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Industrial waste management and management of government networks in the improvement of public service provision: An explanation and suggestion for new ways of industrial waste management supporting sustainable development policy

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Abstract

This mixed qualitative and quantitative method research is aimed at the study of industrial waste management, public services and government network operations in Samut Sakhon Province, Thailand. It seeks to examine how government services and systems responsible for industrial waste management in Thailand might be improved. The data collection methods were documentary work, interviews, survey and focus groups. The study found that Thai industrial waste management under the supervision of the Department of Industrial Works places emphasis on only eight international principles of industrial waste management in comparison with the 10 principles of best international practice. Private factories prioritize disposal first and foremost, and recovery least, indicating that such factories do not concentrate on solving the problem of industrial waste management at its primary source. The industrial waste management situations and problems are related to the government agencies' network for managing industrial waste, inside and outside of the industrial estate, in Samut Sakhon Province. The average score of the efficiency and effectiveness of government services and overall public participation with the agencies remains at a mid-range level. The study concluded that the Thai government requires new ways of service improvement to ensure better efficiency and effectiveness, for example, by establishing networking committees charged with overseeing provincial industrial waste management, and supporting a founding of a joint industrial waste management unit in specific industrial areas among private factories.

Introduction

According to statistics on total industrial waste registered by the Thai Department of Industrial Works' database, there are 6,147,164.56 tons (Department of Industrial Works, 2019) of harmless waste and 1,051,531.92 tons of harmful waste, affecting people both directly and indirectly (Office of Natural Resources and Environmental Policy and Planning, 2016). This illustrates the problems and the consequences from

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improper industrial waste management, derived from multiple causes. For instance, the organization generating the waste may lack legal knowledge and not send the waste through a proper management process as a result. The waste mismanagement problems lead to waste not arriving at the terminal disposer, which in turn results in illegal dumping of industrial waste (Department of Industrial Works, 2015).

Based on this information, it seems likely that the main problem of the government operation responsible for industrial waste management of private factories concerns inefficiency and ineffectiveness. This problem has stimulated research interest in studying issues related to industrial waste management in Thailand. The scope of the study is an examination of industrial waste management practices and related government public services, identifying problems and suggesting ways of increasing efficiency and effectiveness for industrial waste management and which in turn contributes to sustainable development.

The key research objectives are: (1) To study the application of Thai industrial waste management principles according to the international principles established by progressive industrial countries. (2) To analysis the status and problems of industrial waste management, including the government's network operation with private agencies both internal and external to Samut Sakhon Province. (3) To identify ways of improving the government services provision in network operations. Overall, the research intends to contribute to increasing efficiency and effectiveness in industrial waste management of both government agencies and private factories, and in ways which help promote sustainable national development.

Literature Review

Related Theories and Research Works

The government services provision in network operation improvement is a new method that could be applied to the government service. Currently, government service is run bureaucratically and in accordance with the logic and efficiency of organizations founded by order and legal power (Schermerhorn, 2008).

In terms of its overall objectives, the public service of government agency currently appears unsuccessful. However, it may be made more efficient and effective by adopting some theoretical paradigms, namely, the New Public Management: NPM, New Public Service: NPS, and New Public Governance: NPG, including the concept of public service improvement and the concept of balanced scorecard are used, all of which have generated these following main points, shown in Table 1.

This research applies the 10 internationally-accepted principles of industrial waste management in the context of Thailand's industrial waste management; (1) reduction, (2) re –use, (3) recycle, (4) treatment, (5) disposal, (6) sorting, (7) recovery, (8) prevention, (9) storage, 10) energy and material conservation.

The principles are applied relatively to the UN's Sustainable Development Goals (SDGs) no. 8) economic growth, no. (9) preparing industrial, innovational, and structural units, no. 11) building sustainable community, and no. 17) moving towards the 17 goals (The United Nation, 2018), as shown in Table 2.

Regards previous research in this area, the three key studies are summarized as follows:

Table 1 Literature review: Related theories and research works

Theories	Summary
New Public Management (NPM)	The new public management prioritizes these subjects; (1) a catalytic government, (2) a community-owned government, (3) a competitive government, (4) a mission – driven government, (5) a results-oriented government, (6) a customer-driven government, (7) an enterprising government, 8) an anticipatory government, (9) a decentralized government, (10) a market-oriented government, (Osborne & Gaebler, 1992). Meanwhile, applying the basic philosophy of private agencies management and the market force to the government's administration may be seen as disregarding social equity and therefore, not in the public's interest. (Mathiasen, 1999)
New Public Service (NPS)	The new public service prioritizes (1) serving the people, not customers; (2) seeking public benefits; (3) giving citizenship value; (4) thinking strategically but acting democratically; (5) realizing that responsibility is not easy; (6) serving over directing; (7) valuing people, not only productivity. (Denhardt & Denhardt, 2003)
New Public Governance (NPG)	The new public governance is the concept for the complexities of the pluralist state. The concept concerns the participation of the people in the process of setting, applying, directing, following, and evaluating a policy to stimulate the efficiency and effectiveness of the government's service. (Osborne, 2010)
Public Service Improvement	The public service improvement presented by Boyne (2003) aims to create models illustrating public service improvement in accordance with stated objectives and to stimulate the efficiency and effectiveness in applying public policy to service provision in the 21st century. The meaning of public service improvement can be defined as the intimate relationship between perceptible truth and satisfying a standard that will improve work (Boyne, 2003) and maximize the potential of service provision, particularly as it relates to public satisfaction in terms of; (1) serving everyone equally, (2) serving quickly and punctually, (3) serving abundantly, (4) serving constantly, (5) serving with progress. (Millet, 1954)
Balanced Scorecard	The balanced scorecard is a model for the evaluation of an organization's operations within a designated framework (Kaplan & Norton, 1996) that consists of; (1) financial, (2) customer, (3) internal business process, (4) learning and growth, in order to study the efficiency of the organization. According to Simon (1979; Robbins & Judge, 2006) the most efficient work is evaluated on the basis of the connection between the import factor and the outcome product, the consequences of applying the organization's talent to benefit the environment, and by the ability to make the best use of the rare resources in supporting the organization procedure (Williams, 2015; Hall, 1991).
The network concept	The network concept, according to the structure of the networking organization, is divided into four types; (1) individual level network, (2) business unit level network, (3) organization level network, (4) other level network, (Kilduff & Tsai, 2003). These networks are the connection between governmental units and private units (factories), including the connection between the governmental unit and the people to increase effectiveness in achieving the goal the government policy has set in the attainment of the following benefits; (1) improved quality of decision, (2) minimizing cost and delay, (3) consensus building, (4) increased case of implementation, (5) avoiding worst case confrontations, (6) maintaining credibility and legitimacy, (7) anticipating public concerns and attitude, (8) developing civil society (Creighton, 2005; Jones, 1970).
The ten principles of industrial waste management	This research also applies the ten principles of industrial waste management from the countries accepted at the progressive industrial level and international level to the examination of Thailand's industrial waste management; (1) reduction, (2) re–use, (3) recycle, (4) treatment, (5) disposal, (6) sorting, (7) recovery, (8) prevention, (9) storage, (10) energy and material conservation.

Note: the researcher

Lilja (2016) conducted research titled "Promoting waste prevention in industry – search for policy instruments". This study focused on policy instruments to support industrial waste prevention that will in turn lead to an increasing in efficiency.

Solomon (2016) conducted research titled "Review of waste management in the UK construction industry". This focused on the operation of industrial waste management in the UK to inform best practices, examine the legal policy boundaries identified in terms of industrial waste management, and understand how ambiguity in interpreting and applying the theory leads to misunderstanding of the process of waste management.

Kopecka (2015) conducted research titled "The balanced scorecard implementation, integrated approach and the quality of its measurement". The focus of this study was on the BSC principle method, in terms of problems, obstacles, strengths, weaknesses, sources that taken together identify the efficiency of the BSC implementation.

However, the above research has not explored government service provision and network management. Therefore, this study, using Thailand procedures and systems as the context, aims to fill the missing gap in industrial waste management in government service provision, both in terms of network management and public service improvement.

Theoretical Framework

The Theoretical Framework which was integrated from the mentioned theoretical concepts is shown in Figure 1.

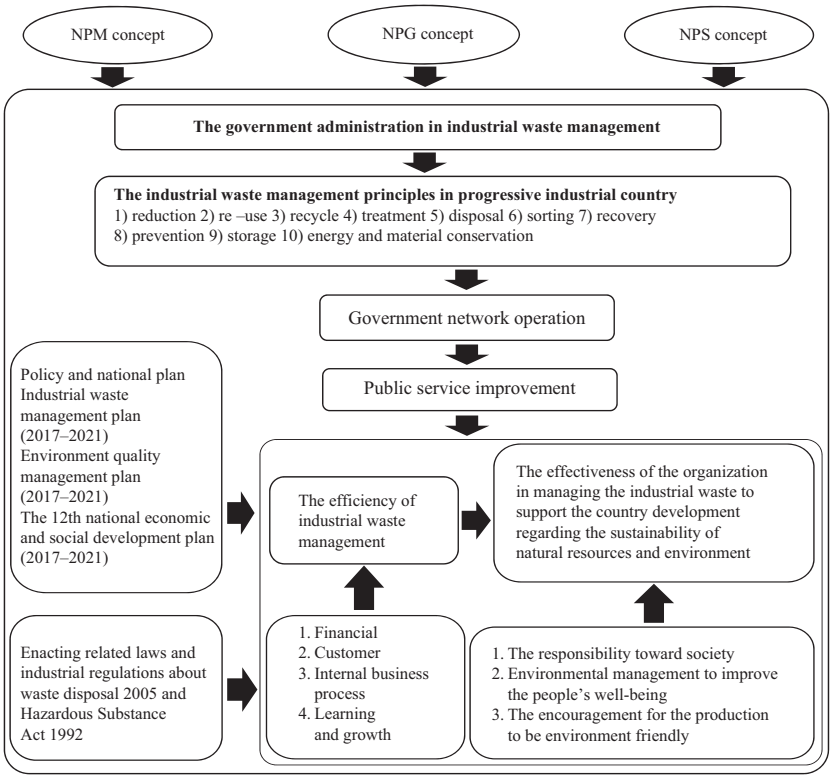

Figure 1 Research conceptual framework

Table 2 Mutual industrial waste management principles information

Order	United States of America	European Union	Japan	Thailand	Mutual Industrial Waste Management Principles Codes
1	reduction		reduction		reduction
2		re-use	re-use	(1) re-use	re-use
3	recycle	recycle	recycle	(2) recycle	recycle
4			treatment	(3) treatment	treatment
5	disposal	disposal	disposal	(4) disposal	disposal
6				(5) sorting	sorting
7	recovery	recovery	recovery	(6) recovery	recovery
8		prevention			prevention
9				(7) storage	storage
10	energy and material conservation				energy and material conservation
				(8) other methods	

Note: information collected by the researcher

The concepts and principles, as conceptualized in figure 1, explain the process of network cooperation between the governmental unit, private unit (factories), and the public, the aim being to increase the efficiency and effectiveness of Thailand's industrial waste management. The governmental unit is the authorizer, controller, caretaker, and supporter; so the private unit's (factories) role will be to manage the waste according to government policy and designated national plan. The private unit (factories) will apply the 10 principles of industrial waste management, starting from the planning phase and the used resources production process, to the incorporation of sustainable improvement principles.

In theoretical terms, this research conceptual framework can be explained as follows: Firstly, by using the concepts of NPM, NPS, and NPG as a study guideline and applying the concept of networking management, and a balanced scorecard that consists of; (1) financial perspective, (2) customer perspective, (3) internal business process perspectives, (4) learning and growth perspectives, and the concept of network cooperation between the governmental unit, private unit (factories), and the people. Secondly, the application of the 10 industrial waste management principles being; (1) reduction, (2) re–use, (3) recycle, (4) treatment, (5) disposal, (6) sorting, (7) recovery, (8) prevention, (9) storage, (10) energy and material conservation.

Methodology

This research examined waste management processes in an industrial estate in Samut Sakhon Province. Private units (factories) both in and outside the industrial estate were researched. Drawing on a mixed qualitative and quantitative methodology, the research had three phases:

Phase 1: Data from primary and secondary sources. The secondary resources were research papers, publications, textbooks, and literary reviews all of which were concerned with both domestic and foreign industrial waste. They explored questions of efficiency, effectiveness, and sustainable development in accordance with the research framework.

Phase 2: Collect primary data by using research questionnaires and in-depth interviews of the representatives of the governmental unit, private units (factories)'s entrepreneurs, environment management public benefit organization, and academia. A total of 28 in-depth interviews were conducted. Meanwhile, the quantitative method was carried out using questionnaires distributed in 66 factories inside the Samut Sakhon Industrial Estate and 279 factories outside. A total of 305 people in Samut Sakhon Province filled out these questionnaires some of whom were members of the public and not associated with industrial waste management. The statistics used were frequency, percentile, average, and standard deviation in order to describe the information collected from the questionnaires.

Phase 3: Test and evaluate methods and findings by holding two focus group discussions. The context for these focus groups was data acquired from Phases 1 and 2. In particular, focusing on suggestions for addressing problems and improving industrial waste management and governmental and private unit's network operation, in and outside the Samut Sakhon Industrial Estate. Residents from the area also participated in both focus groups.

Results and Discussion

The Industrial Waste Management Division, Ministry of Industry, is the main institution in charge of Thailand's industrial waste management and as such has a major role in recommending related policy. It approves, supervises, and enacts measures supporting proper industrial waste management. The following research findings reveal the reality and ongoing problems of waste management. The data reveals to what degree the current system is (in) efficient and (in) effective.

1. Evaluation of efficiency: The industrial waste management procedure in the past, in terms of the financial capability of the public service, has not been high enough. Following the evaluation of industrial waste management capability in accordance with the concept of balanced scorecards, the average scores of the three government agencies involved in industrial waste management were evaluated: Department of Industrial Works, Pollution Control Department, and Local Government Administrative Organization. Based on levels of opinion of the private sector (factories) regards the operation of government sector inside and outside the industrial estates, the scores are as follows: (when lower level of efficiency is 1–1.80, rather low to moderate level of efficiency is 1.81–2.60, moderate level of efficiency is 2.61–3.40, rather moderate to high level of efficiency is 3.41–4.20, high level of efficiency is 4.21–5.0), are shown in details in Table 3.

Table 3 Efficiency of public service performance of the different government agencies as assessed by private sectors (inside and outside the Samut Sakorn Industry Estate):

Industrial waste management	Department of Industrial Works ($\bar{x}$)		Pollution Control Department ($\bar{x}$)		Local Government Administrative Organization ($\bar{x}$)		Total of the average score ($\bar{x}$)	
	inside	outside	inside	outside	inside	outside	inside	outside
Finance perspective	2.95	3.07	3.17	3.09	2.95	3.15	3.00	3.00
Customer perspective	3.20	3.19	3.20	3.17	3.30	3.11	3.24	3.15
Internal business process perspective	3.37	3.20	3.45	3.24	3.45	3.10	3.42	3.18
Learning and growth perspective	3.30	3.29	3.30	3.24	3.50	3.07	3.36	3.20
Total up	3.20	3.18	3.28	3.18	3.30	3.10	3.25	3.13

Note: information collected by the researcher

1) *In the financial field*; inside the industrial estate the average scores ($\bar{x}$), according to different agencies, are 2.95, 3.17, 2.95 respectively and outside of the industrial estate the average scores ($\bar{x}$) are 3.07, 3.09, 3.15 respectively. There scores reflect a moderate level of efficiency only. That means the efficiency for industrial waste management is not yet high enough. This reveals that the budget allocations for (1) improving development in monitoring environment problems and for (2). development of the organization activities in accordance with the government sector policy, are not producing the desired results.

2) *In the field of the customer*; inside the industrial estate the average scores ($\bar{x}$), according to different agencies, are 3.20, 3.20, 3.30 respectively and outside of the industrial estate the average scores ($\bar{x}$) are 3.19, 3.17, 3.11 respectively. That means the efficiency is not yet high enough in authorization operations, and in the removal of unused materials from the factory area. The conditions for private removal of waste from factories are unclear and subject to ambiguous interpretation, this results in the private sector (factories) claiming it is too difficult to implement.

3) *In the field of internal business process*; inside the industrial estate the average scores ($\bar{x}$), according to different agencies, are 3.37, 3.45, 3.45 respectively. This lies in the high moderate to high level band, and outside of the industrial estate the average scores ($\bar{x}$) are 3.20, 3.24, 3.10 respectively, which is at the moderate level. This shows the internal processes of industrial waste management in the government sector are promoted and supervised inside industrial estate rather than outside the industrial estate. This is especially apparent for the personnel development and the use of technology.

4) *In the field of learning and growth*; the average scores ($\bar{x}$), according to different agencies, are 3.30, 3.30, 3.50 in order and outside of the industrial estate the average scores ($\bar{x}$) are 3.29, 3.24, 3.07 respectively, both means are at a moderate level. This can be summarized by saying that the internal management of research by all government agencies (e.g. research to increase skills, training, within the industrial factories) is not yet efficient enough. This is despite the serious current attempts by the government in terms of improving the efficiency and effectiveness of industrial waste management and systems.

2. Evaluation of effectiveness (1): Evaluation of the effectiveness of government service for private units, as assessed by private factories, on industry's responsibility towards society, environmental management for development, public well-being, and the support of environmentally-friendly production inside and outside of the industrial estate in the past five years (2013–2017), (when low level of effectiveness is 1.00–1.67, moderate level of effectiveness is 1.68–2.36, high level of effectiveness is 2.37–3.00), are shown in details in Table 4.

Table 4, indicates the average scores of public service effectiveness ($\bar{x}$) both inside and outside industrial estates are, respectively, 2.26, 2.04, which on the production side is a rather low to moderate level. This indicates that the government management procedures in all three aspects are not yet as effective as they should be.

3. Evaluation of effectiveness (2): The evaluation of the effectiveness of the government service as viewed in terms of public satisfaction (relating especially to public involvement and their well-being), assessed for the period 2013–2017, (when lower level of effectiveness is 1–1.80, rather low to moderate level of effectiveness is 1.81–2.60, moderate level of effectiveness is 2.61–3.40, rather moderate to high level of effectiveness is 3.41–4.20, high level of effectiveness is 4.21–5.0), is as shown in Table 5.

With regard to public satisfaction of government service in industrial waste management over the past five years (2013–2017), the average score ($\bar{x}$) is 2.97, which is only at a moderate level.

Table 4 The resulting effectiveness of industrial waste management from service of government sector viewed by private factories' satisfaction (inside and outside the Samut Sakhon Industry Estate)

The effectiveness aspect of industrial waste management	Opinion level ($\bar{x}$)	
	inside	outside
1. The responsibility toward society	2.23	2.05
2. Environmental management to improve public well-being	2.22	1.93
3. The encouragement for the production to be environment friendly	2.31	2.11
Total up	2.26	2.04

Note: information collected by the researcher

Table 5 Effectiveness as measured in terms of public satisfaction with industrial waste management in the Samut Sakhon Province areas (in the 5 year period, 2013–2017)

Issues service practices	$\bar{x}$
1. People involvement in solving public problems of industrial waste management with the government and in monitoring of illegal industrial waste management	3.13
2. The management relations between government agencies and the people sector inconsistent with industrial waste management for sustainable development	2.98
3. The government sector's provision for people's education regards industrial waste management	2.87
4. Adequacy of government agencies' provision of sufficient information to the people in managing of industrial waste	2.93
5. Increasing public quality of life from service provisions by government agencies in industrial waste management	2.94
Total up	2.97

Note: information collected by the researcher

Thus, the combined information from tables 3, 4 and 5 confirms that the government management procedures in network cooperation in governmental, private, and people units are not as efficient and effective as they should be.

With regards to solving and correcting the problems surrounding the monitoring and continuation of illegal industrial waste management, the results of the focus groups discussions reveal the following suggestions: (1) Improved learning and education in the effects of reduction from the industrial waste. (2) Nationwide dissemination of news and information to the public, and to private factories, designed to promote better life quality and raise awareness in this area.

4. The key problem of (private) industrial waste management, according to the Ministry of Industry's notifications about waste disposal (2005) is that firms have accomplished only eight principles; (1) sorting, (2) storage, (3) re-use, (4) recycle, (5) recovery, (6) treatment, (7) disposal, (8) other methods of management respectively, (Department of Industrial Works, 2015). However, as stated above, the aforementioned eight principles or the seven plus one-other methods, in Thai context, are not efficient enough in application compared to the 10 principles adopted by progressive industrial countries at an international level, notably those in the European Union, the United States of America, and Japan.

To further qualify the above findings, the private units (factories) appear to prioritize the eight principles differently, though they focus on disposal the most. This shows that the disposal principle is the method that is primarily used and that the remaining principles are considered merely optional. However, even if the practice of industrial waste management of the private units (factories) is scored at a high level, institutions producing industrial waste in Thailand do not concentrate on the issue of the origin of the waste to the extent that other countries do. Therefore, the public service delivered by the government department rated by the private sector (factories) and the people sector, only received a service score at the middle level of efficiency. This is confirmed by the fact that Thailand has a problem of government support in the field of knowledge, the attribution of industrial waste sorting, together with law enforcement – this latter aspect not being as efficient as it should be. Therefore, the overall management is not efficient enough since Thailand only focuses on midstream and downstream management while the international progressive industrial countries focus on all upstream, midstream, and downstream management.

5. Looking at networking management and the links between governmental units, private units (factories) and the public, such connections help realize the efficiency and effectiveness of improving public service. These sections have been found working well in those places where industrial waste management and systems are especially efficient. It is obvious that the Thai government's public services do not yet provide the private and public sectors with enough knowledge about each of the industrial waste management principles to produce clear benefits; lessen the industry's negative impacts on society; support environmental management for the public's well-being; and promote more environment-friendly production. As a result, the services are not fully successful and the public's satisfaction remains only at a moderate level.

6. In terms of the theoretical framework utilization, the government unit leads missions focused on results and analyzes decentralization to create an emphasis on marketing and customer service (Osborne & Gaebler, 1992). The concept of a Balanced Scorecard and the Goal Model by Boyne (2003) on public service improvement were utilized to examine targeted objectives and evaluate the efficiency of work, including gathering feedback from the public to formulate, implement, and evaluate policy and track its results (Osborne, 2010). The research analyzed service provision to the private units (factories) in order to decrease any negative effects on the public and change perceptions to that of a public service provider. This gives value to the public, not just customers, and is not solely focused on increasing productivity (Denhardt & Denhardt, 2003). Looking in view of the concept of balanced scorecard and the network concept, discussions from the research results and connections with additional concepts are as follows:

Finance; from the survey results both inside and outside of the Samut Sakhon Industrial Estate, the opinion score is at moderate level. This shows that overall, the governmental unit, both the central and regional administration, has provided limited financial support. These findings are also in line with research conducted by Lilja (2016). These research results for Thailand are also related to objective number eight (The United Nation, 2018). However, in the case of this research in Thailand, there are still issues pertaining to government operations such as the inconsistency of the budget allocated to training programs for entrepreneurs to better understand laws and correctly manage industrial waste according to academic and international principles.

Customers; the survey results obtained from inside and outside the Samut Sakhon Industrial Estate, for which the opinion score is in the moderate range, shows that the government unit prioritizes the law as well as building cooperation with and boosting the motivation of, entrepreneurs and the public, thereby developing a network between the governmental and private units (factories) both within and outside the country. This is in accordance with the UN's Sustainable Development Goals (SDGs) goal number eleven. (The United Nation, 2018). However, there are still issues of further concern in terms of improving public service to customers such as slow service, the effective enforcement of the law, and comprehensiveness of investigations. These persistent issues were also highlighted in research by Solomon (2016) that stressed the importance of comprehensive, holistic (police and government) investigations in industrial waste management.

Internal business process; according to the results obtained from the opinion survey, the internal business process inside the Samut Sakhon Industrial Estate is scored at a high level while outside the estate it is scored at a moderate level. This shows that priority is given inside the industrial estate to the internal processes of industrial waste management since it receives a greater level of support and direction from the governmental unit than outside the Samut Sakhon Industrial Estate. The processes inside the estate focus on building the cooperation and motivation of entrepreneurs and of the public, while promoting continuous development in the application of

various concepts to increase developmental capability. This requires improved actions; for example, study tours and trainings, hiring advisors, and implementing an IT system with a facility for online authorization. Within the context of sustainable development, such actions are in alignment with the UN's Sustainable Development Goal (SDGs) number nine. (The United Nation, 2018). That said, the governmental unit's operations should be holistically investigated to increase efficiency.

Learning and growth; according to survey results obtained from inside and outside the Samut Sakhon Industrial Estate, for which the scores are at moderate levels, we can see that the government unit does prioritize these aspects; for example, in research and skill-learning. These improvements are in line with SDGs number seventeen. (The United Nation, 2018). However, the government's operations still face some issues, such as in the efficiency of the promotion and access of information about customers. This finding, that the promotion of prevention is important for industry waste management in the initial stage, is also confirmed in the research conducted by Lilja (2016).

Conclusion and Recommendation

The government has made attempts to manage industrial waste, but with such a moderate level of efficiency and effectiveness industrial waste management remains problematic between the private and government sectors. This study of the efficiency and effectiveness in industrial waste management is aligned with other studies such as Solomon (2016) and Lilja (2016) that focused on increasing the efficiency of industrial waste management through studying policy instruments and practices. The evaluation of the efficiency of industrial waste management using balanced scorecards still has problems in terms of variety and interpretation. As discussed earlier in this paper, there can be a misunderstanding about the operation process and in the decision-making processes (Kopecka, 2015); this leads to a weakening of the practical public service improvement in terms of agreement on organizational protocols and structure (Boyne, 2003). This research has, however, not only aligned with the international studies detailed above, but has also filled gaps in such research by giving suggestions for improving public service of the government both in policy and in practical ways.

In the evaluation of the effectiveness of the government service for the private units (factories) assessed by the public in the past five years (2013–2017), the average score ($\bar{x}$) is 2.97, which is at the moderate level of people satisfaction. This indicates that the government management procedures in network cooperation in governmental, private, and people units are not as efficient and effective as they should be, and are failing to remedy the problematic effects of unreduced waste. Clearly, the public are not yet satisfied by the government's level of effectiveness in industrial waste management.

When Thai industrial waste management is compared with other international standards of industrial waste management, in an appearance of the Mutual Industrial Waste Management Principles, the evidence shows that Thailand is not on par with international standards. Only 8 principles are followed in Thailand, as opposed to the 10 principles of industrial waste management adopted and followed by progressive industrial countries. Moreover, from the findings, it is found that Thailand's factories still prioritize disposal the most and recovery the least. This confirms that the government industrial waste management does not align with the private units (factories)'s management capacity that prioritize mid and downstream processes of waste management.

1. From the results and problems found, it is clear that the government service needs to improve its efficiency in terms of knowledge management e.g. news and information. Similarly, training on industrial waste sorting needs to be improved since it is not yet sufficient for the needs of the private units (factories) and other units.

2. This research suggests two new ways for the governmental networking management to create a better public service dealing with industrial waste management in the future; (1) setting up a provincial industrial waste management committee board as a special kind of networking body in fulfilling efficiency and effectiveness of government public service, (2) founding an organization or private unit by cooperation of factories with the support from the government to collect industrial waste in a specific area.

3. The researcher suggests that future research focuses on the following topics; (1) a study comparing other countries with similar procedures to identify the strengths and weaknesses; (2) a study of the participation of the public in the government industrial waste management and related contexts.

Conflict of Interest

There is no conflict of interest.

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