

Working Environment in Fishery Small Enterprises in Developing Country

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Abstract

When considering the working environment in small enterprises of the fishing industry in Thailand,we found that the fishery SMEs at Si-Chang Island were impacted by seaport pollution which affected the health of fishermen.In order to identify health problems among fishery workers,we conducted a research in 2008 on the attitudes of the local people at Si-Chang Island towards the impacts of Si-Chang deep seaport on their health and happiness. There were 310 survey samples,and 10 in-depth interview samples,most of them were fishermen employed by fishery SMEs or independent fishermen.The results showed that many fishermen were in very good quality of health (69.0%) and happiness (65.8%).The subjects however,showed concerns regarding the dust particles in the air and in the sea which irritated the eyes and respiratory tract.There are corrective actions from all concerned parties.It is good initiative to show concerns regarding the health problems related to the working environment.

Introduction

In 1989, the Thai government issued a policy aimed at enhancing domestic industry and facilitating economic expansion with an emphasis on water transport development, which proves to be a convenient transport mode, i.e., bulk transport at lower costs than other modes. There was a preliminary study of Thailand's water transport facilities. The study indicated that there was indeed a pressing need for a new port, especially a deep seaport. Si-Chang was deemed to be the most suitable location for the new port because of its inshore water depth of up to 18 metres and its proximity to Bangkok, the capital of Thailand. The private-owned Si-Chang Deep Seaport Project was thus founded in order to construct a deep seaport on Si-Chang Island.

The Si-Chang Island is one of the most important islands in Thailand. It is situated in the Gulf of Thailand, twelve kilometers offshore from the city of Sriracha, Chonburi Province. Its proximity to shipping lanes made it a convenient anchorage spot for dozens of barges which transship their cargoes to lighter boats for the trip up the Chao Phraya, one of the main rivers of Thailand, to Bangkok. Eighty percent of the area being hilly and rocky. A rocky grassland is in the middle part of the island. There are no major rivers, streams or ponds on the island, except one man-made reservoir. The coastal area on the western side of the island consists mainly of rocky shores and steep cliffs while the eastern side consists of rocky beach. Si-Chang Island is home to a small fishing community surrounded by natural beauty. It also served as an anchorage hub for commercial trade routes with China beginning during the Ayudhya period (1350-1767 AD). Located at the center of the eastern seaboard development project, Si-Chang Island has become an important seaport and a tourist attraction. This has resulted in an inflow of labor from other places and, as a result, the area has become densely populated with insufficient public utilities and facilities.

Seaports are major hubs of economic activity and of environmental pollution in coastal urban areas. Due to increasing global trade, transport of goods through ports has been steadily increasing and will likely continue to increase in the future. Evaluating air pollution impacts of ports requires consideration of numerous sources, including marine vessels, trucks, locomotives, and off-road equipment used for moving cargo. The air quality impacts of ports are significant, with particularly large emissions of diesel exhaust, particulate matter, and nitrogen oxides. The health effects of these air pollutants to residents of local communities include asthma, other respiratory diseases, cardiovascular disease, lung cancer, and premature mortality. In children, there are links with asthma, bronchitis, missed school days, and emergency room visits. The significance of these environmental health impacts requires aggressive efforts to mitigate the problem (Bailey and Solomon,2004).

The study of pollution problems resulting from the Deep Seaport Project and affecting people living in the area has inspired the researcher to look into the health-related impacts of the pollution on people living nearby the project site. The researcher has chosen the Si-Chang Deep Seaport Project because it been in existence for 20 years, which a long enough period to show the above-mentioned impacts.

The objectives of this research are: to study attitudes of local residents towards impacts of the Si-Chang Deep Seaport Project in Chonburi Province on their health and happiness; to compare the impacts of the Si-Chang Deep Seaport project on the Si-Chang community's health and happiness by taking into account such variables as gender, age, educational level, occupation, income, hometown, dwelling period in the area and social status; and to consolidate recommendations regarding adjustments and solutions to environmental problems.

Literature Review

Sea transportation as a major hub of economic activity and environmental pollution

Sea transportation plays a major role in the majority of national and international trade and economic growth (Tahar and Hussain,2000). More than 90 percent of international cargo moves through seaports,which have an approximately 99 percent contribution to the economy of the world (Branch,1986). Sea transportation has been an important catalyst of world trade and economic growth in general (Lambertides and Louca ,2005). The deep seaport strategic location between sea and land makes them the best witnesses of pollution coming from land, ships and from the ports themselves (Goulielmos,2000). The problem with any port expansion or development is the priority between environmental and social-economic issues (Finny and Young,1995).

Sources of port pollution

Sources of port pollution are ships,bulk cargoes,bulk liquid cargoes,general cargoes that create dust,odour and oil pollution (Goulielmos and Pardali,1998).

Port pollution due to ships: Ships moving into a port for berthing or while waiting in the anchorage are potential polluters because of their possible collisions or stranding.

Ships pollute ports through gas emission from the main engine and hot water,noise from ships'engines and exhaust emission in the case of passenger ships (Englezou et al.,1993).

Ships'maintenance and repair that takes place in floating or grave docks or alongside a port dock create pollution from rust removal,old paints and various chemicals.In the case of tankers,the risk of pollution increases owing to noxious and inflammable substances that may cause sea water pollution or an explosion.

Polution coming from fuel when being delivered to ships within a port is a frequent cause of serious effects on the sea environment (Goulielmos and Pardali,1998).

Port pollution owing to Bulk cargoes:It is expected that cargoes like coal, iron ore and others, while loaded/unloaded or stored (higher probability) in ports create dust. The dust may damage other cargoes stored in the port e.g. cars or may pollute residences near the port and harm residents' health (Goulielmos and Pardali,1998).

Port pollution owing to Bulk liquid cargoes:Research has shown that the main causes of port pollution have been identified as bad maintenance of storage tanks,improper linkages between ship and shore, valve explosion,breaking out the connection of ship with a pipeline.It is expected that when handling oil and the linkage with shore is broken,then 3,000 litres per hour can be poured into the sea.Ship maintenance is important to avoid the above hazards (Goulielmos and Pardali,1998).

Port pollution owing to General cargoes: General cargoes nowadays are transported in boxes(Bruning,1985),but a considerable percentage of these are dangerous goods.Also,60 percent of all packed dangerous goods are carried in boxes.The most frequent accidents in the case of general cargoes which create pollution are caused by falls of boxes from the cranes and damage caused by cargo handling equipment.Noxious cargoes of course threaten the health of people working in ports and nearby residents and cause land pollution (Goulielmos and Pardali,1998).

According to UNCTAD,common causes of port pollution are ships,cargo,port and city (UNCTAD,1993). Pollution is generated from the maintenance of port's equipment and suprastructure due to gritblasting and spray painting or from ship repairs in the port area.Pollution may come from maintenance and repair works of the industrial plants located in the port (Goulielmos,2000). Requirements among industry sectors need to determine the difference of industry locations (Estonian Marine Institute in Tallinn, 2000).

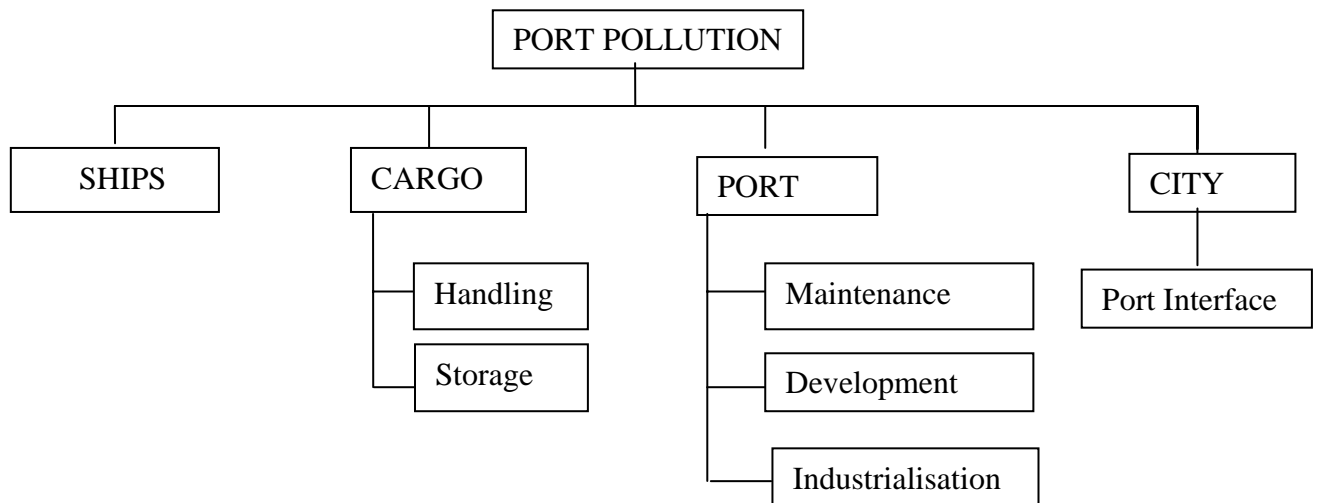


Figure 1. Port Pollution and its causes (constructed from UNCTAD, 1993)

Seaport's minimum requirements

Pollution in the port is also attributable to the port's working procedures, i.e., vessel and pier cleanup and the waste drainage system. Port industry involves materials and chemicals prone to cause damages to the environment, thus they should be strictly overseen (Gibbs, 2008). Infrastructure and technology of port industry, sizes of the ports and ports' operational systems should always be appropriately upgraded so as to streamline ports' operations to meet international standards (Williams, 1991). The port's development plan and technology implementation plan should be promptly executed to ensure minimum impacts on environment (Gailiusis, 2005). Regarding environment-related control and supervision, all international ports must be ISO 14000 certificate holders.

Ports' operational efficiency assessments take into consideration: cargo quality, timing and technology. The ports must offer good services and prioritize customer satisfaction by delivering quality goods on time. A wide range of working units are involved in the ports' operations, therefore the ports must coordinate among them to assure compliance with rules and create environment-friendly measures, for instance crane and machinery inspections and personnel performance checking (Brooks and Pallis, 2007).

Seaport pollution affecting human health

Maritime transport causes 12% of all environmental pollution. Water pollution can be clearly seen in oil leaks. Air pollution partly comes from dust particles produced during the cargo transfer process, which badly affects human health (Goulielmos,2000).

Oil leaks from vessels and waste dumps into the sea carry an adverse threat of aqua-ecological disaster to sea animals and people living nearby, who may be slightly but constantly ill (Pomeroy, 2008).

Methods

This study is based on quantitative as well as qualitative methods. Data for this study were obtained through primary and secondary sources. Secondary data were obtained mostly from journals, books and online databases including Emerald, Sciencedirect. These secondary sources provided broad coverage of academic and trade publications used for the literature review, hypotheses development, and questionnaire development stages.

Primary sources of data were collected from quantitative method which were survey research and qualitative method which were in-depth interviews.

Scope of the research:

Study the attitudes of the population living at Thaewawong District, Si-Chang Island for more than 1 year.

Survey data

A survey was carried out with 310 participants, with the use of a self-administered questionnaire for the empirical test.

Qualitative interviews:

10 In-depth interviews were carried out with a sample group comprised of representatives from each village, who had been carefully selected by the community and the local leaders, consequently can be considered key informants.

3.1 Population

The target population of this research included the population living at Thaewawong District, Si-Chang Island for more than 1 year. Thaewawong District, Si-Chang Island consists of six villages. The number of household in this district was 1,369 households. The total population was 4,681 which 2,329 were male and 2,352 were female.

3.2 Sample

The sample size determination was based on New York State Division of Housing and Community Renew (Yamane, 1973, P.727). The sample size was 309.55 samples, and thus the researcher set the number as 310 instead.

The sampling procedure involved a 2 stages sampling, 1st stage was Stratified Random Sampling of 6 villages, 2nd stage was Simple Random Sampling of the sample unit.

3.3 Validity and Reliability testing of questionnaire.

30 pretest questionnaires was assessed. The reliability of the questionnaire was assessed by using Cronbach's coefficient alpha analysis. The coefficient alpha value exceeded the threshold value of 0.7. The content validity was assessed and corrected.

3.4 Data Analysis

The statistical analysis techniques used for this study were Descriptive statistics and Inferential statistics. First, descriptive analysis for respondents' characteristics was conducted to ascertain frequencies, distributions, means, and standard deviations. Second, T-test and F-test (One-Way Analysis of Variance) were chosen as the statistical techniques to assess hypothesized relationships of differences attributed to groups. The multiple

comparison technique to compare means in several groups after F-test is employed, is LSD (Least Significant Difference).

Results

4.1 The data from the interviews of 10 representative samples are as follows:

1. Positive impacts of the Si-Chang Deep Seaport Project on economic growth

Effectively responding to Thailand policy, the Si-Chang Deep Seaport Project was opened in 1996 and has been functional up until now. It can accommodate five big vessels at one time with the east dock responsible for 100,000-ton ships and the west dock for 240,000-ton ships. Furthermore, the port houses an oil warehouse with a capacity of nine 100,000-barrel oil storage tanks. Since the port's opening, public utilities have been progressively developed. At present, Si-Chang Island is always preoccupied with shipments. The project was designed for offshore cargo transfer of large vessels onto ships heading towards the Klong Toey Port and export cargo transfer to large cargo vessels.

At present, there are six piers in Si-Chang Municipality, two of which are cargo piers, namely Phanurangsri Pier (Up Pier) and Thaewawong Pier (Down Pier). Other piers include Water Police's Pier, Customs Bureau's and Immigration Bureau's Pier, Fishery Pier and Harbor Department's Pier. These piers serve as alternatives for Phanurangsri Pier (Up Pier) and Thaewawong Pier (Down Pier), which are always packed with 100-200 fishing boats, passenger boats, ferries and tourist boats.

The Si-Chang Deep Seaport Project's operations have contributed immensely to Si-Chang Island public utilities: the number of people visiting the island has increased; and rounds of ferries to the island have been increased to serve more passengers since the opening of the port.

2. Pollution of the Si-Chang Deep Seaport Project

The port's operations have brought about many environmental problems on the island due to invasions into restricted areas, land reclamations ruining Si-Chang Island natural areas, oil leaks from cargo ships and pollutants drained into the sea. The port's operations also cause dispersion of dust particles in the air, and oil slicks and precipitation during offshore cargo transfer of large vessels. Pollution problems were derived from vessels' filthiness and waste, vessel cleanup, vessel anchoring, vessels' collision, vessels colliding into the marinas, accidents occurring during vessels' docking procedures, cargo overturns, immense cargoes, air pollution from chemical, liquid and dangerous cargoes. It is possible that during the transfer and transport processes, cargoes in sub-standard packages can be damaged causing the liquid cargoes to spill into the sea.

3. Pollution from cargoes

According to the interviews, the east dock of the port is in charge of both import and export cargo transfer. The export cargoes include rice, corns, cement, soft and hard cassava pellets. The import cargoes are soybean meal, wood, steel, fertilizers, crude and refined oil, which are transferred and shipped to Bangkok Port. Soft cassava pellet transfer causes the most dust diffusion.



Fig 1: Air pollution partly comes from dust particles at Si-Chang Island.

4. Impacts of Pollution from the Si-Chang Deep Seaport Project on the local residents

The finding from the interviews was that the operations of the Si-Chang Deep Seaport Project had caused sea pollution: airborne dust particles resulting from cargo transfer, slicks on the water surface, and oil slicks from both vessels of the Port's project and fishing boats. In addition, there were trashes from tug boats standing by for cargo transfer. These problems had sentimental effects on the concerned and anxious local people. Even though the problems were under Si-Chang Municipality's control, they were still unsolved.

5. Interviewees' views of the causes of problems of the Si-Chang Deep Seaport Project affecting the local residents

According to interviews with local representatives, the Si-Chang Deep Seaport Project has no direct activities with the community, who are informed about the project's information solely by Si-Chang Municipality.

The project has been beneficial to the community but the lack of direct coordination and cooperation is likely to yield negative effects on the project's operations. The central government had handed operational control over the project to Si-Chang Municipality, but the role of the Municipality only went to the extent where problems already occurred. No clear information announcement has been in place.

Working environment as an area of both conflict and consensus in SMEs

Traditionally the working environment in small enterprises was considered very important as an owner-manager explained that the fishermen had to work in the polluted environment affecting them SMEs and their health.

1. Impacts on their occupation. – The question was “How does the Si-Chang Deep Seaport impact the fishing career of the Si-Chang community?” The sample group agreed that the project caused the fish to migrate to somewhere else. Even though fish cage culture was promoted and corals were taken care of, the number of fish still kept decreasing. The operator

stated that "We think that the number of fish has decreased because we have to go further out in the sea and stay longer there and still get fewer fish." We can see that the working environment for small enterprises, especially for fishing ones are vital.

2. Impacts on SME operators' health.

The Si-Chang Deep Seaport Project has caused sea, dust, trash and oil slick pollution, and it intensifies in November and April. The trashes from tug boats waiting for cargo transfer and oil slicks on water surface are not so concerning but frequently happen.

The dust particles causing eye irritation and trash and oil odor causing headaches can be partly be causes of colds, but they are not grave.

Towards a new understanding of OHS (Occupational health and safety) in SMEs?

Looking beyond the traditional perception of working environment in small enterprises, the community was not so aware of fishing working environment. The Municipality, on the other hand, are well aware of health and safety and is trying to get them to protect themselves from the pollution. Examples of activities are Si-Chang Island Heritage Protecting Activity, Trash Management Activity, Waste Water Management Activity, Sea Crab Conserving Project and Coral Conserving Project.

4.2 The data from the survey are as follows:

Survey data: A quantitative survey was carried out with 310 participants.

Gender: 74.8% of which were male and 25.2% of which were female.

Age: 47.1% of which were 41-50 years of age, 31.3% of which were 31-40 years of age, 16.8% of which were > and = 50 years of age, and 4.8% of which were 20-30 years of age.

Education: 70.3% of which had primary education and 21.6% of which attained secondary education, 4.8% of which had Diploma, only 3.3% of which had Bachelor degree and higher.

Monthly income : 50.0% of which had an average monthly income of 5,000 baht and 46.5% of which had the income of 5,001-10,000 baht, 3.5% of which had the income of 10,001-20,000 baht.

Hometown: 76.1% of Si-Chang residents were born there while 23.9% were not.

Dwelling period: 83.9% of the sample group had lived on the island for more than ten years, 15.2% and 1.0% of the group had lived there for 6-10 years and 1-5 years, respectively.

Occupation: 30.6% of the subjects were employees, 29.0% were fishermen and 27.7% were merchants. Only 12.7% had other occupations.

Social status: 82.3% of the subjects did not hold any position in the community while the other 17.7% did.

Analysis result data of the sample group's health showed that the group was largely in stable health conditions, and most of them are concerned about the airborne dust particles.

1. Attitudes of local residents towards impacts of the Si-Chang Deep Seaport Project in Chonburi Province on their health and happiness.

According to a data analysis of attitudes of local residents towards impacts of the Si-Chang Deep Seaport Project in Chonburi Province in terms of health and happiness, it was concluded that the project's operations caused pollution due to airborne dust particles and slicks on the water surface, which cause eye irritation and colds. Oil leaks that produced unpleasant smells and trashes dumps into the sea by ship operators waiting for cargo transfer also contribute to the water pollution. Only 1.9% of the sample group had respiratory problems. Most participants had no hearing and gastrointestinal problems. As for health and happiness, very good quality of health (69.0%) and happiness (65.8%), and good quality of health (27.4%) and happiness (31.3%), because the environmental problems are being very well handled of by Si-Chang Municipality. Moreover, Si-Chang Island is a big island with a lot of space and natural year-round ventilation. The Aquatic Resources Research Institute,

Chulalongkorn University, (2005, p.29-30) stated that Si-Chang Island is quite of a large size with an area of 18 square kilometers and a stable climate and natural year-round ventilation. However, 84.5% of the sample group was most concerned about their health that might be affected by dust particles although no impacts on health were found yet.

Results					
	Very good	Good	Fair	Poor	Total
Health	69.0% 214	27.4% 85	3.6% 11	- -	100% 310
Happiness	65.8% 204	31.3% 97	2.6% 8	0.3% 1	100% 310

Table 1 shows the number and percentage of survey answerers according to health and happiness measuring criteria

Results					
	Stable		Poorer		
1. Respiratory Tract Disease	304	(98.1%)	6	(1.9%)	
2. Hearing Disease	310	(100.0%)	0	(0.0%)	
3. Gastrointestinal Disease	310	(100.0%)	0	(0.0%)	
4. General Disease	308	(99.4%)	2	(0.6%)	

Table 2 shows the number and percentage of survey answerers classified by diseases

Problems	Quantity	Percentage
Dust Problems	262	84.5
Water Problems	69	22.3
Others	15	8.9

Table 3 shows the number and percentage of survey answerers classified by problems regarding the Pollutions.

2.Comparison of the impacts of the Si-Chang Deep Seaport project on the Si-Chang community's health and levels of happiness by taking into account such variables as gender, age, educational level, occupation, income, hometown, dwelling period in the area and social status.

According to a research hypothesis, "Different personal factors are related to different attitude towards the Si-Chang Deep Seaport Project in terms of health". After comparing this hypothesis with the results and considering the impacts in each aspect, we can have the following discussions.

1.Gender : The research result did not correspond with the hypothesis. Different gender does not have different attitude towards the Si-Chang Deep Seaport Project in terms of health.

2.Age : The research result corresponded with the hypothesis. This showed that people of different ages had different health conditions, which was in accordance with Narong Sengphracha's statement (1995, p.95) that people of different ages had different levels of happiness and contentment with quality of life. This statement also corresponded with that of Chairath Thanasanthi (1992, p.23) who said that happiness of people of different ages were different due to their learning and experiences.Attitudes about health varied among people of different ages. In terms of health, it was found that the attitudes of the subjects of more than

51 years of age were different from the 41-50, 31-40, 20-30-year-old subjects, and the 41-50-year-old subjects' attitudes were different from the 20-30-year-old subjects. In terms of happiness, it was found that the attitudes of the subjects of more than 51 years of age were different from the 41-50, 31-40, 20-30-year-old subjects.

3.Education: The research result did not correspond with the hypothesis because 70.3% of the sample group had a primary education level, therefore the health and happiness levels were not different. In addition, the islanders have good health and happiness levels.

4.Occupation: The research result did not correspond with the hypothesis because the people living on the island make a living there. Therefore, even though their occupations are different, they live in the same neighborhood; subsequently have similar health and happiness levels. This corresponds to Sucha Chandra-aem's statement (1981, p.32) that in the same climate and geography, even though people had different careers, the health results of the people would be similar.

5.Income :The research result did not correspond with the hypothesis since the pollution problems on the island are not critical and are well handled by the Municipality, the islanders have a few minor sanitary problems.

6.Hometown (birth place) : The research result did not correspond with the hypothesis because Si-Chang Island has a good climate and the pollutions problems are still at a moderate level. All the subjects had been living there for more than one year, and 76% of which were born there.

7.Dwelling period : The research result did not correspond with the hypothesis because the environmental problems were not severe.

8.Social status (with/without position) : The research result corresponded with the hypothesis. The affected attitude of the persons with community positions was different from those without any positions. Health and happiness assessment results showed that the health

and happiness levels of the persons with community positions were different from those without any positions, which was in accordance with a research by Robert Pomeroy (2008 , p.426) regarding fishery policies of Vietnam, where community leaders and government officials were in charge of environmental protection in villages and working areas. These people had a higher stress level than those holding no community positions.

Therefore, the difference of happiness and health levels of the sample group, classified by different variables: gender, educational level, occupation, income, hometown and dwelling period in the area, was not statistically significant at the statistically significant level of 0.05.

The difference of happiness and health levels of the sample group, classified by different variables: ages and social status (with/without positions), was statistically significant at the statistically significant level of 0.05.

Conclusions

The comments and concerns raised in this paper are offered to provide a starting point for Si-Chang Municipality and the executives of Si-Chang Deep Seaport Project and local resident representatives to initiate discussions regarding environmental issues which impact to the health and happiness of community.

The current operations of the Si-Chang Deep Seaport Project are causing sea pollution due to airborne dust particles and slicks on the water surface, which cause eye irritation and colds. Oil leaks that produced unpleasant smells and trashes dumped into the sea by ship operators waiting for cargo transfer are contributors to the water pollution. Nevertheless, the islanders are not severely affected: they do not suffer from respiratory distress, due to the particles and smells, hearing impairment, or gastrointestinal diseases due to contaminated water and foods. Some of them have some minor natural diseases. The community is slightly concerned about the dust particles, which Si-Chang Municipality, the Harbor Department and the Si-Chang

Deep Sea Port are collectively attempting to find measures to tackle. According to the survey, in Si-Chang District, there is one 30-bed community hospital. Five leading causes of sickness are respiratory diseases, problems with the cardiovascular system, digestive diseases, endocrine and nutritional diseases and accidents.

The port's operations are causing sea pollution such as airborne dust particles, contaminated water and trashes. Although these problems are not severe, to some extent, the locals feel their livelihood is being threatened by the project, which is situated within their vicinity.

According to the research results:

1. The sample group found that the government agency responsible for the Si-Chang Deep Seaport Project held the environment as an important issue.
2. The sample group found that public relations should be improved so the community could be well informed and express their opinions, and there should be more coordination among the local administrative agencies and the community to encourage participation from all parties involved.
3. Most of the sample group found that the major problems and obstacles to protecting Si-Chang environment from the Deep Seaport Project was the rejection of community involvement.
4. Apart from dust, polluted water and noise, the Deep Seaport Project also contributes to garbage problems: tug boats standing by for cargo transfer, and docking in a disorderly manner.

Recommendations regarding adjustments and solutions to environmental problems in Si-Chang District, Chonburi Province.

This study has revealed environmental problems that the community is facing and the reason they remained unsolved is discouragement of community involvement. The current

environmental problems of Si-Chang Island involve both the community and the local administrative work units, i.e., Si-Chang Municipality and the Si-Chang Deep Seaport Project who must work together to protect the environment and solve the problems. The researcher has recommendations for the research as follows:

1. Forums should be organized as a place where the community living on Si-Chang Island and the executives of the Si-Chang Deep Seaport Project can come together and exchange information, find ways to protect the environment and solve the problems. The local representatives, to start with, should take part in local coordination.
2. A work unit such as Si-Chang Municipality should start playing a role in promoting cooperation between the community and the Si-Chang Deep Seaport Project.
3. The community should be well-educated about OHS (Occupational health and safety), so that they are more aware of environmental problems, and their role of defending and protecting the environment, especially water quality, alluvial soils, garbage and sewage problems so as to avoid long-term impacts.
4. According to the UNCTAD approach (UNCTAD, 1993), the major objectives of a port manager are: (a) efficient economic performance, (b) ecological sustainability, and (c) social equity, the Si-Chang Deep Seaport Project should practice this approach.
5. Environmental problems on Si-Chang Island are partly derived from poor environmental measures, and the lack of knowledge and understanding of protection and maintenance. Si-Chang District Municipality should attempt to find ways to protect the environment and solve the problems. Also a standard operating procedure of solving environmental problems should be established, and involved persons should be informed to ensure effective cooperation.
6. Besides the problems of dust particles, polluted water and noises, there is another problem of trashes from boats docking and waiting for cargo transfer due to the fact that the maritime area is beyond Si-Chang Municipality's jurisdiction.

7. The research result showed that the local people changed their careers, so they should be encouraged to embark on professional fishing careers such as fish cage culture and aquaculture.

8. The research result showed that the community did not have a proper understanding about Si-Chang land development. They emphasize on material advancement, which directly affect environmental conservation. Suggestions are that they should have a proper understanding about economic growth, and should not only focus on material advancement and convenience. On the contrary, they should safeguard long-standing culture, traditions, lifestyles and abundance of their local natural resources that are different from other places.

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