Environmental Responsibility of Small and Medium Enterprises (SMEs) and Stakeholder Influences: The Case Study of Water Pollution in Thailand

Kanokkarn Tevapitak

(APPENDICES)

Appendices

Table of Contents

Tables and Figures

Figures

Appendix 1: Data from the fieldwork, its sources of information and establishment of indicators

This part presents sources, establishment and raw data of each underlying factor of polluting entrepreneurs, local government and local community.

The Enterprise

Table 1.1
The Detail of Business, Location and Size of Enterprises

Case	Business	Location	Size	Case	Business	Location	Size
1	Coconut peel	Bangkok	Micro	16	Rice mill	Chacherngsao	Small
2	Preserved vegetable	Bangkok	Small	17	Rice mill	Chacherngsao	Small
3	Pork ball	Bangkok	Small	18	Glucose	Nakornpathom	Medium
4	Syrup	Bangkok	Micro	19	Rice mill	Nakornpathom	Small
5	Tofu	Bangkok	Micro	20	Ethyl alcohol	Ayudhaya	Medium
6	Boiled bean	Bangkok	Micro	21	Rice grain oil	Ayudhaya	Medium
7	Seafood	Bangkok	Me-dium	22	Rice mill	Ayudhaya	Small
8	Preserved squid	Bangkok	Micro	23	Starch	Nakornrat-chaseema	Medium
9	Preserved fruit	Bangkok	Micro	24	Starch	Nakornrat-chaseema	Medium
10	Coconut juice	Bangkok	Micro	25	Starch	Nakornrat-chaseema	Large
11	Soft drink	Bangkok	Large	26	Soft drink	Nakorn-ratchaseema	Small
12	Chicken	Bangkok	Large	27	Ice cream	Nakornrat-chaseema	Small
13	Cut fish	Chacherng-sao	Small	28	Bread	Nakornrat-chaseema	Small
14	Cut fish	Chacherng-sao	Small	29	Starch	Nakornrat-chaseema	Large
15	Rice mill	Chacherng-sao	Small	30	Sugar	Nakornrat-chaseema	Large

External Economic Factors

Table 1.2
The source of information and establishment of external economic factors

Elements	Source of information	Establishment of indicators
1.1 Internationalization	From the questions asked to entrepreneurs: -Do you have customers from abroad? - Do your customers request you to be more environmentally responsible? If yes, what do they request?	High, medium or low is established by whether or not entrepreneurs have international customers. If so, to what extent do customers express environmental concerns?
1.2 Reputation	From the question: Do you have your own brand name? The advertisement information is from the consumer database of Nielsen company (Thailand): which food companies spend the budget on advertisement?	High, medium or low is established by the extent to which that the company has a brand recognition among the public, which is indicated by advertisement of their brands in the media.

Table 1.3
Raw data of external economic factors

Case	Internationalization					Reputation		
	Sell their product to foreigners	Customers' environmental concern	Foreign sale percentage (approximately)	Indicator	Existence of the firm's advertisement in the media**	Existence of own brand	Indicator	Overall indicator
Case 1	No	No		Low	No	No	Low	Low
Case 2	Yes	No	10%	Medium	No	Yes	Medium	Medium
Case 3	No	No		Low	No	Yes	Medium	Low
Case 4	No	No		Low	No	No	Low	Low
Case 5	No	No		Low	No	Yes	Medium	Low
Case 6	No	No		Low	No	No	Low	Low
Case 7	Yes	No	70%	Medium	No	Yes	Medium	Medium
Case 8	No	No		Low	No	No	Low	Low

Case 9	No	No		Low	No	No	Low	Low
Case 10	No	No		Low	No	No	Low	Low
Case 11	Yes	No	10%	Medium	Yes	Yes	High	Medium
Case 12	Yes	High	10%	High	Yes	Yes	High	High
Case 13	No	No		Low	No	No	Low	Low
Case 14	No	No		Low	No	No	Low	Low
Case 15	Yes	No	100%	Medium	No	No	Low	Low
Case 16	Yes	No	100%	Medium	No	No	Low	Low
Case 17	Yes	No	100%	Medium	No	No	Low	Low
Case 18	Yes	No	20%	Medium	No	No	Low	Low
Case 19	No	No		Low	No	No	Low	Low
Case 20	No	No		Low	No	No	Low	Low
Case 21	Yes	yes	50%	High	Yes	Yes	High	High
Case 22	No	No		Low	No	No	Low	Low
Case 23	Yes	Yes	Unknown	High	No	Yes	Medium	Medium
Case 24	Yes	Yes	Unknown	High	No	Yes	Medium	Medium
Case 25	Yes	Yes	Unknown	High	No	Yes	Medium	Medium
Case 26	No	No		Low	No	Yes	Medium	Low
Case 27	Yes	Yes	10%	High	Yes	Yes	High	High
Case 28	No	No		Low	No	Yes	Medium	Low
Case 29	Yes	No	70%	Medium	No	Yes	Medium	Medium
Case 30	Yes	Yes	70%	High	No	Yes	Medium	Medium

** Source: Udomkacha(2013)

Case 7: The information is from the website of the company.

Cases 4 and 8: The information is approximated from the nature of their business.

Financial cost of damage

Table 1.4
Financial calculation of cost of damage

Case	Number of house-holds affected by agricultural loss	Agricultural and aquatic animal loss	Total cost of agricul-tural and aquatic loss (baht)	Number of house-holds affected by a lack of clean water	**Cost at300 baht per households per month	Number of house-holds affected by dirty piped water	**Cost at 300 baht per household per month	Total	Indicator
11	2	x	36,000	~30	9,000			45,000	Med
12				~20	6,000			6,000	Med
13				~20	6,000			6,000	Med
14						~10	3,000	3,000	Med
15				~100	30,000			30,000	Med
16				~100	30,000			30,000	Med
17				~100	30,000			30,000	Med
18	1	x	200,000	~100				200,000	High
19	5	x	-					-	Low
20	5	x	245,000					245,000	High
21	5	x	-					-	Low
22				~20	6,000			6,000	Med
23		x				~300	90,000	90,000	High
24	10	x	376,000			~300	0,000	466,000	High
25	5	x	25,000			~200	60,000	85,000	High
26								-	Low
27	5	x	180,000					180,000	High
28								-	Low
29	200	X	140,000			~1,000	300,000	440,000	High
30	10	X	100,000			~800	240,000	340,000	High

- Med = Medium

- The establishment of financial calculation of cost of damage s: high, medium and low level is empirically distributed. Low level is when there is no financial loss. Medium and high level is determined from the stratification of cases where local people have financial loss. The cut-off point between medium and high level is 50,000 baht (~1,250 euro; 1 euro is ~40 baht).

- Cases 1-10, 19, 21, 26, and 28 do not have financial costs from damage

- **Case 11**

The approximate costs associated with aquatic creatures were calculated as follows: 20 fish of one pond died every day for one month. Therefore, 600 fish died within one month. If one fish weighs 0.5 kilogram, 600 fish weigh 300 kilograms. Fish cost 40 baht per kilogram; therefore, it cost **12,000 baht** for loss of fish within one month.

In the other pond, 40 fish died per day over one month. Therefore, 1,200 fish died within one month. If one fish weighs 0.5 kilogram, 1,200 fish weigh 600 kilograms. Fish cost 40 baht per kilogram; therefore, it cost 24,000 **baht** for loss of fish.

In total, the cost of dead fish is 36,000 baht.

- **Case 18**

Normally there is 2,000 kilograms of shrimp in a pond the size of 1,600 m^3. If 20 percent of the shrimp die, this amounts to 400 kilograms. There were five people who had this problem: 2,000 kilograms were lost in total. The cost of aquatic creatures is calculated by the cost of shrimp which is 100 baht per kilo. This costs 100*2,000 = 200,000 baht.

There were five people who faced extensive loss, but 100 households that were slightly affected by a lack of water, although the problem did not last for a long time. Therefore, they did not incur financial losses from this.

- **Case 20**

The unit of land in Thailand is 'rai' which is 1,600 m^2. Normally a farmer could produce rice in the amount of 500-700 kilograms/1600 m^2 (one rai). In this case, there was serious loss on 10 rai of land, which is equivalent to 5,000-7,000 kilograms of ruined rice.

The cost of rice at that time was 7,000 baht/ton. It cost ~35,000 - 49,000 baht per person per ten rai. There were five people who faced agricultural loss; therefore the total cost was around 245,000 baht.

- **Case 24**

The cost of agriculture and aquatic creatures loss is from the entrepreneur's compensation to the farmers, depending on the extent of loss. In total, it was 376,000 baht.

(1) 9 persons each received 10,000 baht = 10,000*9 = 90,000 baht.

(2) 25 persons each received 4,000 baht = 25*4,000 = 100,000 baht.

(3) 30 persons each received 2,000 baht = 2,000*30 = 60,000 baht.

(4) 30 fish ponds each received 4,200 baht = 30*4,200=126,000 baht.

- **Case 25**

The company paid 5,000 baht for each affected person. Five people were affected, which amounts to 25,000 baht.

- **Case 27**

It is assumed that one person owns one rai, which is 1,600 m^2

A land of 1,600 m^2 has 150 fruit trees which could produce 30-50 kilograms of fruit per tree. All the trees of one rai can produce 4,500-7,500 kilograms of fruit. The fruit costs 30 baht per kilogram. Therefore, an expected average income is 180,000 baht per rai. If there is a 20% loss, then this costs 36,000 baht per rai, per person. Since five persons faced with the problem, it cost a total of 180,000 baht.

- **Case 29**

There are 200 households that faced agricultural loss. If it is assumed that each household owns 1,600 M^2 (1 rai), normally a farmer could produce rice in the amount of 500-700 kilogram /1,600 M^2 (1 rai). If 20% of rice was ruined, it is 20% of 200 households *500 KG, which is 20,000 kilograms.

If 1,000 kilograms cost 7,000 baht, 20,000 kilograms cost (20,000/1,000)*7,000 = 140,000 baht.

- **Case 30**

The company paid 30,000 baht every three years for affected households. Therefore, it is 10,000 baht per year, which is 100,000 baht for ten households.

- The cost of piped water

The cost of piped water in cases 11-18, 20, 22-24, 29 and 30 is calculated by:

Table 1.5
The cost of piped water by the Department of Irrigation

	Volume (m^3)	Price per unit	Total price
The unit of water	0-30 m^3	8.5 baht/ M^3.	250 baht
The next unit	30-40 M^3	10.03 baht/ m^3	50 baht

Source: Metropolitan Waterworks Authority (2014)

Each residential customer consumes an average of 35 m^3. of water per month (based on data from 2007)(Metropolitan Waterworks Authority 2009). It costs around 300 baht per residential customer.

Owner's Personal Attitude

Table 1.6
Source of information and the establishment of indicators

Source of information	Establishment of indicators
From the question: what is the reason for environmental improvement? a. To comply with law b. To have a good relationship with local community c. To gain reputation for the company and attract 'green customers' d. To reduce cost and earn more profit from reuse/recycle technology e. To follow my own interests f. Other	High, medium or low level is established by the degree of concern about other stakeholders: high level is when the concern is about other stakeholders and personal environmental concern; low level is when the concern is only about economics, law and reputation and; medium level is a mixture between the reasons of high and low level.

Table 1.7
The raw data of owner's attitude

Case	Ownership				Environmental attitude					
	A single firm/entrepreneur	A part of a business group	Owned by foreigners	Joint venture	Conform with law enforcement	Economic incentive	Business reputation	Personal environmental concern	Stakeholders concern	Indicator
Case 1	x				x					Low
Case 2	x				x					Low
Case 3	x				x					Low
Case 4	x				x					Low
Case 5	x				x					Low
Case 6	x				x					Low
Case 7		x			x				x	Medium
Case 8	x				x					Low
Case 9	x				x				x	Medium
Case 10	x								x	High
Case11		x			x		x			Low
Case12		x				x	x		x	Medium
Case 13	x							x	x	High
Case 14	x								x	High
Case 15	x				x				x	Medium
Case 16	x								x	High
Case 17	x								x	High
Case 18	x				x				x	Medium
Case 19	x								x	High
Case 20		x			x				x	Medium
Case 21		x							x	High
Case 22		x							x	High
Case 23	x					x			x	Medium
Case 24	x					x			x	Medium
Case 25		x				x			x	Medium
Case 26	x				x	x				Low
Case 27		x					x		x	Medium
Case 28	x				x				x	Medium
Case 29	x					x			x	Medium
Case 30	x				x		x		x	Medium

More detail of entrepreneurs' motivation of environmental improvement

Case 1: the entrepreneur explained that "*at first, I did not improve very much, but when the District Officers came to monitor me very often, I had to extensively improve*".

Case 2: the entrepreneur explained that "*the Department of Industrial Works was involved. I do not want to have a problem with them*".

Case 3: The Department of Industrial Works (DIW) ordered the entrepreneur to stop and pay a fine because the entrepreneur did not have permission to produce as a factory.

Case 4: DIW and the Pollution Control Department (PCD) monitored the problem and informed the District Office in order to solve the problem. (The entrepreneur was not interviewed).

Case 5: The entrepreneur explained that "*if I do not improve, it is difficult to stay here*".

Case 6: The entrepreneur explained that "*I have improved because I was legally forced to do it. Normally I am not bothered by both the local community and the local government*".

Case 7: I did not interview the entrepreneur. They were monitored by both PCD and the District Office, but the neighbour of this company suggested that the entrepreneur was aware of the problem, stating that "*the entrepreneur told me if there is a problem, please let us know*". This suggests the entrepreneur's concern about their stakeholders and law enforcement.

Case 8: The entrepreneur explained that "*the District Officer enforced the law on me. I cannot improve the environmental performance anymore because the investment is too high*".

Case 9: The entrepreneur explained that "*I do not want to have a problem with my neighbours and the District Officer*".

Case 10: The entrepreneur explained that "*I want to look for a solution because I do not want to have a problem with the local community. I have to live here with them. The District Officer did not really get involved with the problem*".

Case 11: The entrepreneur explained that "*we are very concerned about reputation and we need to follow the law*".

Case 12: The entrepreneur explained that "*the motivation is the policy of the company not to make any environmental impact on the local community. Also, we are*

very concerned about reputation". In addition, environmental investment yields some financial benefit for them.

Case 13: The entrepreneur explained that "*my first priority is the local community because they are all my clan family. I do not want to have a problem with them*".

Case 14: The entrepreneur explained that "*I do not want to trouble other people. It is not nice. When the problem is getting better, I feel good about it*".

Case 15: The entrepreneur explained that "*I don't want to cause a problem to other people*". But the Provincial Office of Industrial Works had also asked the entrepreneur to improve their environmental performance, influencing the entrepreneur to improve their environmental performance.

Case 16: The entrepreneur explained that *"we need to improve to be able to live with the local community here*".

Case 17: The entrepreneur explained that "the *local community and neighbours are important. I do not want to trouble them*".

Case 18: The entrepreneur explained that "*we do not want to have a problem. Otherwise, we cannot do the business here*". The company was monitored by the local government and the Provincial Office of Environment.

Case 19: The entrepreneur gave the reason that "*we live and we are a clan family with other local people*".

Case 20: The entrepreneur gave the reason that "*we try to be responsible. We do not want to have a problem with the local people and the authority. The problem has continued for a long time already*". This enterprise was legally enforced to close until they improved their environmental performance.

Case 21: The entrepreneur gave the reason that "*we need to live with local people. If they cannot live because of us, we also cannot live*".

Case 22: The entrepreneur gave the reason that "*I live in the local community. Therefore, I understand the local people and I try to improve my environmental performance*".

Case 23: The manager gave the reason that "*environmental improvement can extensively reduce operational cost. The owner also did not want to have a problem with the local community*".

Case 24: The entrepreneur gave the reason that "*the environmental technology of this industry is quite advanced. We can use waste water to do something else. Also, we need to live with the local community*".

Case 25: The entrepreneur gave the reason that "*the company does not want to have a problem with the local people. The company also benefits financially from the environmental investment*".

Case 26: The entrepreneur gave the reason that "*I want to make it right. I do not like to have several government agencies visiting*".

Case 27: The entrepreneur gave the reason that "*we do not want to cause environmental problems to the local people*". The company is also concerned about their reputation because their products have famous brand names.

Case 28: The entrepreneur gave the reason that "*I am concerned about the local community because I live here. I do not want to cause a problem to other local people*". But the case was investigated by the Regional Environmental Office, which suggested that the entrepreneur improve their environmental performance.

Case 29: The environmental investment reduces operational costs and the owner does not want to cause an environmental problem for the local community.

Case 30: The entrepreneur gave the reason that "*we are very concerned about reputation and we do not want to cause a problem to the local people*".

Employee and organizational characteristics

Table 1.8
The source of information and establishment of indicators

Source of information	Establishment of indicators
Employee: do you have any environmental specialist in the company? - What is the education degree of environmental staff members?	High or low level is established based on the availability of environmental employees and their education.
Operational management: do you have an environmental department in the company?	High or low level is established based on the existence of an environmental department.

Table 1.9
Raw data of employee and organizational characteristics

Case	Employees			Operational management		Case	Employees			Operational management	
	Numbers of environmental staff members	Level of education	Indicator	Managerial style	Indicator		Numbers of environmental staff members	Level of education	Indicator	Managerial style	Indicator
Case 1	-	-	Low	Informal	Low	Case 16	-	-	Low	Informal	Low
Case 2	-	-	Low	Informal	Low	Case 17	-	-	Low	Informal	Low
Case 3	-	-	Low	Informal	Low	Case 18	3	BA	High	Formal	High
Case 4	-	-	Low	Informal	Low	Case 19	-	-	Low	Informal	Low
Case 5	-	-	Low	Informal	Low	Case 20	3	BA	High	Formal	High
Case 6	-	-	Low	Informal	Low	Case 21	2	BA	High	Formal	High
Case 7	-	-	Low	Formal	High	Case 22	-		Low	Informal	Low
Case 8	-	-	Low	Informal	Low	Case 23	1	BA	High	Formal	High
Case 9	-	-	Low	Informal	Low	Case 24	1	BA	High	Formal	High
Case 10	-	-	Low	Informal	Low	Case 25	1	BA	High	Formal	High
Case11	4	BA	High	Formal	High	Case 26	-		Low	Informal	Low
Case12	2	BA	High	Formal	High	Case 27	6	BA = 2	High	Formal	High
Case 13	-	-	Low	Informal	Low	Case 28	-		Low	Informal	Low
Case 14	-		Low	Informal	Low	Case 29	10	BA	High	Formal	High
Case 15	-	-	Low	Informal	Low	Case 30	3	BA	High	Formal	High

Table 1.10
The cost of financial improvement of the entrepreneur

Case	Fixed cost (baht) (1)	Variable cost (per year) (baht) (2)	Yearly cost of ad-ministrative and selling tasks in 2009 (per year) (3)	Fixed cost/cost of admin and selling cost (4)	Indicator
Case 1	10,000		242,221	4.13	Medium
Case 2	60,000	120,000	2,169,918	8.30	Medium
Case 3	10,000	77,760	283,377	30.97	Low
Case 4	20,000	-	242,221	8.26	Medium
Case 5	40,000		242,221	16.51	Low
Case 6	-		242,221	-	High
Case 7	1,000,000	-	62,207,150	1.61	Medium
Case 8	-		242,221	-	High
Case 9	6,000		242,221	2.48	Medium
Case 10	-	-	242,221	-	High
Case11	30,000		4,091,045,116	0.00	High
Case12	40,000,000		1,316,919,942	3.04	Medium
Case 13	20,000	120,000	1,749,733	8.00	Medium
Case 14	5,000	-	1,749,733	0.29	High
Case 15	30,000	-	3,466,732	0.87	High
Case 16		-	42,237,488	-	High
Case 17		-	39,892,061	-	High
Case 18	30,000		36,824,109	0.08	High
Case 19	10,000	1,200	9,661,083	0.12	High
Case 20	6,000,000		7,837,096	76.55	Low
Case 21	300,000	240,000	263,002,346	0.21	High
Case 22	10,000		9,054,430	0.11	High
Case 23	200,000,000		24,858,010	804.57	Low
Case 24	80,000,000		90,026,409	88.86	Low
Case 25	100,000,000		96,672,195	103.44	Low
Case 26	20,000	600	279,992	7.36	Medium
Case 27	8,000,000		67,654,194	11.82	Low
Case 28	10,000	12,000	279,992	7.86	Medium
Case 29	400,000,000		118,391,299	337.86	Low
case 30	170,000,000		352,859,006	48.18	Low

Note

The establishment is if the ratio is lower than one, it is high influence; if the ratio is 1-10, it is medium influence; and if it is more than 10, it is low influence.

Definitions

- The selling cost in (3) is the cost of advertising and marketing products.
- The administrative cost in (3) is the cost that does not include the cost of sale and marketing, such as the cost of salary and logistics.
- The administrative costs of cases 3,7, 11, 12, 15-25, 27, 29 and 30 are from the year 2009. The data is from the database of the Department of Business Development (2014), which collects all accounting databases of registered companies.
- Administrative costs of cases 1, 2, 4, 5, 6, 8, 9, 10, 13, 14, 26, and 28 are from the Industrial Census 2007, National Statistical Office (National Statistical Office 2008), which collects the business information of firms of all sizes and of different industries in each location. The data of these cases is selected from the data of an area where polluting firms of particular sizes are located Since the data is the summation of the number of entrepreneurs, the final calculation is approximated by the total administrative and selling cost of entrepreneurs (from the selected group) divided by the number of firms in that area. The calculation is as follows:
- Cases 1, 4, 5, 6, 8, 9, and 10 are calculated by 8,629,369,500/35,626 (the amount of entrepreneurs) = 242,221 baht
- Case 2 has the approximate cost of 1,141,377,000/526 = 2,169,918 baht.
- Case 26 and case 28 have the approximate cost of 497, 267,300/1,776 = 279,992 baht
- Case 13 and case 14 have the approximate cost of 1,831,970,700/1047 = 1,749,733 baht

Environmental improvement costs

- The environmental costs of cases 2, 4, 5, 9, 12, 13, 15, 21, 23, 24, 27, 29 and 30 were provided by the entrepreneurs.
- The costs of cases 6, 8, 10, 16 and 17 do not explicitly available. The entrepreneur of case 6 moved to another place. The entrepreneur of case 8 stopped the business. The entrepreneurs of case 16 and case 17 use their own land to receive waste water.
- The cost of case 1 is approximated from the cost of building four small waste water containers = 4*2,500 = 10,000 baht.
- The cost of case 2 is the cost of building a new waste water container (60,000 baht) and the monthly cost of a truck delivering waste and waste water to another place (10,000 baht per month = 120,000 baht per year).
- The cost of case 3 is approximated from the number of grease traps (30 litre) multiplied by price = 4*2,500 = 10,000 baht.
- The cost of case 7 is the approximated price from the system they use.
- The cost of case 11 is approximated from cement and aerator cost.
- The cost of case 14 is approximated from the grease traps (30 litre) = 2*2,500 baht = 5,000 baht.
- The cost of case 18 is the cost of air filters = 30,000 baht
- The cost of case 19 is approximated from the pump machine and springer. The variable cost is approximated from electricity and water.
- The cost of case 20 was provided by the entrepreneur. The fixed cost is the cost of buying more land for more waste water ponds: 200,000 baht per rai (1,600 m^2) * 30 rai = 6,000,000 baht.
- The cost of case 22 is the cost of building a waste water container.
- The cost of case 25 is approximated from the bio gas industry.
- The cost of case 26 is approximated from making 3 ponds = 20,000 baht. The variable cost is white cement, which costs 25 baht/kilo/month = 50 baht*12 months = 600 baht.

- The cost of case 28 is the approximated cost from the grease traps (30 litre) =4*2,500 = 10,000 baht. The variable cost is approximated from the cost of effective microorganisms.
- The costs of cases 23, 24, 25 and 29 are the costs of building biogas systems.

Table 1.11
The indicator of organizational characteristics

Case	Employee	Organizational management	Cost of financial improvement	Main indicator /average score
Case 1	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 2	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 3	Low (1)	Low (1)	Low (1)	Low (1.33)
Case 4	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 5	Low (1)	Low (1)	Low (1)	Low (1)
Case 6	Low (1)	Low (1)	High (3)	Low (1.67)
Case 7	Low (1)	High (3)	Medium (2)	Medium (2)
Case 8	Low (1)	Low (1)	High (3)	Low (1.67)
Case 9	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 10	Low (1)	Low (1)	High (3)	Low (1.67)
Case11	High(3)	High(3)	High(3)	High (3)
Case12	High(3)	High(3)	Medium (2)	High (2.67)
Case 13	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 14	Low (1)	Low (1)	High (3)	Low (1.67)
Case 15	Low (1)	Low (1)	High(3)	Low (1.67)
Case 16	Low (1)	Low (1)	High(3)	Low (1.67)
Case 17	Low (1)	Low (1)	High(3)	Low (1.67)
Case 18	High(3)	High(3)	High(3)	High (3)
Case 19	Low (1)	Low (1)	High(3)	Low (1.67)
Case 20	High(3)	High(3)	Low (1)	Medium (2.33)
Case 21	High(3)	High(3)	High(3)	High (3)
Case 22	Low (1)	Low (1)	High(3)	Low (1.67)
Case 23	High(3)	High(3)	Low (1)	Medium (2.33)
Case 24	High(3)	High(3)	Low (1)	Medium (2.33)
Case 25	High(3)	High(3)	Low (1)	Medium (2.33)

Case 26	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 27	High(3)	High(3)	Low (1)	Medium (2.33)
Case 28	Low (1)	Low (1)	Medium (2)	Low (1.33)
Case 29	High(3)	High(3)	Low (1)	Medium (2.33)
Case 30	High(3)	High(3)	Low (1)	Medium (2.33)

Note

The final indicator is the summation of three sub-indicators which have equal weight. To put it clearly, numerical data is given to each indicator high = 3, medium = 2 and low = 1. The final result is the average number of three indicators (X). The categorization of the final result is: High: if X > 2.33. Medium: of 2.33 > or = X > 1.67. Low if X < or = 1.67.

Available Resources and Expected Benefits

Table 1.12
Source of information and the establishment of indicator

Elements	Source of information	Establishment of indicators
Resource availability	It is checked with the government database whether polluting firms are legally registered as a company or not.	High level is a registered company that receives financial support from the government since they are better able to access resources. Medium level is a registered company that does not receive the government's support, while low level is an entrepreneur that is non-registered (as a company).
Expected benefit	From the question: do you experience more benefits or losses from being environmentally responsible?	A firm with expected benefit from the improvement is regarded as high, while low expectation is ranked as low.

Table 1.13
Raw data of available resources and expected benefits

	Resources availability : the company status of entrepreneur and level of government support received		Expected benefit from the current environmental investment		
Case	**Company status**	**Indicator**	**Financial benefits from environmental investment**	**Indicator**	**The main indicator**
Case 1	Non registered	Low	No	Low	Low
Case 2	Non registered	Low	No	Low	Low
Case 3	Registered	Medium	No	Low	Low
Case 4	Non registered	Low	No	Low	Low
Case 5	Non registered	Low	No	Low	Low
Case 6	Non registered	Low	No	Low	Low
Case 7	Registered	Medium	No	Low	Low
Case 8	Non registered	Low	No	Low	Low
Case 9	Non registered	Low	No	Low	Low
Case 10	Non registered	Low	No	Low	Low
Case11	Registered	Medium	No	Low	Low
Case12	Registered	High	Yes	High	High
Case 13	Non registered	Low	No	Low	Low
Case 14	Non registered	Low	No	Low	Low
Case 15	Registered	Medium	No	Low	Low
Case 16	Registered	Medium	No	Low	Low
Case 17	Registered	Medium	No	Low	Low
Case 18	Registered	Medium	No	Low	Low
Case 19	Registered	Medium	No	Low	Low
Case 20	Registered	High	No	Low	Medium
Case 21	Registered	Medium	No	Low	Low
Case 22	Non registered	Low	No	Low	Low
Case 23	Registered	High	Yes	High	High
Case 24	Registered	High	Yes	High	High
Case 25	Registered	High	Yes	High	High
case 26	Non registered	Low	No	Low	Low
case 27	Registered	Medium	No	Low	Low
Case 28	Non registered	Low	No	Low	Low
Case 29	Registered	High	Yes	High	High
Case 30	Registered	High	Yes	High	High

The industries that receive the government's support are: (1) starch production and related industries, (2) vegetable oil, (3) ethanol production,

(4) liquid rubber production, (5) food processing industries and (6) other food industries that are not in the groups above. Other industries include slaughter operations, the chicken processing industry and animal farms (The Ministry of Energy 2011).

To receive government support, a firm must have a system that can produce 400 Nm^3 of methane gas per day, except for those producing starch, ethanol and vegetable oil, which must be able to produce more than 1,000 Nm^3 of methane gas per day (The Ministry of Energy 2011).

The Local Government

Table 1.14
The number of respondents in each case

Case	The number of local government chiefs	The number of local government staff members	Total
Case 1	0	1	1
Case 2	0	1	1
Case 3	0	1	1
Case 4	0	1	1
Case 5	0	1	1
Case 6	0	1	1
Case 7	0	1	1
Case 8	0	1	1
Case 9	0	1	1
Case 10	0	1	1
Case11	0	1	1
Case12	0	1	1
Case 13	2	0	2
Case 14	2	0	2
Case 15	3	4	7
Case 16	1	2	3
Case 17	1	1	2
Case 18	0	1	1
Case 19	0	2	2
Case 20	1	1	2
Case 21	1	3	4
Case 22	1	0	1
Case 23	2	0	2

Case 24	2	1	3
Case 25	3	3	6
Case 26	2	2	4
Case 27	1	1	2
Case 28	0	1	1
Case 29	1	0	1
Case 30	2	2	4

Institutional Set-up

Table 1.15
The source of information and establishment of indicators

Source of information	**Establishment of indicators**
From the question: does the local government have authority to enforce the law on polluting firms?	High or low level is determined by the authority the local government possesses to enforce the law on a polluting firm. The authority is based on local regulations in relation to the Public Health Act of 1992. Local governments have to: (1) Draw up a list of some or all businesses that are listed under section 31 of the Act as controlled business within such locality (2) Draw up general rules and conditions for compliance by operations of business under listed under (1) above, in respect of care of conditions or hygiene of the place used for business operation, and prevent measures against health hazards (Section 32, Public Health Act 1992).Once the local government's environmental rules are used, local government is authorized to control firms/entrepreneurs causing nuisance or any harmful operation because entrepreneurs that fall into the category of harmful business have to ask for legal permission and certification from the local government before a business is started. Entrepreneurs have to continue the certification every year, allowing local government to continue to monitor. If entrepreneurs polluted water, the local government can withdraw the permission to operate the business.

Table 1.16
The distribution of respondents

Case	Authorized to enforce the Public Health Act of 1992	Not authorized to enforce the Public Health Act of 1992	Indicator	Reasons for low influence
Case 1	1		High	
Case 2	1		High	
Case 3	1		High	
Case 4	1		High	
Case 5	1		High	
Case 6	1		High	
Case 7	1		High	
Case 8	1		High	
Case 9	1		High	
Case 10	1		High	
Case11	1		High	
Case12	1		High	
Case 13		2	Low	The list of harmful business was not drawn up yet.
Case 14		2	Low	The list of harmful business was not drawn up yet.
Case 15	4	3	Low	The enterprise and the affected local community are located in different jurisdictional areas.
Case 16	3		High	
Case 17		2	Low	The list of harmful business was not drawn up yet.
Case 18	1		High	
Case 19	2		High	
Case 20	2		High	
Case 21	4		High	
Case 22	1		High	
Case 23		2	Low	The enterprise and the affected local community are located in different jurisdictional areas.
Case 24	3		High	
Case 25	2	4	Low	The enterprise and the affected local community are located in different jurisdictional areas.

Case 26		4	Low	The list of harmful business was not drawn up yet.
Case 27	2		High	
Case 28	1		High	
Case 29	1		High	
Case 30	1	3	Low	The enterprise and the affected local community are located in different jurisdictional areas.

Note

The respondents of case 15 are local government officers and local government chiefs from two local governments: the local government that is responsible for the polluting firm and the local government that needs to solve the spill-over effect. The thesis focuses on the local government that receives the spill-over effect.

Leadership style in relation to environmental solutions

Table 1.17
The source of information and establishment of indicators

Elements	Source of information	Establishment of indicators
Administrative style, political style and no role	From the question: How does the local government react to this water pollution incident? The question is asked to the local government leader and the local government clerk.	- Administrative style is from the answer that the local government leader follows administrative procedures to solve the problem, such as coordinating with other government sectors and/or ordering a polluting firm to improve their environmental behavior. The leader of this style might not prioritize environment as their first priority, but they react to the problem as their responsibility.
	From the question: how does the local government react to this water pollution incident? The question is asked to the local government leader and the local government clerk.	- Political style is determined by how environmental tasks are prioritized in the local government's policy. If it is raised as the first priority of the local government, then the indicator is political style, despite the administrative procedures to solve the problem.
		- No role is the indicator when, based on the interviews of local people and the local government clerk, the local government leader did not play a role to solve the problem. There was also no formal administration and coordination to solve the problem.

Table 1.18
The distribution of respondents: leadership style

Case	Procurement policy/tax	Monitor and advise	Law enforcement	Coordinate with relevant governments and monitor together	Supply water to local people/improve public water sources/improve infrastructure	Mobilize local people	Inform polluting firms of the need to improve	Leadership style
Case 1		1						Admin
Case 2		1						Admin
Case 3		1						Admin
Case 4		1						Admin
Case 5		1	1					Admin
Case 6		1						Admin
Case 7		1						Admin
Case 8		1	1					Admin
Case 9		1						Admin
Case 10		1						Admin
Case11		1			1			Admin
Case12		1			1			Admin
Case 13		1 (informally)					1 (informally)	No role
Case 14		1 (informally)					1 (informally)	No role
Case 15		1		7			3	Admin
Case 16				2			1	Admin
Case 17				2			2	Admin
Case 18				1		1	1	Admin
Case 19		1					1	Admin
Case 20				2			2	No role*
Case 21		1		1			2	Admin
Case 22				1			1	Admin
Case 23				2	1	1	2	Admin
Case 24				3	1		3	Admin

Case 25**		2		3	1	1	4	Admin
Case 26				2			4	Admin
Case 27							2 (informally)	No role
Case 28				1			1	No leader
Case 29								No role
Case 30				2	2		2	Admin

Notes

- In some cases, respondents provided more than one answer.
- Case 13 and case 14: the local government only informally told polluting entrepreneurs to stop their pollution, but there was no concrete formal reaction to solve the problem.
- Case 20: the interviewees (the local government clerk and the village chief) stated that the local government leader did not react to solve the problem.
- Case 25: Two local government leaders are involved. The local government leader that is responsible for the polluting entrepreneur's jurisdictional area mobilized local people to react against the problem, while the local government leader that is responsible for the jurisdictional area of affected local people informed the entrepreneur.
- Case 27: the local government chief did not seriously react to solve the problem.
- Case 28: there was no local government at the pollution time.
- Case 29: the local government only followed other government agencies who were informed about the problem.

Table 1.19
Raw data of the indicators: interest

	Equal priority or interested in other tasks	Environment	Low interest in environment	Personal Interest	Indicator
Case 1	1			Equal priority	Moderate
Case 2	1			Equal priority	Moderate
Case 3	1			Equal priority	Moderate
Case 4		1		Environment	Moderate
Case 5	1			Equal priority	Moderate
Case 6	1			Equal priority	Moderate
Case 7		1		Environment	Moderate
Case 8	1			Equal priority	Moderate
Case 9	1			Equal priority	Moderate
Case 10		1		Environment	Moderate
Case11	1			Equal priority	Moderate
Case12	1			Equal priority	Moderate
Case 13	2			Equal priority	Moderate
Case 14	2			Equal priority	Moderate
Case 15	4	3		Equal priority	Moderate
Case 16	3			Equal priority	Moderate
Case 17	2			Equal priority	Moderate
Case 18			1	Low priority	Low
Case 19	2			Equal priority	Moderate
Case 20	1	1		Equal priority	Moderate
Case 21	4			Equal priority	Moderate
Case 22	1			Equal priority	Moderate
Case 23	2			Equal priority	Moderate
Case 24	3			Equal priority	Moderate
Case 25	4	1		Equal priority	Moderate

Case 26	3	1		Equal priority	Moderate
Case 27	2			Equal priority	Moderate
Case 28	No local government				
Case 29	1			Equal priority	Moderate
Case 30	3	1		Equal priority	Moderate

Note

*Cases 1-12 present the information of the District Directors, not the Bangkok Governor because the District Officers are assigned to manage the environmental tasks of each district. District Officers' interests do not make a significant impact because they have to follow the policy of the Bangkok governor. Therefore, it is regarded as moderate level.

Leadership Quality

Table 1.20
The source of information and establishment of indicators

Elements	Source of information	Establishment of indicators
Education, experience	From the question about level of education, experiences in local government work and personal interest	- High, medium or low education is determined by university degree, secondary degree and primary school degree respectively.
		- High, medium or low experience is determined by years of working. High experience is more than 10 years of working experience; medium is between 5-10 years and low is between 0-5 years.
	Interest: the question is asked from the local government leader or local government staffs.	- High, medium or low is determined by the priority given to the local environment, which is determined from the question: does the local government chief prioritize local environment as the first priority? High is when environmental issues are the first priority, while medium is when environmental issues have the same priority as other local tasks. Low level is when environmental issues are not important for the local government.

Table 1.21
Raw data of leadership quality

Case	Education	Indicator	Experience	Indicator	Main indicator from education and experience
Case 1	Uni	High	>15	High	High
Case 2	Uni	High	>15	High	High
Case 3	Uni	High	>15	High	High
Case 4	Uni	High	>15	High	High
Case 5	Uni	High	>15	High	High
Case 6	Uni	High	>15	High	High
Case 7	Uni	High	>15	High	High
Case 8	Uni	High	>15	High	High
Case 9	Uni	High	>15	High	High
Case 10	Uni	High	>15	High	High
Case11	Uni	High	>15	High	High
Case12	Uni	High	>15	High	High
Case 13	Uni	High	4	Low	Medium (no role)
Case 14	Uni	High	4	Low	Medium (no role)
Case 15	HS	Medium	12	High	Medium
Case 16	PS	Low	12	High	Medium
Case 17	Uni	High	8	Medium	Medium
Case 18	HS	Medium	4	Low	Low
Case 19	Uni	High	12	High	High
Case 20	HS	Medium	8	Medium	Medium (no role)
Case 21	HS	Medium	8	Medium	Medium
Case 22	Uni	High	8	Medium	Medium
Case 23	Hs	Medium	4	Low	Low
Case 24	Uni	High	4	Low	Medium
Case 25	Uni	High	8	Medium	Medium
Case 26	Hs	Medium	4	Low	Low
Case 27	Hs	Medium	12	High	Medium (no role)

Case 28	Uni	High	4	Low	Medium (no role)
Case 29	Hs	Medium	8	Medium	Medium (no role)
Case 30	Uni	High	10	High	High

Note: PS is Primary school, HS is high school and uni is university.

Overall capacities

Planning capacity

Table 1.22
Source of information and establishment of indicators

Source of information	Establishment of indicators
- The question about the existence of an environmental plan and policy during 2006-2011. The question was asked to the local government leader and local government clerk.	- High or low level is determined by the existence of and environmental plan and policy during 2006-2011.

Table 1.23
Raw data of planning capacity

Case	Existence of environmental policy	Details of the environmental policy related to public water sources	Indicator
Case 1	Yes*	To improve the waste water treatment plants and technology for better waste water treatment of Bangkok	High
Case 2	Yes*		High
Case 3	Yes*		High
Case 4	Yes*		High
Case 5	Yes*		High
Case 6	Yes*		High
Case 7	Yes*		High
Case 8	Yes*		High
Case 9	Yes*		High
Case 10	Yes*		High
Case11	Yes*		High
Case12	Yes*		High

Case 13	Yes	To keep the public water sources clean for agriculture, such as by removing waste water treatment plants and deepening public water sources	High
Case 14	Yes	The same as case 13	High
Case 15	Yes	To keep the public water sources clean, to let water flow properly, to maintain the number of aquatic creatures in the public water sources	High
Case 16	Yes	Keep the public water sources clean, especially from waste water treatment plants	High
Case 17	Yes	Keep the public water sources clean, especially from waste water treatment plants	High
Case 18	No		Low
Case 19	Yes	Encourage local people to keep the public water sources clean such as not to discharge waste water into them	High
Case 20	No		Low
Case 21	Yes	Encourage local people to participate in local environmental management	High
Case 22	Yes	Keep the public water sources clean, especially from waste water treatment plants, and encourage local people to preserve environment: not to discharge waste and waste water into public water sources	High
Case 23	No		Low
Case 24	No		Low
Case 25	No		Low
Case 26	No		Low
Case 27	No		Low
Case 28	No		Low
Case 29	No		Low
Case 30	Yes	To keep the public water sources clean	High

Notes

*Cases 1-12 have the same environmental policies: the environmental policies of Bangkok.

The local governments of cases 18, 20, and 23-29 do not have any environmental policy.

Financial capacity

Table 1.24
The percentage of the local government's own revenue to overall revenue
(unit: thousand baht)

	2007			2008			**2009**				
Case	LG income	Total budget	**Ratio**	LG income	Total budget	**Ratio**	LG income	Total budget	**Ratio**	**Average**	Index
1	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
2	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
3	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
4	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
5	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
6	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
7	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
8	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
9	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
10	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
11	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
12	11,580,658	43,400,834	**26.68**	11,981,101	45,470,633	**26.35**	12,007,668	38,648,808	**31.07**	**28.03**	H
13			**-**	680	22,320	**3.05**	340	21,600	**1.57**	**2.31**	L
14			**-**	680	22,320	**3.05**	340	21,600	**1.57**	**2.31**	L
15			**-**	1,080	16,780	**6.44**	1,060	17,250	**6.14**	**6.29**	L
16	1,382	20,318	**6.80**	1,187	24,368	**4.87**	1,034	23,453	**4.41**	**5.36**	L
17	1,026	16,833	**6.10**	1,050	16,064	**6.54**	914	16,242	**5.63**	**6.09**	L
18	3,537	26,311	**13.44**	3,973	26,937	**14.75**	4,167	27,419	**15.20**	**14.46**	H
19	650	26,833	**2.42**	960	27,536	**3.49**	998	26,183	**3.81**	**3.24**	L
20			**-**	2,060	25,290	**8.15**	2,060	24,770	**8.32**	**8.23**	H
21	-	-	**-**	1,460	17,140	**8.52**	1,860	17,450	**10.66**	**9.59**	H

22	-	-	**-**	1,800	26,900	**6.69**	780	25,220	**3.09**	**4.89**	L
23	481	13,587	**3.54**	402	17,338	**2.32**	490	17,713	**2.77**	**2.88**	L
24	812	34,427	**2.36**	932	34,153	**2.73**	780	34,030	**2.29**	**2.46**	L
25	635.00	12,118	**5.24**	892	16,620	**5.37**	913	17,600	**5.19**	**5.26**	L
26		-	**-**	200	14,090	**1.42**	130	14,160	**0.92**	**1.17**	L
27	2,276.00	34,269	**6.64**	2,527	35,687	**7.08**	3,837	34,901	**10.99**	**8.24**	H
28	1,743	22,398	**7.78**	1,685	26,360	**6.39**	1,945	28,279	**6.88**	**7.02**	L
29	-	-	**-**	1,490	31,010	**4.80**	1,040	33,280	**3.13**	**3.96**	L
30	-	-	-	1460	60,140	2.43	1,410	56,660	2.49	2.46	L

Sources: Cases 13-15, 20, 21, 22, 26, 29, 30 is the real revenue from the Department of Local Administration 2008, 2009 (The Department of Local Administration 2010, The Department of Local Administration 2009). Cases 1-12, 16-18, 19, 23, 24, 25, 27, 28 are the real revenue from the budget book of the local government during 2007-2009.

Notes

1. Cases 1-12 present the total revenue of Bangkok. Bangkok is regarded as one unit of the local government. The source of data presents the total revenue of Bangkok, but not the total income that each distract has collected.
2. The establishment is: high influence when the ratio is more than 8 and low when the ratio is equal or lower than 8.

Table 1.25
The ratio of environmental budget to population (Unit: baht)

		2007		2008		2009			
Case	Population in each District/local government in 2009/2010	Environmental budget of each district/local government	Environmental budget per capita	Environmental budget	Environmental budget per capita	Environmental budget	Environmental budget per capita	Average ratio of 2007-2009	Index
1	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High
2	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High
3	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High
4	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High

5	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High
6	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.00**	77.1	High
7	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
8	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
9	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
10	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
11	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
12	8,280,925	810,050,700	**97.8**	418,118,100	**50.5**	687,314,100	**83.0**	77.1	High
13	5,820	-	**-**	264,400	**45.4**	30,700	**5.3**	25.3	Low
14	5,820	-	**-**	264,400	**45.4**	30,700	**5.3**	25.3	Low
15	4,761	-	**-**	260,000	**54.6**	535,000	**112.4**	83.5	High
16	7,712	338,450	**43.9**	659,560	**85.5**	99,900	**12.9**	47.4	Low
17	3,104	245,100	**78.9**	205,000	**66.0**	155,000	**49.9**	64.9	High
18	7,413	0.00	**-**	0.00	**-**	0.00	**-**	0.00	Low
19	2,354	150,000	**63.7**	150,000	**63.7**	250,000	**106.2**	77.9	High
20	4,606	- 0.00	**-**	0.00	**-**	0.00 -	**-**	0.00	Low
21	3,770	- 0.00	**-**	0.00	**-**	0.00 -	**-**	-	Low
22	5,913	100,000	**16.9**	100,000	**16.9**	60,000	**10.1**	14.6	Low
23	5,251	60,000	**11.4**	120,000	**22.8**	100,000	**19.0**	17.8	Low
24	13,191		**-**	50,000	**3.8**	50,000	**3.8**	3.8	Low
25	4,920	100,000	**20.3**	100,000	**20.3**	100,000	**20.3**	20.3	Low
26	3,788	-	**-**	-	**-**	-	**-**	-	Low
27	5,217	70,000	**13.4**	420,000	**80.5**	100,000	**19.2**	37.7	Low
28	9,418	-	**-**	-	**-**	-	**-**	-	Low
29	13,539	257,000	**18.9**	388,000	**28.7**	606,000	**44.7**	30.8	Low
30	6,228	70,000	**11.2**	70000	**11.2**	70,000	**11.2**	11.2	Low

Notes

1. Source of Bangkok population is from Wikipedia (2014). It is the population in 2010.
2. Source of local government population: the Department of Local Administration (2010, 2009). Case 18 and case 19 is the population in 2008 and the rest is the population in 2009.
3. The environmental budget is the budget the local government and Bangkok has planned to spend on (1) cleaning public water sources

and water plants; (2) operating waste water systems; (3) improving waste water systems; (4) training for environmental skills for staff; and (5) environmental projects such as environmental campaigns.

4. Cases 1-12 are the data of Bangkok. The data was acquired from the budget of the Department of Hygiene, the Department of Environment and the Department of Drainage and Sewerage. The budget here does not include the budget of the relevant departments of each district because the budget of each district is mainly the salary and expenditure of employees, not the main environmental tasks. Each District Office only has some budget in this task for their employees, not for the main environmental works.
5. The environmental budget is the planned expenditure.
6. Cases 13-15 do not have available information of the year 2007.
7. The establishment is: high influence when the ratio is more than 50 and low when the ratio is equal or lower than 50.
8. The information of case 26 and case 28 is not available.
9. The environmental budgets of case 25 and case 30 are approximated by the local government.

Table 1.26
The percentage of environmental budget to total budget
(Unit: thousand baht)

	2007			2008			2009				
Case	Environmental budget	Total budget	Ratio	Environmental budget	total budget	Ratio	Environmental budget	total budget	Ratio	Average of 2007-2009	Index
1	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
2	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
3	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
4	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
5	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
6	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
7	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High

8	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
9	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
10	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
11	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
12	810,057	39,000,000	**2.08**	418,118	45,000,000	**0.93**	687,314	46,000,000	**1.49**	1.50	High
13	-	13,000	**-**	264	21,362	**1.24**	30	23,000	**0.13**	0.68	Low
14	-	13,000	**-**	264	21,362	**1.24**	30	23,000	**0.13**	0.68	Low
15	-	9,446	**-**	260	15,466	**1.68**	535	16,889	**3.17**	2.42	High
16	338	19,824	**1.71**	659	27,306	**2.41**	99	27,309	**0.36**	1.49	High
17	245	10,628	**2.31**	205	14,886	**1.38**	155	14,259	**1.09**	1.59	High
18	0.00	23,586	**-**	0.00	24,878	**-**	0.00	24,878	**-**	0.00	Low
19	150	24,630	**0.61**	150	28,272	**0.53**	250	28,495	**0.88**	0.67	Low
20	0.00	12,301	**-**	0.00	19,127	**-**	0.00	17,698	**-**	0.00	Low
21	0.00	10,394	**-**	0.00	13,084	**-**	0.00	16,163	**-**	-	Low
22	100	15,382	**0.65**	100	24,932	**0.4**	60	22,905	**0.26**	0.44	Low
23	60.0	10,000	**0.60**	120	15,518	**0.77**	100	**18,644**	**0.54**	0.64	Low
24	-	17,380	**-**	50	17,380	**0.29**	50	33,810	**0.15**	0.22	Low
25	100	12,118	**0.83**	100	17,698	**0.57**	100	17,770	**0.56**	0.65	Low
26	-	-	**#DIV/0!**	-	14,090	**-**	-	14,160	**-**	-	Low
27	70	31,348	**0.22**	420	40,012	**1.05**	100	41,976	**0.24**	0.50	Low
28	-	14,851	**-**	-	21,166	**-**	-	31,269	**-**	-	Low
29	257	17,340	**1.48**	388	26,149	**1.48**	606	28,000	**2.16**	1.71	High
30	70	26,100	0.27	70	35,370	0.20	70	34,900	0.20	0.22	Low

Notes:

1. The total budget and the environmental budget are the planned budget.
2. The environmental budget is same budget as the previous table.
3. Case 28: the budget of 2007 is approximated by real revenue.
4. There is no data for cases 13, 14 and 15 for the year 2007.
5. Cases 25 and 30: the environmental budget is approximated by the local government.
6. The data of case 26 and case 28 is not available.

Table 1.27
The summation of financial indicators

Case	a. The ratio of local government's own revenue to overall revenue	b. Environmental budget/Population	c. % of environmental budget to total budget	The main financial indicator
Case 1	High	High	High	High
Case 2	High	High	High	High
Case 3	High	High	High	High
Case 4	High	High	High	High
Case 5	High	High	High	High
Case 6	High	High	High	High
Case 7	High	High	High	High
Case 8	High	High	High	High
Case 9	High	High	High	High
Case 10	High	High	High	High
Case11	High	High	High	High
Case12	High	High	High	High
Case 13	Low	Low	Low	Low
Case 14	Low	Low	Low	Low
Case 15	Low	High	High	Medium
Case 16	Low	Low	High	Low
Case 17	Low	High	High	Medium
Case 18	High	Low	Low	Low
Case 19	Low	High	Low	Low
Case 20	High	Low	Low	Low
Case 21	High	Low	Low	Low
Case 22	Low	Low	Low	Low
Case 23	Low	Low	Low	Low
Case 24	Low	Low	Low	Low
Case 25	Low	Low	Low	Low
Case 26	Low	Low	Low	Low
Case 27	High	Low	Low	Low
Case 28	Low	Low	Low	Low

Case 29	Low	Low	High	Low
Case 30	Low	Low	Low	Low

Note

The establishment of high, medium or low is empirically determined by the stratification of the information of all cases.

Technical capacity

Table 1.28
The source of information and establishment of indicators

Source of information	Establishment of indicators
- The availability of environmental experts	- High or low level is established by the availability of environmental experts at the local government. High level is when technical staff is employed and low level is when technical staff is not employed.

Table 1.29
Raw data of technical capacity

Case	Number of environmental experts	Index
Case 1	8	High
Case 2	9	High
Case 3	8	High
Case 4	7	High
Case 5	11	High
Case 6	11	High
Case 7	11	High
Case 8	8	High
Case 9	9	High
Case 10	7	High
Case11	9	High
Case12	9	High
Case 13	0	Low
Case 14	0	Low
Case 15	1	High
Case 16	0	Low
Case 17	0	Low

Case 18	0	Low
Case 19	1	High
Case 20	0	Low
Case 21	0	Low
Case 22	0	Low
Case 23	0	Low
Case 24	0	Low
Case 25	0	Low
Case 26	0	Low
Case 27	2	High
Case 28	0	Low
Case 29	0	Low
Case 30	1	High

The expert is titled "the Public Health Officer".

Convening capacity

Table 1.30
Source of information and establishment of indicators

Source of information	Establishment of indicators
- Lists of actors involved in environmental solutions. It is from the question: Do you coordinate with other organizations to solve this water pollution problem?	- High, medium or low level is established by the involvement of stakeholders to solve the problem: local government, other relevant governments, local community, business associations and advocacy NGOs. Low level has only local government and affected local community, while medium level includes relevant governments and high level includes all stakeholders. The local government with higher convening capacity is expected to invite more relevant stakeholders to solve the problem.

Table 1.31
The raw data of convening capacity

	List of actors involved with environmental solution			
Case	**High**	**Medium**	**Low**	**Indicator**
Case 1			x	Only the District Office and affected local people solved the problem.
Case 2		x		The District Office investigated the problem with the Pollution Control Department and the Department of Industrial Works.
Case 3		x		The District Office coordinated with the Department of Hygiene of Bangkok for scientific evidence. The Department of Industrial Works also monitored.
Case 4			x	Only the District Office and affected local people solved the problem because the Pollution Control Department and the Department of Industrial Works informed them.
Case 5			x	Only the District Office and affected local people solved the problem. The Pollution Control Department (PCD) informed the local government about the problem.
Case 6			x	Only the District Office and affected local people solved the problem.
Case 7			x	The Pollution Control Department investigated because they were informed by affected local people to solve the problem, not the local government.
Case 8			x	Only the District Office and affected local people solved the problem.
Case 9			x	Only the District Office and affected local people solved the problem.
Case 10			x	Only the District Office and affected local people solved the problem.
Case11			x	The Pollution Control Department was informed by affected local people to solve the problem, not the local government.
Case12		x		The District Office coordinated with the Department of Industrial Works to monitor together.
Case 13			x	The Pollution Control Department was informed by affected local people to solve the problem, not the local government.
Case 14			x	The Pollution Control Department was informed by affected local people to solve the problem, not the local government.
Case 15	x			The local advocacy NGOs participated in the solution, in addition to the local government and affected local people.
Case 16		x		The local government coordinated with the District Office and the Provincial Office of Industrial Works to investigate together.
Case 17		x		The local government coordinated with the Provincial Office of Industrial Works and the District Office to investigate together.
Case 18		x		The local government informed the Provincial Office of Natural Resources and Environment to investigate the problem.
Case 19			x	Only the local government and affected local people solved the problem.
Case 20			x	The local community informed the Provincial Office of Industrial Works to solve the problem.
Case 21		x		The local government informed relevant government agencies about the problem and they monitored together.
Case 22			x	The local government was informed by the District Office to solve the problem together.

Case 23	x			Advocacy NGOs and the business association participated in the solution, in addition to the local government and affected local people.
Case 24		x		The local government coordinated with the District Office and the Provincial Office of Industrial Works.
Case 25		x		The local government that is responsible for the affected area informed the District Office about the problem.
Case 26		x		The local government coordinated with the Regional Office of Natural Resources and Environment, the District Office and the District Office of Public Health to solve the problem.
Case 27			x	The Department of Industrial Works and the Pollution Control Department were informed by affected local people, not the local government, to solve the problem.
Case 28		x		The local government coordinated with the Regional Office of Natural Resources and Environment to solve the problem.
Case 29			x	The Department of Industrial Works and the Pollution Control Department were informed by affected local people, not the local government, to solve the problem.
Case 30	x			The local environmental group participated in solving the problem.

Table 1.32
Indicators of all capacities

Case	Planning capacity	Financial capacity	Technical capacity	Convening capacity	The main indicator (average score)
Case 1	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 2	High (3)	High (3)	High (3)	Medium (2)	High (2.75)
Case 3	High (3)	High (3)	High (3)	Medium (2)	High (2.75)
Case 4	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 5	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 6	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 7	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 8	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 9	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case 10	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case11	High (3)	High (3)	High (3)	Low (1)	High (2.5)
Case12	High (3)	High (3)	High (3)	Medium (2)	High (2.75)
Case 13	High (3)	Low (1)	Low (1)	Low (1)	Low (1.5)
Case 14	High (3)	Low (1)	Low (1)	Low (1)	Low (1.5)
Case 15	High (3)	Medium (2)	High (3)	High (3)	High (2.75)
Case 16	High (3)	Low (1)	Low (1)	Medium (2)	Medium (1.75)

Case 17	High (3)	Medium (2)	Low (1)	Medium (2)	Medium (2)
Case 18	Low (1)	Low (1)	Low (1)	Medium (2)	Low (1.25)
Case 19	High (3)	Low (1)	High (3)	Low (1)	Medium (2)
Case 20	Low (1)	Low (1)	Low (1)	Low (1)	Low (1)
Case 21	High (3)	Low (1)	Low (1)	Medium (2)	Medium(1.75)
Case 22	High (3)	Low (1)	Low (1)	Low (1)	Low (1.5)
Case 23	Low (1)	Low (1)	Low (1)	High (3)	Low (1.5)
Case 24	Low (1)	Low (1)	Low (1)	Medium (2)	Low (1.25)
Case 25	Low (1)	Low (1)	Low (1)	Medium (2)	Low (1.25)
Case 26	Low (1)	Low (1)	Low (1)	Medium (2)	Low (1.25)
Case 27	Low (1)	Low (1)	High (3)	Low (1)	Low (1.5)
Case 28	Low (1)	Low (1)	Low (1)	Medium (2)	Low (1.25)
Case 29	Low (1)	Low (1)	Low (1)	Low (1)	Low (1)
Case 30	High (3)	Low (1)	High (3)	High (3)	High (2.5)

Note:

The final indicator is the summation of four sub-indicators which have equal weight. To put it clearly, numerical data is given to each ranking: high = 3, medium = 2 and low = 1. The final result is the average number of four indicators (X). The categorization of the final result is: High: if X > or = 2.5. Medium: if 2.5 > X > 1.5. Low if X < or = 1.5.

Relationship between the local government and entrepreneurs

Table 1.33
The source of information and establishment of indicators

Source of information	Establishment of indicators
From the interview: which roles do firms have in the community?	- High and low level is established from different relationships: high level (of power) is the case where firms are only tax payers, while low level is when polluting firms are clan families, political supporters and employers of local people. It is expected that when the local government does not have any special relationship with local firms, it is more able to exercise its environ-mental influences.

Table 1.34
Raw data of the relationship between the local government and entrepreneurs

Case	Tax payer	Clan family/Very close relationship with a local government leader	Political supporter	Employers of local people	Indicator
Case 1	x				High
Case 2	x				High
Case 3	x				High
Case 4	x				High
Case 5	x				High
Case 6	x				High
Case 7	x				High
Case 8	x				High
Case 9	x				High
Case 10	x				High
Case11	x				High
Case12	x			x	High
Case 13	x	X		x	Low
Case 14	x	X		x	Low
Case 15	x	X	x		Low
Case 16	x	X			Low
Case 17	x	X			Low
Case 18	x			x	Low
Case 19	x	X			Low
Case 20	x			x	Low
Case 21	x			x	Low
Case 22	x				High
Case 23	x		x	x	Low
Case 24	x		x	x	Low
Case 25	x		x	x	Low
Case 26	x	X		x	Low
Case 27	x	X		x	Low
Case 28*	x				High
Case 29	x		v	x	Low
Case 30	x			x	Low

Notes:

*The entrepreneur of case 28 hires local people, but they are not affected by water pollution.

* The entrepreneur of case 12 hires local people, but the District Director is not from the election. Therefore, this aspect will not make any impact on the District Office's environmental decision.

More details on this indicator are suggested by the interviews of some cases:

Case 13 and case 14: the local government chief at that time said that "*if I enforce law on this enterprise, it would make an impact on workers who are local people. I think having a conversation with the entrepreneur to improve the environmental performance is a good solution*".

Case 15: the entrepreneur explained that "*I do not pay attention to the local government because they do not have any environmental knowledge. Also, I am a friend of the local government chief's father. Normally the local government chief comes to have a conversation with me*".

Case 16: the village chief explained that "*the local government chief is close to a local politician who has a mutual benefit with the entrepreneur. Therefore, the local government does not want to deal with the problem*".

Case 23: the local government chief who led the protest explained that "*the local government members were also divided into two sides: those supporting the company, such as the new local government chief and some village chiefs, and those who are against the company. The supporters of the company tried to stop local people from protesting*".

Case 24: the entrepreneur accepted that he politically supported the local government chief (at that time) because the former one was very tough on him.

Case 25: the deputy local governor said that "*the problem has continued for a long time and there is no serious solution, no matter who the local government chief is. There is an issue of political benefits. No one dares to seriously solve the problem*".

Case 26: the local government chief explained that "*I do not enforce law on the entrepreneur because I think that we know each other and we should be able to communicate. We are clan family. Also, if we ordered the enterprise to close, they said that the affected workers are from the same family*".

Case 27: the local government chief said that "*my policy is not very tough. I have to be careful about my political popularity*". The local government chief is also close with the manager of the polluting company.

Case 29: one of affected local people said that "*no one solves the problem. All the leaders are the company's people*". Another one said "*the local government chief and village chiefs benefit from the company. Stinking polluted water has therefore come to have no smell*".

Local Community

Table 1.35
The number of respondents in each case

Case	The number of village chief respondents	The number of local people respondents	Total numbers of respondents	The number of affected villages /communities
Case 1	0	2	2	1
Case 2	1	6	7	1
Case 3	0	4	4	1
Case 4	0	3	3	1
Case 5	1	5	6	1
Case 6	1	6	7	1
Case 7	0	9	9	1
Case 8	1	4	5	1
Case 9	0	5	5	1
Case 10	1	4	5	1
Case11	0	12	12	2
Case12	2	10	12	2
Case 13	1	5	6	1
Case 14	1	6	7	1
Case 15	2	8	10	1
Case 16	2	5	7	2
Case 17	2	6	8	2
Case 18	2	7	9	1
Case 19	0	3	3	1
Case 20	5	9	14	4
Case 21	4	7	11	2
Case 22	3	5	8	1
Case 23	3	8	11	2

Case 24	3	10	13	2
Case 25	4	7	11	2
Case 26	1	5	6	1
Case 27	1	2	3	1
Case 28	0	2	2	1
Case 29	4	18	22	3
Case 30	8	28	36	5

Note: All the respondents were separately interviewed.

Resource System Characteristics

Table 1.36
The source of information and establishment of indicators

Source of information	Establishment of indicators
Observations from polluted places and questions to local people about the features of the public water source	-High, medium or low level is established by the possibility that physical characteristics of public water sources could motivate collective action.
	High level is when resource units are stationary and water is available in storage units. Medium level is when resource units are non-stationary and water is available in storage units or stationary and not available in storage units. Low level is when resource units are non-stationary and not available in storage units. This includes cases of public culverts.

Table 1.37
The raw data of resource system characteristics

Case	Stationary and available storage	Stationary and not available storage	Non stationary and available storage	Non stationary and not available storage	Public culvert	Indicator	Features of the public water sources
Case 1					x	Low	
Case 2					x	Low	
Case 3					x	Low	
Case 4					x	Low	
Case 5				x		Low	A small canal
Case 6					x	Low	
Case 7					x	Low	

Case 8					x	Low	
Case 9					x	Low	
Case 10				x		Low	A small canal
Case11				x		Low	A local canal
Case12				x		Low	A local canal
Case 13				x		Low	A local canal
Case 14				x		Low	A local canal
Case 15				x		Low	A local canal
Case 16				x		Low	A local canal
Case 17				x		Low	A local canal
Case 18			x			Medium	Fruit garden and aquatic ponds that can store and release water
Case 19			x			Medium	Rice field that can store and release water.
Case 20			x			Medium	Rice field that can store water and release water.
Case 21				x		Low	The local river
Case 22				x		Low	The local river
Case 23	x					High	A natural pond that water can be stored in with low flow-ing
Case 24	x					High	A natural pond that water can be stored in with low flow-ing
Case 25	x					High	A natural pond that water can be stored in with low flow-ing

Case 26					x	Low	
Case 27			x			Medium	Fruit garden that can store water and release water.
Case 28					x	Low	
Case 29	x					High	A natural pond that water can be stored in without flowing out.
Case 30				x		Low	A canal

Note

There is no distribution of respondents for this factor because data was not obtained from respondents.

Scale of the problem

Table 1.38
The source of information and establishment of indicators

Elements	Source of information	Establishment of indicators
Scale of water pollution impact	From the question: which type of damage do you face? a. Agricultural loss b. Effect on piped water c. Aquatic animal loss d. Health effects e. Lack of water utilization f. Unpleasant effects (e.g., smell)	- High, medium or low is established from the extent that local people were affected by water pollution. It is low level if local people were affected by an unpleasant smell, while it is high level if water pollution ruined agriculture and affected quality of piped water. But it is medium level if people had another source of water supply when facing agricultural problem or dirty piped water.
Size	From the question: how many households are affected by water pollution? The question was asked to the village chief and affected local people.	- High, medium or low level is empirically determined by the stratification of the information of all the cases.

Table 1.39
The distribution of respondents: impact of water pollution

Case	Water pollution impact							
	Unpleasant malodor	Ruined agriculture	Death of aquatic animals	Lack of clean water to use	Unsafe piped water	No impact	Is there any alternative water supply?	Indi-cator
1	2							Low
2	7							Low
3	4							Low
4	2					1		Low
5	6							Low
6	6					1		Low
7	10							Low
8	4					1		Low
9	4					1		Low
10	3			1		1		Low
11	5		4	9			No	High
12	6		2	7		1	Yes	Med
13	4	1		4	1		Yes	Med
14	5			4	5		Yes	Med
15	3			8		1	Yes	Med
16	2			7			Yes	Med
17	2		2	8			Yes	Med
18	7	2	2	2		1	No	High
19		1				2	Yes	Med
20	12	5	5	1			No	High
21	9		2			2	Yes	Med
22	1			6	1	2	Yes	Med
23	10	1	7		11		No	High
24		6	8		12		No	High
25	7	4	8	4	8		No	High
26	6							Low
27	3	3					No	High

28	2							Low
29	5	10	17	1	15		No	High
30	1	12	25	4	34	1	Yes	Med

Note

Some respondents gave more than one answer. Therefore, the total number of respondents of all impacts is higher than the total number of respondents who filled in the questionnaires.

Table 1.40
The distribution of respondents: the number of affected households

	The number of affected households													
Case	no one	Less than 5	5-10	10-20	20-30	30-40	50-60	100	200	300	500	1000	No idea/ uncer-tain	Total
1			2											2
2			1	2	3								1	7
3					2								2	4
4		1	1										1	3
5		1		4									1	6
6			6	1										7
7		1		1			4						3	9
8			2	1									2	5
9		2	2										1	5
10		3	1	1										5
11			1		3		3	1	3				1	12
12				10			1	1						12
13					5		1							6
14				6									1	7
15							1	3	2				4	10
16		1				1	1	3					1	7
17				1	1			6						8
18			1			1		7						9

19		2	1											3
20		2	1		5								6	14
21	3		2		1			2					3	11
22			1	1	3			3						8
23										10	1			11
24									8	2			3	13
25								1	7			1	2	11
26		3	1	1									1	6
27		1	2											3
28		1	1											2
29								1	1			15	5	22
30		1										33	2	36

Table 1.41
The number of affected households and the main indicator of scale of the problem

Case	Size		
	Number of affected households	Indicator	Overall indicator
Case 1	~10	Low	Low
Case 2	~20	Med	Low
Case 3	~20	Med	Low
Case 4	~5	Low	Low
Case 5	~10	Low	Low
Case 6	~5	Low	Low
Case 7	~60	Med	Low
Case 8	~10	Low	Low
Case 9	~5	Low	Low
Case 10	~5	Low	Low
Case11	~30	Med	Med
Case12	~20	Med	Med
Case 13	~20	Med	Med
Case 14	~10	Low	Low
Case 15	~100	High	Med

Case 16	~100	High	Med
Case 17	~100	High	Med
Case 18	~100	High	High
Case 19	~5	Low	Low
Case 20	~5	Low	Med
Case 21	~5	Low	Low
Case 22	~20	Med	Med
Case 23	~300	High	High
Case 24	~200	High	High
Case 25	~200	High	High
Case 26	~5	Low	Low
Case 27	~5	Low	Med
Case 28	~5	Low	Low
Case 29	~1,000	High	High
Case 30	~1,00	High	Med

Note

The final number of affected households is the number of highest distribution, except for case 20, which presents the number of people who face agricultural loss. This includes case 21 whose highest distribution is 'no one is affected' and case 11, which has equal distribution in three categories. The thesis selects the effect of 30 households because water pollution has several causes, but water pollution from this polluting firm is not extensive, thus it cannot be concluded that its water pollution affects 200 households.

Local community leadership

Table 1.42
The source of information and establishment of indicators

Source of information	Establishment of indicators
From the question: how do you characterize the leadership of the community: strong and active and democratic, not joining public activities; and from the question: how was water pollution solved by an elected local chief. The	High level is when the answer is strong and active and democratic, while low level is when an elected local chief did not want to join public activities.

question was asked to affected local people.	
	-High level is when local residents stated that their village chief is an active chief and: when a chief exercised his power to influence SMEs' environmental behavior by not only informing local government and negotiating with a polluting firm, but also mobilizing local people to react against polluting firms.
	- Medium level is when local residents stated that their village chief is an active chief and when a chief exercised his power to influence SMEs' environmental behavior by informing local government and negotiating with a polluting firm.
	-Low level is when local residents state that their village chief is an inactive chief or when a chief did not exercise his power to influence SMEs' environmental behavior or when there is no community leader.

Table 1.43
The distribution of respondents

	Village chief's environmental reaction						**The number of respondents**					
Case	Inform local govemment	Negotiate with a polluting firm	Mobilize local people to react against the problem	No leader	Do not inform village chiefs	Village chiefs did not do anything	Active	In-active	No idea	Active but did not any-thing	Total	Index
1				x							0	Low
2					x		5		1		6	Low
3		x					2	2			4	Med
4				x							0	Low
5					x		1	3	1		5	Low
6	x	x					5	1			6	Med
7				x							0	Low
8	x	x					3	1			4	Med
9				x							0	Low
10	x	x					3		1		4	Med
11					x			12			12	Low
12						x	1	9			10	Low
13						x		5			5	Low
14	x	x					6				6	Med
15	x						7	1			8	Med
16	x		x				5				5	High
17	x						5	1			6	Med
18	x	x	x				7				7	High
19		-	-		x			3			3	Low

20	x	x	x				5	4			9	High
21					x			7			7	Low
22					x			5			5	Low
23	x		x				8				8	High
24	x	X					10				10	Med
25	x	X					6	1			7	Med
26	x	X					4		1		5	Med
27	x						2				2	Med
28		-	-			x		2			2	Low
29					x		8	6		4	18	Low
30						x	10	8		10	28	Low

Note: The number of respondents in this table does not include the number of local community chiefs. Also, I have not included the number of respondents of cases where local people responded that there was no leader. Therefore, the number of respondents is less than the total number of respondents in the previous page.

Social capital: relationship within the community

Table 1.44
The source of information and establishment of indicators

Source of information	Establishment of indicators
From the question: how do you characterize the relationship between people within your community?	- In each case, 2-40 interviewees (the number is different in each case) were randomly selected by walking into each house without pre-selection of gender, age and occupation. - It is high level when the majority of the answers was 'always support each other'. It is medium level when the majority of the answers was 'support each other when necessary'. It is low level when the majority of the answers was 'not very close relationship' or 'always have a conflict'.

Table 1.45
The raw data of social capital

	The number of respondents in each category						
Case	**Always support each other (high)**	**Support when necessary (medium)**	**Always have conflict (low)**	**Distant relationship (low)**	**Others**	**total**	**Indicator**
Case 1		1		1		2	Low
Case 2		5		1	1	7	Medium
Case 3		2		2		4	Low
Case 4				3		3	Low
Case 5		3		3		6	Low
Case 6		4		3		7	Medium
Case 7		6		2	1	9	Medium
Case 8		5				5	Medium
Case 9		1	2	2		5	Low
Case 10		5				5	Medium
Case11	1	8		2	1	12	Medium
Case12		8		2	2	12	Medium
Case 13	2	4				6	Medium
Case 14		7				7	Medium
Case 15	1	7		2		10	Medium
Case 16	2	5				7	Medium
Case 17	1	7				8	Medium
Case 18	2	5			2	9	Medium
Case 19		2	1			3	Medium
Case 20	7	6		1		14	High
Case 21	3	7		1		11	Medium
Case 22	7			1		8	High
Case 23	2	9				11	Medium
Case 24	8	5				13	High
Case 25		10	1			11	Medium
Case 26		6				6	Medium
Case 27	1	2				3	Medium
Case 28		2				2	Medium
Case 29	6	16				22	Medium
Case 30	12	23		1		36	Medium

Cases 1, 3 and 5 are ranked as low despite an equal number between two categories (support each other and distant relationship) because the

interviews suggested that local people are not very close with each other and that they tend to live individually.

Self-organizing capacity

Occurrence of local meetings

Table 1.46
The source of information and the establishment of indicators

Source of information	Establishment of indicators
From the question: is the problem of water pollution raised in the village meeting to solve the problem? The question is asked from the local chief and affected local people.	High is when the problem is raised in the meeting, while it is low when the problem is not raised in the local meeting.

Table 1.47
The raw data of occurrence of local meetings

Case	Is the problem raised in the local meeting after pollution?	Indicator
Case 1	No	Low
Case 2	No	Low
Case 3	No	Low
Case 4	No	Low
Case 5	No	Low
Case 6	No	Low
Case 7	No	Low
Case 8	Yes	High
Case 9	No	Low
Case 10	Yes	High
Case11	No	Low
Case12	No	Low
Case 13	Yes	High
Case 14	Yes	High
Case 15	Yes	High
Case 16	Yes	High
Case 17	Yes	High
Case 18	No	Low
Case 19	No	Low
Case 20	Yes	High
Case 21	Yes	High

Case 22	No	Low
Case 23	Yes	High
Case 24	Yes	High
Case 25	Yes	High
Case 26	Yes	High
Case 27	Yes	High
Case 28	No	Low
Case 29	No	Low
Case 30	Yes	High

The data represent all answers of respondents in each case.

Local community's participation

Table 1.48
The source of information and the establishment of the indicators

Source of information	Establishment of indicators
From the question that is asked to affected local people: how do you react when there is water pollution? a. Inform local government or other government agencies b. Negotiate with polluting firms c. Socially and economically sanction polluted firms d. Organize with neighbors to react against polluted firms e. Protest f. Other	Informing the local government, other governments and polluting entrepreneurs are regarded as regularized relations, which is low influence, while organizing a group to react against polluting firms, protests and reports to the media are classified as 'movements and moments', which is high influence. Supporting each other to clean public water sources, discussions/sanctions over manufacturing projects in a community and reporting this in the local annual survey are regarded as 'fleeting formations', with medium influence. There was no activity categorized as 'acting as, acting on'.

Table 1.49
The number of respondents according to participation style

Case	Inform local government, relevant governments, participate in the meeting (1)	Negotiate with firms (1)	Discussion and sanction the new manufacturing project, report to the annual local survey (2)	Protest/group together to react against the firms (4)	Report the media (4)	Do not do anything	1. Regularized relation	2. Fleeting formations	3. Acting as, acting on, acting up: alternative interfaces	4. Movements and moments	Indicator
1	1					1	x				Low
2	1	1				5	x				Low
3	1	2				1	x				Low
4	1					2	x				Low
5	1	1				4	x				Low
6	3	1				4	x				Low
7	2	1				6	x				Low
8	2	1				2	x				Low
9	2	2				2	x				Low
10	1	1				3	x				Low
11	4					8	x				Low
12	1	3				10	x				Low
13	1	2				3	x				Low
14	1	2				5	x				Low
15	6			3	1	3	x			x	High
16	2		2			5	x	x			Medium
17	5	1	2			3	x	x			Medium
18	3	2		4		2	x			x	High
19					1	3	x				High
20	10	4	1	2		4	x			x	High
21	2					9	x				Low
22	2	1	1			6	x	x			Medium
23	9	1		5		2	x			x	High

24	7	3			3	5	x			x	High
25	5			1		7	x			x	High
26	4	3			1	2	x			x	High
27	3						x				Low
28**					1	2	x			x	High
29	2	1				19	x				Low
30	13	5		7	1	16	x	x		x	High

Notes

- Case 19 and case 28: The respondents are not the person who informed the media.
- Some respondents gave more than one answer. Therefore, the total number of distribution is higher than the total number of respondents.
- There is no reaction that is regarded as 'Acting as, acting on, acting up'. Work till here

Communicating approach within the community

Table 1.50
The source of information and establishment of indicators

Source of information	Establishment of indicators
From the question that is asked to affected local people: how do you share local information with other people in your community? a. Local media (newspaper, radio) b. Community meeting c. General chatting d. Temple/religious place e. Telephone/internet f. Letter and brochure The question was asked to village chiefs and affected local people.	- If more than three channels of (1) local media (2) community meeting (3) general chat (4) temple and religious places (5) phone and internet and (6) letter and brochure are used to communicate in a community, it is ranked as high. This cut-off point is used because if more than half of channels of communication is used, that community tends to highly communicate with each other.

Table 1.51
The distribution of respondents for each communication channel

Case		Communicating approach within the community							
	Local line	Local meeting	General chat/ In-formed directly by local chief	Temple, religious places	Phone, internet	Letter/ Brochure	No communication or	The total number of communicating channels	Indicator
Case 1			1				1	1	Low
Case 2			5	2		3		3	Low
Case 3	4		2					2	Low
Case 4							3	0	Low
Case 5			6	1		1		3	Low
Case 6	7		4					2	Low
Case 7			9	4				3	Low
Case 8	4		2			2		3	Low
Case 9			2		1		3	2	Low
Case 10	5	2	1					3	Low
Case11	5		8	7				3	Low
Case12	7		7	2	2	1		5	High
Case 13		4	3					2	Low
Case 14	2	2	5					3	Low
Case 15	2	1	8		1	3		5	High
Case 16	1		5		2	2		4	High
Case 17	1	2	6			3		4	High
Case 18	5	4	6	1	1			5	High
Case 19	2		3	2	1			4	High
Case 20	9	3	5	1		3	1	5	High
Case 21	8	1	4	2			1	4	High
Case 22	6		4	3		3		4	High
Case 23	8	4	5	4				4	High
Case 24	10	5	2	3				4	High

Case 25	7	2	3	1				4	High
Case 26	3	1	2		1			4	High
Case 27		1	2	1	1			4	High
Case 28			2					1	Low
Case 29	15	16	8	6				4	High
Case 30	33	14	1	8	1			5	High

Notes

- Some respondents gave more than one answer for communication channel used.
- The ranking is from the total number of all channels that all respondents answered.
-

Table 1.52
Indicators of self-organizing capacity

Case	Occurrence of local meeting after pollution	Participation	Communication	Index of self- organizing capacity (average score)
Case 1	Low (1)	Low (1)	Low (1)	Low (1)
Case 2	Low (1)	Low (1)	Low (1)	Low (1)
Case 3	Low (1)	Low (1)	Low (1)	Low (1)
Case 4	Low (1)	Low (1)	Low (1)	Low (1)
Case 5	Low (1)	Low (1)	Low (1)	Low (1)
Case 6	Low (1)	Low (1)	Low (1)	Low (1)
Case 7	Low (1)	Low (1)	Low (1)	Low (1)
Case 8	High (3)	Low (1)	Low (1)	Low (1.67)
Case 9	Low (1)	Low (1)	Low (1)	Low (1)
Case 10	High (3)	Low (1)	Low (1)	Low (1.67)
Case11	Low (1)	Low (1)	Low (1)	Low (1)
Case12	Low (1)	Low (1)	High (3)	Low (1.67)
Case 13	High (3)	Low (1)	Low (1)	Low (1.67)
Case 14	High (3)	Low (1)	Low (1)	Low (1.67)
Case 15	High (3)	High (3)	High (3)	High (3)
Case 16	High (3)	Medium (2)	High (3)	High (2.67)

Case 17	High (3)	Medium (2)	High (3)	High (2.67)
Case 18	Low (1)	High (3)	High (3)	Medium (2.33)
Case 19	Low (1)	High (3)	High (3)	Medium (2.33)
Case 20	High (3)	High (3)	High (3)	High (3)
Case 21	High (3)	Low (1)	High (3)	Medium (2.33)
Case 22	Low (1)	Medium (2)	High (3)	Medium (2)
Case 23	High (3)	High (3)	High (3)	High (3)
Case 24	High (3)	High (3)	High (3)	High (3)
Case 25	High (3)	High (3)	High (3)	High (3)
Case 26	High (3)	High (3)	High (3)	High (3)
Case 27	High (3)	Low (1)	High (3)	Medium (2.33)
Case 28	Low (1)	High (3)	Low (1)	Low (1.67)
Case 29	Low (1)	Low (1)	High (3)	Low (1.67)
Case 30	High (3)	High (3)	High (3)	High (3)

Note

The final indicator is the summation of three sub-indicators which have equal weight. To put it clearly, numerical data is given to each ranking: high = 3, medium = 2 and low = 1. The final result is the average number of the three indicators (X). The categorization of the final result is: High: if X > 2.33. Medium: of 2.33 > or = X > 1.67. Low if X < or = 1.67.

Local community's dependency on local firms

Table 1.53
The source of information and the establishment of indicators

Source of information	Establishment of indicators
From the questions: - Where do most firms' employees come from? - What percentage of firms' total sale is from the local communities who live nearby? - What percentage of raw material is bought from local communities who live nearby? - Have firms ever supported any community activities? The questions were asked to polluting entrepreneurs.	- Low level is from the answer that local people do not need to rely on polluting firms in any aspect, while high level is from the answer that some local people work with firms, financially rely on firms and/or sell their raw material to firms.

Table 1.54
The raw data of local community's dependency on local firms

Case	SMEs buy material from local people	SMEs hire local people.	SMEs financially support local people/neighbors for a long time	SMEs have good relationship with local people/ neighbors, or they are clan family	No relationship, only neighbors	Indicator
Case 1					x	Low
Case 2					x	Low
Case 3					x	Low
Case 4					X	Low
Case 5					x	Low
Case 6					x	Low
Case 7					x	Low
Case 8					x	Low
Case 9					x	Low
Case 10				x		Medium
Case11					x	Low
Case12		x				High
Case 13		x	x	x		High
Case 14		x	x	x		High
Case 15			x	x		High
Case 16			x	x		High
Case 17			x	x		High
Case 18		x				High
Case 19		x		x		High
Case 20		x				High
Case 21		x				High
Case 22	x				x	Low
Case 23	x	x				High
Case 24	x	x				High
Case 25	x	x				High
Case 26		x		x		High
Case 27		x				High
Case 28					x	Low
Case 29	x	x	x			High
Case 30	x	x	x			High

Appendix 2: Cluster analysis of case studies

Definition of cluster analysis

Cluster analysis is "a generic name for a variety of mathematical methods, numbering in the hundreds, that can be used to find out which objects in a set are similar" (Romesburg 1984: 2). Its goal is to mathematically find out similar objects and classify them into groups or clusters (Romesburg 1984: 2) since "classifications are essential building blocks in all fields of research"(Romesburg 1984: 2). In other words, cluster analysis is a method used to group objects with several common characteristics into a cluster (Mooi and Sarstedt 2011: 238). Each cluster presents groups where their members are "similar in some ways to each other and dissimilar to those in other clusters" (Burns and Burns 2008: 2). Applied to fieldwork information, cluster analysis is useful for grouping cases that have similar ranking of all stakeholders' underlying factors. The cluster analysis allows the researcher to see congruence between clusters sorted from the program and predetermined groups based on the level of firms' environmental response and to consider the appropriateness of all dependent and independent variables.

Clustering procedures

There are several different clustering procedures, however, the main ones are hierarchical cluster analysis, k-means procedure and two step clustering (Mooi and Sarstedt 2011: 243). **Hierarchical cluster analysis** uses "dissimilarities or distances between objects when forming the clusters"(Burns and Burns 2008: 4). At first, each case is considered as a separate cluster and then the two most similar clusters are combined to create new clusters. This is done sequentially until only one cluster is left and finally the program creates a hierarchy of clusters. **K-means procedure** is different from hierarchical cluster analysis because "it uses the within-cluster variation as a measure to form homogeneous clusters" (Mooi and Sarstedt 2011: 256). It aims to group the data based on the minimization of within-cluster variation (Mooi and Sarstedt 2011: 256). Another procedure is **Two-step clustering**, which generalizes clusters based on a two stage approach. At first, it employs similar procedures as K-means analysis and then it uses that result to form homogeneous

clusters by a hierarchical cluster analysis (Mooi and Sarstedt 2011: 259). This procedure is suitable to analyse categorical and continuous variables at the same time (Mooi and Sarstedt 2011: 259).

This thesis employs **Hierarchical cluster analysis** to group cases because it can be used with nominal, ordinal and scale data (Statistics Solutions. 2013: 3) which are the characters of my fieldwork information: ordinal and nominal data. In addition, the procedure is also suitable with a small number of samples which is my situation, with only 30 cases.

Data transformation and clustering method

The thesis transforms the data from alphabetical data to numerical data by assigning numbers to the alphabetical data.

Table 2.1
Data transformation

Level	Location	Size	Leadership
Low = 1	City = 1	Micro = 1	No role = 0
Medium = 2	Peri-urban area = 2	Small = 2	Administrative style = 1
High = 3	Rural area = 3	Medium = 3	Political style = 2
		Large = 4	

The input is presented in Figure 2.1.

Figure 2.1
The Data Input of SPSS Program

	ID	Location	Size	Econfac...	Costofdam age	Owner	Organizati on	Availablere source	Institution	Leadershi pstyle	Leadershi pquality	Capacity	Relationsh ip	Resources ystem	Degreeofp oblem	Communit yleader	Socialcapi tal	Organizing capacity	Dependen cy
1	1	1	1	1	1	1	1	1	3	1	3	3	3	1	1	1	1	1	1
2	2	1	2	2	1	1	1	1	3	1	3	3	3	1	1	1	2	1	1
3	3	1	2	1	1	1	1	1	3	1	3	3	3	1	1	2	1	1	1
4	4	1	1	1	1	1	1	1	3	1	3	3	3	1	1	1	1	1	1
5	5	1	1	1	1	1	1	1	3	1	3	3	3	1	1	1	1	1	1
6	6	1	1	1	1	1	1	1	3	1	3	3	3	1	1	2	2	1	1
7	7	1	3	2	1	2	2	1	3	1	3	3	3	1	1	1	2	1	1
8	8	1	1	1	1	1	1	1	3	1	3	3	3	1	1	2	2	1	1
9	9	1	1	1	1	2	1	1	3	1	3	3	3	1	1	1	1	1	1
10	10	1	1	1	1	3	1	1	3	1	3	3	3	1	1	2	2	1	2
11	11	1	4	2	2	1	3	1	3	1	3	3	3	1	2	1	2	1	1
12	12	1	4	3	2	2	3	3	3	1	3	3	3	1	2	1	2	1	3
13	13	2	2	1	2	3	1	1	1	0	0	1	1	1	2	1	2	1	3
14	14	2	2	1	2	3	1	1	1	0	0	1	1	1	1	2	2	1	3
15	15	2	2	1	2	2	1	1	1	1	2	3	1	1	2	2	2	3	3
16	16	2	2	1	2	3	1	1	3	1	2	2	1	1	2	3	2	3	3
17	17	2	2	1	2	3	1	1	1	1	2	2	1	1	2	2	2	3	3
18	18	2	3	1	3	2	3	1	3	1	1	1	1	2	3	3	2	2	3
19	19	2	2	1	1	3	1	1	3	1	3	2	1	2	1	1	2	2	3
20	20	2	3	1	3	2	2	2	3	0	0	1	1	2	2	3	3	3	3
21	21	2	3	3	1	3	3	1	3	1	2	2	1	1	1	1	2	2	3
22	22	2	2	1	2	3	1	1	3	1	2	1	3	1	2	1	3	2	1
23	23	3	3	2	3	2	2	3	1	1	1	1	1	3	3	3	2	3	3
24	24	3	3	2	3	2	2	3	3	1	2	1	1	3	3	2	3	3	3
25	25	3	4	2	3	2	2	3	1	1	2	1	1	3	3	2	2	3	3
26	26	3	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	3
27	27	3	2	3	3	2	2	1	3	0	0	1	1	2	2	2	2	2	3
28	28	3	2	1	1	2	1	1	3	0	0	1	3	1	1	1	2	1	1
29	29	3	4	2	3	2	2	3	3	0	0	1	1	3	3	1	2	1	3
30	30	3	4	2	3	2	2	3	1	1	3	3	1	1	2	1	2	3	3
31																			

Clustering method

The hierarchical cluster analysis has three main steps in the clustering method: 1) the selection of the clustering algorithm; 2) distance measures; and 3) data standardization.

The first step is to select agglomerative clustering procedure that is suitable with the data. In general, there are five main popular methods: Single Linkage, Complete Linkage, Average Linkage, Centroid and Ward methods. Each of these methodologies provides different results when applied to the same dataset (Mooi and Sarstedt 2011: 252). The details

of these procedures are as follows:

- **Single Linkage** (nearest neighbour): "the distance between two clusters is based on the shortest distance between any two members in two clusters" (Mooi and Sarstedt 2011: 250). This procedure is likely to create one cluster with high numbers of objects and several clusters with a few objects. It produces a "chaining effect" that can be used to find outliers (Mooi and Sarstedt 2011: 252). However, this procedure has been criticised for not taking the cluster structure into consideration (Mathematics Learning Support Centre. 2013: 2).
- **Complete Linkage** (furthest neighbour): "the distance between two clusters corresponds to the furthest distance between two members in two clusters" (Mooi and Sarstedt 2011: 250). It is sensitive to outliers since it is based on highest distance (Mooi and Sarstedt 2011: 252). It tends to create compact clusters with similar sizes (Mathematics Learning Support Centre. 2013: 3).
- **Average Linkage**: "the distance between two clusters is the average distance between all pairs of the two clusters" (Mooi and Sarstedt 2011: 250). It uses the information about all pairs of distances, not closest or furthest (Norusis. 2013: 373).
- **Centroid**: at first, the geometric centre (centroid) of each cluster is computed and the distance between two centroids is equal to the distance between two clusters (Mooi and Sarstedt 2011: 250).
- **Ward's method**: it does not merge two most similar objects, but "cluster membership is assessed by calculating the total sum of squared deviations from the mean of a cluster" (Burns and Burns 2008: 6). It tends to yield clusters with similar size and it is also sensitive to outliers (Mathematics Learning Support Centre. 2013: 3).

The case distribution of the Single Linkage Method (with four fixed clusters) is presented in Table 2.2

Table 2.2
Case distribution of the Single Linkage Method

Case	Cluster	Case	Cluster
1	1	23	2
2	1	24	2
3	1	25	2
4	1	30	2
5	1	27	3
6	1	29	3
7	1	28	4
8	1		
9	1		
10	1		
11	1		
12	1		
13	1		
14	1		
15	1		
16	1		
17	1		
18	1		
19	1		
20	1		
21	1		
22	1		
26	1		

Table 2.3
Case distribution of the Complete Linkage Method

Case	Cluster	Case	Cluster	Case	Cluster	Case	Cluster
1	1	11	2	13	3	18	4
2	1	12	2	14	3	20	4
3	1	21	2	15	3	23	4
4	1			16	3	24	4
5	1			17	3	25	4
6	1			26	3	27	4
7	1			19	3	29	4
8	1					30	4
9	1						
10	1						
22	1						
28	1						

It can be seen that the majority of case distribution of the Single Linkage method (Table 2.1) is in cluster 1. With this feature, it will be very difficult to select cases that represent each cluster. The case distribution from the Complete Linkage method (Table 2.2) tends to be more equal. However, I want to avoid the outliers caused by this method, as mentioned by Mooi and Sartesdt (2011: 252)

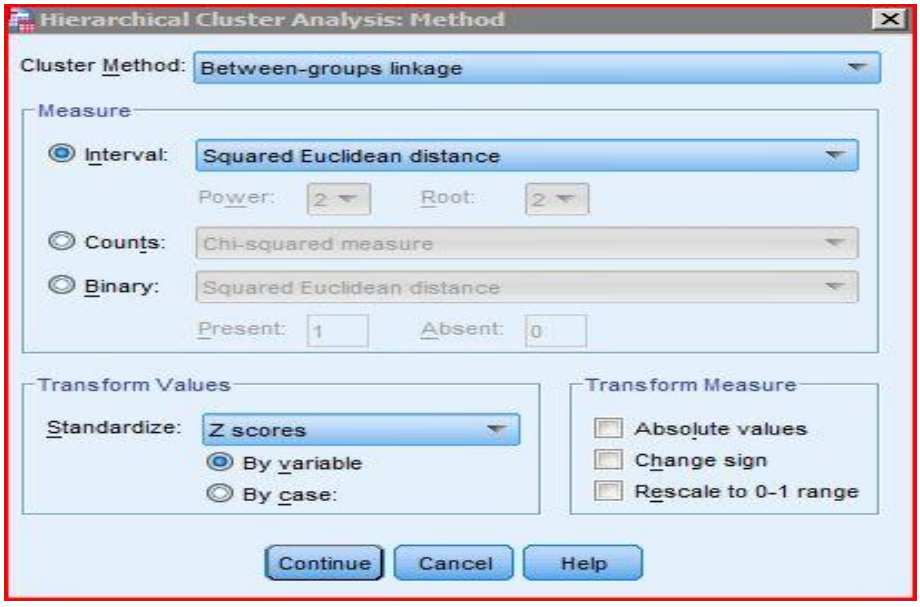
Nonetheless, the thesis selects **Average Linkage method** to avoid the creation of a long chain by the Single Linkage method (the case distribution is presented in Table 3.1) and the sensitivity of outliers by the Complete Linkage method (the distribution is presented in Table 3.2). Average Linkage also works best with both types of clusters that are suitable with these two methods (Statistics Solutions. 2013: 7). Average Linkage is also regarded as "a fairly robust method" (Mathematics Learning Support Centre. 2013: 3). However, Ward's method is not chosen because there is no aim to produce clusters with similar size.

Second, measuring distances is presenting (dis)similarity between pairs of objects (Mooi and Sarstedt 2011: 245), which depends on the type of data: interval, count and binary. To measure the distance of interval data, **Euclidean Distance** is "the most commonly used to ana-

lyse ratio or interval scaled data" (Mooi and Sarstedt 2011: 245). It also matches the most with the type of information that is nominal and ordinal data since the SPSS program does not have the best option for calculating the distance of ordinal data (Gower proximity and Canberra proximity). Even though my data is a combination between nominal and ordinal data, the paper will assume that the scale steps are equidistant (Mooi and Sarstedt 2011: 245). However, the thesis uses **Square Euclidean Distance** because it "place[s] progressively greater weight on objects that are further apart" (Burns and Burns 2008: 6) despite the fact that the **Chebychev distance** is appropriate with ordinal data (Mooi and Sarstedt 2011: 246). But the problem of this measurement is that one single data set is used to represent the data set which might lead to wrong clusters (Filipe and Cordeiro 2011: 285).

Third, the data is standardized before the analysis since variables have different scales (Mooi and Sarstedt 2011: 247). The thesis uses simple Z standardization that produces a means of 0 and a standard deviation of 1 for each variable (Mooi and Sarstedt 2011: 247). These three processes are presented in Figure 2.2.

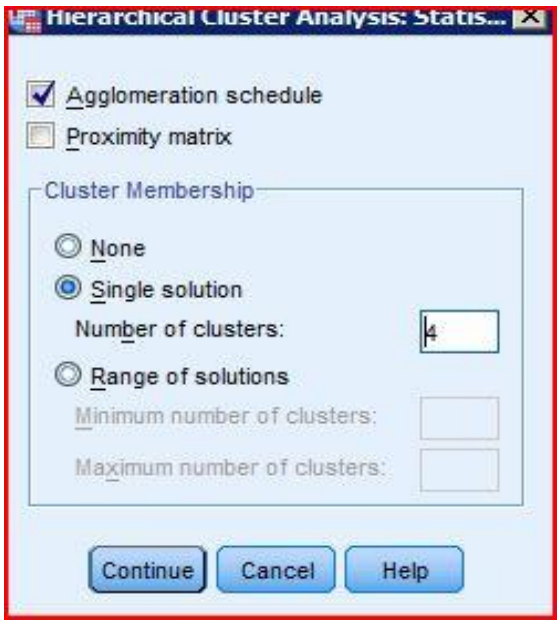
Figure 2.2
Hierarchical cluster analysis method dialogue box



The results of overall cluster and case distribution

When running the program, there are a few options to decide whether none, a single solution or a range of numbers of cluster is needed. The thesis determines four fixed numbers of obtained clusters since the number is consistent with the number of groups of the dependent variable: partial environmental improvement, full environmental improvement, terminate the business/move the business to other location and reuse waste water. However, the thesis does not include the variable of advocacy NGO and business association participation when running the program because there are only two cases that are influenced by the advocacy NGOs and the influence of the business association is low. It should not be used in cluster analysis because their differences are too small to divide cases into clusters.

Figure 2.3
Hierarchical cluster analysis statistics dialogue box



The result of cluster analysis with four fixed umbers of clusters is presented in Table 2.4.

Table 2.4
The Results of Cluster Analysis with four clusters

Status	Case	group	Status	Case	group
Partly	1	1	Complete	11	2
Partly	2	1	Reuse	12	2
Move	3	1	Complete	21	2
Move	4	1			
Move	5	1			
Move	6	1			
Complete	7	1			
Stop	8	1			
Partly	9	1			
Move	10	1			
Status	**Case**	**group**	**Status**	**case**	**group**
Partly	13	3	Partly	18	4
Partly	14	3	Partly	20	4
Partly	15	3	Reuse	23	4
Partly	16	3	Reuse	24	4
Partly	17	3	Reuse	25	4
Complete	19	3	Complete	27	4
Partly	22	3	Reuse	29	4
Move	28	3	Reuse	30	4
Partly	26	3			

There are ten cases in the first cluster, three cases in the second cluster, nine case in the third cluster and eight cases in the fourth cluster.

All information is run again with the fixed number of five clusters to recheck. The program yields similar case distribution as fixed four clusters with one case (case 30) that is separated from the fourth cluster. The distribution results of five clusters are presented in Table 2.5.

Table 2.5
The Results of Cluster Analysis with five clusters

Status	**Case**	**group**	**Status**	**Case**	**group**
Partly	1	1	Complete	11	2
Partly	2	1	Reuse	12	2
Move	3	1	Complete	21	2
Move	4	1			
Move	5	1			
Move	6	1			
Complete	7	1			
Stop	8	1			
Partly	9	1			
Move	10	1			
Status	**Case**	**group**	**Status**	**Case**	**group**
Partly	13	3	Partly	18	4
Partly	14	3	Partly	20	4
Partly	15	3	Reuse	23	4
Partly	16	3	Reuse	24	4
Partly	17	3	Reuse	25	4
Complete	19	3	Complete	27	4
Partly	22	3	Reuse	29	4
Move	28	3	**Reuse**	**30**	**5**
Partly	26	3			

The thesis will therefore choose the case distribution of four clusters because the fifth cluster has only one case.

Case distribution in each cluster indicates that cases in clusters do not exactly match with cases in four groups of pre-determined dependent variables, especially the group of partial environmental improvement and full improvement. On the one hand, the group of partial improvement is separated into three main clusters: clusters 1, 3 and 4. Some cases of partial improvement are combined with cases from the group of terminate the business/move to other locations, while some cases of partly improvement stand in their own cluster (mainly cluster 3). On the

other hand, cases in the group of full improvement are distributed to every cluster. In addition, cases in Cluster 4 are mainly from the group of reuse waste water.

The reason that the cases in the group of partial improvement and full improvement have various results of underlying factors is because cases in the group of partial improvement are mainly from the city and peri-urban areas that present different results in financial cost of damage, local government's and local community's underlying factors. This diversity allows cases in these two groups to match better with cases of other groups that have more similar results. The same situation is found in the group of full improvement. Cases in this group present diverse results of indicators such as firms' external economic factors, owner, financial cost of damage and organizational characteristics, local government's capacity and local community's degree of a problem and resource system characteristics.

Due to the diverse results of underlying factors, cases in fully environmental improvement and partial environmental improvement are distributed to other clusters that match better with the cases of these groups.

In the next section, more detail of each cluster will be explained.

Cluster classification and case selection

Cluster 1

The cluster profile and case distribution of Cluster 1 are indicated in Table 2.6.

Table 2.6
Cluster profile and case distribution of cluster 1

Case		**1**	**2**	**3**	**4**	**5**
	Cluster profile	Partly	partly	Stop	Stop	Stop
Location	City	City	City	City	City	City
Size	Micro	Micro	Small	Small	Micro	Micro
External economic factors	Low	Low	Medium	Low	Low	Low
Financial cost of damage	Low	Low	Low	Low	Low	Low

Owner	Low	Low	Low	Low	Low	Low
Organizational characteristics	Low	Low	Low	Low	Low	Low
Resource availability and benefits associated	Low	Low	Low	Low	Low	Low
Institutional set- up	High	High	High	High	High	High
Leadership style	Admin	Admin	Admin	Admin	Admin	Admin
Leadership quality	High	High	High	High	High	High
Overall capacity indicator	High	High	High	High	High	High
Relationship btw local government and polluting firm	High	High	High	High	High	High
Resource system characteristics	Low	Low	Low	Low	Low	Low
Degree of the problem	Low	Low	Low	Low	Low	Low
Leadership	Low	Low	Low	Med	Low	Low
Social capital	Low/Medium	Low	Medium	Low	Low	Low
Self-organizing capacity	Low	Low	Low	Low	Low	Low
Dependency on firms	Low	Low	Low	Low	Low	Low
Case		6	7	8	9	10
	Cluster profile	Stop	Fully	Stop	partly	Stop
Location	City	City	City	City	City	City
Size	Micro	Micro	Medium	Micro	Micro	Micro
External economic factors	Low	Low	Medium	Low	Low	Low
Financial cost of damage	Low	Low	Low	Low	Low	Low
Owner	Low	Low	Medium	Low	Medium	High
Organizational characteristics	Low	Low	Medium	Low	Low	Low

Resource availability and benefits associated	Low	Low	Low	Low	Low	Low
Institutional set- up	High	High	High	High	High	High
Leadership style	Admin	Admin	Admin	Admin	Admin	Admin
Leadership quality	High	High	High	High	High	High
Overall capacity indicator	High	High	High	High	High	High
Relationship btw local government and polluting firm	High	High	High	High	High	High
Resource system characteristics	Low	Low	Low	Low	Low	Low
Degree of the problem	Low	Low	Low	Low	Low	Low
Leadership	Low	Med	Low	Med	Low	Med
Social capital	Low/ Medium	Medium	Medium	Medium	Low	Medium
Self-organizing capacity	Low	Low	Low	Low	Low	Low
Dependency on local firms	Low	Low	Low	Low	Low	Medium

This cluster is composed of 10 cases from two main groups of the dependent variables: partial environmental improvement and terminate the business/move to other locations. There is one case (case 7) that is fully improved. The cluster shows that all cases are located mainly in the city, which results in more similar underlying factors, especially those of the local government and polluting firms. The cluster shows that more differences are found in the firms' owners and local communities' leadership.

The question of this cluster is why firms in this cluster are mainly from both groups: partial improvement and terminate the business/move the business to other locations, despite the fact that most underlying factors are similar. A possible reason is that cases in this cluster have common characteristics particularly that they are smaller firms located in urban areas, resulting in similar underlying factors for the firms and local governments. However, cases that did not completely improve their environmental performance (case 1, case 2, case 9) continued doing business, perhaps trying to improve their environmental

responsibility until the problem was reduced and no one further complained about it. Therefore, the local government did not come to monitor them. The situation is different from cases that terminate the business because the local governments of these cases were serious in enforcing law on polluting entrepreneurs, resulting in firms' business termination or relocation. For this reason, cases that only partly improve their environmental performance are in the same cluster as cases that stop the business.

Case selection: Case 5 Tofu production

There are three cases that match the most with the cluster profile: case 1, case 4 and case 5 since they are not different from the cluster profile. Out of these three cases, case 5 is the best option because there is sufficient information. Case 1 and case 4 are lacking information from the entrepreneur.

The entrepreneur of case 5 produced solid tofu used for cooking. The local community complained to the Pollution Control Department since the entrepreneur discharged waste water into a nearby public water source, causing a bad smell for the neighbours. As a result, the District Office ordered the entrepreneur to improve and later on enforced the law on them because they did not follow the instructions. The entrepreneur finally moved to another place.

Cluster 2

The cluster profile and case distribution of Cluster 2 is presented in Table 2.7.

Table 2.7
Cluster profile and case distribution of cluster 2

Case	Cluster profile	11	12	21
		Fully	Reuse	Fully
Location	City	City	City	Peri-urban
Size	Large	Large	Large	Medium
External economic factors	High	Medium	High	High
Financial cost of damage	med	Medium	Medium	Low
Owner	Mixed	Low	Medium	High
Organizational characteristics	High	High	High	High
Resource availability and benefits associated	Low	Low	High	Low
Institutional set-up	High	High	High	High
Leadership style	Admin	Admin	Admin	Admin
Leadership quality	High	High	High	Medium
Overall capacity indicator	High	High	High	Medium
Relationship btw local government and polluting firm	High	High	High	Low
Resource system characteristics	low	Low	Low	Low
Degree of the problem	Medium	Med	Med	Low
Leadership	Low	Low	Low	Low
Social capital	Medium	Medium	Medium	Medium
Self-organizing capacity	Low	Low	Low	Medium
Dependency on firms	High	Low	High	High

Case selection

It is case 12 that best matches with the cluster profile and case 11 that is second best. However, the illustrative case of cluster 4 is already in the

group of water reuse. Case 11 which is full improvement is therefore selected to provide diversity to all illustrative cases.

Case 11 Beverage Company (complete environmental improvement)

The local community complained that the company discharged waste water into a public water source, which caused a bad smell and affected local people using water from a public water source.

Cluster 3

The cluster profile and case distribution of Cluster 3 is presented in Table 2.8.

Table 2.8
Cluster profile and case distribution of cluster 3

Case		**13**	**14**	**15**	**16**	**17**
	Cluster profile	Partly	Partly	Partly	Partly	Partly
Location	Peri urban	Peri-urban	Peri-urban	Peri-urban	Peri-urban	Peri-urban
Size	Small	Small	Small	Small	Small	Small
External economic factors	Low	Low	Low	Low	Low	Low
Financial cost of damage	Medium	Medium	Medium	Medium	Medium	Medium
Owner	High	High	High	Medium	High	High
Organizational characteristics	Low	Low	Low	Low	Low	Low
Resource availability and benefits associated	Low	Low	Low	Low	Low	Low
Institutional set -up	Mixed	Low	Low	Low	High	Low
Leadership style	Mixed	No role	No role	Admin	Admin	Admin
Leadership quality	Medium	No	No	Medium	Medium	Medium
Overall capacity indicator	Low	Low	Low	High	Medium	Medium

Relationship btw local government and polluting firm	Low	Low	Low	Low	Low	Low
Resource system characteristics	Low	Low	Low	Low	Low	Low
Degree of the problem	Medium/low	Med	Low	Med	Med	Med
Leadership	Mixed	Low	Med	Med	High	Med
Social capital	Medium	Medium	Medium	Medium	Medium	Medium
Self-organizing capacity	Mixed	Low	Low	High	High	High
Dependency on firms	High	High	High	High	High	High
Case		19	22	26	28	
	Cluster profile	Fully	Partly	Stop	partly	
Location	Peri urban	Peri-urban	Peri-urban	Rural	Rural	
Size	Small	Small	Small	Small	Small	
External economic factor	Low	Low	Low	Low	Low	
Financial cost of damage	Medium	Low	Medium	Low	Low	
Owner	High	High	High	Low	Medium	
Organizational characteristics	Low	Low	Low	Low	Low	
Resource availability and benefits associated	Low	Low	Low	Low	Low	
Institutional set- up	Mixed	High	High	Low	High	
Leadership style	Mixed	Admin	Admin	Admin	No role	
Leadership quality	Medium	High	Medium	Low	No	
Overall capacity indicator	Low	Medium	Low	Low	Low	
Relationship btw local government and polluting firm	Low	Low	High	Low	High	
Resource system characteristics	Low	Medium	Low	Low	Low	
Degree of the problem	Medium/low	Low	Med	Low	Low	
Leadership	Mixed	Low	Low	Med	Low	
Social capital	Medium	Medium	High	Medium	Medium	

Self-organizing capacity	Mixed	Medium	Medium	High	Low
Dependency on local firms	High	High	Low	High	Low

Case selection: case 14

In this cluster, case 13,14,16 and 17 match the most with the profile of the cluster since they have only one or two underlying factors that differ from the cluster profile. However, case 14 is selected because there is more information about it than the other cases.

Cluster 4

The cluster profile and case distribution of cluster 4 are presented in Table 2.9.

Table 2.9
Cluster profile and case distribution of cluster 4

Case	**Cluster profile**	**18**	**20**	**23**	**24**
		Partly	Partly	Reuse	Reuse
Location	Rural	Peri-urban	Peri-urban	Rural	Rural
Size	Medium and Large	Medium	Medium	Medium	Medium
External economic factors	Medium	Low	Low	Medium	Medium
Financial cost of damage	High	High	High	High	High
Owner	Medium	Medium	Medium	Medium	Medium
Organizational characteristics	Medium	High	Medium	Medium	Medium
Resource availability and benefits associated	High	Low	Med	High	High
Institutional set -up	High/low	High	High	Low	High
Leadership style	Admin	Admin	No role	Admin	Admin
Leadership quality	Mix	Low	No	Low	Medium
Overall capacity indicator	Low	Low	Low	Low	Low
Relationship btw local government and polluting firm	Low	Low	Low	Low	Low

Resource system characteristics	High	Medium	Med	High	High
Degree of the problem	High	High	Med	High	High
Leadership	Med/high	High	High	High	Med
Social capital	Med	Medium	High	Medium	High
Self-organizing capacity	High	Medium	High	High	High
Dependency on firms	High	High	High	High	High
Case		25	27	29	30
		Reuse	Fully	Reuse	Reuse
Location	Rural	Rural	Rural	Rural	Rural
Size	Medium and Large	Large	Small	Large	Large
External economic factor	Med	Medium	High	Medium	Medium
Financial cost of damage	High	High	High	High	High
Owner	Medium	Medium	Medium	Medium	Medium
Organizational charac-ters	Medium	Medium	Medium	Medium	Medium
Resource availability and benefits associated	high	High	Low	High	High
Institutional set-up	High/low	Low	High	High	Low
Leadership style	Admin	Admin	No role	No role	Admin
Leadership quality	Mix	Medium	No	No	High
Overall capacity indi-cator	Low	Low	Low	Low	High
Relationship btw local government and polluting firm	Low	Low	Low	Low	Low
Resource system characteristics	High	High	Med	High	Low
Degree of the problem	High	High	Med	High	Med
Leadership	Med/high	Med	Med	Low	Low
Social capital	Med	Medium	Med	Medium	Med
Self-organizing capacity	High	High	Medium	Low	High
Dependency on local firms	High	High	High	High	High

Case selection:

There are eight cases in this cluster. The profile of case 23, case 24 and case 25 are the most similar to the cluster profile, with very few differences. However, case 23 has more stakeholders than case 24 and case 25 since an advocacy NGO also played a role in this case. Therefore, case 23 is selected as the illustrative case of this cluster.

Case 23 Water pollution from a starch company (water reuse)

Case 23 presents that the starch company and other potato drying companies that polluted the public water source for several years. The local community complained to the local government who further informed other relevant authorized government officials to solve the problem. But the government sectors solved the problem too slowly, leading to the gradual worsening of the quality of water. This polluted water made an impact on local people who use piped water supplied by this public water source. The problem continued for a few years with little improvement. Finally, the problem was addressed by the local government and local community leaders gathering local people to demonstrate at the Provincial Government Office. As a consequence, the company had to stop its business operation for a few days to reduce people's pressure and a committee was designated (again) to seriously solve the problem. The company also improved their environmental responsibility by reusing waste water to produce electricity.

Case 20 Water Pollution from an ethyl alcohol company (Partial improvement)

The other case selected from this cluster is case 20. This case should be studied in detail because it is from the group of partial improvement, which is the biggest group among the four main groups. In addition, water pollution in this case has happened several times; therefore, it presents the dynamics of the local community's problem-solving. This case also demonstrates that a firm with larger size (medium) is not always environmentally responsible. Moreover, this case suggests that firms with similar factors, such as case 23 and case 20, do not necessarily have the same response.

The company produces ethyl alcohol from potato (in the past) and molasses (at the moment), generating water pollution which caused a very bad smell and ruined agriculture Two kinds of water pollution can

be classified in this case: one extensive accidental pollution and several minor instances of pollutions. On the one hand, the extensive pollution occurred in 2006 when it rained heavily and the entrepreneur's waste water containers were not enough to receive both waste water and rain. Therefore, all waste water without treatment flowed directly into the nearby rice paddy of the local people. This caused severe agricultural damage, resulting in local people's gathering at the Office of Industrial Department. This situation led to law enforcement on the firm. Furthermore, water pollution by the company had always polluted rice farms around the company, pressuring farmers in that area to sell their land to the company because they could not deal with the agricultural loss from water pollution.

Summary of case selection

Table 44 summarizes five illustrative cases from four clusters. These cases are from four different firms' environmental responses, locations and sizes, and these cases also have different stakeholders' underlying factors. For example, case 5 has low influence from firms' underlying factors, but these influences are higher in case 20, case 11 and case 23. In general, cases with better improvement (case 23 and case 11) have higher external economic factors and organizational characters than other cases.

A similar situation exists with the local community's underlying factors, in that most of them have a low influence on case 5, while other cases have a higher influence, especially from the degree of the problem and social capital, which are the result of different purposes of water usage and locations. However, the local people of case 5 did not economically depend on the entrepreneur, which had an impact on local people's reaction against the polluting entrepreneur. This degree of dependency upon the entrepreneurs tends to play a significant role in local people's environmental reaction in most cases. In addition, the local government has higher power (from capacities and their relationships with polluting firms) and better leadership in case 5 and case 11, resulting in reactions by the local government that differ from other cases.

The combination of different stakeholders' underlying factors results in varying environmental responses by the polluting firms, presented in Table 2.10. Chapter 7 will present more detail of the interaction be-

tween these factors.

Table 2.10
The summary of all illustrative cases

Case	5	11	14	23	20
	Stop	Fully	Partly	Reuse	Partly
Location	City	City	Peri-urban	Rural	Peri-urban
Size	Micro	Large	Small	Medium	Medium
External economic factors	Low	Medium	Low	Medium	Low
Financial cost of damage	Low	Medium	Medium	High	High
Owner	Low	Low	High	Medium	Medium
Organizational characteristics	Low	High	Low	Medium	Medium
Resource availability and benefits associated	Low	Low	Low	High	Med
Institutional set up	High	High	Low	Low	High
Leadership style	Admin	Admin	No role	Admin	No role
Leadership quality	High	High	No	Low	No
Overall capacity indicator	High	High	Low	Low	Low
Relationship btw local government and polluting firm	High	High	Low	Low	Low
Resource system characteristics	Low	Low	Low	High	Med
Degree of the problem	Low	Med	Low	High	Med
Leadership	Low	Low	Med	High	High
Social capital	Low	Medium	Medium	Medium	High
Self-organizing capacity	Low	Low	Low	High	High
Dependency on firms	Low	Low	High	High	High

Appendix 3: Proposal of case selection

This part aims to describe approaches applied to systematically select samples for the thesis. Case selection is divided into two phases. The first phase obtained 20 cases and the second phase added 10 cases.

Case Selection of the First Phase

The focus of case selection is on: (1) type of incident, (2) size of firms, (3) geographic area which is classified as urban, peri-urban or rural area, (4) industrial sector and (5) the combination of stakeholders.

There are two main sources of information:

- Water pollution news collection between 2005-2009 from the web-site of the Pollution Control Department (Pollution Control Department. 2011b)
- The record of water pollution complaints to the Pollution Control Department between 2007-2009 (Pollution Control Department 2009)

In general, criteria to select samples are:

Type of Incident

Samples are selected from among water pollution incidents.

Size of firms

Polluting entrepreneurs in the news and complaint records are mainly small and medium enterprises (SMEs).

Geographic characteristics

The focus will be on provinces where high numbers of water pollution complaints and news are recorded, as suggested above. These provinces are: Bangkok, Samutprakarn, Nakornpathom, Chonburee, Pathumthanee, Ratchaburee, Ayudhaya, Nakornratchaseema, Rayong, Chachernsao, Nonthaburee, Udornthane and Chiangmai.

These provinces have different characteristics in regards to geographical area, economic activities and socio-economic factors. Therefore, area-based classifications such as urban area, peri-urban area and regional

area will be applied to categorize them. The reasons for using this classification are, first of all, there is the linkage between urban and rural areas, which has an impact on "movement of people, goods, capital and other social transaction" (Tacoli 1998). This creates new kinds of areas with mixed characteristics between urban and rural areas, which are called 'peri-urban areas'. The mixture is characterized, for instance, by "either the loss of 'rural' aspects (loss of fertile soil, agricultural land, natural landscape) or the lack of 'urban attributes (low density, lack of accessibility)" (Allen 2003). Second, the above differences differentiate economic activities and the socio-economic character of inhabitants from rural and urban areas, which has an impact on their influence on SMEs and their environmental responsibility. This allows me to analyze influence based on these differences. Third, different areas have been affected by different environmental policies of the local government, depending in the egree of environmental degradation. Urban and peri-urban locations whose environments are more likely to be environmentally damaged receive more attention and more intensive environmental policies from the government. Therefore, geographic characteristics provide the opportunity to understand this impact.

The Characteristics of Different Locations

Locations can be classified as metropolitan, urban area, peri-urban area and rural area.

Metropolitan (Bangkok)

Metropolitan area is defined as "a region consisting of a populous urban core with a high density of employment plus surrounding territory that is socio-economically linked to the urban core by commuting. A metropolitan area is also sometimes known as a commuter belt or a labour market area" (Wikipedia. 2011c). In Thailand, the capital city of Bangkok is regarded as a metropolitan area (Wikipedia. 2011b).

Bangkok, as the capital city, is important as it is the economic, governing, communications, financial commercial and transportation hub of the country. Most ministries and important government bodies are headquartered there. There are also a lot of manufacturers in the city, which attracts labourers from other locations. As a result, Bangkok has become the most populous city, where all kinds of pollution have been generated at high levels.

Apart from being a severely polluted city which requires intensive environmental policies from the government, Bangkok is also interesting to study as its governing system is different from other provinces due to its status as the capital city. It is called a "special local government form" whereby the governor is elected by the people and is authorized to administer Bangkok's tasks. The city is divided into 50 districts where their chiefs (called District Directors) are assigned to manage the Districts' tasks. Both the Bangkok governing team and all districts have councils to monitor their operation. This governing system is different from other provinces where the Provincial governors are assigned by the Ministry of the Interior and heads of the local government (municipality and sub-district organization) are elected.

Given all of these factors, water pollution in Bangkok will have important differences from other areas worth examining, due to the nature of the city, the features of its governance system and the characteristics of local residences. This deserves analytical study and comparison with other areas.

Urban areas (other than Bangkok)

An urban area is generally defined as an area where the density of the population is high (depending on each country) and generally characterized by certain infrastructure such as streets, a town hall, a market place, etc. (Tacoli 1998). Some definitions put emphasis on economic activities, for example, people living in urban areas tend to earn their livelihoods from the industrial sector rather than from agriculture (Tacoli 1998). Other distinguishing factors might include socio-economic factors, structural characteristics and spatial dimensions of social organizations (Pizzoli and Gong 2007).

Rural areas

A rural area is an area with opposite characteristics from an urban area – low population density with high agricultural land use, which results in a high amount of labour in the agricultural sector (Tacoli 1998).

However, the boundaries between urban and rural areas have become blurred as there is high movement between rural and urban areas for the purpose of economic activities. Moreover, resources of each area are transferred between them; for instance, urban people tend to depend on resources from rural areas, while more rural households are increasingly

likely to participate in non-agricultural jobs (Tacoli 1998). Due to this unclear line between these two areas, a definition of peri-urban area has emerged to fill the gap.

Peri-urban areas

Peri-urbanization is "a process in which rural areas located on the outskirts of established cities become more urban in character, in physical, economic, and social terms, often in piecemeal fashion" (Webster 2002). Webster also explains that its development is seen by the fast change from an agricultural way of living to an industrial way. As a result, the environment is rapidly damaged, as large amounts of land are converted into industrial areas. It is said that "peri-urbanization is stimulated by an infusion of new investment, generally from outside the local region in question, including foreign direct investment" (Webster 2002). In other words, peri-urban areas are "where the forces of globalization and localization intersect" (Webster 2002).

Conditions to define each area are still problematic because different countries have unique features and different degrees of development. This results in different categories when different criteria are applied. This limits the ability of any single criterion to cover all aspects of every condition. Since it is beyond the scope of this piece to have a full discussion of different definitions of urban, rural and peri-urban areas, four criteria to define the selected area will be elaborated upon below. These four conditions will be triangulated with each other to reduce the limitations of any one of the criteria.

The Criteria to Distinguish Locations

Employment ratio

Employment ratio is the ratio of employed persons in particular sectors: agriculture, industries and services. Urban area tends to have a high employment ratio in the industrial sector and a low ratio in the agricultural sector, while rural areas have the opposite characteristics. Criteria of employment ratio are defined as follows:

An area is considered peri-urban when (1) employment in manufacturing is more than 20 percent of the region's labor force and rising, and (2) employment in the primary sector (agriculture, fisheries) is more than 20 percent of the labor force but declining (Webster 2002). However,

population growth might not be a suitable indication because the populations of "peri-urban regions tend to be significantly undercounted" (Webster 2002), as there is much migration back and forth between people's hometowns and work places. Therefore, employment ratio conditions are when (1) employment in manufacturing is more than 20 percent of the region's labor force and (2) employment in the primary sector (agriculture, fisheries) is more than 20 percent of the labor force.

There is no indicator of exact employment ratio for urban and rural areas. However, if considered based on the employment ratio of peri-urban areas, this can be adjusted as followed:

It is urban area when the employment ratio in the primary sector is less than 20% and employment ratio in manufacturing sector is higher than 20%.

It is rural area when the employment ratio in the primary sector is higher than 20% and the employment ratio in the manufacturing sector is less than 20%.

However, the ratio does not take into account employment in the service sector because every location has this sector. Therefore, it might not be suitable to use it to define location. Furthers are in Table 3.1.

Table 3.1
Number of employed persons and their proportion to overall employed persons classified by industry during 2006-2009

Province	Detail	2006	Proportion	2007	Proportion	2008	Proportion	2009	Proportion	Justification
Bangkok	Employed Persons by Industry	3,905,968		3,993,150		3,884,223		3,944,106		Metro politan
	Agriculture	29,112	0.75	41,249	1.03	45,533	1.2	45,802	1.16	
	Industry	1,083,626	27.7	1,074,235	26.9	1,061,880	27.3	1,039,222	26.3	
	Services	2,793,230	71.5	2,877,666	72.1	2,776,810	71.5	2,859,082	72.5	
Samut-Prakarn	Employed Persons by Industry	806,027		851,103		774,250		747,741		Urban
	Agriculture	8,578	1.06	7,326	0.8	21,271	2.7	26,600	3.5	
	Industry	462,379	57.4	499,948	58.7	446,909	57.7	395,429	52.*	

	Services	335,070	41.6	343,829	40.4	306,070	39.5	325,712	43.6	
Nontha-	Employed Persons by Industry	718,660		745,273		522,017		519,210		Urban
buree	Agriculture	25,829	3.6	40,741	5.5	18,844	3.6	18,589	3.6	
	Industry	221,706	30.9	213,168	28.6	133,062	25.5	138,884	26.9	
	Services	471,125	65.6	491,364	65.9	370,111	70.9	361,737	69.7	
Pathum-	Employed Persons by Industry	441,512		470,241		462,449		460,928		Urban
thanee	Agriculture	20,916	4.7	32,828	6.9	48,903	10.6	46,778	10.1	
	Industry	201,626	45.6	216,243	45.9	182,005	39.3	179,761	39.0	
	Services	218,970	49.6	221,170	47.0	231,541	50.1	234,389	50.8	
Ayudha-	Employed Persons by Industry	397,282		409,549		430,813		431,625		Urban
ya	Agriculture	59,450	14.9	70,167	17.1	47,519	11.0	60,198	13.9	
	Industry	193,330	48.7	183,922	44.9	220,179	51.1	201,001	46.6	
	Services	144,502	36.4	155,460	37.9	163,115	37.9	170,426	39.5	
Rayong	Employed Persons by Industry	312,979		318,248		342,401		342,169		Peri-urban
	Agriculture	62,744	20.0	81,384	25.6	92,260	26.9	77,728	22.7	
	Industry	119,639	38.2	119,650	37.6	125,890	36.9	129,116	37.7	
	Services	130,596	41.7	117,214	36.8	124,251	36.3	135,325	39.5	
Samut-	Employed Persons by Industry	352,643		357,283		347,035		365,497		Urban
sakorn	Agriculture	35,033	9.9	35,478	9.9	29,235	8.4	24,535	6.7	
	Industry	227,872	64.6	221,337	61.9	201,855	58.2	214,751	58.8	
	Services	89,738	25.4	100,468	28.1	115,945	33.4	126,211	34.5	
Ratcha-	Employed Persons by Industry	497,657		490,169		490,343		512,437		Peri-urban
buree	Agriculture	160,422	32.2	136,869	27.9	135,285	27.6	156,991	30.6	
	Industry	155,131	31.2	152,433	31.1	129,836	26.4	127,019	24.8	
	Services	182,104	36.6	200,867	40.9	225,222	45.9	228,427	44.6	
Nakorn-	Employed Persons by Industry	1,428,373		1,399,572		1,550,586		1,523,781		Peri-urban
rat-	Agriculture	716,279	50.1	622,386	44.5	652,316	42.1	587,454	38.5	
Chasee ma	Industry	286,558	20.1	350,621	25.0	346,614	22.3	371,219	24.3	

	Services	425,536	29.8	426,565	30.5	551,656	35.6	565,108	37.1	
Nakorn-	Employed Persons by Industry	563,470		579,384		571,626		574,721		Peri-urban
pathom	Agriculture	135,701	24.1	125,948	21.7	134,678	23.6	133,396	23.2	
	Industry	194,839	34.6	215,705	37.2	218,587	38.2	205,187	35.7	
	Services	232,930	41.3	237,731	41.0	218,361	38.2	236,138	41.1	
Chacher ng-	Employed Persons by Industry	348,315		356,901		386,790		401,115		Peri-urban
Sao	Agriculture	119,660	34.3	110,793	31.0	127,996	33.1	138,319	34.5	
	Industry	128,890	37.0	141,307	39.6	141,064	36.5	142,235	35.4	
	Services	99,765	28.6	104,801	29.3	117,730	30.44	120,561	30.1	
Chiang mai	Employed Persons by Industry	903,147		958,516		943,004		985,791		Peri-urban
	Agriculture	374,869	41.5	368,266	38.4	279,780	29.7	278,879	28.2	
	Industry	212,845	23.5	209,879	21.9	206,382	21.9	214,574	21.7	
	Services	315,433	34.9	380,371	39.7	456,842	48.4	492,338	49.9	
Udorn-	Employed Persons by Industry	725,751		755,223		861,495		881,947		Rural
Thane	Agriculture	422,052	58.1	447,213	59.2	538,799	62.5	508,890	57.7	
	Industry	79,385	10.9	68,004	9.0	65,781	7.6	93,933	10.6	
	Services	224,314	30.9	240,006	31.8	256,915	29.8	279,124	31.6	
Chonbu-	Employed Persons by Industry	655,019		665,206		677,134		680,139		Urban
ri	Agriculture	45,910	7.0	40,674	6.1	52,589	7.8	55,540	8.2	
	Industry	240,200	36.7	245,394	36.89	251,858	37.2	246,862	36.3	
	Services	368,909	56.3	379,138	57.0	372,687	55.0	377,737	55.5	

Source: National Statistic Organization (2011)

Population Density

Numbers of population and population density are the original criteria used to distinguish urban andrural areas. The criterion is below or above a certain numbers of the population or the population density, which is the overall number of population of a particular area divided by its size. Normally it is in a unit of "persons/km^2".

In Thailand, there is no definition of population density at the provincial level, which is the focus of this part. The reason is that each province is divided into municipal and non-municipal areas, classifications which are related to urban and rural areas, although they cannot be exactly matched. Therefore, the thesis applies the definition used by OECD (1994), which explains that an area is rural if population density is less than 150 persons per km^2. However, this comes with further specifications:

- Predominantly Rural region (PR) : if more than 50% of the population of the region is living in a rural community which is non-municipal area of Thailand[1] (with less than 150 inhabitants / km^2)
- Intermediate Region (IR) or significantly rural area: if 15% to 50% of the population of the region is living in rural local units
- Predominantly Urban region (PU) : if less than 15% of the population of the region is living in rural local units
- This information is indicated in Table 3.2.

[1] Municipality is the local government unit responsible for a particular area (cities and towns). It is divided into three levels; (1) *thesaban nakhon* (city): More than 50,000 citizens (2) *thesaban mueang* (town): More than 10,000 citizens - or a provincial capital (3) *thesaban tambon* (subdistrict municipality): More than 5,000 citizens (Wikipedia. 2010). Areas that do not fit these characteristics are designated as as non-municipal areas, where the *Tambon Administrative Organization* ,which is the smallest local government unit, is responsible.

Table 3.2
Population density and number of population in municipal and non-municipal area in 2009

Province	Population Density (Persons/ KM²)	Justification	Municipal area	Non-municipal area	Total	% of people living in non-municipal area	Justification
Bangkok	3,628.69		5,695,956	**			
Samutprakarn	1,099.82	Urban	614,214	493,412	1,107,626	44.55	Intermediate
Nakornpathom	375.85	Urban	199,447	622,458	821,905	75.73	Rural
Samutsakorn	529.40	Urban	173,450	289,060	462,510	62.50	Rural
Chonburee	276.32	Urban	662,257	547,033	1,209,290	45.24	Intermediate
Pathumthanee	561.50	Urban	354,828	506,510	861,338	58.81	Rural
Ratchaburee	159.49	Urban	261,245	567,685	828,930	68.48	Rural
Ayudhaya	294.92	Urban	254,463	500,132	754,595	66.28	Intermediate
Nakornratchaseema	124.69	Rural	501,903	2,053,684	2,555,587	80.36	Rural
Angthong	293.38	Urban	77,697	206,246	283,943	72.64	Rural
Chacherngsao	122.17	Rural	124,045	530,161	654,206	81.04	Rural
Chiangmai	82.61	Rural	396,568	1,261,730	1,658,298	76.09	Rural
Rayong	161.11	Urban	225,971	347,814	573,785	60.62	Rural
Udornthanee	130.15	Rural	384,894	1,142,668	1,527,562	74.80	Rural
Nonthaburee	1,600.73	Urban	602,168	369,889	972,057	38.05	Intermediate

Source: National Statistic Organization (), Department of Provincial Administration ()

** There is no non-municipal area in Bangkok, as it is the capital city, comprised of 50 districts. The city is different from other provinces as it is the capital of the country. There is no local government, but the elected Bangkok governor with assigned heads (directors) of all districts.

The Proportion of Agricultural Area to Overall Area

In general, a particular location is used for many purposes, such as agricultural area (arable land and permanent crops), artificial surfaces (urban fabric and industrial units), forest and semi-industrial area, wetlands and water bodies (European Topic Center on Land Cover 2000). To define whether a given location is rural, urban or peri-urban is to measure how much agricultural area/artificial area cover more than a certain threshold

(Gallego unknown). Since there is no exact indicator for this, the indicator can be defined as:

- It is a rural area if the agricultural area ratio is higher than 60%.
- It is peri-urban area if the agricultural area ratio is between 30-60%.
- It is urban area if the agricultural area ratio is less than 30%.

See details in Table 3.3.

Table 3.3
Proportion of agricultural land use to total area of each province, 2007

Province	Proportion	Justification
Bangkok	13.94 %	Metropolitan
Samutprakarn	31.2 %	Urban
Nakornpathom	53.41 %	Peri-urban
Samutsakorn	28.68 %	Urban
Chonburee	47.2 %	Peri-urban
Pathumthanee	45.61 %	Peri-urban
Ratchaburee	33.8 %	Peri-urban
Ayudhaya	68.74 %	Rural
Nakornratchaseema	59.99 %	Rural
Angthong	78.93 %	Rural
Chiangmai***	10.7 %	Forest area
Rayong	55.21 %	Peri-urban
Udornthanee	50.98 %	Peri-urban
Nonthaburee	43.08 %	Peri-urban
Chacherngsao	51.23 %	Peri-urban

Source: Department of Agricultural Extension (2011)

*** 80% of Chiangmai area is forest.

To triangulate, justification from all criteria are combined as follows:

Table 3.4
Justification of area type by employment ratio, population density, percentage of population in non-municipal area and agricultural ratio

Province	Employment ratio	Population density	% of People in non-municipal area	Agricultural ratio	Final indicator
Bangkok					Metropolitan
Samutprakarn	Urban	Urban	Intermediate	Urban	Urban
Samutsakorn	Urban	Urban	Rural	Urban	Urban
Nakornpathom	Peri-urban	Urban	Rural	Peri-urban	Peri-urban
Chonburee	Urban	Urban	Intermediate	Peri-urban	Peri-urban
Pathumthanee	Urban	Urban	Rural	Peri-urban	Peri-urban
Ratchaburee	Peri-urban	Urban	Rural	Peri-urban	Peri-urban
Ayudhaya	Urban	Urban	Intermediate	Rural	Peri-urban
Chacherngsao	Peri-urban	Rural	Rural	Peri-urban	Peri-urban
Rayong	Peri-urban	Urban	Rural	Peri-urban	Peri-urban
Nonthaburee	Urban	Urban	Intermediate	Peri-urban	Peri-urban
Nakorn-ratchaseema	Peri urban	Rural	Rural	Rural	Rural
Chiangmai	Peri-urban	Rural	Rural	Forest area	Rural
Udornthanee	Rural	Rural	Rural	Peri-urban	Rural

Table 3.4 indicates that when a location is justified by different approaches, different results are presented. Final justification is decided from the majority of justifications. If there is no majority of justifications, an area will be regarded as a peri-urban area, as this indicates that there are mixed features between urban and rural areas. Regarding the areas examined in this study, the results are:

- Metropolitan: Bangkok
- Urban area: Samutprakarn and Samutsakorn
- Peri-urban area: Nakornpathom, Chonburee, Pathumthanee, Ratchaburee, Ayudhaya, Chacherngsao, Rayong and Nonthaburee.
- Rural area: Nakornratchaseema, Chiangmai and Udornthanee.

Industrial Sector:

Industrial sector selection is to limit the diversity of different industrial sectors which have different technologies, cost/benefit and different demand of customers' environmental standards. These will have an impact on stakeholders' influence on environmental responsibility and on willingness of entrepreneurs to comply.

In selecting the industrial sector, it is to consider that the following:

Potential industries

Potential industries are those that are most frequently reported in the news and are subject to complaint records as pollution cases. These industries are:

- Food processing industry (35 complaint records with different kinds of food)
- Chemical container washing (29 complaint records)
- Steel moulding and related industries (25 complaint records)
- Fabric production (15 complaint records)
- Leather tanning and fabric tanning (15 complaint records)
- Animal farms (12 complaint records – pig, duck and chicken farms)
- Starch production and rice mills (12 complaint records)

Industrial sectors are located in different areas, depending on geographic, investment policies and agricultural products in that area. For example, Nakornratchaseema has several cases of water pollution caused by starch production because it is an area where potato is widely planted, so starch production manufacturers are located at that area as well.

Type of pollution

Water pollution is divided into organic water pollution and inorganic water pollution.

Organic pollution: BOD loading

Since there are several potential industries that can severely pollute water, they need to be grouped by type of pollution since this will indicate the

cost of waste water treatment. One way of calculating waste water treatment cost is from the co-efficient of BOD loading (Biochemical Oxygen Demand) which is "a chemical procedure for determining the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period" (Wikipedia. 2011a) . It is used to indicate degree of organic pollution of water, which means that if waste water has a high level of BOD, it is highly polluted.

The coefficient of BOD can be used as a proxy of cost of water pollution treatment because water treatment cost is calculated from (1) fixed costs such as water treatment system and annual maintenance costs and (2) variable costs such as electricity cost and chemical substances used to reduce the amount of organic substances to reduce BOD loading (Pollution Control Department 2010). This suggests that if the amount of BOD is high, the cost of water treatment will be high as well due to higher cost of chemical substances and electricity used to reduce BOD loading. However, the implicit assumptions here are:

(1)Waste water does not have any solid matter which requires more treatment processes and higher costs as a result.

(2) The cost of other substance treatment such as COD (Chemical Oxygen Demand), which is the indicator of organic pollution, is not significant.

(3) There are no hazardous chemical substances which demand special water treatment to get rid of them.

The coefficient of BOD of each industry has been calculated by the Pollution Control Department to determine the cost of waste water treatment. They have determined the coefficient of BOD loading in both waste water and water after treatment. Hence, the difference between BOD loading in waste water and in water after treatment (BOD removal) indicates the potential cost of water treatment, if water is fully treated. This coefficient of BOD loading is indicated in Table 3.5.

Table 3.5
Coefficient of BOD in waste water and water treatment and Coefficient of BOD removed

Industrial cluster	Industry	Coefficient of BOD in waste water (1) (Kg/ Ton of production)	Coefficient of BOD after water treatment (2) Kg/ Ton of production	Coefficient of BOD removed (2) - (1) = (3) Kg/ Ton of production
Food	2. Agricultural products	1.7	0.054	1.646
Processing	4. Animal products (not aqua animal)	40	5	35
	5. Milk	2	0.077	1.923
	6.Aquatic animal production	20	0.35	19.65
	7. Oil (from vegetable and animal)	31	0.13	30.87
	8.Vegetable, plant and fruit products	23	2.4	20.6
	9.Grain and tuberous products (rice mill, starch)	22	0.24	21.76
	10. Food from Tapioca (cake, bread, etc.)	52	1.5	50.5
	11. Sugar	13	0.85	12.15
	12. Tea, Coffee, Co-coa, Chocolate	12	0.31	11.69
	13.Spices	25	1.2	23.8
	15. Animal food	13	0.71	12.29
Beverage	16. Liquor production	33	*	*
Manufacturing	18. Liquor production from fruit (wine)	13	0.04	12.96
	19. Malt or beer	7.9	0.05	7.85
	20. Water and non-alcohol drinks	1.7	0.045	1.655
Fabric	22. Fabric production	48	4	44
Manufacturing	24. Knitting and clothing	1.6	0.12	1.48
Leather	29.Painting and finishing animal	18	0.41	17.59
Manufacturing	Leather			
	30. Animal leather tanning	*	*	*
	31. Products from animal leather & fur	0.018	0.018	0
Paper and	38. Paper mill and paper	28	1.7	26.3
Paper packaging	39. Paper packaging	0.062	0.03	0.032

	40. Paper mill and cardboard	140	2.1	137.9
Chemical	42. Chemical substances	1.3	0.81	0.49
industry	45. Paint and lacquer	0.66	0.17	0.49
	46. Medicine	8.7	0.78	7.92
	47. Soap and cosmetics	7.2	1.3	5.9
	48. Chemical product	1.6	0.14	1.46
Petro	50. Petroleum production	0.001	*	*
Rubber	52. Rubber	10	0.3	9.7
	53. Plastic products	0.0049	0.000026	0.004874
	54. Glass products	0.06	*	*
	55. Pottery	0.26	*	*
Steel and	56. Block and Tile production	0.05	0.049	0.001
metal	59. Steel smelting	0.02	*	*
manufacturing	60. Metal smelting	0.02	*	*
	61. Furniture maintenance	0.0025	0.0025	0
Others	92. Cold storage	17	2	15
	98. Laundry	10	4.9	5.1

Source: Pollution Control Department (2010)

Industrial sectors that have high amount of BOD removal are the food processing industry such as animal products (non-aquatic animals), aquatic animal production, oil (from vegetable and animal), vegetable, plant and fruit products, grain and tuberous products, food from tapioca, spices. These industries tend to cause similar types of water pollution – water with high amounts of organic substances such as nitrogen, phosphorus. Therefore, they tend to use similar approaches to water pollution treatment.

However, this coefficient of BOD loading is only a rough proxy of each industry's overall BOD loading because small and micro enterprises might have different amounts of raw material used, and different production process, production management and environmental management, which lead to different amounts of BOD and different degrees of water pollution. Even in the same industrial cluster such as vegetable, plant and food products, different sub-industries might also have different amount of BOD.

The conditions of potential industries and BOD loading indicate that a suitable industry for examination in this study is the food processing industry (including the starch and rice mill industries) as it is the industry with the majority of water pollution complaints and news for this type of pollution. Therefore, there are sufficient sources of information related to water pollution by this industry. Further, industries related to food processing tend to be associated with a high BOD, and thus require similar approaches to treat waste water. Apart from these reasons, the food processing industry also has some additional advantages for this study. For instance, the industry is very diverse, as it processes different kinds of food in different parts of value chain. Therefore, this offers the potential to compare environmental influence of buyers who might be domestic or international buyers. In addition, the industry tends to produce similar kind of pollution, so environmental policies supported by the government are more likely to be in the same direction. This makes it easier to control this variable. Moreover, pollution cases in the news and in general tend to garner public concern since organic pollution causes public water sources to be unsuitable for drinking and for agriculture and unlivable for aquatic animals. The main effects are felt within local communities, often leading to intensive advocacy campaigns by environmental NGOs and social movements. Finally, this industry is equally distributed in different locations. This makes it comparable between different locations. Distribution by province can be seen in Table 3.6.

Table 3.6
Food processing sectors, by selected location in Thailand

Province	Area Justification	Starch/rice mill /sugar/ethanol	Food processing
Bangkok	Metropolitan	0	6
Samutprakarn	Urban	0	3
Samutsakorn	Urban	0	7
Nakornpathom	Peri-urban	1	3
Chonburee	Peri-urban	0	0
Pathumthanee	Peri-urban	0	0
Ratchaburee	Peri-urban	0	2
Ayudhaya	Peri-urban	2	1

Rayong	Peri-urban	0	3
Chachernsao	Peri-urban	3	3
Nonthaburee	Peri-urban	0	1
Nakornratchaseema	Rural	5	4
Udornthanee	Rural	1	0
Chiangmai	Rural	0	2
Total		***12***	***35***

The selection will be as follows:

- Metropolitan: Bangkok
- Urban group: Samutsakorn
- Peri-urban group: Nakornpathom, Chacherngsao and Ayudhaya
- Rural group: Nakornratchaseema

Inorganic pollution

Apart from organic pollution indicated by BOD loading, another criterion to be considered is inorganic pollution, which is pollution with substances such as acids released by industrial discharges (especially sulphur dioxide), ammonia, chemical waste (as industrial by-products), fertilizers and heavy metal (Wikipedia. 2011d). These substances are found in chemical plants, detergent and soap, iron and steel, mining and paper and pulp (Studentsguide. 2011). The sources of inorganic pollution can be seen below in Table 3.7.

Table 3.7
Inorganic industrial sectors by selected locations in Thailand

Provinces	Area	Chemical container washing	Dyeing/leather	Steel molding and related products	Chemical, plastic, glass	Paper and printing
Bangkok	Metropolitan	16	5	12	0	1
Samutprakarn	Urban	1	3	4	3	0

Samutsakorn	Urban	0	1	0	0	0
Nakornpathom	Peri-urban	2	0	2	0	0
Chonburee	Peri-urban	1	1	0	1	0
Pathumthanee	Peri-urban	4	2	2	0	0
Ratchaburee	Peri-urban	0	2	2	2	0
Ayudhaya	Peri-urban	1	0	1	0	1
Rayong	Peri-urban	1	0	1	1	0
Chachernsao	Peri-urban	0	0	0	0	0
Nonthaburee	Peri-urban	3	1	0	0	0
Nakorn-ratchaseema	Rural	0	0	0	0	0
Udornthanee	Rural	0	0	0	1	0
Chiangmai	Rural	1	1	1	0	0
Total	35	30	16	25	8	2

The selection will be as follows:

- Metropolitan: Bangkok
- Urban group: Samutprakarn
- Peri-urban group: Pathumthanee and Ratchaburee

However, this might not be suitable to be sampled for several reasons. First, inorganic substances will not pollute water visibly and immediately, but will have been collected for some period before its effects on the health of humans and animals are felt. Second, inorganic pollution exists mostly in Bangkok, one urban area and a few peri-urban areas, as they are the center of industries producing inorganic substances. There are very few cases in rural locations,which leads to difficulty in comparing and contrasting between different locations.

Final Selection

For all the reasons described above, the selection will be food processing industries in these locations:

- Metropolitan: Bangkok
- Urban group: Samutsakorn

- Peri-urban group: Nakornpathom, Chacherngsao and Ayudhaya
- Rural group: Nakornratchaseema

However, since the urban area (Samutsakorn) is very similar to Bangkok in terms of high population density, high proportion of employees in agricultural sector and low agricultural area ratio, the thesis will skip the urban area and study only:

- Metropolitan: Bangkok
- Peri-urban group: Nakornpathom, Chacherngsao and Ayudhaya
- Rural group: Nakornratchaseema

Combination of stakeholders

Cases should contain different stakeholders such as:

- Local community, local government and business sector
- Local community, local government and advocacy NGOs
- Local community and government agencies
- Local community and the local government at a sub-district level (*Tambon administration* (sub-district) or *Tedsaban* administration (municipality)).

The detail of each case is presented in Table 3.8.

Table 3.8
The detail of cases in the First Phase

Location	Type	Size	Date of complaint	Local government
Bangkok	1.Coconut peeling		Dec-08	
	2.Canned vegetable		Feb-09	
	3. Pork ball production		Apr-09	
	4. Syrup production		Oct-09	
Nakornpathom (peri-urban)	5. Products from starch	Medium	Feb-07	
	6. Rice mill	Unknown	Jan-05	
Ayudhaya (peri-urban)	7. Ethanol and acid production	Unknown	Aug-06	
	8. Oil mill	Medium	Aug-08	

	9. Rice mill	Medium	Feb-09	
Chachernsao	10 Fish processing (fish cutting)	Micro	Jun-07	Case 12 and case 13 have the same local government.
(peri-urban)	11. Fish processing (fish cutting)	Micro	Jun-07	
	12. Rice mill	Medium	Jun-05	
	13. Rice mill	Medium	Jan-08	
	14. Rice mill	Medium	Jan-08	
Nakornratchaseema	15. Bread production	Unknown	Jan-08	
	16. Starch production	Unknown	Apr-08	
	17. Beverage company	Small	May-08	
	18. Starch production	Unknown	Jan-08	
	19. Starch production	Medium	Jun-09	
	20. Ice cream production	Medium	Nov-08	

Persons to be interviewed:

Local government (2 sets of questionnaires: the local government chief and the local government staff)

- The Chief of local government
- The Clerk of a municipality/clerk of Tambon administration
- The Head of environment department (or the Public Health Department or other relevant departments)
- The Director of Bangkok District Offices organization or the Head of the Public Health Department

Local community (2 sets of questionnaires: village chief and local people)

- The Chief of a village
- Local people
- Chief of CBO (if there is CBO)
- CBO members (if there is CBO)

Advocacy NGOs

- The Head of the NGO or relevant persons

The business association

- The Chairman of relevant business organizations

Conclusion

This part mainly describes approaches to select samples from water pollution news and water pollution complaint records from the Department of Pollution Control. The focus is on two principles: location and industrial sector. On the one hand, criteria of employment ratio, population density and agricultural land use ratio are employed to justify different types of location, whether they are urban, peri-urban or rural area. The result is:

- Metropolitan: Bangkok
- Peri-urban group: Nakornpathom, Chacherngsao and Ayudhaya
- Rural group: Nakornratchaseema

On the other hand, organic pollution i and inorganic pollution are used to select industrial sector. The result is food processing industry, starch production and rice mill.

Note

At the moment of case selection, the size of entrepreneurs was not checked yet. It was found later that the entrepreneurs in the list of those selected were of all sizes, from microenterprise SMEs to large firms.

The Second Phase of Fieldwork

The first phase of fieldwork had two micro firms, 12 small firms, five medium firms and one large firm in different locations:

- Bangkok 4 cases
- Peri-urban areas 10 cases
- Rural areas 6 cases

This indicated that additional cases should be located mainly in Bangkok and rural areas, with a focus on micro and large firms. There was no need to add more cases for small and medium sized firms in peri-urban areas because there were already sufficient cases in those categories.

This is demonstrated by Table 3.9.

Table 3.9
The number of cases in the first phase and the number of additional cases

Location/size	Micro	Small	Medium	Large	Total
Bangkok	2	2			4
Ayudhaya (peri-urban)		1	2		3
Chacherngsao (peri-urban)		5			5
Nakornpathom (peri-urban)		1	1		2
Nakornratchaseeme (rural)		3	2	1	6
Total	2	12	5	1	20
Complaints in news in 2010/2011 (1)	2			2	4
Complaint records in 2005/2006 (2)	4			2	6

The source of first phase information is from

- The complaint records at the Pollution Control Department from 2007-2009
- The pollution news records (by the Pollution Control Department) from 2005-2009

New information was retrieved from the same sources, but from different periods in order to control for locations. Therefore, news sources of information were:

- The complaint records at the Pollution Control Department from 2005-2006 and from 2010-June 2011
- The pollution news records (from the website of the Pollution Control Department) from 2010-June 2011.

The details of the new cases are in Table 3.10:

Table 3.10
The number of cases in the second phases by location and sizes

Location/size	Micro	Small	Medium	Large	Total
Bangkok	5		1	2	8
Ayudhaya (peri-urban)					0
Chacherngsao (peri-urban)					0
Nakornpathom (peri-urban)					0
Nakornratchaseeme (rural)				2	2
Total	5	0	1	4	10

Table 3.11
The total number of cases in the first and second phases categorized by location and sizes

Location/size	Micro	Small	Medium	Large	Total new cases	Total Old cases	All cases
Bangkok	5		1	2	8	4	12
Ayudhaya (peri-urban)					0	3	3
Chacherngsao (peri-urban)					0	5	5
Nakornpathom (peri-urban)					0	2	2
Nakornratchaseeme (rural)				2	2	6	8
Total new cases	5	0	1	4	10	20	30
Old cases	2	12	5	1	20		
Total old and new cases	7	12	6	5	30		

Information from these sources suggested that there were eight new cases in Bangkok and two new cases in Nakornratchaseeme, the rural area. These 10 cases involved five micro enterprises, one medium enterprise and four large firms. The details of these entrepreneurs are:

- Micro firms: tofu production enterprise (Bangkok), one boiled bean enterprise (Bangkok), one Squid preservation enterprise

(Bangkok), one mango preservation enterprise (Bangkok), and coconut peeling and roasting enterprise (Bangkok).

- Medium firm: one shrimp processing company (Bangkok)
- Large firm: two starch firms (Nakornratchaseema), one beverage company (Bangkok) and one frozen chicken company (Bangkok)

Overall, there are seven micro companies, 12 small firms, six medium firms and five large firms. 12 cases are located in Bangkok. 10 cases are located in peri-urban areas and eight cases are located in rural areas.

Appendix 4: Questionnaires

This part presents the details of the questionnaires used to interview entrepreneurs, local government officials, local community members, advocacy NGOs and business associations.

Questionnaires for SME entrepreneurs

- Interviewee:
- Position
- Interviewee no.
- Sex ....Male ....Female
- Educational level.....
- Date:

General information

1. What is the type of ownership of your unit?
    a. Private firm, single
    b. Private firms, part of a larger business group
    c. Foreign owned firm
    d. Joint venture
    e. Other.....
2. What is the main product of your company?
3. What is the type of your product?
    a. Final product
    b. Raw material
    c. A composition of other products
    d. Several types of products
    e. Other.....
4. Who are your main customers? (more than one answer may apply)
    a. Other producers
    b. Wholesaler

c. Retailer
d. Final customer

5. Do you have customers from aboard?
   a. Yes, please specify..... b. No
6. Do you have your own brand name?
   a. Yes, please specify..... b. No
7. What are inputs for the production process and who are suppliers of those inputs?
   a. Input..... Supplier.....
   b. Input..... Supplier.....

Environmental responsibility

General information

8. Do you have an environmental department/environmental employee in the company?
   a. Yes (go to question 9) b. No (go to question 11)

9. How many staff members does the environmental department have?.....

10. What is the educational level of the staff in the environmental department?
    a. Primary level
    b. High school level
    c. University level with major in.....
11. Do you invest in environmental technology?
    a. Yes (go to question 12) b. No (go to question 13)

12. Between 2007-2009, how much did you invest in water treatment? (percentage of the main investment to the total cost in one year)

13. How do you treat waste water before discharging into a public water source?
    a. Do not treat waste water
    b. Leave waste water in waste water ponds for a few days before discharging
    c. Add more Oxygen or other substances into waste water before discharging
    d. Reuse waste water
    e. Use waste water to produce methane gas and electricity
    f. Other.....
14. What is the reason?

    a. To comply with law
    b. To have a good relationship with local community
    c. To gain reputation for the company and attract 'green customers'
    d. To reduce costs and earn more profit from reuse/recycle technology
    e. To follow my own interests
    f. Other.....
15. Do you gain more benefit or incur more loss from being environmentally responsible?

    a. Yes (which form?.....) b. No

Questions in relation to local government

16. Is it necessary to have an environmental license for the production?
    a. Yes (go to question 17) b. No (go to question 18)
17. What are requested environmental conditions of the production process?
18. How often does the local government monitor your company in one year?
    a. 1-2 times

   b. 3-4 times
   c. 5-6 times
   d. Every month
   e. Never come
19. Is dealing with public sector agencies and individuals in relation to water as an environmental issue an important part of your business?
   a. Very important
   b. Important
   c. Not so important
20. Are good political contacts a crucial motivation for your environmental behaviour?
   a. Very important
   b. Important
   c. Not so important
21. What are the reasons of the answer in question 20?
22. What happened regarding the incident in.....? How did you get involved with the situation?
23. How did the local government react to this incident?
   a. Enforce law on the company
   b. Warn the company
   c. Inform Industrial Department to monitor the company
   d. Ignore
   e. Coordinate with the community to react against the community
   f. Other.....
24. How did you respond to the local government's environmental policy and law enforcement during this incident?
   a. Follow strictly
   b. Follow, but not all the time
   c. Ignore
   d. Try to lobby local government not to enforce law on your firm
   e. Other.....

25. What are the reasons?

Questions in relation to local community

26. Where do most of your employees come from?
    a. Nearby local community
    b. Other local areas
    c. Foreign labourers
    d. Other.....
27. Are your neighbouring communities your customers?
    a. Yes (go to question 28) b. No (go to question 29)
28. What is the percentage of total sale that is from the local community members who live nearby?
29. Does the firm buy raw material from nearby local community?
    a. Yes (go to question 30) b. No (go to question 31)
30. What is percentage of raw material bought from the local community living nearby?
31. Have you ever supported any community activities?
    a. Yes (go to question 32) b. No (go to question 33)
32. If yes, what kind of support?
    a. Training and knowledge for their agricultural needs
    b. Financial support
    c. Local infrastructure
    d. Local needs such as school, health care, sports
    e. Other.....
33. How often does the local community ask for your support in one year?
    a. 1-2 times
    b. 3-4 times
    c. 5-6 times
    d. Every month
    e. Never asks for any support

34. How did the local community react to this incident?
    a. Inform the Industrial Department to monitor the company
    b. Inform the local government about the problem
    c. Negotiate with the company
    d. Organize themselves to react against the company
    e. Ignore
    f. Other.....
35. How did you respond to the local community's environmental concern and reaction after the incident in .....?
    a. Follow strictly
    b. Follow, but not all the time
    c. Ignore
    d. Try to lobby local people/local leader not to react against your firm
    e. Other.....
36. What are the reasons?
37. Have you ever coordinated with the local community or the local government to improve the local environment?
    a. Yes (go to question 38) b. No (go to question 39)
38. Which form of environmental coordination did you have with them?
    a. Public hearing for environmental improvement
    b. Investment in local environmental infrastructure with the local government and local community
    c. Participation in environmental activities arranged the by local government or local community
    d. Provide facilitation to the local government and local community for their environmental activities
    e. Other.....
39. What are the reasons?

Questions in relation to business associations/large firms

Business association

40. Are you a member of any business association that benefits your business?

    a. Yes (go to question 41) b. No (go to question 48)

41. If yes, please list the name of the organization
    a. .....
    b. .....
42. How do you benefit from the business association(s)?
    a. Source of technological information
    b. Source of market information
    c. Source of business partner information
    d. Source of networking
    e. Other.....
43. Would your business be able to survive without being a member of the business association?
    a. Yes
    b. Yes, but with difficulty
    c. No
44. Has the business association tried to encourage the company to be more environmentally responsible?
    a. Yes (go to question 45) b. No (go to question 48)
45. How does the business association try to encourage their members to be more environmentally responsible?
    a. Provide environmental services and training
    b. Provide environmental and technological information
    c. Provide financial support
    d. Provide a platform for sharing environmental information
    e. Other.....

46. How do you react to the encouragement of the business association to be more environmentally responsible?
    a. Follow strictly
    b. Follow, but not all the time
    c. Ignore
    d. Other.....
47. What are the reasons?
    a. .....
    b. .....

Customers

48. Do your customers try to influence you to be more environmentally responsible?
    a. Yes (go to question 49) b. No (go to question 50)

49. If yes, how do they do?

    a. Ask to present environmental certification of materials/inputs
    b. Ask to present the environmental certification of production processes
    c. Ask to monitor the factory
    d. Ask to follow particular environmental standards
    e. Other.....
50. How do you respond to the environmental standards requested by large firm customers/the business association?
    a. Follow strictly
    b. Follow, but not all the time
    c. Ignore
    d. Withdraw from being customers/members
    e. Other.....
51. What are the reasons?
    a. .....
    b. .....

52. Do you receive any environmental support from the business association/customers if you want to be more environmentally responsible?

    a. Yes(go to question 53) b. No (go to question 54)

53. If yes, which form of environmental support have you received from the business association or large firm customers? (You can choose more than one answer)
    a. Environmental information and exchanging of opinions
    b. Financial support
    c. Environmental equipment
    d. Other.....

Questions in relation to advocacy NGOs

54. Have you had any interactions with advocacy NGOs related to the environmental problems??
55. How did you respond to environmental influence from advocacy NGOs in this incident?
    a. Followed strictly
    b. Followed, but not all the time
    c. Ignore
    d. Tried to lobby advocacy NGOs not to influence your firm
    e. Other.....
56. What are the reasons of your response?
    a. .....
    b. .....

Attitude assessment

Questions	Strongly agree	Agree	No opinion	Disagree	Strongly disagree
Government should financially support SMEs to be more environmentally responsible					

I do not need to worry very much about law enforcement by the public sector if I pay enough bribes.					
I will try to be more environmentally responsible because I do not want to have any problems with local government and local community.					
I will try to increase my environmental investment because I do not want to disturb other people.					
I will try to increase my environmental investment because I do not want to lose my business reputation.					
I would like to be more environmentally responsible if the cost to do so was lower.					
The local community is not my concern because they are not my customers.					
Supporting the local community will stop them from complaining if my company pollutes water.					
I am not concerned about the business association's environmental requests.					
I will try to follow my customers' environmental requests because I do not want to lose them.					
Religious beliefs contribute to my environmental awareness.					

Questions for in depth-interviews

- Regarding the the water pollution problem, how did you deal with it?
- What is your motivation to be more environmentally responsible? Why?
- What are the barriers to being more environmentally responsible? Why? How?

- How concerned are you about your business reputation?
- How is your relationship with the local government, local community, NGOs and local business sector? What are the reasons?
- Do the local government, local community, business sector and advocacy NGOs have an influence on your environmental performance? Why or why not?
- Among the local government, local community, business association, large firm customers and advocacy NGOs, which one do you consider to be the most important in terms of the influence it has on your business? Why?
- What is your opinion about the local government's environmental response?
- What is the reason of your response to the local government? (more detail from question 25)
- What is the reason of your response to the local community? (more detail from question 33)
- What is the reason of your response to business associations/large firm customers? (more detail from question 49)
- What is the reason of your response to advocacy NGOs? (more detail from question 55)
- If stakeholders coordinate with each other, how do you respond to that? Why?

Questionnaires for the Local Government

- Interviewee
- Interviewee No.
- Position: .... Local government chief
- ....Head of Public Health Section/Environmental section
- Sex ....Male ....Female
- Educational level.....
- Date:
- Basic information on municipality/district/council

1. Are there, besides this agency, any other central government agencies authorized to enforce law on polluting firms in this area?
   a. No other central or sectorial agency
   b. Yes if yes, please list these other agencies
      a.....
      b:.....
      c:.....
2. In general, does the local government have environmental policies in relation to water?
   a. Yes (go to question 3)
   b. No (go to question 5)
3. What are water-related environmental policies? Please list:
   a.....
   b:.....
   c:.....
4. What are environmental activities in relation to water? Please list:
   a.....
   b:.....
   c:.....
5. Is there any particular environmental policy in relation to water assigned from the central government?
   a. Yes (go to question 6)
   b. No (go to question 7)

6. What are the environmental policies in relation to water assigned by the Central government? Please list:
   a.....
   b:.....
   c:.....

Environmental influence: these questions refer to water pollution incident in ....., 20....

7. What type of damage was caused by this water pollution incident?
   a. Agricultural loss
   b. Effect on piped water
   c. Aquatic animal loss
   d. Health effects
   e. Lack of water utilization
   f. Unpleasant effects (e.g., smell)
   g. Other.....
8. How often is water pollution caused by this source?
   a. Never happened before
   b. 1-2 times a year
   c. 3-4 times a year
   d. 5-6 times a year
   e. Every month
   f. Other.....
9. Which area does the water pollution cover?
   a. One community, within one jurisdictional border of sub-district
   b. Several communities, within one jurisdictional border
   c. Several communities, within several jurisdictional borders
   d. Other.....
10. How many households were affected by the water pollution?
11. Is the polluting firm located in your jurisdictional border?
    a. Yes b. No

12. How did the local government react to this water pollution incident?
    a. Inform the Industrial Department
    b. Negotiate with polluting firms
    c. Improve relevant infrastructures
    d. Socially and economically sanction polluting firms
    e. Organize a group with the local community and other local governments to react against polluting firms
    f. Other.....
13. What is the reason of your reaction from question 12?
    a. The Central government's environmental policy
    b. Royal family's project
    c. Demands of the local community
    d. Pressure from other local governments
    e. The interest of the local government
    f. Local politics
    g. Other.....
14. Has the water pollution been reduced?
    a. No (go to question 15)
    b. Yes (go to question 16)
15. How did you react to the continuous problem?
    a. Keep informing the Industrial Department
    b. Negotiate with polluting firms again
    c. Enforce law more strictly
    d. Wait to react to polluting firms again when there are further complaints
    e. Coordinate with local people to react against polluting firms
    f. Ask for assistance from other agencies (NGOs, private sector)
    g. Other.....
16. Please indicate the results of water pollution reduction:

a. A decrease in number of affected households from...to...
b:...A decrease in affected area (percentage)…….
c:...A decrease in a number of incidents from…….to.....
d Other……

17. Did you coordinate with other organizations in efforts to solve this water pollution problem?
    a. No (go to question 20)
    b. Yes (go to question 18)
18. If yes, please list the name;
    a. .....
    b. .....
19. Which form of coordination was applied?
    a. Information sharing (Which kind of information?.....)
    b. Consultation (Which topic?..... .....)
    c. Financial support
    d. Technical/practical training (What kind of training?....)
    e. Other.....
20. What are reasons?

Relevant factors

Degree of delegation of authority (Institutional set up)

21. Who was authorized to enforce law on this pollution case?
    a. The local governments who are responsible for polluted area
    b. The local government who is responsible for the location of polluting firm(s)
    c. The Industrial Department at the Provincial Government
    d. The Provincial governor
    e. Other.....

22. If water pollution in this case covered an extensive area, which public sector reacted against the polluting firms?

a. The local governments who are responsible for polluted area
b. The local government who is responsible for the location of polluting firm(s)
c. Industrial Department at the Provincial Government
d. Provincial governor
e. Other.....

23. Did the local government have authority to enforce law on polluting firms?
    a. No because it is not in the jurisdictional border of the local government (go to question 25)
    b. No because it is the authority of the Provincial Office of Industrial Works
    c. Yes, but needs approval of the central government/the Industrial Department
    d. Yes, but needs to draw up the list of harmful business first
    e. Yes, independently of local regulations
    f. Other.....
24. How did you react against polluting firms that are not located in your jurisdictional border?
    a. Inform the Industrial Department
    b. Coordinate with other local governments and communities to pressure the responsible local government
    c. Coordinate with other local governments and communities to react against polluting firms
    d. Ignore
    e. Other.....

<u>Planning and budgeting capacity of local government</u>

25. Who is in charge of making the environmental plans of the local government?
    a. The Central government
    b. The local government leader

c. Environmental committee of the local government's council
d. The Planning and Policy Department
e. The Public Health Department
f. CBO
g. Other.....

26. What percentage of total budget was spent on water-related environmental activities in the last 3 years?
    a. 2007.....
    b. 2008.....
    c. 2009.....
27. How many water-related environmental projects have been accomplished in the last 3 years?
    a. 2007.....(from .....total projects)
    b. 2008.....(from .....total projects)
    c. 2009.....(from .....total projects)

Administrative/technical capacity

28. How long did the administrative process of the local government take to start monitoring the problem after the complaint of this water pollution?
    a. Within 3 days
    b. With a week
    c. Within 2 weeks
    d. Within a month
    e. Other.....
29. How many staff members are there in the public health/environmental section?
30. How many staff members are specialists in water-related environmental issues?
31. What is the educational level and area of study of the staff members who are in charge of water-related environmental issues?
32. Does the local government have equipment (water quality tester) to monitor the environmental quality of water?

a. Yes
b. Yes, but with some assistance from external agency
c. No

33. Who provides technical assistance for monitoring water quality?
    a. The Industrial Department
    b. The Pollution Control Department
    c. Other research department & University
    d. CBO
    e. Other.....

CBO support

34. Is there any environmental committee of the local government's council?
    a. Yes (go to question 35)
    b. No (go to question 36)
35. What is the function of environmental committee? Please list:
    a.....
    b:.....
    c:.....
36. Are there any community organizations in your area?
    a. Yes (go to 37)
    b. No (go to 40)
37. Are CBOs politically represented in the local government?
    a. Not at all
    b. Invited to ad-hoc meetings of the Agency or of its relevant (sub)committee
    c. Invited to ad-hoc meetings of field office of Agency
    d. Yes, in the local government council
    e. Yes, in committees of the local government council
    f. Yes, in other local government substructures
38. What is the actual involvement of CBOs in the decision making processes of the local government?
    a. No direct involvement
    b. Primarily in (ad hoc) advisory capacity
    c. Are consulted

d. Have a right of refusal to local government's decision
e. Carry weight in decision making

39. How does the political decision making body of the local government (or its members) responsible for planning & finances normally interact with CBOs in water-related environmental improvement?
    a. No or little particular attention paid to CBOs
    b. Regularly discusses matters with CBOs
    c. Reviews progress and acts upon it
    d. Review, act upon and seek to improve the plans of CBOs
    e. Other.....

Enabling planning practices of the local government

40. Does the local government involve residents or their organizations in programmes to improve of the local environment?
    a. No
    b. Yes
41. If the local government would have any special funds available for CBOs in environmental improvement, how would these be allocated to communities?
    a. On political (undefined) considerations
    b. On first-come, first-served basis
    c. On explicitly formulated (ex-ante) allocation criteria; please specify:.....
    d. Other, specify:.....
    e. Not applicable, such funds do not exist

In-depth interview

Local government leader

Environmental influence (more specific)

- What was the cause of continuous water pollution?
- How were you addressing this continuous problem?

- In your opinion, what were the main factors contributing to the achievement of the local government in improving the environmental quality of water? Why?
- What were the reasons for coordinating with other organizations?
- How did the local government coordinate with other organizations to solve water environmental pollution?
- How did the local government invite local people to participate in environmental solutions?
- How did environmental policies from the central government impact environmental policy at the local government level?

Power/politics

- Have water-related environmental solutions (for this incident) increased or decreased your political popularity? Why/why not?

Institutional set-up

- What were the legal difficulties when enforcing law on a polluting firm?
- Is there any unclear distribution of authority between the local government and relevant public sectors in relation to local environmental issues?
- If yes, what is the problem?
- How did you react to cases in which a polluting firm is not within your jurisdictional borders?
- Do you think the local government has enough authority to deal with polluted firms?
- If authority is enough, which factors do you consider before enforcing law on polluting firms?

Leadership

- How did you raise water-related environmental policy issues in the local government?

- How did you mediate the conflict between the local community and polluting firms?
- What were the political/administrative problems encountered when dealing with polluting firms? How do you solve the problems?

Planning/budgeting capacity

- How has the water-related environmental policy been implemented?
- What were the difficulties in planning and budgeting in relation to water-related environmental issues?
- How did you address the problems above?

Administrative/technical capacity

- When there was a complaint about water pollution, how did the local government respond to that? What was the procedure for dealing with this?
- What were the administrative and technical difficulties in relation to water-related environmental issues?

CBO

- Which factors did you consider before the decision to support/not support CBO?
- How did the local government enable people or CBOs to take environmental actions?

Local government staff members

- Was the local government chief interested in water-related environmental issues? What was the reason?
- Was the local government chief the main person to solve water pollution? What is the reason?
- How did the local government chief politically solve environmental problem?
- How did the local government chief administratively solve environmental problem?
- What were the problems when dealing with firms polluting water?

- In your opinion, what factors contributing to the local government's achievement in improving water environmental quality? Why?
- Why did/did not the local government pay attention to water-related environmental policy? (for local community)
- How did the local community react to environmental policy of the local government?

Other questions about planning, financial, administrative and technical capacities are similar to those above.

Questionnaires for the Local community

- Interviewee:
- Interviewee no.
- Date:

General information

1. What are the age, sex and education of respondent?

   Age
   Sex: male/female
   Level of education:- Primary education
   - Secondary education
   - Tertiary/university level
   How long have you lived in the community?
   Is this place your hometown?

2. Which type of damage did you face? (more than one answer may apply)
   a. Agricultural loss
   b. Effects on piped water
   c. Aquatic animal loss
   d. Health effects
   e. Lack of water utilization

f. Unpleasant effects (smell)
g. No effect

3. How often was water pollution caused by this source?

   a. Never happened before
   b. 1-2 times a year
   c. 3-4 times a year
   d. 5-6 times a year
   e. Every month

4. How many households were affected by this water pollution incident in 20.....?
5. Which area does the water pollution cover?
   a. One community, within one jurisdictional border
   b. Several communities, within one jurisdictional border
   c. Several communities, within several jurisdictional borders
   d. Other.....

Environmental Influence: these questions refer to water pollution year……

6. How did you react to this water pollution incident?

   a. Do not get involved with this problem
   b. Inform the local government
   c. Negotiate with polluting firms
   d. Coordinate with the local government or advocacy NGOs to react against polluting firms
   e. Organize with neighbours to react against polluting firms
   f. Other.....

7. Which factors played a role on your environmental reaction? (more than one answer may apply)
   a. Economic loss; please identify.....
   b. Concern about local people working with the company
   c. Support from local CBOs

d. Support from advocacy NGOs
e. Support from the local government
f. Other.....

8. If the pollution covered an extensive area, do you coordinate with other local communities to react against polluting firms?
   a. Yes (go to question 9) b. No (go to question 10)
9. How did you coordinate with other local communities?
   a……
   b……
10. What were the reasons for coordinating/not coordinating?

11. Did you participate in solving this pollution problem?
   a. Yes (go to question 12) b. No (go to question 13)
12. How did you participate in water pollution problem solving?
   a. Inform the local government and wait for the solution
   b. Inform others in community meetings and wait for the solution from the meeting
   c. Consult in community meetings and try to solve the problem together
   d. Being hired by the local government or an external agency to join local environmental activities
   e. Participate in a local organization initiated by an external agency
   f. Participate in independent local organization and let the group make a decision
   g. Do not participate at all

13. What were the reasons for your reactions?
   a……
   b……
14. How did other local people react to this incident?

15. How did the local government react when this water pollution occurs? (more than one answer may apply)
   a. Monitor

b. Inform the Industrial Department
c. Enforce law on polluting firms
d. Ignore the problem
e. Other.....

16. Has this pollution been reduced?
    a. Yes (go to question 18) b. No (go to question 17)
17. How did you react if the pollution problem continues?
    a. Inform the local government (again)
    b. Negotiate with polluted firms (again)
    c. Coordinate with the local government or advocacy NGOs to react against polluting firms
    d. Organize with neighbours to react against polluting firms
    e. Other.....

Social capital (in general)

18. When talking about 'community', what do you think about?
    a. People in the same village
    b. People in the same sub-district (*Tambon*)
    c. People in the same district (*Amphur*)
    d. People in the same province
19. How do you characterize the relationships among people within your community?
    a. Always support each other whenever it is needed
    b. Support each other when there is enough benefit
    c. Always conflict
    d. Not very close relationship
    e. Other.....
20. How much do you feel to be part of the local community?
    a. Feel isolated
    b. Vaguely feel like part of the community
    c. Feel I belong to the community, but participation is passive

   d. Feel I belong to the community and participation is active
   e. Feel I am an active leader is the community

21. How do you share local information with other people in your community?

   a. Local media (newspaper, radio)
   b. Community meeting
   c. General in-person chatting
   d. Temple/religious place
   e. Telephone/internet
   f. Other

22. How many local people participate in community meetings to solve this pollution problem?
   a. Everyone
   b. Most people (up to 80%)
   c. Half of them (up to 60%)
   d. Some of them (up to 40%)
   e. A few of them
   f. Never

23. How often do you participate in community meetings to solve this pollution problem?
   a. All the time
   b. Often (up to 80%)
   c. Regularly (up to 60%)
   d. Sometimes (up to 40%)
   e. Never

24. Are there any environmental norms or regulations that have been created by local people after the incident?

   a. Yes (go to question 25) b. No (go to question 27)

25. If yes, which kinds of norms or regulations or solution?

26. Has water pollution been solved by the solutions/environmental standards generated by the community?

    a. Yes Please identify the impact.
       A decrease in number of affected households from...to...
       A decrease in affected area (percentage)…….
       A decrease in a number of incidents from…….to.....
    b. No

Leadership

27. How did the local community leader react when this water pollution occurs? (more than one answer may apply)
    a. Monitor
    b. Inform the local government
    c. Organize people into a group and react against polluting firms
    d. Ignore/try not to get involved with the problem
    e. Other.....
28. How did you describe the village chief?
    a. Strong and active
    b. Democratic
    c. Does not like to get involved with public tasks
29. Has the water pollution been solved by the solution from the community?

    a. Yes Please identify the impact……..
    b. No

CBO

Ability to organize into group

30. Do the households of this community have an environmental organisation of their own?
    1. No
    2. Yes if yes, please list:

CBO (1):.....
CBO (2):.....

31. Have you joined the CBO?
    a. Yes b. No

32. What s the reason for joining/not joining the CBO?
33. What is your role in the CBO?.....
34. When was each of the CBOs established?

		CBO(1)	CBO(2)	
a.	In year	20..	20..	
b.	Don't know	....	....	....

35. Which area does this CBO focus on?
    a. Only one village
    b. Several villages, but within one sub-district
    c. The whole sub-district
    d. Several sub-districts, but within one district
    e. Several districts, but within one province
    f. Several provinces
    Please identify.....
36. Who brought about the establishment of this organisation?

For each CBO		CBO(1)	CBO(2)	CBO(3)
a.	Residents themselves	...	...	...
b.	Municipality/council	...	...	...
c.	Industrial Department	...	...	...
d.	the National government	...	...	...
e.	Political party/movement	...	...	...
f.	a foreign NGO	...	...	...
g.	a local NGO	...	...	...
h.	a project	...	...	...

37. How was this CBO found
38. What is the purpose of this organization? (more than one answer may apply)
    a. To increase environmental awareness of local people

b. To enable local people to solve their environmental problems
c. To have collective power to react against polluting firms
d. To represent the environmental needs of local people to the public sector
e. Other.....

Ability to manage community-level affairs

39. Does the CBO have environmental plans or projects to improve this water pollution?

a. Yes, one (or more) have been completed and currently there is one under implementation
b. Yes, there is one currently under implementation
c. Yes, there is one being developed
d. No, if not what are the reasons:.....
If yes, when did/will it start?: 20.....

40. What period did it/is it designed to cover?
a. No period indicated
b. Less than one year
c. One year d. More than one year
e. Don't know

41. How has the environmental plan been implemented?

42. How do you start such an environmental programme in a settlement?
a. Ad hoc, depends on politicians and availability of funds for projects
b. A planning initiative taken by local government
c. A planning initiative taken by central agency
d. A planning initiative taken by residents/CBO

43. Who formulates the environmental plans?
a. The community alone
b. The sector or central agency field office(r)

c. The local government planning/department
d. Central agency field office(r)
e. The local government planner facilitates community planning
f. The central agency planner facilitates community planning
g. NGO
h. Other, specify....

44. How do you characterise the leadership of this CBO? Does it have a strong leader, or rather a group of people or a committee or is it a fairly passive leadership?

For each CBO	CBO(1)	CBO(2)	CBO(3)
a. Strong central leader	...	...	
b. Group/committee	...	...	.
c. Passive leadership	...	...	.

45. How have CBOs tried to improve the environmental situation? (More than one answer can be applied)
    a. Inform the local government
    b. Negotiate with polluting firms
    c. Increase environmental awareness of local people
    d. Socially and economically sanction polluting firms
    e. Provide technical and environmental knowledge to local people
    f. Protest
    g. Other.....
46. How do you allow local people/members to participate and make a decision?
    a. Everyone is allowed to participate, but the decision is made by the head of the CBO.
    b. Everyone is allowed to participate, but the decision is made by the committee.
    c. Everyone is allowed to participate, but the decision is made by the consensus of the meeting.
    d. Other……..
47. How do local people interact with this CBO?
    a. Do not get involved with the CBO

b. Fully participate with CBO
c. React against CBO
d. Wait to see the result and then decide
e. Other.....

48. Who provides technical/organizing assistance for planning and implementation of this CBO?
    a. CBO receives no assistance
    b. NGOs provide assistance
    c. LGO provides assistance
    d. Sector or central agency provides assistance

49. In your view what skills are lacking in the CBOs?
    a. None
    b. General skills of organisation (report writing, running meetings, communication, bargaining)
    c. Planning skills (making surveys, problem identification, problem solving, design and financial)
    d. Technical skills in service areas (e.g. construction)
    e. other:.....

50. Please list the 3 agencies (public, private or NGO) which have contributed most to strengthen organization in this community. [leave blank if none or fewer]
    1:.....
    2:.....
    3:.....

51. What are the reasons? [more than one reason may apply]

    a. Adopt a process approach
    b. Use local/vernacular language
    c. Employ staff residing in settlement
    d. Put emphasis on awareness raising and commitment
    e. Provide practical skills
    f. Provide technical skills
    g. Provide financial resources to implement projects

52. Has this water pollution been reduced by the CBO?

    a. Yes please indicate the impact….. (go to question 53)

    b. No (go to question 54

53. If successful, what explanations can be given? [more than one reason may apply]

a. CBO leadership very capable/strong
b. Favourable characteristics of community
c. Support obtained from NGOs
d. Support obtained from government officials
e. Support obtained from government programme(s)
f Other, please specify:.....

- **<u>Resource access</u>**

54. What is the source of your resources?
    a. The local government/the Central government
    b. NGO
    c. Donation from local people
    d. Private sector
    e. Other.....

55. How do you access the source of resource?
    a. Through the connection with NGOs
    b. Through the connection with the local government
    c. Other....

56. Do CBOs in this community collect any levies/member fees?
    a. No
    b. Yes, CBO collects levies/fees for infrastructure and/or facilities run by CBO

57. What proportion of money is spent from external agency and from CBO's internal revenue?

……...% is from external support.
……...% is from CBO's internal revenue.

In-depth interview

- **Local community**

  a. Local community leader

  - How is the water pollution situation in your area?
  - How did you and local people try to solve the water pollution problem?
  - If the problem has continued, how are you reacting?
  - How is the relationship within local community? What is the reason?
  - What are the reasons for local commitment (or lack of commitment) in addressing the local environmental problem?
  - How did you lead people when dealing with this?
  - Have you joined a CBO? Why? Why not?
  - Has the environmental problem been improved by the community or CBO? Why? Why not?
  - What were the factors contributing to the success (or failure) of the local community's reaction to the environmental problem?

  b. CBO leader

  - Has the pollution problem been solved by the local government?
  - How does the local government implement their environmental plans?

- What are the purposes of this CBO?
- How do you organize this CBO? How does it function?
- What were the activities of the CBO when dealing with water pollution?
- How did you implement environmental an plan?
- How did the CBO persuade people?
- How did you enable people to participate in the CBO?
- How did local residents/local government and advocacy NGOs react to the CBO's environmental activities?
- What were the reasons of response from local community, local government and advocacy NGOs?
- How did polluting firms respond to the CBO's environmental influence?
- What were the reasons of response from polluting firms?
- Has the pollution problem been solved by the CBO?

c. Local residents

- How was your reaction when there was water pollution?
- How did the local government implement their environmental plans and solutions?
- Are you satisfied with the local government's solutions?
- Has the pollution problem been solved by the local government?
- If not, how did you react to the problem/local government?
- How did you respond to the local community's environmental norms and regulations?

- How did you participate in the environmental solutions of the community?
- What was the reason for your response/participation in environmental issues?
- What was the reason for high/low support from the local community when dealing with environmental problems? Please explain in detail.
- Please describe the characteristics of the local chief that supports/is against the environmental solution.
- In your opinion, what is the main factor that leads to an environmental improvement in a situation of pollution?
- Have you joined a CBO? Why? Why not?
- What do you think about CBOs? Is it useful for the community?

Questionnaires for Business sectors

- Interviewee:
- Interviewee no.
- Sex ....Male ....Female
- Educational level.....
- Position.....
- Date:

General information

Business association

1. What is your business association's function? (more than one answer may apply)
   a. To economically support members
   b. To be a networking space where members meet and exchange business information
   c. To provide knowledge and training to members
   d. To coordinate with the government to support the association
   e. Other.....
2. How do you depend on your members? (please rate the importance of each item)
   a. Membership fee
   b. Membership connection
   c. Technological information from members
   d. Business information from members
   e. No dependency on members
   f. Other.....
3. What is the main source of the business's association's income?
   a. Membership fee
   b. Service charges

c. Government funds
d. Funds from other countries
e. Other.....

4. How do your members benefit as a member of the business association?
   a. Find business partner
   b. Business information
   c. Business connections
   d. Technological information
   e. Government support
   f. Networking
   g. No benefits
   h. Other.....

5. Is a non-member able to survive in their business without assistance from the association?
   a. Yes b. Yes, but with difficulty c. No

Environmental influence

6. Is there any environmental policy/plan to encourage your members to be more environmentally concerned?
   a. Yes (go to question 7)
   b. No, but there will be in the future (go to question 9)
   c. No (go to question 9)
7. What are your environmental plans and policies?
   a. .....
   b. .....
   c. .....
8. What are the environmental activities arranged?
   a. .....
   b. .....
   c. ..... (go to question 10)

9. What are the reasons?
    a. .....
    b. .....
    c. ..... (go to question 13)

10. How do you encourage/ influence your members to be more environmentally responsible?
    a. Encourage members to ask their suppliers to present environmental certification of materials before making purchasing decisions
    b. Encourage members to ask their suppliers to present environmental certification of production processes before making purchasing decisions
    c. Encourage members to monitor the factory of their suppliers before a decision to buy
    d. Encourage members to ask their suppliers to follow environmental standards and monitor before a decision to buy
    e. Other.....

11. What is the reason?
    a. Law compliance
    b. Business reputation and environmental responsibility image
    c. Pressure from the public
    d. Pressure from a master company
    e. To reduce cost and earn more profit
    f. Other.....
12. In general, how do your members react to your environmental influence?

    a. Ignore
    b. Follow strictly
    c. Follow, but with support and guidance

d. Other.....

13. How does your organization react to water pollution created by your SME members? (if there are no polluting members, go to 16)
    a. Ignoring
    b. Warning
    c. Removing them from membership
    d. Coordinating with the local government and local community to influence polluting SMEs
    e. Mediating between firms and other stakeholders
    f. Other.....
14. What are the reasons?
    a. .....
    b. .....
    c. .....
15. In cases in which you have influenced polluting firms, how do they react to your influence?

    a. Ignore
    b. Try to improve immediately
    c. Try to improve, but with your support and guidance
    d. Other.....

16. Do you coordinate with other organizations such as local community, NGOs or the local government when trying to influence water-related environmental issues?

    a. Yes b. No, but will be in the future c. No
17. If yes, how do you coordinate with other stakeholders?
    a. Information sharing
    b. Financial support
    c. Participation in their environmental activities
    d. Other.....

In-depth interview

- How/Why do you apply these environmental policies in practice?
- Which factors make an impact on the approach and degree of environmental influence put on your customers/members?
- What are the factors of achievement/failure of your environmental influence/support?
- Do you think that your SME customers are concerned about your environmental policy?
- What are SMEs' motivations to follow your environmental policy?
- Which factors make an impact on the reaction of polluting firms?

Questionnaires of Advocacy NGOs

- Interviewee:
- Interviewee no.
- Date:
- Sex ....Male ....Female
- Educational level.....
- Date:

General information

1. What is the purpose of your organization?

   a.....
   b.....
   c.....
2. In general, what are the criteria you consider before participating in environmental issues?

   a.....
   b.....
   c.....

Environmental influence

1. How did you/the organization get involved with this water pollution issue in .....?

2. What was the incentive to participate in this water pollution issue?

3. Which environmentally related assistance did you provide to the local government/local community?
   a. Provide environmental knowledge and information
   b. Provide practical skills to manage environmental activities

   c. Provide environmentally-related technical skills
   d. Provide financial resources to implement projects
   e. Other.....
4. Which strategies were employed to deal with polluting firms?

5. How long did it take to employ your strategies?
   a. 1-3 months
   b. 3-6 months
   c. 6-12 months
   d. 1 year
   e. 1-2 years
   f. Other.....

6. How much has it cost to assist local community and local government in dealing with this incident?

7. How did polluting firms react to your strategies?
   a. Stop polluting
   b. Ignore
   c. Interrupt environmental activities
   d. Lobby the local government not to enforce the law on them
   e. Other.....
8. How did the local government react to your activity? (More than one answer may apply)
   a. Becomes more active in enforcing the law on polluting firms
   b. Coordinates with NGOs to react against polluting forms
   c. Ignores and continue their own approach
   d. Reacts against NGOs
   e. Neither supports nor interrupts
   f. Other.....
9. How did the local community react on your activity?

a. Becomes more active and coordinates with NGOs to react against polluting forms
b. Agrees, but does not coordinate
c. Neither supports nor interrupts
d. Reacts against NGOs
e. Other.....

10. How did the business sector react to your activity?

a. Coordinates with NGOs
b. Agrees, but does not coordinate
c. Neither supports nor interrupts
d. Disagrees, but does not disturb any activity
e. Reacts against NGOs
f. Other.....

11. For this incident, what have you achieved in terms of impacts?

a.....
b.....
c.....

12. Did your organization coordinate with other advocacy NGOs or other organizations?
    a. Yes (go to question 13) b. No (go to question 16)

13. If yes, please list the name(s) of organization(s):

a. .....
b. .....
c. .....

14. Which forms of coordination were used in this incident?

a. Information sharing (which kind of information is shared?.....)
b. Resource sharing (which kinds of resources are shared?.....)
c. Consulting (which aspect/topic?.....)

d. Participating in environmental activities (How?.....)
e. Other.....

15. What were the reasons (not) to coordinate with other organizations?

    a. .....
    b. .....
    c. .....
    d. .....

In-depth interview

- How did you deal with this water-related environmental issue (detail)?
- What was the incentive to assist in this water-related environmental issue (detail)?
- In your opinion, what were the reasons/factors for your achievement/failure in assisting local community/local government/CBOs to improve their environmental problem? (from question 4)
- Which mechanism was the most effective one for dealing with water-related environmental issues? Why?
- What was the reason of response from the local government, the local community and the private sector? (more detail of question 6,7,8)
- How is your relationship with the local government, the local community and the private sector?

Appendix 5: More detail of local government

This section provides more information on financial and personnel decentralization and on other government agencies that deal with water pollution.

Financial and personnel decentralization

This part aims to provide more detail on the decentralization in financial and personnel tasks to the local government, as described in Chapter 5. Decentralization is significant because it ensures that the local government can carry out its functions with necessary resources. This section will provide information on both financial and personnel decentralization.

Financial decentralization

This form of decentralization allows the local government to collect their own taxes and binds the central government to share some taxes with the local government. Following decentralization, the local government has three main sources of revenue (Krueathep 2010):

- Own resource revenues are revenue that the local government collects by itself . These sources are commercial land and building taxes, land development taxes, signboard taxes, animal slaughter taxes, hotel, gasoline, and cigarette taxes, fees and charges, permits, fines, revenues from properties and miscellaneous.
- Taxes collected by national government agencies and revenue sharing are VAT and sale taxes, specific business taxes, excise and alcohol taxes, motor vehicle taxes, land and real estate transfer fees, and others.
- Intergovernmental transfers are categorized into three groups: (1) general grants which are a) unconditional grants and b) block grants; (2) specific grants which are mandated to be spent on already set up plans and projects by the central government; and (3) transfers attached to the devolved functions (Krueathep 2010: 22).

The information of these three sources of revenue during 2006-2010 is presented in Table 5.1.

Table 5.1
Sources of Thai Local Government Revenue during 2006-2010

(Million Thai baht)

	Revenue Sources	2006	2007	2008	2009	2010
1	**Locally owned sources of revenue**	**29,109**	**32,021**	**35,223**	**38,746**	**29,110**
1.1	Commercial land & building taxes	14,166	15,602	17,164	18,881	14,172
1.2	Land development taxes	1,045	1,148	1,274	1,364	1,026
1.3	Signboard taxes	1,354	1,491	1,640	1,800	1,349
1.4	Animal slaughter taxes	254	274	291	397	341
1.5	Hotel, gasoline, and cigarette taxes	1,986	2,185	2,404	2,611	1,911
1.6	Fees and charges, permits, fines	3,182	3,477	3,819	4,201	3,153
1.7	Revenues from properties	2,297	2,530	2,783	3,061	2,275
1.8	Miscellaneous	4,822	5,311	5,843	6,428	4,879
	Percentage	**8.90**	**8.96**	**9.35**	**9.35**	**8.54**
2	**Revenue sharing and local taxes collected by central agencies**	**171,989**	**186,028**	**193,676**	**212,579**	**171,989**
2.1	VAT and sales taxes	100,120	107,049	107,385	118,975	78,854
2.2	Specific business taxes	2,535	3,553	4,000	2,400	2,280
2.3	Excise and alcohol taxes	26,639	27,341	29,931	30,793	30,029
2.4	Motor vehicle taxes	18,060	20,742	22,510	28,072	28,022
2.5	Land and real estate transfer fees	22,525	24,746	26,952	27,998	27,988
2.6	Others	2,110	2,596	2,896	4,340	4,815
	Percentage	**52.58**	**52.05**	**51.41**	**51.30**	**50.44**
3	**Intergovernmental transfers**	**126,013**	**139,374**	**147,840**	**163,057**	**139,895**
	Percentage	**38.52**	**38.99**	**39.24**	**39.35**	**41.03**
	Total	**327,112**	**357,424**	**376,740**	**414,382**	**340,995**

Source: (Krueathep 2010: 21)

Table 5.1 presents that the proportion of overall locally owned sources of revenue was only 8-9% of total revenue, while revenue sharing and local taxes collected by central agencies accounted for 50% and intergovernmental transfers accounted for 40%. This proportion reflects that the local government financially depends on the central government.

In addition, Table 5.1shows that the main source of locally owned sources of revenue is from commercial land & building taxes and the main source of revenue sharing is VAT and sales taxes. This indicates the uniformed characters of tax/revenue structures of local authorities, which reduces the local government's financial capacity since their socio-economic endowments are quite restricted (Krueathep 2010: 22).

The information in Table 5.2 shows that local government's revenues, which had been projected to reach 35 percent in 2006, "have remained constant at around 25%" (Haque 2010: 682). This suggests that the local government is not able to raise their revenue to match their increasing functions; therefore, the local government is still financially dependent upon the central government.

Table 5.2
Ratio of local government revenue to total government revenue

Fiscal Year	Total local revenue, including transfers (million Thai baht)	Total central government revenue (million Thai baht)	Ratio of total local revenue to central government revenue (%)
1997	93,879	843,477	11.13
1998	97,837	733,411	13.34
1999	97,748	708,832	13.79
2000	99,803	749,835	13.31
2001	154,633	739,021	20.92
2002	176,155	803,651	21.92
2003	184,066	829,495	22.19
2004	241,948	1,063,600	22.75
2005	282,000	1,200,000	23.50
2006	327,113	1,360,000	24.05
2007	357,424	1,420,000	25.17
2008	376,740	1,495,000	25.20
2009	414,382	1,604,640	25.82
2010	340,995	1,350,000	25.26

Source: Weerasak (2010)

Personnel Decentralization

Apart from financial decentralization, personnel decentralization is also important for the local government to operate its tasks. Through decentralization, the local government can acquire administrative staff to operate their routine work through two approaches. The first way is that the central government staff are voluntarily transferred to work for the local government and the second way is the local government hires their own administrative staff based on the central government's plans and budget.

Table 5.3
The number of staff in different local government units

Classification	Executive leader	Executive team	Council member	Administrative staff	Total*	Numbers of Local Government Units*	Proportion of admin staff per unit	Proportion of admin staff per unit per Task
PAO	76	544	2,250	17,223	20,093	76	226.62	0.79
Municipalities	2,082	6,899	20,628	144,644	174,523	2,082	69.47	2.59
TAO	5,693	18,450	131,798	142,236	298,177	5,693	24.98	7.20
Total	7,851	25,893	154,676	304,103	492,523	7,851	38.73	4.65

Source: The Office of Decentralization Committee (2012)

*Information on 31st December 2011

Table 5.3 suggests that the local governments, especially in rural areas (TAO), have approximately 25 employees per unit, while municipalities have around 70 employees per unit. Moreover, when comparing the number of employees in 2011 to the number of tasks already transferred in 2008 (181 tasks), one administrative employee in TAO has to manage around seven tasks, while one employee in a municipality administrates 2-3 tasks. From this it can be implied that the local government in rural area needs additional staff to fulfil their increasing transferred tasks in the future.

Overall, the total number of tasks transferred to local government in 2008 is reflected in Table 5.4.

Table 5.4
The total number of tasks transferred to local government in 2008

Classification	Number of tasks planned to be transferred	Numbers of tasks transferred	The rest of the tasks that are combined in the second plan
1. Local infrastructure and utilities	87	72	16
2. Social welfare	103	69	34
3. Public safety	17	9	8
4. Local economic development	19	14	5
5. Natural resources and environment	17	15	1
6. Cultural promotion	2	2	-
Total	245	181	64

Source: the Office of Decentralization Committee (2012)

Relevant government agencies and laws in relation to water pollution

The Ministry of Industry

The Ministry of Industry is mainly responsible for industrial matters: to strengthen business' potential and enhance national industrial competitiveness in the world market; to enable a suitable environment for industrial investment; and to monitor and control businesses to be sustainable and environmental friendly. There are two main departments dealing with polluting firms: the Department of Industrial Works and the Provincial Industrial Office.

The Department of Industrial Works

The responsibilities of the Department of Industrial Works are to "supervise and coordinate with industrial business' activities by following the guidelines of environmental preservation, safety, and hygiene energy economization" (DIW, 2006).

In this thesis, the Department's functions in relation to SMEs' water pollution are classified into two areas. First, if there is any complaint to their office, they will inform relevant government offices directly, such as the District Office (in Bangkok) or the Provincial Industrial Office (in

other provinces) to monitor. Second, the Department goes to monitor pollution sources itself and orders polluting firms to improve. These cases are normally "registered factories" located in Bangkok.

The Provincial Industrial Office

This office is a branch or unit of the Ministry of Industrial Works at the Provincial level. Its responsibilities in relation to SMEs' water pollution are similar to those of DIW.

Both the Department of Industrial Work and the Provincial Industrial Department are authorized to enforce 'the Factory Act of 1992' on any illegal firms regarded as 'factory'. These organizations also function to encourage entrepreneurs to be more environmentally and socially responsible. In relation to water pollution, their main tasks are to:

- Monitor the quality of waste water discharged from targeted firms
- Monitor/supervise firms causing any pollution problem and enforce the Factory Act of 1992 on them if necessary

The Factory Act of 1992

- Section 35 For the implementation of this Act, the authority shall have the following powers to inspect, search, detain, seize or attach the products, containers, book accounts, documents or any relevant articles in cases where there is a reasonable grounds to suspect that engagement of a business in a factory may cause harm to the persons or property in the factory or its vicinity or an offence under this Act has been committed.
- Section 36 When it appears that any person has committed, or is suspected have so committed, an offence under this Act, the authority appointed from the government officials not lower than level 4 of position classification shall have the power to arrest such person in order to hand over to an inquiry official for further legal action.
- Section 37 In cases where the authority finds out that any person engaging in a factory business violates or fails to comply with this Act or engages in a factory business in such a manner as to cause harm, injuries or troubles to the persons or property in the factory or its vicinity, the authority shall have the power to order such per-

son to stop such violating act or to correct or improve or conform correctly or properly within the specified period.

- If the authority deems it appropriate, upon approval of the Permanent Secretary or a person assigned by the Permanent Secretary, the authority shall have the power to bind and stamp on the machines to prevent them from operating until the compliance with the order of the authority under paragraph one.

The Ministry of Natural Resource and Environment

The Ministry of Natural Resources and Environment is responsible for preserving, maintaining and recovering natural resources and the environment. This includes creating value related to social and economic development. Relevant departments are the Provincial Natural Resources and Environmental Office and the Pollution Control Department.

The Provincial Natural Resources and Environmental Office

This is the branch of the Ministry of Natural Resources and Environment at the Provincial level that is responsible for monitoring and solving environmental problems (include air, noise) of each province. They also need to make environmental plans for their jurisdictional area, investigate local environmental problems, support other government offices in relation to environmental tasks and enable local people to be more environmentally concerned about their local area.

The office is authorized to enforce the Enhancement and Conversation of National Environmental Quality Act (NEQA) of 1992, which is not directly about the production process of a factory. The law focuses on the environment that is outside a factory such as air and water. According to the law, this office can never enforce law on polluting firms until it is obviously proved that the Industrial Department did not carry out its tasks properly.

The Pollution Control Department (PCD)

The Pollution Control Department is the organization that makes environmental plans at the national level. Its tasks are:

- Present opinions for the formulation of the national policies and plans for the promotion and conservation of environmental quality with respect to pollution control,

- Make recommendations for the establishment of environmental quality standards and emission/effluent standards,
- Develop environmental quality management plans and measures to control, prevent, and mitigate environmental pollution,
- Monitor environmental quality and prepare an annual report on the state of pollution,
- Develop appropriate systems, methodologies, and technologies for application in the management of solid waste, hazardous substances, water quality, air quality, noise level, and vibration,
- Coordinate and implement measures to rehabilitate and remedy damages caused by pollution in the contaminated area and environmental damage appraisals,
- Provide assistance and advice on environmental management,
- Investigate public complaints on pollution,
- Perform other functions on pollution control as specified by the Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992) and other related laws,
- Perform other functions as may be designated by law to be the responsibilities of the Department or by the Ministry of Natural Resources and Environment or by the Cabinet (Pollution Control Department. 2011a).

When local people complain about their pollution problem to the Pollution Control Department, they have to coordinate with relevant government officials such as the local government and the Department of Industrial Works to solve the problem. In some cases, they might go to monitor the incidence because the local government does not have sufficient ability to scientifically prove and solve the problems. This is described in Enhancement and Conversation of National Environmental Quality Act (NEQA) of 1992.

Enhancement and Conversation of National Environmental Quality Act (NEQA) of 1992

Section 83: In cases in which it is deemed reasonable in the interest of co-ordination of action among agencies concerned, the pollution control official may:

- Recommend the official who has the legal power to control the point source of pollution, to close down its operation, to suspend or revoke the license of its owner or operator, or to bar its use or utilization in any way, especially in connection with the point source of pollution under section 68, section 69 or section 74, which has no intention to treat the polluted air, wastewaters or other wastes and illegally discharges the untreated wastes into the environment outside the limits of its site and premises.
- Recommend to the local official to take legal action against the owner or possessor of the point source of pollution under section 71 or section 72 in order to mandate him to send wastewaters or wastes to be treated or disposed in accordance with this Act.
- Give advice and suggestions to the local official or the government agency concerned in connection with the operation and maintenance of the central wastewater treatment plant or the central waste disposal facility under the responsibility of such local official or government agency.

The Ministry of Public Health

The Ministry of Public Health is responsible for developing and providing effective public health services to everyone. This includes disease prevention and monitoring. The main departments dealing with public health related to water pollution are the Provincial Public Health Office and the Department of Health.

The Provincial Public Health Office

This office functions as the Ministry of Public Health unit at the Provincial level: to ensure that good public health services provided to local people and to promote disease prevention and control at the provincial level.

The Department of Health

The department promotes public health among people by researching, developing and transferring knowledge and technology about health promotion, health factors and health effects. This includes promoting participation by the regional department, the local government and all networks to promote good health of Thai people.

In relation to water and environmental management, the local government is fully authorized to enforce only the Public Health Act 1992, and only Bangkok and municipalities are further authorized to enforce other relevant laws such as the Factory Act of 1992, as of 2009. If the pollution is extensive, the local government, especially in rural areas (TAOs), still needs to rely on the central government (the Provincial Industrial Office) or other government agencies to assist them in monitoring.

Apart from these Ministries and departments, there are also other ministries dealing with water pollution legislation, such as the Ministry of Agriculture and Cooperatives that can enforce the Royal Irrigation Act of 1992, the Fisheries Act of 1947 and the Canal Maintenance Act of 1983, or the Ministry of Transport and Communication that can apply the Navigation in Thai Water Way Act of 1992. The local government is not authorized to enforce all these laws and regulations.

It can be explained briefly by Table 5.5: Legislation and regulatory activities of different organizations responsible for environmental tasks.

Table 5.5
Legislation and regularities of different organizations responsible for environmental tasks

Legislation	Regulatory Activities	Responsible Ministries	Remarks
Enhancement and Conversation of National Environmental Quality Act (NEQA) of 1992	Regulates specified point sources for wastewater discharged into public water resources, or the environment, based on effluent standards	MoSTE	Amendment to NEQA is being drafted key environmental legislation to fill gaps; no criminal or civil liability for violation of standards
Factories Act of 1992	Limits level of effluent discharges and restricts concentration levels of chemical and/or metal pollutants	MoInd	MoInd also promotes industrial development activities, which creates conflicts of interest. An amendment to the Act is being drafted to require polluters to pay for clean-up costs.
Public Health Act of	Regulates nuisance activi-	MoPH	Decentralized implementation to

1992	ties related to water pollution such as odor, chemical fumes, wastewater discharge from buildings, factories or animal feedlots that cause harmful health effects		LGAs
Navigation in Thai Waterways Act (Volume 14) as amended in 1992	Prohibits dumping of any refuse including oil and chemicals into rivers, canals, swamps, reservoirs, lakes or waterways that may pollute the environment or disrupt navigation in Thai waterways	MoTC	Many cases have been successfully brought against polluters.
Cleanliness and Tidiness of the Country Act of 1992	Prohibits dumping of refuse in water ways	LAOs	Decentralized implementation to LGAs
Canal Maintenance Act of 1983	Prohibits dumping or discharging of wastewater in canals	MoAC	Little used
Building Control Act of 1979	Regulates discharges of water pollution from buildings	MoInt	Decentralized implementation to LGAs
Penal Code of 1956	Prohibits adding harmful substances into water resources reserved for consumption	OAG	Little used
Fisheries Act of 1947	Prohibits dumping or discharging of hazardous chemicals into water resources reserved for fishing	MoAC	Difficult to prove intention for criminal liability
Royal Irrigation Act of 1942	Prohibits dumping of garbage or discharging polluted water or chemicals into irrigation canals	MoAC	Limited jurisdiction

Source: World Bank (2001)

LAO Local Administrative Organization
MoAC Ministryof Agriculture and Cooperatives
MoInd Ministry of Industry
MoInt Ministry of Interior
MoPH Ministry of Public Health
MoSTE Ministry of Science, Technology and Environment
MoTC Ministry of Transport and Communications
OAG Office of the Attorney General

Appendix 6 Limitations of the study

Limitations of the study

Firstly, some real information is limited by the informants especially the financial information from entrepreneurs, who did not want to reveal too much information about this.

Secondly, some informants did not give real information about the problem because doing so could reveal their flaws or irresponsibility. For instance, one of the local government leaders told me to go to the villages that were not affected by water pollution and did not mention those that were affected. Some local governments informed that water pollution was not caused by the entrepreneur because they were not producing. However, the information was wrong because the company was still operating. This situation confused me a lot and it took a lot of time to double check all the information again. The last point is using a ranking system such as high, medium and low might not be able to capture all the facts, which are complicated and dynamic. In-depth case studies are necessary to present the detail of the story.

References

Allen, A. (2003) 'Environmental Planning and Management of the Peri-Urban Interface : Perspectives on an Emerging Field', *Environmental and Urbanization* 15(1): 135-148.

Burns, R. and R. Burns (2008) *Business Research Methods and Statistics using SPSS*. London: SAGE Publications.

Department of Agricultural Extension (Last updated 2011) 'Database for Agricultural Extension' (a webpage of Department of Agricultural Extension). Accessed 8 January 2011 <http://www.agriinfo.doae.go.th/>.

Department of Provincial Administration 'Population Number of Thailand in 2006' (a webpage of Department of Provincial Administration). Accessed 11 January 2011 <http://www.dopa.go.th/>.

European Topic Center on Land Cover (2000) *CORINE Land Cover*. Belgium: Geographic Information Management NV.

Filipe, J. and J. Cordeiro (eds) (2011) *Enterprise Information Systems: 12th International Conference, ICEIS 2010*
Revised Selected Papers. London: Springer.

Gallego, F.J. (unknown) *Mapping rural/urban Areas from Population Density Grids*. Institute for Environment and Sustainability.

Haque, M.S. (2010) 'Decentralizing Local Governance in Thailand: Contemporary Trends and Challenges', *International Journal of Public Administration* 33(12-13): 673-688.

Krueathep, W. (2010) 'Thailand Decentraliazation: Challenges and Agendas for Inclusive Growth', No. 1Asian Development Bank.

Mathematics Learning Support Centre (Last updated 2013) 'Statistics: 3.1 Cluster Analysis' 18 March <http://mlsc.lboro.ac.uk/resources/statistics/Clusteranalysis.pdf>.

Metropolitan Waterworks Authority (Last updated 2014) 'Water Tariffs' (a webpage of Metropolitan Waterworks Authority). Accessed 17 September 2013 <http://www.mwa.co.th/ewtadmin/ewt/mwa_internet_eng/ewt_news.php?nid=309>.

Metropolitan Waterworks Authority (2009) 'Annual Report 2009'. Bangkok: Metropolitan Waterworks Authority.

Mooi, E. and M. Sarstedt (2011) *A Concise Guide to Market Research*. Berlin: Springer-Verlag Berlin Heidelberg.

National Statistic Organization (2011) Kanokkarn Tevapitak. 'Number of Employed Persons between 2006-2009'. (statistics). Bangkok: .

National Statistic Organization 'Map and Annual Statistic of Thailand' (a webpage of National Statistics Organization). Accessed 7 January 2011 <http://service.nso.go.th/nso/nsopublish/servGis/Report_stat/1_6.htm>.

National Statistical Office (2008) 'Industrial Census 2007 (Bangkok, Peri Urban, Northeast and Middle Area)'. Bangkok: National Statistical Office.

Norusis, M. (Last updated 2013) 'Chapter 16 Cluster Analysis' 18 Mar, 2013 <http://www.norusis.com/pdf/SPC_v13.pdf>.

OECD (1994) *Creating Rural Indicators for Shaping Territorial Policies*. Paris: OECD Publications.

Pizzoli, E. and X. Gong (2007) 'How to Best Classify Rural and Urban?', pp1-13.

Pollution Control Department (Last updated 2011a) 'Mission Statement of Pollution Control Department' (a webpage of Pollution Control Department). Accessed 15 August 2011 <http://www.pcd.go.th/about/en_ab_mission.html>.

Pollution Control Department (Last updated 2011b) 'News Clipping' (a webpage of Pollution Control Department). Accessed 2 November 2010 <http://newsclip.pcd.go.th/index.asp>.

Pollution Control Department (2010) *The Evaluation of Coefficient of Waste Water and BOD from Sources of Pollution from Industries*. Bangkok: Pollution Control Department.

Pollution Control Department (2009) 'Performance Report of Pollution Complaint'. Bangkok: Pollution Control Department.

Romesburg, H.C. (1984) *Cluster Analysis for Researchers*. Florida: Robert E. Krieger Publishing Company.

Statistics Solutions (Last updated 2013) 'Conduct and Interpret a Cluster Analysis'. Accessed 18 March 2013 <http://www.statisticssolutions.com/academic-solutions/resources/directory-of-statistical-analyses/cluster-analysis-2/>.

Studentsguide (Last updated 2011) 'Sources of Industrial Pollution' (a webpage of Studentsguide). Accessed 1 February 2011 <http://www.studentsguide.in/biology/pollution-environment/sources-of-industrial-pollution.html>.

Tacoli, C. (1998) 'Rural-Urban Interactions: A Guide to the Literature', *Environment and Urbanization* 10(1): 147-166.

The Department of Business Development (Last updated 2014) 'Business Information' (a webpage of The Department of Business Development). Accessed 15 September 2013 <http://www.dbd.go.th/ewt_news.php?nid=7485&filename=index>.

The Department of Local Administration (2010) *The Information of the Local Government's Revenue 2009*. Bangkok: The Department of Local Administration.

The Department of Local Administration (2009) *Information of the Local Government's Revenue 2008*. Bangkok: The Department of Local Administration.

The Ministry of Energy (2011) 'Biogas Energy (in Thai)', The Manual of Development and Investment in Substituting Energy, No. 5, pp. 1-72. Bangkok: The Ministry of Energy.

The Office of Decentralization Committee (2012) Kanokkarn Tevapitak. 'The Number of Local Government Staff and the Number of Transferred Tasks to Local Government'. Bangkok: .

Udomkacha, C. (2013) Kanokkarn Tevapitak. 'Advertising on Television and Rasio Expenditure of Companies in Food Sectors'. The Nielson Company (Thailand). (The information is given as a file by email.).

Webster, D. (2002) 'On the Edge: Shaping the Future of Peri-Urban East Asia', pp. 1-53. Standard: Standford University. Accessed 20 December 2010 .

Wikipedia (Last updated 2014) 'Bangkok' (a webpage of Wikipedia). Accessed 20 September 2014 <http://en.wikipedia.org/wiki/Bangkok>.

Wikipedia (Last updated 2011a) 'Biochemical Oxygen Demand'. Accessed December 20th 2010 <http://en.wikipedia.org/wiki/Biochemical_oxygen_demand>.

Wikipedia (Last updated 2011b) 'List of Metropolitan Areas in Asia by Population' (a webpage of Wikipedia). Accessed 1 February 2011 <http://en.wikipedia.org/wiki/List_of_metropolitan_areas_in_Asia_by_population>.

Wikipedia (Last updated 2011c) 'Metropolitan Area' (a webpage of Wikipedia). Accessed 1st February 2011 <http://en.wikipedia.org/wiki/Metropolitan_area>.

Wikipedia (Last updated 2011d) 'Water Pollution' (a webpage of Wikipedia). Accessed 1st February 2011 <http://en.wikipedia.org/wiki/Water_pollution>.

Wikipedia (Last updated 2010) 'Administrative Division of Thailand' (a webpage of wikipedia). Accessed 10 January 2011 <http://en.wikipedia.org/wiki/Administrative_divisions_of_Thailand>.

World Bank (2001) 'Thailand Environment Monitor 2001 Water Quality', Thailand Environment Monitor, pp. 1-38. Bangkok: World Bank.