

A model of participatory learning process for management of environmental health impacts in industrial communities area

Supawadee Komonkanjanakul and Rachanont Supapongpichate
Mahidol University, Bangkok, Thailand

Abstract

Purpose – The purpose of this paper is to implementing environmental education concepts to manage environmental health impacts by letting the people in the community learn through the participatory learning process.

Design/methodology/approach – The participatory action research (PAR) and the environmental education concept were conducted in managing the learning process for the people in Map Kha Sub-district, Rayong province. The purposive sampling technique and the stakeholder analysis were used to derive the informants of this study. They are those people living or working in the Mab Kha Sub-district area at least 2 years, aged more than 20 years old, and were willing to participate in all steps of the study. A total of 30 informants were divided into three groups as follows: The Key Informants, The Casual Informants and The General Informants. Data collection employed workshops with three techniques – Participatory Rural Appraisal (PRA), Future Search Conference (FSC) and Appreciation Influence Control (AIC) – to organize cooperative learning processes to managing environmental health impacts. The Content Analysis was utilized in this study through the categorization, grouping, analysis, interpretation and systemization of data. The study period was from June 2014 to December 2015.

Findings – The study found that most people are concerned and aware of the environmental pollution problems affecting the health in the areas and need to solve such problems. They are also prepared for various problems. However, they face the problems on that they still lack of the chance to be informed about the information on the pollution problems and lack of the chance to participate. For the participatory learning process used to manage the environmental health impacts in the industrial community, it is found that the people and the leading network partners perform well through the knowledge building process on the environmental pollution problems and the planning and evaluation lead to desired behavior of people and industrial community to manage environmental health impacts.

Originality/value – The study results emphasized that the participatory learning process of the network associates was the critical key in forming the community power to manage the environmental health impacts. Therefore, the learning process should be easy, not complicated, take a short time and be friendly that will make the community understand the problem and help protect the environment systematically.

Keywords Participatory learning process, Environmental health impacts, Environmental education, Industrial communities, Thailand

Paper type Research paper

Introduction

Rayong province is one of Thailand's industrial development goal sites. Since 1981, the Eastern Seaboard project was established in the region which led to large investment projects

© Supawadee Komonkanjanakul and Rachanont Supapongpichate. Published in *Journal of Health Research*. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

The authors would like to thank the following for their support: Assoc. Prof. Dr. Kraichat Tantrakarnapa, Assoc. Prof. Dr. Chalermchai Chaikittiporn, Dr. Nawiya Nuntapanich, Dr. Pairat Thidpad, and Dr. Wee Rawang.



and a large population of migrants coming into Rayong. As a result, there have been serious environmental problems including water pollution, air pollution and soil pollution. These problems have caused conflict and illness amongst residents [1].

Because of these problems, Rayong was declared a pollution control zone consisting of six sub-districts in 2009 [2]. Map Kha Sub-district, located in Nikom Pattana District, is one of the six sub-districts within the province's pollution control zones facing environmental problems and a steady rise in industrial plants. In 2013, 280 industrial plants were established and increased up to 320 in 2015. The majority of industrial plants in the area are electrical and electronic components factories including automotive parts and plastic products, plastic granules and industrial chemicals manufacturing factories.

The situation is further exacerbated by the establishment of scattered factories in the area with no Industrial Estate Authority of Thailand (IEAT) to take care of and provide space for industrial plants to be systematically and methodically integrated. The Department of Industrial Works (DIW) oversees the operation of factories to meet the standards and maintain price level of products manufactured for the public but environmental management issues are not properly maintained.

A report by the Office of Natural Resources and Environmental Policy and Planning (ONEP) [3] found that the three canals in the Mab Kha Sub-district including the Mab Kha canal, the Mab Yai canal and the Chang Tai canal had an unusual color and shallow water, causing water pollution affecting industrial plants and houses (approximately 10,631 households). Moreover, regarding air pollution, the density value of the Vinyl Chloride Monomer (VCM) was detected in the range of 0.26–0.46 micrograms per cubic meter, Methylene Chloride was 0.18–2.23 micrograms per cubic meter, 1,2-Dichloroethane (EDC) levels were 0.2–1.58 micrograms per cubic meter, and Benzene levels were 1.19–3.72 micrograms per cubic meter exceeding the standard value. Furthermore, contamination in the soil detected heavy metal, lead, manganese and arsenic that exceeded the standard value. Survey results from the Rayong Provincial Public Health Office, found that most residents in the Map Kha Sub-district thought that industrial environmental pollution caused cancer, respiratory problems, and dermatitis. From 2012 to 2015, environmental pollution problems and cancer were found to be the top five problems in the province [4].

However, Rayong is in the “Eastern Economic Corridor (EEC)” [5] in accordance with the National Strategy Development Goals (2018–2047) and expected to enhance the country's potential to become a developed country [6]. As a result, areas in the pollution control zones and Mab Kha Sub-district are important targets for industrial investment development, transportation, and logistics and will include many large project investments. As a consequence, environmental problems will inevitably be intensified [7]. It is known that the pollution control zones are under special supervision. The use of legal measures and local authorities are responsible for developing action plans to reduce and eliminate pollution with public participation. This plan must be approved by the National Environment Committee and the governor is responsible for setting pollution standards at its source [8]. Although Mab Kha has implemented effective measures in the past, the more severe pollution problems have not been resolved. Most people lack knowledge of environmental problem management and lack serious involvement in the preparation of plans or surveillance of environmental problems in the area causing conflict and opposition from residents [9].

Therefore, it is important, necessary and urgent to educate and organize participatory learning processes for the management of environmental health impacts and ensure that people and communities can work towards achieving the country's emerging development goals.

Methods

The participatory action research (PAR) method was qualitatively used in the study. Data were collected by workshops using three techniques: Participatory Rural Appraisal (PRA), Future Search Conference (FSC), and Appreciation Influence Control (AIC) to organize cooperative learning processes to manage the environmental health impacts.

The purposive sampling technique was used to select the informants who were people who have lived or worked in the Mab Kha Sub-district area for at least 2 years, were aged 20 years old or above, and were willing to participate in every step of the process such as in-depth interviews, workshops on the participatory learning process, workshops to create the body of knowledge, and the evaluation of the outcomes of the learning process.

The stakeholder analysis was utilized to derive 30 informants who were involved in the management of the environmental health impacts in the area, comprising 10 key informants including community leaders, representatives from the private sector who were environmental security officers of factories, representatives from the government sector, 10 casual informants whose health was affected by environment and selected by the community leaders; 10 general informants selected by the community leaders, and representatives from each village in the Mab Kha Sub-district.

The process used workshops to organize cooperative learning processes, to build knowledge, and analyze, and solve problems. For the analysis of the implementation of the participatory learning process, workshops were employed to start the lessons by asking for feedback and raising ideas together. This step helped to analyze the appropriateness of the learning process and seek improvements which could be made to suit the context of the area. Content analysis techniques were used through the categorization, grouping, analysis, interpretation, and systemization to triangulate data for data accuracy verification [10].

Ethical consideration

This study was approved by The Committee for Research Ethics, Faculty of Social Sciences and Humanities, Mahidol University (COA.No. 2014/151.2805).

Results

Most participants were female (64.0%), aged between 20 and 29 years (29.80%) and married (64.5%). A total of 30.8% were educated to bachelor's degree level, the highest academic level amongst participants.

Situation on the environmental health impacts

The greatest pollutants were in the air (76.00%) and industrial factories were the main cause resulting in smelly and dusty air. This was followed by water pollution (51.00%) of which the problems were smelly and spoiled water and garbage in the water (45.00%). The main cause of water pollution was from the households or the community.

Environmental education is comprised of six elements including knowledge, awareness, attitude, skill, participation and evaluation ability. Participants' awareness of each level is summarized below:

- (1) Knowledge: Most participants described their Knowledge to be at a medium level ($\Gamma = 3.33$). Participants stated that knowledge of the health problem caused by environmental pollution is necessary and useful for the prevention and resolution of the problem at a high level ($\Gamma = 3.57$).

- (2) Awareness: Most participants displayed high levels of awareness of the problem ($\Gamma = 3.59$). Participants noted that it was the duty of all people in the community to help solve environmental pollution problems at a high level ($\Gamma = 3.73$).
- (3) Attitude: Most participants identified attitude levels as highly significant ($\Gamma = 3.70$). Residents in the Mab Kha Sub-district should participate in preventing and improving the environment at a high level ($\Gamma = 3.84$).
- (4) Skill: Most participants identified skills at a medium level ($\Gamma = 2.91$). Participants had the ability to survey the data on the environmental pollution problems in the area at a medium level ($\Gamma = 3.00$).
- (5) Participation: Most participants saw the significance of participation at a medium level ($\Gamma = 3.24$). Participants stated that participation in community planning initiatives would help solve the environmental problems in the area at a medium level ($\Gamma = 3.43$).
- (6) Evaluation Ability: Most participants identified their evaluation ability at a medium level ($\Gamma = 2.89$). Most participants could make the decision to choose an appropriate method used to survey the data on the environmental pollution problems in the area at a medium level ($\Gamma = 2.94$), [Table 1](#).

The Participatory Learning Process

The participatory learning processes involved learning techniques including PRA, FSC and AIC to form a community-cooperative learning process to manage environmental health impacts.

For the PRA, it was found that (1) the population in Mab Kha Sub-district could be divided into two types, the semi-urban and semi-rural community, and the urban community, (2) regarding the analysis of the community regarding the pollution problems affecting the health in the area, it found that the air pollution problem (released from factories and smog in the area both from industrial factories and in the community), and the water pollution problem (wastewater drained into the public canals), (3) The pride of the community was in having strong public health volunteers, strong leaders, highly educated children, and cooperative community members. For aspects that should be developed in the community, the community should get rid of the pollutions and create a good environment, and consecutively check their health. The PRA analysis concluded that the community could find out its own strong points or the feelings of pride which leads to the fact that the people love their community, and are aware of, and like to conserve the community. Regarding aspects that needed to be developed, it showed that the community has a chance to learn the characteristics of the community and was aware of their role in community development.

During the FSC phase of the study, the community had changed on all sides, in the past, the people lived by the help provided to each other without any factories. At present, there are more than 300 factories, and this number is set to increase rapidly. This leads to the growth of the urban city due to a rising population, increased consumption, and a rise in criminal problems. Without local administration organizations, public health offices, schools and temples working to prevent and solve the problems, the community would not be able to resolve their health and the pollution problems. Consequently, the cancer rate will be higher and lifespan expectancy would be reduced.

For the AIC, the data on the situations of the community problems were derived to make use of them in the planning performance including the problems that required resolution based on the degree of severity and extent to which it affected the community. It was based on the basic data of the community which was practical and useful in determining the

Table 1.
Mean and standard
deviation of the sample
based on the
environmental
situation in the
environment education
dimension

The environment situations in the environmental education dimension	Γ	SD	Interpretation
<i>1. Knowledge</i>			
1. Knowledge of environmental pollution and its effects is necessary and useful in preventing and solving the problems in the community	3.53	0.878	High
2. Knowledge of the health problem caused by environmental pollution is necessary and useful in preventing and solving the problems in the community	3.57	0.968	High
3. Knowledge of plan-making and solving community problems is necessary and useful	3.56	0.940	High
4. Mab Kha Sub-district has information on environmental pollution which can be easily retrieved and accessed	3.10	0.910	Medium
5. You are knowledgeable about environmental pollution	3.15	0.881	Medium
6. You are knowledgeable about environmental pollution and the health problems caused by environmental pollution	3.06	0.848	Medium
Total	3.33	0.640	Medium
<i>2. Awareness</i>			
7. You perceive and are aware of the environmental pollution problems in the area as a danger to your health	3.47	0.884	Medium
8. Solving the environmental pollution problem is the duty of all people in the community and all must help to resolve it	3.73	0.952	High
9. To solve the environmental pollution problems and their effects on health, activities should be held to let the people in the Mab Kha community and entrepreneurs in industrial factories see the significance and participate in problem-solving	3.64	0.974	High
10. The environmental pollution problems in the Mab Kha Sub-district area can be solved if the local people participate in resolutions together as a community	3.64	0.907	High
11. If there is a change or related offices, request cooperation in making the strategic plans to solve the environmental pollution problems in the community and ensure that you are always willing to cooperate	3.67	0.914	High
12. Overall, most people in the community perceive and are aware of the environmental pollution problems as a danger to health	3.40	0.892	Medium
Total	3.59	0.688	High
<i>3. Attitude</i>			
13. You are concerned about the environment and environmental pollution problems	3.77	0.840	High
14. You need to participate in taking care of and solving environmental pollution problems	3.57	0.850	High
15. You need the people in Mab Kha Sub-district to cooperate in preventing and improving the environment	3.84	0.922	High
16. You need the local administration organization to let residents participate in preventing and improving the environment	3.77	0.918	High
17. You need the local administration organization to let the community participate in planning for development and solving the environmental pollution problems in the area more than is done at present	3.77	0.913	High
18. Overall, most people in the community have a concern for environmental problems and need to participate in taking care of and solving the environmental pollution problems	3.47	0.952	Medium
Total	3.70	0.735	High
<i>4. Skill</i>			
19. You have the capacity to survey the data on environmental pollution problems	3.00	0.886	Medium
20. You can examine the cause of environmental pollution problems	2.90	0.865	Medium

(continued)

The environment situations in the environmental education dimension	Γ	SD	Interpretation
21. You can analyze environmental pollution problems	2.80	0.845	Medium
22. You can guide others on how to take care of and solve the environmental pollution problems	2.90	0.864	Medium
23. You have the capacity to survey the data on environmental pollution problems	3.00	0.886	Medium
24. You can examine the cause of the environmental pollution problems	2.90	0.865	Medium
25. You can analyze the environmental pollution problems	2.80	0.845	Medium
26. You can guide others on how to take care of and solve the environmental pollution problems	2.90	0.864	Medium
27. You can give your opinions on community plan-making	2.87	0.898	Medium
28. Overall, most people in the community can survey the data and examine the cause of the environmental pollution problems	2.97	0.916	Medium
Total	2.91	0.724	Medium
<i>5. Participation</i>			
29. If there is an opportunity to participate in making the community plans, the environmental pollution problems can be solved	3.28	0.929	Medium
30. If there is an opportunity to participate in learning how to make community plans, environmental pollution problems can be solved	3.29	0.867	Medium
31. If the people in the community have a chance to participate in making community plans, the environmental pollution problem can be solved	3.43	0.864	Medium
32. If the people in the community have a chance to learn how to make the community plans, the environmental pollution problems can be solved	3.35	0.839	Medium
33. Overall, the local administration organization (Municipality/Village administration organization) let the people in the community participate in making the community plans	3.15	0.808	Medium
34. Overall, most of the people in the community participate in making the community plans	2.96	0.806	Medium
Total	3.24	0.626	Medium
<i>6. Ability to evaluate</i>			
35. You can choose an appropriate method to transfer knowledge and recommendations on the environmental pollution problems	2.89	0.790	Medium
36. You can choose an appropriate method to survey the data on the environmental pollution problems	2.94	0.811	Medium
37. You can choose an appropriate method to examine the cause of the environmental pollution problems	2.92	0.813	Medium
38. You can choose an appropriate method to analyze the environmental pollution problems	2.87	0.792	Medium
39. You can choose an appropriate method to evaluate the solutions to the environmental pollution problems	2.88	0.778	Medium
40. Overall, most of the people in the community can choose an appropriate method to evaluate the solutions to the environmental pollution problems	2.89	0.830	Medium
Total	2.89	0.652	Medium
Overview of six sides	3.28	0.847	Medium

Table 1.

community images based on truth rather than expectation. This was done through the experiences of those beneficiaries only. The determination of the community images led to the making of the strategic plans used in managing the environmental effects on the health of the Mab Kha Sub-district residents.

Building-up of body of knowledge

Our studies found that most people in the community had never participated in community planning and only a small number of people ever joined the Local Administration

Organization. Besides, most of them still lacked the knowledge related to the management of environmental pollution problems affecting the health and in making problem-solving plans in the community.

From the interviews with the target group on their views of the problems and the management of the environmental pollution problems affecting the health in the area, it was found that most participants agreed that the industry of the Mab Kha Sub-district area has been developed and the industrial factories have grown rapidly. This can be seen from the increasing numbers of industrial factories, cars, motorcycles, trucks and the increasing population in the area resulting in more private residences, dormitories and rented houses among the others. The topics of the lecture were divided into three issues: (1) The environmental pollution problems affecting the health; Problem and Management; (2) Strategic Planning; and (3) Evaluation.

Data obtained from the workshop which educated the target group through the discussion and opinion-sharing found that most of them had better knowledge and understanding than in the past and they felt that it was not difficult to make the plans, but rather that there should be clear steps to take that are systematic and that resolutions can be implemented with tangible results. From the meeting, all participants gained both the knowledge and related skills to make plans and they also understood the participation process and had a better appreciation of the evaluation process. This made them more confident in themselves and able to participate in making strategic plans. They were satisfied with the knowledge and the building-up of the body of knowledge processes at the highest level.

A Model of Participatory Learning Processes for the Management of Environmental Health Impacts in Industrial Communities

The participatory learning process was derived through the integration of the environmental education concept and the social science process. The process was conducted through the integration of three techniques: PRA, FSC and AIC in order to derive a model of a participatory learning process for the management of environmental health impacts in industrial communities area, and found that the people and the leading network partners performed well through the knowledge building process on the environmental pollution problems, the planning and evaluation led to desired behaviors of people and the industrial community to manage environmental health impacts as shown in [Figure 1](#).

- (1) When developing ways of solving the pollution problems of the community, a varied demographic of the community must participate from the outset in thinking, doing, making decisions, taking charge of, and evaluating to prevent and solve the environmental problems in the area.
- (2) The Local Administration Organizations are responsible for taking care of the health of the people in the area. The cooperation from the Local Administration Organization in the areas is essential to carrying out the process and encouraging access to the community.
- (3) In the Environment Office, the provincial environment office, and the Natural Resources and Environment Office take charge of the management of the quality of the environment at the provincial level and monitors, evaluates and checks the environmental situations of the province. Therefore, to efficiently manage the environment, cooperation and support from this office is required.
- (4) The Public Health Office refers to Sub-district health promotion hospitals or public health stations at the district level. This office can support in terms of knowledge on

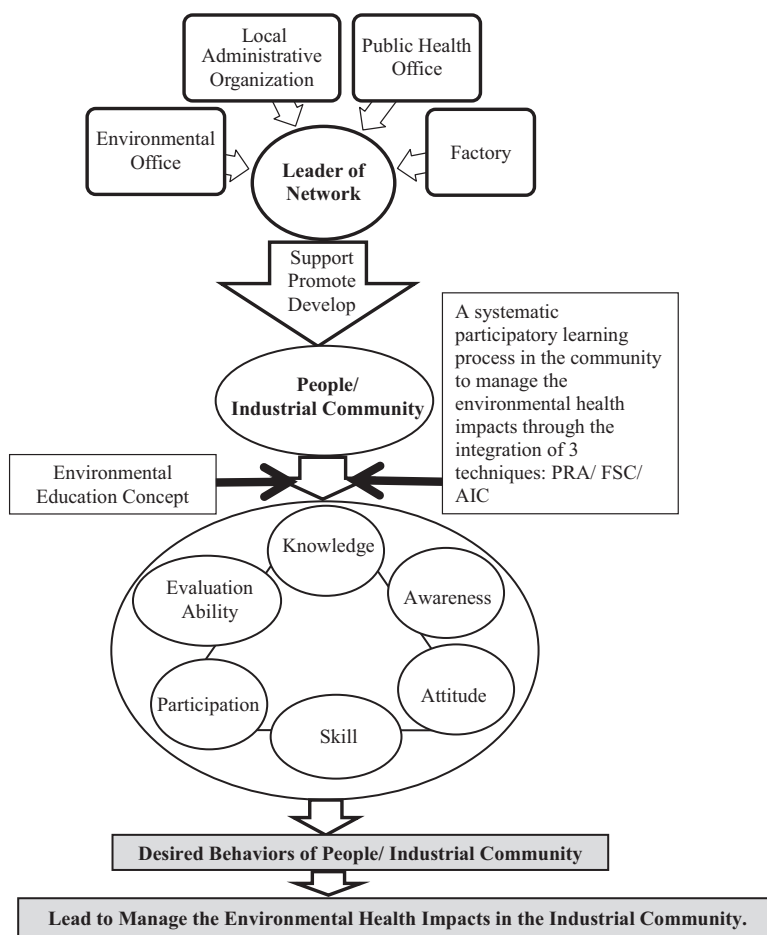


Figure 1.
The participatory
learning process model
of the community to
manage the
environmental health
impacts in the
industrial community

how to take care of health and to provide the community with confidence and trust in the services.

- (5) Industrial Factories are private companies that invest in the community by constructing factories and hiring workers in the areas. However, most people in the industrial areas agree that the industrial factories are the main cause of pollution to the environment and the people in the community. Involving these factories is essential and necessary to solving the environmental pollution problems in the areas.

Discussion

The environmental health impacts of most people in the area are caused by air pollution, water pollution and garbage pollution. This corresponds with the study of Rayong Provincial Public Health Office [4] which found that the essential pollution problem in Rayong province area was air pollution, and especially that it was contaminated with the Volatile Organic Compounds (VOCs) and dust particles smaller than 10 Micron (PM10). This also corresponds

with a study of Ornkerd [11], and Janthana [12] which found industrial development affects to the environment in the forms of air pollution, wastewater pollution, noise pollution, and garbage pollution. This also corresponds with the research of Chankaew [13] which found that the pollutions from the industry can diffuse through the air, water and human body which further affects human health.

Regarding the environmental education dimension, it was found that most people saw the significance of all six aspects at the medium level. The attitude aspect was ranked at the highest level. This is likely since they had settled in the area for a long time and had direct experience of problems with pollution. This corresponds with the study of Udom [14] that found that environmental education helped the people to know, understand and be aware of their environment and the environmental problems. This also corresponds with the study by Bowman [15]. The significance of this concept is regarded as the mirror reflecting an awareness and understanding of the situations, problems and obstacles, and roles of the environment in Thai society.

The participatory learning process helped the people in the Mab Kha Sub-district area learn, develop, and be aware of the existing problems in the community and participate in analyzing the data on the community which led to the planning and implementation to solve the problems. This corresponds with the concept of Wasri [16] that the PRA technique helps the people to think, do and conclude the lessons, and receive the outcomes from the community's learning. This corresponds with the study by Chantarasiri [17] which found that the continuous use of the participatory learning processes with three techniques (PRA, FSC, AIC) combined with the development of knowledge skills could respond to the needs of the community. This enables the community to learn the true conditions of the problems and their needs and can set guidelines for meeting their own needs and communities according to their potential in the community context.

Limitation

The informants were divided into three groups, however, the casual informants and general informants selected by the community leaders may not be a real representation of the entire community. Also, the period for data collection was quite limited because the informants were mainly free after work and during holiday periods which is usually time spent with family so would not be convenient for active participation in this study.

Conclusions

Regarding the Participatory Learning Process for the management of environmental health impacts in the industrial community area, an important factor is the process of developing ideas and behaviors that lead to learning and modifying ideas and behaviors. The environmental education concept should be used to link all types of learning by educating and encouraging people in the community to have desirable behaviors. When they are used together to manage environmental problems, they will increase efficiency. People in the community have "the desired behaviors" and understand the problem, but they are also willing to find an appropriate solution, which is key to encouraging the community to manage the problem on its own. Therefore, the learning process should be simple and short, and the people should participate in every step of the decision.

Recommendations

The community can create a participatory learning process to manage the problems which correspond with the ways of living in the community and that covers all aspects of living. The

government should then promote and support the community in developing learning through a participatory workshop in the community in order to let the individual or the community systematically seek problem issues, causes, and solutions so that they can apply these in their careers or their daily living until they can effectively rely on themselves.

The learning process should be started in a small group and expanded thereafter. In the learning process leaders must be familiar with the community. They should be friendly and not focus on only one learning model. They should integrate one with another based on the situations of each community.

The participatory learning process provides the model useful for the development of public health as well as the related offices in the areas. Therefore, the related offices should be interested in and continually drive the model by containing it in the action plans and evaluate it afterward.

The empowerment and development of networking parties should be strengthened in terms of knowledge management, development planning, and organizing activities to raise awareness of environmental problems. It emphasizes the comprehensive participation of networking parties by allowing local people to initiate processes involved in the development and management of the problems, including (1) analyzing stakeholder groups to participate in the process of participation in problem management, (2) creating collaborative approaches using the process of participation in planning/project, (3) defining roles clearly, (4) building knowledge, (5) enhancing communication channels to be comprehensive and easily accessible, (6) managing legal and environmental knowledge and (7) organizing continuous monitoring and evaluation.

Conflict of Interest: None

References

1. Ministry of Public Health, Department of Health. Environmental health situation in the years 2014. Nonthaburi: Ministry of Public Health; 2014.
2. Notification of the National Environment Committee No. 24. On setting air quality standards in the general atmosphere, issued in accordance with the national environmental quality promotion and preservation act B.E. 2535 (1992). 121. The Government Gazette; 2004. Special episodes 104d. (22 September 2004).
3. Ministry of Natural Resources and Environment. Office of natural Resources and environmental policy and planning. Education project report status of pollutant contamination in Rayong province. Bangkok: Ministry of Natural Resources and Environment; 2010.
4. Rayong Provincial Public Health Office. Results of the survey of public opinion on the surveillance and health hazards from environmental pollution. Rayong: Sirimongkol Printing; 2014.
5. Office of the Eastern Special Development Zone Policy Committee. Eastern economic corridor development overview plan; 2017-2022. [updated 2018 Nov; cited 2021 Jan 31]. Available from: <https://eeco.or.th/th/filedownload/1478/cf4092afd2456bb1f03995574db27a75.pdf>.
6. Office of the National Economic and Social Development Council. Supporting documents for clarifying the preparation of major projects for the year 2022 to achieve the goals of the National Strategy issue (9) special economic zones. [updated 2020 Jun; cited 2021 Jan 30]. Available from: <http://nscr.nesdb.go.th>.
7. Rayong Provincial Industry Office. Industrial situation report in Rayong province. Rayong: Rayong Provincial Industry Office; 2015.
8. Ministry of Natural Resources and Environment, Pollution Control Department. The promotion and conservation of national environmental quality act (Total version) by the Office of the Council of State. [updated 2021 Jan 18; cited 2021 Jan 30]. Available from: <https://www.pcd.go.th/laws/>.
9. Boonyathikarn Y. Environmental management for project due to the initiative of Royal Thai Army. Bangkok: Ramkhamhaeng University; 2008.

10. Keeves JP. Models and model building. In: Keeves JP, editor. Educational research, methodology and measurement: an international handbook. 2nd ed. Oxford: Peraman Press; 1997.
11. Ornkerd P. The expansion of the community life in Tha Sai sub-district municipality, Nonthaburi. Bangkok: Kasetsart University; 2007.
12. Janthana N. Attitudes of people towards environmental impacts from growth of amata nakorn industrial estate. Chonburi: Burapha University; 2009.
13. Chankaew K. Environmental education. Bangkok: Aksorn Siam Printing Press; 1993.
14. Udom P. Environmental education. 2nd ed. Songkhla: Thaksin University; 2009.
15. Bowman MLC. Assessing college student attitudes toward environmental issues. J. Environ. Educ. 1974; 6(2): 1-5. doi: [10.1080/00958964.1974.10801847](https://doi.org/10.1080/00958964.1974.10801847).
16. Wasri P. Learning network for sustainable community development. Bangkok: Thai Wattana Panich; 1995.
17. Chantarasiri W. The health promotion model by the community participation process under the policy of establishing comprehensive health insurance Moo 8, NaPa sub-district, Muang district, Chonburi province. Chonburi: Regional Health Promotion Center. 2002; 3.

Corresponding author

Rachanont Supamongpichate can be contacted at: supamongpichate@gmail.com