruded rubber or extruded plastic)
34. Factories related to wood
35. Factories producing containers or utensils from bamboos, rattans, straws, reeds, or water hyacinths
36. Factories related to wood or cork products
37. Factories producing household furnishings or furniture for buildings from wood, glass, rubber, or metals (which are not extruded plastic), including their parts
38. Factories producing pulps or paper
39. Factories producing packages from all kinds of paper or from fiberboard
40. Factories related to pulps or cardboards
41. Factories engaged in printing, document file making, binding, making a cover or decorating printed matters, making metal mold
42. Factories related to chemical products, chemical substances, or chemical materials (which are not fertilizers)
43. Factories related to fertilizers or pesticides
44. Factories producing synthetic resin, elastomer, plastic, or synthetic fiber (which are not fiber glass)
45. Factories related to paints, varnishes, shellacs, lacquers, or patching or caulking products

46. Factories related to medicines
47. Factories related to soap, cosmetics, or body beautifications
48. Factories related to specified chemical products
49. Petroleum refinery
50. Factories related to petroleum, coal, or lignite products
51. Factories producing, repairing, retreading, or remolding inner or outer types for vehicles driven by machines, manpower, or animals
52. Factories related to rubber
53. Factories related to plastic products
54. Factories producing glass, fiberglass, or glassware
55. Factories producing porcelains, earthenware, ceramics, including their materials preparations
56. Factories manufacturing bricks, tiles or tubes for constructing metal crucibles, architectural terracotta, grooves in the furnace or chimney stacks or fireproof materials from clay
57. Factories related to cement, lime, or plaster
58. Factories related to non-metallic products
59. Iron and steel basic industries (smelting, melting, casting, rolling, drawing or producing of iron and steel)
60. Non-ferrous metal basic industries (smelting, melting, casting, rolling, drawing or producing of non-ferrous metals)
61. Factories manufacturing, embellishing, modifying, or repairing tools or devices made of iron or steel, including their components or equipment
62. Factories manufacturing, embellishing, modifying, repairing household furnishings or furniture for buildings that are made or mainly made of metal, including components or equipment
63. Factories related to metal products for construction or installations
64. Factories related to specified metal products
65. Factories manufacturing, assembling, modifying, or repairing engines, turbines, including their parts and equipment
66. Factories manufacturing, assembling, modifying, or repairing agricultural or animal husbandry machines, including their components or equipment
67. Factories related to machineries, machinery components or accessories for woodwork or metalwork

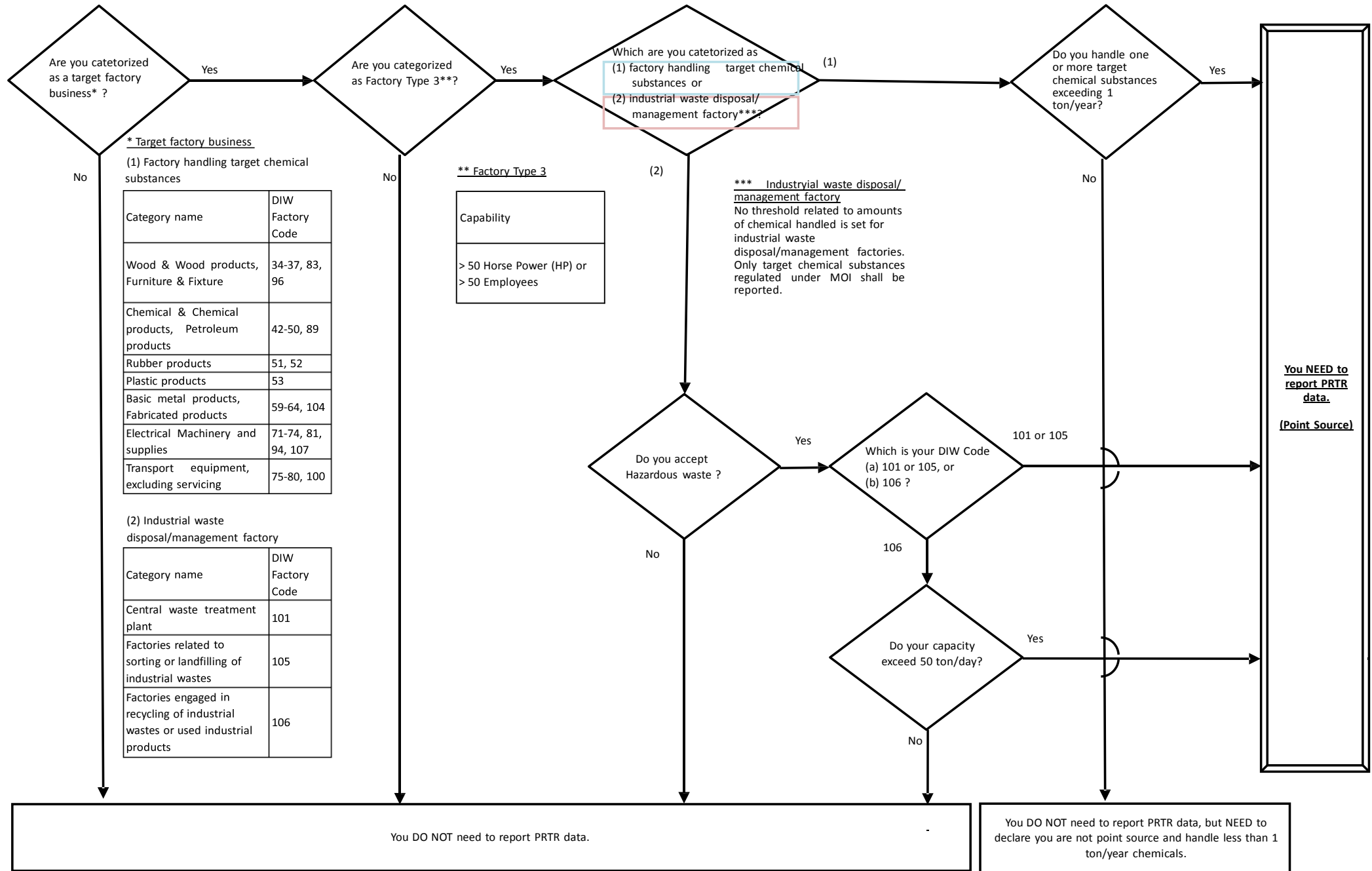
68. Factories manufacturing, assembling, modifying, or repairing machineries for paper industry, chemical industry, food industry, pipe production, printing, cement or clay productions, construction, mining, petroleum drilling or oil refinement, including their components or accessories
69. Factories producing, assembling, modifying, or repairing calculators, accounting machines, punching machines, digital or analog computers or associated electronic data processing equipment or accessories, typewriters, weighing machines (that are not used in the scientific laboratory), copiers (which are not the photocopiers), including their components or accessories
70. Factories producing conditioners or air ventilators, sprinklers, refrigerators or their components, vending machines, cleaning machines, washing machines, dry cleaning machines, ironing machines, sewers, mechanical transmitters, elevators, cranes, lifts, escalators, trucks, tractors, industrial trailers, stackers, furnaces, kilns, oven or stove that are not electrical-activated, including their components and equipment
71. Factories manufacturing, assembling, modifying, or repairing electric machineries or products listed in Factory Type 70, electric motors, electrical generators, transformers, electric switches or controls, electric panel instruments, electric diverters, electric transmitters, electric control machines, or electric welders
72. Factories manufacturing assembling, modifying, or repairing radio receivers, television receivers, transmitters or sound recorders, phonographs, dictation recorders, tape recorders, video players, video recorders, discs, recorded magnetic tapes, cord or cordless telephones and telegraphs, radio transmitters, television transmitters, transceivers or sensory devices, radars, semi-conductor or related sensitive semi-conductor devices, fixed or variable electronic capacitors or condensers, radiographic machines or radiographic tubes, fluoroscopic machines or fluoroscopic tubes, or X-ray machines or X-ray tubes, as well as manufacturing equipment for such electronic devices
73. Factories manufacturing, assembling, or modifying electric tools or utensils not listed in any sequence including their components or

equipment

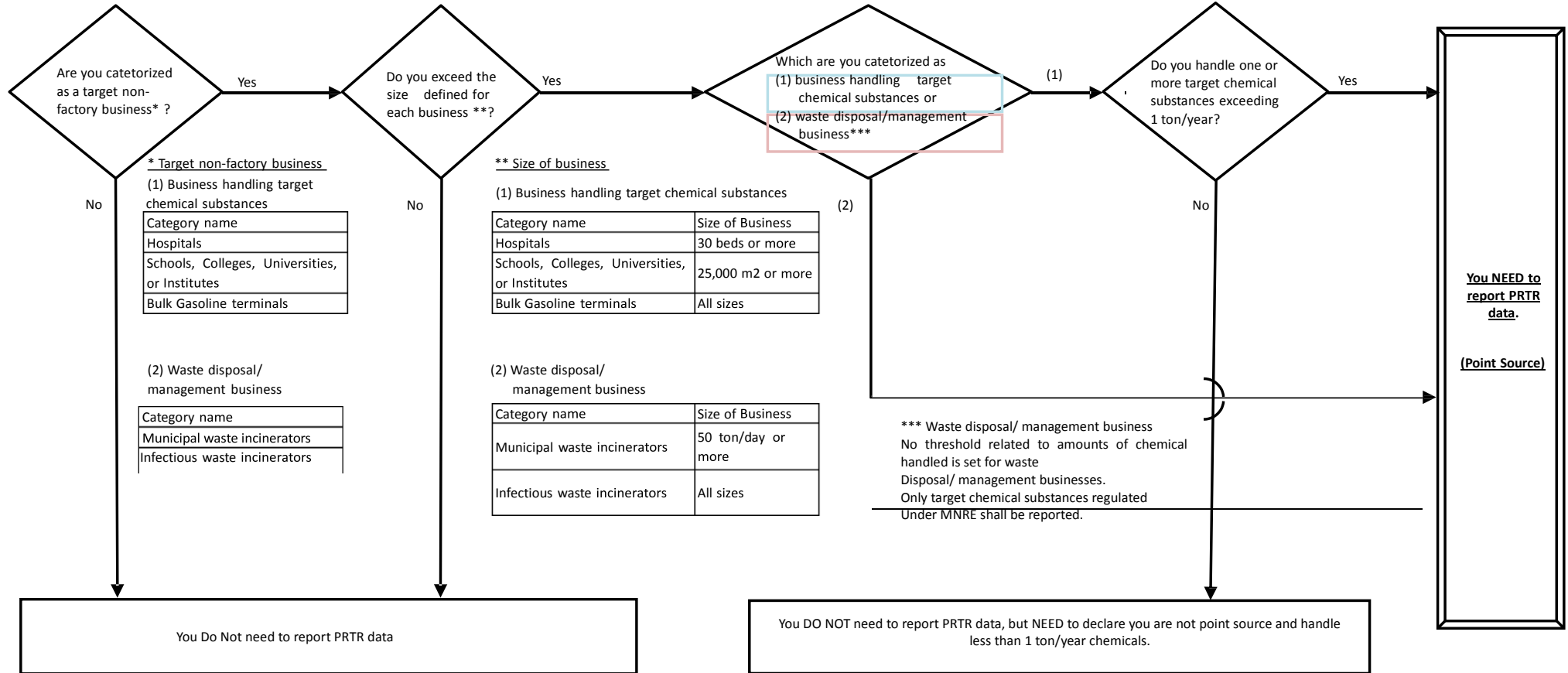
74. Factories related to specified electrical appliance or equipment
75. Factories related to ship or shipwork
76. Factories related to trains, streetcars, or cable cars
77. Factories related to automobiles or trailers
78. Factories related to motorcycles, tricycles or bicycles
79. Factories related to aircrafts or hovercrafts
80. Factories manufacturing, assembling, modifying, or repairing wheeled vehicles propelled by human or animal powers (that are not bicycles), including their components or equipment
81. Factories related to scientific or physical equipment or instruments
82. Factories manufacturing tools or instruments for eyes or visual acuity test, lenses, light-activated tools or instruments, or photocopiers
83. Factories producing or assembling timepieces or parts of watches or timepieces
84. Factories related to diamonds, precious stones, gold, silver, alloy of gold, silver, and copper, or gems
85. Factories producing or assembling musical instruments including their parts or components
86. Factories producing or assembling equipment or apparatus for sports, body exercise, billiard, bowling, fishing, as well as their parts or components
87. Factories related to playthings, tools or devices that are not listed in other Factory Types
88. Factories producing, transmitting, or distributing electrical power
89. Factories producing gas (which is not natural gas), transmitting, or distributing gas.
90. Factories supplying water, purifying water or distributing water to buildings or industrial facilities
91. Factories related to a packaging process (which does not involve any production process)
92. Cold or refrigerated storage
93. Shoes or leather repairing factory
94. Electrical appliances, domestic or personal appliances repairing factory

95. Factories engaged in servicing motor vehicles, trailers, tricycles, bicycles, or their components
96. Factories repairing clocks, timepieces, or accessories made of diamond, precious stone, gold, white gold, silver, alloy of gold, silver, and copper, or gems
97. Repairing factories (which are not mentioned in any Factory Type)
98. Factories for laundering, dry-cleaning, cleaning, ironing, pressing, or dyeing of apparel, carpet, or fur
99. Factories producing, repairing, modifying, or changing the form of firearms, ammunitions, explosives, weapons or other articles capable of killing, destroying or disabling in the same manner as firearms, ammunitions or explosives, including their components
100. Factories engaged in dressing or changing appearance of any product or its components (without any production involved)
101. Central waste treatment plant
102. Factories related to salt
103. Factories manufacturing, assembling, modifying, or repairing boilers or boiling container using liquid or gas to conduct heat, pressure vessels, including their components or equipment
104. Factories related to sorting or landfilling of industrial wastes
105. Factories engaged in recycling of industrial wastes or used industrial products
106. Factories making CDs, products for electronic data, sound, and image recording readable by a device requiring high-powered light sources such as laser, a disc, a magnetic picture recording tape, a magnetic sound recording tape, and a magnetic picture and sound recording tape, be it in the form of recorded products, re-recordable products, or non-recorded products

Flow Chart of Point Source Definition - Factory



Flow Chart of Point Source Definition - Non-factory



5. Basic paper for non-point source target selection

Basic Idea for the Definition of NPS

03 Feb, 2012 by JET Shirane

1. Preface

In the PRTR system, it is known that emissions from only point sources cannot always understand the current state of emissions of all chemicals. Since non-point sources (NPS) have a wide variety of category, it is necessary to make sure of the direction at the definition of NPS. In response with the proposal for the definition of point source (PS), the definition of NPS comes necessary. It is not too much to say that the quality of estimated results depends on the reliability of used data or references. Before the final definition of NPS, the basic idea of NPS is memorized to share the direction what are NPS.

2. Current State of NPS Disclosure in Other Countries

Many countries are carrying out PRTR or TRI system; however, there are various kinds of ideas on the publication of NPS emissions shown in Table 1. Only Japan publishes estimation results of NPS emissions for many numbers of chemical every year.

Table 1, Publication of NPS data in Japan, USA, EU and Australia

	Japan	USA	EU/E-PRTR	Australia
Publication of NPS Emissions	Results of compiled estimation by prefecture	No publication under TRI	Publication by gridded map	Results of estimation by state or sub-state (Not every year)
Estimated by	MOE/METI	---	Each country	States or sub-states
Targets	-Out of reporting in target categories - Non-target categories -Households -Mobile sources	(by NEI) -Small size of PS -NPS of Agriculture or wild fire -Mobile sources	(Under CLRTAP and UNFCCC) -Transport -Non-industrial combustion -Non-covered industrial by E-PRTR -Agriculture	-Non-manufacturing; transport -Household activities; lawn mowing -Commercial activities; bakery -Non-reporting business
Number of substance	462 (354 until fy2009)	(NEI) To Air: 7 ^{a)}	(Under the above Conventions) To Air: 6 ^{b)} To Water: 2 ^{c)}	To Air: 90 To Water: 2 ^{c)} + Metals in some parts
Estimation Methods	22 estimation methods	---	---	21 NPS emission manuals + 93 estimation method manuals

a) CO, NO_x, SO_x, VOC, PM_{2.5}, PM₁₀, NH₃

b) CO, CO₂, NO_x, SO₂, PM₁₀, NH₃

c) N, P

3. Basic idea for target chemical substances for NPS

Basic idea of chemical substances included in the categories of non-point sources is thinkable like followings:

- (1) Chemical substances of which emission amounts are supposed large
- (2) Chemical substances with high toxicity and possibility to be released into the environment
- (3) Chemical substances not to be covered by the PS definition
- (4) Chemical substances of which information on activity data and emission factors to estimate emissions is available in Thailand.

4. Consideration

- (1) Large emission amounts

Examples of results of estimation in Japan ranked by emission amount are shown in Table 2. Wide-used 2 chemicals of toluene and xylenes are in a different class, and several chemicals from mobile sources and from households follow. The ratios of emissions from NPS in 14 of top 23 chemicals are occupied more than 97%. It is supposed that large emission amounts would be probably found also in Thailand as NPS emissions; in particular agricultural chemicals, components of paints, surfactants from households, and VOCs and aldehydes from mobile sources.

<Table 2, See at the end of document>

In the next place, there is a unique list shown in Table 3 for the estimation of emissions of volatile organic compounds (VOCs) in paints or cleaning solvents used in car repairing factories in Bangkok, surveyed in 2005. These data were taken at the project done by DIW and JETRO to take any technical measures to the largest number of claims from citizens in Bangkok. Released amounts of chemicals into air were estimated by multiplying the used amount of paints or thinner, in 110 of 1305 car repairing factories in the Bangkok Metropolitan Area (BMA), by the composition rate of each VOC described in MSDS of the said product. Paints and thinners used in target factories in BMA included 53 chemicals from MSDS information. Table 3 shows that large amount of chemicals were released into air from such small in size as a car repairing factory; the released amount of toluene (2,205t/y in BMA) is considerably large. In Rayong Province the similar emissions are easily supposed.

Table 3, Example of estimated amounts of top 15 VOCs from car repairing factories in BMA

No	Chemicals	CAS No.	Estimated Amounts released into air in Bangkok (t/y)
1	Toluene	108-88-3	2,205
2	Butyl acetate	123-86-4	1,501
3	Methanol	67-56-1	803
4	Acetone	67-64-1	632
5	Xylenes	1330-20-7	609
6	Ethylbenzene	100-41-4	267
7	Isobutyl acetate	110-19-0	200
8	2-Methoxy-methylethyl acetate	108-65-6	166
9	1-Methoxy-propanol acetate	41448-83-3	144
10	Styrene	100-42-5	135
11	1,2,4-Trimethylbenzene	95-63-6	109
12	Ethyl 3-ethoxypropionate	763-69-9	99
13	Amyl acetate	628-63-7	76
14	2-Butoxyethyl acetate	112-07-2	64
15	Methyl isobutyl ketone	108-10-1	63

[extracted from “JETRO, Research Report for Building a Database of VOCs (in Japanese)”, Mar 2006]

Table 4, Top 20 imported agricultural chemicals in BE 2552

No.	Common Name	Type	Quantity (kg)	Value (THB)	Active ingredient (kg)
148	glyphosate isopropylammonium	Her.	47,807,190	2,750,144,563	23,391,839
203	paraquat dichloride	Her.	22,202,740	2,163,858,736	10,765,455
7	2,4-D sodium salt	Her.	3,567,800	300,940,833	3,390,770
147	glyphosate acid	Her.	2,690,000	327,449,280	2,555,500
22	atrazine	Her.	2,795,820	330,594,369	2,351,788
4	2,4-D dimethyl ammonium	Her.	3,894,762	117,874,497	1,833,147
52	butachlor	Her.	2,074,546	211,709,133	1,812,748
18	ametryn	Her.	1,601,600	262,459,012	1,281,856
73	chlorpyrifos	Ins.	1,294,998	210,213,097	1,105,658
120	fenobucarb	Ins.	1,105,200	109,993,839	1,055,330
101	diuron	Her.	1,204,790	188,089,448	963,832
173	mancozeb	Fun.	1,192,758	149,438,447	934,460
226	propanil	Her.	891,381	113,809,733	835,742
64	cartap hydrochloride	Ins.	1,372,616	270,983,536	755,540
6	2,4-D isobutyl ester	Her.	830,350	65,880,897	703,474
86	cypermethrin	Ins.	770,390	239,246,605	677,220
261	thiourea	PGR.	670,500	36,228,930	663,795
185	methomyl	Ins.	1,159,450	303,928,405	662,338
250	sulfur	Fun.	782,375	34,088,390	625,900
14	alachlor	Her.	783,759	73,324,616	538,983

(2) High Toxicity

The Department of Agriculture (DOA) publishes the amounts of agricultural chemicals imported shown partly in Table 4. DOA updates every year within 3-4 months after the end of target period. These agricultural chemicals are not produced in Thailand and are not used in manufacturing factories. Since these agricultural chemicals have various kinds of toxicity, target chemicals in the list were extracted from higher exposure risk by calculating with each unit risk. Thus, all of listed agricultural chemicals shall be included in target chemicals of NPS.

At another JICA project for the development of environmental and emission standards of VOCs in Thailand, the emission inventory for 7 toxic chemicals of benzene, 1,3-butadiene, vinyl chloride, 1,2-dichloroethane, trichloroethylene, tetrachloroethylene and dichloromethane has been reported. Some of reported values are shown in Table 5. The results of emission inventory tell us that such toxic chemicals as benzene, trichloroethylene and tetrachloroethylene seem to be released into air from mobile sources, electronics and machinery industries, Tetrachloroethylene is emitted from dry cleaning industry and carcinogenic benzene is released also from gas stations in storage facilities.

Table 5, Emission inventory for 7 toxic chemicals

Chemicals	Estimated emissions by emission source (t/y)									Total
	Mobile sources	Storage facilities	Industrial combustion	Chemicals factories	Electronics factories	Machinery factories	Auto/Auto parts factories	Dry cleaning	Others	
Benzene	1,588	323	122						1	2,048
1,3-Butadiene	371		0.2						0	2,651
Vinyl chloride				116					0	116
1,2-Dichloroethane				275					2	277
Trichloroethylene				39	2,156	4,933	494		17	7,639
Tetrachloroethylene						5		1,205		1,210
Dichloromethane				78	4,261	36	763		445 ^{a)}	5,583

Note a) 432 t/y from paint remover

[Extracted from “Report on The Development of Environmental and Emission Standards of Volatile Organic Compounds (VOCs)” from PCD (PCD 03-101 ISBN 9789742866907) and “Report on 3rd phase Emission Inventory, Output No. 9, Project for Development of Environmental and Emission

(3) Non-covered by PS

As shown in Table 2, there are so many chemicals of which NPS distribution is much larger than PS. Also in the case of imported agricultural chemicals, the PS definition cannot cover these chemicals because agricultural chemicals are not generally used at the manufacturing site.

On the other hand, DIW made an investigation in 2004 to analyze used chemicals and the amount of used chemicals in factories registered to DIW. From the investigation, it is known that 81 out of 113 target chemicals were used (Table 6, see the end of the document), which means 32 of 113 chemicals were not used in factories. Five chemicals were less than 1t/y, and 15 chemicals were less than 10t/y at the averaged used amounts, respectively. The used amount of these chemicals may not be reported.

There are some business types not to be included in PS categories due to small in size, which are textile, paper & paper products, printing and publishing. The emissions from those business types need to be counted as emissions from NPS.

Unintentionally produced substances are also included in this category.

- Polychlorinated dioxins (PCDDs)
- Polychlorinated furans (PCDFs)
- Polychlorinated biphenyls (PCBs)
- Hexachlorobenzene (HCB), pentachlorobenzene
- PAHs

It is, however, far from enough emission data or monitoring data on the above mentioned chemicals to estimate. It is better to begin estimation as NPS after obtaining more reliable data.

A synthetic pyrethroid is a main insecticide for home use in Thailand, and it can be a target from households.

(4) Availability of data used for estimation

It is necessary to investigate in details for the availability of activity data and emission factors. Chemical substances with less information at the time shall not be estimated until reliable data are surely obtained. Unfortunately, as of Jan 31 2012, most of information on

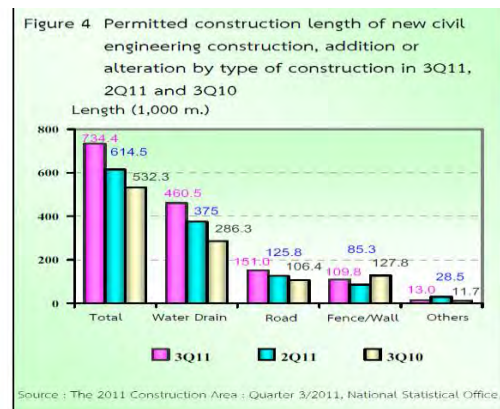
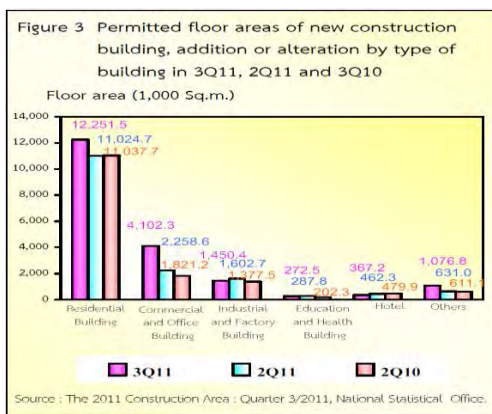
data availability in Thailand is not made clear; what kinds of statistics are published, who are publishers, or how much frequency are data updated, and emission factors for mobile emissions have not been provided sufficiently.

Information on the chemical composition of products such as MSDS is the one of the most important data as well as in PS. The availability of information on the composition of chemicals in Thailand may be difficult due to no regulation on issuing MSDS to the producers of chemicals.

JICA expert team, therefore, will request “Data Survey of Statistics and Emission Factors to Estimate Emissions form Non-Point Sources” in advance to fix the definition of NPS if available early in the next fiscal year, probably May to June 2012. Methodology for the estimation differs from available data.

We can know how much amount of any agricultural chemical is imported to Thailand. If the used amount in a year is the same as that of imported in the same period, and if the emission factor to land is put at 100%, emission amount to land in this country can be estimated. However, our purpose is to estimate at the unit of district. To allocate used amount of agricultural chemicals, statistics of agriculture can make help. If chemical is used for vegetable, the planted or harvest area of vegetable in province or district of interest is useful.

Permitted floor areas of new construction building or construction length of new civil engineering construction reported by the National Statistical Office Thailand (TNSO) in the below figures seem to be useful to allocate nationwide data for paints to provinces or districts, if raw data of province or each district can be obtained. However, if we cannot obtain those data in each local area, we need to change the kind of index to allocate.



5. Direction

Target categories and chemicals in NPS are considered in Table 9. Some names of chemical will be changed depending on the data survey.

Table 9, Target categories and chemicals for the present

	Categories	Target Chemicals
1	Mobile sources	benzene, toluene, xylenes, styrene, 1,3-butadiene, formaldehyde, acetaldehyde, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene (ethylbenzene is better to be target)
2	Agriculture	All of proposed agricultural chemicals
3	Construction including civil engineering	toluene, xylenes, acetone, methanol, ethyl acetate, methyl acrylate, ethyl acrylate, vinyl acetate, methyl methacrylate, butylphthalate, bis(2-ethylhexyl)phthalate, ethylene glycol, chromium (VI) compounds, lead and its compounds (ethylbenzene is better to be target)
4	Households	1,4-dichlorobenzene in repellents poly(oxyethylene)=nonylphenyl ether in detergents insecticides for hygiene/unpleasant pest, termite (Agricultural chemicals used in home gardens will be summed up in the category of "Agriculture")
5	Small businesses in target categories	BTEX from gas stations Volatile chemicals from car repairing factories Tetrachloroethylene from dry cleaning industry

Table 2, Example data of NPS emissions (Japan PRTR fy2009)

PRTR No.	PRTR Chemicals Name	Estimated Releases of NPS (t/y)					Emissions (t/y)		Percentage (%)	
		PS but small	Non-Target Business Types ^{a)}	House-holds	Mobile Sources	NPS total	PS	PS+NPS	PS	NPS
227	toluene	8,998	9,406	310	31,631	50,345	71,146	121,491	59	41
63	xylene	6,041	21,710	755	18,961	47,466	32,507	79,973	41	59
307	poly(oxyethylene)alkyl ether (alkylC=12-15)	739	5,483	22,506		28,728	106	28,834	0	100
24	n-alkylbenzenesulfonic acid and its salts (alkylC=10-14)	3,061	1,693	10,889		15,643	18	15,662	0	100
85	chlorodifluoromethane; HCFC-22	3,710	8,341	815		12,865	301	13,166	2	98
40	ethylbenzene	1,940	5,059	208	5,125	12,332	13,649	25,981	53	47
140	p-dichlorobenzene	0	11	11,925		11,936	31	11,968	0	100
299	benzene	118	779	69	9,127	10,093	807	10,900	7	93
137	1,3-dichloropropene; D-D		9,624			9,624	6	9,629	0	100
310	formaldehyde	276	148	105	8,349	8,878	243	9,121	3	97
214	chloropicrin		6,730			6,730	1	6,731	0	100
132	1,1-dichloro-1-fluoroethane; HCFC-141b	3,201	116	782		4,098	580	4,678	12	88
11	acetaldehyde	0	39	400	3,173	3,612	99	3,711	3	97
180	Dazomet	0	3,268			3,268	0	3,268	0	100
224	1,3,5-trimethylbenzene	540	397	25	1,984	2,946	1,092	4,037	27	73
268	1,3-butadiene	0	34	85	2,722	2,841	102	2,942	3	97
43	ethylene glycol	1,691	696	77		2,464	1,212	3,676	33	67
50	Mancozeb	0	2,237			2,237	0	2,237	0	100
16	2-aminoethanol	841	89	1,249		2,179	68	2,247	3	97
166	N,N-dimethyldodecylamine N-oxide	960	75	839		1,873	1	1,874	0	100
177	styrene	6	73		1,588	1,667	2,161	3,828	56	44
304	boron and its compounds	1,293	4	0		1,298	2,980	4,277	70	30
145	dichloromethane	1,289				1,289	13,474	14,763	91	9
	Total of above 23 chemicals	34,706	76,010	51,038	82,659	244,412	140,582	384,994	37	63
	% of 23 in 354 chemicals	86%	87%	96%	99%	92%	80%	87%		
	All of 354 chemicals	40,391	87,357	53,335	83,820	264,903	176,110	441,013	40	60

a) Agriculture, Forestry, Fishery, Construction, Civil engineering, etc

Table 6, Used amounts of target chemicals in factories, by DIW in 2004

No.	Name of Chemical	CAS No.	Number of Factories	Total amount of chemicals used (t or kL)	Averaged amount of chemicals used (t or kL/factory)
44	Styrene	100-42-5	33	22,842,645	692,201
38	Propylene	115-07-1	7	2,390,970	341,567
3	Dichloroethane, 1,2-	107-06-2	5	966,000	193,200
2	Vinyl Chloride	75-01-4	7	732,446	104,635
10	Methyl tert-Butyl Ether (MTBE)	1634-04-4	3	153,400	51,133
64	Hexane, N-	110-54-3	69	3,255,767	47,185
84	Carbon Disulfide	75-15-0	1	21,912	21,912
40	Bisphenol A	80-05-7	7	90,318	12,903
4	Acrylonitrile	107-13-1	12	78,156	6,513
58	Pentane, n-	109-66-0	4	20,051	5,013
54	Xylene, Mixture	1330-20-7	179	857,330	4,790
59	Epichlorohydrin	106-89-8	2	9,502	4,751
37	Ethylene Glycol	107-21-1	104	429,378	4,129
1	Propylene Oxide	75-56-9	4	12,592	3,148
33	Butadien, 1,3-	106-99-0	2	5,626	2,813
45	Phthalic Anhydride	85-44-9	15	17,126	1,142
34	Benzene	71-43-2	6	6,271	1,045
49	Vinyl Acetate	108-05-4	19	16,739	881
48	Aluminum	7429-90-5	185	138,676	750
7	Methylene Chloride	75-09-2	55	33,557	610
26	Formaldehyde	50-00-0	51	30,823	604
89	Toluene	108-88-3	205	109,272	533
36	Methanol	67-56-1	246	113,371	461
42	Phenol	108-95-2	25	10,933	437
68	Methylenediphenyl Diisocyanate	101-68-8	3	1,240	413
43	Methyl Methacrylate	80-62-6	11	4,461	406
51	Isopropanol	67-63-0	118	45,007	381
60	Acetone	67-64-1	168	58,913	351
93	Glyphosate-isopropylammonium	38641-94-0	1	341	341
5	Ethylene Oxide	75-21-8	3	759	253
6	Bis(2-ethylhexyl)phthalate	117-81-7	77	17,853	232
39	Zinc (Metallic)	7440-66-6	189	33,882	179
50	Ethyl Acetate	141-78-6	129	20,812	161
66	Hexanedioic Acid	124-04-9	8	1,291	161
53	Methyl Ethyl Ketone (2-Butanone)	78-93-3	127	14,501	114
69	Maleic Anhydride	108-31-6	6	673	112
104	Copper		93	9,532	102
110	HCFC-141	25167-88-8	5	509	102
62	Ethylene Glycol Monobutyl Ether	111-76-2	53	4,797	91
61	Propylene Glycol	57-55-6	12	991	83
99	Manganese		14	1,106	79
23	Captan	133-06-2	2	155	78
86	Propanil	709-98-8	6	464	77
76	Ametryn	834-12-8	1	71	71
70	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	64	3,654	57
29	Chlorothalonil	1897-45-6	2	99	49
12	Trichloroethylene	79-01-6	17	791	47
52	Acrylic Acid	79-10-7	10	450	45

13	Atrazine	1912-24-9	12	475	40
90	2,4-D-Butyl	94-80-4	6	226	38
17	Chromium(VI)	1333-82-0 or 18540-29-9	162	6,046	37
65	Isobutyl Alcohol	78-83-1	56	2,027	36
9	Ethyl Acrylate	140-88-5	4	129	32
63	Formic Acid	64-18-6	47	1,421	30
41	Lead and Compounds	7439-92-1	31	930	30
19	Isophorone	78-59-1	5	141	28
47	Phosphoric Acid	7664-38-2	82	1,955	24
96	Boron		188	4,298	23
108	Butachlor	23184-66-9	3	57	19
56	Cyclohexanone	108-94-1	42	611	15
75	Methyl Acrylate	96-33-3	4	49	12
92	Polyethylene glycol nonylphenyl ether	9016-45-9	9	109	12
16	Tetrachloroethylene	127-18-4	6	72	12
74	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	5	51	10
55	Paraquat Dichloride	1910-42-5	1	10	10
82	Chlorpyrifos	2921-88-2	1	10	10
105	Propion acid	79-09-4	1	10	10
25	Dichlorvos	62-73-7	4	31	8
24	Acrylamide	79-06-1	8	61	8
21	Dichlorobenzene, 1,4-	106-46-7	1	3	3
113	Malachite green chloride	569-64-2	1	3	3
31	Arsenic	7440-38-2	4	8	2
18	Nickel Soluble Salts	7718-54-9 or 7440-02-0	212	377	2
73	Diethylene Glycol Monobutyl Ether	112-34-5	2	2	1
81	Sodium Cyanide	143-33-9	72	74	1
97	Phosphorus pentoxide and other	1314-56-3	1	1	1
102	Potassium chlorate	3811-04-9	7	6	1
30	Hydroquinone	123-31-9	3	1	0
91	Sodium chlorate	7775-09-9	2	0	0
80	Methyl Acetate	79-20-9	1	0	0
57	Tin	7440-31-5	5	0	0
Total			3,353	32,584,411	9,718

6. Risk communication policy paper

**Basic design on promoting the Risk Communication
regarding PRTR system in Thailand
(Draft ver. 1)**

**September 2012
JICA Expert Team**

1. Background

In recent days, public tend to request industry the information of the industry activity by right-to know, however industry would not disclose their information in a positive way. In the case of communication failure between industry and public, the trust was lost and only conflict would be last for many years.

The case of Map Tah Put is most famous pollution issue in Thailand. There are another polluted area that will have same problem as Map Tah Put which are Samutprakan province and Samutsakorn province. The pollution problem in Thailand is increasing to southern part of nation.

The above case seems like unavoidable problem when the agricultural area growth toward to industrializing rapidly. The base of these problems is chemical emission to environment from industry, however the communication failure between company and community people worsen the situation.

There are not so much severe victims like Japanese Minamata disease in Map Tah Put. However, there are some factors in Thailand's pollution issues.

- 1) Original community people around the Map Tah Put are mainly farmer and fisher, and distrust to company people (no information and lie).
- 2) Company influenced specified community person by money and it caused segmentation of the community.
- 3) Company brought many another province people as employee and it also caused decoupling the community.

As mentioned above, the cause of the Map Tah Put case is not only chemical hazard problem but also social problem.

2. Implementation of PRTR system and Risk Communication

Thailand government, PCD, DIW and IEAT are now planning the implementation of PRTR system. Under the PRTR system, industry will report their chemical emission data to the government, and the government should disclose the data to public. It is very important issue to mature the confidence between industry and community people before the disclosing the data.

In the existing PRTR system of OECD countries, the risk communication on the PRTR chemical has been regarded with significant concern.

The ways to promote two-way communications include:

- Approach A: Brochures and written leaflets,
- Approach B: Internet website materials,

- Approach C: Public presentations and discussions,
- Approach D: Exhibitions, educational fairs, participation in science centers, visits to schools,
- Approach E: Inspection tours of facilities (open houses, special events in-house, etc.),
- Approach F: Citizen consensus conferences.

(Ref. OECD GUIDANCE DOCUMENT ON RISK COMMUNICATION FOR CHEMICAL RISK MANAGEMENT, 2002, partially modified)

These activities may be controlled under PCD/DIW/IEAT and DEQP including financial and legislative supports.

Table 1 shows the matrix of activities and each stakeholder responsibilities.

Table 1. Activities and competent authorities (draft)

Activities	PCD	DIW	IEAT	DEQP
Approach A: Brochures and written leaflets	O	(O)	(O)	
Approach B: Internet website materials	O	(O)	(O)	
Approach C: Public presentations and discussions	O	(O)	(O)	
Approach D: Exhibitions, educational fairs, participation in science centers, visits to schools	O	(O)	(O)	
Approach E: Inspection tours of facilities (open houses, special events in-house, etc.)	(O)	O	O	
Approach F: Citizen consensus conferences	O	(O)	(O)	
Training of supporter for above activities.				O

The meeting between industry and community people (above approach C~F) will be promoted by two different steps.

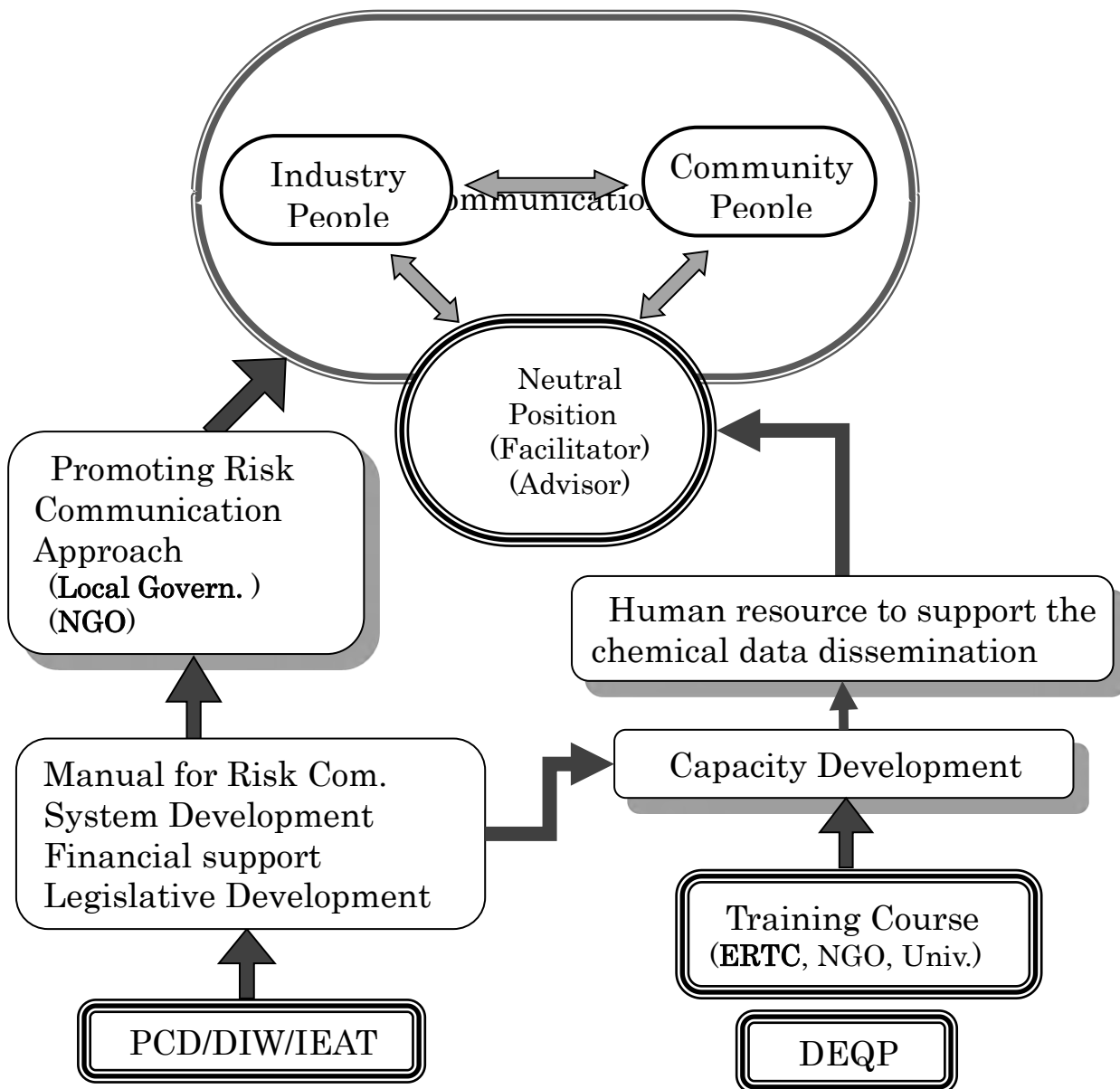
One is making the plan to promote the meeting by the staff of local government or NGO.

Another is capacity building of supporter who can manage the meeting from the neutral position when the meeting was held. There are three types of supporter such as “Facilitator”, “Chemical Advisor” and “Moderator”. The role of Facilitator is to arrange the discussion and make it smoothly avoiding conflict, and the training of “Facilitator” may be controlled under DEQP, ERTC.

The registration and certification of “Chemical Advisor” may be managed under PCD and/or DIW and/or Academic authorities (ex. Chulaborn Research Institute, National Institute of Health, etc.).

These activities may be correlated each other, and can not work well on themselves own. The capacity development to support the risk communication about chemical risk is most important issue for PRTR system.

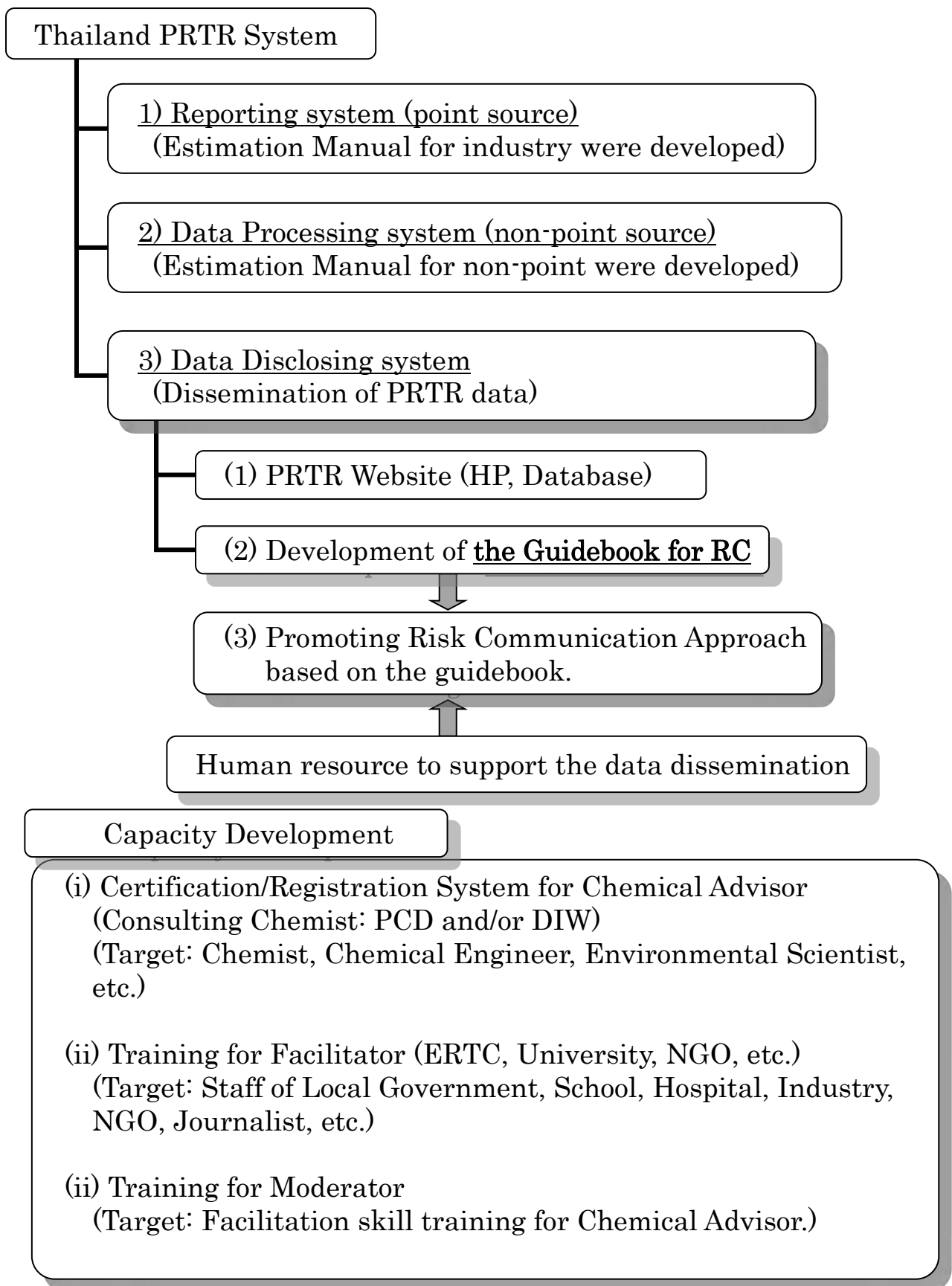
Image of Promoting the Risk Communication in Thailand



[Risk Communication Approach]

- Approach A: Brochures and written leaflets,
 - Approach B: Internet website materials,
- Approach C: Public presentations and discussions,
- Approach D: Exhibitions, educational fairs, participation in science centers, visits to schools
- Approach E: Inspection tours of facilities (open houses, special events in-house, etc.),
 - Approach F: Citizen consensus conferences.

Whole Scheme of PRTR System and the Role of Risk Communication



[Definition]

- (1) Chemical Advisor (consulting chemist);
who has well knowledge about chemicals, toxicity of chemicals, methods of risk analysis (assessment), fate of chemicals in the environment, PRTR system and the estimation method, and so on.

(Target: Chemist, Chemical Engineer, Environmental Scientist, etc.)

- (2) Facilitator;
who has well knowledge about PRTR system, target chemicals and target categories, PRTR data estimation method, and have skill to promote the meeting between the industry and community people, in proper manners
knowledge about the chemicals to understand the meaning of the question when people made a question about chemicals.

(Target: Staff of Local Government, School, Hospital, Industry, NGO, Journalist, etc.)

- (3) Moderator;
who has well knowledge on the chemicals and its risk, and who can manage the meeting between industry and peoples
in
proper manners, and act like a chair-person and make a summery
of meeting, and so on.

(Target: Chemical Advisor who is trained for facilitation skill.)

[The Contents of Guidebook/Handbook for PRTR (Draft image)]

1. Outline of the PRTR system
 - 1.1 Target sources (point source, non-point source)
 - 1.2 Target chemicals
 - 1.3 General Principal of emission estimation methods

2. Responsibility of each stakeholder
 - 2.1 Government (central, local)
 - 2.2 Industry
 - 2.3 Community, NGO
 - 2.4 Media
 - 2.5 Academic party (University, Institute, etc.)

3. Better way to explain the PRTR data
 - 3.1 Key points of making materials for PRTR data disclosure
 - 3.1.1 Writing and leaflets
 - 3.1.2 Internets
 - 3.1.3 Public seminar/presentations

 - 3.2 Key points of the meeting for PRTR data explanation
 - 3.2.1 Identifying the stakeholders
 - 3.2.2 Advertising methods
 - 3.2.3 Setting the meeting
 - 3.2.4 Conducting the meeting
 - 3.2.5 Better way to do easy explaining

- Appendix 1. Chemical Fact Sheet (datasheet of chemical properties, toxicities, handling methods, etc. of PRTR target chemicals).

- Appendix 2. Method of Risk Assessment of PRTR chemicals.

- Appendix 3. Method of Risk Analysis using PRTR data.

- Appendix 4. FAQ (Frequently-asked questions) and better answers to explain the chemical risk with scientifically correct manner.

**11.4. Annex 4 : Implementation plan for PRTR system
in Thailand**

**Implementation plan for
PRTR system in Thailand**

February 2016

**Pollution Control Department
Department of Industrial Works
Industrial Estate Authority of Thailand**

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1 Regulatory arrangement

To secure the sustainability of PRTR system, the system shall be legal regulation.

1.1 Revision of the Enhancement and Conservation of the National Environmental Quality Act (The Environment Act) B.E. 2535

The Environment Act shall be revised to include PRTR as a new tool for environmental management. The brief system design and objective shall be described in the Act, and the authority to implement the system shall be given to MONRE/PCD. Detail of the system can be described in Ministerial Notification.

1.2 Ministerial notification under the Factory Act. B.E.2535

Ministerial Notification under the Factory Act shall be issued to make industry reporting of PRTR as legal obligation. Detail of such Notification shall be in coordination with the Notification at MONRE side.

1.3 Voluntary arrangement under Eco Industrial Town Program

Eco Industrial Town Program at Department of Industrial Works and Industrial Estate Authority of Thailand is aiming to develop better relationship between industrial establishment and the nearby community through environmental improvement. To measure the impact of such program, satisfaction of the people is one of the direct item.

Information disclosure is one critical item which lead to the satisfaction of the people. In this regards, it is recommended to integrate PRTR as an essential item in Eco Industrial Town Program.

Integration of PRTR into the program does not mean the system is legal obligation, but on voluntary basis it will be mandatory in the selected area. If the PRTR become the legal obligation through revision of the Environmental Act, and notification under the Factory Act, still this integration shall contribute to the higher reporting percentage from the industry side.

2 Institutional arrangement

Below arrangement for institutional set up shall be formalized by means of “Prime Minister’s office Rule and Regulation”. To seek this end, below arrangement shall be discussed and approved by PRTR subcommittee, Pollution Control Committee and then National Environmental Board. Pollution Control Department shall take leading role for the task.

2.1 Principle implementation agency:

Pollution Control Department, Ministry of Natural Resource and Environment

- Responsible for overall implementation of PRTR coordination among the stakeholders.
- Responsible overall for non-point source, and collection, compilation of all PRTR data.
- Responsible for point source from hospital, school and bulk gasoline terminal, and non-DIW registered waste management facility.
- Responsible for data disclosure and risk communication, periodical review and update of PRTR.

2.2 Co-implementation agencies:

Department of Industrial Works, Ministry of Industry

(Responsible for point source and non-point source in industrial sector)

- Responsible for overall for industrial point sources. Especially for those factory outside of Industrial Estate.
- Responsible for awareness raising, training, data validation, audit of industrial point sources.
- Responsible for non-point source estimation for industrial SMEs.

Industrial Estate Authority of Thailand

(Responsible for point source within Industrial Estate)

- Responsible for overall for industrial point sources in cooperation with DIW. Especially for those factory inside of Industrial Estate.
- Responsible for awareness raising, training, data validation, audit of industrial point sources inside Industrial Estate.

2.3 Supporting agencies

Ministry of Transport

(Responsible for non-point source estimation of mobile source)

- Estimation of mobile source will be implemented in cooperation with Pollution Control Department.
- Task for Ministry of Transport shall be to provide traffic volume data of the province under PRTR, while Pollution Control Department shall provide emission factor for target substance from mobile source and calculate release data.

Ministry of Agriculture

(Responsible for non-point source estimation of agriculture)

- Estimation of agriculture will be implemented in cooperation with Pollution Control Department.
- Task for Ministry of Agriculture shall be to provide application rate data of target substance as AI (Active Ingredients) for different crop types, area of plantation crops, while Pollution Control Department shall calculate release data.

Ministry of Energy

(Responsible for non-point source estimation of gas station)

- Estimation from gas station will be implemented in cooperation with Pollution Control Department.
- Task for Ministry of Energy shall be to provide gasoline/ gasohol/ diesel distribution data and compositional data of fuel.
- Pollution Control Department shall calculate the release data.

Ministry of Public Health

(Responsible for point/non-point source estimation of hospitals)

- Estimation from hospital will be implemented in cooperation with Pollution Control Department.
- Task for Ministry of Public Health shall be to provide utilization data of target substance in those facilities and size of hospital (number of bed).
- Pollution Control Department shall calculate release data. Ministry of Public Health is also responsible for guiding hospitals to report PRTR data, if it is in point source category.

Thailand Paint Manufacturer's Association(TPMA)

(Responsible for non-point source estimation of paint/construction)

- Estimation from paint/construction will be implemented in cooperation with Pollution Control Department.
- Task for TPMA shall be to provide shipment data of paint and compositional data of the paint for various demands area.
- Pollution Control Department shall calculate release data.

2.4 Local agencies

Local agencies shall cooperate in all area of PRTR implementation with PCD, DIW and IEAT. More specifically, their role will be as follows;

Provincial government

- Provincial government shall take coordination role of the activities as described below for other provincial organization. Those are implementation of risk communication and awareness raising activity, promotion of PRTR reporting from factories outside of Industrial Estate.

Provincial Natural Resources and Environment Office

- Provincial Natural Resources and Environment Office shall take leading role in implementation of risk communication and awareness raising activity

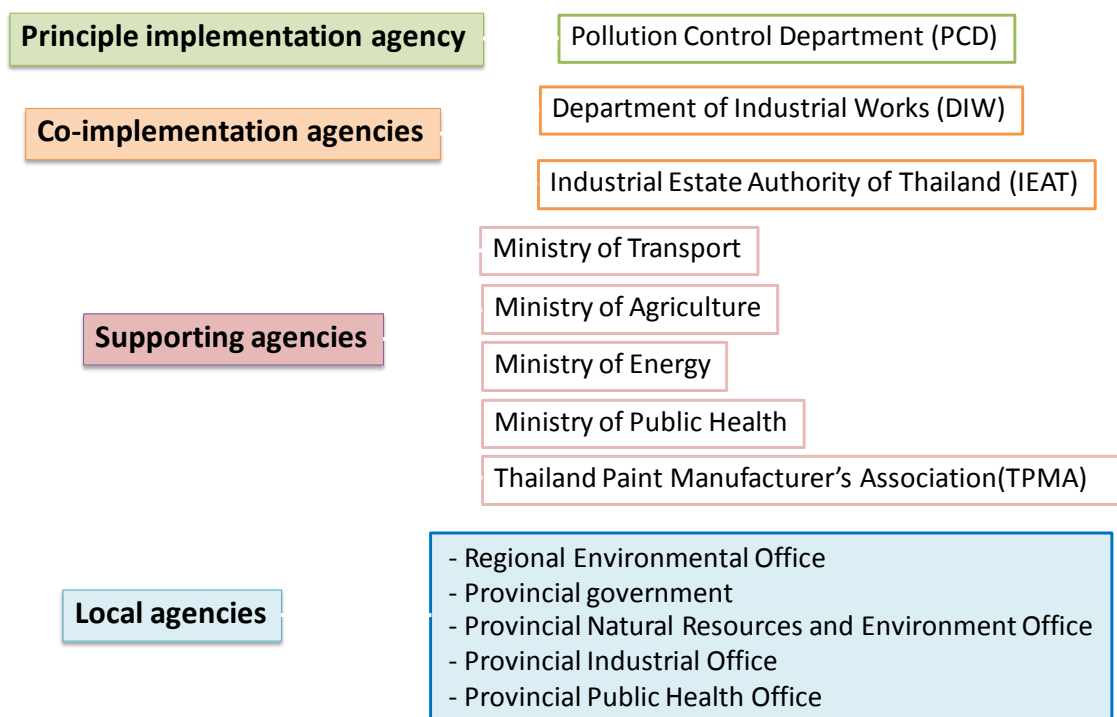
Provincial Industrial Office

- Provincial Industry Office shall assist DIW in promoting PRTR reporting from factories outside of Industrial Estate.

Provincial Public Health Office

- Provincial Public Health Office shall assist Provincial Office of Natural Resources and Environment in area of risk communication as well as awareness raising activity.

Institutional set up for PRTR Implementation



3. Recommended action for continuation and expansion of pilot project

3.1. Awareness raising

Precondition of successful PRTR implementation is good awareness in general public. For this purpose, awareness raising activity shall be organized ahead of time. Pollution Control Department shall take this responsibility.

Means of awareness raising can be various, including but not limited to followings.

- Through WEB site
- Provision of printed material
- Article in journal/magazine/newspaper
- Organization of information seminar/workshop

The activity shall start immediately in 2016 and continued up to 2020.

3.2. Continuation of pilot at Rayong

Pilot at Rayong shall be continued in order not to lose the momentum in each factories who have submitted PRTR report. To prepare PRTR report, each factory spent considerable effort in awareness raising inside, data collection, and release/transfer estimate and report preparation. It is not so difficult to continue the reporting once such practice is done. On the other hand, long time gap may cause such experience to vanish inside the factory and reactivation will become difficult task.

The activity shall start as soon as possible and Jan. – Dec. 2015 period shall be reported.

3.3. Expansion to other provinces

Pilot activity shall be expanded to other provinces on step by step basis. By expanding the area which may have different characteristic of industry, further knowledge and experience on PRTR and its adaptability in Thailand will be obtained.

Following provinces shall be considered for priority for expansion.

- | | |
|------------|--|
| Priority 1 | Chonburi, Samut Prakarn,
Pilot in the provinces shall start in 2017. |
| Priority 2 | Nontaburi, Pathum Thani, Ayutaya, Lumphoon
Pilot in the provinces shall start in 2018 |

3.4. Requirement to start PRTR in new province

PRTR implementation requires considerable cost and manpower at both public and private sector. Necessity to apply PRTR in certain province shall be considered carefully. For example, if there is no significant industry in the province, immediate need for PRTR may be questionable. Also PRTR implementation, especially awareness raising and risk communication, requires considerable input and manpower at local government side. To secure the effort, willingness and commitment of the local government shall be confirmed.

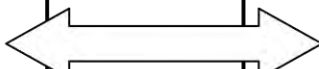
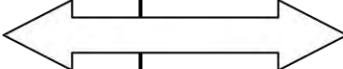
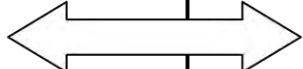

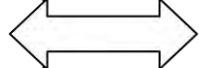

Consultation with local government is recommended before the expansion to new provinces.

3.5. Tasks

When implementing PRTR in new provinces, task phased in pilot in Rayong shall be utilized. They are following.

- Phase I Awareness raising

- Phase II Training to point sources
- Phase III Implementation support
- Phase IV Reporting and data compilation
- Phase V Data disclosure and risk communication
- Phase VI Feedback

	1 st year	2 nd year	3 rd year	4 th year	
Phase I Awareness raising to all stakeholders					
Phase II Training (Estimation and Reporting method) to Point Sources					
Phase III Implementation and Support to point sources					
Phase IV Reporting and compilation					
Phase V Disclosure and Risk communication					
Phase VI Feedback					

Task and action for each phase is summarized in below table.

Phase I Awareness raising to all stakeholders	
Step 1 (Duration 3 months)	
Action No.1	Organize workshop for Local government and municipalities
Action No.2	Organize workshop for IEAT officers
Action No.3	Organize workshop for Industrial Park/Land/Zone officers
	A workshop for each implementation sector will be organized at the pilot province selected. A workshop will be half day or one day. Target participant and topics covered will be as follows.

	<p>Target participant Focal point officers from each implementation sectors</p> <p>Content of the workshop</p> <ul style="list-style-type: none"> ■ Introduction of PRTR system ■ Target chemical substance and its selection criteria/process ■ Point source definition (who to report) ■ Coverage of non-point source activity ■ Pilot Project Implementation plan ■ Risk communication – introductory training – ■ Discussion session ■ Next step <p>Lecturer will be from PRTR implementation team (PCD/DIW/IEAT).</p>
Step 2 (Duration 6 month depending on industry size)	
Action No.4	Organize workshops for Point Sources (industry, etc.) at each sub-district office or municipalities
Action No.5	Organize workshops for Industry at each Industrial Estate office.
Action No.6	Organize workshops for Industry at each Industrial Park/Land/Zone office.
	<p>Series of workshops for each implementation sector will be organized at Rayong. A workshop will be half day or one day. Target participant and topics covered will be as follows.</p> <p><u>For local government sector:</u> Target participant : Community /resident and point sources in the area.</p> <p><u>For Industrial Park/Zone/land sector and IEAT sector:</u> Target participant: Factories (as point sources) in the area</p> <p>Content of the workshop</p> <ul style="list-style-type: none"> ■ Introduction of PRTR system ■ Target chemical substance and its selection criteria/process ■ Point source definition (who to report) ■ Coverage of non-point source activity ■ Pilot Project Implementation plan ■ Risk communication – introductory training – ■ Discussion session ■ Next step <p>Lecturer will be basically from PRTR implementation team (PCD/DIW/IEAT), but also from focal point officers when possible.</p>

1.1. Phase II Training (Estimation and Reporting method) to Point Sources (Duration 6 months)	
Action No.7	Organize workshops for Point Sources (industry, etc.) at each sub-district office or municipalities
Action No.8	Organize workshops for Industry at each IE office.
Action No.9	Organize workshops for Industry at each Industrial Park/Land/Zone office.
	<p>Series of workshops for each implementation sector will be organized at Rayong. A workshop will be half day or one day. Target participant and topics covered will be as follows.</p> <p><u>For local government sector:</u> Target participant : Point sources in the area (those who are confirmed as point sources).</p> <p><u>For Industrial Park/Zone/land sector and IEAT sector:</u> Target participant: Factories (as point sources) in the area</p> <p>Content of the workshop</p> <ul style="list-style-type: none"> ■ Review of PRTR introduction ■ Method of release estimation ■ Introduction of industry specific estimation manual ■ Implementation support plan ■ Discussion session ■ Next step <p>Lecturer will be basically from PRTR implementation team (PCD/DIW/IEAT), but also from focal point officers when possible.</p>
1.2. Phase III Implementation and Support to industry (Duration 1 year)	
Action No.10	Provision of model study for reference
	When new industrial sector is included in the point source, model study shall be implemented to provide estimation method specific to the sector. PRTR team, more specifically DIW, is going to implement model study
Action No.11	Provision of model study for reference at small industry (as non-point source)
	Those small factories outside of point source definition will be considered as non-point source and their release of chemical will be estimated in total. For this reasons, PRTR team, more specifically DIW, is going to implement model study The result will be used to estimate their emission as non-point sources.
Action No.12	Provision of consultant advice to point sources/factories

	In addition to providing industry specific estimation manual and model study, consultant advice will be provided on individual basis. For this reason, PRTR team is going to engage with local engineering/consultant firm to provide such service to the point sources/factories. Currently approx. 50 factories will be the target number for this consulting advice.
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1.3. Phase IV Reporting and compilation (Duration 9 months)	
Action No.13	Monitoring of point sources reporting
	Factory and other business defined as point source shall make report as per requested format to either IEAT office (if they are inside IEAT) or to DIW. If the factory and other business who meets the criteria of point source but not for chemical amount handled criteria shall also submit the statement of non-point source. Focal points officer shall monitor the progress of such reporting.
Action No.14	Data collection for non-point sources
	PRTR team will collect the data necessary to estimate the emission from non-point sources. Separate implementation plan for non-point source shall be prepared.
Action No.15	Compilation of the data
	Data reported from point sources as well as data estimated for non-point source will be reviewed and compiled by PRTR team. Detail to be discussed.

1.4. Phase V Disclosure and Risk communication (Duration 6 months)	
Action No.16	Data disclosure at web site
Action No.17	Various information dissemination activities
Action No.18	Risk communication meeting.

1.5. Phase VI Feedback (Duration 3 months)	
Action No.19	Questionnaire survey for feedback from all stakeholders.

3.6. Time frame

Approximate task schedule during 2016-2020 was summarized in the table below.

PRTR Implementation Plan in Thailand					
Action	2016	2017	2018	2019	2020
Legal and Regulatory Arrangement					
Drafting revision of the Environmental Act	→				
Approved by the Parliament		→			
Drafting and Issuing Ministerial Notification under the factory Act.		→			
Drafting and Issuing Ministerial Notification under the Environment Act		→			
Notifications in effect					→
Integration to Eco Industrial Town Program		→			
Institutional Arrangement					
Approval at PRTR subcommittee	→				
Approval an PCC	→				
Approval at NEB		→			
Prime Minister Office Rule and Regulation		→			
Field activities					
Awareness raising	→				
Continuation of pilot at Rayong	→				
Expansion to Chonburi		→			
Expansion to Samut Prakarn		→			
Expansion to Pathum Thani			→		
Expansion to Ayuttaya			→		
Expansion to Lamphun			→		

Attachment

Future NPS estimation of emissions

Future NPS estimation of emissions

02 Sep 2015 by PCD NPS TF & JICA Expert Team

1. Summary of estimation of emissions from NPS

(1) Preface

In this document, non-point sources except SME are discussed, in which the number of target category is 7 shown below:

- Non-Target Business Type (2); Agriculture, Construction (Paint)
- Non-Factory (3); Hospital, Schools/Institutes, Gas station
- Mobile Sources (Automobiles, Motorcycles)
- Households

In principle, an equation shown below is used to calculate emissions from NPS.

$$[\text{NPS Emissions}] = [\text{Activity Data}] \times [\text{Emission Factor (EF)}]$$

And, flow diagrams of estimation are not changed as described in the pilot implementation plan.

(2) Method Selection

In the pilot implementation, bottom-up methods were used to estimate emissions from NPS in many categories due to the lack of usable EFs. Since EFs unavailable before the start of the pilot implementation had been prepared with some outsourced surveys, we can use the top-down-methods in all categories, if the EFs obtained in those surveys are reasonable to be applied to the next opportunities. However, EF values are easily changeable dependent on the change of composition ratios and so on, so we make some proposal on the maintenance of activity data and EFs for the future opportunity to estimate emissions from NPS.

2. Expansion to other provinces

At estimating in other provinces, activity data at target areas shall be used, and EFs used at the pilot implementation can be applied to target areas.

- In Agriculture, since the Japan concept of ratio of pesticide (active ingredient) release to land 100% is not acceptable in Thailand, any studies are necessary to know the distribution ratios to each medium (air, water, soil). And, it is said that the relation of agricultural chemicals and the types of crop is different from the area, so any survey at new target areas is necessary.
- Also in Mobile sources, it takes cost to collect traffic data at new target areas.
- Activity data for Construction, Households, Hospitals, Schools, and Gas station can be obtained through free charge ways.

Table 1 Activity data and EFs if expanding to other areas

NPS Categories	Activity Data	EFs
Agriculture	Needs to study on distribution ratios to each medium (air, water, soil). Also needs distribution indicators at target areas	
Construction/Paints	Distribution indicators (construction statistics) at target areas	The same as in Rayong Province
Mobile Sources	New survey for traffic data* at target areas	The same as in Rayong Province
Households	The number of house at target areas	The same as in Rayong Province
Hospitals	The number of bed at target areas	The same as in Rayong Province
Schools, Institutes	The number of student at target areas	The same as in Rayong Province
Gas Station	Sold volume of fuel in the target areas shall be used	Correction by ambient temperature

*) traffic data = (a) VKT, (b)/the number of vehicle, (c) vehicle type distribution, (d) vehicle age distribution, (e) fuel type distribution

3. Annual estimation

If continuing estimation only in Rayong Province; we can apply the same EFs as the pilot implementation, and the latest statistics shall be used as activity data. In Mobile sources, it is better to raise the contribution of motorcycles more by additional traffic information.

Table 2 Used activity data and EFs if continuing estimation in Rayong Province

NPS Categories	Activity Data	EFs
Agriculture	The latest statistics	The same as in Rayong Province
Construction/Paints	Correction of shipping volume and distribution indicators by the economic growth	The same as in Rayong Province
Mobile Sources	Additional survey for traffic data on MC. Correction of traffic volume and VKT by some indicator	The same as in Rayong Province
Households	The latest statistics	The same as in Rayong Province
Hospitals	The latest statistics	The same as in Rayong Province
Schools, Institutes	The latest statistics	The same as in Rayong Province
Gas Station	The latest statistics	The same as in Rayong Province

4. Improvement of estimation methods

EFs used in the pilot implementation are not always usable for a long time. Here, in most of categories, it is recommended to review EFs every 5 years and/or at every event something changed, but there is no scientific reason how every years EF values should be changed in many cases. And, if having enough budgets, it is also recommended to revise current EFs by not waiting 5 years, because in some categories the number of example was too small to make use of EFs for some years.

Table 3, Frequency of the review of EFs in the future

NPS Categories	Frequency of the review of EFs
Agriculture	Every 2 years according to the change of component ratios of agricultural chemicals
Construction/Paints	Every 5 years by component ratios
Mobile Sources	Every 5 years or at the revision of fuel-regulation by experiments at AEL
Households	In future every 5 years by any survey, but currently better to have new surveys
Hospitals	In future every 5 years, but currently better to have new surveys
Schools, Institutes	In future every 5 years, but currently better to have new surveys
Gas Station	Composition ratios of fuels by outsourced analysis every 5 years. At the opportunity of the revision of fuel regulation

Note:

- 1) It is necessary to pay attention to revise "Check Sheet for the Estimation of Emissions from NPS" according to the revision of AD or EF.
- 2) TPMA calculate the emissions from the use of paints in the whole country, so TF shall distribute calculated emissions to target district using construction statics.
- 3) Collaboration with other organizations may lead to lower cost and higher precision.