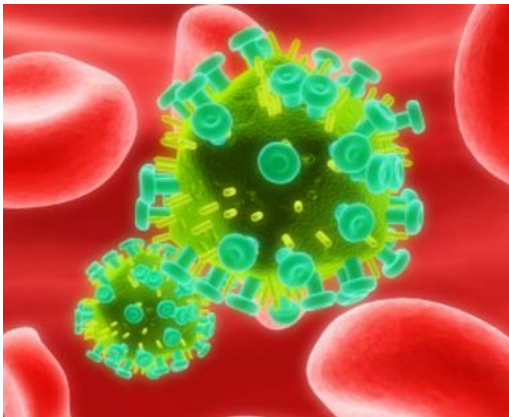


RISK COMMUNICATION IN THAILAND

A Case Study in Rayong Province



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Hannah Shapiro



This report represents the work of one or more WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

Risk Communication in Thailand:

A Case Study in Rayong Province

An Interactive Qualifying Project and Science and Social Project
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in partial fulfillment of the requirements for the degree of bachelor of science by

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Abstract

This project investigates communication strategies used to convey petrochemical pollution, HIV/AIDS, and motorcycle accident risks in Rayong, Thailand. Our goal was to characterize risk communication in Rayong to provide suggestions for improving risk communication in Rayong and Thailand. We accomplished this goal through interviews with government officials, civil-societies, academic researchers, and Rayong province residents. We identified successful strategies from other countries to develop recommendations, which we present regarding improving information flows, tailoring of information, collaboration among stakeholders, and building trust.

Acknowledgements

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First, we want to thank our sponsors, Dr. Nuntavarn Vichit-Vadakan and Dr. Seth Tuler, for their guidance throughout the project and for making us think critically about risk communication.

We would also like to thank the following organizations for allowing us to interview them: the Ministries of Public Health, National Resources and Environment, and Industry, the Rayong provincial government, the Map Ta Phut Municipality, the Camillian Socio-Health Institutions Identity, the Don't Drive Drunk Foundation, Kho-Keaw HIV Club, the Petroleum Institute of Thailand, and the Thailand Global Road Safety Partnership. Additional thanks go to Niphattra Haritavorn and Nitaya Vajanapoom for also letting us interview them.

Special thanks are given to Uma Langkulfen for her help in scheduling interviews and writing official documents, and Khun Chanida Chandtranangkul, the Head of the Disease Control and Prevention Division in Map Ta Phut Municipality for helping us schedule and perform interviews with various HIV/AIDS organizations in Rayong.

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Final thanks go to our Worcester Polytechnic Institute and Chulalongkorn University advisors: Professors Chrysanthe Demetry, Supawan Tantayanon, and Richard Vaz for their guidance throughout the project. Their extensive comments helped us to learn how to write more clearly and think more critically about risk communication.

Executive Summary

Risk communication is “...any communication that supplies laypeople with information they need to make informed independent judgments about risks to health safety and environment” (Fischhoff, 1992). Risk communication is an effective practice for communicating health safety and environmental risks, and it tends to be more advanced in more developed countries because they have been refining their practices for longer periods of time. Risk communication in Thailand is still believed to be in the developing stages and little is known about the current efforts being performed.

In order to characterize the current risk communication situation in Thailand, we investigated three public health issues—HIV/AIDS, motorcycle accidents, and petrochemical pollution. We used the Rayong province as a case study because of its controversial history with petrochemical pollution. In addition, HIV/AIDS and motorcycle accidents are of continual concern in Rayong as well. We discovered that stakeholders approached each issue differently, that communication flows varied between issues, and that stakeholders have different purposes and motivations to communicate information for each issue.

With these considerations in mind, the goal of our project was to determine the current risk communication strategies in Rayong province regarding the three public health issues to provide suggestions for improving risk communication within both Rayong and Thailand. To achieve our project goal, we developed the following research objectives:

- 1) To characterize the risk communication efforts in Rayong concerning HIV/AIDS, motorcycle accidents, and petrochemical pollution,
- 2) To assess and compare communication efforts, stakeholder perspectives, and risk issues,
- 3) To identify possible strategies to develop the improvement areas discovered through our analysis, and
- 4) To develop recommendations for improving risk communication activities in Thailand.

To characterize the risk communication efforts regarding each of the respective health issues in Rayong, we interviewed government officials, civil-societies, academic researchers, and residents of Rayong. We interviewed representatives of three different departments in the Ministry of Public Health, one department each in the Ministry of Industry and the Ministry of Natural Resources and Environment, as well as the Public Health Department of Rayong province and the Department of Public Health and Environment of Map Ta Phut Municipality. Similarly, we interviewed representatives of the Petroleum Institute of Thailand, the Thailand Global Road Safety Partnership, Camillian Socio-Health Institutions Identity, Kho-Keaw HIV Club, and the Don’t Drive Drunk Foundation, all of which are civil-societies that focus their work on one of the public health issues we researched. We also interviewed two academic researchers working for the Faculty of Public Health at Thammasat University regarding their expertise in HIV/AIDS, motorcycle accidents, and petrochemical pollution. Additionally, we conducted interviews with thirty Rayong residents.

From the interviews we gained an understanding of the communication strategies used by each stakeholder as well as their interactions with each other. To assess and compare the communication efforts, stakeholder perspectives, and risk issues, we performed three different types of analysis in the data obtained through the interviews. The first analysis was a “within-issue” analysis; we compared the efforts of every stakeholder about a particular issue to each other and identified areas of congruence and incongruence in their statements. Second, we used a “cross-stakeholder” analysis; we discussed and asked

how each stakeholder approached each issue in comparison to the other stakeholders. Last, we employed a “cross-issue” analysis; we assessed and compared the criteria, goals, and risk communication efforts being used for one issue with those used for the other two issues. After identifying similarities, differences, and gaps in current risk communication in Rayong, we determined areas for improvement. We used successful risk communication strategies from countries around the world and research about risk communication to help us develop recommendations to improve risk communication in Rayong and Thailand.

During our project we faced several challenges and limitations. When conducting interviews, we experienced some problems getting the interviewees to fully or directly answer our questions. This was particularly challenging because all most all of the interviews were conducted in Thai, and our Thai researchers had to constantly translate to the American researchers. One limitation we faced was the time constraint to complete the project in seven weeks. Due to this factor, we were unable to transcribe the interview recordings. Without the full text of our interview responses, we may have misinterpreted what we heard when listening to the recordings. Another limitation we faced was being unable to choose a representative sample of the people of Rayong; we conducted interviews with community members without running a previous sampling study. Using the data gathered through our interviews and the methods described, we attempted to portray the current risk communication situation in Rayong by focusing on communication flows, stakeholder interactions, and using three different public health risks as examples of different types of risk.

Through the evaluation and interpretation of our interview responses, we developed the following findings regarding risk communication methods used for each particular health issue.

We developed three main findings concerning HIV/AIDS risk communication:

HIV/AIDS risk communication is reaching a wide range of people. We found that the national government and the hospitals are the main sources of information. Information is then forwarded to the other levels of government and civil-societies. The national, provincial, and local governments as well as the civil-societies use various campaigns to convey the information to the public in order to reach a wide range of people. The public suggested it was receiving this information.

HIV/AIDS risk information involves two-way communication as a result of feedback loops. We found from our interviews that after every campaign the stakeholders have protocols to allow the public to provide feedback. The government and civil-societies provide the public with surveys, so the public can give recommendations on the campaigns. This data suggested there is strong two-way communication because feedback loops are used to make communication efforts more effective.

HIV/AIDS stakeholders have the same purpose for communicating risks. We found that all of the stakeholders’ purpose is to share information with the public in order to prevent the spread of HIV/AIDS, and that they are all interested in reaching all types of audiences. Collaboration among stakeholders is evident because civil-societies act as mediators between the government and the public, encouraging communication while also increasing the credibility and comprehensibility of the information.

We also developed two findings for motorcycle risk communication:

Messages about motorcycle risk are received and understood by the public. We found through our interviews that the main sources of information include the government, hospitals, and civil-societies. Campaigns are used to convey the information to the public and a wide variety of media

such as television and radio is used to transmit the information. Additionally, interviews with the residents of Rayong indicated that the people knew and understood motorcycle safety information.

Motorcycle accident stakeholders have the same purpose for communication. We discovered that every stakeholder we interviewed has the same objectives for risk communication; they are fully committed to preventing motorcycle accidents. We also found collaboration between the stakeholders, and we concluded they work well together because they share the same purposes for communicating risks.

Finally, we generated three main findings for petrochemical pollution risk communication:

There is limited evidence of two-way communication between stakeholders regarding petrochemical risk communication. Our interviews revealed that the information flows between stakeholders concerning petrochemical risk communication are far more complicated for two reasons: the information about pollution provided by the industry and the government is often confusing and cannot be understood by all the stakeholders, and feedback from the public is not considered by the stakeholders and often goes unanswered. This led us to believe that two-way communication is weak.

Petrochemical risk stakeholders have different objectives because they are influenced by outside factors. Petrochemical risk communication, unlike the other two health issues, is influenced by an outside factor, economic growth. This means petrochemical stakeholders often have differing objectives. This struggle to balance economic growth with social implications has resulted in little collaboration and communication between and within stakeholders to share information.

There is public outrage and a lack of trust as a result of poor petrochemical risk communication. Our interviews revealed that many residents do not respond positively to the communication efforts made by the stakeholders for three reasons: they do not trust the monitoring techniques or the data gathered by the industry and the government; they do not trust services provided by the industry; and they have been physically affected by pollution. The combination of these factors makes communication difficult in this particular case.

We then generated two findings concerning the comparative analysis of the risks in Rayong:

The fundamental difference between behavioral risks and risks that are out of the individual's control is how they are perceived by the public. We discovered that despite the effectiveness of risk communication, individuals may still choose to take a behavioral risk because many behavioral risks are not associated with many risk perception factors, lessening the amount of concern they receive. Conversely, risks that are out of the control of the individual tend to have more risk perception factors associated with them, thus increasing the concern they receive. These types of risks are often associated with lack of trust and outrage. These conclusions parallel what we learned from the risk communication literature.

Civil-societies have differing roles in risk communication depending on the type of risk. We discovered civil-societies involved with behavioral risks simply contributed to the already existing communication flow supplementing their information to the information generated and forwarded by other sources and transmitters. However, civil-societies involved with risks that were out of the control of the individual seemed to align their purposes or efforts with only certain stakeholders and hindering communication.

Based on our findings, we developed a final set of recommendations. While our project focused on studying risk communication efforts in Rayong for HIV/AIDS, motorcycle safety, and petrochemical pollution, we concentrated on developing recommendations that could be applied to general risk communication challenges. It is in this broadening of the recommendations that we hope they will help improve risk communication beyond the Rayong province to all of Thailand.

We recommend senders of information establish feedback loops with receivers of information.

Feedback loops should be developed from the public to the local government, civil-societies, and other stakeholders. Developing a feedback loop between the public and the local government might allow for simpler communication flow of public feedback from the local government to the provincial government and ultimately the national government. We suggest the establishment of call centers to encourage and respond to feedback. Call centers have been helpful in promoting and addressing feedback between the public sector and the government and private sectors of Singapore.

We recommend stakeholders collaborate to share the same information. Collaboration between the public, civil-societies, government, and other stakeholders, as well as within each of these stakeholder classes, could make the same information accessible to all of these stakeholders. Sharing information avoids unnecessary repetition of research and prevents conflicting data from being released. Using a national database system, similar to the one in Vietnam, might allow stakeholders to share their information easily and efficiently.

We recommend the establishment of civil-societies that are objective towards other stakeholders' advocacies in order for the civil-societies to facilitate communication between all stakeholders. Civil-societies that are objective towards other stakeholders' purposes are able to facilitate communication between stakeholders by acting as transmitters of information. They can share information without bias and strengthen or form communication flows between stakeholders that are weak. Creating these flows, along with having an intermediary organization, makes collaboration between stakeholders with different objectives easier. Objective civil-societies already exist for some risk issues, but their existence for all issues might greatly benefit risk communication in Thailand.

We recommend companies and the government establish trust with local communities during the planning stage of projects, especially when the project is likely to involve stakeholders with different objectives. Establishing trust is not hard to do when stakeholders have the same purposes for communicating risks, but when an external factor influences stakeholders' objectives, communication may be set aside resulting in a lack of trust. Once lost, trust is very difficult to restore.

We recommend all stakeholders use or develop strategies to mitigate outrage and to rebuild trust after it has been lost. Mitigating outrage and building trust go hand-in-hand. People are angry as a result of their lack of trust, so attempts to rebuild trust will often result in a lowered level of outrage. Ways that trust can be rebuilt are for the stakeholder not being trusted, usually the government or an extra stakeholder such as a company, to make itself "transparent" to the public, to participate in community activities, to directly benefit the local community, to actively consider community concerns, and to involve community members in development stages.

We recommend sources and transmitters use multiple communication channels. Using multiple channels for communication such as newspapers, television, telephones, radio, internet, pamphlets, and various campaigns helps messages reach a greater number of people. Different types of channels stimulate people differently, so using multiple channels may help to reach and affect a wider range of people.

We recommend sources and transmitters consider everyone a target audience. When communicating risks, transmitters of information such as the local government and civil-societies should consider everyone a target audience. These stakeholders should equally communicate to a wide range of people, including, but not limited to, children, adults, educated people, homeless people, migrant workers, and sex workers. By targeting as many people as possible, more people that could potentially be affected by an issue can protect themselves.

We recommend sources and transmitters make information understandable to the general public. Local government and civil-societies, as transmitters, should tailor information so it is understandable to a wide range of people, especially when sharing technical information. Local governments and civil-societies can use comparisons to explain difficult information or choose to only communicate about how the public can protect itself while making technical information available to those who specifically request it.

We recommend sources and transmitters appeal to the cultural beliefs of the receivers. The local government and civil-societies can tailor information by making it appealing to the cultural beliefs of the public. Karma is a popular belief among many Thais, and correlating its message with a risk prevention method could be useful to improve the effectiveness of risk communication.

These recommendations, if implemented, could potentially serve to improve risk communication in Rayong. In addition, we hope they will help improve risk communication beyond the Rayong province to all of Thailand. Although none of these recommendations are easily implemented and will likely require long-term efforts before they work, it is our hope they will serve as guidance for future work such as workshops for training professionals in risk communication.

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1. Introduction

People cough while clutching bloody, white handkerchiefs to their mouths. A man with an air mask is wheeled in a stretcher on the sidewalk. An IV rolls by, trailing after the patient to which it is attached. These are the images Greenpeace activists recreated outside Thailand's Ministry of Industry in February of 2007. They were protesting the Thai government's resistance to recognizing the negative health effects associated with petrochemical pollution in a town called Map Ta Phut (Greenpeace Southeast Asia, 2007). Heavily industrialized by various petrochemical companies, the town is located in the province of Rayong and is known for its petrochemical pollution.

A study conducted in Rayong by Greenpeace revealed that two cancer-causing agents, benzene and 1,2-dichloroethane, were found to violate United States' screening levels by sixty and 3,300 times, respectively (Greenpeace Southeast Asia et al, 2005). Standards developed by the United States are commonly used as a reference point worldwide because they are well-established and easily accessible. While Thailand does have several pollution standards, it does not yet have any regarding these particular compounds (Issarapan, personal communication, January 26, 2009). Because of protests led by civil-societies¹, or non-governmental organizations such as Greenpeace, and health studies conducted by scientific researchers, Map Ta Phut has garnered increased attention over the past few years. Meanwhile, other health risks in this town and throughout Thailand are sometimes overshadowed due to the mounting attention given to industrial pollution. Both communicable diseases and traffic fatalities are also serious concerns throughout the country, and yet, they do not receive as much attention as industrial pollution.

Historically around the world, risk communication has been used to manage problems such as those occurring in Thailand. Effective risk communication increases awareness and enables individuals to make informed decisions regarding their health. It has taken several decades for nations with the most effective risk communication strategies to refine them. In countries where risk communication is still developing, communities are not always provided with enough information to protect themselves and their environment. Thailand is one of these countries in the early stages of risk communication development, and many of its citizens are susceptible to the negative effects associated with certain public health issues.

Thailand has made a considerable effort in addressing industrial pollution, communicable diseases, and traffic accidents. These three public health issues represent different types of risk; industrial pollution is an example of a risk beyond the control of the individual, whereas communicable diseases and traffic accidents are behavioral-related and somewhat within the control of the individual. Even though they are different types of risk, they can all have negative impacts if not addressed by effective risk communication. For example, the amount of air, water, and soil pollution generated from Thailand's petrochemical industry has increased so much that studies are now linking the pollution to the high prevalence of cancer in the surrounding communities (Liu, 2005). Similarly, many people have continued to be affected by HIV/AIDS and motorcycle accidents. Just five years ago, 17,000 people were newly infected with HIV in Thailand (World Health Organization, 2005), and last year, 43% of all road accidents involved motorcycles (Thailand Accident Research Center, 2008). With these growing national concerns, Thailand has made several attempts to provide its public with the means to protect its health through legislative measures and national campaigns, but these statistics suggest perhaps more can be done. Understanding how this province, the national government, and other stakeholders are currently

¹ For the purposes of this project, we used unconventional terminology. The term, *civil-society*, includes both non-governmental organizations as well as grassroots organizations.

addressing these three public health issues through risk communication could allow for the identification of areas for improvement.

Our project focused on providing recommendations for the improvement of risk communication efforts throughout all of Thailand. We concentrated on three types of risk within the province of Rayong in order to explore a range of risk types. We chose petrochemical pollution as an example of a risk out of the individual's control and motorcycle accidents because it is a behavioral risk. HIV/AIDS was also chosen because it too is a behavioral risk; however, it has a stigma attached to it. We attained our goal by addressing the four following objectives:

- 1) Characterization of the risk communication efforts in Rayong concerning petrochemical pollution, HIV/AIDS, and motorcycle accidents,
- 2) Assessment and comparison of communication efforts, stakeholder perspectives, and risk issues,
- 3) Identification of possible strategies to develop the areas identified for improvement, and
- 4) Development of recommendations for improving risk communication activities in Thailand.

Through a series of interviews and their analysis, we sought to discover how each issue is currently handled, what risk communication strategies have been successful, and what efforts can be improved. We drew suggestions for improvement from strategies used around the world and altered them to accommodate the situation in Thailand, such as cultural and socio-economic factors. Our recommendations could be used in risk communication training workshops, such as those Dr. Nuntavarn Vichit-Vadakan, the Dean of Public Health at Thammasat University in Thailand, and Dr. Seth Tuler, a social-science researcher and Fulbright scholar, are leading. Our work, in collaboration with the research of Drs. Nuntavarn and Tuler, helped identify areas of improvement and how to address them. Our final recommendations were intended to apply not only to petrochemical pollution, HIV/AIDS, and motorcycle accidents, but also to other issues throughout the country that involve these same types of risks, such as industrial pollution, communicable diseases, and transportation. We hope the implementation of these recommendations will serve as a contribution towards helping improve and strengthen Thailand's risk communication strategies, and we hope they will help better protect and empower people to make informed decisions about their health.

2. Background and Literature Review

In this chapter we begin by introducing the concepts of risk management and risk communication and how they are used and applied within many countries to help protect and inform the public. Second, we provide a review of Thai government structure and the roles that each of the departments of interest plays and some of their current risk communication efforts. Lastly, we introduce Rayong province and its relevance to our project as well as the three public health issues—petrochemical pollution, HIV/AIDS, and motorcycle accidents—on which we focused because they represent three different types of risk. We present this information in the following sections.

2.1 Western Models for Risk Management and Communication

In the following sections, we will explain the relationship between risk management and risk communication. These two terms are relatively new to the country of Thailand even though policies in the country do contain certain aspects of them. Because multiple other countries around the world, particularly western countries, have continuously been refining their systems of both risk management and communication for several decades now, the lessons learned by these countries may be helpful for reference when developing risk management and communication plans in countries such as Thailand. To explain risk management and risk communication, we will first describe what is meant by risk management and the processes it involves. Then we will share various definitions for risk communication, describe how it typically evolves, and explain a model widely used to depict risk communication information flows.

Risk Management

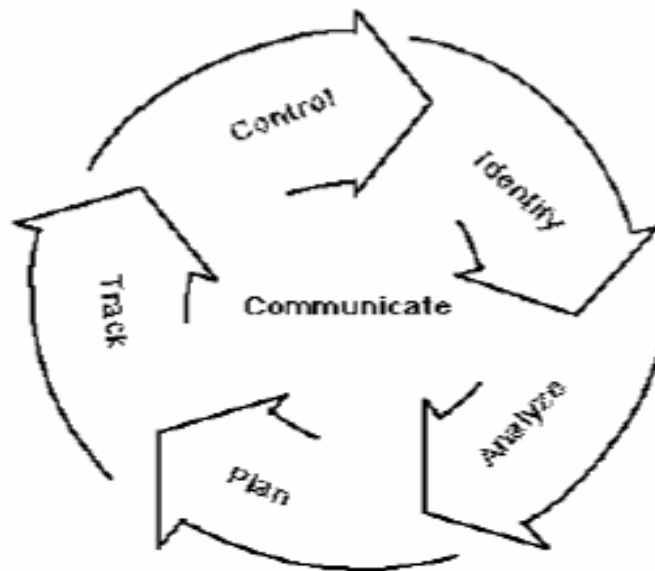
Risk management is a practice which involves processes, methods, and tools for managing risk in an organization or project. Originating in software development, risk management has been used to apply to multiple fields of study. Barry Boehm, a Director at the University of Southern California's Center for Software Engineering is responsible for creating several models for software engineers relating to risk management in the early 1990s. He claims that in order for risk management to be successful, there is a sequential order of steps generally followed:

- 1) *Risk assessment*. This step involves identifying all potential risk through a variety of techniques including brainstorming, interviews, questionnaires, and previous experience (“Risk Management Approach,” 2006).
- 2) *Risk analysis*. Risks are analyzed for their probability of occurrence and their extent of potential impact. They are usually organized into a single document consolidating what is known about them. The proper parties can then take responsibility for the risk in order take the necessary steps towards minimizing it (Boehm, 1991).
- 3) *Risk planning*. This step involves finding ways to decrease the chance of occurrence by removing and reducing risk effects before they actually start to occur. It also involves the process of finding mitigation methods to minimize the severity of the impact of the risks (“Risk Management Approach,” 2006).

- 4) *Risk resolution*. After all possible methods of reducing the risk are considered, a resolution can be created where one method is selected for implementation. (Boehm, 1991).
- 5) *Risk monitoring and control*. Risk monitoring and control help ensure the risk management plan is not only being followed but also works; otherwise, ideally new approaches should be developed (Boehm, 1991).

A model developed at Carnegie Mellon University, shown in Figure 1, visually demonstrates this process. The risk is identified, analyzed, and a plan is formed in order to address the risk. The progress is measured through tracking and the risk is carefully controlled.

Figure 1: Risk Management Model (Carr, Konda, Monarch, Ulrich, 1993)



As can be seen in the figure, risk management is a continuous process, and at the center, where all of the steps revolve, is risk communication. This is the central component to all steps of risk management; without communication, the risk cannot be adequately addressed (Carr, Konda, Monarch, Ulrich, 1993).

Risk Communication

Similar to the term *risk management*, risk communication also cannot be easily described. It is an abstract concept, and therefore, different people and organizations have varying definitions. In 1989 the United States National Research Council, a government organization that generates advice regarding science, technology, and health policies, used a formal and lengthy approach to define risk communication. The Council described it as,

An integrative process of exchange of information and opinions among individuals, groups, and institutions; often involves multiple messages about the nature of the risk or expressing concerns, opinions, or reactions to risk messages or to the legal and institutional arrangements for risk management (The National Research Council of 1989 and National Academy of Sciences, 2009).

In far fewer words, Vincent Covello, the Director for the Center of Risk Communication in New York City known for his research in the field of risk communication, simply defines the term as any “purposeful exchange of information about health or environmental risks between interested parties” (Golding, 2000). Another well-known expert in risk communication is Baruch Fischhoff, and he considers the term to be any “...communication that supplies laypeople with information they need to make informed independent judgments about risks to health safety and environment” (Fischhoff, 1992). Fischhoff’s definition is useful because he incorporates the term *laypeople*, meaning the public; he recognizes the need for the public to be involved when communicating risks. All three of these definitions come from reliable sources; the National Research Council, Vincent Covello and Baruch Fischhoff, all of which have extensive experience in the field of risk communication, and yet they all choose different words to describe it. These variations demonstrate that risk communication is a dynamic field where no single approach to it can be applied solely or equally well to all purposes, audiences, and situations.

Evolution of Risk Communication

The countries with more extensive risk communication policies are at a higher level of development because they started establishing their risk communication strategies decades ago when they began industrializing and experiencing the associated negative effects. Many experts have studied the evolution of risk communication throughout these countries, including Fischhoff, who describes it in seven stages:

- 1) All we have to do is get the numbers right
- 2) All we have to do is tell them the numbers
- 3) All we have to do is explain what we mean by the numbers
- 4) All we have to do is show them that they’ve accepted similar risks in the past
- 5) All we have to do is to show them that it’s a good deal for them
- 6) All we have to do is treat them nice
- 7) All we have to do is make them partners (Zwanenberg, 2006).

Fischhoff uses the term “we” to represent organizations that release information. His seven stages describe what these organizations considered to be effective risk communication at the time. Other scholars thus far have also studied the evolution of risk communication. Roger Kasperson, a professor at Clark University and a member of several committees on the Council of the Society for Risk Analysis, has identified four main evolutionary phases (Clark University Academic Catalog, 2009, Kasperson, 1991, and Leiss 1996). The countries with more risk communication experience are still refining their practices, which demonstrate the evolutionary nature of risk communication. Perhaps in a few years, scholars will include additional fifth and sixth phases to the accepted four phase model of evolution.

According to Kasperson, the first phase of risk communication involves simply presenting information to the public without explanation. Emphasis is on making sure the data is accurate. The government and the industry often have difficulty realizing why the public cannot understand the information, and meanwhile, the public becomes frustrated because it feels its concerns are being ignored. Kasperson also recognized this pattern, stating the government and the industry are “...unwilling to allow them [the public] to participate in decisions that intimately affect their lives” (Kasperson, 1991).

The second phase of risk communication involves improving credibility and persuasiveness. It requires consideration for varying risk perceptions among different audiences and therefore, the information is tailored to better explain the risk and make the information more persuasive. This marks the first appearance of trust and credibility as a major factor in communicating risks; if the public does not trust the organization or person presenting the information, the public will continue to be skeptical of the

information. Unfortunately, the lack of community involvement in direct decision making hinders the amount of trust that is placed in the organization (Leiss, 1996).

The third phase addresses this issue of trust and credibility by trying to create a partnership between those providing the risk information and the public. Dialogue between the two parties and increased community involvement allows the public to share its concerns while also being a part of the decision-making process. When the United States was in this third phase of risk communication, Covello and the United States' Environmental Protection Agency, developed the *Seven Cardinal Rules of Risk Communication*:

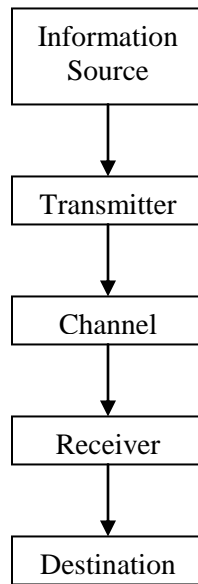
- 1) Accepting and involving the public as a legitimate partner,
- 2) Planning carefully and evaluating your efforts,
- 3) Listening to the public's specific concerns,
- 4) Being honest, frank, and open,
- 5) Coordinating and collaborating with other credible sources,
- 6) Meeting the needs of the media, and
- 7) Speaking clearly and with compassion (Covello, 1988).

The key aspects of risk communication conveyed by these Cardinal Rules include involving all parties, using multiple channels, showing humility and empathy to the public, and presenting truthful information. By including all parties, the outcomes of risk communication are mutually beneficial and partnerships can form. When information is shared with the appropriate audiences, a more trustworthy relationship can develop. Through the use of multiple *channels*, or modes of communication, the public can be sufficiently informed because a variety of techniques are used to convey and explain information. The channels can be tailored for different forms of media; for example, sound-bites and visuals are useful for communication through television and in-person presentations. It is also important for the organization communicating the information to be empathetic and willing to acknowledge its weaknesses and shortcomings. By presenting truthful information and admitting when its information is incomplete, organizations can avoid over-reassuring the public and causing future complications. The organization can also continue gaining trust by consistently demonstrating commitment to responsible and forthcoming risk communication efforts through the implementation of these seven rules (Covello and Sandman, 2001). However, remaining honest, frank, and open can sometimes prove to be a complicated Cardinal Rule to follow for many sources and transmitters of information. Ortwin Renn, the Director of Dialogik, a German non-profit company committed to communication and cooperation research, explains that building trust between involved parties is not "...produced or generated, but only accumulated by performance..." (Renn, 2008).

The Sender-Receiver Model

The combination of the evolution of risk communication with an understanding of the Seven Cardinal Rules provides a fairly accepted and general interpretation of some of the theoretical practices for risk communication. The Sender-Receiver Model attempts to depict one interpretation for the process of risk communication. It was developed in 1949 by Claude Shannon and Warren Weaver, who were actually engineers at Bell Telephone Labs working to improve telephone cable and radio wave efficiency. Their model of communication was originally supposed to help create a theory of communication, but instead became used by computer scientists, and was later applied to human communication (Chandler, 1994). Their model attempts to describe the relationship between sources, transmitters, and receivers of information and can be seen in Figure 2.

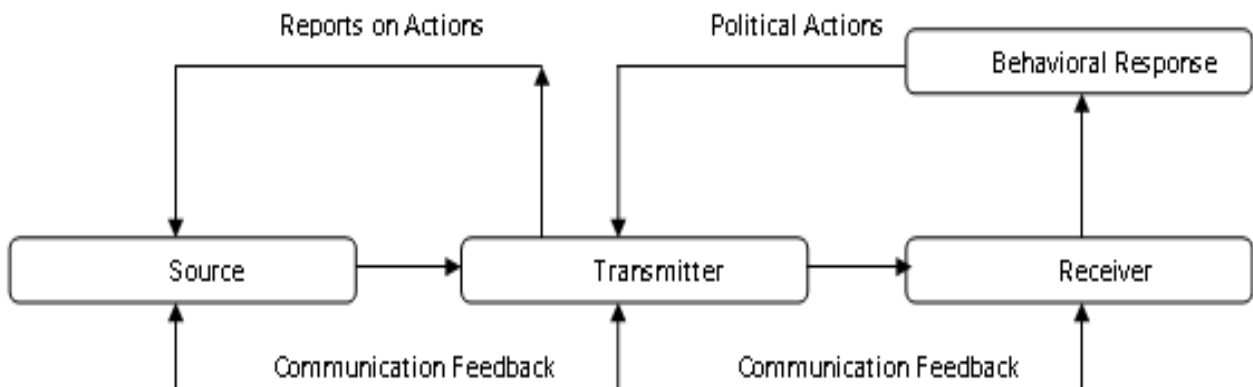
Figure 2: Shannon and Weaver's Model (Chandler, 1994)



The sources create a message to be sent to the transmitters who edit it to make it easier for the receivers to understand. The receivers receive this tailored message and interpret its meaning.

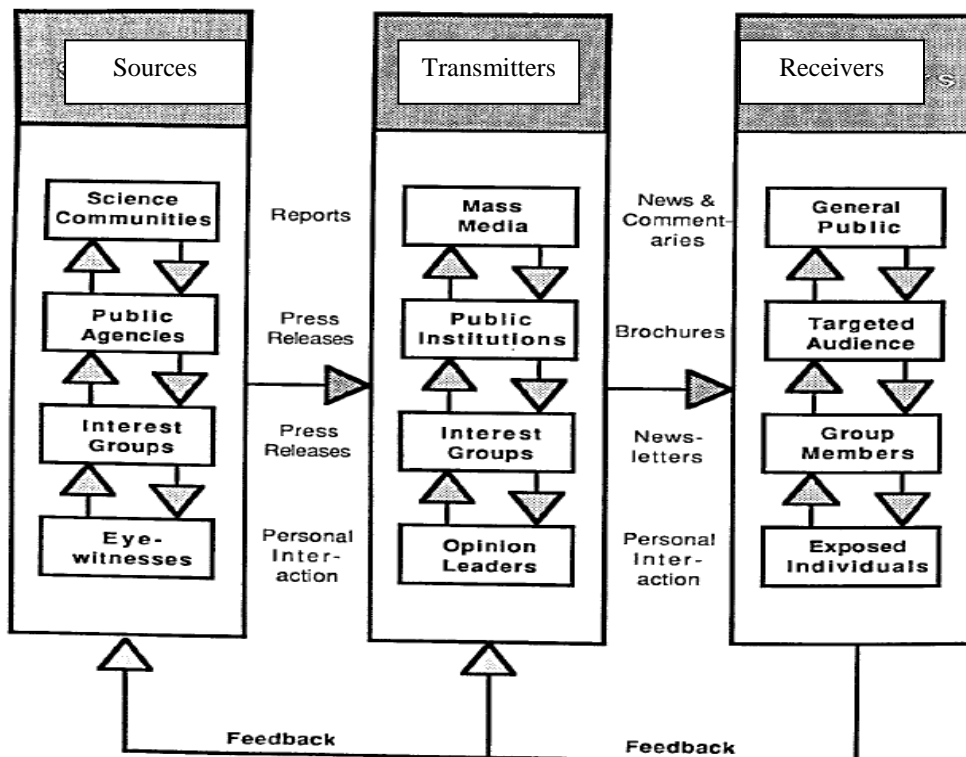
Shannon and Weaver's model is not flawless; it has acquired many critics over the years, most of which criticize the model's lack of feedback loops. Daniel Chandler, a doctor and a professor of communications at a university in the United Kingdom explains that their model is "...a linear, one-way model... However, communication is not a one-way street" (Chandler, 1994). The information flows should be represented by double-headed arrows indicating two-way communication between the source, transmitter, and receiver. *Two-way communication* involves communicating information back and forth; it includes the sharing of information and then the response to the information. This can occur through speech or written word. After interpreting the message, the receivers may generate feedback, but in Shannon and Weaver's model, there is no pathway for that feedback to be returned to the source or the transmitter. Feedback loops allow for the sources and transmitters of information "...to adjust their performance to the needs and responses of their audience," and they were later added to the model by theorists (Chandler, 1994). This feedback could be in the form of verbal or written complaints or even a behavioral response such as political action (Renn, 2008). Figure 3 is a basic visual representation of this modified Sender-Receiver Model.

Figure 3: Sender-Receiver Model (Renn, 2008)



Similar to Figure 3, another visual representation of the Sender-Receiver Model also depicting the flows of communication is shown in Figure 4. The feedback loops, which were not in Shannon and Weaver's original model, can be seen in both figures illustrating their importance to effective risk communication (Chandler, 1994). Figure 4, however, is more detailed in its inclusion of the various types of senders, transmitters, and receivers involved in risk communication. In this figure, the term *interest group* is similar to what we have defined as a civil-society. It also shows the channels used by the sources, transmitters, and receivers to share their information with each other. Additionally, Figure 4 demonstrates that communication must happen within all sources, all transmitters, and all receivers respectively, in order for the correct information to be conveyed and then received appropriately by the various receivers.

Figure 4: Sender-Receiver Model of Risk Communication (Renn, 2008)



According to this model, the first step of risk communication involves the primary sources sending the message to the transmitters in the form of either a report, press release, or through personal interaction. In this step, the source must frame the message it would like to convey. A message will not be successfully transmitted if it does not gain social support (Renn, 2008). This means the message needs relevancy for the receivers or must attract the attention of the media. This is called social amplification. By manipulating messages to make them appeal to particular psychological, social, institutional, and cultural processes, sources and transmitters can influence the risk perceptions, and consequently, the outrage and behavioral responses of the final receivers (Renn, 2008).

This term *risk perception* is used within the description of the Sender-Receiver Model to explain how the social amplification component of the model works. Risk perception describes how a person or an organization perceives a risk and the judgments people make regarding certain events or situations (Renn, 2008). There are many factors that can influence the way a person perceives a particular risk. One category of risk perception contains factors related to the individual, such as culture, sex, ethnicity,

religion, literacy level, and education. For example, one study observed the differences between eastern and western countries' risk perceptions. It stated the difficulty in comparing data between the east and west due to the differences in politics, economics, and culture (Renn and Rohrmann, 2000). Another category includes factors related to risk presentation, also known as risk perception factors. This involves the way in which a message is conveyed. People are more likely to respond to interactively provided information and believe information from credible sources. The credibility of the organization depends on its past performance in communicating risks and whether or not the people appreciate the organization's openness and flexibility for incorporating the public (Renn, 1990). Table 1 lists these specific factors along with an explanation and a relevant example.

Table 1: List of the Eight Risk Perception Factors (Lin, 2007)

Risk Perception Factors	Explanation	Example
Dread	Certain risks invoke more dread than others	Cancer causes more dread than heart disease
Control	People are more afraid of events when they feel a lack of control	Fear of plane crashes is greater than fear of car crashes, because in an airplane there is very little sense of control
Natural vs. Man-Made Risk	Man-made risks evoke more fear than natural risks	Nuclear energy sources are often a greater cause of concern than the radiation produced by the sun
Effect on Children	When children are exposed to a risk, it is considered a greater danger than when adults are exposed to the same substances	Children exposed to asbestos or lead paint in schools cause greater concern
Scientifically Unknown/New Risks	Risks that are unfamiliar produce a lot of alarm	SARS epidemic caused great alarm compared to the yearly influenza epidemic, even though the flu causes more deaths each year
Awareness	Wide coverage by media and public health officials will often create more alarm in the public	West Nile Virus has received a lot of coverage in the media and is of greater concern than air pollution
Possibility of Personal Impact	People who are close to a risk, and who have a clear knowledge of the consequences, will have a greater perception of risk	People living closer to industrial sites are more agitated by pollution than people living farther away
Trust	Public perception of risk is greater if the lines of communication are from sources that are perceived to be untrustworthy	Studies about the relationship between smoking and lung cancer from a tobacco company may be mistrusted

As seen in Table 1, there are multiple factors that can influence how people perceive a risk. Once an organization has acknowledged and addressed all of these factors influencing risk perception, it can start focusing on creating an effective risk communication plan. Consequently, when explaining how the Sender-Receiver Model works, risk perception is inherently involved.

Outrage, which can also be manipulated through social amplification, has been described by Peter Sandman, an expert in the field of risk communication, as how much the risk upsets, angers, or frightens the receiver. People are less likely to accept information about a risk that upsets them. Sandman suggests that in order to perform effective risk communication, the outrage must be addressed first before attempting to accomplish other components of risk communication (Sandman, 2004).

Additional uses of social amplification techniques include how transmitters often edit and tailor the information or message so the receiver can understand it. This process may include deciding what pieces of information provided by the source is relevant for the receivers. Renn provides an example to illustrate

this point: a scientist may have valuable information for the public, but it is contained in a lengthy, complicated, scientific report (Renn, 2008). A transmitter, such as a public interest group, could take the scientist's report and sift through it to find the relevant messages. Additionally, a transmitter could combine messages from multiple sources to make the information less technical and thus, more appealing and understandable to the receivers. In this example, the role of the transmitter is crucial because while the scientist is likely more interested in the calculations of a report, the public might be more interested in the number of people affected, the types of people affected, and who is to blame (Renn, 2008). Therefore, the transmitter considers both the public's wants and needs and balances them with the important message the scientific source wants to convey in order to pass a message on to the receiver. The transmitter appropriately tailors the information for the target audience (Renn, 2008). Consequently, the transmitter is involved in the social amplification of risk. The alteration of the information by appropriately increasing or decreasing individual and social reactions to it, word choice and tone, and the channels used can all influence social amplification.

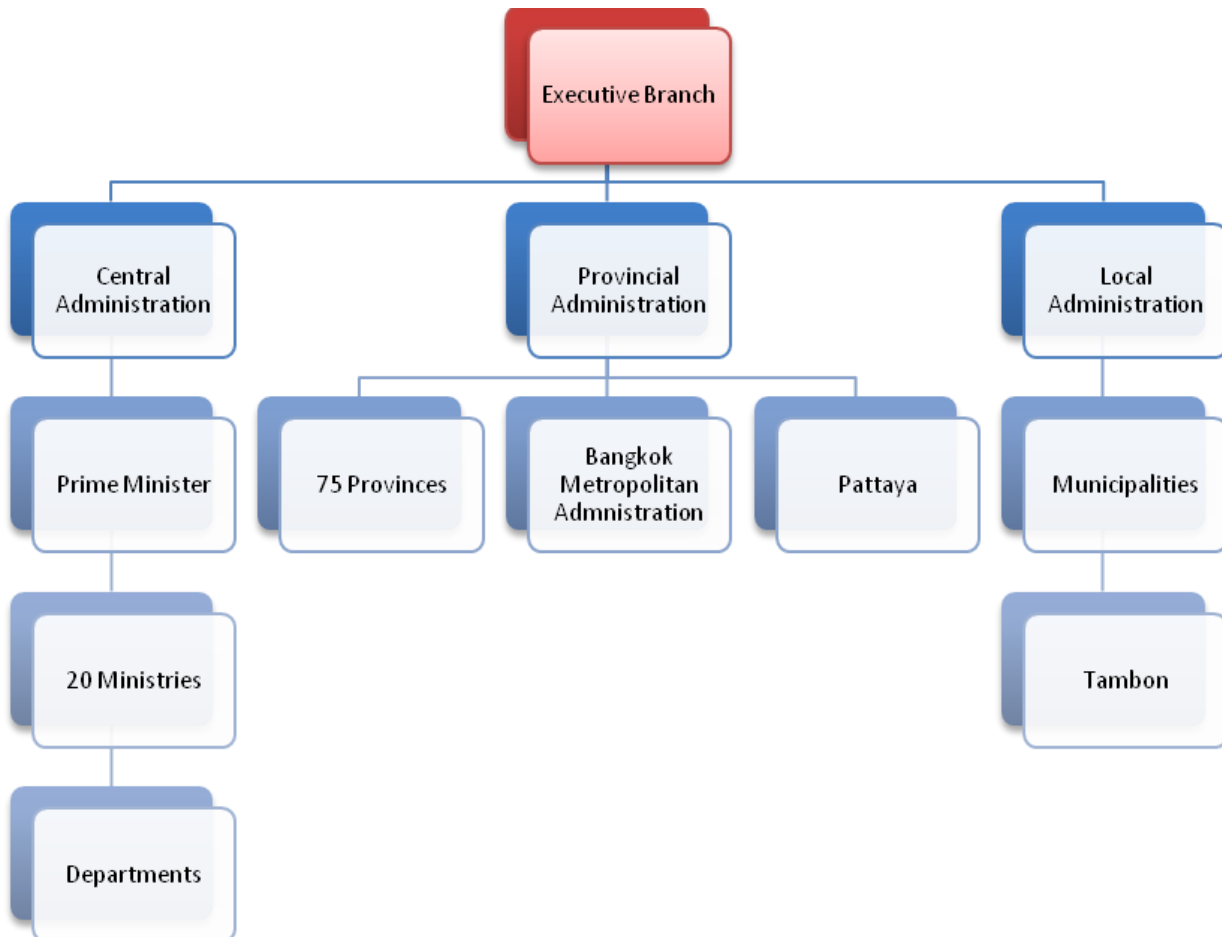
This technique could also be used to take advantage of manipulating people's risk perceptions and level of outrage by allowing sources and transmitters of information to elicit certain behavioral responses among receivers. For example, many cigarette advertisements show beautiful young people smoking. This is a social amplification tactic used by the cigarette company to appeal to the receivers of this advertisement. Often, one of the messages conveyed in these advertisements is "if you smoke our brand of cigarette, you will be young, beautiful, and popular too." Thus, it is possible for this process of social amplification to be used to abuse people's risk perceptions and outrage levels. However, social amplification can also raise awareness for important issues. For example, if a particular risk is not receiving adequate attention, the media could be used to make television advertisements while public interest groups could create brochures. The variety of sources of information, as well as the use of multiple channels would result in a wide range of people learning about the risk and trusting what they have learned. The receivers can then develop their own opinions and make their own educated decisions regarding those risks. This is the main goal of risk communication—providing the information in such a way that people can make informed decisions regarding their behavior (Renn, 2008).

2.2 Efforts in Risk Communication by Three Ministries of the Royal Thai Government

According to the Sender-Receiver Model, one typical source and sender of information in many situations is the national government. Often, it conducts its own research and shares its information with various transmitters, such as lower levels of government and civil-societies. In Thailand, the Royal Thai government, through the legislation it creates and the information it gathers, acts as both a source and a transmitter of risk information.

The Royal Thai government is a constitutional monarchy in which the Prime Minister is the head of government and His Majesty the King is the head of state. The government is comprised of three branches—the legislative, the executive, and the judicial. The executive branch is the most relevant in regards to communication because it is responsible for creating policies and legislation to be presented and voted on by the legislative branch. It has the power to make laws incorporating and requiring risk communication. The executive branch is divided into the central, the provincial, and the local administrations. The central administration, also known as the cabinet, is led by the Prime Minister and consists of twenty ministries each run by its own respective minister. While the cabinet makes laws regulating all of Thailand, the provincial and local administrations create laws specifically for their jurisdictions, and are usually the key enforcers when implementing national legislation ("Complete Royal Thai Government," 2002). Figure 5 is an organizational chart of the Royal Thai government (for an organizational chart of the complete Royal Thai government including the legislative and the judicial branches, please see Appendix E).

Figure 5: Organizational Chart of the Royal Thai Government (“Complete Royal Thai Government,” 2002)



Because the Royal Thai government consists of such a wide variety of ministries and departments, only the three ministries most pertinent to our project are described in the following three sections. The responsibilities and some of the legislation created by the Ministry of Public Health, the Ministry of Industry, and the Ministry of Natural Resources and Environment are explained.

Ministry of Public Health

One of the ministries most involved with risk communication is the Ministry of Public Health (MOPH). It is in charge of creating and enforcing legislation regarding public health (“Complete Royal Thai Government,” 2002). In 2007, the Ministry published the National Health Act (NHA). This act focuses on protecting people’s health, and it proclaims that everyone has the right to live in a healthy environment. To promote public health, a department called the National Health Commission (NHC) was created which monitors and controls all situations concerning public health, including the preparation of a program for Thailand’s national health system. The national health program must be created by the NHC based on certain criteria described in the NHA—the promotion of health and the prevention and control of disease and hazards, the use of quality assurance and control, the protection of the consumer, and the forwarding

and communication of information related to the public's health. Most importantly, the Commission must consider the opinions and suggestions brought forth by the National Health Assemblies. These assemblies, which are held every year, are used to provide, to promote, and to support health policies and strategies, to disclose information related to health improvements and policy to the public, and to prescribe rules and procedures on monitoring and evaluating the national health system. They allow for discussion and suggestions to be brought forth to the NHC (Thai National Health Act B.E. 2550).

Furthermore, the National Health Act provides the people with the right to demand for an assessment if the public's health is being affected. Formally called Health Impact Assessments, they require developers, such as industry managers and construction planners, as well as public policy creators to consider broader social concerns—not simply the economic benefits—but the effects their industry or policies will have on societal factors such as traffic and public and environmental health. Additionally, both developers and state agencies must allow the public to have access to information about their company or industry.

Another department within the Ministry of Public Health is the Department of Health, which controls the activities of the Department of Disease Control (DDC). The DDC conducts research on diseases that threaten the health of the Thai public and works to control these diseases in order to protect overall national health (“About DDC,” 2007). Thailand's DDC collaborates with the United States' Centers for Disease Control and Prevention (CDC), one of the most developed and oldest organizations for providing information to the public, in order to provide its country with the best protection from communicable diseases. This partnership began in 2001 to help Thailand control HIV/AIDS and has led to the creation of the Bureau of Epidemiology as a division of the DDC (“Partnering to Fight HIV/AIDS,” 2008). This bureau is responsible for epidemiological surveillance and investigation of diseases in Thailand. The data it collects is used by the DDC to create legislation and to inform the public of the severity of diseases (“About Us,” 2009).

Ministry of Natural Resources and Environment

The second ministry that incorporates aspects of risk communication is the Ministry of Natural Resources and Environment (MONRE). This ministry creates and enforces legislation regarding environmental health and protection. One such important legislation is the National Environmental Quality Act (NEQA). This act was an effort to place regulations and limitations on pollution in order to protect the environment, which in turn, is a step in protecting public health.

The NEQA was put into effect in 1992, and it addresses several environmental quality concerns. It established the National Environmental Board, which can make standards for limiting pollution, create “Action Plans” for regulation and control of pollution, and oversee any efforts related to the environment. These Action Plans are the responsibility of the provincial and local governments. They are documents including information about how to manage industrial pollution, how to respond during both chronic and acute situations, and how to monitor and minimize these risks from occurring and growing. Additionally, the act contains a list of all the types of pollution such as water, air, noise, and hazardous waste, and it provides specific rules associated with each particular form of pollution. For example, the act states all vehicles must meet predetermined emission pollution standards. If the vehicle fails to meet those standards, it cannot be used (Thai National Environmental Quality Act B.E. 2535)

The National Environmental Board regulates several other departments of the MONRE. One of these departments is the Pollution Control Department (“About Us,” 2003). The Pollution Control Department (PCD) has the responsibility of controlling pollution in Thailand in order to protect the people and the environment. It does this by creating and enforcing standards to regulate natural resources, air and noise pollution, water pollution, and soil pollution. The department holds several campaigns, conducts training

workshops, and organizes conferences to advise industries about the existence of these standards and how to achieve them and instructs the public how to properly manage their health as a result of certain pollution, all of which are various efforts by the PCD to communicate these risks (“About Us,” 2003).

The National Environmental Board also regulates the Office of Natural Resources and Environmental Policy and Planning (ONEP). This office creates policies regarding conservation and management of natural resources and environment. It is also responsible for assuring these policies are being practiced and for monitoring environmental impacts according to Environmental Impact Assessment (EIA) reports, which all industries and development projects are required to write (“About Us,” 2003). These reports must be completed by a consulting firm registered by ONEP and then approved by ONEP itself. They must include a detailed summary of all environmental impacts from the project, the measures the organization will take to prevent and correct the negative effects associated with their pollution, a section about the consideration of alternative methods, as well as a monitoring plan to assure its project plan is effective and being followed. The National Environmental Quality Act does not specify if these reports are to be published for public viewing, but they do attempt to improve the quality of life as a result of creating a healthy environment (“Environmental Impact Assessment,” 2008). In other words, it is a form of risk communication between the industry and new development projects and the government.

Ministry of Industry

The third and final ministry related to our project is the Ministry of Industry. Of its ten departments, two of them are involved with risk communication activities in the public health sector. These departments, the Department of Industrial Works and the Industrial Estate Authority of Thailand, are sources of information, sharing it while also providing instructions on how to keep the public and the environment safe.

The Department of Industrial Works regulates the waste industries release from their facilities throughout their daily processes. It also monitors the negative effects these released industrial wastes have on the environment and the public (“About Us,” 2007). One division within this department is the Public Information Center (PIC), which collects and analyzes data about the effects industry has on the environment. It then posts this data on its website for public access. It also shares this information with the industries making it both a source and a sender of information according to the Sender-Receiver Model. Another important aspect of the PIC is its complaint center for people who are harmed by the negative effects created by the industry (“About PIC,” 2007). This feature creates feedback loops between the public and the center forming two-way communication pathways.

The second agency of the Ministry of Industry is the Industrial Estate Authority of Thailand (IEAT). Its mission is to develop industrial estates by simultaneously managing the integration of the industry with surrounding communities so they can coexist. For example, the formation of the industrial estate cannot alter or remove any other industry or public facility already in that location (“About IEAT,” 2007). IEAT wrote the Thai Industrial Estate Act to clarify the specifications for how an industrial estate is to be developed. This act requires the implementation of a management plan to keep the community and the environment safe. It requires proper waste disposal from the industry as well as the maintenance of the condition of the land. The plan is then enforced, and there are punishments if it is not followed (Thai Industrial Estate Act B.E.2522). Another aspect of this act is its promotion of good relations between the industry and the community by requiring the industry to provide benefits for the community such as scholarships and grants for students. Overall, the purpose of the Thai Industrial Estate Act is to enable the government to develop industrial estates throughout Thailand in a way that is safe for the community and environment, while at the same time, also contributing to the local economy and community (Thai Industrial Estate Act B.E.2522). These two ministries, controlled by the Ministry of Industry, are involved

with both risk management and communication; they share information while also providing instructions on how to keep the public and environment safe

All three of these Ministries are sources of information because they are gathering information about health and environmental issues. However, according to the existing legislation, there is little to no communication required of the Ministries between each other and especially with other stakeholders. The Ministries generally only share their information within themselves between departments and divisions.

2.3 Rayong Province as a Case Study for Risk Communication in Thailand

Despite the various legislative efforts of the Ministry of Public Health, the Ministry of Natural Resources and Environment, and the Ministry of Industry, pollution issues are still prevalent in Thailand. One particular province is of great interest due to recent studies showing the negative health effects potentially caused by heavy industrial pollution. This province, Rayong, is highlighted in yellow in the map of Thailand presented in Figure 6.

Figure 6: Map of Thailand (Hilken, 2003)



As can be seen from the image, Rayong province is located on the coast of the Gulf of Thailand, making it an important region for the development of many industrial sectors, particularly the petrochemical sector, because petroleum reserves exist in the Gulf of Thailand. Containing over 500 factories, the province is a major contributor to the country's expanding economy. Thus, one of the central issues for

the Rayong province is developing a way to manage and mitigate the health risks created by the industries while still encouraging and fostering economic growth.

The demographics of Rayong are heavily influenced by the province's heavy industrial sectors. According to a professor and epidemiologist of the Faculty of Public Health at Thammasat University, the people living in Rayong are generally more prosperous than those in other provinces because they are the employees of the companies located in the province's industrial estates. Many workers are immigrants from the eastern parts of Thailand and work as laborers because they have little education. The owners and leaders within the industry, however, are highly educated and generally live outside of the Rayong province (Vajanapoom, personal communication, January 21, 2009).

Unfortunately, along with the province's growth came the negative health effects associated with high pollution and densely populated areas. Rayong has the highest annual death rate due to cancer in all of Thailand at 88 deaths per 100,000 people ("Environment: Pollutants in Rayong to be Made Public, 2008). Between 1997 and 2005, the National Cancer Institute of Thailand stated the number of people in Rayong with cancer increased three-fold, jumping from 444 to 1,263 people per 100,000 people (Wipatayotin, 2006).

We initially chose the Rayong province because of its recent problems with petrochemical and industrial pollution. We hoped to help improve risk communication efforts in Thailand using solely the petrochemical pollution in Rayong as the basis for our information. However, characterizing petrochemical pollution risk communication was too narrow a case study. To incorporate a range of different types of risks, we decided to also observe two other public health issues. The petrochemical pollution issue is a risk out of the control of the public, while issues such as HIV/AIDS and motorcycle safety are more in the control of the public. Concern over HIV/AIDS and motorcycle accidents has also sparked the interest of several stakeholders, or involved parties, such as independent academic researchers and civil-societies and therefore we concentrated on all three of these public health issues affecting Rayong.

Petrochemical Pollution

In the following section, we will discuss the importance of the petrochemical industry and the negative health effects associated with it referencing one particular health study to illustrate the extent of the pollution in Rayong. We will then share some of the efforts being made to address this public health issue.

The petrochemical industry has become an increasingly important sector for the economy of Thailand due to the wide range of applications for petrochemicals. They are used to make supermarket plastic bags, band-aids, soaps, car tires, rubber bands, and many other household commodities. The challenge is finding "...the balance between health protection and economic growth" as Kamjad Ramakul, the Director of the Ministry of Public Health Ministry Occupational and Environmental Diseases Bureau stated in an interview with the *Bangkok Post* (Wipatayotin, 2008B).

Many of the pollutants caused by these petrochemical facilities have proven to be hazardous to the health of humans as well as the environment. The production processes used in the petrochemical sector generate wastes as byproducts. For instance, the process used in the manufacture of carbon black, a material produced by the incomplete combustion of heavy petroleum products, generates particulate matter contributing to air pollution emissions (International Carbon Black Association, 2004). The air pollutant emissions found in Table 2 are often released into the environment as a result of petrochemical

processing. The table also shows some of the major petrochemical products and processes used in the industry and their associated health effects.

Table 2: Air Pollution Emissions and Controls: Petrochemical Processes (Vallero, 2008, McClellan, 1950, Reus, 2005, Lorz, 2002, WHO 1998, ICBA 2004)

Petrochemical Product	Use	Air Pollutant Emissions	Health Consequences/Side Effects
Ethylene oxide	Antifreeze, sterilizer	Ethane, ethylene, ethylene oxide	Headache, dizziness, convulsions and coma
Formaldehyde	Building block for chemical compounds	Formaldehyde, methanol, carbon monoxide, dimethyl ether	Cancer, allergies, toxicity of central nervous system and heart
Phthalic anhydride	Production of dyes, chemical intermediates	Organic acids and anhydrides, sulfur dioxide, carbon monoxide, particulate matter	Acid Rain, Skin and eyes irritation
Acrylonitrile	Acrylic fibers, carbon fibers, rubbers, and fumigants	Carbon monoxide, propylene, propane, hydrogen cyanide, acrylonitrile, acetonitrile	Cancer, respiratory problems, extreme exposure can be deadly
Carbon black	Reinforcing filler in rubber products, inks	Hydrogen, carbon monoxide, hydrogen sulfide, sulfur dioxide, methane acetylene, particulate matter	Acid rain, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat

In Thailand, the petrochemical industry is spread throughout the entire country, but centers in the Bangkok and Rayong provinces (“Report: Energy Development in Thailand,” 1997). In Rayong’s most heavily industrialized town, Map Ta Phut, studies have shown that residents of the town have a high risk for various types of cancers, brain damage, and respiratory diseases. Out of 2,000 villagers studied in Map Ta Phut, ninety-one people had dangerously high levels of benzene, a known cancer-causing agent, in their blood (“Map Ta Phut Industrial Estate: Health Panel to Urge Review of Expansion,” 2008). With over ninety industrial facilities in just this one town and forty-five of them being petrochemical producers, twenty-five surrounding communities are chronically polluted by the wastes of this industry. This concentration of industrialization and the increasing negative health effects has made Map Ta Phut a region of great interest and controversy (Buakamsri, 2005).

For the past two decades in Map Ta Phut, there have been several reports of diseases affecting citizens’ respiratory, nervous, reproductive, and muscular systems, as well as data showing increased rates of mental disorders and certain types of cancers (Buakamsri, 2005). In a study performed by Greenpeace Southeast Asia, a well-known civil-society, gas samples were collected from different locations near the city’s industrial zone. The samples were analyzed revealing their respective pollutant levels. When the Map Ta Phut samples were compared to the United States’ air pollution standards, most of the samples exceeded the standards. According to the Head of Information Technology at the Department of Disease Control, Greenpeace compared the Map Ta Phut samples to those from the United States because the US standards are openly published and the strictest in the world (Issarapan, personal communication, January 26, 2009). Some of the chemicals found in the samples, such as benzene, vinyl chloride, 1, 2-dichloroethane, and chloroform, are known to be carcinogenic. For every compound discovered in the Map Ta Phut samples, with the exception of carbonyl sulfide, the Environmental Protection Agency’s standards were exceeded. Both benzene and vinyl chloride, known cancer-causing agents, exceeded almost all of the United States’ standards.

In response to the Greenpeace study, some efforts have been made to address the problem in Map Ta Phut including a pilot program to train faculty and students in seventeen schools how to identify a chemical leak and what to do if such an incident were to occur (Wipatayotin, 2008A). In August of 2008, the National Health Commission, under the direction of the Ministry of Public Health, wanted the town's development plan to be reviewed and revised. The Committee proposed five recommendations that included a revision of the plan, the publication of the result of the studies conducted in Map Ta Phut, the creation of a set of plans for potential disaster situations, the suspension of new factory building, and the education of the surrounding communities ("Map Ta Phut Industrial Estate: Health Panel to Urge Review of Expansion," 2008). Before the establishment of the National Health Act and the Commission, people in places like Map Ta Phut could not provide their input and opinions regarding the growth of industry in their communities.

The national government is not the only stakeholder involved with making efforts to address petrochemical pollution. Some petrochemical companies have taken preventative measures separate from what the government requires. Many of them belong to Petroleum Institute of Thailand (PTIT), a civil-society similar to an accreditation board to which companies can apply to be a member, and in order to be accepted, they must meet specific requirements pertaining to the quality of the company. This includes pollution control. The Institute conducts an annual pollution control training workshop to educate its members on more environmentally friendly practices. Additionally, several Thai petrochemical companies are International Organization for Standardizations (ISO) compliant, which means they follow certain regulations or practice particular manufacturing and quality control procedures. For example, PTT Chemical is compliant with the ISO 14001, which is concerned with providing the requirements for environmental management systems ("ISO 14000 Essentials," 2008). Also compliant with the ISO 14001 is the Alliance Refining Company, which in addition, is also in the process of integrating a new form of Laboratory Information Management System (LIMS). This system provides a way for the company to collect its data and guarantee that it follows all regulatory procedures and requirements ("Legacy LIMS Replaced at Thai Refinery," 2008). Unfortunately, despite these efforts, petrochemical pollution is still a growing concern among public health issues in the Rayong province.

HIV/AIDS

Another public health issue that has affected the people of Rayong is the Human Immunodeficiency Virus, or HIV. This virus attacks the human immune system and can eventually lead to Acquired Immune Deficiency Syndrome, more commonly known as AIDS. HIV becomes AIDS when the number of immune system cells drop below a certain level or when a person becomes seriously ill. AIDS is an extremely serious condition because individuals with the syndrome have very little defense against disease and infection. HIV/AIDS is typically sexually transmitted, but it can also be transmitted from sharing needles, blood transfusions, or from infected mothers to their babies. It has been a growing concern worldwide as well as within Rayong, and it is one of the leading causes of death in several countries. The number of people infected with HIV globally has drastically risen from around 8 million in 1990 to over 33 million in 2007 ("The History of HIV and AIDS in Thailand," 2008). More than 25 million people have died from AIDS since 1981, and in 2007 alone, it was the cause of over 2 million deaths ("The History of HIV and AIDS in Thailand," 2008).

Since its discovery in the 1980s, HIV/AIDS has gained the attention of governments and civil-societies worldwide. Programs and campaigns have been created around the world to raise awareness and to help prevent this disease. Control of HIV/AIDS is particularly difficult because it is often associated with socially unacceptable behaviors such as promiscuity, homosexuality, and drug abuse. This stigma causes those people affected by it to be afraid of revealing their status or from seeking help. Therefore, they often become sicker and will continue to infect more people whether or not they are aware of having the disease

(United Nations Development Programme, 2004). Thailand is no exception to this global epidemic. As of 2007, the number of people living with HIV was 610,000, approximately 1% of the entire population. The estimated number of deaths caused by AIDS was 31,000. Some believe that because of the recent successes in communicating HIV/AIDS information, it affects only 1% of Thailand's entire population (United Nations Development Programme, 2004).

The history of HIV/AIDS in Thailand shows how the country has worked to inform and protect the public from this fatal disease. The first case of AIDS in Thailand occurred in 1984. Consistent with the stigma associated with this disease, at first, it mainly affected homosexual men, sex workers, injecting drug users, and tourists. The government took some basic measures to deal with the issue, but it was not yet apparent that HIV was a true epidemic. Most of these measures targeted these high-risk groups ("The History of HIV and AIDS in Thailand," 2008).

It was not until 1991 when the numbers of people infected had severely increased, that AIDS prevention and control became one of the highest national priorities. Massive public information campaigns on AIDS were launched by the national government in order to begin raising awareness of the disease. One of these campaigns was the "100% Condom Programme," which encouraged regular condom use in all commercial sex establishments. Condoms were distributed freely to brothels and massage parlors, and sex workers were required to use them with their clients (United Nations Development Programme, 2004). This campaign started as a trial in Ratchaburi province, where all sex establishments were required to use condoms. A "no condom, no business" policy was implemented and enforced. The United Nations Development Programme (UNDP), an international organization devoted to connecting countries to increase the quality of living all around the globe by eradicating HIV/AIDS, claims it was because of this campaign's success that led to its implementation throughout all of Thailand in 1992 (United Nations Development Programme, 2004).

This campaign was not the only effort by the Thai government to control AIDS however. Also in 1991, both the national government and various civil-societies worked together to release information about how HIV is acquired, what it does, and how it can be prevented. This information was aired every hour on over 500 radio stations and all seven national television channels in Thailand. Advertisements and articles in newspapers and magazines published this information as well (United Nations Development Programme, 2004). This movement demonstrated a strong and thorough effort by these two stakeholders to improve risk communication about HIV/AIDS, and it later proved to be extremely effective. This effectiveness can be seen in Figure 7, which shows the number of newly infected people each from 1985 to 2003. This number peaks in 1991, at around 140,000 people, and then this number dramatically decreases to less than 20,000 people in 2003.

The steady decline in the number of new infections of HIV in Thailand since 1991 correlates to the start date of the "100-Percent Condom Programme" and the media's efforts to promote risk communication in the early nineties. Another graph, presented in Figure 8, shows the number of infections estimated to have been prevented through Thailand's efforts of risk communication. In it, the United Nation's Development Programme (UNDP) predicts the number of cases that *would* have occurred without these efforts versus the number of cases that were actually reported. The UNDP estimates 9 million people were protected from acquiring HIV.

Figure 7: Yearly New Infections 1985-2003 (United Nations Development Programme, 2004)

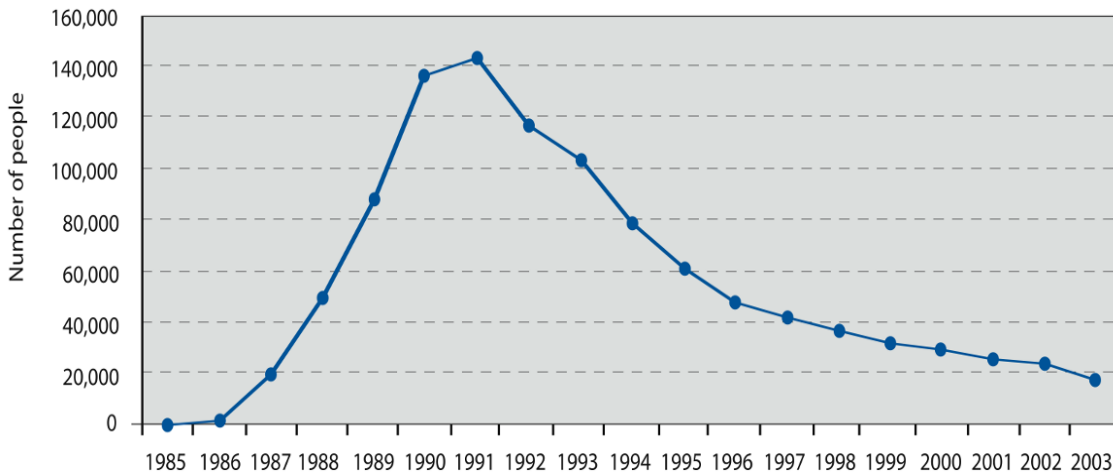
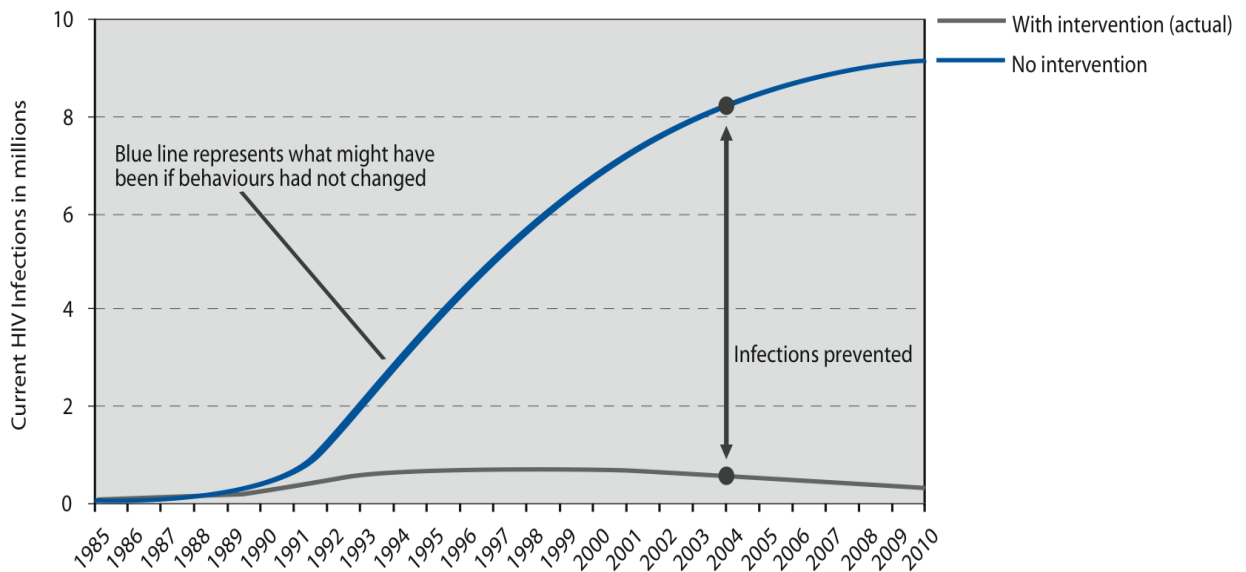


Figure 8: Millions of Infections Averted (United Nations Development Programme, 2004)



The UNDP acknowledges that HIV/AIDS risk communication efforts in Thailand appear to have been working, but according to Figure 7, the rate of newly infected people is not decreasing as rapidly as it was before. This could be a warning sign; the decrease in HIV infections could relapse as a result in a lack in continued attention. The UNDP says that less time, money, and effort is being spent on the prevention of HIV because of the outstanding success of Thailand’s efforts (United Nations Development Programme, 2004). If this continues, the UNDP believes HIV awareness will continue to proceed to fade into the background in comparison to other public health issues. And because more people *not* associated with the stigma are beginning to be infected, this epidemic could make a strong comeback (United Nations Development Programme, 2004).

A similar pattern of decreasing number of HIV/AIDS cases is also apparent in Rayong. A survey was conducted by the UNDP and the World Health Organization from 1990 to 2004. It estimated the

prevalence of HIV among different types of people in every province in Thailand. These estimates were released by the Ministry of Public Health in 2006. The data for Rayong, shown in 3, disclosed that 27.8% of injecting drug users, 5.8% of sex workers, 3.4% of pregnant women, and 1.7% of sexually transmitted infections (STI) patients were newly infected with HIV. All of these percentages were the highest in 1995 with the exception of STI patients, which peaked in 1992. All percentages decreased with minor fluctuations between their peak year and 2004, which resulted in the lowest percentages to date (UNAIDS and WHO, 2006).

Table 3: Percentage of Newly Infected People in Rayong with HIV (UNAIDS and WHO, 2006)

Category of People	Peak Year	Peak Percentage	2004 Percentage
Injecting Drug Users	1995	65.6%	27.8%
Sex Workers	1995	29%	5.8
Pregnant Mothers	1995	7.8%	3.4
STI Patients	1992	23.3%	1.7%

This report suggests how risk communication efforts for HIV/AIDS may have had some positive effects on the Rayong province similarly to how they have been working throughout the rest of Thailand. As previously mentioned, this success does not mean risk communication is no longer necessary. For example, a recent article written in the *Bangkok Post*, reported that the number of AIDS cases had increased from approximately 14,000 in 2007 to near 20,000 in 2008. The article said a combination of lawyers, academics, youths, parents, teachers, and a medical research organization "...blamed a weak prevention policy for [this] increase in the number of new AIDS cases..." (Treerutkuarkul, 2009). Perhaps a contributing factor to this rise in AIDS cases is the fact that only 20-30% of sexually active young people wear condoms (United Nations Development Programme, 2004). Despite the diminishing trend of HIV infections in 2003, AIDS was still the number one killer in Thailand at nearly double the number of deaths caused by traffic accidents, which was the second leading killer (United Nations Development Programme, 2004).

Motorcycles

Four years ago in 2005, almost 13,000 people in Thailand were killed due to vehicle related accidents. It is estimated that this number should have actually been over 20,000 if those who had died after leaving the accident scene were included. With over 25 million vehicles operating on 218,000 km of road, hazardous driving conditions are often created. The Thai government is aware of this situation, and it estimates a total of 2.1% of the nation's GDP is used to address motor-vehicle accidents. With the number of vehicles on the roads growing each year at about 5-10%, these dangers are only increasing (Global Road Safety Partnership, 2008).

Officials claim motorcycles are one of the main causes of these accidents. In 1992, 90% of all traffic deaths in Thailand were motorcycle drivers (World Health Organization, 2009). It is difficult to distinguish the causes of death in a motorcycle accident because so many factors could be involved. These could include, but are not limited to, helmetless driving and riding, incorrect helmet use, overcrowding of passengers, lack of protection offered by the motorcycle, poor motorcycle driving practices, and drunk driving (Siriphanich, personal communication, February 17, 2009). We chose to focus on the use of helmets because injury severity due to lack of helmet use is a measurable factor.

Attempts have been made by various organizations to address some of these issues in the hopes of decreasing people's chances of getting in a motorcycle accident. One of these attempts was when the government established a law in 1994 requiring all motorcycle riders to wear helmets. In some regions,

this proved to be a success; one province experienced "...a 40% reduction in head injuries among motorcyclists and a 24% drop in motorcyclist deaths..." only two years after the law was implemented (World Health Organization, 2009). The World Health Organization also agrees with the importance of wearing a helmet, "...[it] has been shown to decrease the risk and severity of injuries among motorcyclists by about 70%, the likelihood of death by almost 40%, and reduce the costs of health care associated with such crashes" (Global Road Safety Partnership, 2008A). Another attempt, this time sponsored by a civil-society committed to sharing information with the public about drunk driving, conducted a campaign involving disabled victims of drunk driving accidents. In wheelchairs, these victims travel from Bangkok to Laos raising awareness about the dangers of drunk driving (Siriphanich, personal communication, February 17, 2009).

Even though the government and other organizations have made concerted efforts to promote motorcycle safety, death and injury rates due to motorcycle accidents still remain high. Many of these organizations attribute the high death and injury statistics to the lack of proper helmet use. Ten years after the mandatory helmet law was established, half of the deaths on national highways still involved motorcycles, and in 2002 in one northern province, 81% of those brought to a hospital were victims of motorcycle accidents (Global Road Safety Partnership, 2008). Moreover, only about 85% of the people injured in motorcycle accidents were wearing helmets. In an article written for the *Accident Analysis and Prevention Journal*, three academic researchers concluded the helmet law was generally unsuccessful for several reasons: even though more people were wearing helmets, almost half of them did not wear their helmets correctly. The law did not provide education to teach people about the importance of wearing a helmet and how to wear one correctly, and it did not take into consideration that the production of helmets in Thailand is unregulated. Many helmets are not made of the proper materials to protect the motorcyclist in an accident even if he is wearing one (World Health Organization, 2004).

After observing the continued rise in motorcycle fatalities and injuries, the government again put forth another effort to address motorcycle safety through the Thailand Road Safety Action Plan of 2004-2008. This plan focused on decreasing the number of vehicle deaths over the course of five years by increasing law enforcement, using traffic engineering, providing education, bettering emergency response, and implementing a monitoring and evaluation system. This has proven successful considering death rates have decreased between 1995 and 2005 by 23% as well as between 2003 and 2005 by 11% (Global Road Safety Partnership, 2008A). The government has also participated in other efforts to increase motorcycle safety awareness among the public. For His Majesty, the King's birthday in 2007, the government started a project called Helmets for the King, which involved organizations donating 1,000 helmets each that were painted yellow and sold for less than three US dollars. Attached to the purchasing of the helmet was a promise to always wear it (Global Road Safety Partnership, 2008).

Another program offered, separate from the efforts of the government, is sponsored by the car company, Honda. Their *Wear and Tighten Helmet Campaign*, which donates free helmets to motorcyclists who attend their training courses, has handed out over 100,000 helmets since 2003. The government, too, has also helped in providing affordable helmets to the public. In collaboration with the insurance industry in 2004, the government decided to pay for two-thirds of the cost of a helmet for motorcyclists in the hopes that more people would be able to afford them.

The dangers of motorcycle driving and riding has caught the attention of multiple international organizations as well, such as the World Health Organization, the United Nations Road Safety Collaboration, the Global Road Safety Partnership, the Foundation for the Automobile and Society, and the World Bank. In 2006, these civil-societies created a manual to increase the public's awareness about motorcycle safety. They sponsored workshops to publicize the manual's contents, and it is available in

printed and electronic forms (Global Road Safety Partnership, 2008A). Multiple other manuals also exist addressing other motorcycle safety issues such as drunk driving and safe driving techniques.

These efforts by the national government, private corporations such as Honda, and international civil-societies, to help Thailand start addressing the high rates of motorcycle accidents are all attempts to communicate to the public about motorcycle safety. However, very little is known about accident rates specifically in Rayong province other than it being one of the leading provinces in the nation for motorcycle deaths (Issarapan, personal communication, January 26, 2009). As the population continues to increase in Rayong, the number of people driving motorcycles is proportionally increasing, thereby increasing the likelihood of getting in an accident. By communicating this risk and promoting safe driving and helmet wearing practices, the Thai government and civil-societies can help control this issue.

Risk communication is a developing concept in Thailand, and consequently few have studied its development. By exploring the risk communication efforts within Thailand, we hope to answer some aspects of the following questions: How does the evolution of Thai risk communication compare to its evolution in western countries? Can established theories of risk communication such as the Sender-Receiver Model provide guidance for understanding challenges and improving communication processes? What aspects of the government's and civil-societies' efforts in regards to the three public health issues correspond to the Sender-Receiver Model? Can aspects of the Seven Cardinal Rules be accepted and used by an eastern country? How does the situation in Rayong compare to the broader risk communication situation at a national level? What can studying Rayong tell us, in respect to risk communication of petrochemical pollution, HIV/AIDS, and motorcycle safety? While answering such questions completely is beyond the scope of our project, these are some of the big questions that inspired our research.

3. Methodology

The goal of this project was to provide suggestions for improving risk communications efforts within Thailand. For the purposes of this project, we defined a *risk communication effort* as any written, visual, or verbal attempts to convey health risk information between a source and a receiver. To achieve this goal, we:

- 1) Characterized the risk communication efforts in Rayong concerning petrochemical pollution, HIV/AIDS, and motorcycle accidents,
- 2) Assessed and compared communication efforts, stakeholder perspectives, and risk issues,
- 3) Identified possible strategies to develop the areas identified for improvement, and
- 4) Developed recommendations for improving risk communication activities in Thailand.

In the following sections, we describe how each of these four objectives was accomplished.

3.1 Objective One: Characterizing Risk Communication in Rayong

The first objective was to characterize the risk communication efforts in Rayong concerning petrochemical pollution, HIV/AIDS, and motorcycle accidents. We hoped to discover how information had been sent and received between stakeholders. In this chapter, we will describe how we identified interviewees, designed interviews, and conducted interviews. We generated four research questions in order to achieve this objective:

- What are the flows of information?
- What are the purposes and goals of communicating risks?
- What are stakeholders' opinions about the success of risk communication efforts?
- How do stakeholders assess risk communication efforts?

To begin answering these research questions, we identified interviewees. We selected five stakeholder classes involved as senders, receivers, and/or transmitters of information to interview. They included the government, civil-societies, academic researchers, companies, and the public. We familiarized ourselves with these five stakeholder classes in order to find organizations within each class. We conducted research while in both the United States and Thailand that gave us a better understanding of these organizations and helped us to choose specific representatives. In addition to the individuals we chose, we asked for suggestions from Dr. Nuntavarn, Dr. Tuler, and other independent researchers within the Faculty of Public Health at Thammasat University to help us obtain new contacts as well as streamline the original list. We also used the "snowball effect," a term used to describe how we acquired more recommendations for additional contacts during interviews. Similarly, a community leader in Rayong gave us a list of residents to interview. While this list was not a representative sample of the public in Rayong, it provided us with specific people we could speak with in order to attempt to answer the research questions. Taking into account the project's time constraint, we prioritized a final list of contacts from all stakeholder classes by considering the ability of these individuals to help us answer the research questions. We looked at their positions and organizations to decide who we believed possessed the most pertinent information for answering the research questions.

We chose to use semi-structured interviews in order to obtain information to characterize risk communication in Rayong. We generated a list of questions which can be found in Appendix A (see

Appendix B for the Thai version) to use as a guideline when conducting interviews. These questions were based on the research questions, and we hoped that they would clarify organizations' purposes and objectives for communicating risks, their sources of information, how they communicate, and if there was opportunity to receive feedback. More specifically, the questions asked about interactions between different stakeholders, their participation in various awareness campaigns, the particular techniques they were using for communication, and their methods for ensuring the information was received and understood. The questions also asked about how stakeholders have evaluated their own risk communication efforts, such as the criteria they have been using to self-assess. When generating the guideline, we carefully considered the order of the questions, so that they would make sense to the interviewee by having a chronological flow that clearly tied the questions together. We avoided generating "double-barreled" questions, which ask about two issues in one question and might confuse the interviewee. Additionally, we avoided starting questions with the word "why" because it might elicit a defensive response. Instead, we used the phrase "how come," which would invite the interviewee to elaborate and continue speaking, enhancing the flow of the interview. We included follow-up questions to encourage further discussion on particular topics of interest and to allow for adjustment of questions according to interviewee responses (Berg, 2007). This semi-structured style is less rigid and more conversational than the traditional structured interview, which has a strict list of questions that must be followed ("Using Interviews in Research," 2008).

In addition to creating an interview guide, we developed a consent form to be presented to interviewees at the start of each interview. We wrote two versions of the consent form, one in English and one in Thai, which can be found in Appendices C and D, respectively. Through these forms we hoped interviewees would fully understand our project, our purpose for interviewing them, and what was going to happen with their information after the interview. We put a box at the bottom of the form for the interviewee to check whether or not he or she wanted to remain anonymous in the final report. The consent form explained that should the interviewee choose to remain anonymous, only the five researchers, sponsors, and advisors for the project would know his or her true identity. All interviewees, with the exception of the Rayong residents, signed the consent form allowing us to publish their names.

We contacted all of the individuals from the final list we developed to schedule interviews with them, and our final list of interviewees can be seen in Table 4. This table shows the individuals we interviewed according to their stakeholder class, their positions, and their respective organizations. Due to time constraints and conflicts, we were unable to schedule interview with companies; therefore, this stakeholder class does not appear in the chart.

Prior to every interview, we reviewed our research about the interviewee and his or her respective organization because we wanted the interviews to be efficient, insightful, and beneficial to our efforts. With this background information, we sought to establish a level of trust with the interviewee by demonstrating an interest in his or her work. Also from this information, we were able to tailor the interview guide according to the interviewees' expertise prior to the interview. For example, the purpose of conducting interviews was to characterize risk communication in Rayong about three different health issues, and while some interviewees could provide information about all three issues, others would only know about one or two of them. Additionally, some interviewees, such as the public and certain community leaders, were less educated and had limited knowledge of risk communication, so we tailored our questions in a way that simplified them and made them more understandable. We sent these tailored interview guides to the interviewees in a brief reminder email prior to the interviews.

Table 4: Interviewees According to Stakeholder Class

Organization	Department	Individual Contact	Position/Title
Government			
Ministry of Public Health	Department of Disease Control: Bureau of Occupational and Environmental Diseases	Mr. Pibool Issarapan, MD	Head of Information Technology
Ministry of Natural Resources and Environment	Pollution Control Department	Mr. Wijarn Simachaya	Director of Air Quality and Noise Management Bureau
Muang Rayong Municipality	Public Health and Environmental Department	Ms. Kanjana Teeriyachod (focus group)	Head of Department
Rayong Provincial Government Office	Public Health Department	Ms. Theevara Kunawut	Head of Department
Ministry of Public Health	Department of Disease Control	Dr. Somyot Kittimunkong	Chief of AIDS Cluster
Ministry of Public Health	Department of Infectious Diseases: Non-communicable Disease Division	Mr. Tairjing Siriphanich	Researcher
Ministry of Industry	Industrial Estate Authority of Thailand	Somchint Pilouk	Director of Environment and Safety Department
Ministry of Industry	Map Ta Phut Industrial Estate	Pervatana Rungraungsri	Director of Map Ta Phut Industrial Estate Office
Civil-Societies			
Petroleum Institute of Thailand		Mr. Samrat Yindepit	Safety, Health, and Environment Advisor
Thailand Global Road Safety Partnership		Mr. Robert Klein	Regional Programme Director of Asia and Secretariat
Camillian Socio-Health Institutions Identity		Father Peter	Vice-President
Kho-Keaw HIV Club, Rayong		Ms. Uthumporn	Club Staff
Don't Drive Drunk Foundation		Mr. Tairjing Siriphanich	Secretary-General
Academic Researchers			
Thammasat University	Faculty of Public Health	Ms. Niphattra Haritavorn	Researcher (Open Society)
Thammasat University	Faculty of Public Health	Dr. Nitaya Vajanapoom	Associate Professor
Public			
30 Rayong residents chosen by Mr. Suthi Atcjasai, Coordinator of Eastern People Network			

We followed a specific procedure for conducting the interviews. At the beginning of every interview, we introduced ourselves to the interviewee, explained the project, presented the consent form, and asked permission to record the interview on both tape and laptop. We explained the interview was solely informative and not judgmental, and that the interviewee could withdraw from the interview at any time. Interviews were conducted in English and lasted for approximately 60 to 120 minutes. We chose to conduct the interviews in English so that all researchers could understand and participate. However, when an interviewee did not understand a question presented in English, a Thai researcher explained and clarified the question in Thai. The interviewee could respond, even if it was not in English, while we still received the necessary information. Also, in the case that an interviewee could not speak any English, we performed the interview completely in Thai. At least one Thai researcher and one American researcher

conducted every interview. One person asked the questions, while the other took notes and managed the recorder. During the interviews, the Thai researchers looked for culture-specific mannerisms, also known as social interpretations, which are the messages sent to another individual through nonverbal channels, or body language and nonverbal sounds. The intention of this strategy was for the Thai researchers to "...hear not only what the subject sa[id] but also how they sa[id] it" (Berg, 2007). We could better understand interviewees' answers by noting these social interpretations. After the interview was completed, we thanked the interviewee for his or her time and valuable knowledge.

Some limitations and challenges affected the selection of individuals we interviewed and their responses. Time and scheduling conflicts necessarily limited the number of interviews we could conduct. It was sometimes difficult to get a direct answer or to keep an interviewee on topic, and occasionally, the length of time for which the contact was available was not long enough for us to complete our list of questions. In this case, we chose to skip certain questions. There was also a possibility of translational errors while conducting interviews especially because the interview questions were originally generated in English.

3.2 Objective Two: Analyzing Efforts, Perspectives, and Risks

The second objective was to assess and compare risk communication efforts, stakeholder perspectives, and risk issues in the Rayong province. We identified the areas of risk communication still developing in Rayong, and which communication efforts *were* working, so they could be used later when we developed recommendations. In this section, we will describe how we organized the interview data and analyzed it to answer three research questions. These research questions were:

- To what extent do the risk communication efforts accomplish the originally stated purpose?
- How do the criteria, purposes, and preferences for risk communication activities compare between different stakeholders?
- How do the criteria, purposes, efforts, and communication flows compare between petrochemical pollution, HIV/AIDS, and motorcycle accidents?

To answer these questions, we organized the interview data by major theme and interviewee. This allowed us to easily find which interview contained certain information when we later analyzed the data (Berg, 2007). The research questions from Objective 1 were our major themes. We used the following method to organize the interview data: all researchers listened and took notes regarding pertinent information to the research questions with the interviews conducted in English. The Chulalongkorn researchers also did the same for the interviews conducted in Thai and translated their notes into English for all researchers to understand. We recorded the time at which each relevant comment occurred, so that we could refer back to the interview at those noted specific times for clarification or to transcribe verbatim phrases to be used as quotations. This organizational strategy allowed us to review information from the interviews quickly without requiring the time needed to transcribe and translate every word.

We used Table 5 to organize all of the information that pertained to research questions according to stakeholder class and public health issue in order to facilitate analysis.

Table 5: Stakeholder Responses Organized By Research Question and Public Health Issue

Stakeholder Class	Research Question	Health Issue		
		Petrochemicals	HIV/AIDS	Motorcycles
Government	1			
	2			
	3			
	4			
Civil-societies	1			
	2			
	3			
	4			
Academic Researchers	1			
	2			
	3			
	4			
Companies	1			
	2			
	3			
	4			
Public	1			
	2			
	3			
	4			

We performed three types of analysis using Table 5. The first analysis was a “within-issue” analysis. We looked down the column labeled “petrochemicals” and assessed and compared what the representatives of the five stakeholder classes said about petrochemical risk communication. We identified areas of congruence and incongruence in their statements. This means, for example, if the government official described its department’s purpose was to share petrochemical information with civil-societies, we attempted to discover from the civil-societies if the government was, in fact, sharing information and fulfilling its purpose. We repeated this same process with the other two remaining columns for HIV/AIDS and motorcycles. This “within-issue” analysis provided us with information regarding communication flows and whether stakeholders accomplished their goals within a specific health issue.

The second analysis we performed using Table 5 was a “cross-stakeholders” analysis. We looked across the row labeled “government” and discussed and assessed what each stakeholder class said about petrochemicals, HIV/AIDS, and motorcycles in comparison to what other stakeholder classes said about these three issues. We identified similarities and differences between the risk communication efforts of each stakeholder class by repeating this process with the other four stakeholder classes. Through this “cross-stakeholders” analysis, we could detect how different stakeholders compared to one another based on their criteria, goals, and risk communication activities in relation to all three public health issues.

Our last analysis was a “cross-issue” analysis. We looked down the columns of the public health issues and compared and assessed the criteria, goals, and risk communication efforts being used for one issue with those used for the other two issues. For example, we identified the similarities and differences of

how all five stakeholders generally addressed petrochemical pollution in comparison to how they addressed HIV/AIDS and motorcycle accidents. Through this “cross-issue” analysis, we could detect how different health issues compared to one another based on the criteria, goals, and risk communication efforts being used.

By reviewing the outcomes of our three analyses, we were able to detect areas of risk communication that were still developing in Rayong as well as efforts that appeared to currently be working. We identified gaps, problems, and consistencies, along with risk communication practices interviewees believed were already successful, that were not previously apparent to us. We used the Sender-Receiver Model, the Seven Cardinal Rules, and the evolution of risk communication as a conceptual framework to develop an understanding of the actual effectiveness of current risk communication efforts based on these gaps, problems, consistencies, and “successful” practices. Finally, we were able to identify areas for improvement as well as current efforts that already seemed effective at communicating risks.

The main challenges to completing this objective were the level of completeness of the interviewee responses, translational errors, and limited interviews with the public. When conducting interviews, we experienced some problems in trying to get the interviewee to fully or directly answer the questions we asked. This resulted in difficulties in organizing our interviewee responses according to the research questions. We were unable to conduct full analyses of the information without completely filling the analytical chart with responses. Consequently, this made it difficult to identify what stakeholder efforts seemed to be working or needed improvement. Additionally, we may have misinterpreted interviewee responses as a result of translational errors of interviews conducted in Thai. Another limitation to completing this objective was that we did not interview a representative sample of the public. Therefore, we may have gathered an inaccurate opinion of the entire public based on such a small sample of residents influencing our findings generated from their statements.

3.3 Objective Three: Identifying Strategies to Improve Risk Communication in Thailand

The third objective was to identify possible strategies to develop the areas identified for improvement. We researched practices from other countries that have been successful in developing the areas we identified for improvement in order to provide useful recommendations that could be applied to all of Thailand. In this section, we will describe how we chose strategies and identified aspects that might make them inappropriate for Thailand. We generated two research questions to achieve this objective:

- What strategies used by other countries have been successful in improving the previously identified gaps in Rayong’s risk communication?
- What cultural, legislative, or socio-economic factors may inhibit the implementation of these strategies in Thailand?

We researched risk communication strategies in other countries in order to find examples for how to develop the previously identified areas of improvement. We investigated situations that not only tried to improve similar areas of risk communication, but also had success in doing so. By finding cases that achieved their goal, we could legitimize the strategies that were used as a type of “best practice.” It would have been impossible to consider all examples for developing a specific area for improvement, so in order to justify the ones we chose, we selected examples that were successful and had a clear description of how they attained this success.

The improvement strategies we identified were mostly from Western countries because risk communication has been developing there longer than other parts of the world, but Western culture is different from Thai culture in several ways and other socio-economic conditions and legislation might

influence the appropriateness of certain strategies to be implemented in Thailand. After we described strategies for improving various areas of risk communication, we considered their appropriateness for Thai culture, Thai legislation, and socio-economic situations. We used knowledge acquired from interviews, the opinions of the Thai members of our research team, and knowledge from research as a basis for identifying aspects of strategies that might not be appropriate for these conditions. During interviews, interviewees both intentionally and unintentionally explained certain cultural beliefs as well as their various socio-economic circumstances. The Thai researchers were also able to identify some cultural beliefs and other socio-economic conditions. All researchers had performed research about the government and Thai legislation prior to interviews, which made it possible to identify some aspects of improvement strategies that might not be appropriate for Thailand.

The main limitation for completing the third objective was that we could not consider all strategies for every improvement area we identified. There may have been several other examples that approached improving these areas differently that also proved to be successful, but for our purposes we only considered a select few.

3.4 Objective Four: Developing Recommendations

Our last objective was to develop recommendations for improving risk communication activities in Thailand. We considered the improvement strategies identified in Objective Three as well as the cultural, legislative, and socio-economic conditions in Thailand to develop recommendations we hoped would be appropriate for Thailand. We considered cultural and socio-economic factors identified by interviewees and the Thai researchers as well as information gathered from research about Thai legislation in an effort to tailor the improvement strategies. We also considered examples from interviews that were similar to the “best practice” strategies in order to identify ways that these strategies needed to be tailored. We compiled these tailored strategies to make the final list of recommendations for improving risk communication through out all of Thailand.

4. Findings: Current Risk Communication in Rayong Province

In order to develop recommendations to improve risk communication in Thailand, we identified successful communication strategies as well as areas in need of improvement in Rayong for three public health issues. From the information gathered in interviews, we characterized current risk communication in Rayong by distinguishing the efforts being used to communicate information concerning the risks of HIV/AIDS, motorcycles, and petrochemical pollution and then comparing them to each other. We created information flow charts, based on the Sender-Receiver Model, for each health issue. These charts helped us describe the circumstances of communication in Rayong, and they helped us answer our two first research questions: *What are the information sources, transmitters, and receivers, and how are they connected?* and *What are the stakeholders' purposes and goals of communicating risks?* Additionally, we were able to categorize each issue's risk communication efforts as either successful or not successful based on Fischhoff's definition for risk communication:

“...communication that supplies laypeople with information they need to make informed independent judgments about risks to health safety and environment” (Fischhoff, 1992).

Once we obtained our interview data, we considered the extent to which the information was reaching the public during our analyses. However, due to time constraints and scheduling conflicts, we were unable to interview multiple individuals from each stakeholder class. For example, we only interviewed two academic researchers, thus limiting our understanding of their function in risk communication and how to place them in the Sender-Receiver Model. Consequently, the findings presented in this chapter are only a suggestive summary of the risk communication efforts in Rayong.

In the following sections, we will explain how and what we found about information flows and stakeholder purposes for each issue as well as what we found about the similarities and differences in these flows and purposes when comparing the three issues to each other.

4.1 HIV/AIDS Risk Communication in Rayong

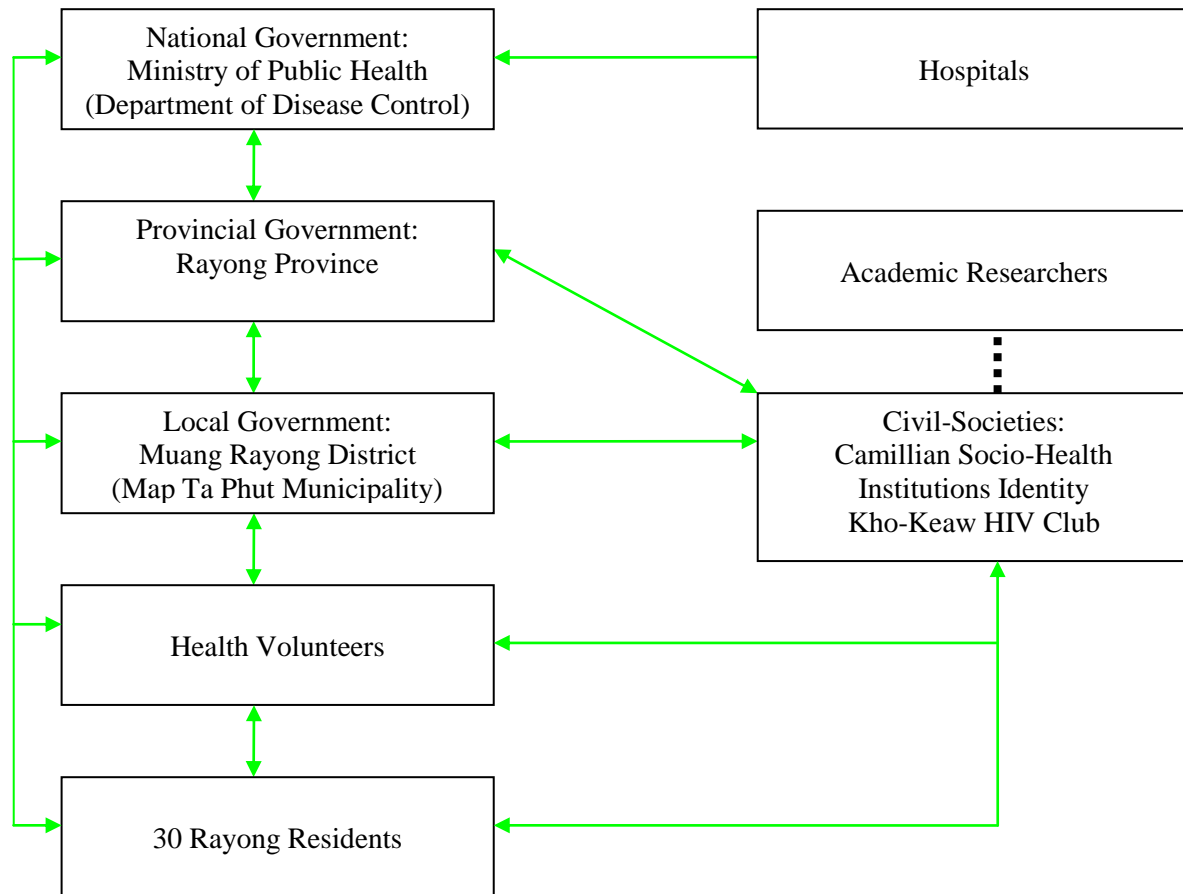
In the following section, we provide a chart to help illustrate the flow of information between stakeholders based on our interviews regarding HIV/AIDS (Figure 9). This diagram was constructed based on the Sender-Receiver Model and depicts the roles of our interviewees as sources, transmitters, and receivers of information. The arrows in between the stakeholders are representative of the conclusions we made from the information obtained in our interviews. In particular, the double-headed arrows represent two-way communication between parties. The single-headed arrows represent one-way communication. The green colored arrows represent the flow of accurate and useful information, and the dotted black line between the academic researchers and the civil-societies is representative of inconclusive evidence. The stakeholders shown in this model are those we actually interviewed or any organization our interviewees mentioned.

This chart presents a model that summarizes what we learned about risk communication about HIV/AIDS in Rayong, and from it, we were able to develop three main findings:

- 1) Risk information is reaching a wide range of people,
- 2) Risk information involves two-way communication as a result of feedback loops, and
- 3) Stakeholders have the same purpose for communicating risks.

In the following sections, we will explain what these three findings mean and how we reached them.

Figure 9: Information Flow Chart of HIV/AIDS Risk Communication in Rayong



HIV/AIDS risk information is reaching a wide range of people

With the exception of academic researchers and hospitals, the chart contains double-headed green arrows between all of the stakeholders, an indication of two-way communication. We found that some of the main sources of information for HIV/AIDS information in Rayong were hospitals, the Ministry of Public Health’s Department of Disease Control, and the two civil-societies we interviewed, the Kho-Keaw HIV Club and the Camillian Socio-Health Institutions Identity. The hospitals simply provide statistical data to the national government—they are solely a source of information. These three other organizations, however, gather information about the disease including statistics, how the disease works, and methods of prevention. They also share information with each other in order to achieve a better understanding of HIV/AIDS and its impact in Thailand.

The national government, as an information source, has used campaigns to share its information. The Rayong residents said they had seen some of the national television advertisements and had heard of the 100% Condom Campaign, confirming that the efforts of the national government had reached the communities in Rayong. The national government also gives statistics, prevention and transmission information, and even funding to the provincial government.

The provincial government, as one of the primary transmitters, will occasionally go to schools and educate students about the disease. However, it usually passes the funds, as well as the information, on to the local government, which as another transmitter, does most of the campaigning and education within the actual communities. Through the interviews with the various officials of the Rayong municipality, we learned of the many outreach programs made by the local government. The officials explained how they taught sexual education classes at various schools. Classes included posing questions such as “can you get AIDS by kissing someone?” and then providing an explanation. They also incorporated interactive games. For middle aged groups, the officials would run a more formal discussion meeting with factual information.

Not only do these local government officials share information through school systems, they also extend their efforts to reach a wide audience. The local government officials explained they design campaigns to target other groups of people, not only those groups associated with the stigma. They said “Everyone is part of the problem.” They explained HIV/AIDS can affect anyone. When speaking with members of the local government, officials said their risk communication efforts are specially tailored to target the local youth, adults, sex workers, uneducated people, and illegal immigrants alike. It does not matter if a person is not a legal citizen of Thailand or illegally working in a sex shop; they still should have the information. For example, the local officials said that because migrant workers often come from Burma, Cambodia, and Laos, they have conducted several of their campaigns in the languages of Burmese, Cambodian, and Laos. Additionally, the officials said they go directly to the brothels to teach sex workers about the dangers of HIV/AIDS and the importance of wearing a condom. They even go to nightclubs because many of the waiters are also sex workers. One elderly couple we interviewed said they received information about the disease which shows how the information is even reaching elderly people who would not typically be considered a target audience for HIV/AIDS information. These efforts show how the local government has made several attempts to reach a wide range of people.

Another important transmitter we identified through our interviews was health volunteers. These are members of the public, selected by the local government, to be trained monthly on current health issues in order to personally communicate HIV/AIDS risks with residents and their families at home. The volunteers even provide free condoms upon resident request. The municipality officials said these health volunteers discuss how HIV/AIDS is transmitted, what it does, and how it can be prevented. The officials stated there was one volunteer for every twenty homes in the community. Once they were done explaining about their efforts to share their information, we asked them what they felt about the success of all these programs. All seven officials agreed their efforts have made a lot of progress because in their opinion, now the entire municipality is very familiar with HIV. They claimed that everyone knows about the methods of infection and prevention. In a different interview, another man echoed this statement; he felt the people in Rayong were generally well-informed about HIV/AIDS. As an infected individual, he said he felt responsible to tell other people about the disease by either word-of-mouth or through an occasional informal meeting.

Even though we already previously identified the two civil-societies we interviewed as sources of information, they are also transmitters because they combine information given to them by the government with their own to run campaigns. The Camillian Socio-Health Institutions Identity, a civil-society for children with HIV, takes the information provided to them by the Ministry of Public Health and “...softens it,” as one of its leaders explained, “...to make it more resident friendly.” As a transmitter, the Camillians take the raw information provided by the Ministry and tailor it for the receivers. The organization also gives courses on HIV to teach the parents of the children about the disease. They too, like the local government, train health volunteers to go out into the communities to teach people in their homes. The Camillians said they also bring people in from the surrounding communities to meet HIV+ children to show that even though these children have HIV, they are still “regular people.” This, the Camillians explained, was another of their goals—to teach people to accept those infected with HIV.

The other civil-society we interviewed, the Kho-Keaw HIV Club, was created by people with HIV for people with HIV. This club is not exclusive to children, but is open to anyone. They said they share their information through conferences and group discussion sessions. They even bring in other sources of information to their club by inviting guest speakers. They make posters, bulletin boards, and radio advertisements to share information about HIV/AIDS transmission and protection. The staff members told us about a special program for mothers with infants. The club provides powdered milk for the mothers to feed their children. Both of these civil-societies are transmitters because they combine and edit the information to make it more useful to the public.

We identified the public as the final receivers of information. As receivers, the residents in Rayong are not only receiving the information, but they are also able to understand it in order to make informed decisions. The same elderly couple previously mentioned said they were not concerned about HIV/AIDS because they were very old. They came to this conclusion because they knew how HIV/AIDS spreads and how to prevent it. They knew they would most likely not be exposing themselves to situations that would lend them to acquiring HIV. Community members are receiving and understanding the HIV/AIDS information provided by the government and the civil-societies.

HIV/AIDS risk information in Rayong is reaching a wide range of people through the various efforts of various civil-societies and the national, provincial, and local governments.

HIV/AIDS risk information involves two-way communication as a result of feedback loops

In addition to the HIV/AIDS information flowing from sources to transmitters to receivers, feedback information runs from the receivers to transmitters and sources. The Rayong residents give feedback to the national, provincial, and local governments as well as to the civil-societies. The provincial government, as explained by the Head of the Public Health Department within the Rayong Provincial Government Office, will require students to take a pretest of their knowledge on HIV/AIDS before conducting a campaign within a school. After the campaign, the students will take another test to find out how much they learned. The provincial government will then provide them with a survey asking questions about what games during the campaign they enjoyed or what activity helped them learn the most. The Head of the Office said these pre- and post-tests help the provincial government determine how much information the students originally have before the campaign and how much they retain after the campaign. This survey, she said, was the most important part because it assessed the provincial government's efforts by providing her department with the information necessary to improve their campaigns.

Another way the public has provided feedback was revealed to us in our interview with the HIV Club. When asked about methods of feedback, the staff said during their conferences, they ask questions of the participants about what was taught. The club staff went on to explain how the leader chooses a random person to stand up, come to the front of the group, and explain certain topics covered in the discussion. The staff members can evaluate how well they taught the information depending on how well the student reiterates it. Then the leader asks the group what topics they do not completely understand that require more explanation.

We discovered that risk communication about HIV/AIDS has strong two-way communication because feedback is used to make communication efforts more effective.

HIV/AIDS stakeholders have the same purpose for communicating risks

We found that all stakeholders share the same purpose for communicating risks about HIV/AIDS. This purpose is to share information with all members of the public in order to prevent the spread of HIV/AIDS. The Chief of the AIDS Cluster Bureau, a division of the DDC, said the Bureau's purpose was "...to share information about the current situation of HIV/AIDS to reduce infection." They also said they promote condom use as a means to prevent infection. Similarly, the Vice President of the Camillian Socio-Health Institutions Identity said his organization's purpose was to communicate information to teach people how to prevent the spread of HIV/AIDS and how to protect themselves. They provide educational courses to teach parents of children with HIV about the disease, and they train volunteers to share information in homes within the community.

Several stakeholders have collaborated to communicate risks because they share the same purpose. For example, the local and provincial governments report HIV/AIDS prevalence rates among various groups of people to the national government. This allows for the national government to tailor its campaigns for particular groups of people with high HIV/AIDS prevalence. Recently, the number of fishermen infected with HIV/AIDS has increased. When speaking with the Rayong government officials, they said they forwarded this information to the national government. The officials explained that in response, the national government has started to focus its campaigns to share information with fishing communities in Rayong.

4.2 Motorcycle Accident Risk Communication in Rayong

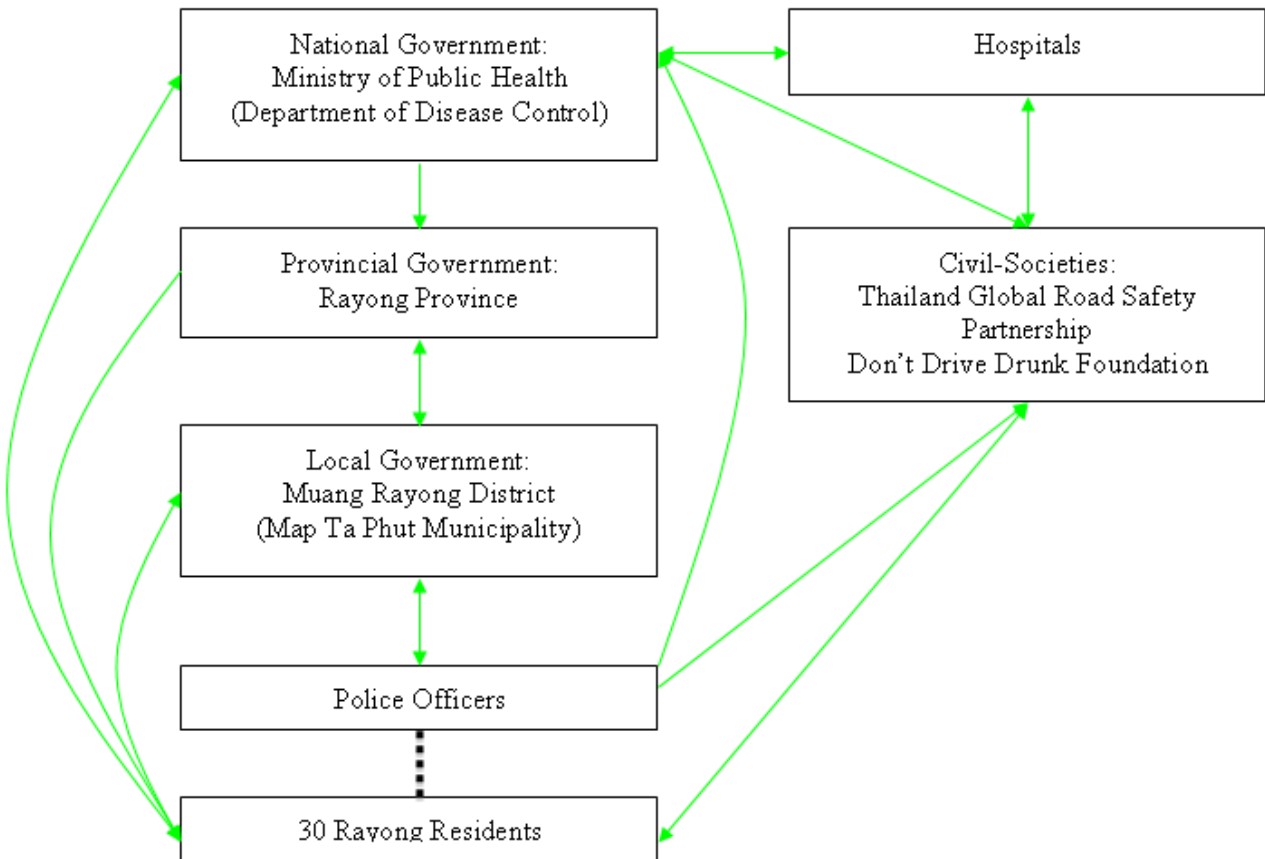
In the following sections, we provide a similar diagram to the one provided for illustrating HIV/AIDS information flows (Figure 10) and an explanation of our findings. Again, this diagram was also constructed based on the Sender-Receiver Model in order to show the sources, transmitters, and receivers of information. The stakeholders shown in this model are those we actually interviewed or any organization our interviewees mentioned. The double-headed arrows represent two-way communication between parties. The single-headed arrows represent one-way communication. The green colored arrows represent the flow of accurate and useful information. The dotted black line between the police officers and the public is indicative of a lack of enforcement, which although not directly related to risk communication was found a major factor in people practicing poor motorcycle driving habits. Motorcycle accidents can be attributed to many factors such as excessive speed, not using headlights, driving in between lanes of traffic, and driving drunk. During our interviews, we focused primarily on helmet use because it is difficult to distinguish only one cause of a motorcycle accident; they can be caused by a combination of factors. However, injury severity due to lack of helmet use is a measurable factor. The information flow chart is based primarily on helmet use.

We were able to develop two main findings through our interviews and using this chart:

- 1) Messages about motorcycle risk are received and understood by the public and
- 2) Stakeholders have the same purpose for communication.

In the following sections, we will explain what these two findings mean and how we reached them.

Figure 10: Information Flow Chart of Motorcycle Accident Risk Communication in Rayong



Messages about motorcycle risk are received and understood by the public

From the information flow chart, the primary sources, transmitters, and receivers of information can be identified. Generally, the main sources of statistical data include civil-societies and the national government. However, one interview revealed that an outside source—various Thai hospitals—was their primary source of information. The Secretary-General of the Don't Drive Drunk Foundation (DDD), explained how "...about seven years ago, I ask every hospital of Thailand to send the data of the dead people on the road." In this situation, the Foundation acted as a transmitter. It took the hospital's statistical data, added its own message about the dangers of drunk driving, and forwarded the information to the national government. "We took this number to the Prime Minister's Secretary of the Health Ministry [Ministry of Public Health].... the Prime Minister said he would tell the people, and get the attention of the media with front page in newspapers." He continued by saying that the Prime Minister wanted more statistics from the Foundation. According to the Prime Minister's Secretary, he was able to publish this information in the newspapers. Thus, the public, as the final receivers, got both the statistics originally supplied by the hospitals and the important message from the Foundation about the dangers of drunk driving. Several of the residents with which we spoke could not read, but the few that could said they recalled reading information in the newspapers warning about drunk driving. This example illustrates the flow of information between an outside source, a civil-society, the government, and the public.

Information does not only reach residents through newspaper articles. Several residents recalled seeing advertisements on the television and hearing loudspeaker campaigns. One woman explained how a police

officer stood on a truck passing by her house and used a megaphone to remind citizens about motorcycle safety laws including the mandatory helmet law. She said the officer reminded the residents that children under five years of age could not ride motorcycles. The woman confirmed she understood the messages the officer was conveying. The efforts of the DDD, the national government, and the Rayong local police officers all facilitate risk communication.

Motorcycle accident stakeholders have the same purpose for communication

Every stakeholder we interviewed had the same objective for risk communication; they were fully committed to preventing motorcycle accidents, and often, the problem has been addressed by a collaborative effort. Instead of working against each other by withholding information, the stakeholder groups have cooperated to use each other's strengths and resources to help the public. For example, police officers, hospitals, and the local government all share their accident statistics because each stakeholder gathers information about different types of accidents. A government official for the Division of Non-communicable Diseases said, "Police officers give us statistics about the number of accidents reported. Hospitals give us information about the number of people needing medical attention because of an accident." A local official in the Public Health and Environmental Department of the Rayong Municipality told us they receive information from the public through a hotline, which people can call to report road accidents. This data is then forwarded to the national government.

Although there is no single database or depository used or responsible for collecting *all* of this information, the interviews did reveal that sharing does occur between particular stakeholders. As mentioned earlier, the DDD combines its information with the statistics provided by the hospitals and the local policemen. With this numerical data, the Foundation has been able to gain a better understanding of the magnitude of the entire issue. It forwarded the statistics along with its own information to the national government. All three stakeholders were willing to share their information with each other and the public because their objective was the same. The DDD's Secretary-General shared with us how the Secretary for the Prime Minister originally did not consider road accidents to be a national concern; however, when he received the statistics from the DDD, the Secretary began taking action. Through this discovery, the objectives of the national government and the DDD became the same—to decrease the number of traffic fatalities.

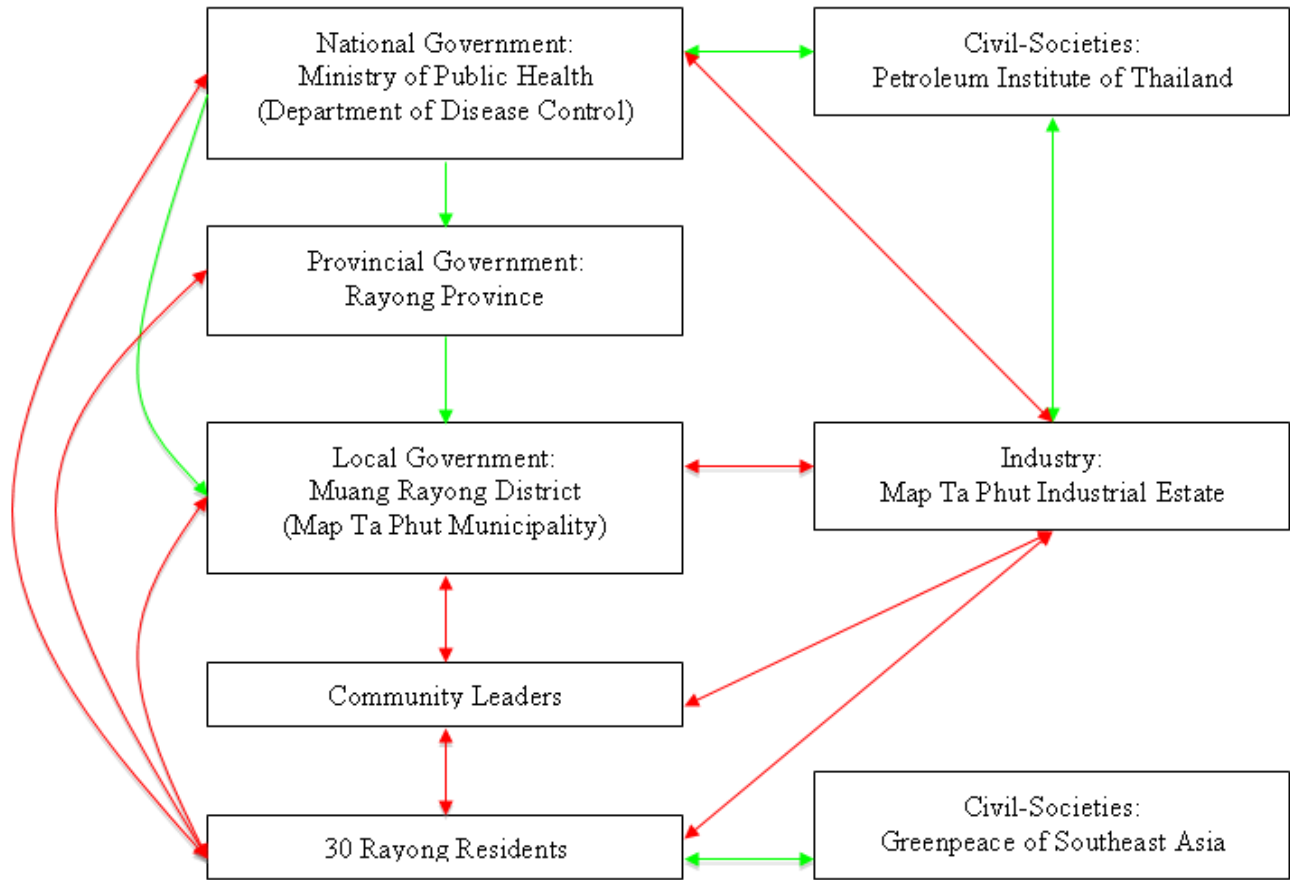
Other collaborative efforts have been made as a result of stakeholders sharing the same purpose. In the interview with the woman who described the loudspeaker campaign, she revealed that it was a joint effort conducted by the local police officers and the car company, Honda. Another woman said the police officers and the Honda representatives also had a station at the city hall for residents to visit and receive free helmets. In addition, this woman said whenever someone buys a motorcycle, the purchaser receives a free helmet. Although Honda and motorcycle dealers are not civil-societies nor part of the government, these examples show how stakeholders can work together in order to communicate risk information because they share the same purposes.

4.3 Petrochemical Pollution Risk Communication in Rayong

In these sections, we will describe key findings regarding petrochemical pollution risk communication in Rayong. From information gathered through interviews, we were able to generate a flow chart (Figure 11) describing the flows and quality of information exchanged between petrochemical stakeholders. This chart is based on the Sender-Receiver Model and incorporates the key stakeholders we identified for petrochemical communication in Rayong: residents, community leaders, civil-societies, companies, and all three levels of government. We included only those we actually interviewed or any organization our interviewees mentioned. The double-headed arrows represent two-way communication between parties. The single-headed arrows represent one-way communication. The green colored arrows

represent the flow of accurate and useful information. The red colored arrows represent poor and weak flows of either inaccurate or confusing information.

Figure 11: Information Flow Chart of Petrochemical Pollution Risk Communication in Rayong



Using the Sender-Receiver Model, we categorized the different stakeholders as sources, transmitters, or receivers. The major sources of information for petrochemical pollution were the Pollution Control Department (PCD) and the Department of Disease Control (DDC). Both are part of the national government, as well as the Map Ta Phut Industrial Estate. The major transmitters were the Rayong Provincial Government, the Muang Rayong Municipality, and the community leaders. The sole receivers were the Rayong residents. Additionally, civil-societies seemed to act as both sources and transmitters of information; however, we only interviewed one civil-society, the Petroleum Institute of Thailand (PTIT), which collects information from the companies and transmits it to the national government to help develop economic policies. From the literature review, we found that Greenpeace, another civil-society, gathered information about pollution levels in ambient air and transmitted these results to the public. Due to time constraints and scheduling conflicts, we were only able to interview a limited number of individuals; therefore, Figure 11 is an approximation of communication flows in Rayong.

We were able to develop three main findings from the interviews regarding petrochemical pollution:

- 1) There is limited evidence of two-way communication between stakeholders,
- 2) Stakeholders have different objectives because they are influenced by outside factors, and
- 3) There is public outrage and a lack of trust as a result of poor communication.

In the following sections, we will explain what these three findings mean and how we came to conclude them.

There is limited evidence of two-way communication between stakeholders regarding petrochemical risk communication

Our first research question for characterizing petrochemical risk communication efforts in Rayong was to develop an understanding for the flows of information between petrochemical stakeholders. One flow of information that we looked at was regarding pollution standards. We found the PCD monitors the ambient air quality in Rayong and records pollution levels, while the Map Ta Phut Industrial Estate monitors and records levels of pollutants still in companies' stacks. The Director of the Air Quality and Noise Bureau said that companies give their pollution data to the PCD and that the PCD then combines this information with its own data into a report which it gives to the provincial government. The provincial government said it passes this report on to the Muang Rayong Municipality, which makes the information available to the public. The Director also said the Municipality is responsible for fining companies in the Map Ta Phut Estate whose pollution levels exceed the national standard.

The flow of data regarding pollution levels is successful for implementing fines; however, the formal report is only made accessible to Rayong residents and never specifically given to them. Some residents mentioned they knew pollution levels were being measured, but none of them had gone to look at the reports. Many said they could not read. The Head of the Public Health and Environmental Department of the Muang Rayong Municipality said these reports were complicated and difficult to understand because they contained technical information. The Head of Information Technology for the Bureau of Occupational and Environmental Disease made a similar comment regarding information he provides directly to the residents of Rayong. He explained the DDC performs urine tests to measure the level of metabolite in residents that live near Map Ta Phut Industrial Estate and sends letters about these levels back to the individuals tested. When we asked how he checked to make sure the residents could understand the letters, he explained, "I invite the woman who clean[s] up the room to read the mail, but she cannot understand.... So we invite a PhD student to read the letter, and she cannot understand. So we rewrite the mail many times." The information the Head of Information Technology shares is difficult to understand even for a PhD student, which means less educated people, like the residents in Rayong, are also unlikely to understand. He further went on to explain that there was no word for "metabolite" in Thai, which was another reason the information is difficult to understand.

There was one way a few residents said they have received some information that they could understand about pollution. One woman explained they have two community leaders, one that is elected and one that is not. She said one leader tells them about the harm that could happen if more industry were to come, and the other leader works on reducing existing pollution. She also said that neither leader tells the residents the information they want to know, such as what chemicals are being released, how chemicals can reach them, what negative health effects are associated with these chemicals, and how they can protect themselves.

We tried to identify feedback loops from the public to other stakeholders in order to find pathways of two-way communication. When we asked the Head of Information Technology what kind of feedback he received, he said that he did not receive any directly, but had heard that, "People want to know what to do next." He believed the residents are more interested in knowing how to protect themselves. The Head of Information Technology admitted he does not provide the information the community members need, but he also said it is not his job to find out how the people can protect themselves. The Head of the Department of Public Health for the local government also confirmed the residents were not getting the information they needed when she said, "We only get reports on ambient pollution levels from the Pollution Control Department. We don't deal with health information." The local government seems to

understand that technical data is not useful for the residents, but it also does not believe its purpose is to relay health information.

We also found that the residents of Rayong who lived within close proximity to the Map Ta Phut Industrial Estate frequently complained to the Estate and all levels of government by writing letters and making phone calls. One woman described a protest she participated in where residents drove to Bangkok and threw fish at the Ministry of Natural Resources and Environment. She explained the irony of the situation because presumably the government officials ate the fish that came from the water polluted by the Industrial Estate the government helped create. The residents try to make their feedback heard, but they said the industry always denies responsibility for the pollution. The residents also said when they complain to the local and provincial governments, the government says it is not their job to regulate the industries or pollution. The Head of the Public Health and Environmental Department for the local government confirmed this claim by saying the local government is only responsible for fining the industries.

Two-way communication does not appear to have been successfully established yet for risk communication of petrochemical pollution. The public does not currently understand the information it is given and the information it is receiving is not what it needs. Additionally, feedback loops, which the Sender-Receiver Model identifies as an important part of two-way communication, can only be established if feedback is actually considered and acknowledged by some sort of response. The feedback of the public often goes unanswered and so two-way communication is weak.

Petrochemical risk stakeholders have different objectives because they are influenced by outside factors

In order to characterize petrochemical risk communication in Rayong we also wanted to understand stakeholders' purposes for communicating risks and how successful they believed they were in achieving these goals. We found the outside influence of economic growth contributed to how various stakeholders' objectives were defined or weighted. For example, the Head of Information Technology for the Bureau of Occupational and Environmental Safety seemed to describe his purpose as informing the public about health risks, so we asked if his research was ever used to create pressure for the industry to make changes. He said, "In Thailand, we cannot blame the industry, but [the residents] have pressured industry to decrease emissions of VOC[s]." He explained the urine tests for metabolite levels cannot differentiate what the source of metabolite is; it could be cigarettes, car emissions, or pollution, but "Residents [are] constantly creating pressure for industry. One of the use[s] of the research we have [is to] present it to the national committee [National Environmental Board (NEB)]." He continued to explain that in order to get the NEB to lower emissions, there needed to be a good political argument, not a good scientific argument. He described the priority of the NEB to be economic growth first, then environmental and health risks, which seems to contradict the National Environmental Quality Act that makes the NEB the regulatory body for protecting the environment. This same man also explained how the petrochemical companies were created first, and only now is the government realizing the negative health effects associated with them. An academic researcher at Thammasat University made a similar comment relating to these standards. She said standards were recently lowered, and they are too strict now so few companies can achieve the standards without ruining their economic growth. She said the government needed to find a balance between social implications and economic benefits.

This battle to balance health risks and the economy seems to have influenced different stakeholders to have different objectives for communicating risks. The public wants to protect itself, while the companies want to expand. Because companies are reluctant to address community feedback, it appears public health is not a major concern to them; they have made little to no efforts towards addressing public concerns. Most of the residents mentioned they had gone on tours of the Map Ta Phut Industrial Estate, but the

companies only talked about how they were meeting standards and doing everything “right.” Several community members suggested companies will often bribe community leaders to say only good things about the industry during community meetings.

A stakeholder class that appears to be divided when it comes to objectives for communicating risks is civil-societies. From the interview with a representative of PTIT, we discovered its purpose advocated for the advancement of the petrochemical industry, whereas the literature revealed Greenpeace’s purpose seemed to advocate for public and environmental health. The Safety, Health, and Environment Advisor from PTIT seemed to become very agitated when Greenpeace’s studies in Map Ta Phut were mentioned. The results of this study are very different from the pollution data gathered by the Map Ta Phut Industrial Estate as well as the PCD and DDC. The representative said Greenpeace’s findings made the public angry so the Map Ta Phut residents will not believe the data provided to them by the government.

When different stakeholders deliver conflicting messages about the same issue to the public, the public can become very confused. This is true for the Rayong residents we spoke with because several individuals mentioned that they did not understand why the PCD and industry were both saying pollution standards were being met when they heard pollution around Map Ta Phut was exceeding standards from another source. It seemed the residents were referring to Greenpeace’s study, but we cannot verify this fact. It does appear, however, that due to a lack of collaboration between stakeholders, conflicting information seems to be reaching and confusing the residents of Rayong. This collaboration could be a result of stakeholders having different objectives for communicating risks. We thought it was interesting that while the DDC and the PCD are both concerned about pollutants, neither department said they shared their data with the each other. This could be a result of having different objectives because the DDC communicates risks to help protect the public, while the PCD communicates pollutant levels to make sure companies are not over-polluting. Also, as explained in the previous finding, the local and provincial governments as well as the PCD and DDC all made the same comment at some point in their interviews that some task was “not their responsibility.” It seems as though these organizations did not see their relationship with each other as a result of different objectives.

There is public outrage and a lack of trust as a result of poor petrochemical risk communication

Despite the industry’s and the government’s efforts to communicate with the people of Rayong, the interviews revealed many residents do not respond positively to their efforts for three reasons—the public does not trust the monitoring techniques or the data gathered by the industry or the government, they do not trust services provided by the industry, and they have personal experience by being physically affected by pollution.

The first reason residents appear to not respond positively to communication efforts is because they do not trust the monitoring techniques used by the industry and the PCD nor do they trust the data the industry and PCD gather. This mistrust appears to stem from the conflicting information the public has been receiving. Information from the industry and the PCD conflicts with other studies residents have heard about, such as those conducted by Greenpeace. Also, the information residents receive from the industry and the PCD does not make correlate with their daily observations. One resident described how the company “...came and told [him] that the pollution levels were good but then one day it rained and the fish in [his] pond died.” Conflicting statements increase the amount of mistrust between the public and the industry as well as the public and the government.

Secondly, services provided by the industry such as free medical examinations seem to contribute to the growing mistrust. For example, another resident shared his experience with one of these examinations, “When the doctor comes, no one goes because we all know that no matter what symptoms we have, all

we are going to receive is paracetamol [ibuprofen].” The residents do not seem to believe that the services provided by the industry are actually in their best interest.

Lastly, many residents are extremely angry because they have been physically affected by pollution. A Rayong resident explained “My eyes are always red, whenever I go into the sea I’m always itchy, my voice has deteriorated over the years.” Additionally, one woman we interviewed showed us four inhalers she needed to take due to asthma she has developed, which she believed was a result of the pollution. An example of the public’s outrage towards this issue can be seen by one resident’s response when asked about possible methods for the industry to improve its communication. She declared, “I don’t care about information. I don’t trust anyone except myself. I just want to see some results.” The combination of all these stories with the lack of response by the government and the petrochemical industry further increases the public’s level of mistrust and outrage.

4.4 Comparative Analysis of Risks in Rayong

We categorized the three public health issues into two categories; HIV/AIDS and motorcycle risks were considered behavioral risks, whereas petrochemical pollution risks were out of the control of the individual. In the following sections, we will provide a description of our findings resulting from the comparisons between these two different types of public health risks.

The fundamental difference between behavioral risks and risks that are out of the individual’s control is how they are perceived by the public

Behavioral risks are within the control of the individual where a person can choose to behave a certain way either increasing or decreasing personal risk. This means that no matter how effective risk communication efforts are, individuals can still choose to take the risk. The Head of Information Technology at the Bureau of Occupational and Environmental Diseases explained how many people subconsciously conduct an internal assessment of the risks versus the benefits. More formally known as a Risk/Benefit Analysis, residents divide the risk by the benefits brought to them by taking the risk. For example, in the case of riding motorcycles, the risk would be getting in an accident while the benefits include an inexpensive mode of transportation in an area lacking public transportation. The Head finally concluded his explanation by stating the public feels the number of benefits outweighs the risk, so people choose to take the risk. This example demonstrates how behavioral risks are in control of the individual despite effective risk communication, and it agrees with the risk communication literature regarding risk perception. As behavioral risks, they are usually not perceived with as much concern because they are not associated with multiple risk perception factors.

For example, HIV/AIDS has been studied for a long period of time and is well understood by many people; it is not scientifically unknown. Consequently, the public generally does not panic or experience great alarm. Additionally, the public trusts HIV/AIDS information is reliable and accurate because stakeholders’ purposes are generally similar for behavioral risks; they usually involve trying to educate the audience in order to change a behavior. These similar stakeholder purposes result in sources and transmitters providing the same accurate information to the public. Therefore, their similar purposes result in the public trusting that the information is reliable.

Risks that are out of the control of the individual usually involve another stakeholder that controls the individual’s level of risk. For example, the residents in Rayong rely on the government and the petrochemical companies to control the level of pollution. The reason risks are out of the control of the individual is because the involved stakeholders are usually influenced by outside factors. In the situation within Rayong, the government is torn between fostering economic growth and protecting the people and the environment from pollution, and companies are only now just beginning to consider public health

impacts. Because these purposes differ from those of the public risks that are out of the individual's control are often associated with mistrust and outrage.

When considering the eight risk perception factors (Table 1), all eight factors can dramatically influence people's perceptions for a risk that is out of the control of the individual. We found this was true for the petrochemical pollution in Rayong—residents expressed their frustration with their lack of control, their alarm at exposing their children to the pollution, and their anger at what they perceived to be a lack of honesty on behalf of the companies and the government. Using the same Risk/Benefit Analysis described by the Head of Information Technology, the residents described their situation as “all risk and no benefit.” The culmination of all these factors has led the residents to not trust the government and the industry, which inhibits risk communication from being successful. Even if these stakeholders were making risk communication efforts, the public would not be receptive. This suggests risks that are out of the individuals' control pose challenges for conducting effective risk communication because risk perception factors and their impacts on outrage and trust must be considered.

From our literature review, we were already familiar with this theory about certain types of risk being perceived differently. This theory has been accepted by many risk communication experts, and our findings from Thailand also corroborate this theory. We found risks that were out of the control of the individual pose greater challenges in communicating risk information effectively than behavioral risks.

Civil-societies have differing roles in risk communication depending on the type of risk

As we already explained, stakeholders involved with behavioral risks tend to have similar purposes for communicating risks. It is easier for stakeholders with similar purposes to act as intermediaries and catalysts for facilitating communication between all involved stakeholders. Through this objectivity, civil-societies can have a major role in the flows of risk information, which seemed to be the case for behavioral risks in Thailand.

Stakeholders involved with risks that are out of the individual's control, however, tend to have different purposes for communication. These differing purposes appeared to exist because these stakeholders are often influenced by other outside factors resulting in their advocacy for one particular stakeholder's interests. We observed this situation when we interviewed the Petroleum Institute Thailand, which advocated for the petrochemical industry's interest for economic growth, whereas Greenpeace advocated for the people's interest in public health.

We did not discover any civil-societies for risks out of the individual's control that were objective towards multiple stakeholders' advocacies. As a result, we found civil-societies did not facilitate communication between all stakeholders as they did for behavioral risks. There may be some objective civil-societies in existence; however, throughout our research, we did not discover any pertaining to the petrochemical sector.

5. Risk Communication Strategies

In this chapter, we provide a series of descriptions of strategies that have been successfully used to address risk communication challenges we found in our Rayong case study. The following sections will explore these areas and what other countries or communities have done to address them. We will also discuss, as needed, aspects of these strategies that may not be appropriate for Thailand according to what we have learned about Thai culture, socio-economic conditions, and legislation from research, interviews, and the Thai researchers working on this project.

5.1 Development of strong feedback loops and use of multiple channels

An example of how to improve feedback flows is a practice known as Customer Relationship Management, or CRM. CRM is sometimes referred to as xRM because its procedures are not only applicable for customer service, but for public service as well (Kwok, 2009). Paul Greenberg, the author of a book about CRM currently used at several universities worldwide to teach effective customer service strategies, explains how this practice can be used to improve communication flows between the public, private, and government sectors by providing opportunities for the public to give feedback (“About Me,” 2008). CRM can make information easily accessible and understandable to almost anyone who requests the information independent of a person’s socio-economic status (Greenberg, 2008). It also encourages and empowers people to voice their opinions because CRM makes giving feedback very quick and easy to do. Greenberg explains that in order for feedback loops to be complete, some sort of response acknowledging feedback must be made. He says the government and private sectors should consistently listen to the public and respond effectively to their input on a routine basis (Greenberg, 2008).

The country of Singapore has been distinguished for its national advancements utilizing and implementing CRM as common practice. In 1995, the Singapore Public Service Division started a movement to foster an attitude of superior service in order to meet the needs of the public. This movement, known as Public Service for the 21st Century (PS21), also worked to develop an environment that embraces change as a way to increase efficiency and effectiveness in Singapore while simultaneously maintaining the welfare of the public. PS21 encourages an attitude of openness, responsiveness, and involvement throughout all sectors (Public Service for the 21st Century, 2005).

Singapore has recognized the significance of using multiple channels to improve public service. The use of multiple channels allows for more people to be reached not only to provide feedback, but to also be provided with information. While the country is constantly developing preexisting forms of channels such as newspapers, television, and telephones, it also embraces new types of media such as online communities and blogs. In 2007, Singapore invested \$500 million (USD) for the expansion of interactive digital media, a type of media enabling active participation by the receiver, in an effort to make the country’s feedback flows more efficient (Greenberg, 2008). Examples of this type of media are the internet, television, and telephones where the receiver can respond directly to information he or she is given.

PS21 strives to improve the quickness and effectiveness of government and private sector response to the public. Constituents can go online or make a phone call and have direct contact with a public service officer from almost any private or governmental organization. The public service officer will respond to the person’s question during the call because it is often more satisfying to the caller to get an immediate answer rather than waiting for a call back. Public service officers are nationally trained by the government

for consistency and in order to portray an attitude of service excellence that appeals to callers. The goal of portraying such an attitude is to make the public feel satisfied and confident its concern will be taken seriously (Waxer, 2008). These officers are also trained to appropriately explain information to a broad range of people in an attempt to make sure everyone can understand what they are being told. The intention of training public service officers to have this ability is to make receivers feel more comfortable calling in knowing they will most likely be able to understand the information they are given. Public service officers have direct access to a significant amount of information that may be necessary in order to answer questions or respond to comments. This process is extremely quick and efficient allowing people with little time to voice their opinions (Waxer, 2008).

PS21 has been developing for over a decade, and every year it is updated and improved. Singapore's advanced public service system has taken a long time to reach the point it is currently at, but it has established a system of strong feedback loops by encouraging and responding to public feedback. In the year 2000, the Public Service Division conducted a survey of 8,920 members of the public. The public was asked to rate customer service on a scale of 1-7. The range of 1-3 indicated "extremely poor" to "poor," and the range of 5-7 indicated "good" to "excellent." The average rating was 5.09 indicative of a "good" rating. This rating increased from a 5.00 in 1996, only one year after PS21 began. Additionally, the Public Service Division found that public service expectations rose from 1996 to 2000, which it attributed to improved service. For example, in 1996, the public expected email to be responded to within five to seven days; however, in 2000, they expected email to be responded to within only one or two days (Chia, 2000). The results of this survey demonstrate that PS21's efforts might have been successful in improving public service in Singapore.

One key aspect of this movement to be considered regarding its appropriateness for Thailand is internet access. Singapore has broadband internet access everywhere in the country. This is not the case in Thailand. From interviews in Rayong, we learned many residents could not afford a computer, let alone internet. However, most residents did have telephones and televisions, which have also played an integral role in the PS21 movement.

5.2 Collaboration between stakeholders to share the same information

An example of a strategy to collaborate between and within stakeholders by sharing information is Vietnam's National Road Accident Database. In a recent project developed in Vietnam to address road safety, \$6.2 million (USD) was used to create and implement analysis systems coupled with a National Road Accident Database System. The two systems together, collect, organize, analyze, and store information on motor-vehicle accidents. The database system keeps track of a variety of information such as where the accident occurred, what kinds of vehicles were involved, and the extent of the injuries. This data is recorded in the system and is accessible to any government official. The database prevents unnecessary repetition of research because government officials can see what research has already been conducted. The government can use this compilation of information to identify patterns in road accidents to develop useful solutions for preventing them (Ha, 2005). Although this database is used in Vietnam primarily within one stakeholder class, the government, the General Director of the Traffic Safety Projects Management Unit suggests that the database will be used to share information between all interested stakeholders (Chau, 2008). A system similar to this database could be used to share information between all stakeholder classes including the public.

5.3 Use of objective civil-societies to facilitate communication between stakeholders

As revealed in the findings chapter of this report, civil-societies are not always objective in their purposes. The Petroleum Institute of Thailand is clearly aligned with the efforts of the industry because it is a civil-society committed to encouraging economic development within the petrochemical sector. However, Greenpeace, the civil-society that led the protest in front of the Ministry of Industry, is aligned with the efforts of the public and oftentimes prods and agitates it into action. The ability of civil-societies to have such an influence on certain issues demonstrates the impact they could have in facilitating communication and collaboration between stakeholders especially if the stakeholders have different purposes. Rather than all civil-societies "...operate[ing] directly on the government of the day', and employ[ing] their tactics in attempting to influence a variety of agencies..." (Hall, 2008), objective civil-societies "...can operate and introduce resources in a conflict or war because they are expected to have no desire to win it" (Bjørreng, 2003). For example, the Population and Community Development Association (PDA), the largest civil-society in Thailand, brought the efforts of the government and the corporate world together to increase development in a rural community. This program, called the Thai Business Initiative in Rural Development (TBIRD), started in the early 1990s to encourage corporations and governments to take an interest in rural communities' abilities to sustain themselves and to work together. Corporations possess the technological, marketing, and financial resources, while governments have the necessary local connections (Frank, no date). The civil-society, by remaining objective can act as a mediator between stakeholders, help them use their resources, and find common purposes to cause positive change.

One of the specific projects of the TBIRD program involved jointly introducing NIKE and various government levels to several rural communities. The PDA "...work[ed] as a catalyst, motivating private companies to join the program and to help them.... [and it] provide[d] training and facilitate[d] relations with provincial and district authorities as well as specialized government agencies" (Frank, no date). Together, these three stakeholders taught villagers sustainable development strategies such as training children how to raise chickens and grow vegetables and teaching women how to make sugar coated bananas, chili paste, shampoo, and compost piles. Additionally, the three stakeholders provided monetary support in the form of loans and academic scholarships for students, encouraged physical activity by conducting sporting events and promoting sportsmanship, and training women in local politics so they could participate in their communities' governments. Educational programs were implemented to teach the villagers about HIV/AIDS and drugs. The combination of these three stakeholders, encouraged and supervised by the PDA, demonstrates that when working together, stakeholders can accomplish projects to improve the quality of life for several communities at a time. The PDA, as an objective stakeholder, was able to include NIKE, the local and national governments, and a rural community in a project to help them work together in order to complete a successful program (Frank, no date).

5.4 Rebuilding Trust

Building trust with surrounding communities is a very difficult task for industrial facilities. It is even more of a challenge for companies attempting to regain trust after it has been lost. A chemical company in England seems to have accomplished this feat, however, and its efforts can be used as a model for other industrial facilities trying to regain public trust.

This company was established in 1851, in Longfield, England. As of 2003, it employed approximately 600 people, and approximately 8,000 people lived in the surrounding community (Simmons, 2003). Peter Simmons, a member of the Society for Risk Analysis whose research is dedicated to the socio-cultural perspectives on public understanding of risk, wrote about this company's success at regaining trust. He could not disclose the company's name, but refers to it as "Foschem." The company's efforts to obtain public trust have included holding site-open days, an event similar to an open house, providing regular

tours of the plant, organizing frequent public discussions, and distributing newsletters to local residents and businesses. Simmons explains these efforts were used to make the company transparent to the public. *Transparency* means the residents believe the company is not withholding any information from them. Simmons also describes how “Foschem” encourages public participation to make the residents feel involved and that the company is considering their feedback. The company coordinates several community activities to improve the environment such as planting trees. These activities show the public the company cares about the environment in addition to public health.

Despite these efforts, “Foschem” did not experience much success with building trust because residents continued to complain. To address the problem, in 1975 the company created a community liaison committee of ten to twelve residents, local officials, and representatives from various other community organizations in order to encourage stronger public participation and to assure consideration of public feedback. This committee convenes four times a year to discuss community concerns and to address the informational needs of the community (Simmons, 2003).

It took several years for the culmination of “Foschem’s” efforts to regain the trust of the public and to subdue its anger. Simmons describes how the number of complaints to both the company and the local environmental regulator did eventually decrease to only one or two complaints per year throughout the 1990s (Simmons, 2003). He also states the company is a member of the Chemical Industries Association of England, which encourages and enforces aspects of the current Responsible Care program. The main goal of Responsible Care is to regain trust by demonstrating how chemical firms can be responsible, self-regulating corporate citizens. It achieves this goal by monitoring and enforcing its environmental, health, and safety (EHS) code of conduct (Delmas and Montiel, 2008). This code requires companies to record their EHS activities, continually improve them, communicate them to other stakeholders especially the public, and then, to train their suppliers to practice this same code (Prakash, 2000).

Simmons says although “Foschem’s” efforts pre-dated Responsible Care by nearly ten years, the company’s success was a result of the same strategies encouraged by Responsible Care. Although “Foschem” was not explicitly practicing Responsible Care when it originally obtained public trust, it is continually regulated by the Chemical Industries Association of England to assure that it maintains this positive relationship.

Efforts to gain trust, like those of “Foschem” and Responsible Care, are not only evident in England, but also worldwide. One major company in Thailand, the Electricity Generating Authority of Thailand (EGAT), has made similar attempts to regain the public’s trust. EGAT’s website advertises that in 2002 it became the first nationwide organization in Thailand to implement a policy to encourage and commit the company to a collaborative relationship based on consideration of and generating respect within the surrounding communities (People Policy, 2008). EGAT describes that this policy, called the People Policy, was founded on the idea that development and community and environmental protection are important to society, and therefore, both need to be considered and balanced. The company publicizes that the People Policy strives to boost the local economy while improving the quality of life of the people who live near EGAT facilities by following nine work plans. These work plans encourage not only following environmental health standards and regulations, but also supporting the local community financially and socially. The company also donates money for scholarships, hires guest speakers at schools, organizes events on national holidays, and participates in important community activities such as anti-drug campaigns (People Policy, 2008). On its website, EGAT describes its efforts are building a relationship with the public that will hopefully one day regain the public’s trust. Once lost however, trust is very difficult to restore, and little is known about EGAT’s success in restoring trust with the public. Gordon Walker, Peter Simmons, Alan Irwin, and Brian Wynne, all experts on risk communication and public participation explain,

Communities have long memories which can survive the most well-thought through programmes of communication and image building. Risk communication, in this light, needs to be seen as a long term and ongoing process, as one which involves active listening to public reasoning about risk and which has a sensitivity to the context in which communication is taking place and to the appropriateness of different mechanisms of communication in different settings (Walker, Simmons, Irwin, and Wynne, 1999).

Just as these experts state, regaining trust is a long and extensive process. It took “Foschem” almost two decades to even begin producing noticeable results, while EGAT is still trying to produce favorable results from its efforts over the past six years.

5.5 Making information understandable to the general public

One example of how information was tailored to both reach and be understood by as many people as possible was through the risk communication efforts in response to an incident that occurred in Madison, Connecticut in 2008. An anonymous letter, sent to school officials, stated that elevated levels of uranium were discovered at a property close to two of the town’s public schools. After conducting tests of the groundwater at the schools, officials reported the uranium levels were over three times the EPA standard for uranium in groundwater supplying individual homes. Uranium, a radioactive substance, has been known to cause kidney disease, and thus, after its discovery, the town’s residents were confused and enraged at the news that their children had been drinking radioactive water. In response, the schools immediately shut down their water fountains and the town has been supplying both schools with bottled water for drinking and cooking their cafeteria food. Additional testing of the water supplying other schools in the town revealed the other water sources were safe and not in violation of the EPA standards (Pinto, 2008).

In response to this discovery, the town held a meeting for residents two days later for them to ask questions. This meeting allowed the town to find out what residents wanted to know. Additionally, online newspaper articles provided the option for readers to leave their comments in response to the article. Long strings of comments between residents and self-proclaimed health experts go back and forth expressing concerns and asking questions (Pinto, 2008). This shows the importance of providing the information that the public actually needs. The next month, residents received a letter and a pamphlet from the state’s Department of Public Health containing the answers to their questions posed at the town meeting. The pamphlet was divided into multiple sections to address the various topics of concern expressed, such as describing uranium and its associated negative health affects, the standards for uranium levels, and how levels are monitored within humans. The pamphlet explains what had already been done in Madison and what potential courses of action were. It also contained numerous phone numbers both within the town and the state department which residents could call for more information. They provided the public with these additional sources of information in case a resident’s question was not adequately answered or addressed; the resident could call one of these phone numbers and receive the answer to the question.

Although the pamphlet did have a chart showing the results of a laboratory experiment about the effects of uranium on dog kidneys, the pamphlet itself is not an overwhelming bombardment of numerical data. According to several studies, most people express difficulty in understanding numerical data because “...their interpretation is dependent on their level of numeracy and on the specific numbers used to illustrate a risk” (Julian-Reynier, 2003). The state recognized that most people would not understand the technicalities of the dog kidney test results, and so it simplified the data into a small, simple chart followed by a full explanation (Connecticut Department of Public Health, 2008). Because of the town meeting and various online comment threads, the town and the state were fully aware of what information the Madison residents wanted, and they were able to provide that information to address the needs of the

residents. This shows the importance of tailoring information to address the questions and concerns about which the public is most worried. Providing the answers to the public's questions is an example of tailoring the information according to the public's needs so they can better understand it.

Furthermore, the state's decision to send this pamphlet through regular post mail instead of through email or a newspaper announcement was a conscious decision; a majority of the town's population is elderly and does not have email while many people do not read the newspaper. Consequently, the state chose the most reliable way to send information to as many of the town's residents as possible. In the *New Haven Register*, a local newspaper, one journalist reported that according to a Madison resident who is a parent of students attending both schools supplied by the uranium water, "...while she found the news startling, she trusted that the situation would be handled and would not result in any health problems for her children" (Pinto, 2008). It appears many of the residents of Madison, although surprised and somewhat angered by the news that their children had been ingesting uranium-supplemented water, have been satisfied by the communication efforts and corresponding actions of the town and the state to begin fixing the problem.

5.6 Appealing to cultural beliefs

An example from Thailand that used cultural beliefs to make risk communication more effective was the Don't Drive Drunk Foundation's (DDD) good luck amulet campaign. Explained to us by the Foundation's Secretary-General, this campaign was led at a well-known Chinese temple in Thailand to promote the benefits of not driving drunk. During this event, the Foundation led a ceremony to bless pocket-sized, golden amulets to bring good luck and fortune to those who carried them. This Chinese blessing was written on the amulets, and anyone could write a letter to the DDD requesting one. The Foundation mailed the requested amulet along with a packet of information about the dangers of drinking and driving. The purpose of these amulets was to remind people whenever they looked at them that good fortune comes to those who do not drink and drive; they are supposed to make individuals think twice before drinking and driving. The DDD appealed to the Chinese population in Thailand by using the Chinese belief of good luck and good fortune in order to convey a message that would influence people's decisions about driving drunk.

6. Conclusions and Recommendations

In this chapter, we provide a brief summary of our findings and an explanation of our recommendations. Through research and analysis of interviews, we were able to characterize risk communication efforts in Rayong, identify areas for improvement, and discover potential strategies to help improve these areas. It is in this chapter that we complete the last objective towards achieving the goal of this project by developing a final set of recommendations. We hope these recommendations will help improve risk communication efforts in Thailand.

6.1 Summary of Key Conclusions

The interviews we conducted helped us to determine risk communication efforts currently being used in Rayong. However, we must acknowledge the limited scope of our data gathering, as we were unable to interview several stakeholders due to time constraints and scheduling conflicts. Therefore, our conclusions can only be considered suggestive of the risk communication efforts in Rayong, Thailand.

We developed three main findings concerning HIV/AIDS risk communication:

HIV/AIDS risk communication is reaching a wide range of people. We found that the national government and the hospitals are the main sources of information. Information is then forwarded to the other levels of government and civil-societies. The stakeholders use campaigns to convey the information to the public. We concluded that HIV/AIDS information in Rayong is reaching a wide range of people through the efforts of various civil-societies as well as the national, provincial, and local governments.

HIV/AIDS risk information involves two-way communication as a result of feedback loops. We discovered that after every campaign, stakeholders usually have protocols to allow the public to provide feedback. The government provides the public with surveys so it can give recommendations on their campaigns. Similarly, we discovered that civil-societies encourage people to ask questions during classes, conferences, and discussion meetings. This data suggested there is strong two-way communication because feedback is used to make communication efforts more effective.

HIV/AIDS stakeholders have the same purpose for communicating risks. Many of the stakeholders involved with sharing HIV/AIDS information shared the same purpose—to communicate information with the public in order to prevent the spread of HIV/AIDS. We discovered all stakeholders were interested in reaching all types of audiences. The collaboration among stakeholders was evident because civil-societies acted as mediators between the government and the public, increasing the credibility and comprehensibility of the information.

We also developed two main findings for motorcycle risk communication:

Messages about motorcycle risks are received and understood by the public. We discovered that the main sources of information include the government, hospitals, and civil-societies. Campaigns are used to convey the information to the public using a wide variety of media such as television, radio, and posters to transmit the information. Additionally, interviews with the residents of Rayong suggested the people knew and understood the information regarding motorcycle safety.

Motorcycle accident stakeholders have the same purpose for communication. We discovered with every stakeholder we interviewed, that they all had the same purpose for risk communication; they are fully committed to preventing motorcycle accidents. We also found evidence of collaboration between stakeholders and concluded they work well together because they share the same purpose for communicating motorcycle risk.

We then developed three main findings for petrochemical pollution risk communication:

Petrochemical risk stakeholders have different objectives because they are influenced by outside factors. Petrochemical risk communication, unlike the other two health issues, is influenced by an outside factor, economic growth. This means petrochemical stakeholders have different objectives from those of HIV and motorcycle accidents. This struggle to balance economic growth with social implications has also resulted in complicated information flows and little collaboration between and within all stakeholders to share information.

There is limited evidence of two-way communication between stakeholders regarding petrochemical risk communication. Our interviews revealed that the information flows between stakeholders concerning petrochemical risk communication are far more complicated for two reasons: the information about pollution provided by the industry and the government is often confusing and cannot be understood by all the stakeholders, and feedback from the public is not considered by the stakeholders and often goes unanswered. This directed us to believe that two-way communication is weak.

There is public outrage and a lack of trust as a result of poor petrochemical risk communication. Our interviews revealed that many residents do not respond positively to the communication efforts made by the stakeholders for three reasons: they do not trust the monitoring techniques or the data gathered by the industry or the government; they do not trust services provided by the industry; and they have been physically affected by pollution. The combination of these factors makes communication difficult in this particular case.

Finally, we generated two findings concerning the comparative analysis of the risks in Rayong:

The fundamental difference between behavioral risks and risks that are out of the individual's control is how they are perceived by the public. We discovered that despite the effectiveness of risk communication, individuals may still choose to take a behavioral risk because many behavioral risks are not associated with many risk perception factors, lessening the amount of concern they receive. Conversely, risks that are out of the control of the individual tend to have more risk perception factors associated with them, thus increasing the concern they receive. These types of risks are often associated with lack of trust and outrage. These conclusions parallel what we learned from the risk communication literature.

Civil-societies have differing roles in risk communication depending on the type of risk. We discovered civil-societies involved with behavioral risks simply contributed to the already existing communication flow supplementing their information to the information generated and forwarded by other sources and transmitters. However, civil-societies involved with risks that were out of the control of the individual seemed to align their purposes or efforts with only certain stakeholders and hindering communication.

6.2 Recommendations

Through the consideration of these findings and conclusions, we developed a final set of recommendations. While our project focused on studying risk communication efforts in Rayong for HIV/AIDS, motorcycle safety, and petrochemical pollution, we concentrated on developing recommendations that could be applied to general risk communication challenges. It is in this broadening of the recommendations that we hope they will help improve risk communication beyond the Rayong province to all of Thailand. None of these recommendations are easily implemented and will likely require a long-term effort that could be facilitated by training and development projects. These projects could use the examples of successful improvement strategies we provide with each recommendation as a base for ideas or discussion. Details regarding these specific examples can be found in Chapter 5.

We recommend senders of information establish feedback loops with receivers of information.

Without feedback loops, sources and transmitters of information receive no assessment from the receivers concerning their risk communication efforts. These feedback loops are particularly important for risks that are out of the individual's control because it provides the individual with some semblance of control. If feedback loops were developed between the public and the local government, civil-societies, and other extra stakeholders such as companies, the public could provide useful information in order for these other stakeholders to improve their risk communication efforts. For Thailand, a feedback loop between the public and the local government would allow for simpler transmission of public feedback from the local to the provincial governments and ultimately, the national government. Feedback loops not only help to assess the effectiveness of risk communication efforts, but they also identify and share the public's specific needs to the transmitters and sources. They are only complete once the involved stakeholders consider and respond to the feedback in some manner. The following example provides a strategy that can be used to help develop feedback loops in Thailand.

Public Service for the 21st Century in Singapore

The Public Service for the 21st Century movement in Singapore has worked to develop strong feedback loops from the public to the private and government sectors. It uses call centers where public service officers are uniformly trained to address the public's concerns in an effort to satisfy the callers and consider its opinions. Call centers also organize feedback in order to identify common concerns among the public. This allows private and governmental organizations to evaluate and improve their current risk communication efforts as well as make other necessary changes that show public opinion matters and is being considered.

We recommend stakeholders collaborate in order to share the same information.

Collaboration between all stakeholders can make the same information accessible to everyone. Specifically, organizations that primarily gather information about pollution, such as the Department of Disease Control, the Pollution Control Department, the Map Ta Phut Industrial Estate, and Greenpeace, could share information before releasing it to avoid conflicting data. Consequently, messages would be more convincing to receivers because they are not receiving conflicting messages. It could also help to avoid unnecessary repetition of research. The following example demonstrates a strategy that can be used to help stakeholders collaborate to share the same information, especially the numerous departments and divisions of the Thai government.

The National Road Accident Database System used in Vietnam is a database that makes road accident information readily accessible to government officials. Officials can easily look up the information they need and communicate risks using the same information to avoid confusion or conflicting messages.

We recommend the establishment of civil-societies that are objective towards other stakeholders' advocacies in order for the civil-societies to facilitate communication between all stakeholders.

Civil-societies that are objective towards other stakeholders' purposes are able to facilitate communication between stakeholders by acting as transmitters of information. Because they are objective, they can share information without bias and strengthen or form communication flows between stakeholders. Creating these flows, along with having an intermediary organization, makes collaboration between stakeholders with different objectives easier. Specifically, for risks that are out of the individual's control where stakeholders typically have differing purposes, the establishment of objective civil-societies would provide a transmitter responsible for sharing accurate information between them. Objective civil-societies already exist for some risk issues, but their existence for all issues, would greatly benefit risk communication in Thailand. The following example provides strategies for how objective civil-societies can facilitate communication and collaboration between stakeholders with different objectives.

PDA Collaboration with Nike, the Government, and the Public in Thailand

The Population and Community Development Association (PDA), as an objective civil-society facilitated communication and collaboration between Nike, the Thai government, and the public. It organized and managed a project to teach sustainability techniques to a rural community within close proximity to a Nike facility. The PDA divided project efforts between both the company and the government in order to create an equal sense of ownership and involvement in the project. Ultimately, the public benefited from the project, improving the public image of both Nike and the government because residents had previously felt neglected by these two organizations. Nike and the government would not have been able to successfully work together without the PDA.

We recommend companies and the government establish trust with local communities during the planning stage of projects, especially when the project is likely to involve stakeholders with different objectives.

In order for risk communication to occur, trust must exist between all stakeholders. This is not hard to do when stakeholders have the same objectives for communicating risks as is often the case for behavioral risks, but when an external factor influences stakeholders' objectives to be different, communication may not take priority resulting in a lack of trust. This lack of trust usually occurs between the receivers, typically the public, and the sources of information. By making risk communication and trust-building an evident priority during the planning stages of a project, trust can be more easily established.

We recommend all stakeholders use or develop strategies to mitigate outrage and to rebuild trust after it has been lost.

Once lost, trust is very difficult to restore. Many times, this is because the level of outrage has escalated. Receivers will not listen to risk communication if their level of outrage is too high; therefore, outrage must be mitigated in order for communication to occur. Mitigating outrage and

building trust go hand-in-hand. People are often angry as a result of their lack of trust, so attempts to rebuild trust will often result in a lowered level of outrage. Ways that trust can be rebuilt are for the stakeholder not being trusted, usually the government or an extra stakeholder such as a company, to make itself “transparent” to the public, to participate in community activities, to directly benefit the local community, to actively consider community concerns, and to involve community members in development stages. The following examples provide strategies to accomplish these tasks and to attempt to rebuild trust. These strategies would be particularly useful for risks out of the individual’s control simply because the nature of this type of risk lends itself to a lack of trust.

“Foschem’s” Trust Building in England

A company in England, identified as “Foschem” for the purposes of this paper, successfully rebuilt its trust with the public through several strategies. This success, however, only occurred after almost twenty years of hard work. “Foschem” strived to make itself transparent to the public by opening itself up for open site days and regular tours as well as periodically distributing newsletters to local residents and businesses. It encouraged public participation through public discussions and assured the important consideration of community concerns by creating a community committee to provide input during development stages. “Foschem” also established a more positive relationship with the public by organizing community activities to improve the environment such as planting trees.

EGAT’s Efforts to Build Trust in Thailand

The Electricity Generating Authority of Thailand (EGAT) has attempted to restore trust with local communities for almost a decade. As of yet, there is no evidence as to whether or not its attempts have worked. However, its nine work plans to rebuild trust parallel the efforts of “Foschem”, which could mean establishment of trust may be in the near future. One effort that EGAT makes, in addition to those of “Foschem”, is that it provides monetary funding to directly benefit local communities through social activities on holidays, scholarships for students, and guest speakers at schools.

Recommendations for Sources and Transmitters to Tailor Information for Receivers

The following four recommendations are aimed to help sources and transmitters have their information reach, be understood by, and appeal to the receivers. By using multiple communication channels, considering everyone a target audience, making the information understandable, and appealing to cultural beliefs, sources and transmitters can increase their chances of conducting successful risk communication. The first three of these recommendations are applicable to both behavioral risks and risks out of the individual’s control, while the last one is primarily applicable to behavioral risks.

We recommend sources and transmitters use multiple communication channels.

Using multiple channels for communication such as newspaper, television, telephone, radio, internet, pamphlets, and various campaigns, helps messages reach a greater number of people. Not all people can afford a computer or a television, but most do have telephones, and newspapers are easily accessible to virtually everyone. Different types of channels stimulate people differently, so using multiple channels may help to reach and affect a wider range of people. The following example, also used as an example for developing feedback loops, provides strategies for utilizing multiple channels to increase outreach.

This movement encourages the continual development and use of multiple types of media in order to accommodate the largest number of people. The Singapore government specifically supports the development of interactive digital media, which enables receivers to interact with the media to appeal to a more active learning style. While telephones and televisions are both types of interactive digital media, online communities, blogs, and forums, as a result of nation-wide internet access, have been the main contribution to Singapore's success in outreach.

We recommend sources and transmitters consider everyone a target audience.

Oftentimes health issues affect virtually everyone. When communicating risks it is often useful for transmitters of information such as the local government and civil-societies to consider everyone a target audience. If these stakeholders focus solely on specific groups of individuals, then the information will not reach other groups of people who may also be in need of the information. By stakeholders equally communicating their information to a wide range of people, more people will be exposed to the information. By targeting as many people as possible, sources and transmitters can share their information with more people.

We recommend sources and transmitters make information understandable to the general public.

Often information is received by the receiver but is not understood. According to Fischhoff's definition of risk communication, this results in an unsuccessful exchange of information. This is a frequent problem when trying to share technical information. By considering the nature of the audience, sources and transmitters can not only convey their message to the receiver but also have it understood. Some transmitters use comparisons to explain difficult information, while others may choose to communicate only about how the public can protect itself and only making the technical information available to those who specifically request it. The following examples describe strategies for achieving this recommendation.

Uranium in the Water Supply in Madison, CT, USA

The town government of Madison, CT, provided useful information to local residents about the discovery of uranium in the town's water supply by tailoring technical information based on the needs and concerns of the people as expressed in a town meeting. The government created a pamphlet that explained what uranium was, its health effects, what was currently being done to control the problem, and what people could do to protect themselves. The pamphlet was written to contain as few technical terms and numerical data as possible to avoid confusing residents.

We recommend sources and transmitters appeal to the cultural beliefs of the receivers.

The local government and civil-societies can tailor information by making it appealing to the cultural beliefs of the public. This recommendation could be especially effective for communicating behavioral risks. For example, Karma is a popular belief among many Thais, and correlating its message with a risk prevention method could be useful in improving the effectiveness of Thai risk communication. If local governments and civil-societies suggest that doing an action such as wearing a helmet is "good," then people might choose to wear a helmet if they believe doing so will bring them good fortune in the future. The following example demonstrates a strategy for appealing to cultural beliefs.

The Don't Drive Drunk Foundation held a campaign at a popular temple in Thailand to explain the benefits of not driving drunk. The Foundation tried to make its risk message appeal to cultural beliefs by making amulets that were blessed by a temple for good fortune and distributing them to the public. The amulets were supposed to remind drivers that good fortune would come to those that did not drive drunk.

Recommendations for Future Work

We have identified two recommendations for future researchers based on two gaps in our research that we feel should be considered.

We recommend that risk communication researchers solicit the viewpoint of the private sector.

Due to time constraints and conflicts, we were unable to interview any petrochemical facilities in Rayong. While we did complete interviews with the Industrial Estate Authority of Thailand and the Map Ta Phut Industrial Estate, both of which manage several petrochemical companies within Rayong province and the rest of Thailand, we believe interviews conducted directly with companies would provide a more thorough understanding of every stakeholder's viewpoint concerning risk communication. Understanding every stakeholder's viewpoint would result in a more representative model of the current risk communication efforts in Rayong and Thailand.

We recommend that risk communication researchers solicit the viewpoint of a wide range of academic researchers.

We were only able to interview two academic researchers whose responses to interview questions were quite different. As a result, we were unable to draw any conclusions as to their role in risk communication. We feel their contributions could potentially be similar to those of civil-societies by facilitating communication between other stakeholders. We considered some academic researchers might hold workshops, teach classes at community centers, or perhaps even take a similar role to health volunteers in sharing their information on a more personal level. We believe interviewing several academic researchers from a wide range of issues could help to establish a more thorough understanding of their roles in risk communication in Thailand.

6.3 Concluding Remarks

In conclusion, we hope the risk communication flow charts, strategies, conclusions, and recommendations we have developed can be used to help improve risk communication efforts in Thailand. These recommendations in conjunction with the example strategies we provided could be used as a foundation for material and discussion topics in training workshops and other development initiatives to facilitate improvement of risk communication in Thailand. Improvement in risk communication could result in better awareness of public health in order for all stakeholders to make informed decisions as well as to help prevent people from being harmed by various risk issues.

Appendices

Appendix A: List of Stakeholder Interview Questions (English Version)

Our interview questions were generated from our research questions.

- 1) What is your job? What do you do?
 - a. For Changwat officials, could you explain your Action Plan and how it works?
 - i. Is a written copy accessible? Where?
- 2) What is your department/organization's goal/mission?
 - a. Does your organization ever get involved in any of these two other issues (follow up later if time permits)?
- 3) How important do you think it is to communicate risks?
 - b. How come?
- 4) What is your purpose for communicating risk?
 - c. Could you provide an example?
 - i. What would have happened if there was no communicating of risks in that example?
 - d. What happens when communication of risks occurs?
 - i. Benefits/Consequences?
 - e. What do you think would happen if there was no communication?
 - i. Benefits/Consequences?
 - ii. Do you have any personal experience in a situation where there was a lack of communication?
- 5) What (who) are your sources of information?
- 6) How do you share information?
 - f. What forms of media do you use (channels)?
 - g. What kind of language do you use?
 - h. How much information do you share?
 - i. How do you determine what information is/is not shared?
 - i. How do these techniques change when your audience changes?
 - j. How come you share information in this way?
 - i. Do you think this method is effective?
 - How come?
- 7) Do you consider yourself a source of information or a receiver of information?
 - k. How come?
 - l. Have you ever considered that you are also a _____ (insert opposite)?
- 8) Who do you provide information to (receivers/audience)?
- 9) Do you think your information reaches your target audience?
 - m. If not, how come?
 - n. How do you monitor and assess this (process/criteria)?
 - o. What is the quality of the information once it reaches your target audience?
- 10) How does the public let you know it is not receiving enough of adequate information?
 - p. Do you connect with local officials/communities about feedback of information?
- 11) What kind of information do you share?
 - q. How come you share this particular information?
 - r. How do you determine what information to share?
- 12) Can you describe the ideal flow of information?

13) Who else should we talk to?

Extra Questions

- In your opinion what would help to improve the flow of information?
- How do you feel about the government's/NGOs' role in communicating risks?
- For academic researchers, Who do you consider your audience? Who should be receiving your information?
 - o Do you see yourself as a source or a receiver of information?
 - o Do you feel any personal obligation to share your information (if so, why and what do you do)?
- For government, How do you enforce communication and information sharing?
- Experiences in other issues (Supawan's suggestion)?

Appendix B: List of Stakeholder Interview Questions (Thai Version)

Our interview questions were generated from our research questions first in English. Then Sudatip (Yok) Chaiwattanaroj and Withasinee (Oat) Rattanabumrung translated them into Thai.

- 1) บทบาทหรือหน้าที่ของคุณในหน่วยงานคืออะไร? ทำอะไรบ้าง
- 2) วัตถุประสงค์หลักและหน้าที่หลักของหน่วยงานคุณคืออะไร
- 3) คุณคิดว่าการประชาสัมพันธ์เกี่ยวกับอันตรายให้ประชาชนทราบและการรณรงค์มีความจำเป็นมากน้อยเพียงไรเพราะเหตุใด
- 4) จุดมุ่งหมายและจุดประสงค์ในการประชาสัมพันธ์เกี่ยวกับเรื่องดังกล่าวคืออะไร
 - a. ในหน่วยงานของคุณ?
 - b. การประเมินผลหลังการรณรงค์/ประชาสัมพันธ์?
 - i. ประโยชน์ที่ได้รับ
 - ii. ผลที่ตามมา
 - c. ในความคิดเห็นของคุณ จะเกิดอะไรขึ้นหากไม่มีการประชาสัมพันธ์ในเรื่องดังกล่าว
 - i. ประโยชน์
 - ii. ผลที่ตามมา
- 5) คุณนำแหล่งข้อมูลต่างๆมาจากที่ใด
- 6) คุณเผยแพร่ข้อมูลจากอันตรายดังกล่าวโดยวิธีใด
 - a. ใช้ช่องทางใดเป็นสื่อในการเผยแพร่ข้อมูล
 - b. ระดับภาษา หรือ ภาษาที่ใช้(อังกฤษ/ไทย)
 - c. ข้อมูลที่เผยแพร่ นั้นมากน้อยเพียงใด
 - i. อะไรคือข้อตัดสินใจในการเผยแพร่หรือไม่เผยแพร่ข้อมูลนั้นๆ
 - d. วิธีการในการเผยแพร่ข้อมูลเปลี่ยนไปกับกลุ่มเป้าหมายหรือไม่ อย่างไร
 - e. ถ้ามี เหตุใดจึงเลือกที่จะใช้วิธีดังกล่าวในการสื่อสาร
 - i. วิธีดังกล่าวเป็นผลหรือไม่ อย่างไร
- 7) คุณคิดว่าคุณหรือหน่วยงานของคุณคือแหล่งข้อมูลหรือผู้รับข้อมูล
- 8) ใครคือกลุ่มเป้าหมายผู้รับข้อมูลของคุณ?
- 9) คุณคิดว่าข้อมูลที่คุณนำมาเผยแพร่เข้าถึงกลุ่มเป้าหมายหรือไม่
 - a. ถ้าไม่/เพราะเหตุใด
 - b. มีวิธีปฏิบัติ

C. ข้อมูลเมื่อส่งถึงกลุ่มเป้าหมายมีคุณภาพมากน้อยเพียงใด

- 10) ประชาชนทั่วไปสามารถร้องเรียนหากไม่ได้รับข้อมูลข่าวสารดังกล่าวได้หรือไม่ อย่างไร?
- 11) ทางหน่วยงานติดต่อประสานงานในผลตอบรับของข้อมูลหรือไม่
- 12) ข้อมูลที่กล่าวมาข้างต้นทั้งหมดเป็นข้อมูลประเภทใด
- 13) เหตุใดจึงต้องเป็นข้อมูลดังกล่าว
- 14) เหตุผลในการเลือกข้อมูลเพื่อประชาสัมพันธ์
- 15) อธิบายภาพรวมในการสื่อสารกับประชาชนเกี่ยวกับอันตรายในเรื่องดังกล่าว
- 16) สามารถแนะนำผู้อื่นที่สามารถให้ความรู้เพิ่มเติมที่เป็นประโยชน์ต่อโครงการได้หรือไม่



Chulalongkorn University
Thammasat University
Bangkok, Thailand
Worcester Polytechnic Institute
Massachusetts, USA



CONSENT FORM

Risk Communication in Thailand: A Case Study in Rayong Province

1. What is the purpose of this project? The purpose of this project is to better understand the efforts of risk communication within Thailand and specifically, the Rayong province, in relation to petrochemical pollution, HIV/AIDS, and motorcycle accidents. We want to use this information to help improve Thailand's risk communication efforts.
2. Why do we want to speak with you? We want to speak with you because we think you have valuable information about risk communication and/or public health.
3. What do I have to do? We will schedule one meeting to interview you. We will request to record the interview, take notes, and later, transcribe the tape.
4. Who will know what I say? We, the five students working on this project, our sponsors, and our advisors associated with Chulalongkorn University, Thammasat University, and Worcester Polytechnic Institute will know what you say. Our final report will be available for public viewing through the Worcester Polytechnic Institute's online library website. At your request, we will keep your name, position, and/or complete identity confidential.
5. Are there any risks and/or benefits of participating in this project? We believe there will be no risks to you by participating in this project. Upon your request, we will omit or change your name from our report and our transcripts and notes of the interview. We believe the interview will provide you with a chance to share your opinions so they can be heard.
6. Do I have rights as a respondent? Yes. Your rights as the respondent include asking any questions regarding our project and our research. You may withdraw from the study at any time because your participation is voluntary, and you may request for your name to be omitted or changed in our report and/or transcripts.
7. What will be published? We will produce a report containing our findings, which will contain material that may be used in risk communication training workshops.
8. If I want more information, whom can I contact?

Sudatip Chaiwattanaoj, gazaalong72@hotmail.com
Miguel Herrera, herreram@wpi.edu
Rebecca Holmberg, r44rey18@wpi.edu
Withasinee Rattanabumrung, thisis_oat@yahoo.com
Hannah Shapiro, hshapiro@wpi.edu
Dr. Seth Tuler, sptuler@SERI-us.org

Please check which box applies:

I do not want my name and position to be included in the report
It does not matter if my name and position are included in the report

Interviewee Signature: _____ Date: _____

Interviewer Signature: _____ Date: _____

Appendix D: Consent Form (Thai Version)



Chulalongkorn University
Thammasat University
Bangkok, Thailand
Worcester Polytechnic Institute
Massachusetts, USA



ใบยินยอมด้วยความสมัครใจ

การวิจัยเรื่อง การสื่อสารปัจจัยเสี่ยงด้านอนามัยสิ่งแวดล้อมในมาบตาพุด จังหวัดระยอง

วันที่ให้คำยินยอม วันที่.....เดือน.....พ.ศ.....

ก่อนที่จะลงนามในใบยินยอมให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัย ถึงวัตถุประสงค์ของการวิจัย วิธีการวิจัย รวมทั้งประโยชน์ที่เกื้อหนุนจากการวิจัยอย่างละเอียด และมีความเข้าใจดีแล้ว

ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆ ที่ข้าพเจ้าสงสัยด้วยความเต็มใจ ไม่ปิดบังซ่อนเร้นจนข้าพเจ้าพอใจ
ข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วม โครงการวิจัยนี้เมื่อใดก็ได้และเข้าร่วม โครงการวิจัยนี้โดยสมัครใจ
ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่เป็นสรุปผลการวิจัย
การเปิดเผยข้อมูลข้าพเจ้าต่อหน่วยงานต่างๆ ที่เกี่ยวข้องกระทำไปเฉพาะกรณีจำเป็น ด้วยเหตุผลทางวิชาการเท่านั้น
ข้าพเจ้าได้อ่านข้อความข้างต้นแล้ว และมีความเข้าใจดีทุกประการและได้ลงนามในใบยินยอมนี้ด้วยความเต็มใจ
ข้าพเจ้าไม่สามารถอ่านหนังสือได้ แต่ผู้วิจัยได้อ่านข้อความในใบยินยอมนี้ให้แก่ข้าพเจ้าฟังจนเข้าใจดีแล้ว
ข้าพเจ้าจึงลงนามหรือประทับลายนิ้วมือเมื่อขวาของข้าพเจ้าในใบยินยอมด้วยความเต็มใจ

ลงนาม.....ผู้ยินยอม

(.....)

ลงนาม.....พยาน

(.....)

- ต้องการให้ใส่ชื่อและตำแหน่งลงในผลงาน
 ไม่ต้องการให้ใส่ชื่อและตำแหน่งลงในผลงาน

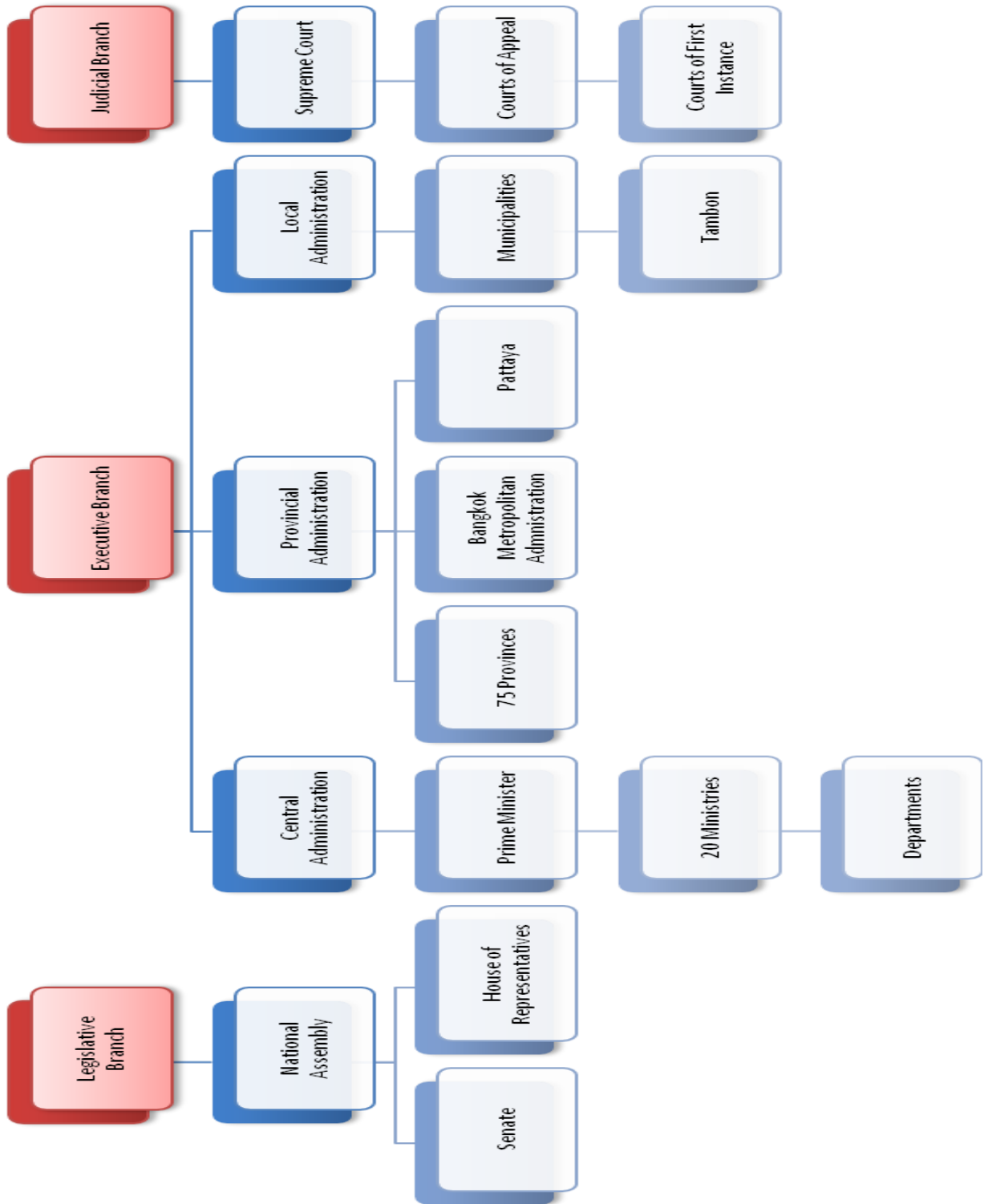
หากมีข้อสงสัยประการใดเกี่ยวกับการศึกษาวิจัยครั้งนี้สามารถติดต่อสอบถามได้ที่

นางสาวสุดาทิพย์ ชัยวัฒนาโรจน์ โทร 08-9633-7995 E-mail:gazaalong72@hotmail.com, นางสาววิธาสินี รัตนบำรุง โทร08-1190-7536 E-mail: thisis_oat@yahoo.com คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

Mr. Miguel Herrera E-mail: herreram@wpi.edu, Miss Rebecca Holmberg E-mail: r44rey18@wpi.edu หรือ Miss Hannah Shapiro E-mail: hshapiro@wpi.edu
Faculty of Science Worcester Polytechnic Institute, Massachusetts, USA

Dr. Seth Tuler, sptuler@SERI-us.org

Appendix E: Organizational Chart of the Entire Royal Thai Government (“Complete Royal Thai Government,” 2002)



Appendix F: Chart of Interviewees

Organization	Department	Position/Title	Interviewees	Language
Government				
Ministry of Public Health	Department of Disease Control (Bureau of Occupational and Environmental Diseases)	Head of Information Technology	Dr. Seth Tuler Sudatip Yok Chaiwattanaoj Hannah Shapiro	English
Ministry of Natural Resources and Environment	Pollution Control Department	Director of Air Quality and Noise Management Bureau	Dr. Seth Tuler Miguel Herrera Sudatip Yok Chaiwattanaoj	English
Rayong Municipality	Public Health and Environmental Department	Head of Department	Sudatip Yok Chaiwattanaoj Miguel Herrera Withasinee Oat Rattanabumrung	Thai
Rayong Provincial Government Office	Public Health Department	Head of Department	Sudatip Yok Chaiwattanaoj Miguel Herrera	Thai
Ministry of Public Health	Department of Disease Control	Chief of AIDS Cluster	Sudatip Yok Chaiwattanaoj Miguel Herrera	Thai
Ministry of Public Health	Department of Infectious Diseases (Non-communicable Disease Division)	Researcher	Rebecca Holmberg Hannah Shapiro	English
Civil-Societies				
Petroleum Institute of Thailand	N/A	Safety, Health, and Environment Advisor	Dr. Seth Tuler Rebecca Holmberg	English
Thailand Global Road Safety Partnership	N/A	Regional Programme Director of Asia and Secretariat	Sudatip Yok Chaiwattanaoj Withasinee Oat Rattanabumrung	English
Camillian Socio-Health Institutions Identity	N/A	Vice-President	Sudatip Yok Chaiwattanaoj Miguel Herrera	Thai
Kho-Keaw HIV Club, Rayong	N/A	Club Staff	Sudatip Yok Chaiwattanaoj Miguel Herrera	Thai
Don't Drive Drunk Foundation	N/A	Secretary-General	Rebecca Holmberg Hannah Shapiro	English
Academic Researcher				
Thammasat University	Faculty of Public Health	Researcher (Open Society)	Rebecca Holmberg Hannah Shapiro	English
Thammasat University	Faculty of Public Health	Associate Professor	Sudatip Yok Chaiwattanaoj Hannah Shapiro	English
Public				
Rayong residents (Mr. Suthi Atejasai, Coordinator of Eastern People Network)			Dr. Seth Tuler All team members	Thai

Appendix G: Cultural Essays of WPI Researchers

The WPI-Bangkok Project Center provides students with a special opportunity to advance their intercultural awareness and competence. During the preparation period and on-site, students learn about general categories of cultural difference, specific aspects of Thai culture, and how to distinguish cultural stereotypes from appropriate generalizations. The essays in this Appendix use the Describe-Interpret-Evaluate (D-I-E) process for debriefing and analyzing cultural encounters in constructive ways. Recommended by intercultural learning and study abroad experts, this model guides learners to separate observable facts from interpretation, and to delay judgment until multiple perspectives of the same events or behaviors have been identified and considered. By doing so they are more likely to be empathic and less likely to make incorrect interpretations and negative judgments that will limit their effectiveness when working internationally or domestically with people of different origins. Using this process can also help people manage the stress and frustration often felt in cross-cultural situations.

The following three sections contain the cultural essays of the three American students.

Miguel Herrera

In the first day that I was in Thailand, a group of friends (Rose, Nathan, Joe and Kelsey) and I decided to go visit some temples. For the first half of the day we only visited two temples because we didn't have any idea of what temples we wanted to see or how to get there. Moreover, we were reluctant to grab a tuk tuk or a taxi every time we wanted to go for a new temple because we didn't want to spend that much money. Hence, we decided to trust our feet and the map for reaching our destinations. After walking for around two hours and being lost for more than one, we started thinking that maybe it wasn't a good idea what we were doing. The interesting part of my story begins here. We stopped at a corner and we decided to ask the first Thai person we saw for advice on what temples we should go. The person was very nice and he kindly made a list of the most popular temples to see in the area. It is funny because in the conversation I remember him saying that we should take the yellow tuk tuks because they were the best for this kind of activity. As soon as he finished writing the list "coincidentally" two yellow tuk tuks popped out of nowhere and the first thing they did was to ask for the list that the first person gave us. I felt a little curious about the situation, but at the end we all agreed in taking the tuk tuks and started what would turn into a fun day of tourism.

My first interpretation of the situation was that we were part of a team effort for picking up "farangs". From my perspective it just seemed like a fixed situation, this is because, back home in Mexico, people always try to take advantage of tourists and this kind of scenarios (where people engage tourists into taking a tour or a taxi for sightseeing) happen very often and usually they are not the best deals you can get. Likewise, the "coincidence" factor was very suspicious. Another interpretation that I have is that the tuk tuks were just passing by and they spotted the following situation: a group of farangs showing and pointing at maps at a Thai person. I'm sure they immediately devised a business opportunity and decided to stop by. Again, the "timing" was very suspicious because they arrived exactly when the Thai person gave us back the list of temples. A final interpretation came days later after learning more about Thai culture, Buddhism and predestination. I can recall that the Thai persons who gave us the advice seem very happy when the tuk tuks arrived. Maybe he was happy because according to Buddhist beliefs he was meant to help us. Similarly the tuk tuks were meant to show up at that precise moment and we were just lucky.

For the situation encountered I had a wide variety of feelings, According to my first and second interpretations. I felt a little pissed because I thought we were victims of some kind of team effort for engaging tourists, which I always try to avoid when I'm back home in Mexico. Furthermore, I felt I couldn't have said no to the tuk tuks because I thought that it would have been disrespectful not to follow the advice of the Thai person and more because he was standing next to us. However,

according to my third interpretation I feel lucky and happy because if I think about it, Thai people would believe that this situation was destined to happen. The thought that I was destined to have a day full of fun and that the situation “worked out” by itself should help me realize that I was indeed lucky that day.

In conclusion my cultural experience was based on different approaches towards an everyday situation. In my home town this kind of scenarios are very common and I tend to take a negative attitude towards them. However, Thailand taught me an important lesson because there are many ways any situation can be approached and not all situations are the same.

Rebecca Holmberg

Surprisingly it was only after our first week in Bangkok when I had a cultural encounter that quite jarred me. It occurred on the weekend our group traveled to a reshotel in Kanchanaburi, where I shared a bungalow with a Thai student. After experiencing this encounter, I immediately shared it with my friends in the group simply because I was so shocked at what had happened. However, it was not until I had considered the possible reasons for why my roommate had acted the way she did, that I fully understood and actually appreciated the events of this incident. I realized I had made some conclusions about my Thai roommate without even considering her reasoning.

Exhausted from the day’s early start for our trip to Kanchanaburi—famous for a weekend filled of fun from riding elephants, climbing waterfalls, and shopping at a market floating on a river—I was eagerly looking forward to falling asleep that evening. Although my roommate and I both fell asleep relatively early, it was only a few hours later when, startled and breathing heavily, I woke up to intermittent noises in the bathroom. After sitting on the bed for a half hour listening to make sure I actually did hear legitimate noises, I called my roommate’s name. When she woke up, I asked if she had heard the noises as well. After listening for a few minutes, she confirmed she heard them but was not scared; I, on the other hand, admitted I was terrified. She called a friend from another bungalow to help us inspect the bathroom. When the friend arrived, the noises stopped. The friend opened the bathroom door, and all three of us inspected the room; nothing was hiding under the sink, in the toilet, or in the shower. All of our toiletries were in place. After the friend offered to let me sleep in her bungalow, which I adamantly refused, my roommate and I attempted sleep again. She immediately fell back to sleep, while I remained awake, waiting and listening for the movements in the bathroom to begin again. The next day, my roommate and our tour guide met me in our bungalow to discuss what had happened during the night. I described the noises, and they both agreed a ghost was haunting me. To fix the situation, they suggested I switch beds with my roommate. When I asked them why, the tour guide told me about a Chinese belief that my bed was in an unfavorable position in relation to the bathroom door, and therefore, I was being haunted by a ghost. Later that day, I returned to the bungalow and was closing the curtains above our beds when an eight-inch lizard sprinted out from under them and climbed onto the bathroom ceiling.

While I was extremely relieved to know that the lizard was our nighttime visitor, I was still confused by my roommate’s reaction to the entire situation; there were several ways I could interpret her actions. The first of which was that she actually believed there was a ghost haunting me. From my American point of view, I could not believe she had used a ghost story to explain the night noises. I explained what had happened in the reshotel bungalow to one of my Thai team members, and she laughed but then offered an explanation. She said it was not unusual for Thais to use a ghost, or a spirit, as an explanation for the unexplainable. She shared two stories with me. She said one of her friend’s rocking chair started rocking when no one was sitting in it because the spirit from the tree out of which the rocking chair was made was angry at being cut down. In the other story, she said another friend had gotten hair extensions and the next night, her bed kept moving due to the angry owner of the hair from which the extensions had been made. With this new information, I considered the possibility of my Thai roommate offering this ghost haunting as a feasible explanation. According to one of my Thai partners, this is a common practice, and perhaps because we could not find the source of the noise when we did investigate, she formulated this story as an explanation instead.

My second interpretation involved recalling what our Thai teacher had mentioned during one class and on the readings by William Klausner, a westerner who has conducted research on Thai culture for over thirty years, for another possible explanation for my roommate's story (Klausner, 1993). I remember our teacher explaining how Thais like to "save face." She said generally Thais like to avoid emotional investment, and I interpreted my roommate's story to be her attempt to keep me from feeling embarrassed; she was offering me an explanation for the noises for which I had no explanation. Klausner also echoes this cultural habit in one of his excerpts. He begins by saying how the Thai culture is associated with "...its avoidance of overt expressions..." (Klausner, 2003). Even though this situation did not exactly involve a confrontation, my Thai roommate was offering her story in order to "save *my* face" of being embarrassed by getting so scared from a few nighttime noises.

Despite doing this exercise and imagining the potential possibilities as to why my roommate would so matter-of-factly explain the scampering and rummaging noises away as a ghost, I will admit that I am still a little baffled by their reactions. When they offered the ghost explanation, I was incredulous—*how could a woman over thirty believe a ghost was the source of the noises? How could their solution to the problem involve sleeping in a different bed in the same bungalow?* When I first heard the noises coming from the bathroom, I tried to figure out what was making the noises. Then I tried to explain logically what was creating the noises. I considered tree branches or some Thai version of a squirrel running around our roof. I feel that as an Americans, we tend to believe in concrete and tangible explanations, which is what I was trying to uncover while sitting in bed. If we cannot understand why something occurs, we usually take investigative measures to discover the answer. I also think many Americans separate the secular from the spiritual—this may be a subconscious part of American culture especially since it is engrained in our country's history. Our government has always tried to adhere to the "separation of church and state" practice. Thus, the possibility of a spirit causing the noises never occurred to me. I was not a Thai but an analytical American and one who wanted a logical explanation for the noises in the bathroom.

Waking up to the sounds of movement and skittering feet in the room next door at three in the morning in an unfamiliar place was a frightening experience. From my perspective, the cause of the noise was tangible; some kind of animal had gotten into our hotel bungalow and was rummaging around our bathroom. I only wanted to discover what was making the noise so I could calm down and go back to sleep. From my Thai roommate's reaction, the cause was apparently supernatural—a ghost was haunting me. This experience was eye-opening because I had to prevent myself from giving my Thai roommate disbelieving facial expressions and an impatient, curt response when she told me the noise was a ghost. I remember having to consciously tell myself to not argue with her about her explanation. After finding out how many Thais use ghosts to explain certain events and considering her actions as a way to hide my embarrassment, I am less puzzled by her reaction.

Hannah Shapiro

My cultural experience took place on the day of our team's final presentation. The team had agreed to meet at 9:45AM at the lecture hall where we would be presenting. At 10:00AM the presentations began, and one of our teammates had not yet arrived. This particular team member often arrived twenty minutes late for meetings, so we assumed she was on her way and would be there soon. After the morning session of presentations was complete, our fifth teammate still had not arrived or called any of us. I decided to call her at the start of the lunch break to find out where she was. She did not answer, so twenty minutes later another teammate called her. This time, our missing team member answered her phone and informed us that she was stuck in traffic and would be at Chula in a half hour. The second round of presentations was to start at 1:30PM, so our team had decided to do a practice run-through at 1:00PM to "warm-up" for our final presentation at 2:30PM. At 1:00PM the missing team member had still not arrived, so the team began practicing without her. Another team member began learning the missing teammate's part in case she did not show up in time. At 1:10PM, almost three and a half hours after the time our team agreed upon to meet in the morning, our fifth

teammate arrived. We practiced our presentation, and at 2:30PM we gave a strong final presentation that everyone was pleased with.

When reflecting on this experience later that day, I came up with two reasons or interpretations why this member was so late to our final presentation, which was probably the most important day of the entire project. My first interpretation was based on my American culture. I know that I personally value time as a precious commodity, and I have witnessed that several other Americans seem to agree with this value. I have found that many Americans have expected me to be on time, especially for important events. My American interpretation of my teammate's lateness to our final presentation was that she did not care about the presentation. It seemed that the presentation was not a priority to her because it was not important to her to show up on time.

My second interpretation was based on my knowledge of Thai culture. The team member that was late was a Thai student, so her lateness could have been attributed to her Thai culture. William Klausner, a Westerner who has lived in Thailand for over fifty years and conducted a significant amount of research regarding Thai culture, explains that Thais tend to have a "more casual approach to the pressures of time" (Klausner, 1993). My Thai interpretation of my teammate's lateness was that it was "normal" because it is her culture to have a loose sense of time. Her constant tardiness to meetings was just a result of her way of life.

Both of these reasons made me feel a very different way when evaluating them with respect to my American culture and what I know about Thai culture. As an American, I was very frustrated at my teammate's lateness to our final presentation. I had been frustrated when she was late to other team meetings because I felt like she did not care about the project, but her lateness on this important day really bothered me. Our whole team had worked so hard to make our presentation the best it could be, and I was astonished that she would risk her entire grade by not leaving early enough to get to the presentation on time. I also thought it was disrespectful that she did not seem to want to watch everyone else's presentations when they would all be watching hers.

Considering this same situation with a Thai perspective, I have very different feelings towards this experience. I might not have been so worried about my teammate's lateness because I might have known she would have shown up eventually. I might have understood that it is not uncommon for people to be late to meetings and even important events. I might have felt indifferent towards my teammate's lateness and accepted it as an everyday occurrence in Thai culture.

In conclusion, my cultural experience was based on conflicting values of time. While I value every minute of every day, perhaps my teammate, like Klausner said, "has a more casual approach to the pressures of time". At the end of the day, I was impressed with our team's final presentation, and I completely forgot that one of our members showed up over three hours late.

Appendix H: Summative Team Assessment

Our team created a contract containing all the expected requirements in order for the team to function successfully. Each team member contributed to the creation of this document. In it, we describe a typical meeting, which divided the day into three sections—arrival, goal setting, and debriefing/reflection. We decided that a typical day would be from 8am-6pm. Everyone was expected to arrive on time and prepared with the necessary materials to complete the day's tasks. At the start of each meeting, we set the goals for the day and divided work based on individual preference and strength. For example, Sudatip and Withasinee researched Thai government and legislation that could only be found in Thai. At the end of each workday, we reconvened and everyone shared his or her accomplishments for the day. We recorded all goals and accomplishments in a team journal to use as a reference in our team assessments. This debriefing period also allowed team members to appreciate the accomplishments of others while verifying what still needed to be completed. In this contract, we included a calendar mapping out the entire project over the course of the eight weeks. It distinguished which days we would travel to Thammasat or remain at Chula depending on the Thai students' class schedules. This calendar also helped us track our progress throughout the project.

As previously mentioned, we divided “assignments” according to individuals' strengths in order to make the team more efficient. Rebecca and Hannah were more comfortable at writing, so they spent most of their time writing, revising, and editing drafts. Miguel, Withasinee, and Sudatip were more comfortable researching and conducting interviews, so they primarily were responsible for summarizing their research and going to interviews. However, the whole team wanted to work on areas they were less comfortable with in order to strengthen their weaknesses. For example, Miguel, Withasinee, and Sudatip worked together to write the executive summary and abstract. Rebecca and Hannah conducted some interviews to gain experience running a formal interview. Another way we efficiently divided labor was when we went to Rayong for a day to interview local residents. Instead of remaining in a large group, we broke up into three groups in order to speak with as many residents as possible. On the way home, while sharing interview stories, we all agreed that this experience really put our project into perspective; we could all see how our project could actually have a significant impact on the lives of everyday people.

One of the team's biggest strengths was every member's honesty and seriousness during weekly team assessment meetings. Everyone agreed from the start that our team assessments were an integral part of making sure our project was successful. Together, we created very extensive team, self, and team member evaluation forms (please see Appendix I). The team evaluation form required every one to reflect on the team's general effort for the week and state what the team had accomplished and how the team could improve. One week, we noticed that the team was not successfully setting goals in the morning because everyone was busy checking email. The team agreed that this lack of goal setting was detrimental to our progress, and we decided to keep our laptops closed until the goals had been set every morning. This agreement worked for the remainder of the project.

Self-evaluations required individuals to evaluate their personal roles and contributions as well as identify areas for improvement. We distinguished five roles that a team member could fill (leader, secretary, motivator, creator, and worker) with a description of each one. Members checked off which role(s) they felt they filled for that particular week. Additionally, members evaluated their writing skills and overall effort. The personal contributions section allowed team members to share and remind other members of their accomplishments. This section allowed the team to positively reflect on each member's accomplishments. The section of the self-assessment where team members identified their personal areas for improvement involved thoughtful personal introspection and strength to admit to weaknesses. Other team members were able to provide suggestions for improving these specified areas for improvement. For example, Miguel expressed his concern about his ability to write. Hannah suggested that he say what he wanted to write out loud before writing it down because she felt he was able to clearly explain his thoughts when speaking. Rebecca also offered to sit down with him after he wrote certain passages in order to explain how and why certain changes were made

to make his writing more clear. Team members were receptive to these suggestions and willing to consciously work on them throughout the rest of the project. For instance, Withasinee said she wanted to work on her English, so Rebecca suggested she resist the temptation to speak through Sudatip as a translator. The next day, Sudatip and Withasinee approached Hannah and Withasinee asked Hannah if she would like to go to 7-11. The team was impressed that Withasinee was making a conscious effort to speak English. This continued throughout the term and was exemplified in her final presentation.

Teammate evaluations required each team member to evaluate all other team members individually. This form paralleled the self-evaluation so that the two forms could be compared to each other. Additional elements included evaluating each other's writing, speaking, listening, and communication skills as well as concentration and focus. These elements were an integral part of recognizing team members' growths through out the project. For example, the team wanted Hannah to speak slower during presentations. The team suggested she work on this during all team meetings, not just during presentations. By the end of the project, the team felt that her conscious effort through out the term enabled her to speak clearly and slowly in the final presentation. Team members were comfortable communicating their opinions because they knew the rest of the team would be respectful of and seriously consider their thoughts.

The second part of the teammate evaluations was identifying teammate's weekly accomplishments and areas of improvement. Similarly to the self-assessment, this contributed to both boosting team morale regarding individual accomplishments as well as confronting other team members with concerns. For example, in the first week of the project, the team expressed concern that Rebecca came across as pessimistic about the project. She said that her pessimism was her motivation to do the project well; however, the team worried that this kind of attitude would complicate group dynamics. Rebecca's willingness to steadily work on this concern was increasingly evident as the term progressed. Team members were extremely impressed with how she handled herself when her computer crashed. Another aspect of teamwork involved with this situation was Sudatip's generosity to lend her computer to Rebecca for the remainder of the project.

One aspect of our team that everyone was consistently impressed with was our ability to handle changes to our project. Multiple project changes occurred within the first two weeks thus preventing us from solidifying our objectives and refining our methodology. Despite these unexpected changes, we remained positive and focused on parts of the project on which we could work such as expanding our risk communication and Thai government sections. We also looked at Thai legislation during this time. Once our goal and objectives were solidified we were able to rewrite our introduction and methodology chapters as well as complete our literature review. Additionally, we were able to start scheduling interviews and conducting them the third week into the project. This late start meant that we only had two weeks to conduct all of our interviews and complete all five drafts. We knew that we would not be able to finish our drafts in time because of the extensive analysis we needed to complete before writing our findings, successful strategies, and recommendations chapters. We were willing to accept the fact that submitting quality drafts on time would not be possible, and we felt it would be more beneficial to hand them in late in order to receive more useful feedback from the advisors. We emailed our advisors ahead of time to inform them of this team decision, and they agreed allowing us to submit drafts we felt were more representative of our work.

Another team challenge was trying to balance the needs of the sponsors and the advisors. At the start of the term, our team expressed concern to the sponsors that we felt we needed to schedule interviews as quickly as possible in order to schedule and complete them early enough in the term to sufficiently analyze them. Our sponsors led us to believe that interviews would only take two days to schedule due to the secretarial staff at Thammasat. We later learned that this was not the case, and our advisors expressed concern that we had not yet started interviewing at the end of the second week of the project. As a team, we were worried that our advisors thought we did not have initiative as a result of our project changing and the misguidance of our sponsor. Once speaking with our advisors, we immediately started contacting interviewees ourselves and scheduling interviews. As previously

mentioned, we were able to complete our interviews, conduct quality analysis, and submit our last draft only four days late.

Team Summary of Individual Contributions

Sudatip Chaiwattanaoj

Sudatip shared responsibilities with Miguel as a primary interviewer of our project. She served as an invaluable translator during interviews as she asked the questions in Thai, received answers, and translated them into English for Miguel. She was also additionally helpful when reviewing the recordings of the interviews conducted in Thai because she again helped translate certain quotes and passages. She helped with the analysis of the data collected in the interviews. She also translated the interview questions from English to Thai. Sudatip was our primary contact person; she contacted and scheduled all of the interviews. She also performed research on topics for the literature review. Additionally, she coauthored and edited the executive summary, abstract, and acknowledgements.

Miguel Herrera

Miguel, along with Sudatip, was one of the primary interviewers during the fieldwork stage of our project. He helped analyze the data collected in the interviews. In addition, he performed research for the background chapter and contributed in writing some sections of this chapter. He coauthored and edited the executive summary, abstract, and acknowledgements. He also contributed in the writing of the findings section of the report. He animated the flow charts from our findings to be used in our final presentation.

Rebecca Holmberg

Rebecca was a major writer of the report. Along with Hannah, she wrote the introduction, background, methodology, findings, best practices, and recommendations chapters of the report. She formatted the report and made all of the PowerPoint presentations. She revised and edited all of the drafts as well as conducted research for the background and best practices chapters. Rebecca participated in the organization and analysis of the interview data from the interviews she conducted. She was also the primary note-taker during all meetings.

Withasinee Rattanabumrung

Withasinee was responsible for translating the interviewee consent form and interview questions from English to Thai. She was a useful translator in the interviews with the residents of Rayong. She performed research for the background chapter. In addition she contributed in the writing and editing of the executive summary, abstract, and acknowledgements.

Hannah Shapiro

Hannah was a major writer of the report. Along with Rebecca, she wrote the introduction, background, methodology, findings, best practices, and recommendations chapters of the report. She revised and edited all of the drafts as well as conducted research for the background and best practices chapters. Hannah participated in the organization and analysis of the interview data from the interviews she conducted.

Personal Assessments by Individuals

Sudatip Chaiwattanaoj

Throughout the project, I contributed to the group work by arranging interviews, conducting interviews, researching for information and I also contributed in writing the Abstract, Executive Summary and the Acknowledgement sections.

In arranging interviews, I made telephone calls to the provincial and local government of Rayong and Map Ta Phut an NGO in Rayong, the Don't Drink Drive Foundation, Robert Klein, from the Thailand Road Safety Partnership, the Ministry of Public Health as well as the department of TB and AIDS.

After making the appointments, I sent the documents required for the interview as well as consent forms to all of the people I contacted. I conducted 10 interviews with various organizations and people including, the DDP, PCD, the Rayong Municipality, the Rayong Provincial Government Office, the Chief of Aids from DDP, Robert Klein from the Thailand Global Road safety Partnership, Camillion, the Socio Health Institution Identity, the HIV Club Rayong the Kho Kaew HIV Club, an academic researcher in public health and also the residents of Rayong. During and after the interviews, I translated and transcribed the information to my teammates.

The information I researched on included information from the Ministry of Industry and also the Industrial Estate Authority of Thailand. In Rayong, I also contacted an NGO from Map Ta Phut, who guided us to a local community area.

In the writing section, I helped to write the Abstract, Executive Summary as well as the Acknowledgements section along with Withasinee and Miguel.

Miguel Herrera

I believe that I have put a significant amount of effort for the project. My schedule was every day from 8a.m to 6p.m and when necessary, I stayed up late doing extra work as well as working on the weekends. For the team, I was the primary interviewer along with Sudatip. I interviewed with representatives of one department in the ministry of public health (department of disease control), one department in the ministry of natural resources and environment (pollution control department), as well as the public health department of Rayong province and the department of public health and environment of Maphaphut municipality. Similarly I interviewed representatives of the camillian socio-health institutions identity and kho-keaw HIV club as well as residents of Rayong. In total I interviewed more than 25 people. During the interviews I switched roles with Sudatip in asking questions, taking notes and operating the recorder.

I believe one of my major contributions to the team is that I analyzed most of the recordings of the interviews with the help of Sudatip and created tables summarizing the key points of the interviews. I also wrote the abstract, acknowledgements and the executive summary with the help of Withasinee and Sudatip. Additionally I conducted research on HIV/AIDS, outrage factors, negative health effects of petrochemical pollution and Thai legislation (NHA). I summarized and shared this information with Hannah and Becca, and I wrote the negative health effects of petrochemical pollution section and a part of the HIV/AIDS section of the literature review. I also took a major role in the writing of the findings chapter and gave insightful suggestions drawn from the interviews that served to add value to our report. Lastly, I animated the information flow charts of our presentation to better convey our findings to the audience.

I believe that fostering friendship and respect between the people in a team is what makes a team successful and efficient. In the team I always focused in creating a good working environment and in building relations with my teammates that go beyond being just “working” partners. My teammates will agree that I played the role of the motivator. I always tried to encourage my teammates to do work and I strived to maintain a positive attitude throughout the project. During stressful times I tried to cheer my teammates up and play music so the team could relax and work better. Being a motivator became a difficult task when tension among teammates started rising. It was hard for me to maintain a positive attitude when no one else was.

During the team assessment meetings I always tried to provide constructive criticism based on my strengths and to work in the advice that my teammates gave me. For example, Becca and Hannah told me that sometimes it was very frustrating for them not to know what I was working on, and they advice me to constantly update them. After that, I made a conscious effort to tell them at the beginning of the day what I was going to work on. Similarly, when the work was done I will let them know that I was going to start working on something else. This helped our team to coordinate better.

I also tried to give constructive advice. For example, Becca tended to feel overwhelmed with work. This triggered a mood that affected the whole team dynamics. I told her that every time she felt overwhelmed, she could talk to us and let us know what had to be done and how could we help. I encouraged her to delegate responsibilities among the team members to even the work load so she wouldn't feel overwhelmed. The suggestion seemed to help.

Rebecca Holmberg

I believe the role of leader is a natural position for me. From athletics to school projects, I seem to fill that role by setting an example of my hard work and gaining the respect of my teammates. I felt I was the primary leader throughout both ID2050 and during our time here in Thailand. Some days I shared this role with Hannah; however, most days I felt I was the primary leader. I tried to delegate assignments to fit everyone's strengths and personal preferences because in one of our first assessment meetings, Miguel specifically requested tasks be provided to him. I tried to keep the team on track during meetings—I felt that the team always looked to me to start our meetings in the morning and to start our debriefing and reflection period at the end of the workday. I made a conscious effort to include everyone, especially Yok and Oat. To try to get them more involved in our sponsor-advisor meetings, I suggested they take notes and prepare some questions the night before so they could participate in the discussion. I tried to invite them to share their opinions during our own team meetings because I knew they would not offer them unless prompted. I also realized early on that Miguel had a way of wording things in a way I would never have thought of, and I tried to pose questions to him so that we could all benefit from his responses. In our assessment meetings, all of the team members agreed that I was the group's primary leader. In addition to the role of leader, I also was the team secretary. I took copious notes during every meeting. I know the team relied on me to take these notes as it was stated several times in our team assessment meetings, which was another reason my notes were so thorough. I also was responsible for compiling and storing all of the written drafts. My organizational skills helped the team keep track of the numerous drafts.

I feel I have done a great deal of the writing for this project. Because our project was more writing-based, I realized early on that I would be one of the primary writers for this group. I consider myself a strong writer, and I know that it is often the revision stage where the most effort is required, and I feel that I have done a majority of the revisions. I took our advisors' comments, discussed them with my teammates, and thought critically about them myself. I spent many hours simply trying to better understand the comments and trying to make our writing as clear as possible to the reader. I also believe I have a very comprehensive grasp of English grammar, and therefore, I was one of the primary editors for the report. When Miguel expressed concern about his ability to write, I suggested he conduct research and then write a summary draft of what he had written. Once he completed the draft, I had him read it *with* me, and together we went through it, and I explained how certain sentences were unclear or why a comma was needed. While we were making his section more understandable, I also helped him to learn some grammar rules and writing techniques.

I believe I have made major writing contributions to this project's report, and all team members have agreed this is true during our team assessment meetings. I wrote the Introduction with Hannah the first two times during ID2050 and once again when we arrived here. I was so proud of it when we finally submitted it. Then when we got the feedback, I was so excited that we had finally written something that had really impressed our advisers. I believe the Introduction is the part of this report, and I am proud to say I was part of its creation. Additionally, I wrote a majority of the Background Chapter with Hannah. While we all conducted research on different sections, I was responsible for the Sender-Receiver and risk perception sections, the National Health Act and the National Environment Quality Act sections, and the introduction to Rayong province, petrochemical, and motorcycle sections. Since our objectives were changed in the second week, Hannah and I completely rewrote our Methodology Chapter, and I helped write the Findings Chapter, specifically the HIV/AIDS and motorcycle sections. Together with Hannah, we rewrote the Comparative Analysis section. I wrote the PDA and the Madison excerpts from the Success Stories Chapter, and in the Recommendations Chapter, I wrote the original draft of the conclusions summary. Outside of the report, I helped the team draft agendas and write research and interview questions. Because I consider myself a fairly artistic person, I formatted

our final report to make it aesthetically pleasing. I enjoy using PowerPoint, so I was responsible for making the layout and the slides for all of our presentations.

I know I have put in my absolute best effort into every aspect of this project. This was echoed in all three team assessment meetings we conducted—all members considered me a very hard worker and Yok even called me a motivator for her because I was always doing work. I am an extremely thorough person, which was echoed by my re-reading drafts multiple times before submitting them. I conducted a lot of our writing both during and after our 8am-6pm workday. I was not afraid to ask questions of advisors or sponsors or even other teammates if I did not understand a concept. I feel that I conducted myself professionally at all meetings, and I felt comfortable speaking with our sponsors. I prepared well for Friday presentations, and I tried to make Miguel, Yok, and Oat feel more comfortable with their speaking parts. I would listen intently to them multiple times, and I shared how I used to be a nervous-wreck before presentations to let them know it was normal to be scared. I always made sure to congratulate them after the formal presentations to let them know I appreciated their preparation.

Sometimes as a leader, it can be difficult to admit to personal weaknesses. However, I feel that I have learned a lot about myself from our team's extensive team assessment meetings. I have never participated in a feedback session within a team before, and I really tried to use my teammate's suggestions. For example, in our very first assessment meeting, Miguel said my frustration and anxiety with the project was often apparent to the whole team. For the rest of the term, I have tried to cope with my expressions and my emotions to prevent them from affecting other team members. Then, in the assessment meeting after my computer crashed, Miguel said he could tell I had been working on controlling my emotions because he had been expecting an eruption of anger from me when my hard-drive died. He said he was really impressed that I just went up to my room for fifteen minutes to control myself and then came back downstairs ready to work with pen and paper. He referenced another time when I controlled my frustration; Dr. Tuler had just come to meet with us to explain how the changes to our project required us to redo our objectives. Miguel said he saw me start to get flustered and then decide to simply work on the new objectives. I am glad he was willing to bring this problem to my attention at the beginning of the term to allow me to work on it throughout the project. I am also glad he remembered specific examples when he noticed my improvements.

Another situation when my frustration would become apparent was whenever other teammates were late for meetings. Originally, this *really* bothered me. I could not understand why everyone found it so difficult getting to meetings on time. I will admit I would make my frustration apparent when a teammate finally showed up for a meeting because I wanted them to know I was offended that they did not feel arriving on time was important. However, throughout the term, I realized that sometimes other factors such as public transportation can prevent team members from arriving on time (I am so used to everyone driving their own car in a smaller city, that I never really understood how dependent people are on the schedules of public transportation). I again realized there was no reason to be upset with team members when we had a project to complete—it simply created unnecessary tension.

I know that my cynical and sarcastic attitude is often perceived as pessimism by others. I realize now that this too, can affect my teammates. When everyone on the team said I should try to look at all the tasks we had accomplished instead of what we still had yet to complete, my outlook on the project changed dramatically. Instead of being frustrated that our project was changed two weeks into the term, I was now proud of the way our team handled the changes and focused myself on developing a new methodology.

These situations have taught me that it is pointless to waste energy being frustrated or worried about something out of my control and that my emotions can have a strong impact on my teammates. I simply need to move-on and complete the next task. I think this is the most valuable lesson I have learned from working in a group. The assessment meetings really helped me to see myself from someone else's perspective and provided me with suggestions to help make our group into one cohesive team.

Withanisee Rattanabumrung

Throughout the project, I have contributed to various tasks. One of the first things that I contributed was searching data from the Thai Government websites. One of the types of data, which I collected and translated, was data from the National Committee Vaccine Office and the Bureau of Epidemiology which are part of the Ministry of Health. I also read the Thai version of the Thai legislation in order to clarify various points. Apart from looking at the Thai Government legislation, I also found information which was written in Thai from the departments of Environmental Quality Promotion, Pollution Control and the Office of Natural Resources and Environmental Policy and Planning from the Ministry of Natural Resources. I also obtained information from the Pollution Control Department (PCD) and translated the important information to my teammates.

During the collection of interview information, I went to interview an official in Bangkok. I conducted an interview with PTT's Environmental Advisor with Rebecca and Dr. Seth Tuler, our sponsor. After that I went to interview officials, the experts in each our section; petrochemical pollution, HIV/AIDS and motorcycle accidents, at the local government in Map Ta Phut, Rayong province with Sudatip and Miguel by taking notes in Thai then translated to English. I also went to interview villagers in Rayong with our team and Dr. Seth Tuler, the first interview was with selected villagers from the Nikom Utsahakam Asia (the Industrial Estate) area. I and Rebecca conducted interviews with 6 villagers to which I asked the questions in Thai and translated the answers to Rebecca, who wrote the answers down in English. In the second set of interviews, I went with Rebecca to another village further away from the Nikom Utsahakam area. In the village, we had to go and ask the villagers whether we can conduct the interviews. We again conducted the interviews with randomly villagers around three people and I asked the questions and translated the answers to Rebecca.

In the writing components, I contributed by writing the Abstract, Executive Summary as well as the Acknowledgements section together with Sudatip and Miguel.

Hannah Shapiro

I believe I contributed a significant amount of time and effort to the completion of this project. I believe that because of this as well as my ability to meet deadlines set by the team, teammates would say that I was always reliable. I worked every weekday from 8AM to 6PM, but when necessary, I spent hours after work contributing to the project including nights and weekends. I wrote major sections of every chapter with the exception of the abstract and executive summary. Specifically, I wrote the risk management and most of the risk communication sections of the literature review, which I believe were two of the most difficult and important parts to write. I also wrote the entire section on Thai government with the help of research conducted by Sudatip and Withanisee as well as myself. I took a paragraph that Miguel wrote about HIV/AIDS, added valuable statistics and research to it, and lengthened it to make it a thorough section on the topic. For the methodology, I originally drafted the second and third objectives, but made extensive revisions to the entire chapter after it had been commented on by our advisors. For the findings chapter, I originally wrote the HIV/AIDS section as well as all of the comparison sections, and I later revised the petrochemical section and jointly revised the comparison section with Rebecca. I also researched and wrote about several of the successful strategies in our "extra" chapter. Lastly, I wrote most of the recommendations. I collaborated with Rebecca to revise and edit the entire report.

In addition to writing, I went on an interview with the Head of Information Technology for the Bureau of Occupational and Environmental Diseases of the DDC and conducted interviews with the Secretary-General of the Don't Drive Drunk Foundation and Niphattra Haritavorn. I also conducted interviews with nine residents in Rayong. After these interviews, I organized information from them and discussed them when our team conducted our analysis. I helped in the creation of our information flow charts by contributing my interview data as well as my knowledge about the Thai government.

I consider my greatest strength my writing, and so I concentrated on improving other personal areas through out this project. I believe that I am a very open person and receive constructive criticism well.

I think I proved my ability to receive and implement others' suggestions through out this project. For a specific example, my teammates informed me during the first week of the project that I had a tendency to interrupt people while they were talking. I considered their concern and suggested that they let me know whenever I interrupted someone. I made a conscious effort to catch myself every time I interrupted someone. After our second team assessment, team members told me that it was apparent I had been trying to control myself. By the end of the term, I believe I no longer interrupted teammates while they were speaking, and I believe team members would agree with this statement.

I not only considered the suggestions of my teammates, but also strived to address the concerns of my advisors. After our first presentation, my advisors told me that I spoke too fast. Speaking fast was an area I had felt I needed to work on, and during our team assessment I informed my teammates that I would work on this issue by making a conscious effort to speak slower at all times and making sure to enunciate words in order to help with my speech impediment. I was able to identify specific actions I could take to modify my behavior. The following week, my advisors informed me that they tell I was making an effort to speak slower because I caught myself during the presentation and slowed down.

The last way I believe I contributed greatly to the team was my ability to give constructive feedback to other team members. For example, when Sudatip was having a difficult time writing in English, I suggested she say what she was thinking and then write down what she said because while her writing was not clear, her speech was very cohesive. This suggestion seemed to help. Additionally, I often felt like an intermediary for other members of the team because they did not feel as comfortable providing feedback or they did not believe they could do so in a way that would be receptive by the team member they wanted to "criticize." For example, when Rebecca and I felt like we were contributing more to the project than other team members, I would often be the one to suggest ways in which those other team members could contribute more. Specifically, there was one day where every one on the team seemed to be in a "bad mood," and the team became extremely frustrated with each other. The next day, I initiated an open discussion about the situation, and everyone seemed responsive. We were able to resolve our issues and continue full-speed with the project.

Appendix I: Self, Team, and Teammate Evaluation Forms

The following three sections contain blank self, team, and teammate evaluation forms. These were completed by each member of the project team for every team assessment meeting.

Self Evaluation

Personal Roles (check those that apply):

Generally, when I am in a group situation or a team meeting, I consider myself filling the following roles (under the column titled "This Evaluation Period," please select the roles you filled during this particular period of evaluation).

Role	In General				This Evaluation Period
	All the time	Mostly	Sometimes or Occasionally	Never	
Leader (decision making)					
Secretary (organization, scheduling, note-taking)					
Motivator (spirit and enthusiasm)					
Creator (inventiveness and idea generator)					
Worker (reliability, determination, and persistence)					
Other (explain)					

Writing Skills (check one):

- I consider myself a(n) excellent writer, good writer, average writer, or poor writer.
- I believe I have done more than the assigned amount of writing, the assigned amount of writing, or less than the assigned amount of writing

Self Evaluation:

- My effort for this project has been excellent, good, average, inconsistent, or poor.
- This effort is representative of my usual standard or below my usual standard.
- I would consider my effort worthy of a(n) A, B, C, or F.

Using the following chart and the explanations provided in the team contract, I would rank myself (on a scale of A, B, C, or F) for the following qualities.

Quality	Grade
Punctual	
Hard-working	
Respectful	
Prepared	
Enthusiastic	
Focused	
Communicative	
Patient	
Initiative	
Supportive	

- My personal contributions to the project and the team have been:
- The areas where I could have done better are and how I can improve them are:

Team Evaluation

Overall Team Evaluation

- The team’s overall effort this period has been excellent, good, average, inconsistent, or poor.
- (To be completed after the first period of evaluation) This effort is representative of the team’s usual standard or below the team’s usual standard.
- The team accomplishments have been:
- The team could improve in what areas and how:

Teammate Evaluation

Name of Teammate Being Evaluated: _____

Teammate’s Roles

My teammate filled the following role(s).

- leader
 - secretary
 - motivator
 - creator
 - worker
 - other (explain) _____
-

Overall Teammate Evaluation

- My teammate’s effort for this project has been excellent, good, average, inconsistent, or poor.
- (To be completed after the first period of evaluation) This effort is representative of my teammate’s usual standard or below my teammate’s usual standard.
- My teammate’s writing skills are excellent, good, average, or poor.
 - o Please explain.
- My teammate’s speaking skills are excellent, good, average, or poor.
 - o Please explain.
- My teammate’s listening skills are excellent, good, average, or poor.
 - o Please explain.
- My teammate’s concentration and focus on the project work has been excellent, good, average, or poor.
 - o Please explain.
- My teammate’s communication skills are excellent, good, average, or poor.
 - o Please explain.

Using the following chart and the explanations provided in the team contract, I would rank my teammate (on a scale of A, B, C, or F) for the following qualities.

Quality	Grade
Punctual	
Hard-working	
Respectful	
Prepared	
Enthusiastic	
Focused	
Communicative	
Patient	
Initiative	
Supportive	

- My teammate’s contributions to this project include :
- My teammate could have done the following better and how:

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