



**FINAL REPORT FOR**  
**LOCAL ACCIDENT MITIGATION AND PREVENTION (LAMP)**  
**PROGRAM IN THAILAND**

**SUBMITTED TO:**

**UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)**

**OFFICE OF FOREIGN DISASTER ASSISTANCE (OFDA)**

**SUBMITTED BY:**

**WORLD ENVIRONMENT CENTER (WEC)**

**DECEMBER, 1995**

**COOPERATIVE AGREEMENT AOT-2515-A-00-2125-00**





**FINAL REPORT FOR**  
**LOCAL ACCIDENT MITIGATION AND PREVENTION (LAMP)**  
**PROGRAM IN THAILAND**

**DECEMBER, 1995**

**COOPERATIVE AGREEMENT AOT-2515-A-00-2125-00**



## Table of Contents

|  |     |
|--|-----|
| Acronyms.....  | i   |
| Foreword .....                                       | iii |
| Executive Summary .....                              | v   |
| <br>   |     |
| I. Introduction .....                                | 1   |
| II. Implementation Approach and Site Selection ..... | 3   |
| II. Baseline Indicators .....                        | 7   |
| IV. Activities .....                                 | 9   |
| V. Impact, Sustainability, and Replication .....     | 21  |
| VI. Lessons Learned .....                            | 23  |

### Appendices

|   |    |
|---|----|
| A. Chronological Summary of LAMP/Thailand Initiatives ..... | 25 |
| B. Network of LAMP/Thailand Actors .....                    | 33 |
| C. Industrial Estate Authority of Thailand Overview .....   | 35 |
| D. Thai Government Agencies Using CAMEO™ .....              | 37 |
| E. LAMP/Thailand Impact Table .....                         | 39 |



## Acronyms

|         |  |
|---------|--|
| ADPC    | Asian Disaster Preparedness Center                                       |
| AIT     | Asian Institute of Technology  |
| APELL   | Awareness and Preparedness for Emergencies at the Local Level            |
| CAER    | Community Awareness of Emergency Response                                |
| CAMEO   | Computer Aided Management of Emergency Operations                        |
| CANUTEC | Canadian Transport Emergency Centre                                      |
| CDC     | Centers for Disease Control  |
| CEPPO   | EPA Chemical Emergency Preparedness and Prevention Office                |
| CMA     | Chemical Manufacturers Association                                       |
| CRI     | Chulaphorn Research Institute  |
| DOT     | Department of Transportation (U.S.)                                      |
| EPA     | Environmental Protection Agency (U.S.)                                   |
| ICI     | Imperial Chemical Industries   |
| IEAT    | Industrial Estate Authority of Thailand                                  |
| FAPEP   | Anti Air Pollution & Environment Protection                              |
| FEMA    | Federal Emergency Management Association (U.S.)                          |
| GIA     | General Insurance Association  |
| LAMP    | Local Accident Mitigation and Prevention                                 |
| LEPC    | Local Emergency Planning Committee                                       |
| LPG     | Liquid Petroleum Gas   |
| MIACC   | Major Industrial Accidents Council of Canada                             |
| MOI     | Ministry of Industry   |
| MOIt    | Ministry of Interior   |
| MOPH    | Ministry of Public Health  |
| NESDB   | National Economic & Social Development Board                             |
| NGO     | Non-governmental Organization  |
| NICE    | National Institute for Improvement of Working Conditions and Environment |
| NFPA    | U.S. National Fire Protection Association                                |
| NSC     | National Safety Council (Thailand)                                       |
| OFDA    | Office of Foreign Disaster Assistance                                    |
| PIN     | Product Identification Number  |
| TEEX    | Texas Engineering and Extension Service (Texas A & M University)         |
| TERI    | Transportation Emergency Response Information                            |
| RTG     | Royal Thai Government  |
| US-AEP  | United States - Asia Environmental Partnership                           |
| USAID   | United States Agency for International Development                       |
| UN      | United Nations   |
| UNEP    | United Nations Environment Programme                                     |
| UNDP    | United Nations Development Programme                                     |
| WEC     | World Environment Center   |



## Foreword

This final report is submitted by World Environment Center (WEC) in accordance with its Cooperative Agreement AOT-2515-A-00-2125-00 with the United States Agency for International Development's (USAID) Office of Foreign Disaster Assistance (OFDA) for a Local Accident Mitigation and Prevention (LAMP) program in Thailand. The LAMP/Thailand project began in October, 1992 along with separate, parallel projects being conducted in India, Indonesia, and Mexico. While the three other country projects continue, the LAMP project in Thailand concluded operation in September, 1995 due to the suspension of U.S. foreign assistance to Thailand.

This report summarizes the impact of the Thailand project from 1992 - 1995 and discusses the activities and accomplishments during the three years operation at the two chosen sites -- Map Ta Phut Industrial Estate and Bangpoo Industrial Estate. The report goes on to discuss the replication of LAMP initiatives at other industrial areas in Thailand. In keeping with OFDA's Monitoring and Evaluation Manual (April, 1995), baseline indicators are referred to throughout the report as a benchmark against which all progress is measured. The report also includes discussion of lessons learned by WEC that will serve as an example for future initiatives based on or resembling the LAMP program.

WEC wishes to acknowledge the support of USAID/OFDA for providing core funding for this project, and to also thank them for their continuing support of the LAMP program in India, Indonesia, and Mexico.



## Executive Summary

In October, 1992 the World Environment Center (WEC) initiated a cooperative agreement with the U.S. Agency for International Development's (USAID) Office of Foreign Disaster Assistance (OFDA) to establish a five year Local Accident Mitigation and Prevention (LAMP) program designed to mitigate man-made disasters and emergencies in high-risk industrial areas in India, Indonesia, Mexico, and Thailand. The goals of the LAMP program are founded on OFDA's prevention, mitigation, and preparedness (PMP) mandate – to save lives and protect economic investments.

The LAMP program builds on the United Nations Environment Programme's (UNEP) Awareness and Preparedness for Emergencies at the Local Level (APELL) process and borrows key principles of developing safety and awareness capacity from this proven process. In conducting LAMP activities, WEC also relies on the expertise and experience of U.S. organizations such as the Environmental Protection Agency's (EPA) Office of Chemical Emergency Preparedness and Prevention (CEPP), the Centers for Disease Control's (CDC) Division of Environmental Hazards and Health Effects, the Department of Transportation (DOT), and other private and public sector organizations such as the Chemical Manufacturers Association (CMA), the Major Industrial Accidents Council of Canada (MIACC), and the United Nations.

LAMP's objective is to reduce the incidence and impact of major industrial, hazardous materials transport, or other technological accidents and disasters in selected areas of the target countries. LAMP activities are designed to foster sustainable improvements in emergency response and planning within the context of the local conditions and restraints such as financial resources, motivation to improve safety systems, etc. In this way LAMP works to achieve realistic goals that improve safety in the short-term and remain effective in the long-term. Another key component of LAMP is that its impact can be replicated throughout the countries where it works, and not only at the industrial sites where activities are conducted. The program is intended to be a prototype that lays the groundwork for further preparedness and mitigation efforts that can continue following the LAMP program. In addition, the capacity building that occurs and the emergency response plans and infrastructure created by LAMP, are also valuable in times of natural disaster.

LAMP has achieved a number of sustainable and replicable impacts in Thailand. Activities were curtailed in September, 1995 due to the suspension of U.S. foreign assistance to Thailand. The following report summarizes LAMP activities and achievements in Thailand during the past three years. The report also outlines the key actors at the national, regional, and local levels involved with accident mitigation and prevention at the two designated sites in Thailand: Map Ta Phut Industrial Estate and Bangpoo Industrial Estate. In conclusion, the report makes observations about the LAMP process in Thailand, and also cites lessons learned in Thailand that would be applicable to LAMP programs in other countries.

The report is submitted as a requirement of WEC's cooperative agreement with OFDA. It is also intended for audiences concerned with industrial safety in Thailand or other rapidly industrializing nations, where WEC's experience might be relevant.

The LAMP program was directed by the WEC Country Manager, Mr. Chakthep Senivongs, through interaction with key leaders from the national and local levels in Thailand. During the program's three year history, activities included a series of interventions such as APELL workshops, chemical emergency preparedness and accident prevention (CEP&AP) trainings, assessments of chemical risk and emergency plans, and hands-on training for first responders. To assist Thai emergency response groups prepare effective plans for chemical emergencies, LAMP also promoted and helped to implement the use of CAMEO™ (Computer-Aided Management of Emergency Operations). LAMP also encouraged response teams to conduct periodic emergency response exercises in order to develop capabilities. In addition, LAMP conducted medical response seminars and hospital audits to prepare medical personnel for chemical accidents in areas surrounding both LAMP sites.

LAMP depends upon the participation of emergency planning and response experts from the U.S. and other industrialized nations as a means of conveying critical safety and planning information. However, the program's overall success hinges on the leading Thai constituents, including government ministries, the Industrial Estate Authority of Thailand (IEAT), industry safety clubs, and other community and industry leaders. By design, the program is also dependent upon the catalytic nature of the coordinating actions and technical experience of the Country Manager. Therefore, the achievements of the LAMP/Thailand program are due to the cooperative efforts of these groups and their commitment to confront issues related to industrial accident mitigation and prevention. By working together the LAMP program and Thai government and industry leaders have made progress on many fronts that will improve industrial safety in the short-term while also leading to further improvements for years to come.

LAMP played a critical role in Thailand by actively facilitating the APELL process and by organizing and encouraging Thai groups to improve emergency planning mechanisms, upgrade safety and response equipment, and practice emergency response procedures by conducting mock drills. As a result of these joint efforts to increase the level of preparedness, emergency response equipment budgets were expanded in both private and public sectors to provide industry workers and emergency responders with improved, often state-of-the-art equipment. The Ministry of Interior (MOIt), for example, purchased 100 emergency response trucks in early 1994 for all provinces throughout Thailand. Also, a Thai delegation will participate in an industrial safety equipment "buying mission" to the U.S. in early 1996. Three years ago, such a mission would not have been productive since planning, training, and other industrial safety mechanisms had not advanced enough to identify real needs and integrate state-of-the-art safety equipment.

As equipment is purchased and infrastructure improves, there has been an increasing demand for specialized training in Thailand to educate responders. Expert trainers that conducted LAMP activities for WEC are already encountering opportunities to return to Thailand and teach teams in fire and confined space rescue, hazardous materials emergency response, and other areas where expert advice and training is needed. This is

yet another sign that the achievements seen under LAMP will continue far beyond the program.

Another important area of achievement involves the progress made to date with regard to emergency management information. LAMP introduced CAMEO™ software and trained information managers in the use of the programs. As a result of these efforts, over 17 Thai agencies now use CAMEO™. CAMEO™ has also prompted information managers to develop other channels for collecting and, in the case of an emergency, disseminating information. For example, the Ministry of Industry (MOI) has published over 5000 copies of CANUTEC's "Dangerous Goods Initial Response Emergency Guide" in Thai. Additionally, the Ministry of Industry and LAMP are developing a Transportation Emergency Response Information (TERI) database for future distribution in Thailand. This ongoing collaborative project will provide critical chemical information to emergency response groups that previously had few, if any, emergency information resources.

These achievements indicate that LAMP has and will continue to influence disaster mitigation and preparedness efforts for years to come in Thailand. The IEAT and the Ministry of Industry continue to broaden their roles in developing accident prevention and mitigation at Map Ta Phut and Bangpoo. In July, 1994 fourteen Thai Provinces adopted policies for duplicating the planning programs developed in Map Ta Phut under the guidance of the National Economic and Social Development Board (NESDB). Thailand is now confronting industrial safety issues on a nationwide level with more vigor and more rigor than before the program started. The experiences gained and policies developed during the course of the LAMP program are being carried forward in a manner that is fully consistent with and indeed exceeds some of the original OFDA goals.



## I. INTRODUCTION

This final report is submitted to the United States Agency for International Development's (USAID) Office of Foreign Disaster Assistance (OFDA) in accordance with WEC's Cooperative Agreement for the Local Accident Mitigation and Prevention (LAMP) program for Thailand. LAMP's objective in Thailand was to reduce the incidence and impact of major industrial, hazardous materials incidents in and around the industrial estates of Map Ta Phut and Bangpoo, both of which are under the authority of the Industrial Estate Authority of Thailand (IEAT)<sup>1</sup>. The following sections summarize and discuss the accomplishments of the LAMP program in Thailand in an attempt to give OFDA and other interested readers an indication of the overall impact achieved during the three years that the program was in operation.

Section II, **Implementation Approach and Site Selection**, discusses WEC's philosophy in implementing the LAMP program.

Section III, **Baseline Indicators**, discusses the technological risks in Thailand prior to the beginning of the LAMP program in October, 1992. This section also discusses the baseline abilities of local and national agencies to respond to technological accidents and other inherent risks associated with rapid industrial development.

Section IV, **Activities**, summarizes the major initiatives conducted during the LAMP program and the results of those activities.

Section V, **Impact, Sustainability and Replication**, discusses the overall meaning of the LAMP program to Thailand and the reasons why Thailand will continue to benefit from the LAMP program in the years to come.

Section VI, **Lessons Learned**, comments on the process of conducting the LAMP program in Thailand as well as WEC's perspective regarding efforts to conduct similar programs elsewhere.

Appendices follow the body of the report.

---

<sup>1</sup> See Appendix C for overview of IEAT.



## II. IMPLEMENTATION APPROACH AND SITE SELECTION

WEC's philosophy in implementing the LAMP program hinges upon three central components which contribute to the overall direction of the program and the goals that it intends to achieve. First, LAMP builds on the United Nations Environment Programme's (UNEP) Awareness and Preparedness for Emergencies at the Local Level (APELL) process as a model for systematically increasing awareness and developing emergency management capabilities. The ten-step APELL process is illustrated in Figure 1.

In Thailand, the LAMP program achieved many objectives because UNEP/APELL had previously worked to raise awareness of industrial safety and accident prevention and mitigation issues. LAMP was designed to bring additional resources to bear and, thereby, continue the APELL process. WEC conducted or participated in over 50 activities in Thailand that fall within the framework of the APELL process. The major activities are summarized in Section IV, and the full list of activities are outlined in Appendix A. The following list, however, gives an indication of the broad range of issues addressed in Thailand through the LAMP program:

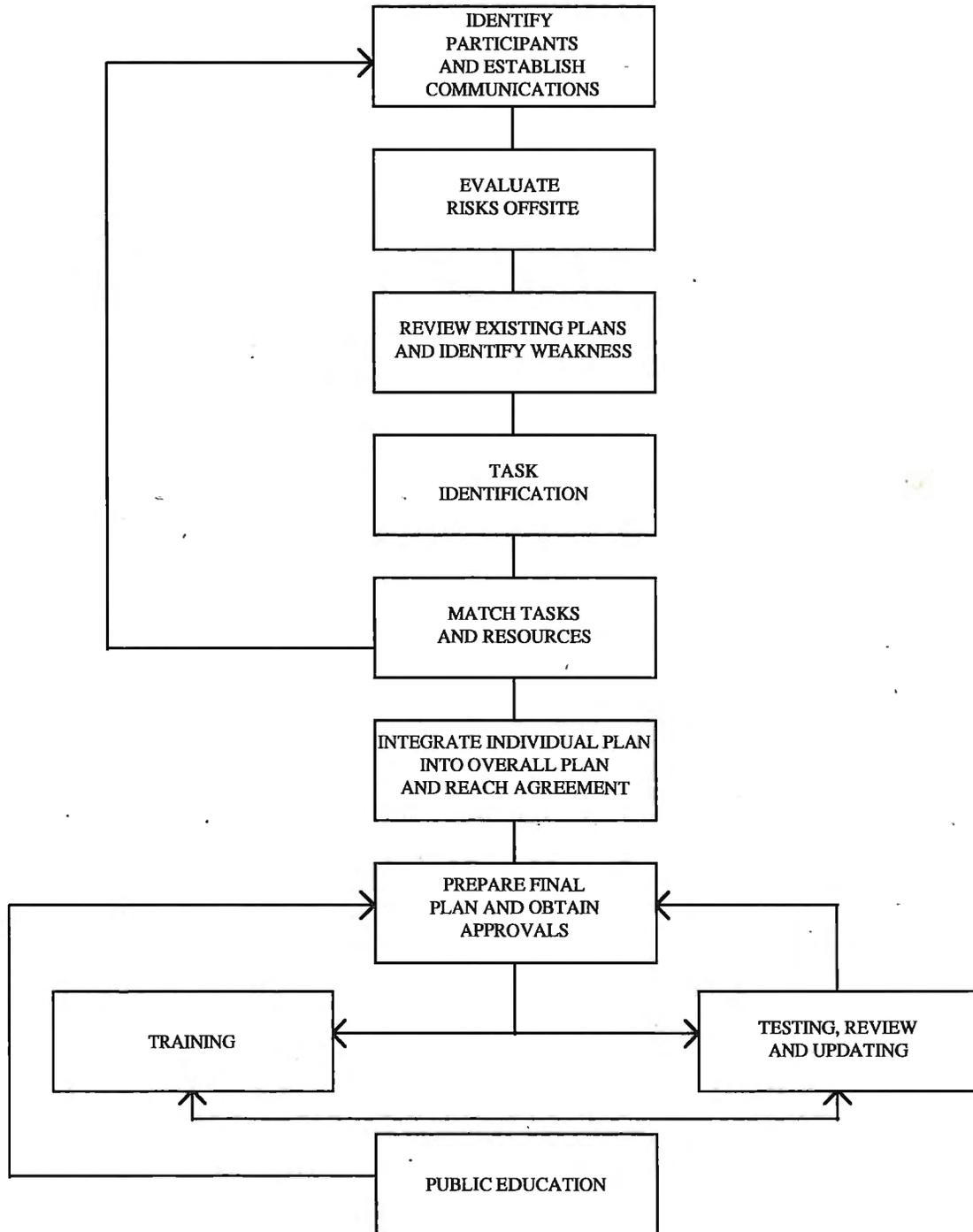
- Risk assessments of plants and industrial complexes;
- Chemical emergency preparedness and accident prevention (CEPAP) training;
- Information management seminars, including the use of Computer Aided Management of Emergency Operations (CAMEO™) technology, and other database systems;
- First responder training in industrial fire safety and hazardous materials incidents;
- Medical response training for doctors, nurses, and paramedics;
- Hospital capability assessments;
- Mock emergency drills involving local response teams; and
- Other appropriate activities suiting the needs of at-risk communities.

Apart from the benefit of conducting such activities, LAMP builds upon the APELL process by relying on the direct involvement of accomplished and respected industrial leaders from the countries where the program operates. This high-level involvement is the second key component of the LAMP program.

In Thailand WEC Country Director, Mr. Chalot Sripicharn, hired Mr. Chakthep Senivongs as Country Manager for the LAMP program. Mr. Senivongs is a former Senior Executive of Shell/Thailand whose last position was as Refinery Project Manager at Map Ta Phut, and is intimately familiar with key government and industry. Mr. Senivongs' network of contacts and his appreciation for the need to improve emergency response procedures in Thailand allowed him to bring direction and focus to the LAMP program in Thailand. The success of a LAMP program in any country where it works hinges upon the leadership role taken by the Country Manager to apply the APELL process to local conditions. Mr. Senivongs' commitment to the LAMP program galvanized support for LAMP initiatives and united leaders within Thai industry and government.

# Community Emergency Plan Implementation Flow Chart<sup>1</sup>

Figure 1.



<sup>1</sup> A Process for Responding to Technological Accidents, UNEP/APELL, 1988, p. 34

Since LAMP is designed to develop model industrial planning and response systems, site selection is the third and final critical component of LAMP. In order to optimize LAMP efforts and maximize program impact while also minimizing cost, two industrial estates under IEAT jurisdiction were selected for LAMP/Thailand: Map Ta Phut and Bangpoo.

Map Ta Phut Industrial Estate is located in Rayong Province (200 km from Bangkok), is the most modern petrochemical complex in Thailand, and also contains a deep sea port. The Map Ta Phut complex includes natural gas separation and olefin plants as well as many downstream petrochemical industries. There is extensive multinational investment from companies such as Union Oil, Caltex, Hymont, Monsanto, Dow, and Shell Oil. Total investment for this industrial estate exceeds U.S. \$20 billion and includes two new refineries.

Bangpoo Industrial Estate is the first industrial estate established by the IEAT. It is located in Samut Prakarn Province, adjacent to the eastern side of Bangkok. Bangpoo is home to over 200 international and national companies. Approximately 55,000 people work in the facility, and investment is estimated at over U.S. \$100 million.

The implementation of LAMP in Thailand was designed to occur in two stages, the first to focus on the more technologically sophisticated site of Map Ta Phut, and the second to include Bangpoo as well as Map Ta Phut. Map Ta Phut and Bangpoo were chosen as LAMP sites for three reasons. First, both sites were deemed likely to benefit from the program. Second, they were chosen to serve as examples throughout Thailand that improved awareness and preparedness was both necessary and possible.

They were also chosen because of the differences between the two sites. Map Ta Phut was more advanced in terms of infrastructure, responder training, training facilities, and resources available to further improve in these areas; whereas Bangpoo had a strong desire to improve industrial safety at the industry level. Factories on the Bangpoo estate ranged from being safe and efficient to unsafe and a menace to their neighbors. Thus, many industry leaders there were highly motivated by the need to prevent accidents, reduce pollution, and also improve their image within the community. For the lack of state-of-the-art equipment and financial support, therefore, simple motivation and awareness of risk made them an excellent candidate for the LAMP program. This contrast between Bangpoo and Map Ta Phut was the third reason that both industrial estates were selected as LAMP sites.

The determination of LAMP's success at Map Ta Phut and Bangpoo depends on the changes seen during the life of the program in contrast to the baseline conditions found when the program began. The next section of this report covers the baseline indicators that relate to the LAMP program in Thailand.



### III. BASELINE INDICATORS

Thailand's baseline indicators for the LAMP program were derived from two independent assessments conducted during 1992. First, an initial survey was conducted by the Economic Preparedness Planning Division of the Office of National Economic and Social Development Board (NESDB). Second, WEC hired Mr. Robert Boldt, a retired Vice President of Dow Canada, to visit Map Ta Phut and evaluate existing emergency response plans for industries located in that industrial estate. These assessments resulted in the identification of the baseline indicators that were used as a basis for comparison throughout the program. The primary indicators are as follows.

- **Government agencies and industry groups lack the technical know-how to effectively prepare and plan for emergencies.** This finding indicated that one of the primary goals for LAMP would be to promote technical capabilities within relevant emergency response and planning offices at the local, regional, and national levels.
- **Government officials who have responsibilities both in the planning and operation of emergency response do not clearly understand the consequence and impact of man-made disasters.** This relates to issues of awareness and basic education which the APELL process typically addresses. Although APELL had been in place in Thailand prior to LAMP, it was recognized that continued effort must be made to address issues of understanding risk at a basic level.
- **Coordination, communication, and integration of plans between industry groups, the Industrial Estate Authority of Thailand (IEAT), and the Provincial Authority are inadequate to effectively respond to emergencies.** This problem was determined to be a critical area where improvement was needed. For example, the existing emergency protocol identifies the Provincial Authority Governor as incident commander for a major crisis, however, there was no sufficient mechanism for cooperation or communication between this commander and the other groups involved in a response. Thus, it was recognized that the LAMP process must engage all actors -- from fire fighters to doctors to incident commanders -- in this education process in order to foster appropriate participation and cooperation among groups.
- **There is no attempt to create public awareness in relation to the general population's safety.** This indicator shows that addressing issues of awareness and understanding among emergency response officials would be only one aspect of the LAMP activities. The program would also need to operate at the grass-roots level and engage average citizens potentially effected most by made-made disasters.
- **A number of chemical accidents and explosions in Thailand point to the need to address issues of safety and preparedness.** For example, in September, 1990 a truck carrying liquid petroleum gas (LPG) tanks overturned on New Phetchburi road in downtown Bangkok, *killing 91 people*, and destroying 36 shops, 34 cars, and other property. In February, 1991 a truck carrying explosives overturned near Phang Nga. The subsequent explosion *killed 171 people*. A chemical fire and explosion in March, 1991 in the Klong Toey Port of Bangkok destroyed 642 homes, left 5,000 people homeless, and

*exposed an estimated 60,000 people to toxic fumes.* On May 10, 1993 the most disastrous factory fire in the world occurred in Nakhon Pathom. *188 people were killed,* and three buildings were destroyed along with all associated machinery; several hundred workers were hospitalized<sup>2</sup>. All of these examples point to the extreme but real risks posed by industrial development in Thailand.

- **The rapid industrialization of Thailand is greatly increasing the risks posed to life and property.** Deaths and injuries in industrial accidents rose 38 percent from 1989 to 1992. There were 67,912 accidents reported in 1989 and 103,296 in 1992<sup>3</sup>. Statistics such as these point to the urgent need to address safety and preparedness issues in developing countries like Thailand, where industrial development often thrives in spite of inadequate safety and planning measures.
- **Industry response teams are not adequately equipped to address likely accidents, nor do they regularly conduct mock emergency exercises.** This last indicator points to an area where tangible improvements must be made. Without proper equipment, planning and rehearsal of disaster scenarios, those responsible for emergency response cannot hope to accomplish their job of minimizing the effects of industrial disasters.

---

<sup>2</sup> Strengthening Disaster Management Strategies in Thailand. United Nations Development Programme, March, 1994.

<sup>3</sup> Ibid.

## IV. ACTIVITIES

This section describes the major initiatives conducted in Thailand under the LAMP program and also gives a brief indication of the importance of each activity in terms of the overall objectives of the LAMP program. A complete list of the LAMP activities is given in Appendix A. Activities listed in Appendix A represent the actions taken by Mr. Chakthep Senivongs, LAMP Country Manager, to engage himself and others in the LAMP process. As discussed above, LAMP activities are designed and developed in accordance with the guidelines set forth by the United Nations Environmental Programme's (UNEP) Awareness and Preparedness for Emergencies at the Local Level (APELL) process. Figure 1. (above) outlines the basic principles of the APELL process.

### 1. Identify participants, roles, and resources in Map Ta Phut - February, 1992

Prior to the beginning of the LAMP program, a seminar was held in Map Ta Phut to convey the basic concepts behind the APELL process and at the same time establish communications with industry and government leaders interested in improving industrial safety in and around Map Ta Phut. The participants comprised of 26 managers from 20 companies in Map Ta Phut as well as the officials from the following government agencies.

| Thai Agencies  | Number of participants |
|--|------------------------|
| Ministry of Defense  | 2                      |
| Ministry of Interior   | 7                      |
| Ministry of Industry   | 3                      |
| Industrial Estate Authority of Thailand  | 6                      |
| Map Ta Phut and Map Kha local Authority<br>(Kamnan and village leaders)                      | 7                      |
| Medical coordinating Office (doctors)  | 2                      |
| National Institute for the Improvement of<br>Office of the National Environment Board (ONEB) | 2                      |
| Secretariat of National Security Council   | 1                      |
| PTT (Petroleum Authority of Thailand)  | 4                      |
| National Disaster Prevention Committee   | 1                      |
| Private sector managers  | <u>26</u>              |
| <b>Total</b>   | <b>62</b>              |

During this workshop the Thai stakeholders agreed on the need for a harmonized and well coordinated awareness and preparedness prevention plan for industrial disasters among all sectors involved with industrial development in Thailand. The participants further agreed to select Map Ta Phut Industrial Estate as a pilot site for the APELL program. The APELL plan discussed consists of the following three areas of responsibility:

- Accident prevention plans for individual industries;
- An accident prevention plan of the industrial area which will be the responsibility of IEAT; and
- A public disaster prevention and remedial plan of the related Royal Thai Government (RTG) agencies.

The coordination of such plans was also discussed, with emphasis placed on prevention techniques, equipment and supplies among all sectors, community awareness and participation, and the importance of regular drill exercises.

## **Outcome**

This seminar took place during the design phase of the LAMP program. WEC's presence laid the groundwork for further involvement with Map Ta Phut industrial safety and accident prevention efforts through the LAMP program, which began in October, 1992.

## **2. CAMEO™ training - October, 1992**

WEC arranged a training activity in the use and management of Computer Aided Management of Emergency Operations (CAMEO™) with the assistance of IBM Thailand and the Pollution Control Department under the Ministry of Science, Technology and Environment. The U.S. EPA also presented a one day demonstration of CAMEO™ to 37 Thai Government, NGO, and industry representatives.

CAMEO™ is a software system developed by the National Oceanic and Atmospheric Administration and the U.S. Environmental Protection Agency to assist in planning for and responding to chemical accidents, and in managing information collected under the Emergency Planning and Community Right-to-Know Act (SARA, Title III). CAMEO™ is a user-friendly application that integrates a chemical database, an air dispersion model, mapping capabilities, and data management capabilities. CAMEO™ is widely used in the U.S. by federal, state, and local governments and responder groups. CAMEO™ is also increasingly used in many countries as part of the UNEP/APELL process.

The list of organizations that participated in the CAMEO™ workshop is as follows:

### **CAMEO™ Workshop Participants**

---

#### **Thai Government Agencies:**

- |   |  |
|---|--|
| IEAT  | - Information Technology and Computer Application Center<br>- Privileges Department  |
| Ministry of Industry                            | - Industrial Works Department  |
| Ministry of Interior                            | - Civil Defense Department<br>- National Institute for Improvement of Working Conditions and Environment<br>- Office of Urban Development      |
| Ministry of Public Health                       | - Department of Health   |
| Ministry of Science, Technology and Environment | - Office of Environmental Policy and Planning<br>- Pollution Control Department  |
| Office of the Prime Minister                    | - National Economic and Social Development Board (NESDB)<br>- Economic Preparedness Planning Division<br>- National Safety Council of Thailand |

#### **Private Companies:**

ICI Asiatic (Agriculture) Co., Ltd.  
ICI Asiatic Chemical Co., Ltd.  
Rhône-Poulenc Thai Industries  
The Shell Company of Thailand  
Siam Occidental Electrochemical Co., Ltd.  
THASCO Chemical Co. Ltd.  
Petroleum Institute of Thailand  
The Federation of Thai Industries (Industrial Environmental Management Program)

#### **Universities:**

Asian Institute of Technology  
Chulalongkorn University  
Kasetsart University  
Mahidol University

## **Hospitals:**

Siriraj Hospital  
Bangkok Biomaterial Center

## **Media:**

The Nation  
Business Review Journalism

## **Outcome**

The workshop seemed to fit the needs of many groups in Thailand that were ready to address chemical emergency management issues head on. Since the workshop, at least 16 RTG agencies have installed CAMEO™ in their offices and are continuing to use the system as a planning tool on a regular basis. Appendix D contains a complete list of groups now using CAMEO™.

Due to certain technical limitations of CAMEO™ and the high-tech nature of the system, the LAMP Country Manager took the initiative to develop a user-friendly computer database for emergency response to chemical transportation accidents. The system, called TERI (Transportation Emergency Response Guide), is based on the Canadian Transport Emergency Centre's (CANUTEC) Dangerous Goods - Initial Emergency Response Guide as translated into Thai by the Ministry of Industry (MOI). The database contains a cross reference of key emergency response information using the United Nations chemical codes.

### **3. Review industrial and community planning for chemical emergencies - January, 1993**

WEC arranged for two experts from the U.S. EPA and one veteran of the U.S. Fire Service to conduct an on-site assessment of chemical risk and relevant emergency preparedness plans at Map Ta Phut Industrial Estate. This activity was conducted in conjunction with the National Economic and Social Development Board (NESDB) and the Industrial Estate Authority of Thailand (IEAT). The following 10 companies in the industrial zone were visited and audited for chemical emergency risks:

- National Petrochemical Co., Ltd.;
- HMC Polymers;
- Thai Plastic and Chemicals;
- Thai Polyethylene;
- Viny Thai;
- Thai Tantalum;
- Peroxy Thai;
- Thai Tuntex; and
- Laports.

## **Outcome**

Evaluation reports were passed back to the individual companies and remedial actions were taken as appropriate. The activity allowed participating companies to benefit from expert advice on a non-biased and non-threatening basis. It also proved to be an excellent exercise that stimulated discussion of the linkages and integration of plans between groups on and off-site at Map Ta Phut Industrial Estate.

### **4. Identify the medical roles and responsibilities in an emergency - March, 1993**

In March, 1993 WEC organized a trip for two doctors from the U.S. Centers for Disease Control (CDC) to assess the medical readiness to industrial emergencies at Rayong General Hospital and Ban Chang Hospital, both of which are located near Map Ta Phut Industrial Estate. The experts also visited other hospitals close to selected high-risk chemical and industrial production facilities in Map Ta Phut. Surveys of health care facilities were conducted, followed by a one-day workshop on industrial emergency preparedness and response at Mahidol University for the local medical and public health community. This workshop covered topics such as:

- An introduction to disaster medicine;
- Chemical and industrial disasters;
- The importance of hazard and vulnerability assessments;
- Medical sector planning roles;
- Rapid assessment of medical and public health impact; and
- Medical management under crisis conditions.

During a subsequent visit to the Samut Prakarn region, the CDC experts assessed the following health care and industrial facilities at or near Bangpoo Industrial Estate:

- Imperial Chemical Industries (ICI) (produces primarily paraquat);
- Muang Samut Hospital (small private hospital in Samut Prakarn);
- Samut Prakarn Provincial Hospital; and
- Samrong Hospital (large private hospital with several affiliated satellite health centers).

## **Outcome**

At the conclusion of each hospital audit, suggestions were made to hospital staff for improving off-site emergency plans (i.e. documentation of chemical risks for morbidity and mortality, scenarios of likely disasters and important actions during disaster response) and the relationship of those plans to the local public health community and other relevant emergency response sectors (primary treatment centers, local health departments, fire services, civil defense, industrial and occupational health community, etc.).

Bringing the medical community into the LAMP program was an important step for the program as a whole. Not only did the experts from CDC give much needed training and

advice to the doctors, nurses, and paramedics with whom they met, but they also stimulated interest in the roles that medical professionals must play in case of a chemical emergency.

This LAMP activity also helped influence hospital administrators to consider installing proper decontamination facilities. As discussed below, the first isolated decontamination facility in a Thai hospital was completed at Ban Chang Hospital in Rayong in August, 1995, just as the LAMP program concluded. The CDC hospital audit of Ban Chang Hospital provided useful information and the impetus to develop the decontamination facility.

## **5. Develop an integrated community response plan - April, 1993**

Beginning in April, 1993 the NESDB developed an integrated community plan, obtained approval for the plan from all concerned groups, and committed the plan to writing. The plan covers the following topics:

- A list of the agencies involved;
- Areas of responsibility for emergency response, evacuation, health care, control access to accident site, public/media liaison, liaison with regional responders, establishing and manning command centers, points of the contact, position, 24-hour telephone number, the chain of command, etc.;
- Identification of the community emergency transportation network;
- A list of equipment and materials which are available at the local level to respond to emergencies; and
- Communication channels during an emergency.

Parallel to this community wide planning process, the LAMP Country Manager also worked with the Rayong Public Health Office to develop a unified emergency response plan for hospitals within Rayong Province. He also assisted the Thai Plastic and Chemicals Co., Ltd. in conducting emergency response drills.

### **Outcome**

The combined efforts of the NESDB and WEC during this period resulted in a coordinated plan for Map Ta Phut and the surrounding communities. WEC and IEAT worked at the local level, while NESDB executed a top-down approach from the national government level. The result was a very successful first step toward developing integrated plans for emergency response where before, no such plans existed. This planning process paved the way for drill exercises to be conducted. Such activities are now conducted on a regular basis.

## **6. Ensure that responders are trained and aware of integrated plans - October, 1993**

Having made considerable progress to this point at in Map Ta Phut, WEC began working with the second LAMP site, Bangpoo Industrial Estate, located in the Samut Prakarn region near Bangkok. With the support of EPA experts and IEAT, WEC conducted a three day training on "Emergency Preparedness and Accident Prevention" for industry groups from both LAMP

sites. This activity included the participation of 23 key people from over 15 government agencies, industries, and planning committees at both industrial estates. The main issues covered were:

- Formation of the planning group;
- Hazard analysis process;
- Developing an emergency plan;
- Risk communication; and
- Testing the emergency plan.

## **Outcome**

Sharing the experience of the EPA planning experts and the participants was a very effective means of conveying planning concepts to the key leaders at both sites. Furthermore, the Bangpoo Industry Club benefited by being involved with the more experienced group from Map Ta Phut. At the end of the workshop, one sensed that the Bangpoo group felt a challenge to work towards the same goals that Map Ta Phut had set for itself.

This competitive spirit between the two groups continued beyond the workshop, and is an example of LAMP being replicated from one industrial estate to another. Continued interaction between Map Ta Phut, Bangpoo, and other IEAT industrial estates will result in similar replication of LAMP initiatives.

## **7. Establish procedures for periodic testing and review of the plan - June, 1994**

From October, 1993 to June, 1994 the groups at both Map Ta Phut and Bangpoo worked to develop their own integrated emergency response plans. With progress being made at the local level by industry groups, the NESDB decided to take a leadership role and promote regular mock drill activities at industrial sites that had initiated emergency response planning. Thus, the NESDB designated a committee to prepare written scenarios that identified drill objectives, components of the plans to be tested, expected participants, sequence of events, and simulated hazard levels. A group of non-participating observers was also designated to evaluate the test drills using prepared evaluation sheets.

In July, 1994 the NESDB funded a full-scale emergency response drill at Map Ta Phut Industrial Estate as a means of identifying further improvement areas. The entire program was coordinated by a committee headed by the Governor of the Rayong province and was an excellent example of the LAMP/APELL concepts put into action. A workshop was organized the day after the drill to reflect on the experiences of those involved and discuss lessons learned. WEC was involved throughout the drill preparation process through the direct participation of the LAMP Country Manager. At the dry-run exercise one day prior to the actual drill, the LAMP Country Manager was one of the key coordinators marshaling the test drills.

## **Outcome**

The leadership role taken by the NESDB in this regard, to sponsor, facilitate, and assess mock drill exercises has had a significant impact at both LAMP sites. Test drills are now carried out twice a year at Map Ta Phut. At Bangpoo, test drills are being carried out by individual industry and selected government emergency response agencies, such as the provincial fire brigade and local hospitals.

The last drill was conducted on August 28, 1995 at Map Ta Phut. The Bangpoo emergency response group was also present at the drill as observers.

## **9. Revise plans to improve responder roles and communication channels - October, 1994**

Through funding provided by the Asian Disaster Preparedness Center (ADPC), WEC and the Map Ta Phut Safety Club organized a one-day workshop to educate industry response teams in the communications procedures during an integrated response situation. Radio communication experts from the Police Department were the key presenters. They discussed the concept of a unified command system which would require the integrated response of response teams from different companies. Approximately 40 representatives from 25 companies participated in the workshop.

## **Outcome**

Following this workshop, the Rayong Provincial Office authorized Map Ta Phut Industrial Estate to broadcast through the provincial radio frequency in the event of emergency incident. Ten major industries in Map Ta Phut shared the cost to acquire 16 radio sets that were needed to make the system work. Radio sets were also given to the Ban Chang Hospital, the Provincial Emergency Response Center, and the Rayong Highway Police unit. The emergency radio communication network is now in place. Daily testing procedures are also used to ensure that the system will work in case of an emergency.

## **10. Delegation visits U.S. to study and assess emergency response systems - December, 1994**

In December, 1994 WEC hosted a delegation of five senior Thai Government officials in order to expose them to possible options for improving emergency response systems and planning mechanisms in Thailand. The Thai delegation spent two weeks touring U.S. emergency response facilities and meeting with government and private organizations involved with disaster prevention. The itinerary included visits to OFDA, the Chemical Manufacturers Association (CMA), the Federal Emergency Management Association (FEMA), EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO), CDC, the National Institute for Chemical Studies, Texas A&M University's Texas Engineering and Extension Services (TEEX) Spill Control Training Center, and meetings with Local Emergency Planning Committees (LEPC) in Charleston, West Virginia and Pasadena, Texas.



1. Emergency response team, Map Ta Phut Industrial Estate



2. Fire Department, Samut Prakarn



3. Recently purchased hazardous materials emergency response vehicle,  
Rayong Municipality Fire Brigade



4. Emergency response equipment on display for WEC/LAMP,  
Rayong Municipality Fire Brigade



5. LAMP Country Manager, Mr. Chakthep Senivongs, directing mock drill activities, Rayong Occupational Health Office



6. Emergency responders conducting mock emergency drills as local media watches, Rayong Occupational Health Office



7. (above) LAMP Country Manager demonstrates CAMEO™ to Ban Chang Hospital staff, Rayong.



8. (left) Ban Chang Hospital doctors and nurses rehearse procedures for treating victims of acute toxic exposure.

The Thai delegation included the following participants:

- Mr. Tanya Hanpol, Deputy Governor, IEAT;
- Mr. Werayuth Wongsiri, Director of Information Technology and Computer Application, IEAT;
- Mr. Paichit Boonyanugraha, Director, Industrial Safety Division, Ministry of Industry (MOI);
- Mr. Chalao Virijapongse, Mayor of Rayong; and
- Mr. Prasert Wongeroon, Deputy Mayor of Samut Prakarn.

### **Outcome**

The U.S. study tour provided the participating officials with an invaluable opportunity to witness and learn about the process of emergency preparedness and chemical emergency planning in the U.S. It also allowed them to meet with numerous U.S. experts and discuss options for improving planning and emergency response systems in Thailand.

### **11. Increase awareness of transportation safety procedures - February, 1995**

WEC developed a special management training course for industry operations managers and government first responders to assist them in coordinated response to hazardous materials transportation incidents. The training was conducted by a hazardous materials response expert from Texas Engineering Extension Service (TEEX), a division of Texas A&M University. The program was conducted at both Map Ta Phut and Bangpoo. Approximately 100 participants from various response brigades attended the sessions. Topics discussed included:

- Hazardous materials transportation emergency response techniques;
- Product identification and placarding; and
- Chemical transportation and container inspection.

### **Outcome**

The Map Ta Phut Safety Club implemented a "Community Awareness and Emergency Response" (CAER) campaign by agreeing that all chemical trucks would begin carrying labels and placards using the United Nations Product Identification Number (PIN) and hazard classification system. Initially, over 50 trucks from various companies participated in the program, which went into effect in October, 1995. Widespread placarding of chemical transport units are recognized as an important step to improving the safety and ability of response personnel who must deal with damaged, leaking, or otherwise exposed cargo. The Safety Club expects that the program will soon involve other companies and their trucks.

In addition, 40 portable fire extinguishers were given to the Rayong Highway Police Unit to be installed in the police patrol vehicles. The donation was organized by the members of the Map Ta Phut Safety Club. To further improve the transportation response capabilities in Map Ta Phut and other parts of Thailand, the MOI published a Thai version of CANUTEC's "Dangerous Goods Initial Emergency Response Guide" (as translated by the Industrial Works

Department). Now in its second edition, over 5,000 copies of the Thai CANUTEC guide are in circulation.

## **12. Improve awareness of medical roles in a chemical emergency - August, 1995**

In August, 1995 WEC, Ban Chang Hospital, and the Thai Plastic and Chemicals Company organized a two day workshop for the doctors and head nurses from the Map Ta Phut and eastern seaboard region to understand the basic procedures and practices for medical emergency response to the hazardous material incident. The training was conducted by Dr. Jonathan Borak, a U.S. specialist in occupational and environmental medicine, with extensive experience training medical personnel in chemical accident treatment. Dr. Borak is also an Associate Clinical Professor of Internal Medicine at Yale University. Following the two day event in Map Ta Phut, a similar one day session was given at the Bangpoo Country Club in Samut Prakarn. Over 100 emergency response medical personnel participated in the two workshops. Emergency hospital capabilities and procedures were also reviewed by Dr. Borak during this mission.

### **Outcome**

This LAMP activity was exceptionally well received by the doctors and nurses in attendance. As a result, the Occupational Health Department of the MOI has decided to conduct a similar program for other doctors and head-nurses in key industrialized provinces twice a year on an ongoing basis in order to continue raising the level of awareness and skills for medical professionals. The Map Ta Phut office will serve as a training venue.

Concurrent to this LAMP activity, Ban Chang Hospital was in the process of building a modern decontamination facility in their emergency ward. Once completed, it will become the first hospital in the Thailand to have a complete decontamination facility for victims of acute exposure to toxic substances. Dr. Borak's visit provided a timely opportunity to advise the Ban Chang Hospital management on critical aspects of the decontamination room.

## **13. Replication of LAMP in other industrial areas - July, 1995**

A workshop was organized by NESDB for government officials and industry representatives from provinces along eastern seaboard of Thailand where major industries are located. The workshop included critiques and explanations of past mock drill activities. The APELL process and its basic concepts were also discussed so that leaders from other parts of Thailand could begin working on their own plans to improve safety, and preventing the loss of life and property.

### **Outcome**

The workshop inspired government and industry leaders from 14 separate provinces to adopt a similar process of developing their "Provincial Emergency Response Plans," such as the one developed and demonstrated in Map Ta Phut.

The 14 provinces that will follow Map Ta Phut's example are:

|                |               |
|----------------|---------------|
| Samut Prakarn  | Ayudhya       |
| Samut Sakorn   | Nondhaburi    |
| Samut Songkram | Saraburi      |
| Pathum Thani   | Korat         |
| Cholburi       | Karnchanaburi |
| Rajburi        | Songkla       |
| Lampang        | Surajthani    |

#### **14. Reinforce progress made under LAMP by continuing drill activities - August, 1995**

During the last week of August, 1995 the National Petrochemical Public Co., Ltd. organized another emergency response drill at Map Ta Phut to test the mutual aid mechanisms among industries, as well as the communication procedures with other responders. This program was part of the ongoing plan to review and improve the integrated plan.

#### **Outcome**

Regularly scheduled mock drill activities will continue in Map Ta Phut. The next emergency response drill as requested by the Governor of Rayong will occur in December, 1995.



## V. IMPACT, SUSTAINIBILITY, AND REPLICATION

During its three years of operation the LAMP program achieved meaningful results that will continue to foster improvements in industrial safety and accident prevention and mitigation in Thailand. LAMP proved to be a positive force in establishing vibrant community based emergency preparedness activities at Map Ta Phut, and also created a means by which these activities can be replicated at Bangpoo and other locations in Thailand.

As mentioned previously, the process of replication is already under way in the form of a commitment on the part of 14 regional governments to follow the lead set by Map Ta Phut and develop similar emergency response plans. Bangpoo and the industrial estates located in these 14 regions have strong support from national agencies as well. The Industrial Estate Authority of Thailand (IEAT) has established a national advisory committee on emergency response and accident prevention, and will lead a delegation to the U.S. to investigate sources of safety equipment that can further improve safety and response capabilities in Thailand. The National Economic and Social Development Board (NESDB) has taken the lead to finance, develop, and support periodic mock drills. The Ministry of Industry (MOI) publishes the CANUTEC Dangerous Goods guide in Thai. MOI also uses CAMEO™, as do 14 other Royal Thai Government (RTG) agencies (see Appendix D). Furthermore, the MOI, in conjunction with the LAMP Country Manager, is in the process of developing its own Transportation Emergency Response Information (TERI) database for future distribution in Thailand. These are but a few key examples of the progress made in Thailand over the three year course of the LAMP project – clear indications that the program's impact will continue to influence planning and response initiatives for years to come.

The one area where LAMP could not apply the APELL process relates to educating the public and developing community awareness, the final step in the ten step APELL process. Due to the political dynamics at both LAMP sites, WEC decided to go slowly and nurture support for community awareness programs and conduct such activities in the fourth and fifth years of the LAMP program. Since the program ended prematurely it was determined to be inappropriate to begin such potentially polemical activities without sufficient time for follow through. For LAMP to achieve its original goals and objectives in areas concerning public education, the program duration would need to have been maintained for the full five years.

Although the program ended prematurely and WEC was not able to conduct community outreach activities, there are healthy signs that the community is nonetheless benefiting due to the publicity surrounding the mock drill activities. In Map Ta Phut, where the APELL process is most advanced, large scale mock drill activities receive widespread coverage in radio and news media. Also, since they have an emergency broadcast network that must be periodically tested, the public is slowly being educated about emergency response planning and their roles in case of an emergency.

While it is unfortunate for Thailand that LAMP could not continue into the fourth and fifth years of the program, it is appropriate that public education be carried out in a politically sensitive manner when the time is right. The United Nations Environmental Programme (UNEP) is correct to include community activities as the final step in their ten step APELL process; any effort to promote community activism in Map Ta Phut or Bangpoo would have

been premature and potentially detrimental to the successes achieved in other areas of the LAMP program.

## VI. LESSONS LEARNED

The September, 1995 closure of the LAMP program in Thailand, while on the one hand being a premature end to a successful and worthwhile project, provides WEC and OFDA with an opportunity to step back and consider the LAMP process as a whole. While discussing the sustainability of LAMP activities in Thailand, then, the LAMP process itself must be analyzed in terms of key components to identify lessons learned over the three year history of the Thailand program. These lessons contribute to the work being done through LAMP in India, Indonesia, and Mexico today, and will serve as an example for future LAMP programs in other countries as well. The following issues bare mentioning in this context.

- **LAMP is most successful when working with people and groups that are highly motivated to address the problems associated with industrial accident planning, prevention, and mitigation.** In conducting any development program it is too easy to see the final outcome as a function of the project alone. It is more accurate to say, however, that any prototype project, such as LAMP, is merely a part of the overall development process taking place. Success requires that project managers identify supportive stakeholders and work closely with those groups. For any industrial or environmental initiative, where legal, regulatory, and political forces play a large role, it is mandatory that government and industry participants provide funding and resources that serve project objectives. LAMP interventions in Thailand came at the right time and with the right compositions of local and national Thai actors. The commitment to the LAMP/APELL process demonstrated by WEC's Thai partners was the most important factor in the success of the program.
- **Effective intervention requires the leadership of a committed LAMP Country Manager.** A corollary to the first lesson learned, this observation relates to the critical role played by an in-country program leader. Since LAMP programs deal with myriad issues ranging from the technical aspects of first responder roles to the political sensitivity regarding the public's "right to know," the experience, credibility and dynamism of the country program manager is imperative. In choosing the right person to spearhead similar programs, organizing groups should look for someone committed to the program, and not someone qualified to simply carry out the fundamental roles and responsibilities of the job. Mr. Senivongs' commitment to the LAMP process was an important factor contributing to the success of the program.
- **Local industrial "safety clubs" or LEPC-like organizations provide a platform of essential support for the LAMP program.** To achieve program goals that improve emergency response in the short-term and remain effective in the long-term, LAMP programs must be supported by organized leadership at each site. If local planning groups or safety clubs are not yet formed in a cohesive manner, an organization or donor agency should strongly consider the option *not* to initiate LAMP activities. The process of mobilizing forces is much more cost-effective and likely to succeed than any attempt to organize concerned parties, introduce safety and APELL planning concepts, only then to begin the process of developing and/or strengthening existing emergency mechanisms. WEC was fortunate to find organized, aware, and motivated groups in both Map Ta Phut and Bangpoo. Both groups were poised to benefit from the activities conducted under LAMP.

- **The development of prototype systems that can be replicated throughout the country requires that LAMP, within the confines of available funding, works intensively at a few selected sites.** For strategic planning and performance monitoring, there is a need to concentrate LAMP program activities at one location to obtain maximum impact and enable full program completion for replication at other sites. Once the first site begins the LAMP process, other sites may be added on a selective basis. In Thailand, Bangpoo was added only when Map Ta Phut had proceeded to a point where it served as an example to the Bangpoo constituents. Now, they both set the standard for over 24 industrial estates managed by the IEAT, as well as other industrial sites throughout Thailand.
- **Emergency response infrastructure is a primary indicator of a community's preparedness for the LAMP program.** Training and workshop programs provide basic awareness to the attendees. However, without the availability of modern response equipment and protective gear, the ultimate level of preparedness to respond effectively to hazardous materials emergencies will be limited. Training first responders without providing appropriate safety equipment can also lead to a potentially life threatening, false sense of competency on the part of responders. If suitable safety equipment is not currently available at sites where training is to be conducted, programs should be developed by taking into account the resources available and the likelihood that equipment upgrades will be made in the near future.

## Appendix A

### Chronological Summary of LAMP/Thailand Initiatives

| <u>Date</u>    | <u>Activity</u>  |
|----------------|--|
| October, 1992  | WEC, IBM/Thailand and the Pollution Control Department arranged a one day CAMEO™ program demonstration (Computer Aided Management of Emergency Operations) by U.S. EPA's Sherry Fielding to 37 Government officials, NGO and industry representatives.   |
| October, 1992  | Coordinated first voluntary industry core team comprised of seven companies and IEAT meeting to start CAER program for Bangpoo Industrial Estate.  |
| December, 1992 | WEC arranged an additional CAMEO™ program demonstration and discussion for Public Health officials and Thai Pesticide Association.   |
| January, 1993  | Craig Mathiessen, John Ferris from U.S. EPA and Michael Callan, veteran of the U. S. Fire Service conducted an on-site assessment of chemical risk and relevant emergency preparedness plans at Map Ta Phut Industrial Estate. The group also conducted a CAER Workshop at Bangpoo Industrial Estate.  |
| February, 1993 | WEC facilitated an information exchange workshop on Emergency Response Programs at the Swedish Embassy, chaired by the First Secretary Mr. Lars Andreasson. Representatives from WEC, Swedish Embassy, Industrial Work Department, Chulaphorn Research Institute (CRI), Ministry of Public Health, National Safety Council for Thailand, Thai Pesticides Association, GIFAP Local Office and Office of National Economic and Social Development Board (NESDB) and Bangpoo Industrial Club attended the workshop. |
| March, 1993    | WEC sponsored Eric K. Noji, M.D. and Scott R. Lillibridge, M.D. from CDC to assess the readiness to industrial emergency situations at hospitals in Map Ta Phut and Bangpoo Industrial Estate areas. They also ran a one day seminar on "Readiness to Cope with Industrial Disaster in Public Health and Medical Areas" for 120 representatives from universities, government and private companies.   |

| <u>Date</u>     | <u>Activity</u>   |
|-----------------|---|
| May, 1993       | The LAMP Country Manager and Ms. Kasemsri Homchean, Director of Environmental and Safety Control Division, IEAT, observed the emergency response drill at Thai Oil Refinery and Cholburi Hospital.  |
| June, 1993      | The IEAT installed CAMEO™ at their Makkasan head office; WEC trained computer operators how to use it.  |
| July, 1993      | WEC conducted a Safety, Health & Environment (SHE) Management development workshop for Allied Chemical. Eventually this Thai owned factory will be used as a training resource in "Training the Trainer" programs.  |
| July, 1993      | The LAMP Country Manager attended a training course for fire emergency response at W.R. Grace Co., Ltd. at Bangpoo.   |
| August, 1993    | The LAMP Country Manager accompanied the third group of City Counselors from Samut Prakarn, led by Mr. Prasert Wongaroon, Assistant Mayor to visit the City of Corpus Christi, Texas and studied their waste management system.   |
| August, 1993    | Bangkok Port (Klong Toey) installed CAMEO™ for incorporation into Pollution Control Department's Emergency Plan. Ms. Wanida S. demonstrated the program to Bangkok Port Officials.  |
| September, 1993 | The LAMP Country Manager attended an international workshop arranged by EPA to develop and test an international training course for "Emergency Preparedness and Accident Prevention."  |
| September, 1993 | WEC demonstrated CAMEO™ for the office of Economic Preparedness Planning Division of NESDB, who plans to incorporate it into the Emergency Plan at Map Ta Phut and the Royal Navy.  |
| October, 1993   | Through funding provided by USAID's US-AEP program, WEC arranged for a visit by Ms. Alma Howard of CMA, to work with Anti Air Pollution & Environment Protection (FAPEP), to investigate and recommend the introduction of CMA's CHEMTREC® Center for chemical transportation emergencies.  |
| October, 1993   | WEC and the National Institute for the Improvement of Working Conditions and Environment (NICE), arranged two three day Fire Prevention/Protection Training Courses for factory managers in Bangkok and Samut Prakarn. The courses were run by WEC and volunteers, Steve Krivan, from Hoechst Celanese and Jim Carano from Health |

Date

Activity

- Environmental Loss Prevention. Forty seven people attended the Bangkok session and 22 people in Bangpoo. During the training, the instructor team also conducted a hands-on fire risk analysis for government officials and Eason Paint Co., Ltd.'s fire team at their plant in Bangkok.
- October, 1993 With the help of EPA volunteers William J. Finan, Kate Piva and Scott Engle, WEC and the Bangpoo Industry Club, arranged a three day training on "Emergency Preparedness and Accident Prevention." The attendants came from the Emergency Committee for Bangpoo and Map Ta Phut areas. Twenty eight people attended. This training led to the formation of local emergency teams in both LAMP sites. IEAT kindly contributed the use of a training center and meals at no cost.
- November, 1993 Union Carbide Thailand Ltd. kindly invited WEC to nominate three persons to participate in their three day regional "HELP Emergency Response Training" at no cost. WEC nominated one person each from Pollution Control Department, Labor and Welfare Department and Mr. Chakthep Senivongs, LAMP Country Manager for WEC.
- December, 1993 WEC and the General Insurance Association (GIA) and NFPA arranged a half day seminar on "Introducing NFPA, its resources and standards" with 20 people from 16 government organizations attending. WEC also conducted a 3 day training course on "Fire Inspector Training" for GIA members, industries and government officials. There were 32 people attending the training.
- December, 1993 The LAMP Country Manager attended a regional APELL seminar in Shanghai, China.
- February, 1994 The LAMP Country Manager traveled to Indonesia to introduce CAMEO™ to appropriate government and private sector groups and discuss its emergency response uses. He also advised WEC/Jakarta in the planning of an APELL workshop for LAMP/Indonesia.
- March, 1994 WEC invited Dr. Noji of CDC to visit Dr. Chawalit Suntikitrunguang, Director, Technical Cooperation Division, Department of Medical Service, Ministry of Public Health, to follow up on the readiness of medical service in response to industrial accidents. He also conducted a half day "Doctor Outreach Program" for Samut Prakarn Medicine and Health group. There were 40 attendants from 21 government and industrial organizations.

| <u>Date</u>  | <u>Activity</u>  |
|--------------|--|
| April, 1994  | WEC facilitated the first working group meeting to prepare for in-plant first aid training for industry in Bangpoo. The Bangpoo Industry Club and local medical professionals attended.  |
| April, 1994  | The LAMP Country Manager demonstrated CAMEO™ at the Rayong Province Hospital and trained staff members in its use.   |
| April, 1994  | WEC conducted a trial run for computerized medical database link-up between the Ministry of Public Health's offices in Bangkok and Rayong Province Hospital. The LAMP Country Manager participated in the presentation of protective chemical suits donated by DuPont Co., Ltd. to the Samut Prakarn Municipal Board Members. A joint fire drill with the Municipal Fire Brigade followed the presentation.  |
| May, 1994    | The LAMP Country Manager demonstrated CAMEO™ at the MOI Industrial Safety Division and trained staff members in its use. WEC participated in the Local Emergency Response Committee meetings in preparation for the Emergency Response Exercise at Map Ta Phut Industrial Estate.<br><br>The LAMP Country Manager also participated in the "Chemical Transportation Awareness" training program conducted at National Petrochemical Corp. Ltd. for the Highway Police Force. One hundred Highway Police officers attended the program. |
| June, 1994   | The LAMP Country Manager demonstrated CAMEO™ for the Metropolitan Police Fire Brigade. LAMP Country Manager and WEC/Country Director participated in the Emergency Response Drill at Map Ta Phut Industrial Estate and TPC plant. Coordinated visit of representatives from TEEX to review the fire training facilities at National Petrochemical Corp. Ltd.   |
| July, 1994   | WEC was represented in the local official emergency drill at Map Ta Phut. Its contribution was highly appreciated by the host, IEAT. LAMP Country Manager attended a two week LAMP Coordinator program in Washington, D.C. with other WEC staff.   |
| August, 1994 | A First Aid Training was organized for 47 people from 20 companies of Bangpoo Industry Club. The joint training team was represented by eight organizations. David Gratz, Director International Operation assisted  |

Date

Activity

|                |   |
|----------------|---|
|                | <p>WEC in identifying and evaluating potential training needs for an upcoming NFPA session - "Managing Fire Prevention and Inspection Programs."</p> <p>The Ministry of Public Health formally informed WEC that it was qualified to receive financial assistance up to 500,000 Baht for the Doctor Outreach Program.</p>   |
| August, 1994   | USAID/OFDA project evaluation team visited Thailand.  |
| November, 1994 | WEC participated in setting up of the Bangpoo Industrial Estate Emergency Response Committee. Richard Williams, LAMP Manager, and the LAMP Country Manager participated in an emergency fire drill at the ICI Asiatic (Agriculture) Co., Ltd. located in the Bangpoo Industrial Estate.   |
| December, 1994 | <p>LAMP Country Manager led a Thai delegation to the U.S. on a Local Emergency Planning Committee (LEPC) orientation program in the U.S. The participants were:</p> <p>Mr. Chalao Virijaponse, Mayor of Rayong Municipality<br/>Mr. Prasert Wongaroon, Deputy Mayor of Samut Prakarn<br/>Mr. Tanya Hanpol, Deputy Governor - Operation, IEAT<br/>Mr. Weerayuth Wongsiri, Director of Information Technology &amp; Computer Application Center, IEAT<br/>Mr. Paichit Boonyanugratra, Industrial Safety Director, MOI</p> |
| January, 1995  | Trained CAMEO™ to Ban Chang Hospital staff and the Map Ta Phut office of Occupational Health Division, Ministry of Public Health.   |
| March, 1995    | WEC and TEEEX conducted a "Hazardous Materials Transportation Emergency Response" training program at Map Ta Phut Industrial Estate.  |
| March, 1995    | Conducted the "Hazardous Materials Transportation Emergency Response" training program at Bangpoo Industrial Estate.  |
| March, 1995    | Participated in the set-up of Mutual-aid Center to be established at Map Ta Phut & Bangpoo Industrial Estates as a pilot program by IEAT.   |
| March, 1995    | Organized orientation program for TEEEX representatives Mr. Don Carloss & Mr. James Rountree to visit Thai Oil, at Sriracha; Rayong Hospital, Rayong; NPC, Caltex Refinery, IEAT training facility at Map   |

| <u>Date</u>  | <u>Activity</u>   |
|--------------|---|
|              | Ta Phut; IEAT Head Office, Shell Installation and U.S. & Foreign Commercial Service, American Embassy, Bangkok.   |
| March, 1995  | LAMP Country Manager and Helen Arromdee, Ministry of Industry, attended a CAMEO™ Workshop in Louisville, Kentucky.  |
| April, 1995  | Demonstration of CAMEO™ for Windows at the Industry Safety Division, Ministry of Industry, and at the office of Information Technology & Computer, IEAT.  |
| April, 1995  | Assisted IEAT with proposal from Chairman of IEAT mutual-aid Emergency Response and Mitigation Center requesting funding support from the office of Technology Cooperation, US Embassy Thailand.        |
| April, 1995  | Followed activities with collaborators of the training program on "Hazardous Material Transportation Emergency Response" at Map Ta Phut and Bangpoo.  |
| May, 1995    | Participated as a resource person in the APELL workshop at Gresik, Indonesia.   |
| May, 1995    | Participated in the "Doctor Out Reach" Program, on medical information identification and requirement.  |
| June, 1995   | Meeting with K.C. Gupta from the Indian National Safety Council.  |
| June, 1995   | Lectured at AIT on LAMP activities in Thailand to participants from Asian Region attending Risk Management Program.   |
| June, 1995   | Coordinated with UNEP Regional office in Bangkok to promote the implementation of vehicle placarding for chemicals/Petroleum bulk transportation in Thailand.   |
| July, 1995   | LAMP/Indonesia Coordinator toured Map Ta Phut, Bangpoo, and IEAT head office as well as the office of U.S. Embassy to learn about LAMP activities in Thailand for appropriate replication in Indonesia. |
| July, 1995   | Preparation for the upcoming medical responders training program.   |
| August, 1995 | Coordinated the final proposal for approval of US-AEP funding for Thai delegation to visit USA for identification of most updated emergency response equipment.   |

**Date**

**Activity**

August, 1995

WEC sponsored Dr. Jonathan Borak, MD to conduct training program for medical responders to hazardous materials accidents at Map Ta Phut and Bangpoo.

September, 1995

LAMP Program Director and LAMP Indonesia Country Manager observed the results of LAMP activities in Thailand. They also visited IEAT head office, Department of Industrial Works, the National Safety Council, and the IEAT office and Rayong Municipal Fire Resource Center.

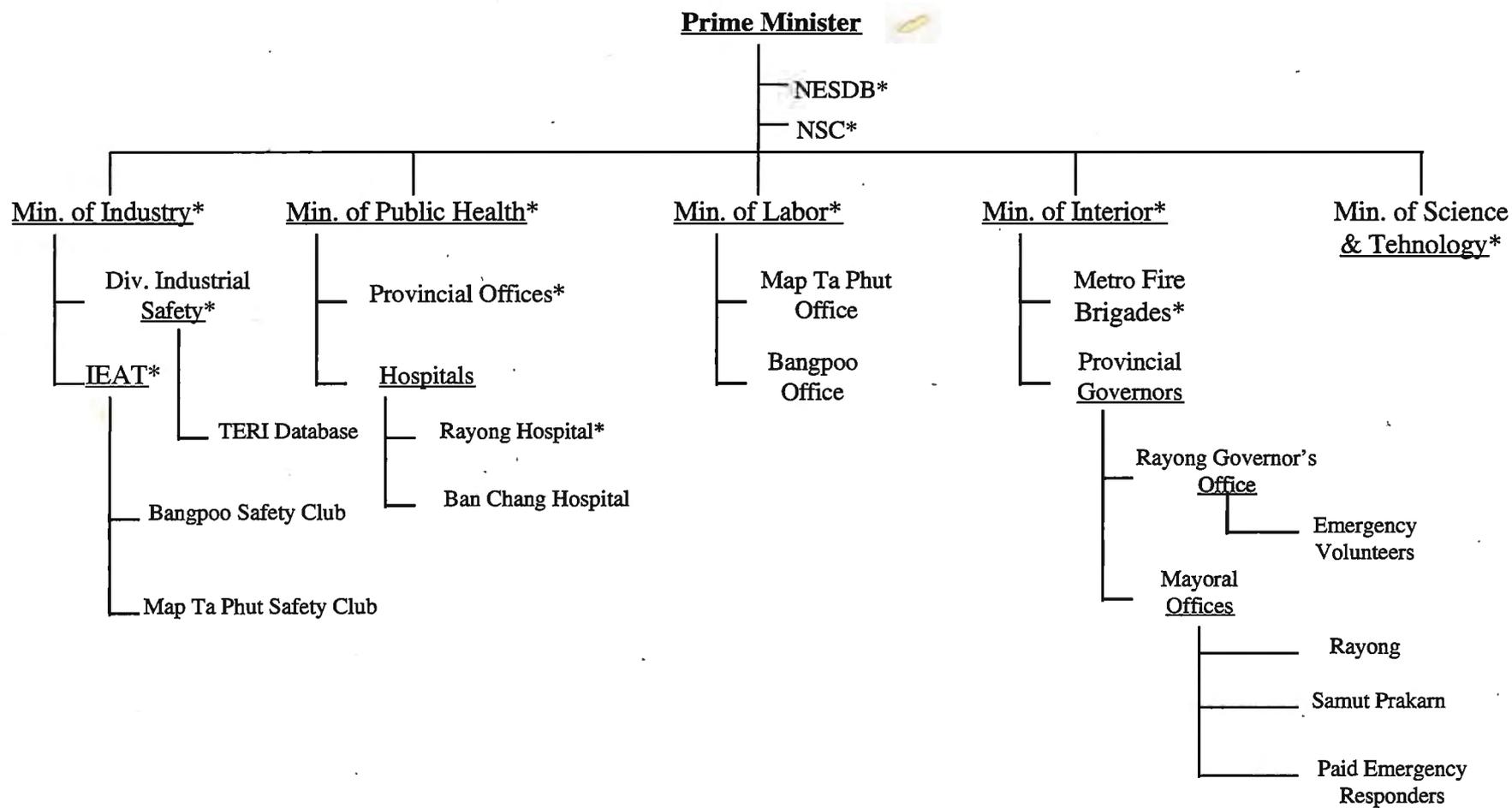
September, 1995

Participated in the Emergency Response Training Program organized by the Ministry of Industry.



## Appendix B

### Network of LAMP/Thailand Actors



\* Indicates agencies using CAMEO™.



## Appendix C

### **An Overview of the Industrial Estate Authority of Thailand (IEAT)<sup>1</sup>**

The Industrial Estate Authority of Thailand (IEAT) is a state enterprise attached to the Ministry of Industry. It is chartered to implement the government's industrial development policy. The objective is not only development but to ensure orderly, planned industrialization of the industries concerned and the country as a whole.

For more than two decades since 1972 - the IEAT has been a guiding light in Thailand's systematic and orderly industrialization. The progress and pace of Thailand's industrial growth over the past 20 plus years can only be described as explosive. Strong government support, much of it channeled through the IEAT, has made much of this growth possible.

Industrial Estates are, by design, self-contained communities: new, fully structured and serviced towns adjacent to new full infrastructure industrial parks, supported by all the amenities required to grow their businesses in an orderly way, to be mutually beneficial to themselves, the nation and its people. With the added problems related to various locations, the control and monitoring of industrial pollution, for example, the broad planning needed to manage all this called for a national authority with the muscle. And so the Industrial Estate Authority was formed.

IEAT provides a one-stop service for Thai and foreign industrial organizations from start to completion, including all types of permits, information and advice on investment and how to set up, incentives and privileges, promoted zones, loan sourcing - even design of the factory itself. Efficient, expeditious, IEAT helps to meet the needs of all entrepreneurs anywhere in Thailand.

IEAT has been working to facilitate foreign investment in Thailand and technology transfer into the country. The policy of government towards industrial decentralization - development away from Bangkok - has been given considerable momentum by IEAT's services to investors, both foreign and Thai. Now with nearly 30 estates under its jurisdiction nationwide, IEAT's achievement is concrete.

#### **Keeping Industrial Development "Green"**

Environmental management is another transfer and application of science and technology by IEAT, and IEAT is charged with implementing policy in regard to the government's rules and regulations in order to stop damage to our environment as necessary development takes place. To choose those avenues and directions which will cause the least (damage), so that our national heritage remains intact, is enhanced by our growth and expansion into the modern industrial world. Everybody in the country is responsible for keeping Thailand green and tidy. In developments like Map Ta Phut and others, IEAT is planting trees, landscaping factory parks, providing water and waste treatment and disposal (to) protect the country's environment and turning it into Green City. Thailand must develop for the future, ensuring that industry grows in harmony with life.

---

<sup>1</sup> Industrial Investment Opportunities, Investment Promotion Division, IEAT, 1995.



## **Appendix D**

### **Thai Government Agencies Using CAMEO™**

- Office of the Prime Minister
  - National Safety Council
  - National Economic and Social Development Board
  - Economic Preparedness Planning Division
  
- Industrial Estate Authority of Thailand
  - Head Office
  - Map Ta Phut Industrial Estate Office
  - Bangpoo Industrial Estate Office
  
- Ministry of Industry
  - Industry Safety Division
  
- Ministry of Labour and Welfare
  - National Institute for the Improvement of Working Conditions and Environment (NICE)
  
- Ministry of Interior
  - Office of Metropolitan Fire Brigade
  
- Ministry of Public Health
  - Rayong Public Health Provincial Office
  - Rayong Hospital
  - Ban Chang Hospital
  - Samut Prakarn Public Health Provincial Office
  
- Ministry of Science and Technology
  - Pollution Control Department

#### **Other Government Agencies planning to use CAMEO™**

- Royal Thai Navy
  - Sattahip Naval Base
  
- Ministry of Interior
  - Office of Highway Police Head Quarter



## Appendix E

### LAMP/Thailand Impact Table

| Performance Indicators            | Baseline   | Cumulative (Final)   | Final Quarter Actual Activities   |
|-----------------------------------|--|--|---|
| <b>1. Emergency Groups Formed</b> | Industrial On-site Emerg. Plan required; few off-site plans prepared | Industry "Safety Clubs" formed and active on monthly basis at both Map Ta Phut and Bangpoo Industrial Estates; IEAT involvement strong at national/estate levels (i.e. building safety center in Map Ta Phut as model for other estates); some companies expanding off-site safety and cleanup procedures and services (good signs that individual industries are taking responsibility for their products once they leave the production facility). |   |
| 1.1 increased preparedness        | few local community reps involved in Emerg. PIng.                    | CAMEO loaded and in-use at local and national levels (in hospitals and mayoral offices at local level; Ministry of Industry, NESDB at national level); Transportation Emergency Response Information (TERI) database also being developed and used in Thai.  | Establishment of decontamination facility at Ban Chang Hospital (Map Ta Phut) - first ever in Thailand.       |
| 1.2 more responders               | few trained emergency responders                                     | Medical, hazmat, and train-the-trainer programs effective; raised level of awareness has prompted many equipment upgrades in both private and public emergency response units; responders are now more numerous and also better equipped.  | trng. for medical response doctors & nurses, audit of decontamination room being built at Ban Chang Hospital. |
| 1.3 site replication              |  | IEAT will use both LAMP sites as models for improving safety and preparedness at other sites throughout Thailand. IEAT Deputy Governor, Tanya Hanpol established a national safety committee (with WEC representation) as permanent planning and policy committee for industrial safety affairs.   |   |

| Performance Indicators        | Baseline   | Cumulative (Final)  | Final Quarter Actual Activities   |
|-------------------------------|--|---|---|
| <b>2. Increased Awareness</b> | No Joint Industry & Community Exercises conducted before | Good links established between civil & industry Emergency Resp. groups; greater awareness at local, regional, and national levels; all groups highly aware of chemical emergency risks and ramifications.   |   |
| 2.1 by community              |  | Little progress to date to directly involve the public in safety activities, although mock drill activities do give good publicity; communities are safer due to great progress at government and industry levels; community members also benefited via residual (trickle down) effect of program. The general population is aware, generally speaking, of the inherent dangers that exist; however, more should be done to directly involve community members. |   |
| 2.2 by industry               | only few large firms have emergency plans                | Better mutual aid among industry; positive "competitive rivalries" developing among companies to improve safety standards (i.e. safety awards given at Bangpoo, integrated response plans accepted at both sites); increase in awareness leading to increased purchases of response/safety equipment at both sites  | USAID approves safety equipment buying mission to US for five key leaders from industry and gov't. Project would not have been worthwhile without greater awareness of safety issues and equipment needs. |
| <b>3. Improved Response</b>   | No integration of on & off-site Emergency Response       | Improved cooperation between industry & local mayors; integration of emergency response now common in response planning. Medical teams involved in response, too.   |   |
| 3.1 plan testing              | no community exercises conducted before                  | Mock drills conducted regularly at both Map Ta Phut and Bangpoo.  | Mock drills conducted at Map Ta Phut and Bangpoo.   |
| 3.2 national network          | weak national emerg. response network                    | Electronic emergency database of transportation response information developed in Thai; CANUTEC hazmat guidebook also published in Thai. Ongoing efforts to continue developing national and local use of CAMEO.  |   |



