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United Nations Industrial Development Organization

Final Report

Title: Energy and Environment Information System (EEIS) in Thailand (Phase II)

UNIDO Project: XP/INT/95/004

Duration: 3 months

Project site: Thailand

Contract No.: 95/208/VK

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Brief description:

Effective national information mechanisms are recognized by the international community as integral components of Agenda 21 objectives. The establishment of an 'Energy and Environment Information System' (EEIS), as outlined in a national study undertaken in 1993, is a crucial step towards the Environmentally Sustainable Industrial Development (ESID) of Thailand. Accordingly, UNIDO is currently providing assistance for the realization of a pilot-EEIS in this country. The initiative follows UNIDO's determination to assist Thailand in its transition to a modern industrial nation pursuing sustainable development. A progress report on the first phase of pilot activities (1 March - 30 June 1995) was submitted to UNIDO in August 1995 by the Center for Library and Information Resources (CLAIR) of the Asian Institute of Technology (AIT).

The Institute of Geology of the University of Vienna has been sub-contracted by UNIDO (Contract No. 95/208/VK, September 11, 1995) for the execution of services as described in the terms of reference dated 24 August 1995. An interim report was presented on September 28, 1995 and activities were carried out accordingly during a mission to Thailand (October 16 - December 20, 1995). These activities form the basis of the underlying report and were mainly focused on information gathering, the identification of a pool of human resources and providing a foundation for new concepts concerning the use of computerized tools for data presentation and decision-support.

A

Context

1. Description of the (sub-) sector

Thailand is lacking an appropriate environment information system which is urgently needed to support ESID strategies. To keep pace with current and expected industrial development in Thailand and its related aspects of raw material usage and potential environmental impact, decision-support tools, and related standards and guidelines will have to be introduced to ensure that sufficient and appropriate information is available to the decision-makers, which is in a form that they can readily understand. This in turn would support new development of industries in northeastern Thailand (*Isan* or geographical area of the Khorat Plateau) which from the start considers issues related to sustainability.

1.1 UN standards and guidelines related to information management according to Agenda 21

Agenda 21 of the United Nations Conference on Environment and Development defines the following important objectives for Information for decision-making (Chapter 40) (A/CONF.151/L.3/Add.40/Item 40.5.):

(a) *To achieve more cost-effective and relevant data collection and assessment by better identification of users, in both the public and private sectors, and of their information needs at the local, provincial, national and international levels;*

(b) *To strengthen local, provincial, national and international capacity to collect and use multisectoral information in decision-making processes and to enhance capacities to collect and analyze data and information for decision-making, particularly in developing countries;*

(c) *To develop or strengthen local, provincial, national and international means of ensuring that planning for sustainable development in all sectors is based on timely, reliable and usable information;*

(d) *To make relevant information accessible in the form and at the time required to facilitate its use.*

Decision-support tools which will be required include *inter alia*: standardized data collection mechanisms; a network infrastructure; and presentation kits (GIS, tabular and multimedia software). A high standard of data presentation is imperative for the successful implementation of any activities related to the above.

2. Host country strategy

The 7th National Economic and Social Development Plan (1992-1996) of Thailand emphasizes the need for 'Decentralization of Urban Development and Infrastructure Service to the Regions', setting targets and development guidelines for different regions and sectors/services.

One of the regions referred to in the Plan is the northeast of Thailand. Under the development guidelines, the promotion of industrial estates, using local raw materials, will provide the economic basis (with Nakhon Ratchasima and Khon Kaen as the industrial centres) of the region.

The rapid growth experienced in other parts of the country has also started to have an impact on Isan and will soon bring about major changes for the region. A wide spectrum of activities has evolved from a favorable investment climate ranging from international exhibitions such as the WORLDTECH '95¹, to joint projects for large scale industrial and infrastructure development.

The 1992 UNIDO industrial development review 'Thailand - Coping with the Strains of Success' states: *'Along with Thailand's rapid industrial growth has come a rapid deterioration of the environment both in terms of an over-exploitation of natural resources and various types of pollution and waste generation in urban agglomerations...Many Thai companies are showing increasing awareness and commitment to environmental issues. In line with the growing consensus that industrial growth will need to be environmentally sustainable, the Seventh [National Social and Economic Development] Plan (1992 - 1996) sets specific targets in an attempt to address crucial facets of an environment-friendly industrial sector.'*

3. Project & on-going programme

3.1. General background

The 1993 study entitled 'INTIB Energy and Environment Information System: Thailand' prepared for UNIDO by Environmental Resources Limited (ERL), London, provides an analysis of the key issues related to environmental information infrastructure support in the country and forms the basis of this study and of pilot information dissemination activities. Among the conclusions of this study the following points may be highlighted:

- *There is a general openness to and interest in new information services. However, the success of such a service will depend on the quality, reliability and pertinence of the information provided. Most managers want to be served with "ready to use" information. They also expect that a fee has to be paid for information.*

¹ see also 'Activities', B.1.1

- *Concern about environmental issues is becoming a central issue. Several respondents pointed to the timeliness of such a service.*

Of course, in launching a new information service in Thailand, much effort would have to be devoted to promoting it and to educating the target clientele on how to use it.

3.2 UNIDO's Environment Programme

3.2.1 Impact of Reform - An outline of improvements at UNIDO 1994-1995

UNIDO is in an period of transition. Structural reforms have been initiated in an attempt to improve the performance of the organization. This process will reshape UNIDO so it can carry out its mandate more efficiently. *In addition to narrowing down some activities planned in the Programme and Budgets 1996-1997, UNIDO is focusing its entire work programme on the seven thematic priorities. In order to be able to respond flexibly to different resource scenarios, the key areas of work under each thematic priority have been further ranked by assigning high, medium and low priority status to each of them.*

Four fundamental criteria have been used to establish this ranking:

- *Identified demand from Member States;*
- *UNIDO's present and foreseeable technical capabilities and comparative advantage;*
- *Activities being undertaken by other UN agencies and organizations;*
- *Approximate range of estimated financial resources available.*

The following items of document GC 6/30/ADD.1 - 17 November 1995 relating to the various thematic priorities were given high or medium priority status and were selected with regard to their importance for this study:

Thematic priority 2: Environment and energy

Environmentally sustainable industrial development (ESID) strategies

- Capacity-building for ESID policy implementation
- Implementation of national agenda 21 programmes

Clean and safe production

- National Cleaner Production Centre programme
 - full operation of eight existing centres
 - establishment of new centres
- Programmes for specific subsectors of industry
- Special initiatives
 - industrial water management and treatment

Thematic priority 3: Small and medium enterprises: Policies, networking and basic technical support

Policy analysis and advice

- Strengthening of information systems to support SMEs
- Development of policy implementation mechanisms through involvement of private sector

Thematic priority 5: Industrial information, investment and technology promotion

Technological and investment information

- Building up sustainable national information networks (capacity-building)
- Integrating all UNIDO information services and offering them on-line
- Improving information on clean technologies and coverage of environmental dimension in industrial statistics

Investment promotion

- Strengthening of World Investment Network Services (WINS) and linking with UNIDO information services

3.2.2 Framework/mandate

All pilot project activities are being conducted within the framework of UNIDO General Conference resolutions, programmes as presented in the report of the Programme and Budget Committee (11th session, PBC.11/CRP.3, 18 April 1995). The most relevant are listed below:

- *The specialized agencies of the United Nations system have been requested by the United Nations Conference on Environment and Development to integrate the concept of sustainable development into their programmes and projects. UNIDO has been requested by its Member States (through GC.5 Res.6 and IDB.13 Dec.7) to continue in particular in its efforts towards supporting Agenda 21, the implementation of international environmental treaties and conventions and the transfer of clean and safe technologies. (Point 57)*

This theme will be addressed through four component programmes (Point 58) which include environmentally sustainable industrial development (ESID) strategies and clean and safe production.

Environmentally sustainable industrial development (ESID) strategies

- *ESID strategies are based on a holistic approach that brings the environmental dimension to bear on all planning, policies and measures related to industry. (Point 59)*
- *UNIDO will support developing countries in their related endeavors in the following areas:*
 - a) data and information collection and analysis;*
 - b) development of monitoring and enforcement mechanisms; and*
 - c) training on environmental management tools such as information system design.*

(Point 60 abbreviated)

Clean and safe production

- *Water management*

The complex issue of water management includes monitoring and analysis of industrial sources of water pollution, drawing up reduction prevention strategies, and helping government agencies in formulating and enforcing regulations.

(Point 67 abbreviated)

Programme and budget 1996-1997

Programme 520 has the objective to develop and enhance the access to information sources and to support INTIB regional, national and sectoral networks. This will be achieved inter alia by providing information services to SMEs, identification of technology transfer opportunities, and enhancing the database on clean technologies.

3.2.3 Environment Information

An adjunct to operational activities is the development of and access to electronic information systems such as the UNIDO Industrial and Technological Information Bank Energy and Environment Information System and the Referral Database on Energy and Environment (REED). The former continued establishing networking mechanisms in Member States to strengthen their ability to collect, store and disseminate industrial environment and energy information, while the REED database totalled more than 10,000 records by mid-1994. (Point 99)

3.3 Context

All tasks described in the terms of reference were part of the EEIS-pilot project with special attention to industrial and infrastructure development in NE-Thailand (or *Isan*) for the following reasons:

- a) The Seventh National Social and Economic Development Plan fell short of achieving all of the objectives set and the Thai Government decided to put emphasis on a few urgent issues such as the development of *Isan*, environmental issues in general and ESID.
- b) Thailand's rapidly deteriorating state of the environment has manifested itself in growing public concern. Increasing environmental awareness has forced the government to take action.
- c) Current developments and activities in *Isan* - e.g. scientific research, the WORLDTECH '95 in Nakhon Ratchasima (Nov. 4-Dec. 16, 1995) - provided vital insights to and information on key environmental technologies and the policy-/decision-making framework of the region (GO's, NGO's and private companies).

4. Institutional framework for the (sub-) sector

The mission to Thailand was based at the local UNIDO country office at ESCAP, Bangkok. Research was also conducted at the WORLDTECH '95 in Nakhon Ratchasima and related events in Bangkok. Further information on the various events can be extracted from Chapter B as well as from the Annexes.

All activities were carried out by the Institute of Geology of the University of Vienna and coordinated by the Industrial Information Section of UNIDO in close collaboration with partner organizations (see also Annex III - Partner Organizations and Contact Points).

B. The Execution of Services

1. Strategy

1.1 Problem to be addressed: the present situation

Thailand is lacking an appropriate information infrastructure to support activities which address the deteriorating state of the environment, waste of natural resources and transfer of environmentally sound technologies². New concepts for improved information management and dissemination were derived from UNIDO's EEIS-pilot project which proposed a methodology to provide adequate information for decision-support and to induce the capacity-building processes. The 1994 Annual Report of UNIDO defines the following development objective:

National capacities for environmental policies

In all environment policy-related endeavors UNIDO aims to build national capacities for attaining ESID. A cornerstone of capacity-building is the need to have trained human resources in Governments, industry support institutions and industry itself, which can analyze issues and have skills to initiate industry-related environmental protection initiatives. (Point 103)

The Secretary-General's Report on Information for Decision-making for the third session of the Commission on Sustainable Development, 1995, states:

Information systems should be set up close to end-users: (i) to ensure that end-users have knowledge of the existence of a given information source; (ii) to facilitate access by end-users; and (iii) to ease two-way information flow, i.e., from the information source to local users, with feedback and lateral information exchange. (B/Point 27)

Both the systems for delivery and the information content must be based on user needs and capabilities. Therefore, the knowledge about the users needs is as important as the ability of the information user to know why technology is needed, what technological options are available, and how to access and apply an appropriate technology. (B/Point 28)

2. General strategy

2.1 The following papers have been reviewed to enhance the overall working strategy:

- ◆ OECD Workshop on Development Assistance and Technology Co-operation for Cleaner Industrial Production in Developing Countries (Hanover, Germany / 28-30 September 1994)³

² See also Point 6 / special considerations - technology transfer and technical assistance

³ Abstracts or summaries of these papers are attached to this report in Annex IV

- a. *Thailand Country Report on the Opportunities for and Barriers to Promoting Cleaner Industrial Production in Thailand*. NOODHARMCHO, A. - Thailand (Paper No.11)
- b. Country Paper submitted by Thailand (Paper No.22)
- c. *The Environmental Situation in Thailand (Summary of the Thailand Environmental Technology Study)*. Submitted by DGE (Deutsche Investitions- und Entwicklungsgesellschaft mbH) (Paper No.30)

◆ The Execution of Services Related to the Energy and Environment Information System (Phase II) (Project No.: XP/INT/94/014)

The 1st EEIS Network meeting (8 December 1994, AIT, Bangkok, Thailand) has created vital contacts with officials from Thai GOs and NGOs. The AIT has assisted the Institute of Geology in furthering of these contacts.

2.2 Activities and related working strategy

The activities carried out can be grouped as follows:

I. *Information gathering*

- Interviews
- Participation at expert meetings and conferences
- Study of project relevant literature
- Retrieval of data about the existing database infrastructure

II. *Formation of a pool of human resources*

- Intensification of existing contacts
- Establishment of new ties with mission-critical organizations
- Plan of action for future cooperation

III. *Strategy for the second phase of the project*

- Identification of constraints
- Conclusions and recommendations
- Strategy and plan of action

2. Activities

2.1 Conferences, exhibitions and other events

- **WORLDTECH '95 - World Agricultural and Industrial Exhibition, Thailand (Nov 4-Dec.16, 1995)**

Place: a purpose-built technopolis on the new 300 acre campus of the Suranaree University of Technology (SUT) in Nakhon Ratchasima (259 km NE of Bangkok)

Objective: *The World agricultural and Industrial Exhibition or WORLDTECH '95, Thailand is organized to portray the national development in the areas of agriculture, industry and environment.*

Organization: The event was organized by the Royal Thai Government under the Office of the Prime Minister and the Ministry of University Affairs. The Organizing Committee consisted of 39 members from various GOs and NGOs.

Activities: The exhibition was visited on three occasions, two of which corresponded to conferences held at the Surasamanakham Convention Centre of the SUT. A number of companies engaged in the environmental sector were surveyed and the information gathered converted into ASCII format. New ties with potential partner organizations for the EEIS-Thailand were forged and profiles prepared. Statistics and profiles are attached in Annexes II and III.

General impression: After a somewhat slow start the WORLDTECH '95 became the biggest exhibition ever held in Thailand eventually attracting over 100,000 visitors daily. The exhibition's main theme 'In Search of Better Living' and its emphasis on sustainable development and clean technology depicted the strong rise in public awareness about the rapidly deteriorating state of the environment in SE-Asia. Workshops, conferences and seminars attracted an international audience mainly interested in entering the new Indochina market. The pavilions were designed to serve the needs of large-scale public relations campaigns and the quality of the information material varied from place to place. A lot of unskilled representatives were hired quickly who often could not provide the requested information, thus, it took some time to collect all the facts. However, most of the desired material could be retrieved successfully and further material can be requested at any time, since a list of all exhibitors and contact addresses is available.

Special Findings:

UNIDG should intensify its contacts with:

- Electricity Generating Authority of Thailand (EGAT);
- Ministry of Science Technology and Environment (MOSTE);
- Petroleum Authority of Thailand;
- Petrochemical Industry of Thailand in order to assess their funding and human resources.

(see Annexes II & III)

- **AGRIMACH '95 - Agricultural Machinery Exhibition and Symposium (4-6 November 1995)**

Place: Management Center of SUT and AGRIMACH '95 Pavilion, SUT campus, Nakhon Ratchasima, Thailand.

Primary objective: The primary objective of AGRIMACH '95 was to provide a forum for the exchange of information on design, development and adaptation, local manufacture, dissemination, and marketing of agricultural machinery.

Organization: AGRIMACH '95 was organized by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) under the Regional Network for Agricultural Machinery (RNAM) project. RNAM is executed by ESCAP with technical assistance from the Food and Agriculture Organization (FAO) of the UN, UNIDO and the International Rice Research Institute (IRRI).

Activities: The AGRIMACH '95 exhibition was surveyed for clean technologies in the post harvesting and food processing sectors.

General impression: The event clearly showed the necessity of further cooperation in the agricultural machinery sector in order to improve the standard of agriculture in the region. The exhibition did not place any emphasis on cleaner production methods in the post harvesting sector.

- First Asia Pacific Seminar on Small Satellite Technology and Applications (5-7 November 1995)

Place: Surasamanakham Convention Centre, SUT campus, Nakhon Ratchasima, Thailand

Objectives:

1. To survey the worldwide status and to promote understanding of small scale satellite technology and its applications;
2. To exchange ideas, views, experiences and information pertaining to small satellite activities among participants;
3. To discuss and strengthen cooperation among countries in the Asia-Pacific region on utilization of small satellite technology in sustainable development.

Organization: The seminar was organized by the Government through the Prime Minister's Office and the Ministry of University Affairs.

Activities: The participation in the seminar provided up-to-date insights on the utilization of small satellite technology in sustainable development. Expert opinions concerning the use of GIS and decision-support tools were gained and addresses, contact points and background material collected.

General impression: The fact that the opening ceremony of the seminar was presided over by HRH Princess Maha Chakri Sirindhord shows the importance attributed by Thailand to satellite technology and computerized decision-support tools for sustainable development. The event was attended by an international audience comprising top experts from science and business.

- The 16th Asian Conference on Remote Sensing (ACRS) (20-24 November 1995)

Place: Surasamanakham Convention Centre, SUT campus, Nakhon Ratchasima, Thailand

Objectives:

- a) To discuss Asian problems in Remote Sensing and GIS;
- b) To exchange academic, application and technical information;
- c) To promote regional cooperation amongst the member countries;
- d) To promote operational applications of remote sensing and space technology.

Organization: The event was co-organized by the Organizing Committee WORLDTECH '95, the Asian Association on Remote Sensing (AARS), the National Research Council of Thailand (NRCT) and SUT.

Activities: Background material and expert opinions on GIS and related issues were collected. Contact points and human resources identified. Further information can be found in Annex II and III.

General impression: The conference drew a high-profile international audience of over 400 to a location over 250 km from Bangkok. Many new ideas were presented during the event and potential new partner organizations for the EEIS-Thailand were identified.

Special findings:

- UNIDO should closely liaise with the National Research Council of Thailand (NRCT) for the assessment of future funding strategies.
- UNIDO should intensify its contacts with other organizations in the Asia-Pacific Region that have an obvious interest in establishing joint initiatives to enter the highly complex SE-Asian market. A list of interesting organizations is presented in Annex III.

- **CLEANTECH '95 - International Exhibition on Environmentally Sound Technologies (22-28 November 1995)**
Place: The exhibition was held at ESCAP, Bangkok, and was organized by APCTT (ESCAP).

Objectives:

- (i) To promote awareness of the availability of clean technologies;
- (ii) To provide a forum for technology trade between suppliers and users of technology.

Organization: The event was organized in conjunction with the Ministerial Conference on Environment and Development in Asia & Pacific and interfaced with the WORLDTECH '95 and its environment-related activities.

Activities: Background information on clean technologies was collected. A list of exhibitors is attached in Annex VI.

General information: The main focus of CLEANTECH '95 was to promote 'environmentally sound technologies' (EST) and sustainable development covering: clean technology; clean products; and low- and non-waste technologies (LNWT). Further information can be obtained from the UNIDO office in Bangkok.

2.2 Interviews and surveys

A large number of interviews were conducted during the mission, comprising 37 companies in the environmental sector, 6 companies with focus on GIS and database technology and services, 2 companies in the petrochemical sector, 2 companies in the energy sector, 5 departments of MOSTE, 2 departments of the Ministry of Industry (MOI), 4 NGOs, 6 universities and several individuals. Selected data on environmental technologies were compiled in ASCII files in a pre-defined format according to Point 6 of the TOR.

The findings derived from these activities represent the basis for the conclusions and recommendations. Further information can be retrieved from the Interview Keynotes Section (Annex II) and the charts section (Annex III).

Special findings:

- There exists a lot of interest in UNIDO's activities in the environmental sector and the EEIS-Thailand initiative. Some of the interviewed individuals have asked for information material on these activities (see Annex III).
- Some of the interview partners asked for information on UNIDO's activities in Thai language.

2.3 Interim report

An Interim Report was submitted on September 28, 1995 based on the insights gained from preparatory work carried out in Vienna prior to the mission to Thailand. Most of the activities underlying that report were conducted according to Point 1 of the TOR.

2.4 Follow-up action

A plan of action is described under Point 3.

CONCLUSIONS AND RECOMMENDATIONS

- INTIB's environment information activities are not restricted to the EEIS project - they are rather a set of initiatives to work out programmes and plans for future national activities and cooperation aimed at establishing an international network.
- The formation of strategic alliances and of the networked pool of human resources are essential for the successful implementation of this initiative.
- Networking, an integral part of the EEIS-project, is the key concept for UNIDO's initiative. Networking and decentralization to (alliance) partners of competence is the main alternative to single-point centralization, traditional concepts of hierarchy and vertical integration.
- National lead centres for this initiative should be located at the UNIDO country office or representation. The existence of such headquarters for such an activity is a prerequisite for the establishment of a national and (as a long-term goal) international network of contact points (CPs) and collaborating entities, eventually leading to an international initiative led by a global forum.
- UNIDO should act as the central CP for the following reasons:
 - a) UNIDO's political acceptability is very high;
 - b) UNIDO has the reputation of being a neutral mediator between industrialized and developing countries;
 - c) UNIDO's focus on industrial development implies a close linkage with the private sector - a feature which is missing in many other UN organizations;
 - d) UNIDO has the capability of performing all the functions of a central CP in coordinating the initiative and establishing the PHR. In a strategically aligned PHR, UNIDO does not have to rely on a single PCP to carry out mission-critical tasks but it can rather refer to a wider range of diversified cooperation partner that serve as network CPs.
- UNIDO, due to its well-established contacts to industry and its role as the UN organization specialized in industrial development, has excellent access to data from industry and related governmental and non-governmental organizations. UNIDO has the broadest information base on industry and related issues within the UN system. Subsequently, UNIDO should exploit the opportunities deriving from the existing human and information infrastructure more efficiently in order to achieve a higher degree of cooperation which is imperative if it is to conduct such a large scale programme.

- There exists a substantial shortage of human resources for the implementation of future stages of this programme within UNIDO itself and most other organizations included in the survey. In conclusion none can handle such an activity independently and there are no other initiatives along these lines, although many have thought of doing something similar. This shortage of experts can be found mainly in the following information fields: GIS; database development and operation; Internet and advanced telecommunication services; network administration; information system design; and decision support tools. This lack of experts without receiving substantial human and budgetary contributions can only be overcome by wide-ranging interdisciplinary cooperation and the formation of a pool of human resources (PHR). A list of organizations that have substantial mission critical resources can be found in Annex II (Profiles of Selected Organizations and interview keynotes) or in Annex III. Many of these resources could also be accessed through UNIDO's existing channels.
- UNIDO was found to have sufficient project-relevant resources in the following fields: policy planning and sustainable development; international standards; regulations and guidelines; industrial information services; administration of large-scale projects; organization of meetings, seminars and conferences; pilot database and World Wide Web (WWW) services; pilot project implementation; expert systems; machinery and heavy industry; petrochemical industry; biotechnology; and agriculture.
- UNIDO should liaise more closely with industry for better access to project-relevant data, a wider funding basis, enhancement of human resource infrastructure, wider political acceptability and a more customer-oriented approach. In doing so UNIDO should not restrict its field of operation to the SMIs since many critical parameters such as marketing, technology, funding and human resources depend on cooperation and political backing from large-scale industries⁴. UNIDO should exploit its capabilities to act as an interface between the SMIs and large scale industries (LSIs), since there exists an obvious demand for assistance in the transfer of technology from LSIs to SMIs and cooperation between the two groups is often hampered by lack of a mediator. The INTIB initiative provides a good opportunity to establish UNIDO's role as an interface by uniting the two sides in joint projects.
- A widening of cooperation with other organizations in the UN system engaged in energy and environment would certainly strengthen the initiative.
- An astonishing 100% of all individuals included in the survey expressed their interest in Internet and on-line database services. There was wide-spread consensus that any environment information system has to have an interface with the Internet for easy access to online database and information services.

The low cost of Internet access due to the local telephone tariff of three BHT per call and the easy and fast accessibility of data were the major issues in the discussions. However there seemed to be great concern about data security within such a system.

⁴ A list of potential partners within the range of large scale industries in the energy and environment sectors is listed in Annex III

- There was great interest in the UNIDO WWW site and many people would have liked to get more information about the EEIS over the Internet. In conclusion, environment-related information should be served to the global community using UNIDO's WWW-server for promoting the initiative and in order to reduce the cost of promotion material and to enhance marketing strategies.
- UNIDO has to work out precise schemes for cooperation with potential partner organizations prior to intensifying contacts.
- The terminology of SCP should be changed to Contact Point (CP) with regard to the networking philosophy underlying the EEIS-initiative, since a large number of people expressed the opinion that the term CP has a less hierarchical and more neutral appearance.
- The present PCP, AIT/CLAIR should also be referred to as CP because of reasons of political acceptability.
- The implementation of GIS and other decision-support tools in the EEIS will require major funding and input from experts. A list of experts and/or organizations is presented in Annex III. Concepts for funding are still subject to further discussion, and a list of possible sources is presented in Annex III.
- Future phases of the EEIS-Thailand should unite a set of key-institutions in a strategic alliance. A list of some key-institutions is presented in Annex III.
- UNIDO's current budget crisis could hamper the future implementation of EEIS related activities. To counter an eventually exacerbating funding situation a concept for sustained operation at minimal funding is presented in the plan of action.
- UNIDO should continue to make use of large scale international exhibitions and related events in order to gather information on new technologies and projects.

Plan of Action

- Prof. Dr. Hermann Häusler and Mr. René Pitayataratom from the Institute of Geology of the University of Vienna volunteer to organize an awareness seminar on future opportunities and strategies for INTIB's environment information programme focusing on the following issues: mission update with special emphasis on funding and budgetary policy; implementation of GIS; on-line database service on the World Wide Web (WWW); and funding and promotion of the initiative. The seminar will be held free of charge.

- Within the limitations of regular research budgets, private contributions of volunteering researchers and human resources available the Institute of Geology could assist UNIDO in the following activities.
 - d. extension of contacts with Austrian, Thai and Australian institutions operating in the field of GIS, database development and operation, energy and environment.
 - e. establishment and extension of contacts with companies engaged in environmental research and development.
 - f. establishment of initial contacts with the Technology Transfer Center (TTZ) of the Montanuniversität Leoben;
 - g. formation of a pool of human resources;
 - h. promotion of the initiative within the scientific community.

All of the mentioned services will be offered at no or minimum cost to UNIDO in order to extend the good relationship between the Institute of Geology, University of Vienna and UNIDO, pending resource availability

SPECIAL CONSIDERATIONS

- **Information Material**

Hand-outs / brochures that briefly and generally introduce UNIDO were not available.

- **Software and decision-support tools**

The two most commonly used GIS software packages were ARC/INFO[®] and Intergraph MGE[®], both can be considered as market leaders in GIS and related software applications. Both have interfaces to export and import data in a broad number of formats (including ASCII) and can exchange data between each other. Both products are available on different platforms.

ARC/INFO is available for UNIX platforms and can be found installed mainly on workstations of the SUN SPARC family under SUN's Solaris Operating System, although there is a Windows-based version, which is mainly used for training purposes. ARC/INFO is one of the pioneers in the field of GIS software, a fact which is reflected in its great market share. No other product has been on the market for such a long time and comes with so many case studies. There are plenty of ARC/INFO users and advice and training can be found in many places.

However, expert knowledge must be acquired and expensive training courses will be necessary for successful implementation of ARC/INFO. It has the reputation of not being the most user-friendly product and it is a major investment. A further problem might be that SUN-platforms and similar workstations are quite expensive in comparison to PC based GIS packages, which are slowly taking over the GIS-workstation market.

Intergraph, which also started its GIS product palette on UNIX-based workstations, has recently shifted its entire Modular GIS Environment (MGE) product line to Microsoft Windows NT. Like Environmental Systems Research Institute (ESRI), Intergraph is a major player in the GIS market and its user-friendly Windows NT-based interface gives it a competitive edge over UNIX-based products. Other than ARC/INFO, Intergraph MGE is a CAD add-on using Microstation as the primary interface - an approach which enjoys increasing popularity among software developers. With the introduction of Windows NT 3.5 and 3.51, Microsoft has made a major move to conquer the UNIX-dominated workstation and server market. It is a cross-platform 32-bit operating system, Windows 95- and largely Windows 3.11- and MS-DOS-compatible. To add to the broad spectrum of software, Microsoft has also produced a large number of Windows NT compatible versions of the popular MS Office package and Microsoft SQL Server 6.0. More importantly, it has induced a large number of software developers to provide Windows NT versions of their products. Given the fact that Microsoft plans to make Windows NT its primary operating system designed to replace the Windows 3.x and Windows 95 product-line and Windows NT's focus on client/server and database features it would be an advantage to base any future EEIS/GIS implementation on this operating system.

Special findings:

Virtually every modern database and GIS package has an interface to export and import data as ASCII files facilitating data conversion and integration. The ASCII format probably represents the most reasonable way to handle the integration of REED data into a GIS. For the conversion of large quantities of data a small computer program will have to be developed which performs the conversion of the various ASCII files. Such a program does not require a lot of expert knowledge or funding to develop and could be handled by some of the consultants.

ANNEX I

XP/INT/95/004/21-01

Energy and Environment Information System (EEIS) - Phase II

Terms of Reference

As an extension to current pilot EEIS information activities in Thailand, the consulting agency should examine issues related to information management to assist in environment-related decision-support concentrating on the emerging north-eastern industrial zone.

In particular the consulting agency should

1) Review previously-prepared material on the EEIS in Thailand (national survey, reports on progress of pilot activities), concentrating on network linkages between its institutions (and those in the EEIS report not currently participating in pilot activities).

2) Undertake a review of those institutions in Thailand which already work with decision-support tools such as GIS as well as those which can provide the data required for them.

This will require preparation of: profiles of potential partner institutions for the next phase of this project; similar activities underway in Thailand; the available human, hard- and software infrastructure to carry the activities.

3) Undertake a review of: existing national data base infrastructure to provide input to decision-support tools; existing national data, its characterization and availability; technical aspects related to data conversion, networking, links to GIS tools etc.

4) Present conclusions, recommendations and a draft project outline for the next phase, including listings of benefits and constraints.

5) Collect information on environmental technologies from the WORLDTECH '95 exhibition and related events.

6) Record data on environmental technologies (including the owners/vendors of the technologies) from the WORLDTECH '95 exhibition and related events. The data should be prepared as an ASCII file in a pre-defined format which will be made available during the pre-mission briefing.

In carrying out the above duties, the consulting company will be required to: closely liaise with AIT/LRDC; hold discussions with the Thai agency responsible for funding the national environment programme to ascertain their interest in supporting second phase activities;

**ANNEX II - PROFILES OF SELECTED ORGANIZATIONS AND INTERVIEW
KEYNOTES (October - December 1995)**

D) UNIVERSITIES

**Asian Institute of Technology (AIT)
P.O. Box 2754, Bangkok 10501, Thailand**

UNIDO Primary Contact Point - Center for Library and Information Resources (CLAIR):

Dr. Robert D. Stuart, Prof., School of Advanced Technologies and Executive Director of CLAIR. Tel.: 524 58 53; Fax: 524-5870, 516-2126; E-mail: <s'ueart@rccsun.ait.ac.th>. CLAIR is currently carrying out a UNIDO-contract on INTIB/EEIS and is the designated Primary Contact Point (PCP). CLAIR will present a final report by mid-January which is one month behind schedule - the delay was caused by the retirement of Mrs. On-Anong, who played a key role in the implementation of UNIDO activities. The researchers who had to replace her in her function had little time to prepare for the task. UNIDO's intent to proceed with the implementation of following project phases will be discussed on the occasion of the second EEIS-meeting where the final report of AIT will be presented. Dr. Stuart plays a coordinating role and has delegated research to the following scientists:

Dr. Divas B. Basnyat, Senior Information Scientist at CLAIR and at the Regional Energy Resources Information Center (RERIC). Dr. Divas has been asked to replace Mrs. On-Anong for the rest of the project and has only recently joined the team (September 1995). Since then he had to play a double role at CLAIR and RERIC. Together with his colleague, Ms. Supalak, he carried out most of the EEIS related tasks since September. Tel.: 516 0110-44 Ext.5866; Direct Phone: 524 58 66; Fax: 524 58 70; E-mail: <e.irenic@ait.ac.th>.

Ms. Lilia Robles-Austriaco, Manager - Information Centers, Editor - Journal of Ferrocement, FIN News, Geotechnical Engineering Bulletin, International Coordinator - Ferrocement International Network. Tel.: 516 0110-44; Direct Line: 524 58 64; Fax: 516 21 26; E-mail: <IFIC@emailhost.ait.ac.th>, <AGE@emailhost.ait.ac.th>.

Activities and issues discussed: A set of questions was handed over to Mr. Divas in order to overcome unclarities which surfaced after the first meeting and to replace the first questionnaire which disappeared after being sent by e-mail. It emphasized AIT's activities in promoting and marketing the REED system under UNIDO contract No. 94/102, but also contained questions about CLAIR's activities concerning the gathering of mission critical information and the search for future EEIS partner organizations. A tour through RERIC and STAR facilities was organized by Mr. Divas on December 7, 1995. A mailing list for the EEIS was sent by e-mail and is attached in Annex XI.

Conclusions:

- a) *CLAIR researchers stated that interest in the REED was not as high as expected, a fact which is being blamed on the lack of effectiveness of the promotional material.*
- b) *With regard to concepts for funding of later stages of the EEIS including the sustained operation at AIT Ms. Robles-Austriaco outlined that there had been no research in this direction because the mentioned issues had not been part of the TOR..*
- c) *Ms. Robles-Austriaco said that the final report is expected to be ready by January 20, 1996.*
- d) *CLAIR did not produce any information material in Thai language which had an obvious effect on the amount of interest generated among the Thai organizations.*
- e) *CLAIR does not have the capabilities of carrying out the implementation of GIS technology and Internet-related services into the EEIS, though other departments at AIT could handle such tasks.*
- f) *With regard to their survey CLAIR researchers pointed out that within the range of governmental organizations dealing with energy and environment issues there are no similar projects and no similar database and information systems.*
- g) *Focusing on future cooperation CLAIR has consulted nine governmental organizations the EEIS, a list of which is presented in Annex III.*

Interviewed GIS/environment experts: Space Technology, Applications and Research Center (STAR). STAR is a research program of the School of Environment, Resources & Development of AIT and has a large number of scientists from the computer, environmental and geosciences. The spectrum of hardware available is impressive and meets the needs for most large scale research projects (especially if GIS focused): a large number of 80486 and Pentium based platforms, several SUN-SPARC 20 workstations, an Ethernet-based LAN and a great lot of peripherals. The most commonly-used GIS package is ARC/INFO in both PC-based and workstation based (UNIX) versions. Further GIS software used includes GRASS and PCI. The center offers regular international training courses in GIS and cartography and has conducted a broad range of international projects.

Mr. Awadh K. Sar (M.Sc.), Research Associate, GIS and Remote Sensing expert, last research project: "Mapping of Salt-affected Soils using Remote Sensing and Geographic Information Systems: A case study of Nakhon Ratchasima, Thailand". Tel.: 524-5584; Fax: 524-5597, E-mail: <NRB957807@rccvax.ait.ac.th>.

Mr. Shanker Raj Pathak (M.Sc.), Program Specialist I, GIS Application Center, Programmer and GIS specialist for environmental applications. Tel.: 524-6195, Fax: 524-5597, 524-6147, E-mail: <pathak@ait.ac.th>.

Dr. Jean-Pierre Delsol, Assoc. Prof., Remote Sensing and GIS expert, leading expert of the STAR program. Tel.: 524-6125; Fax: 524-5597; E-mail: <RS4591@ccvax.ait.ac.th>.

Natural Resources Program (NRP):

Dr. Apisit Eiumnoh, Head of NRP, Remote Sensing and GIS expert, expert on soil salinity mapping. Tel.: 524-5588; Fax: 524-5597.

UNEP/AIT collaboration on the Environment Assessment Programme - Asia and Pacific:

Mr. Chandra Giri (M.Sc.), Programme Specialist, GIS and Remote Sensing Expert. Last project: "Developing Land Cover Classification System for Remote Sensing Applications in Asia". Tel.: 524-6236; Fax: 516-2125; E-mail: <cpgiri@ait.ac.th>.

Conclusions:

AIT's heavy investments in the STAR and NRP programs make it a desirable partner organization in the fields of remote sensing, GIS and environmental sciences. Through these programs AIT has access to significant human resources and is implementing a good number of international projects with regional focus. The programming capacity in the database and GIS range is good and suitable for further project activities. AIT's high interest in the Internet only adds to the spectrum of opportunities which could be exploited.

Considerations:

The cost-benefits

UNIDO would have to make sure of the cost benefits and availability of the human resources it is interested in, since the AIT due to its precarious funding situation tends to engage in many projects at the same time while charging more than other institutions for comparable services.

Political acceptability

Although AIT enjoys great popularity in the academic community, especially at the university level, its political acceptability at the various departments of the Ministry of Science, Technology and Environment (MOSTE) and the Ministry of Industry (MOI) is limited. The general attitude is one of cooperation as equal partners (see also Conclusions and Recommendations). In conclusion AIT's designation as the Primary Contact Point for the EEIS hampers UNIDO's effort to promote the initiative. In fact, I was asked why UNIDO cannot establish the PCP at the local UNIDO country office and do what AIT has been doing so far.

Khon Kaen University (KKU)
Khon Kaen 40002, Thailand

Khon Kaen University (KKU), established in 1964 under the first National Development Plan, was the first regional university and the leading educational and research institution of Northeast Thailand (also called Isan). The Northeast region occupies an area of 170,000 sq km and has 19 million inhabitants or about one-third of the total area and population of Thailand, yet the Northeast is the poorest and least developed region in the country. The majority of the Northeasterners make their living as small scale farmers with a per capita income that is one-third of the national average and one-tenth of the Bangkok average. These people have long faced problems of poor soil fertility, erratic rainfall and drought. To ameliorate this situation special emphasis was put on the development of the Northeast within the framework of the Seventh National Social and Economic Development Plan (1992-1996). Further development programs are also being outlined in the up-coming 8th National Development Plan. The opening of the surrounding Indochina countries Laos, Vietnam and Cambodia has triggered a wave of regional development not experienced in the last five decades. KKU is investing heavily to extend its role as a regional center for education, research and international affairs. KKU enjoys not only a very good reputation but also a high political acceptability.

Interviewed researchers:

Faculty of Technology: The Faculty of Technology produces graduates with the managerial ability to effectively develop and utilize Thailand's natural resources, especially in the Northeast. Three departments make up the Faculty: the Departments of Biotechnology, Geotechnology and Food Technology. The Faculty has skilled academic personal displaying a pragmatic approach towards applying technology to solve problems. Three additional departments namely Material Technology, Energy and Petroleum, and Production Technology have been recently established. A Technology Transfer and Adaption Unit will be set up to coordinate community outreach activities.

Prof. Kasem Nantachai (Ph.D.), Asst. Prof. and Dean, Dept. of Food Technology, food technology expert engaged in technology transfer. Tel.: (043) 239 329; Fax: (043) 241 216; E-mail: <kasem@kku1.kku.ac.th>.

Prof. Chalong Buaphan (Ph.D.), Assoc. Prof. of Groundwater, Assoc. Dean for Academic Affairs, Dept. of Geotechnology, groundwater and GIS expert. Tel.: (043) 242 331-47; Fax: (043) 239 329; E-mail: <chalong@kku1.kku.ac.th>.

Faculty of Science: The Faculty consists of six departments, namely: Biology, Chemistry, Mathematics (and Computer Science), Microbiology, Physics and Statistics. Four other departments are to be opened soon, namely: Biochemistry, Environmental Ecology, Computer Science and Material Science.

Boonsong Watanakij (M.Sc.), Dean, computer scientist and programmer. Tel. & Fax: (043) 237 603; E-mail: <boonsong@kku1.kku.ac.th>.

Library:

Ms. Aphai Prakobphol, Head Librarian. Tel. & Fax: (043) 237 302.

Contacted officials:

Prof. Dr. Prinya Chindaprasirt, President, Assoc. Prof. . Tel.: (043) 237 092; Fax: (043) 244 476; E-mail: <prinya@kku1.kku.ac.th>.

Prof. Suwit Laohasiriwong (Ph.D.), Head Institute of Dispute Resolution, legal expert and economist. Tel.: (043) 241 146; Fax: (043) 243 097; E-mail: <suwit@kku1.kku.ac.th>.

Conclusions:

KKU's role as a leading university in NE-Thailand gives it a strong standing as a partner for any project aimed at developing the region. Most of the academic staff interviewed expressed their interest in the EEIS-initiative, sustainable development of the region and on-line information systems in general. KKU's importance as a primary source of environmental data of NE-Thailand was stressed on several occasions and there was widespread consensus that an EEIS can never be implemented successfully without support from and contacts within the regions.

KKU has good contacts to key institutions engaged in the energy and environment sectors in Thailand such as the NRCT, the Mekong River Commission and various departments of the MOSTE. It is a policy of the university to promote international cooperation and joint research programs with obvious benefit for NE-Thailand and Indochina. KKU enjoys great political support and a solid funding basis. It could contribute considerably to the success of the initiative. Hardware, software and human-resources are suitable for carrying out medium-scale GIS projects with regional focus.

Considerations:

Given KKU's involvement in a large number of regional development projects it will not be easy to convince them to contribute some of their tightly-managed resources without government support and political backing from other sources. KKU does not operate a database system focused on energy and environment, though it has excellent software and hardware in the GIS and database sector and a broad range of analogue material which could be integrated. Like other Thai universities KKU has a large number of skilled students which could be hired for database entry at relatively low cost.

Ramkhamhaeng University
Bangkapi, Bangkok 10240, Thailand

Ramkhamhaeng University is an open-admission university founded in 1971 which also offers nation-wide distant learning courses. The institution has seven faculties and is widely known for its extensive use of advanced means of telecommunication for educational purposes such as courses via satellite TV for remote areas or Internet-based services. With the number of students exceeding 30,000, the university is enjoying great popularity - PR is one of the great strengths of the institution. The organization has a declared interest in the use of advanced information systems and services which can enrich the spectrum of educational programmes.

The following individuals were interviewed:

Dr. Amnuay Narthasilpa (Ph.D.), Faculty Council Committee, Faculty of Science, Department of Computer Science, computer scientist and system analyst. Tel. & Fax: (662) 300-5247.

Assoc.Prof. Piboon Puriveth (Ph.D.), Dean, Faculty of Science, ecologist. Tel.& Fax: 314-2035.

Conclusions:

Ramkhamhaeng University is a main user of information services and information technology and could provide vital insights and new concepts for an environment information system in Thailand. Its surprisingly pragmatic and applied approach towards technology, provide good opportunities for cooperation at least at the consultant level. The institution focuses on education rather than research, though individuals are being encouraged to establish new research projects within their field. Programmes in the environmental and computer sciences are well established and the organization has good contacts with foreign universities.

Considerations:

Ramkhamhaeng's engagement in GIS-related programmes has just started and further development will be needed until a critical mass is achieved which can handle medium to large scale GIS projects.

**Suranaree University of Technology (SUT)
Nakhon Ratchasima 30000, Thailand**

Suranaree University of Technology, founded in 1990, was designed to provide the Northeast with a second large-scale academic center to improve the educational infrastructure and facilitate the transfer of vital technologies to Thailand's least developed region. SUT recently hosted the WORLDTECH '95 and received governmental support for the event. SUT is equipped with state-of-the-art computer and telecommunications equipment and is located 14 km from the city of Nakhon Ratchasima, Thailand's third largest city. The campus area displays some of Thailand's most modern educational facilities and will be the place of major exhibitions in the future. It is the target of the institution to contribute to sustainable development of the region and to become a gateway for technology transfer and development.

Contacted individuals:

Prof. Ruben C. Umaly (Ph.D.), Director, Centre for International Affairs. Tel.: (044) 216 191-8 ext. 1154; Fax: (044) 216 122; E-mail: <umaly@sura1.sut.ac.th>.

Dr. Yuvadee Manakasem (Ph.D.), Institute of Agricultural Technology, crop production technology expert. Tel.: (044) 216 191-8 ext. 2275; Fax: (044) 216 102; E-mail: <yuvadee@sura1.sut.ac.th>.

Considerations:

SUT is still a very young university and it will take some time to establish its role as a leading scientific institution in Thailand, although its modern facilities and equipment as well as major financial contributions from the government will provide a quick and smooth start. Given SUT's policy as a 'green' but technology-oriented university and its focus on clean technology, UNIDO faces should establish contact. SUT's standing in the GIS sector is still weak but it seems that the database sector is well developed. In conclusion, contacts with SUT should be intensified now, following WORLDTECH '95 and SUT officials should be invited to participate in the second EEIS-meeting.

Conclusions:

Due to SUT's engagement in WORLDTECH '95, the university's academic operations were suspended for about three months. As a result, few researchers were available for informative talks and most of the academic staff had to participate in the organization of the event. However, the following findings could be derived from visits to the WORLDTECH '95 and interviews:

- SUT has been granted major funds to hire top-experts from abroad to enhance their academic programmes.
- SUT is eager to broaden their spectrum of international cooperation.
- SUT has a declared interest in the sustainable development of the region and is looking for partners to initiate joint projects in the energy and environment sectors.
- SUT has a solid funding basis to support future initiatives.
- SUT emphasizes on computer sciences and is currently initiating database and GIS projects. In conclusion SUT should be contacted for further information on their human and scientific infrastructure.

Kasetsart University

Phaholyothin Road, Chatuchak, Kasetsart Campus, Bangkok 10900, Thailand

Kasetsart University is one of the most renowned scientific institutions in Thailand. Focusing on agricultural development, its researchers helped to make Thailand the fifth largest net food exporter of the world. Faced with the rapid deterioration of the environment, its more recent focus has become one of sustainable agricultural development and cleaner production methods.

Contacted official:

Dr. Supan Kamchanasuthum (Ph.D.), Deputy Director, Office of Agricultural Economics, GIS and remote sensing expert. Tel.: (662) 579-8545; Fax: (662) 579-0617.

Conclusions:

Kasetsart has a long tradition in the use of GIS and database technology as computerized decision-support tools for the agricultural sector. The organization is dominating the sector in Thailand in terms of education and research and enjoys good national and international contacts. Kasetsart's role in the development and transfer of environmentally sound technologies could make it a valuable partner, which could contribute vital data for the EEIS-Thailand - although a lot will have to be converted into digital format. In order to evaluate the true potential of the university further contacts will be necessary, since some of the leading experts in the database sector were on mission during November and December 1995.

King Mongkut's Institute of Technology (KMITT)
48 Sukawadi Road, Thonburi, Bangkok 10140

King Mongkut's Institute of Technology is one of the leading technical institutions in Thailand and has several branches in other provinces. The Technical Information Service (TIS) of KMITT is an EEIS contact point and a competent partner for UNIDO's initiative. TIS has been providing information services on renewable energy and food technology at an international level for a number of years. It was learned from this experience that their subscribers greatest interest was environmental issues. With support from KMITT's School of Bioresources and Technology and the Pilot Plant Development and Training Institute, it was decided to launch an Environment TIS (ENTIS), to be supported by a regular abstracts journal. TIS' recent focus on the environment and common objectives with the EEIS provide a good basis on which to continue cooperation for mutual benefit.

Interviewed researcher:

Mr. Terry Commins, Head of TIS, Manager in the National Centre for Genetic Engineering & Biotechnology of the MOSTE, information technology expert. Tel. & Fax: 428 - 4014.

Other contacted researchers of KMITT:

Dr. Suthi Aksornkitti (Ph.D.), Assoc. Prof., Faculty of Engineering, space technology expert. Tel.: 587-0020-9 ext.8647, Fax: 585-1181.

Conclusions:

TIS has plans to extend its range of information services and initiate new projects aimed at providing better access to technical information. These projects might also involve CD-ROM based products and decision-support tools. TIS is offering training on their information systems and has 8 staff members. Its target group is *international and not limited in any way*.

The organization's hardware consists of stand-alone units made up of UNIX-based SUN workstations and Windows 3.11 and 95 based PCs. According to Mr. Commins no LAN was needed so far though by June 1996 a WWW-server and a LAN will be set up to link TIS with on-line database services in Singapore, the Philippines and Indonesia. TIS is not operating a homepage now. The departments main database (90% of which is bibliographic information) is operated under ISIS which was chosen because of a long-term PC based perspective and cost factors.

Mr. Commins listed the following constraints for the establishment and operation of information systems in Thailand:

- the shortage of commercial service providers and the lack of competition
- the low quality of Internet related services and the lack of adequate data infrastructure
- the shortage of experts in the fields of computer science, database development and GIS

TIS offers information about database services from other organizations to its subscribers and prefers an international focus to a national one. The data collected, however, should be applicable to meet the demand of the region. TIS's mailing list contains over 4.000 individuals in 170 countries and territories.

The following recommendation was given by Mr. Commins concerning the operation of WWW and online database services:

User statistics derived from monitoring database access in online and conventional systems should be the main criteria to selectively put data on the World Wide Web in order to ensure a customer-oriented approach.

II. Ministry of Industry (MOI)

Department of Industrial Works
Rama VI Road, Bangkok 10400

In a short interview the Department of Industrial Works' main functions were described as follows

- 1) Nationwide administration of operating licenses of all industrial facilities excluding government-owned industrial estates,
- 2) Monitoring and inspection of these facilities for environmental impact assessment,
- 3) Provision of decision-support to the decision-makers in the MOI.

The department is currently studying the establishment of a Clean Technology Center with technical assistance from UNIDO. It has 800 staff members, (200 professionals - engineers, managers and environmental scientists) and modern computer hard- and software. At present, however, full Internet access is only available in the library section and on-line database services are not used because of the shortage of skilled personnel.

Interviewed researcher:

Dr. Jullapong Thaveesri (Ph.D.), Office of Industrial Environmental Management, environmental engineer. Tel.: 202-4235; Fax: 202-4226.

Conclusions:

The Department of Industrial Works has a highly ambitious GIS and database programme aimed at establishing an industry-focused information system for all 76 provinces of the country. The GIS and database system will put special emphasis on industrial aspects of pollution monitoring and hazardous waste management. Pilot systems are in operation and cover the Bangkok Metropolitan Area and the Samut Prakla province. The main GIS package used is ARC/INFO running on SUN SPARC 20 workstations. Dr. Jullapong said that cooperation on the information system is appreciated, but that, at present, there is no established relationship with any other organizations in this respect. UNIDO has already several well-established contacts and could hold informative talks on possible future collaboration on the EEIS.

Industrial Estate Authority of Thailand (IEAT)
618 Nihom Makkasan Road, Bangkok 10400

The Industrial Estate Authority of Thailand is a state enterprise attached to the MOI. IEAT was established in 1972 to plan, develop and manage industrial estates throughout the country both separately and in cooperation with private enterprises.

The Authority's main objectives are to decentralize industrial development, provide systematic industrial development including public facilities and services, operate industry-related business and promote and supervise public and private industrial estates.

IEAT is a designated EEIS-CP and has a well established relationship with UNIDO.

Interviewed official:

Mr. Chaiyut Changjenrob, chemical engineer, Environmental & Safety Control Division.
Tel.: 253-0561; Fax: 252-9273.

Conclusions:

IEAT currently manages 23 industrial estates in Thailand, 80% of which are situated within a 50 km radius of Bangkok Metropolitan Area. The organization is currently planning a computerized environment information system for its estates (with assistance from the Japanese Government) to replace the current analogue system. The main focus of the system will be on pollution monitoring and control (also online systems), environmental impact assessment, land development and decision support. Hard- and software will be acquired to meet the needs of such an undertaking, however expert knowledge is still a critical factor. IEAT is currently collaborating with the Pollution Control Department of MOSTE on GIS-related matters and does not have its own GIS or database programme in the environment sector. Main target groups for IEAT-services are specialized governmental agencies, such as the Pollution Control Department, the management level at IEAT and decision-makers in other ministries. The Environmental & Safety Control Division has 13 professional staff members mostly consisting of engineers and environmental scientists. IEAT's Information Section is providing access to the Internet and related services to the various divisions.

The Federation of Thai Industries (FTI)

**Queen Sirikit National Convention Center, 60 New Rachadapisek Rd., Klongtoey,
Bangkok 10110, Thailand**

The Federation of Thai Industries previously known as Association of Thai Industries was founded in 1967. The FTI is an autonomous organization responsible to the MOI. Its major objective is to work cooperatively with various government agencies in the development of Thailand's economy, particularly in the private sector.

FTI's objective is to produce a wide economic base for the development of the agricultural, industrial and service sectors of society.

In 1994 FTI agreed to become a CP for the EEIS-Thailand.

Interviewed official:

Ms. Dominica Dacera, environmental engineer, The Industrial Environmental Management Program. Tel.: (662) 229-4930-5; Fax: (662) 229-4940.

Conclusions:

FTI recently abandoned a major database project after USAID withdrew its financial support. In order to continue its line of activities, the organization initiated an Internet-based online database project sponsored by the Royal Danish Government. The main purpose of the system will be to provide information to FTI members and the public and to promote the exchange of information by providing better and faster channels for its access and dissemination. Although FTI is currently not operating a LAN, major hard- and software improvements will follow within the next months. FTI's role as an interface between Governmental Organizations and the private sector is currently reaching a point of severe limitations because of the lack of adequate online database and information services, decision-support tools and qualified staff for the management and operation of such advanced services. At present there are only two professionals to manage the library and the computer services at FTI. FTI just started a pilot Internet-based information service.

Special findings:

In the interview, Ms. Dacera stressed the importance of the following criteria for the successful establishment of an EEIS in Thailand:

- The information must be carefully selected to serve the needs of an export-oriented industry. Information on environmental technologies with international focus should be complemented by information on underlying environmental standards and regulations.

- The EEIS should serve as a forum for 'environmental auditing' in order to provide easy ways to contact experts in environmental technology and related fields
- The EEIS should feature high-quality but cost-effective clean technologies in order to promote ESID in the SME's.
- The EEIS should provide background information on investment and funding opportunities in the environment sector.

III. Ministry of Science, Technology and Environment (MOSTE)⁵

**National Science and Technology Development Agency (NSTDA)
Technical Information Access Center (TIAC)
Vidyabhathana Building, Chulalongkorn University Soi 12, Phaya Thai Road,
Bangkok 10330, Thailand**

TIAC's is an NSTDA-sponsored agency with the main objective to provide technical information to the public. Its location on the campus of Chulalongkorn University shows the close relationship between TIAC and Thai universities. TIAC provides access to and information from online database systems as well as library catalogues and information material on CD-ROM. The center offers subsidized services and has an extensive document service. In 1995 TIAC agreed to become an EEIS-CP. There seems to be no focus on decision-support tools. TIAC has recently initiated two database projects, namely, the Thai Thesis Database Project and a bibliographic Research Database Project.

Interviewed researcher: Dr. Sudhiporn Patumtaewapibal (Ph.D.), Director of TIAC, information management expert. Tel.: 216-8801-4; Fax: 216-8800; E-mail: <oispt@chulkn.chula.ac.th>.

⁵ An organizational chart of the ministry is presented in Annex VII

Special findings:

Prof Sudhiporn highlighted the following important factors for successful database management:

- Customer orientation
- Avoidance of duplication and redundant information
- Constant update of existing information

**National Research Council of Thailand (NRCT)
196 Phaholyothin Road, Bangkok 10900, Thailand**

The NRCT is a government-sponsored think-tank and a forum for the promotion of activities related to science, technology and environment. The council plays a vital role in providing decision-support to other GOs especially related to funding and budgetary policies. The functions of the NRCT is detailed in Annex VII.

Contacted official:

Prof. Dr. Suvit Vibulsresth (Ph.D.), Secretary General, leading remote sensing and GIS expert. Tel.: 579-2280; Fax: 561-3035.

Special findings:

The NRCT has pioneered remote sensing and GIS in Thailand and has some of the leading experts in these fields. The use of GIS and other computerized decision-support tools for sustainable development is being heavily promoted and although the NRCT itself is only funding small to medium scale projects it plays a vital role in directing funds to large scale research projects.

The NRCT would be a competent partner in the field of GIS and the environmental sciences.

IV. Other selected organizations and companies

■ **Thailand Development Research Institute Foundation (TDRI)**
565 Soi Ramkhamhaeng 39, Bangkapi, Bangkok 10310, Thailand

Contact person: Dr. Mingsam Kaosa-ard (Ph.D.), Director, National Resources and Environment Program. Tel.: (662) 718-5460; Fax: (662) 718-5461-2; E-mail: <ming@leela.tdri.or.th>.

Dr. Direk Patmasiriwat, Ph.D., Senior Research Fellow, Natural Resources and Environment Program. Tel.: (662) 718-5460; Fax: (662) 718-5461-2; E-mail: <direk@leela.tdri.or.th>.

Key features: strong standing in GIS, main GIS package: ARC/INFO, nationwide environmental study programme, clean technology, government sponsored think-tank, environmental impact assessment, long experience in the implementation of environmental research project, well established programmes

■ **Thailand Environment Institute (TEI)⁶**
210 Sukhumvit 64, Bangchak Refinery Building 4, Prakanong, Bangkok 10260, Thailand

Contact persons: Dr. Dhira Phantumvanit (Ph.D.), President. Tel.: 331-0047; Fax: 332-4873; E-mail: <tei!dhira@senior.nectec.or.th>.

Ms. Qwanruedee Limvorapitak, research fellow, environmental engineer. Tel.: 331-0047; Fax: 332-4873; E-mail: <tei!qwanruedee@senior.nectec.or.th>.

Key features: aggressive and successful NGO founded in 1993, project volume 1995: 110 Mill. BHT, 93 staff members, capable of conducting large scale GIS and database projects, desirable partner for the EEIS-Thailand, large GIS programmes under the Environmental Information Center (EIS), major GIS system: ARC/INFO, solid funding basis, good national and international contacts

Special activities: A presentation on the EEIS-Thailand was held on 8 November 1995, 13 researchers participated in the event. Information material was distributed.

⁶ The Annual Report 1995 is available upon request.

■ **ESCAP/ENRMD**

UN Building, Rajdamnern Avenue, Bangkok 10200, Thailand

Contact person: Dr. Changchui He (Ph.D.), Officer-in-Charge, Space Technology Applications Section, space technology expert. Tel.: 288-1456; Fax: 288-1000; E-mail: <changchui.unescap@un.org>.

Key features: Regional Remote Sensing Programme, 8 professional staff members. C.S and remote sensing focus

■ **Internet Thailand**

Bangkok Thai Tower, 108 Rangnam Road, Phayathai, Bangkok 10400, Thailand

Contact person: Dr. Thaweesak Koanantakool (Ph.D.), Director. Tel.: 642-7065; Fax: 642-7064; E-mail: <htk@inet.co.th>.

Key features: Commercial branch of the National Electronics and Computer Technology Center (NECTEC), leading Internet service provider, further information material will be sent to UNIDO

■ **Loxley Intergraph (Thailand) Ltd.**

Gypsum Metropolitan Tower, 539/2 Sri Ayuthaya Road, Rajdhavee, Bangkok 10400, Thailand

Contact person: Ms. Roongnapa Swaddisanpa, Director, Technical Services. Tel.: 248-8274-76, Fax: 248-8278.

A company profile is added in Annex VIII.

■ **UNEP - Regional Office for Asia and the Pacific**

UN Building, Rajdamnern Ave, Bangkok 10200, Thailand

Contact person: Mr. Mark P. Radka, Coordinator, Network for Industrial Environmental Management (NIEM). Tel.: 288-1679; Fax: 280-3829; E-mail: <Mark_Radka_at_UNESCAP1@un.org>.

Further information is available over UN channels.

■ **Telecom Asia Corporation Public Co., Ltd.**

Telecom Tower 18, Ratchadaphisek Road, Huai Khwang, Bangkok 10310, Thailand

Contact person: Ms. Patcharin Jetinai, Engineering Record System Division, Engineer. Tel.: 643-1111; Fax: 643-0544.

Key features: one of the biggest telecommunications companies in SE-Asia, recent focus on the development of information systems, further information material will be made available

- **Trillium Technologies Ltd.**
#6 Jalan SS18/3E, Subang Jaya 47500, Petaling Jaya, Selangor Darul Ehsan, Malaysia

Contact person: Ms. Charlotte Ow (M.Sc.), remote sensing/GIS analyst. Tel. & Fax: (6-03) 732-9935.

A detailed company profile is attached in Annex IX.

- **Electricity Generating Authority of Thailand (EGAT)**
R&D Office, Nonthaburi 11000, Thailand

EGAT is a mighty organization which will require a special survey. Further information can be requested from the Mr. Winai.

Mr. Winai Naknam, electrical engineer, Energy Planning and Development Division. Tel.: (662) 436-1633; Fax: (662) 436-1635; E-mail: <rdown@email.egat.or.th>.

- **PASCO Corporation**
Higashiyama Bldg., 1-1-2, Higashiyama, Meguro-ku, Tokyo 153, Japan

Contact person: Dr. Li Xidong (Ph.D.), GIS expert, GIS Division, Technical Development Department #1, Systems Engineering Center. Tel.: 03-3715-1221; Fax: 03-3715-1421.

Key features: space technology and applications, large GIS division, international clientele, information system design and development, capable of handling large scale GIS related projects, excellent contacts to leading software developers, data conversion and integration, programming, custom-tailored GIS-applications

- **ASEAN Institute of Forest Management**
IGB Plaza 6, Jalan Kampar, 50400 Kuala Lumpur, Malaysia

Contact person: Dr. Malcolm Gray (Ph.D.), remote sensing and GIS specialist. Tel.: 603-442 9251; Fax: 603-442 5115; E-mail: <mgray@aifm.po.my>.

Key features: long experience with the use of GIS and other computerized decision-support tools for forest management, focus on GIS and database technology

■ **Curtin University of Technology (CUT)**
Prockway Road, Floreat, WA 6014, Australia

Contact person: Mr. Peter Caccetta (M.Sc.), Division of Mathematics and Statistics. GIS expert and computer specialist. Fax: 9-387-0121.

Key features: strong environmental programmes, GIS and database specialists, international research projects and R&D initiatives in SE-Asia, extensive contacts to other Australian research institutions

■ **Devel-Tech Inc.**
201 Robin Crescent, Saskatoon, Saskatchewan, Canada S7L 6M8

Contact person: Dr. Kit M. Sarkar (Ph.D.), President, GIS specialist. Tel.: (306) 933-1020; Fax: (306) 033-0180; E-mail: <develtec@eagle.wbm.ca>.

Key features: Devel-Tech's broad range of services ranges includes GIS implementation, R&D, project planning, feasibility studies (!), pilot studies, project implementation as well as training and maintenance services. A corporate profile is available upon request.

Annex III - List of key institutions for the EEIS-Thailand

- **Organizations with strong programmes in the energy and environment sectors**
 - Asian Institute of Technology (AIT)
 - Thailand Environment Institute (TEI)
 - Khon Kaen University (KKU)
 - National Science and Technology Development Agency (NSTDA)
 - Suranaree University of Technology (SUT)
 - Kasetsart University
 - National Research Council of Thailand (NRCT)
 - Thailand Development Research Institute Foundation (TDRI)

- **Organizations with experience in GIS and other computerized decision-support tools**
 - Kasetsart University
 - AIT
 - TEI
 - TDRI
 - KKU
 - NRCT
 - King Mongkut's Institute of Technology (KMITT)

- **Companies offering suitable GIS software**
 - Intergraph Corporation
 - Environmental Systems Research Institute

- UNIDO Contact Points
 - AIT
 - Federation of Thai Industries (FTI)
 - Technical Information Access Center (TIAC)
 - Industrial Estate Authority of Thailand (IEAT)
 - Technical Information Service (TIS)

- Companies with special focus on GIS and database services
 - PASCO Corporation
 - Trillium Technologies Ltd.
 - Loxley Intergraph Thailand Ltd.
 - Devel-Tech Inc.

- Companies and organizations currently conducting projects aimed at the establishment of computerized environment information and/or database systems
 - Department of Industrial Works
 - TEI
 - TIS
 - AIT
 - KKU
 - FTI

- Companies and organizations that have expressed their interest in a joint initiative for the establishment of an environment-related information system
 - IEAT
 - SUT
 - Loxley Intergraph Thailand
 - NRCT

- Trillium Technologies Ltd.
- TDRI
- Companies and organizations with funding potential for the initiative
 - EGAT
 - Petroleum Authority of Thailand (PTT)
 - NSTDA
 - Department of Industrial Works
 - IEAT
 - NRCT
 - SUT
- Key companies and organizations for the operation of on-line database services
 - NECTEC
 - Internet Thailand
 - Telecom Asia
- Organization contacted by AIT/CLAIR:
 - Department of Energy Development and Promotion
 - National Science and Technology Development Agency (NSTDA)
 - Thai Institute of Scientific and Technical Research
 - International Institute for Energy Conservation
 - Thailand Environment Institute (TEI)
 - Department of Industrial Works/Office of Quality Development and Environment
 - New Energy and Industrial Technology
 - Rural Industry Information Services Unit
 - Thailand Development Research Institute (TDRI)

ANNEX IV

ABSTRACTS OF RELATED OECD STUDIES

Paper No.11. Submitted by A.Noodharmcho (THAILAND). 7 pages.

ABSTRACT.

In Thailand, the change from an agricultural to a more industrialised society only began in earnest early in the 1990s, but development is now fast-growing. Pollution prevention and environmental protection has not until recently become a priority, and as a result Bangkok is now suffering from severe pollution. In the Seventh National Economic and Social Development Plan, (1991-6) the government has set definite targets to improve the quality of the Thai environment. Based on the principle "The Polluter Pays", the plan offers tax incentives for the private sector to invest in equipment to reduce the causes of pollution. The Ministry of Science, Technology and the Environment has created three agencies; Pollution Control Department (PCD), Office of Environmental Policy and Planning (OEPP), and The Department of Environmental Quality Promotion (DEQP) to facilitate carrying through the aims of the plan. The clean production campaign cuts across the Thai philosophy 'eliminate rather than prevent', but several "clean production promoting" actions have already been taken. These are; Enforcement, Technology Transfer, and Economic Incentive, all of which are reviewed. Regarding development assistance and technology cooperation, the Ministry of Science, Technology and the Environment is trying to initiate projects via its agencies PCD, OEPP, and DEQP - "magic eyes" being a typical example. Bilateral arrangements have been reached with Japan (The Environment Research and Training Centre), and also the UK where short and long term training for Thai personnel in the Great Britain is projected.

Paper No. 22. Submitted by THAILAND. 4 pages.

ABSTRACT.

A serious pollution problem exists in Thailand as a result of rapid industrialisation. At the present rate of development, it is estimated that 6m tons of waste will be generated annually by the year 2001. In addition to this, air quality in the most industrialised sectors has deteriorated markedly as gaseous pollutants arise from fuel combustion - in 1991 some 87m tons of CO₂ were produced. Plans to combat this situation are in hand. The 7th Five Year National Economic and Social Development Plan sets out development strategies for cleaner production and pollution prevention. A six point plan for this is presented. The government expects to cooperate with both private and public industrial sectors in a number of initiatives, including products with a "green label", and establishing waste recycling centres for waste buyers and sellers to trade their wares. Obstacles to introduction of clean technology are discussed. The action plan to encourage clean production is split into short term (2 years), medium term (5 years) and long term (10 years). This system is characterised by ever tightening legislation besides the incentives. The institutions responsible for cleaner production in Thailand are; Thailand Industrial Standards Institute, Department of Industrial Works of the Ministry of Industry, Department of Pollution Control of Ministry of Science Technology and Environment as well as research units in Universities, some industries and private organisations. However, inadequate liaison between them and lack of suitable personnel hamper their efforts. Thailand desires increased bi- and multilateral cooperation with developed nations in order to forward its clean production ambitions. The Pollution Control Department plans to establish a cleaner technology information centre to store relevant information. The future aims of this centre include targeting the industries most in need of assistance, these being; leather tanning, metal working (plating, cleaning, and finishing), food, and chemicals.

Paper No.30. Submitted by DGE (GERMANY). 5 pages.

ABSTRACT.

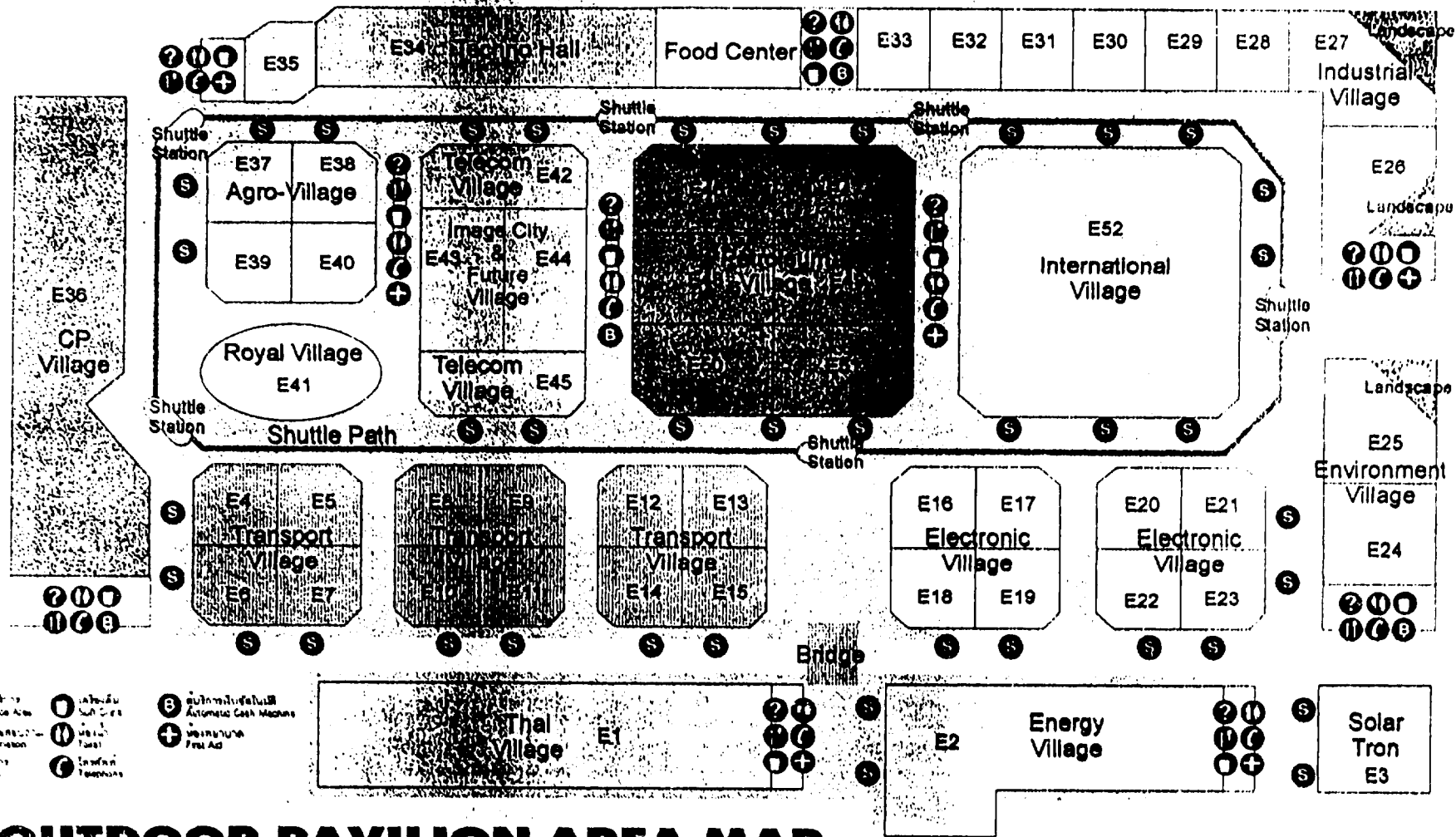
The paper is a study of the Thai environmental technology market up to the year 2000. It assesses and documents the possibility of technological cooperation between European environmental technology equipment manufacturers and Thai private enterprises and identifies the most promising types of technology that offer the best prospects of Euro-Thai cooperation. The background of Thailand's environment is presented. The very rapid economic expansion has left Thailand with a raft of problems including; an unbalanced increase in the demand for water and energy and a rate of waste and pollution generation well in excess of its GDP. Many pressures beset the Thai economy including; water shortages in the Bangkok Metropolitan Administration area, virtual lack of any centralised form of waste water treatment facilities and infrastructure and increasing difficulty in handling and effective disposal of municipal, industrial and hazardous wastes. However, there are some promising signs. Confidence in the regulatory authority framework has grown on account of its evenhandedness and the transparency of its policies. Major investment in key areas have been announced and are itemised. The Thai market for environmental technology is assessed in depth and tabulated on the basis of both low growth and high growth scenarios. The study's conclusion is that there are promising markets for European environmental technologies in Thailand. The key to establishing successful business activities with Thai partners are; demonstrate commitment to Thailand, establish and accumulate extensive contacts, and create a base of local people working for and growing with the firm. For European investors, Thailand has to be seen not only as a market for environmental technology, but also as a place to learn and develop innovative, regionally adapted products capable of sharpening companies' capabilities to do business elsewhere in Thailand.

ANNEX V

MAP OF WORLDTECH '95



WORLDTECH '95
Thailand



OUTDOOR PAVILION AREA MAP

ANNEX VII

ORGANIZATIONAL STRUCTURE OF THE
MINISTRY OF SCIENCE, TECHNOLOGY
AND ENVIRONMENT

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MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

His majesty King Rama IV, known to foreigners as King Mongkut, had devoted his spare time studying astronomy and was able to predict the occurrence of the total solar eclipse, at Wa Ko sub-district in Prachuab Khiri Khan province on August 18, 1868, - over a century ago so well as if he were well equipped with modern scientific equipment. In 1982, the Bangkok Bicentennial Anniversary Year, the Thai Government had designated him the 'Father of Science of Thailand'. The Thai scientists are all grateful to him for his pioneering spirit in introducing modern science to national development. Therefore, they all reached a consensus to name August 18 of the year as the 'Thai National Science Day'.

Overview

Ministry of Science, Technology and Energy was established on March 24, 1979 under the amendment Act of the Proclamation of Revolutionary Party No. 216 dated September 29, 1972 and announced in Royal Gazette Vol. 96 dated March 23, 1979. Before the establishment of Ministry of Science, Technology and Energy, Science and technology activities were independently and un-coordinately carried out by many agencies, thus resulting in overlapping in functions, operations and plans. Moreover, there existed neither effective plans nor policies designed as proper guideline for science and technology development. Which, therefore, gave rise to many problems such as the lack of continuity of the activities and waste of many human resource, budget and equipment. Aiming at the remedy of such problems, the Ministry of Science, Technology and Energy was established by the recommendation of National Research Council Meeting for the objectives to formulate, operate and develop science and technology work. Science and technology is the prime mover of the economic and social development of the nation, as well as provides the basis of a better life for its people. In addition, it has always been the key to man's greatest achievement and the answer to his dreams of a better world. Science and technology plays the vital role in various production processes. Since Thailand possesses limited amount of natural resources which now becomes deteriorated pertaining to the poorly-conceived exploitation, the productivity improvement should therefore be regarded as a mean of rehabilitation rather than an end of the sources. To enhance such goal and thereby ensure stable, long-term growth of Thai economy and steady improvement of national life, it is crucial that Thailand positively promotes the development of science and technology, not only for the sake of the nation prosperity but also encouragement of the product of wisdom and innovation of the Thai people. Ministry of Science, Technology and Energy has changed its name to Ministry of Science, Technology and Environment by virtue of the Improvement of Ministries Act (No. 6) B.E. 2535, announced in the Royal Gazette Vol. 109 dated April 3 B.E. 2538 (1992).

FUNCTIONS

- To lay out policy, plan, scheme and project related to science, technology, energy and environment.
- To control, conduct, command and perform the works related to science, technology, energy and environment along the policy, plan, scheme and project for the efficient working and good coordination which will bring the most socio-economical benefit and the national stability.
- To perform the working plan, follow up and evaluate the works related to science, technology, energy and environment.
- To improve the plan, scheme and project concerned to be always appropriate and modern.
- To develop technology within the country towards the production and marketing. : To provide service and promote both the internal and external technology transfer.
- To study, analyze, research and provide the significant data for science, technology, energy and environment.
- To collect, compile and propagate the outcome of the research and the development related to science, technology, energy and environment.

ORGANIZATION

The Ministry of Science, Technology and Environment constitutes 9 Departments, 1 State Enterprise and 1 Agency as follows:

- 1 _____
 - 2 _____
 - 3 _____
 - 4 _____
 - 5 _____
 - 6 _____
 - 7 _____
 - 8 _____
 - 9 _____
 - 10 _____
 - 11 _____
-

OFFICE OF THE SECRETARY TO THE MINISTER

Rama VI RD., Ratchathewi Bangkok 10400 Thailand TEL. 246-0064, 246-1382-6 Telex: 20838 MINSTEN TH CABLE: MINSTEN BANGKOK 10400 FAX NO. 66-2-2468106

FUNCTIONS

- To be responsible for political and general affairs of the Minister.
 - To control, inspect and carry out the works according to the policy of the Prime Minister and the Minister.
 - To coordinate routine works with political and parliamentary works of the offices within the Ministry, among the Ministries and other offices concerned.
 - To collect, consider, analyze and research data as well as provide new recommendation or project to the Minister.
 - To perform, follow up and evaluate report with a view to solve various problems.
 - To receive for consideration and remove the petition from the people before submitting to the Minister.
 - To make appointment, handle reception party, prepare meeting agenda, do reports etc.
 - To carry out and control general affairs, correspondence work, working system management, statistical data collection, etc.
-

OFFICE OF THE PERMANENT SECRETARY

Rama VI RD., Ratchathewi Bangkok 10400 Thailand TEL. 246-0064, 246-1382-6 Telex: 20838 MINSTEN TH CABLE: MINSTEN BANGKOK 10400 FAX NO. 66-2-2468106

FUNCTIONS

- To be responsible for the general administration of the Ministry.
 - To coordinate and render services concerning science and technology information and technology transfer
 - To lay out, conduct and follow up the policy, plan and project for the development of manpower, science, technology, energy and environment according to the national social and economic development plan
 - To coordinate with foreign agencies for exchanging expert & expertise concerning science, technology, energy and environment and raising fund for development.
 - To render computerized services and perform data processing for scientific and technological information
 - To publicize scientific and technological information, news and research works by press release and so on.
 - To search for new technologies and provide such information to Thai agencies and private sectors
 - To coordinate with Thai scientists, technologists Working abroad and to be participants in conferences seminars, meetings and so on
 - To seek foreign assistance in order to develop science, technology energy and environment works
 - To act as an agent in the selection and negotiation of foreign technologies as well as salesman for locally developed technologies
-

DEPARTMENT OF POLLUTION CONTROL

66/1 Soi Phibun Wattana 7 Rama VI Road, Bangkok 10400 Tel. 279-7180-9 Fax: 279-0672

FUNCTION

- To Submit opinion for the formulation of policy and plans to promote and conserve national environmental quality pollution control.
 - To make recommendation for the formulation of environmental quality standards and pollution control standards from sources.
 - To formulate environmental quality management plan and measures to control, prevent and prevent and mitigate environmental problems caused by pollution
 - To monitor and to prepare a report on the state of the pollution.
 - To develop systems, scheme and appropriate methodologies for the application in the management of water quality, air quality, noise, hazardous substances and solid waste.
 - To perform functions stipulated in the Improvement and Conservation of National Environmental Quality Act concerning pollution control.
 - To take actions on the petition concerning pollution.
 - To perform other functions as may be designated by law to be those of the Department or as may be entrusted by the Ministry or by the Council of Ministers.
-

DEPARTMENT OF ENERGY DEVELOPMENT AND PROMOTION

Kasat suk Bridge Bangkok 10330 Tel. 223-0021-9 , 222-4103-8,223-2593-5 Fax 226-1416

FUNCTIONS

- To investigate, compile, analyze, experiment and examine data related to energy sources, production, transformation, Transportation and distribution and utilization.
 - To study, plan and formulate projects related to energy and energy related activities. . To design, construct and maintain of energy production facilities as well as facilities for energy transformation including transportation and distribution and utilization systems such as electricity generation from new and renewable sources of energy, fuel production from biomass and water pumping by electricity.
 - To lay down regulations and standards related to production, transformation, transportation and distribution, utilization and conservation of energy resources and regulate and oversee the enforcement of such regulations and standards
 - To establish rate for energy supplied by Department of Energy Development and Promotion
 - To secure, control, construct, buy, sell, rent, loan, transfer or receive energy production, transformation, transportation and distribution system and to issue permits for energy production or expansion of energy facilities
 - To provide energy technology transfer, promote energy audit training and disseminate energy issues related to energy production transformation, transportation and distribution, utilization and conservation as well as being coordination centre for cooperation on energy and related activities
-

DEPARTMENT OF SCIENCE SERVICE

Rama VI Road, Ratchathewi, Bangkok 10400 Tel. 246-0703, 246-1382-6 Fax 247-9468

FUNCTIONS

- To be government's scientific and technological laboratories.
 - To provide chemical, physical and biological analysis services to governmental and private organizations
 - To carry out research works on the utilization of the nation's natural resources and industrial and agricultural wastes for economic benefit.
 - To provide analysis and testing services in order to control and certify the quality of industrial products, food and beverage.
 - To provide consult and trouble shooting service for industry.
 - To offer analytical chemistry training for university students and personnel of the various governmental and industrial laboratories.
 - To render services concerning scientific and technological information.
 - To establish, maintain and disseminate the national measurement standards in science and technology.
 - To provide calibration, training and other related measurement services to industries and other agencies.
-

DEPARTMENT OF ENVIRONMENTAL QUALITY PROMOTION

60/1 Soi Phibun Wattana 7 Rama VI Road, Bangkok 10400 Fax : 278-3950

FUNCTIONS

- To provide public education and liaise with media on environmental protection.
 - To collect and establish database on environmental information and technology
 - To provide environmental knowledge to other government agencies and the private sector.
 - To perform other functions specified by law.
-

OFFICE OF THE NATIONAL RESEARCH COUNCIL OF THAILAND

196 Phahon Yothin Road, Chatuchak Bangkok 10900 Tel. 579-1370-9 Fax : 561-3035

FUNCTIONS

- To advise the National Research Council policies and research programmes which are suitable to recommend to the Cabinet.
- To consider the establishment of scientific branches and recommend accordingly to the National Research Council.
- To consider ways and means of obtaining funds for research and to advise the National Research Council on the acquisition of such funds.
- To submit to the National Research Council an annual report on the results of research.
- To promote and instigate research and research institutes.
- To Coordinate research in various branches of sciences.
- To promote and encourage government and private research.
- To maintain a register of research workers and persons qualified in various branches of sciences.
- To assign the conduct of particular research projects to assignees.
- To consider the preparation of a budget for research.
- To allot research grants and awards.
- To make contact and to promote cooperation with research institutes and research workers abroad
- To carry out any other matters which the law determines to be the functions of the National Research Council or the office of the National Research Council.

In addition, there are presently three research centers under the coordination of the office of the National Research Council of Thailand namely:

- 1 Thailand Satellite Remote Sensing Receiving Station : The Station is situated 40 km east of Bangkok in the Lad Krabang District. The reception area of the station covers most countries in South and Southeast Asia including the Philippines, Indonesia, Malaysia, Sri Lanka, Nepal and Bangladesh. The ground facilities are equipped with data processing and reproducing systems to enable the production of landsat, SPOT, MOS-1 data. These data products are then distributed to domestic and foreign users upon request. The application of satellite remote sensing data to natural resources survey in Thailand includes forestry, irrigation, land use, geology, water and mineral resources.
 - 2 Sakaerat Environmental Research Station : This is a center for research in agriculture, forestry, land development, plant species conservation, plantation of softwood trees, changes in forest environment, prevention of shifting cultivation and meteorological data collection.
 - 3 National Biological Control Research Center : This is a research center for activities in the prevention and control of blight including insects, plant and animal diseases, by means of biological processes rather than chemical agents.
-

OFFICE OF ENVIRONMENTAL POLICY AND PLANNING

60/1 Soi Phibun Wattana 7 Rama Vi Road, Bangkok 10400 Tel. 279-7180-9 Fax : 279-0672

FUNCTIONS

- To prepare the national policy and plan for enhancement and conservation of environmental quality in accordance with other national policies as well as to follow up and evaluate the policies.
- To coordinate the preparation of environmental quality management plan according to the enhancement and conservation of national environmental quality act.
- To monitor and prepare the report on a natural resources profile of problem/situation
- To coordinate the natural resources management according to the national policy and plan for enhancement and conservation of environmental quality, the national policies on socio-economic development plan ; and the environmental quality management plan.
- To provide guidelines, Term of References, and review all governmental, and non-governmental program/project, which may cause a deterioration to the environmental quality.
- To initiate and provide guideline, role also to cooperate among various countries in the international environmental obligation.
- To make recommendations on policy and guideline as well as to coordinate in the administration and management of the administration environmental fund, including raising-fund campaign for environmental fund in accordance with the enhancement and conservation of national environmental quality act.
- To coordinate the management of regional environmental issues/program and project.
- To perform other functions as may be provided by authority of the Office of Environmental Policy and Planning, the Ministry, and/or the Cabinet

OFFICE OF ATOMIC ENERGY FOR PEACE

16 Vibhavadi Rangset Road, Chatuchak Bangkok 10900 Tel. 579-0138, 579-5230 Fax : 561-3013

FUNCTIONS

The responsibilities of the Office of Atomic Energy for Peace (OAEP) are to initiate, promote and coordinate studies and research on the utilization of atomic energy, to lay down rules and regulations to ensure safe uses of atomic energy and radiation, to advise the Thai Atomic Energy Commission (Thai AEC) on permits for import, export and uses of radioisotopes, radioactive materials and special nuclear materials. The OAEP is an operative body of the Thai AEC which advises the Government on the national policies related to atomic energy. These policies are carried out and coordinated by the OAEP. The OAEP is also the official body responsible for international relations in the field of atomic energy. In addition, it represents Thailand at the International Atomic Energy Agency (IAEA), of which Thailand is a member

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH

169 Phahon Yothin Road, Chatuchak Bangkok 10900 Tel. 579-1121,579-5515,579-0160 (30 lines) Fax : 579-0180

FUNCTIONS

- To initiate and conduct research and to provide scientific and technological services to state agencies and private enterprises for economic and social development of the country.
 - To conduct scientific and technological research in order to promote the utilization of natural resources appropriate to the economic conditions, environment, health and welfare of the people.
 - To improve productivity in accordance with the Government policies by propagating the results of scientific and technological research to benefit the country in agriculture, industry and commerce.
 - To train scientific and technological researchers.
 - To provide for the testing and measuring services and other scientific and technological services.
-

NATIONAL SCIENCE AND TECHNOLOGY DEVELOPMENT AGENCY

6th Floor, Jaran Insurance Building 401 Ratchadapisek Road, Bangkok 10310 Tel, 276-1314, 279-1325 Fax : 276-1326

FUNCTIONS

The National Science and Technology Development Agency (NSTDA) is a funding and research organization established under the Science and Technology Development Act of B.E. 2534 (1991) on December 30, 1991. NSTDA is an autonomous organization operating under policy guidance of its own board, chaired by the Minister of Science, Technology and Environment. This special organization outside the normal framework of state-enterprise and civil service enables NSTDA to undertake a broad-based systematic approach towards developing and marshaling the whole S & T system of the country in support of national economic and social development. The newly-established NSTDA is comprised of a project and the three national centers formerly under the control of the Ministry of Science, Technology and Environment.

Those are :

- 1 Office of the science and Technology Development Board (STDB)
- 2 National Center for Genetic Engineering and Biotechnology (NCGEB)
- 3 National Metal and Materials Technology Center (MTEC)
- 4 National Electronics and Computer Technology Center (NECTEC)

SIGNIFICANT ROLES OF NSTDA :

- Science and Technology Development Enhancing scientific and technological knowledge and capabilities to increase the ability in production and in provision of services as well as to raise the level of economic and social development of the country inclusive of the development of the capacity for assimilating and transferring technology both within the country and from other countries for national development in all aspect
- Research, Development and Engineering Analytical works and studies aiming at applying the results to improve products or processes of industrial and agricultural production as well as service or other related activities, and analytical works and studies leading to new products, new processes, new services or new activities, including dissemination of the results and their further development towards the stage of commercial production

ANNEX VIII

COMPANY PROFILE
OF
LOXLEY INTERGRAPH (THAILAND)

COMPANY PROFILE**LOXLEY INTERGRAPH (THAILAND)****BACKGROUND**

Loxley Intergraph (Thailand) Ltd. is a joint venture company between Loxley Public Co., Ltd. and Intergraph Corporation, U.S.A. Loxley Intergraph is the sole representative for Intergraph products and services in the Kingdom of Thailand. Intergraph is best known world wide for Interactive Engineering Graphics.

Loxley Intergraph (Thailand) Ltd. is currently supporting many large customers in Thailand. These customers are involved in various industries such as Telecommunications, Transportation, Architectural Design, Engineering, Construction, Plastics, Automobiles, and Petroleum Refining. In addition, Loxley Intergraph is the supplier of digital mapping equipment to The Royal Thai Survey Department, Thailand's official mapping agency.

Loxley Intergraph (Thailand) Ltd. employs over 70 people. Of these more than half hold degrees in engineering or geography and are dedicated to supporting the Company's customers. Loxley Intergraph (Thailand) is a very unique corporation. It has the most wide-ranging-solutions of any computer vendors. The solutions range from mapping to mechanical design to electronic design to architectural design. In short, any geo-based structure or any objects whether natural or man-made can be represented and designed using Intergraph equipment and software.

Loxley Intergraph (Thailand) Ltd. is a single-source-solution provider, in that it supplies the entire solution: hardware, software, implementation and system integration. In this way our customers need only one contact point for resolution of problems and do not have to worry whether the problem is caused by components of the hardware or whether it is caused by the software. Loxley Intergraph (Thailand) supports the entire system with our qualified system engineers and their supporting team.



INTERGRAPH
COMPUTER SYSTEMS

ADMINISTRATION AND STAFFING

Loxley Intergraph (Thailand) Ltd. operates from centrally located offices in Bangkok

The general administration and management functions of Loxley Intergraph (Thailand) operations are performed by the following company principals:-



M.L. Saksiri Kridakorn - President



Mr. Vasin Supprakorn - General Manager

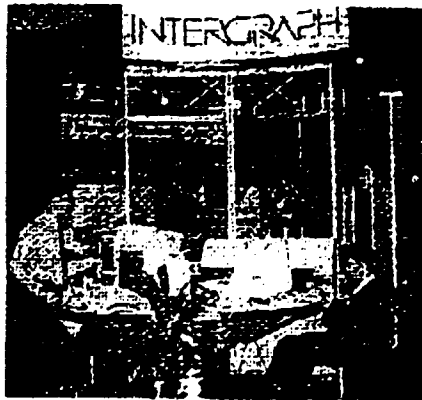


Mr. Samrit Anantasuk - Vice President Sales & Marketing



Ms. Roongnapa Swaddisanpa - Director, Technical Services

Loxley Intergraph (Thailand) is committed to the principles of Total Quality and structures its staff to ensure that this principle can be attained. As a joint venture with Intergraph Corporation, the local staff are, in turn, supported by the Intergraph SEA in Singapore, Intergraph Asia Pacific Headquarters in Hong Kong, and finally by personnel from Intergraph headquarters in Huntsville, Alabama, U.S.A



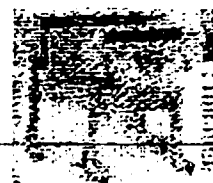
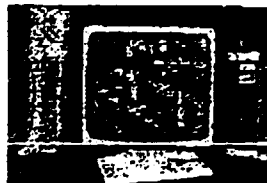
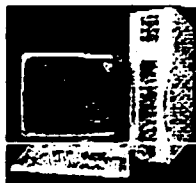
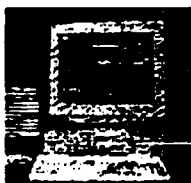
PRODUCTS AND SERVICES

Intergraph's platform of choice is WindowsNT running on workstations of its' own design built around Intel Processors. These high-end Personal Workstations are designed specifically for the task of engineering and therefore are optimized for the graphic environment. In addition, Intergraph builds many task related Personal Workstations such as Photogrammetric Stations and Dispatch Stations for a Computer Aided Dispatch Management Systems. More than anything else over the years Intergraph has been known for its innovative use of graphic-based systems to address the problems in the mapping industry and engineering disciplines. Over the same period Daratech, in its annual customer survey, has consistently rated Intergraph as the company with the most customer satisfaction and loyalty. Loxley Intergraph (Thailand) intends to continue that tradition in Thailand

The services offered by Loxley Intergraph (Thailand) include:-

- o High quality digital cartography services and implementation of digital mapping systems
- o Geographical Information Systems implementation and consulting
- o Topographic, cadastral, geological and other resource mapping services
- o Map, blue print, and document conversion services
- o Land and geographic information systems (GIS) implementation and consulting
- o Automated Mapping/Facilities Management systems (AM/FM) implementation & consulting
- o Dispatch Management Systems implementation and consulting
- o Architectural, Engineering and Construction Systems implementation and consulting
- o Mechanical design and manufacturing systems implementation and consulting
- o Document management systems implementation and consulting
- o Intergraph products distributor - sales, training, support
- o Provision of relevant consulting and customization services to assist customers with implementation of Intergraph Solutions. Services include tasks of managerial and technical nature for the improvement of work flow efficiency, quality control and development of work procedures and instructions.

 MicroStation

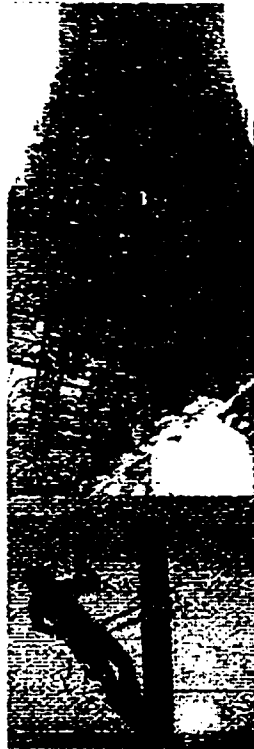


MAJOR PROJECTS

Some of the more significant projects which are currently being undertaken by Loxley Intergraph (Thailand) include the following:-

TelecomAsia (TA)

AM/FM System for 2 million telephone line installation within Bangkok



Thai Telephone and Telecommunication (TT&T)

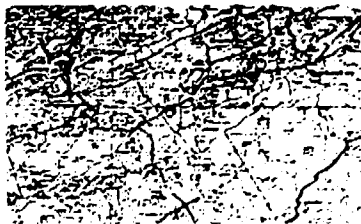
OSP System for 1 million telephone line installation outside Bangkok.

Royal Thai Survey Department (RTSD)

Photogrammetry and Digital Map Production System to produce maps of Thailand

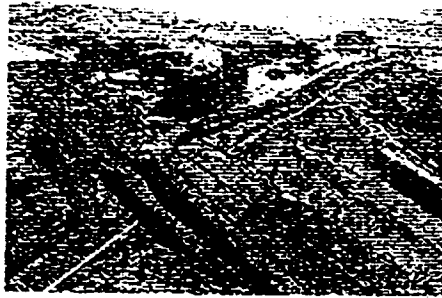
National Research Council of Thailand (NRC)

Remote sensing analysis, image processing and GIS



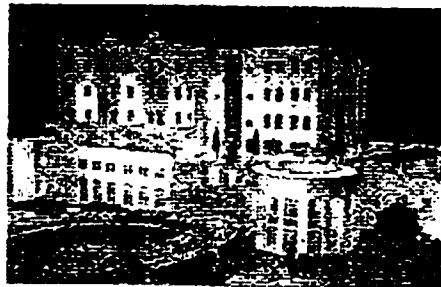
Expressway and Rapid Transit Authority of Thailand (ETA)

- Property Re-appropriation
- Conversion for 3rd stage Expressway Project
- (Conversion include land, property and expressway)



Electricity Generating Authority of Thailand (EGAT)

- Design of power transmission towers
- Architectural Engineering and Construction applications
- Power Generation and Substation design



Board of Investment (BOI)

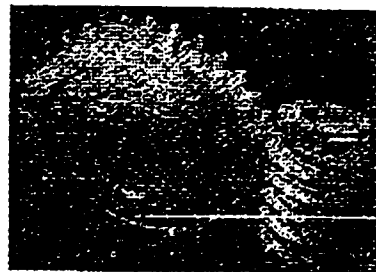
Geographic Information System

Remote Sensing Agriculture Center

Geographic Information System, Remote Sensing,
Global Positioning System

Chulalongkorn University

Architectural Design, CAD package



Chiangmai University

Geographic Information System, Remote Sensing,
Global Positioning System

Suranaree Technology University

Geographics Information System and Remote Sensing

Directorate of Civil Affairs (Royal Thai Army)

Mapping and Geographics Information System

ANNEX IX

COMPANY PROFILE
OF
TRILLIUM TECHNOLOGIES LTD.

COMPANY PROFILE

Trillium Technologies Ltd was established in 1994, with offices in Singapore and Kuala Lumpur, to help satisfy the growing demand for Geographic Information Systems (GIS) and Remote Sensing services in Malaysia and South-East Asia.

The company provides a complete range of GIS and remote sensing consultancy and advisory services to government departments and agencies, non-governmental organisations, private sector companies, and educational institutions

AREAS OF SPECIALISATION

Trillium Technologies has experience and specific capabilities in the following areas

- **Geographic Information Systems**
 - data capture and conversion, database construction, data modeling, analysis, value-added mapping, map production

- **Remote Sensing**
 - data acquisition, image processing and interpretation, thematic mapping, topographic mapping

- **Database Management**
 - resource management systems, facilities management systems, subsurface information systems

- **Project Management**
 - turnkey projects, project team selection, technical supervision, specialist input

- **Training and Technology Transfer**
 - formal lectures, ad-hoc seminars, in-house training

AREAS OF APPLICATION

- Natural Resource Management
- Environmental Management and Planning
- Agriculture
- Transportation and Distribution
- Land Information Management
- Geotechnical Information Management
- Facilities Management
- Urban and Infrastructural Planning and Design
- Marketing
- Education

OFFICES

Singapore:

110 McNair Road, #05-245, S(320110),
Republic of Singapore

Malaysia:

6 Jalan SS18/3E, Subang Jaya, 47500
Petaling Jaya, Selangor Darul Ehsan, Malaysia

Tel/Fax: (6-03) 732-9935

ANNEX X

INTERVIEW PSYCHOLOGY

Interview psychology and information gathering

Major international exhibitions and related events such as conferences, seminars or expert group meetings provide a good background for gathering information and for establishing new contacts and working out new concepts in interdisciplinary surroundings. Also interview psychology can be fine-tuned and adjusted to fit the local environment. As for many other activities some of the most important ingredients for successful information gathering are as follows:

- a relaxed atmosphere (no notebook computers, no long questionnaires, no rush-hour interviews, ...)
- hand-outs / brochures that briefly and generally introduce the organization
- continuity and redundancy in contacting and information exchange (who can I refer to if I need further information (e.g. contact persons, addresses, how can I keep myself informed about future activities (mailing lists, bulletin boards, newsletters, ...), is there a local representation I can turn to [people are not likely to make a lot of long distance calls and prefer to talk or to phone rather than to write and fax], for consultants on mission: when will you be in the country next time, will you be available for further informative talks [this often goes beyond the time-frame of the mission] and if not who will be up to date so that I can continue talks without having to start from scratch?)

ANNEX XI

AIT/CLAIR
EEIS MAILING LIST

AIT/CLAIR MAILING LIST

Wednesday, 20. December 1995 02:51:12

Message

From: LRDC-ENSIC/RERIC.enreric@ait.ac.th,Internet

Subject: Mailing List of SMIs

To: René Pitayataratom

Mr. Thana Chaiprasit
2100 Ramkhamhaeng Rd
Bang-Kapi
Bangkok
10240

Mr. Veerasak Duangmal
63 Wiphawadee Rangsit Rd.
Huay Kwang
Bangkok
10310

Mr. Yongyut Wiboonart
56 Silom Rd. Yada Bldg. 4 Fl.
Bangrak
Bangkok
10500

Ms. Oranut Kiatkanokkul
9 Charan Sanit Wong Rd.
Bangkok Noi
Bangkok
10700

Mr. Ichiro Sasaji
Ajinomoto Frozen Foods (Thailand) Co., Ltd.
487/1 Si Ayuthya Rd.
Phaya Thai
Bangkok
10400

Mr. Prayoon Polpipattanapong
Chiang Frozen foods Co., Ltd.
149/32 Surawong Rd.
Bangrak
Bangkok
10500

Mr. Robert L. Hawthorne
Cold Thailand Co., Ltd.
1126/1 New Petchburi Rd.
Phaya thai
Bangkok
10400

Ms. Chalong Komuthakiet
General Agro Co., Ltd.
672 17-18 Si Phraya Rd.
Bangrak
Bangkok
10500

Mr. Maitree Wasantwongse
Kasetisarn Co., Ltd.
518/5 Phloen Chit Rd.
Maneeva Center Bldg. 15 F.
Pathum Wan
Bangkok
10330

Mr. Chankij Khajorndechpical
New Laem Thong Food Industry Co., Ltd.
41/8 Sukhumvit 11 Rd.
Phra Kanong
Bangkok
10110

Mr. Prasobsak Sirisopana
River Kwai International Co., Ltd.
231/16 Sukhumvit 63 Rd.
Phra Khanong
Bangkok
10110

Mr. Sak Techakraisri
Sahachai Thai Crops Co., Ltd.
534/5 Nakhon Chaisi Rd.,
Dusit
Bangkok
10300

Mr. Phanporn Tappharangsi
Thai Pineapple Co., Ltd.
118/1 Rama VI Rd.
Phaya Thai
Bangkok
10400

Trang Seafood Product Co., Ltd.
137/4 Sukhumvit Rd.
Phra Kanong
Bangkok
10260

Mr. Somkhuan Itthirattikul
Tropical Food Industry Co., Ltd.
213/58 Phatthanakan Rd.
Phra Kanong
Bangkok
10110

Mr. Thaweesak Laotrakul
Uro Asian International Seafood Co., Ltd.
83/367 Moo 7
Sukhumvit Rd.
Meang
Samutprakarn
10270

Mr. Than Tobunmee
Western Farm (1990) Co., Ltd.
755/4 Ratchawithi Rd.
Bang Plad
Bangkok
10700

Mr. Charik Kantanarumittrakul
Charkul Seed Co., Ltd.
690 Sukhumvit Rd., Chokchai Bldg. 6 Fl
Phra Kanong
Bangkok
10110

Mr. Wanchai Kunananthakul
51 Poochaosamingprai Rd.,
Samutprakarn
10130

Mr. Wanchai Kunananthakul
51 Poochaosamingprai Rd.,
Phra Pradaeng
Samutprakarn
10130

Mr. Phin Arksornuvat
Arksara Granite and Marble Co., Ltd.
133-137 Jakkrawat Rd.
Bangkok
10100

Mrs. Mery Ratanarachchartikul
Eimen Co., Ltd.
78 Chalermket 3 Rd.
Pomprab
Bangkok
10100

Mr. Srongsak Chatchaiskul
Jinyong Wire Rope (Thailand) Co., Ltd.
92/314 Phaholyothin Rd.
Lukhok Muang
Phatumtance
12000

Mr. Apichai Yampitomsri
M.F. Industry Co., Ltd.
57/5 Sukhumvit Rd.
Muang
Samutprakarn
10270

Mr. Anuwat Burapachaisri
MFC Mining Corporation Co., Ltd.
3 Sukhumvit Rd.
Bangkok
10110

Mr. Khajorn Wanichkecrati
NTS Steel Group Co., Ltd.
668/1 Bang Ko Laem
Bangkok
10120

Mr. Lo Tsai Hsin
Pan International Electronic (Thailand) Co., Ltd.
101/47/15 Phaholyothin Rd.
Klong Luang
Pathum Thani
12120

Mr. Somboon Songpiboon
Thai Granite Co., Ltd.
542/184-185 Ratchadaphisek Rd.
Bang Khen
Bangkok
10900

Ms. Mala Thanakornnithikul
World Bish Trade Co., Ltd.
759 Charoen Krung Rd.
Samphan Thawong
Bangkok
10100

Mr. Kiang Suributr
73/12 Ratchadaphisek Rd.
Chatuchak
Bangkok
10900

Mr. Pongthorn Sirithiengthong
Thai Marble Mining Co., Ltd.
3136 New Petchburi Rd.
Huai Khwang
Bangkok
10310

Mr. D.N. Arad
318-38 Sukhumvit Rd
Bangkok
10260

Mr. Pichet Kiatdechpanya
99-78 Phuttha Monthon Sai 2 Rd
Phasi Charoen
Bangkok
10160

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104 Surawong Rd.
Panawong Bldg. 5 Fl
Bangkok
10500

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47/87 Chan Rd.
Yannawa
Bangkok
10120

Mr. Songwut Champraphawut
2 Silom Rd.
Bangrak
Bangkok
10500

Mr. Wichit Loaluelert
2000/69 Charoen Krung Rd.
Yannawa
Bangkok
10120

Mr. Kiat Mungkornkarn
Chang Thai Enterprise Co., Ltd.
536 Sukhumvit Rd.
Muang
Samutprakarn
10280

Mr. Billy M. White
PPG-Siam Silaga Co., Ltd.
500 Phloen Chit Rd.
Amarin Tower 8 Fl.
Bangkok
10330

Mr. Pramual Liaophairat
Petrochemical Thai Industry Co., Ltd
175-177 Surawong Rd.
Bangkok Saha Insurance Bldg
Bangrak
Bangkok
10500

Mr. Charles F. O'Brien
PQ-Heco Chemicals Co., Ltd.
21-1 Phaholothum Rd.
Bangkok
10400

Mr. Suwit Khirsang
Thai Chemical Calcium Carbonate Co., Ltd.
146-152 Rama I Rd.
Pathum Wan
Bangkok
10330

Mr. Kiang Suribat
Thai Yo Tech Co., Ltd.
320 Rama IV Rd.
Bangrak
Bangkok
10500

Mr. Hevn Sang Sae Hor
Thai Graphicber Products Co., Ltd.
178 Moo 3, Ratsima-Chok Char Rd.
Muang
Nakorn Ratchasima
30000

Mr. Charasia Phumiwat
110/1 Moo 7
Lard Krabang
Bangkok
10520

Mr. Chuk Tingsapat
8/72 Wangthonglang Rd.
Bang Kapi
Bangkok
10240

Mr. Kasem Jatikawanich
21 Sathorn Tai Rd.
Yannawa
Bangkok
10120

Mr. Prawit Tangkarakhun
TOA Co., Ltd.
31/2 Bangna-Trad Km. 23 Rd.
Bang Phli
Samutprakarn
10540

Tipeo Asphalt Co., Ltd.
126/5 Phitsanulok Rd.
Phaya Thai
Bangkok
10400

Mr. Chankit Srituenglung
1016 Rama IV Rd
Cathay Trust Bldg
Bangkok
10500

Mr. Masaaki Mino
62 Silom Rd.
Thanya Bldg. 6 Fl
Bangrak
Bangkok
10500

Mr. Peter Vaz
Matangki Dyestuff Industry Co., Ltd.
699 Silom Rd.
Kongboonma Bldg. 10 Fl.
Bangkok
10500

Mr. Yingsak Siamvalla
Siam Dye for Textile Co., Ltd.
210 Surawong Rd.,
Bangrak
Bangkok
10500

Thai Ampikas Chemicals Co., Ltd.
219 Rajawongse Rd.
Diwaejamd Bldg. 8 Fl.
Bangkok
10100

Mr. Narong Vuthasathien
Hi-Tech Paper Co. Ltd.
122-122-1 Sathorn Nua Rd.
Silom
Bangkok
10200

Mr. Suthee Kumarn
1705 Phahon Yothin Rd
Bangkok
10400

Mr. Wiwat Parepiewngam
Siam VNC Engine Co., Ltd.
243 Moo 4 Muban Sethakit Rd.
Phasi Charoen
Bangkok
10160

Mr. Surawut Sae Aung
To Heng Co., Ltd.
1484/3 Sukhumvit Rd.
Klong Toey
Bangkok
10110

Mr. Chalermphol Srisakonkij
Heavy Equipment Co., Ltd.
85 Suksawas Rd.
Samutprakarn
10270

Mr. Paulo Rosa Rodrigues
Chong C.S. #3 Phatanakarn Rd.
Moobann Leam Thong 2 Bldg.
Praves
Bangkok
10250

Ms. Jintana Thawornrat
59/17 Moo 7
Rama II Rd.
Bang Khun Thian
Bangkok
10150

Mr. Eugene Song
Imex Industrial Co., Ltd.
6/341-4 Bang Na-Trat Rd.
Phra Khanong
Bangkok
10260

Mr. Vichit Ith
Merlin Gerin Co., Ltd.
140 Wireless Rd.
Kian Kwan Bldg. 9 Fl.
Bangkok
10330

Mr. Prateep Liewpairat
Petrochemical Thai Industry Co., Ltd.
175-177 Surawong Rd.
Bangkok Union Insurance Bldg.
Bangrak
Bangkok
10500

Mr. Pornthep Foraprapa
Siam Hitasi Elevator Co., Ltd.
1200 Phaholyothin Rd.
Chatuchak
Bangkok
10900

Mr. Mark Lim
Sunbeen Precision Machine (Thai) Co., Ltd
51/65 Phra Khanong
Bangkok
10260

Mr. Hikaru Shintaku
161/1 Silom Rd.
Bangkok
10500

Mr. Kenzo Seke
161 Rajdamri Rd.
Thai Obayashi Bldg. 12 Fl.
Bangkok
10330

Mr. Suthichai Bunsiripattanajoen
39/35 Moo 4 Suksawas Rd.
Phra Pradaeng
Samutprakarn
10130

Mr. Tochiaki Undo
Kowasasakuso (Thailand) Co., Ltd.
114 Moo 8 Ladprao Rd.
Bang Kapi
Bangkok
10230

Mr. Teisuke Watanabe
Seico Instrument (Thailand) Co., Ltd.
60/83 Klong Luang
Pathumthane
13180

Mr. Kazuhiko Mori
Thai Mori Tech Co., Ltd.
62 Silom Rd
Thaniya Bldg. 6 Fl.
Bangrak
Bangkok
10500

Mr. Sithisak Kongsang
Fuji Chinko (Thailand) Co., Ltd.
101/30 Klong Luang
Pathumthane
13180

Mr. Bruce F. Grey
Klind Industry Co., Ltd.
888/101 Phloen Chit Rd.
Mahatun Plaza Bldg. 10 Fl.
Bangkok
10330

Mr. Bruce F. Grey
Klyde Industry Co., Ltd.
888/101 Phloen Chit Rd.
Mahatun Plaza Bldg. 10 Fl.
Bangkok
10300

Siam Toyota Industry Co., Ltd.
102 Moo 4 Chalong Krung Rd.
Samutprakarn
10260

Mr. Klahan Cheewitanon
Siam Zuziya Co., Ltd.
4/13 Moo 3
Laksong Nong Kham Intapat Rd.
Bangkok
10220

Mr. Anuchit Boonthong
250 Pracha Chun Rd.
Bangsue
Bangkok
10800

Mr. Arthur Pavmer
89/2 Moo 8 Petchkasem Rd.
Sam phian
Nakhonprathom
73110

Mr. Kao Min-Hui
668 Moo 4
Muang
Samutprakarn
10280

Mr. Kazuhiko Hachiro
209 Poochaosamingpray Rd.
Phra Pradaeng
Samutprakarn
10130

Mr. Ko Eul Soo
56 Silom Rd.
Yada Bldg.
Bangrak
Bangkok
10500

Mr. Kraisi Kasemsawas
45/15 Bang Kapi
Bangkok
10310

Mr. Pachara Suwanpimolkul
256/2 Linchee Chongnonsri Rd
Yannawa
Bangkok
10120

Mr. Peerapong Siriwech
1845 Rama 4 Rd
Bangkok
10110

Mr. R. Van Cutsem
888/101 Ploechit Rd
Mahathun Plaza Bldg
Bangkok
10330

Mr. Suchat Sapketkaew
50/9 Pattanakarn Rd
Prawas
Bangkok
10250

Mr. Teo Joo Kiak
12/1-4 Rong Munag Rd
Pathumwan
Bangkok
10330

Mr. Wichai Thirangkul
337/18-19 Bangthad Thong Rd.
Phaya Thai
Bangkok
10400

Mr. Yuan Jia Yu
23/15 Moo 8 Petchkasem Rd.
Sam Phran
Nathornprathom
73110

Ms. Sangwan Chaiyakarn
10/77-81 Pracha Uthit Rd
Rat Burana
Bangkok
10140

Mrs. Potchamarn Chinnawatra
Advance Infor Service Co., Ltd.
526 Rama V Rd
Dusit
Bangkok
10300

Mr. Ono Koki
Akebono (Thai) Co., Ltd.
262 Chalong Krun Rd
Lat Krabang
Bangkok
10520

Mr. Apichart Leersaranukul
Asian Stanley International Co., Ltd.
48/1 Moo 1
Lat Lum Kaew
Pathumthane
12140

Mr. Chatchai Charoentham
Cassette Magnadism Industry Co., Ltd.
5/5 Bung Kum
Bangkok
10240

Mr. Yuchul Kim
Chem Tronic Industry Co., Ltd.
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Bang Kapi
Bangkok
10240

Mr. Lee Chung Lih
Chung Cheng Plastic (Thailand) Co., Ltd.
191/54, 191/57 Ratchadaphisek Rd.
CTI Tower Bldg.
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Bangkok
10110

Mr. Sumet Nitisupornrat
Circuit Industries Co., Ltd.
329 Moo 2 Setthakij Rd.
Krathum Ban
Samutsakhorn
74110

Mr. Boonchu Songsiwa
Diamond P.C.B. Co., Ltd.
39/12 Moo 1 Srinakarintara Rd
Praves
Bangkok
10250

Dr. Wipat Roengpithya
Draco PCB Co., Ltd.
140 Wireless Rd., 1 Bldg.
Bangkok
10330

Dynasty Electronics Co., Ltd.
Sub Lt Yongyut Kanamporn
174-175 Moo 5
Putha Monthon Sai 4 Rd.
Sam Phran
Nakhompathom
73110

Mr. Thomazi B.
Europe Asia Connector Co., Ltd.
1999/1 Moo 1
Samrong
Samutprakarn
10270

Mr. Hideo Motonaga
FDK Tatung (Thailand) Co., Ltd.
89/24-25 Ratchadaphisek Rd.
Huay Kwang
Bangkok
10310

Mr. Prawes Nantiruj
Hua-Thai Instrument Transformer Manufacture Co., Ltd.
213/15-18 Ratchadaphisek Rd.
Yannawa
Bangkok
10120

Mr. Prasit Lertpongpaibul
Inter Cuppa Corp., Ltd.
14/31-32 Patumwan
Bangkok
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Mr. Liu Ning Hai
Jet Industry (Thailand) Co., Ltd.
3354/35 Rama IV Rd.
Manorom Bldg. 10 Fl.
Phra Kanong
Bangkok
10110

Mr. Boonchu Songwisawa
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10250

Mr. Kamol Leelaket
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94/6 Sukaphibal 2 Rd
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Bangkok
10240

Mr. Takaya Watanabe
Kochin (Thailand) Co., Ltd
60/68 Klong Luang
Pathumthane
12120

Mr. Masao Kubo
Matsuchita Electric Works (Thailand) Co., Ltd
106 Moo 3
Klong Luang
Pathumthane
12120

Mr. Siwa Nganthawee
Nganthawee Electronic Co., Ltd.
82/3 Moo 1
Bang Khen
Bangkok
10900

Mr. Tang Heem Moh
Northern Telecom (Thailand) Co., Ltd
Morning Bldg., 6 Fl. Payathai
Bangkok
10400

Mr. Kamol Leelaket
Oriental Electronic Co., Ltd
101/11 Moo 3
Sukhaphiban 3 Rd.
Bangk-Kapi
Bangkok
10240

Mr. Lee Ying Tsai
Sikony Electronic (Thailand) Co., Ltd
129 Sukhumvit 93 Rd
Bangkok
10110

Mr. Hideto Momomi
T.I.T. Warco (Thailand) Co., Ltd
201 Vibhavadi-Rangsit Rd.
Bang Khen
Bangkok
10900

Mr. Yutaka Sugura
FTK (Thailand) Co., Ltd.
60/80 Moo 19, Phaholyothin Rd.
Khlung Luang
Pathumthance
12120

Ms. Churairat E. Bonython
Thai Coil Winding Co., Ltd.
183 Rajdamri Rd.
Regent House Bldg. 19 Fl.
Pathumwan
Bangkok
10330

Mr. Dien Heng Wu
Thai Kuang Industry Co., Ltd.
41/110 Moo 12
Sukhaphiban 1 Rd.
Bangkapi
Bangkok
10240

Mr. J. P. Choi
Howin Co., Ltd.
984/155 Sukhumvit 71 Rd.
Bangkok
10110

Mrs. Churairat E. Bonython
Ital Doff Co., Ltd.
183 Ratchadamei Rd.
Regent House Bldg. 19 Fl.
Bangkok
10330

Mr. Gilbert Pain
Marchorret (Thailand) Co., Ltd.
60/10 Navakakorn Industrial Zone
pathumthance
12120

Mr. Somboon Udompholkul
Wonder Toy Co., Ltd.
205/108 Patthanakarn Rd.
Phra Kanong
Bangkok
10110

Asia Wiwat International Co., Ltd.
984/26-30 Rama VI Rd.
Phaya Thai
Bangkok
10400

Mr. Wisanu Amornwutisakul
Pan Asia Gulf Coporation Co., Ltd
25/23-24 Sukhumvit Rd
praves
Bangkok
10250

Bangkok Plastic Products Co., Ltd
13/11 Petchkasem Rd.
Phasi Charoen
Bangkok
10160

Mr. Rof Granstrom
Ericsson Communication (Thailand) Co., Ltd.
99/349 Chaeng Wattana Rd.
Don Muang
Bangkok
10210

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