Information Management and Business Review
Vol. 6, No. 1, pp. 42-48, Feb 2014 (ISSN 2220-3796)

Pollution Management and Industrial Estates: Perceptions of Residents in the Vicinity of Map Ta Phut Industrial Estate, Thailand

Supaporn Pinyochatchinda, John Walsh*
School of Management, Shinawatra University, Thailand
*jcwalsh@siu.ac.th

Abstract: Industrial pollution has become a serious problem in most states and has been tackled by initiatives at the national and transnational levels. However, public opinion is still affected by the events of the past. This situation is explored through the case of Map Ta Phut industrial estate in Thailand,which has been bedeviled by environmental and safety issues since it was opened in 1989. Despite improvements in management systems, notwithstanding the explosion in 2012 which killed 12 workers in one factory, the opinions of nearby residents has been badly affected by the memories of the past. This has led to mistrust and suspicion of the industrial estate among those residents and so protests and dissent have been more common. This study employs a quantitative survey of 400 residents living in the vicinity of Map Ta Phut with a view to understanding their perceptions of environmental management on the estate and, hence, some indications of how better flows of information might improve confidence among these important stakeholders. There will need to be more effective long-term methods of dealing with health issues relating to pollution and conveying knowledge about what is being done in order to recapture public trust.

Keywords: *Environmental management, industrial estate, residents, Map Ta Phut, Thailand*

1. Introduction

Map Ta Phut industrial estate was founded in 1989 in the south of Thailand, near to the city of Rayong, which is a port on the coast of the Gulf of Thailand and the principal location for oil and gas extraction. The industrial estate was established to take advantage of proximity to these resources and also because of the Thai government's plan to decentralize some economic activities away from Bangkok, both to promote employment and income-earning opportunities in provincial areas and also because of the need to relieve the pressure on transportation and public services in the capital. Map Ta Phut now consists of 6,949 rai (1,111.8 hectares) of ordinary industrial zones with 60 factories, in addition to another 1,609 rai (257.4 hectares) of business industrial zones. Most of the factories are involved with some aspect of hydrocarbon processing or some other form of heavy industry. It is the largest industrial estate in the country and a significant site of economic and industrial activity. It is also an industrial estate that has been bedeviled by environmental problems through the years, from an explosion in 2000 that killed two workers to another in 2012 that killed 12 and wounded more than 100 more (*Bangkok Post*, 2012). There have also been persistent stories about abnormally high rates of cancer among people in the vicinity of the estate (Fuller, 2009) and various types of pollution and environmental degradation. Governed by the Industrial Estate Authority of Thailand (IEAT), Map Ta Phut industrial estate management has taken steps to improve the quality of its environmental management and to resolve outstanding issues. Although some success has been achieved, this has been undermined by the negative publicity and, of course, the 2012 disaster. This raises the question of what is the attitude towards and perception of environmental management at Map Ta Phut industrial estate among nearby residents. For the industrial estate to have a sustainable career, it will need to reduce the transaction costs resulting from mistrust in the country as a whole and, in particular, among residents in nearby communities This is evident from the various protests that have taken place and the calls for additional research and checking of pollution levels.

Although the existence of some protests against the estate indicates that members of communities in its proximity are unhappy, it is not known how many people blame the estate for poor health and environmental conditions and to what extent. It is also not known whether the measures taken by managers in some companies have had an impact on public opinion. There is evidence from other countries where industrial

pollution has affected health that public opinion has been vocal (e.g. Bickerstaffe and Walker, 2001; Moffatt et al., 1995; Markowitz and Rosner, 2003). Is this the case for Thailand or have more recently implemented initiatives helped to convince people that industry is cleaner today? This is the principal objective behind the current paper, which reports on opinions provided by 400 community members living in close proximity to Map Ta Phut. The paper continues with a review of relevant literature, followed by a description of the methodology employed and then the findings, discussion and implications. A brief conclusion then indicates future research directions.

2. Literature Review

Since industrial estates are important elements of the developmental strategies of many states, including Thailand, it is necessary to understand how to deal with the pollution problems that are caused by their presence (Singhal & Kapur, 2002). Pollution is a form of negative externality: that is, it is a physical phenomenon created by the act of production but which is not its principal objective. Pollution can affect the air, water or the land and may have short-term and/or long-term effects. There may also be noise pollution, which occurs when loud and consistent noises can have damaging effects on human health, as well as leading to stress and anxiety and lowered quality of life (Stansfeld & Matheson, 2003). Pollution may spread across borders and is in any case quite separate from geographical boundaries (Ludema & Wooton, 1994). Until quite recently, pollution was generally considered to be an unavoidable part of the production process and, since manufacturing was considered to be beneficial to the state as a whole, then it was appropriate for the state to pay for it. This was demonstrably inequitable since the people who suffered from the negative externality were not those who had caused it and not only did they not benefit from the process but they might have been very badly affected by it. Much of the acid rain resulting from the burning of coal in the UK ended up falling in Scandinavia (Williams, 2004), while the 1984 release of toxic chemicals in Bhopal in India by a subsidiary of Union Carbide resulted in more than 2,000 deaths and much more illness and damage (Koplan, Falk & Green, 1990).

In Thailand, the well-known case of elevated lead levels at Klity Creek has been associated with serious health problems for many villagers (Pusapukdepob et al., 2007). As a result, pressure from the public, non-governmental organisations (NGOs) and some state governments made popular the 'polluter pays principle' (PPP) that was included in the 1992 Rio Declaration on Environment and Development (Porras, 1992). The PPP places the onus of responsibility for any emissions or other pollution at the feet of those who caused it. This also means that states become responsible for the pollution caused by the industrial units within their jurisdiction. States can use both regulatory and fiscal instruments as policies to try to bring about reductions in emissions (Eskeland & Jimenez, 1992). It has also led to the creation of a variety of market-based approaches which have involved the exchange of carbon licenses and other allowances as a means of reducing emissions overall. However, market failures have been prominent (Nash, 2000). In this context, then, the responsibility for management of environmental issues has devolved downwards from the state level to the level of industrial estate management and to the managers and owners of individual facilities within those estates. This depends on the governance of the estates concerned, which is described below.

Governance of Industrial Estates: Industrial estates can belong to the public sector, the private sector or a combination of the two. Since the siting of an industrial estate requires land ownership, it is at least initially determined by the public sector, which may use the policy for regional development, for example by encouraging firms to locate to areas of high unemployment or low alternative options (Roberts, 2004). In the case of Thailand, most industrial estates are managed by the Industrial Estates Authority of Thailand (IEAT). The IEAT operates under the Ministry of Industry and is responsible for "… the development and establishment of industrial estates, where factories for various industries are closely and systematically clustered together. With industrial estates as an implementation tool, IEAT also serves as a governmental mechanism to decentralize industrial development to provincial areas throughout the country (IEAT, n.d.)." The Thai government has been pursuing decentralization as a deliberate policy since the 1980s and, in particular, the 1990s (Pearson &Kusakabe, 2013:26). The most common form of governance is missed since, of the 49 industrial estates in total currently in the country, 11 are operated directly by the IEAT and the remaining 38 are operated jointly with private sector developers (IEAT, n.d.). As a matter of definition, industrial estates are areas in which the laws of the land are different, slanted in ways generally to give

benefit to capital at the expense of labour. The issue of liability also has an impact on the establishment of specific and properly-defined legal regulations (Boyd, Harrington & MacAuley, 1996). Firms in the Map Ta Phut industrial estate, as for all estates nationwide, must obey all the laws of Thailand unless specifically exempted from doing so by IEAT-mediated regulations (Charmondusit & Keartpakpreak, 2011). In general, to supplement the national laws, industrial estate managers will impose some form of environmental managements system (EMS) to which firms will be expected to conform (Geng & Côté, 2003).

Environmental Management Systems: According to Sripoung (2007), the purpose of an EMS is to develop, implement, manage, coordinate and monitor corporate environmental activities so as to ensure compliance and waste reduction. They may consist of a mix of policies, processes and procedures configured to the particular types of industry concerned and the relevant spatial and temporary issues. Well-known components of EMS include the international standards of quality ISO 9001 and ISO 14001. Evidently, the nature, complexity and cost of creating and implementing a suitable EMS will vary on a case-by-case basis and will also vary over time (Darnall & Edwards, 2006). When different forms of EMS exist in proximity to each other, such as in the case of an industrial estate, then it is evident that all companies are at the risk of being judged by the weakest or least effective system. This problem has helped to spur the creation of the industrial ecology concept (Singhal & Kapur, 2002). This concept is based on the idea that individual firms exist not in a vacuum but in a highly responsive and interactive set of physical, social and virtual environments which link stakeholders, including nearby communities. In this ecology, problems in one area could lead to problems elsewhere in the system and serious problems could result in destruction. The ecology evolves and changes and requires attention from all members (Huber, 2000). If there were, for example, problems derived from negative perceptions of the EMS on the behalf of local residents, this might provoke a serious problem within the ecology as a whole and it is this issue that the current paper investigates.

3. Methodology

This research project is part of a larger programme of doctoral research concerning broader issues of environmental management relating to Map Ta Phut industrial estate. It involves a quantitative study of people living in proximity to the estate. The Yamona equation suggested that a sample size of 400 would be appropriate to obtain a 95% level of confidence in the results. This sample was obtained using a combination of convenience and purposive sampling techniques and the researchers visited several communities close to the estate in order to find respondents on a house-by-house approach. There was quite a high level of resistance to being interviewed among potential interviewees and this was at least in part the result of many outside agencies and individuals having already taken an interest in this area. This may indicate a possible problem with respect to non-response bias. For example, many people who worked outside of the community were not available for interview and so have not been included. The questionnaire was constructed on the basis of content analysis of documents describing issues of concern and criticisms made about the environmental management of the industrial estate, together with some questions about demographic details. The questionnaire was written in Thai and the interviews were conducted in the same language and the results have been interpreted into English for the purposes of this paper. An initial pilot study indicated that the questionnaire was comprehensible to respondents, who were able to answer it completely in a reasonable period of time. Both the pilot test and the subsequent main study indicated that, through the use of Cronbach's alpha, the questionnaire was constructed in a valid manner. The research was completed in 2012.

Among the sample of 400 individuals, slightly more than half (53.5%) were female and the remainder male. Just over half of all respondents (56.5%) were married and education was usually quite basic, with 43.3% having completed only the primary level, 23.4% having completed the secondary level of education, 10.0% had achieved diploma status and 23.3% had received an undergraduate degree. This level of education was reflected in personal monthly income, which was less than 10,000 baht (US$330) for 30.0% of respondents, 10-15,000 baht (US$330-495) 23.5%, 15-30,000 baht (US$495-990) for 10.0% and more than 30,000 baht (US$990+) for the remaining 36.5%. In terms of age, 10.0% were between 18-29 years old, 33.3% were from 30-39 years old, 36.8% were from 40-49 years old and the remaining 20.0% were 50 years or older. The results of the survey were entered into the SPSS programme for subsequent computer analysis, which is reported in the next section. Care was taken to ensure that data were correctly entered through checking.

4. Findings

A total of 400 respondents completed questionnaires for this study. Respondents were considered to be eligible if they lived in the proximity of Map Ta Phut industrial estate. A total of 30% lived within one kilometre of the estate, 26.7% between 1-2 km and the remaining 43.3% more than 2 km away (n = 400 for all results unless otherwise noted).Among the respondents, 33.5% had relatives or acquaintances working in the estate and 10% themselves worked directly in the estate. When asked, all the respondents answered that they believed they lived close to Map Ta Phut. They all universally also answered that having the estate in this proximity was beneficial to them financially, although 23.3% of the respondents nevertheless felt that there should not be an estate so close to their community. When asked if they ever felt uncomfortable about having the estate so close to them, this proportion increased to 53.3%. As much as 33.3% of respondents claimed to have been admitted as a result to the Sattahip Naval Hospital for one or two days.

Health Impacts: Respondents were asked what, if anything, was the main impact on health caused by the estate. Most people (56.5%) replied that it was the effect on the respiratory system, with 10% each mentioning skin problems, nervous system (headaches) and gastroenteritis. Only 13.5% said that the estate produced no negative health impacts. When asked how they knew the estate had health impacts, 62.6% responded that it was because of having regular medical check-ups, while 37.4% answered that it was because they were aware of protests (n = 214). All of the respondents believed that the estate management should encourage health promotion campaigns to help local residents understand what risks exist and what they should do about them. They believed that promotional campaigns should be held every month (40.0%), every 3 months (33.3%) or every 6 months (26.7%). However, when asked what was the principal thing estate management should do to protect local communities, 43.3% said tackling the impact on air pollution should be the leading priority, 16.7% the impact on water pollution and 40.0% the impact on people's health (n = 373).

Pollution: Respondents were asked to name up to three forms of pollution which they believed were caused by the estate. All respondents gave at least one answer and a total of 892 responses were garnered. Of these, 35.9% related to air pollution, 29.8% to water pollution, 25.3% to soil pollution and 9.0% to transportation-caused pollution. When asked which agency should take the lead in managing pollution issues, with respondents being able to name up to three agencies, a total of 1120 responses was received, with the following agencies specified: Ministry of Public Health (35.7%); Ministry of Industry (22.7%); Ministry of Natural Resources and the Environment (16.6%); Department of Energy (13.1%) and the Ministry of Labour (11.9%). It might be noted that the IEAT works under the Ministry of Industry. One of Thailand's developmental problems is the presence of multiple overlapping public sector agencies, which often compete for resources and responsibilities and this helps explain the confusion within the mind of the respondents. The estate was also thought to have a negative impact on agriculture in the area and 90% of respondents said this was the case. Of those who gave an answer as to the main impact on agriculture (n = 320), 41.9% said that vegetables were damaged by rotten leaves, 16.6% that there was soil degradation, 16.6% that there were damaging air emission, 12.5% that the plants' growth was affected and 12.5% that there were residues in the plants.

Environmental Management at Map Ta Phut: Respondents were provided with a battery of statements with Likert scales (5 = high) and asked to indicated their opinion of the performance of estate management with respect to various environmental issues The results were as follows:

It is notable that respondents generally agree with nearly all of the statements put to them and that most of these statements are negative in nature. Taken in conjunction with the other results reported here, it is evident that residents still have a generally negative opinion about Map Ta Phut industrial estate management and its performance and do not seem to have received accurate information about it.

Table 1: Opinions about Environmental Management at Map Ta Phut Industrial Estate;source:Original Research

	Mean	SD
Map Ta Phut has an impact on the community	3.90	1.06
Map Ta Phut releases dangerous chemicals and gases	3.87	0.73
More health information should be provided about the impact of Map Ta Phut	3.87	0.78
The area where you live is affected by air pollution odours	3.77	0.90
Map Ta Phut causes respiratory system infections	3.77	0.63
Factories which have ISO 9000 or ISO 14000 certification still cause pollution	3.77	1.04
The area where you live is affected by air pollution heat	3.70	0.79
Public and private sector organizations should be involved in managing Map Ta Phut industrial estate	3.60	1.07
Big factories pay attention to pollution management	3.50	0.51
The existence of Map Ta Phut affects your health	3.40	0.72
Map Ta Phut industrial estate management pays attention to pollution management	3.30	0.47
The area where you live is affected by traffic problems	3.17	0.73
Companies in Map Ta Phut industrial estate show responsibility for nearby residents	3.07	0.58
The area where you live is affected by waste water pollution	2.97	1.24
The area where you live is affected by noise pollution	2.53	1.04

Discussion: It is clear that the IEAT and the Map Ta Phut industrial estate management, as well as individual factory owners, have a problem when it comes to negative public impressions about the management of environmental issues. Significant proportions of the respondents believe that the estate causes air and water pollution and has negative impacts on their health and on the community as a whole. There seems to be a legacy of mistrust and suspicion among residents about environmental management and this returns to the fore whenever there are new incidents reported. To deal with this problem, it will be necessary for management at all levels to involve the public in discussion and be open to receiving suggestions and input from the public at large. This form of public consultation has become common in the country since the time of the writing of the so-called People's Constitution of 1997, which took place in the wake of the Asian Financial Crisis of that year and has subsequently been replaced by another constitution produced by the military junta after the 2006 coup.

There are nevertheless, some cautious areas for optimism. All the respondents believe that the estate provides financial benefit to them directly and also generally accept the fact that companies on the estate do appreciate that companies take their responsibilities seriously. This suggests that people may be convinced to think differently if they have access to good quality information and are able to satisfy themselves of its veracity. Nevertheless, it should still be borne in mind that important health and pollution impacts have been recorded with respect to Map Ta Phut (e.g. Pimpisart, Jinsart& Hooper, 2005; Sripoung, 2007; Peluso et al., 2008) and these represent long-standing problems which cannot be eradicated overnight. Any failure in environmental management will have long-term repercussions for the physical environment and in the court of local public opinion. It is quite evident that there is not only protest taking place around the area from time to time but also a reasonable degree of scientific research concerning the people and the environment in which they live. This may not be very reassuring for residents who may not be aware of the nature and purpose of such research.

Implications: The first implication to be drawn from this research lies in the persistence of memory: the awareness of the pollution and other problems of the past weighs like a nightmare on the living (Marx, 1983). Irrespective of the efforts made by companies and their management in the present, people still mistrust them and there will need to be more confidence-building measures taken before that mistrust is displaced. One means of approaching this is through the creation of an independent body to regulate industrial estates and pollution management generally. This is an approach that has been attempted elsewhere with mixed levels of success and is not guaranteed to work in Thailand, where the reputation of independent bodies is not very high. Second, the relationship between the state and its developmental goals and the public should also be considered. It is very evident that industrial estates have been a very important part of Thailand's economic strategy and enormous amounts of money have been invested in them from both domestic and

international sources. The number of estates will increase in the future and, consequently, the number of communities living in proximity to them will also increase. As the findings reported here indicate, people have strong and often negative opinions about this level of proximity even if they and their families directly benefit from that proximity. Although the IEAT has announced that it will promote Eco-Industrial Villages in the future and has itemized its plans, it is not yet clear whether the public will recognise the attributes and benefits of such a policy. Some attempts to incorporate public opinion at some level would be helpful, although currently such public consultations have become politicized to a disabling degree. Third, long-term impact on health and environmental impact should be taken more seriously at all levels of government. The recent creation of low-cost access to health services for all Thai people has raised expectations of what level of service people might expect to receive and broadened coverage and scanning among many people who would not previously have been covered. Under these circumstances, it will no longer be so easy to sweep away protests and health complaints as has happened in the past. More attention to the Polluter Pays Principle will be required.

5. Conclusion

This paper has explored the perceptions of a sample of 400 residents living close to Map Ta Phut industrial estate concerning environmental management taking place on the estate. Those perceptions certainly seem to have been shaped significantly by previous episodes of poor management that have taken place and negative feelings are likely to reappear quite swiftly if given reason to do so. The IEAT and Map Ta Phut management teams should give some consideration to what impact this has on their stakeholder management plans. There is a need to repeat this research in some form to determine how people's opinions change over the course of time and, indeed, with respect to any further incidences of mismanagement. It is also necessary to study the ways in which industrial estate management teams around the world have tackled these issues with a view to determining best practice and distilling the lessons learned for use back in Thailand.

References

Map Ta Phut Toll. (2012). 12 Dead, 129 Injured, Bangkok Post (May 6th, 2012), available at: http://www.bangkokpost.com/news/local/292091/map-ta-phut-toll-12-killed129-wounded.

Bickerstaffe, G. & Walker, G. (2001). Public Understandings of Air Pollution: The Localisation of Environmental Risk. *Global Environmental Change*, 11(2), 133-45.

Boyd, J., Harrington, W. & MacAuley, M. K. (1996). The Effects of Environmental Liability on Industrial Real Estate Development. *Journal of Real Estate Finance and Economics*, 12, 37-58.

Charmondusit, K. & Keartpakpreak, K. (2011). Eco-Efficiency Evaluation of the Petroleum and Petrochemical Group in the Map Ta Phut Industrial Estate, Thailand. *Journal of Cleaner Production*, 19(2), 241-52.

Darnall, N. & Edwards, D. (2006). Predicting the Cost of Environmental Management System Adoption: the Role of Capabilities, Resources and Ownership Structure. *Strategic Management Journal*, 27(4), 301-20.

Eskeland, G. S. & Jimenez, E. (1992). Policy Instruments for Pollution Control in Developing Countries. *The World Bank Research Observer*, 7(2), 145-69.

Fuller, T. (2009). In Industrial Thailand, Health and Business Concerns Collide, New York Times (December 18th, 2009), available at: http://www.nytimes.com/2009/12/19/world/asia/19thai.html.

Geng, Y. & Côté, R. (2003). Environmental Management Systems at the Industrial Park Level. *Environmental Management*, 31(6), 784-94.

Huber, J. (2000). Towards Industrial Ecology: Sustainable Development as a Concept of Ecological Modernization. *Journal of Environmental Policy and Planning*, 2(4), 269-85.

Industrial Estates Authority of Thailand (IEAT). (n.d.). Roles and Responsibilities (n.d.), available at: http://www.ieat.go.th/ieat/index.php/en/about-en/roles-responsibilities.

Koplan, J. P., Falk, H. & Green, G. (1990). Public Health Lessons from the Bhopal Chemical Disaster. *JAMA:The Journal of the American Medical Association*, 264(21), 2795-6.

Ludema, R. D. & Wooton, I. (1994). Cross-Border Externalities and Trade Liberalization: The Strategic Control of Pollution. *The Canadian Journal of Economics*, 27(4), 950-66.

Markowitz, G. & Rosner, D. (2003). Deceit and Denial: The Deadly Politics of Industrial Pollution (Berkeley and Los Angeles, CA: University of California Press).

Marx, K. (1983). The Eighteenth Brumaire of Louis Bonaparte, in Eugene Kamenka, ed. and translator, The Portable Karl Marx (London: Viking Penguin, Inc., 1983), 287-324.

Moffatt, S., Phillimore, P., Bhopal, R. & Foy, C. (1995). If This Is What It's Doing to Our Washing, What Is It Doing to Our Lungs? Industrial Pollution and Public Understanding in North-East England. *Social Science and Medicine*, 41(6), 883-91.

Nash, J. R. (2000). Too Much Market? Conflict between Tradable Pollution Allowances and the 'Polluter Pays Principle. *Harvard Environmental Law Review*, 24, 465-535.

Pearson, R. & Kusakabe, K. (2013). Thailand's Hidden Workforce: Burmese Women Factory Migrant Workers (Chiang Mai: Silkworm Books).

Peluso, M., Srivatanakul, P., Munnia, A., Jedpiyawongse, A., Meunier, A., Sangrajang, S., Piro, S., Ceppi, M. & Boffetta, P. (2008). DNA Adduct Formation among Workers in a Thai Industrial Estate and Nearby Residents. *Science of the Total Environment*, 389(2), 283-8.

Pimpisart, D., Jinsart, W. & Hooper, M. A. (2005). Modeling of the BTX Species Based on an Emission Inventory of Sources at the Map Ta Phut Industrial Estate in Thailand. *Science Asia*, 31, 103-12.

Porras, I. M. (1992). The Rio Declaration: A New Basis for International Co-operation. *Review of European and International Environmental Law*, 1(3), 245-53.

Pusapukdepob, J., Sawangwong, P., Pulket, C., Satraphat, D., Saowakontha, S. & Panutrakul, S. (2007). Health Risk Assessment of Villagers Who Live near a Lead Mining Area: A Case Study of Klity Village, Kanchanaburi Province, Thailand. *Southeast Asian Journal of Tropical Medicine and Health*, 38(1), 169-77.

Roberts, B. H. (2004). The Application of Industrial Ecology Principles and Planning Guidelines for the Development of Eco-Industrial Parks: an Australian Case Study. *Journal of Cleaner Production*, 12(8), 997-1010.

Singhal, S. & Kapur, A. (2002). Industrial Estate Planning and Management in India – an Integrated Approach towards Industrial Ecology. *Journal of Environmental Management*, 66(1), 19-29.

Sripoung, N. (2007). Resolution of Air Pollutants Affecting Health in Map Ta Phut, Rayong (Bangkok: Department of Disease Control, Ministry of Public Health, 2007).

Stansfeld, S. A. & Matheson, M. P. (2003). Noise Pollution: Non-Auditory Effects on Health. *British Medical Bulletin*, 68(1), 243-57.

Williams, M. (2004). Air Pollution and Policy: 1952-2002. *Science of the Total Environment*, 334, 15-20.