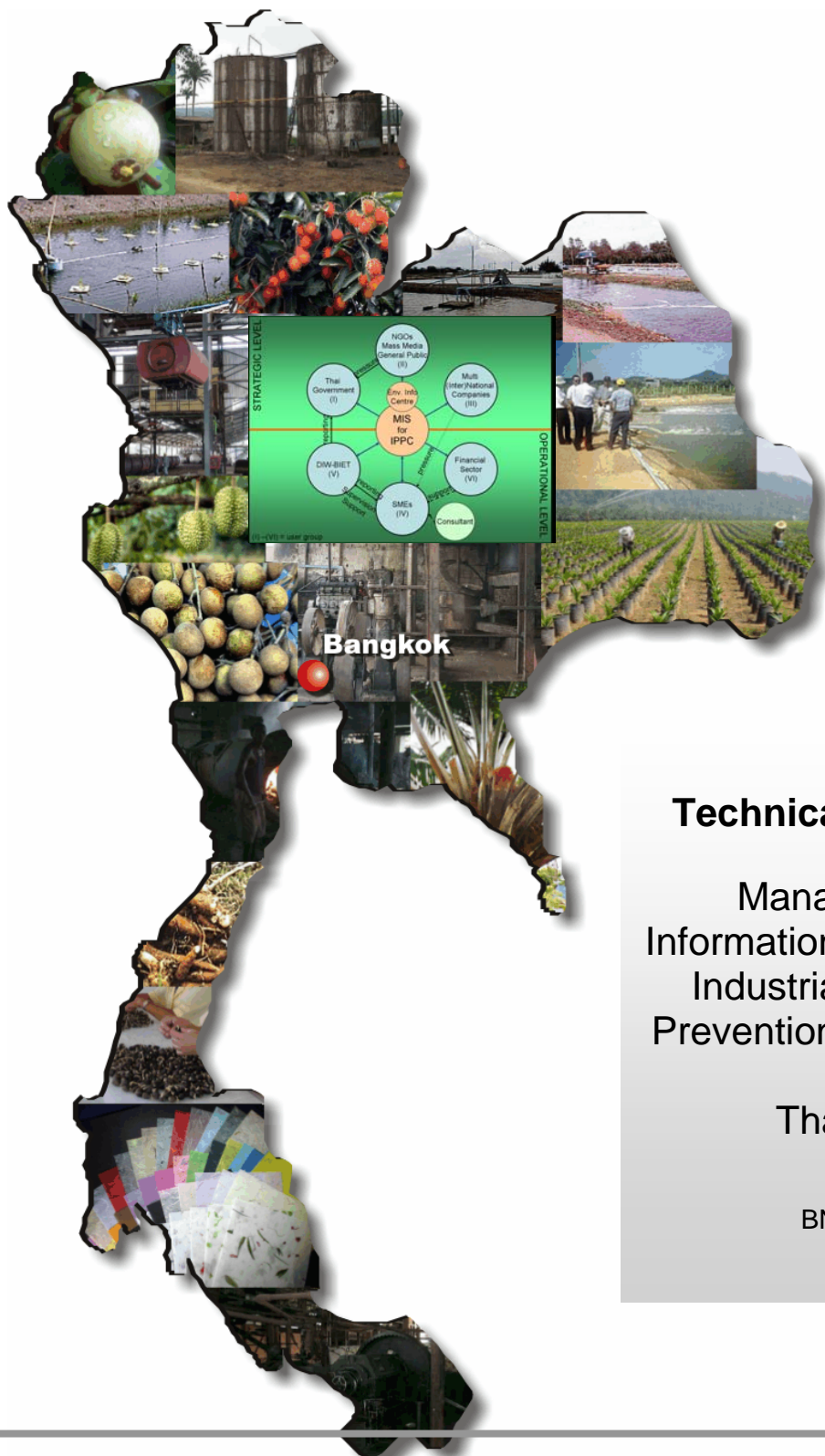




Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH



Technical Proposal

Management Information Systems for Industrial Pollution Prevention and Control

Thailand

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TABLE OF CONTENTS

Abbreviations	4
Table of Figures	5
1. Consortium INTEGRATION-Knoten Weimar	6
1.1. Presentation of the consortium	6
1.1.1. INTEGRATION environment & energy	6
1.1.2. Knoten Weimar	6
1.2. Experience of the consortium	7
1.2.1. Professional Experience	7
1.2.2. Regional Experience	12
2. Implementation Concept	14
2.1. Eco-efficiency in the agricultural sector	14
2.1.1. Main problems related to eco-efficiency in the agro sector	16
2.1.2. Institutional framework	18
2.1.3. Existing MIS in Thailand	19
2.1.4. Data Management in SMEs	20
2.2. Project Objective	21
2.2.1. Remarks on the design and implementation of a MIS for IPPC	21
2.2.2. Target groups	23
2.3. Remarks on the ToR	23
2.4. Methodology and task breakdown	27
2.5. Time schedule	44
2.6. Themes intersecting the other components / GTZ P3U	46
2.7. Conceptual Alternatives	47
2.7.1. Involvement of the Financial Sector	47
2.7.2. Distinction between sovereign tasks and support services	47
2.7.3. Focus on one industrial sector (in-depth approach)	48
2.7.4. Broaden the use of MIS for IPPC on the operational level for SMEs	49
2.7.5. Public Private Partnership Approach	50

2.8.	QMS, M&E and Impact Monitoring	51
2.8.1.	Quality Management (QMS)	51
2.8.2.	Monitoring & Evaluation (M&E)	55
2.8.3.	Impact monitoring	57
2.8.4.	Reports	61
3.	Technical Backstopping	62
3.1.	Personnel	63
3.2.	Infrastructure (Technical Facilities)	65
3.3.	Knowledge and Information Management	65
3.3.1.	WinISIS	65
3.3.2.	Wiki	66
3.3.3.	Active Information Exchange	67
4.	Involvement of local resources	68
5.	Personnel	71
5.1.	International long-term expert	71
5.2.	International short-term experts	74
5.2.1.	General tasks of the STEs	74
5.2.2.	STE Pool	75
6.	Attachments	79
Annex 1.	CV of the international long-term expert	
Annex 2:	CVs of the international short-term experts	
Annex 3:	CVs of the backstopping personnel	
Annex 4:	Appendices & references	

Abbreviations:

BIET	Bureau of Industrial Environmental Technology, Department of Industrial Works, Ministry of Industry
BOD	Biochemical Oxygen Demand
BUDA	Operational environmental data analysis (Betriebliche Umwelt-Daten Analyse)
DEQP	Department of Environmental Quality Promotion, Ministry of Natural Resources and Environment
DIW	Department of Industrial Works, Ministry of Industry
ECDA	Entrepreneurial Competencies Development Association
ECM	Environmental Cost Management
EIA	Environmental Impact Assessment
EMS	Environmental Management System
GIS	Geographical Information System
GTCC	German-Thai Chamber of Commerce
IC	Information Centre
IIC	Industrial Information Centre, Department of Industrial Works, Ministry of Industry
INT	INTEGRATION GmbH
IPPC	Industrial Pollution Prevention and Control
IT	Information Technology
IZU	Bavarian Environmental Information Centre (Infozentrum UmweltWirtschaft)
KW	Knoten Weimar
Mg	One mega-gram is 1.000.000 grams or one metric tonne
MIS	Management Information System
OHS	Occupational Health and Safety
PCD	Pollution Control Department, Ministry of Natural Resources and Environment
SIA	Social Impact Assessment
SME	Small and medium sized enterprise
TEEWAS	GTZ sector network T ransport, E nvironment, E nergy, W ater A sia
TGI	Thai-German Institute
THB	Thai Baht
ToR	Terms of Reference

Table of Figures:

Figure	Title	Page
Figure 1	Webpages Industrial Pollution Estimates by PCD	19
Figure 2	The six user groups of MIS for IPPC	22
Figure 3	Thai-German Programme Components / Projects	27
Figure 4	Production costs reflecting eco-efficiency potential of a small paper mill in China (before / after implementation of specific eco-efficiency measure)	33
Figure 5	Excerpt of: China National Cleaner Production Standard -Petroleum Refinery Industry (HJ/T126-2003)	34
Figure 6	Excerpt of a basic data collection sheet	39
Figure 7	WebPortal BUDA	48
Figure 8	INTEGRATION Management Information System – IMIS	51
Figure 9	Backstopping system	62

1. Consortium INTEGRATION-Knoten Weimar

1.1. Presentation of the consortium

1.1.1. INTEGRATION environment & energy

INTEGRATION offers consultancy in the field of environmental and energy related issues to public and state-owned institutions, industries, enterprises and private clients.

INTEGRATION International Management Consultants GmbH was founded in 1976 in Frankfurt am Main. The company specialises in planning, implementation and evaluation of bilateral and multilateral, international cooperation projects. INTEGRATION Frankfurt currently employs 42 permanent professionals in Germany and abroad, with a total turnover of ca. € 4.6 m. (2003). INTEGRATION provides innovative strategies designed to enhance export capabilities and manage investment promotion programs throughout the world.

Since 1991 INTEGRATION has implemented a large number of projects with a strong environmental and/or energy focus. The increasing importance of this field was recognised with the establishment of a subsidiary company, INTEGRATION environment & energy GmbH, which was launched in 1998.

INTEGRATION environment & energy GmbH, with headquarters in Gräfenberg near Nuremberg, currently has 21 permanent employees in Germany and abroad at its disposal and a staff of permanently associated experts, with an overall turnover of € 3.1 m. (2003). INTEGRATION E&E is currently implementing a number of projects in the **Industrial Environmental Management and related Management Information Systems** field, a selection of which is described in section 1.2.

1.1.2. Knoten Weimar

KNOTEN WEIMAR was established in 1998 within the Network for Environmental Biotechnology, initiated and funded by the German Ministry of Education and Research (BMBF). In 2000 the project evolved into KNOTEN WEIMAR International Transfer Centre Environmental Technology Ltd. In 2001 it was nominated to be an "Institute at Bauhaus University Weimar".

KNOTEN WEIMAR has developed a network of SMEs and experts offering a variety of technologies and services in the field of environment and infrastructure. Since the close co-operation with the Bauhaus University Weimar and the Technical University Braunschweig, KNOTEN WEIMAR has carried out many projects in training and capacity building for international experts (public and private sector) but also in consulting German companies for technology transfer, fundraising and networking.

Thailand is one of the four regional focal points besides South Africa, Hungary and Brazil. In each of the countries KNOTEN WEIMAR has a local partner operating on behalf of KNOTEN WEIMAR and its network, and in Thailand that is Prof. Dr. Kanoksak Eam-O-Pas.

In all training projects, an internet-based management system (developed at Bauhaus-University) is used for managing the course, presenting and distributing information, and also providing communication tools (chat, forum, message boards etc.) for experts and participants. This tool has been introduced in Thailand to run a “Distance Master course for environment and infrastructure”, a project in co-operation between Bauhaus-University, University of Leeds and the Asian Institute of Technology, Bangkok.

1.2. Experience of the consortium

1.2.1. Professional Experience

The following project descriptions provide information on projects implemented by the consortium members, which we believe are relevant for the envisaged MIS project in Thailand.

China: Liaoning Integrated Environmental Programme, Lot Cleaner Production, EU (INTEGRATION)

Year: 1999 - 2005

Key Words: Eco-efficiency benchmarks, training and capacity building, incentive schemes, information clearing house

The general objective of this programme is to assist Liaoning Province in its efforts to tackle the interrelated issues of pollution abatement, economic modernisation and social redeployment, the province of the North East of China currently faces. The broad aim of the Cleaner Production Component within this programme is to introduce the concepts and practices of eco-efficiency into factories within the province to support the goal of sound industrial development. In particular, the project supports the Liaoning Provincial Government in its effort to foster the idea of Cleaner Production. This resulted in a Liaoning Cleaner Production Action Plan (which is part of the 10th Five-Year-Plan of the province), which stipulates the implementation of CP activities in 60% of all major polluting enterprises. Therefore, a specialised training programme was conducted to train Chinese experts and governmental officials in all 14 cities of the province.

The project elaborated different tools to support industry in eco-efficiency. First for all, eco-efficiency indicators and benchmarks were designed for the different industrial sectors (refining, fertilizer and iron & steel). These benchmarks were published by the China State Environmental Protection Administration as national standards. Complementary, self-assessment manuals were developed guiding staff of enterprises to identify eco-efficiency potentials.

An additional part of the Liaoning Cleaner Production Action Plan, the Liaoning Provincial Cleaner Production Revolving Fund is established. This fund consists of a commercial credit line (volume 180 million CNY, equivalent to € 18 million), which provides loans to enterprises for implementing CP technologies (high cost CP options). Certain evaluation procedures have been established to select projects in a transparent manner to ensure that these projects have the right demonstration character. A tool for the Liaoning government was developed to rank financial investments according to their environmental benefit to ensure that the most eco-efficient projects are financed first.

In addition, a training programme for the financial sector has been conducted to stimulate commercial banks investing in enterprises, which incorporated CP into their daily management. Specific trainings for enterprise staff are designed helping them to elaborate bankable investment proposals for CP projects.

A web-based information clearing house (www.Incpc.com.cn) was established providing information on eco-efficiency, ISO 14001 and circular economy to the general public.

For further information: <http://www.eu-liep.org/>

China: Environmental Management Cooperation Programme, Lot 1 - EU (INTEGRATION)

Year: 2001 - 2005

Key Words: Indicator development, capacity building and training, awareness raising, publications

The purpose of EMCP Institutional Development is to strengthen the institutional capacities of China's key institutions involved in the decision-making processes of high priority fields in sustainable development substantially. The fields selected include among others:

- Impacts of globalisation on sustainable development,
- Development of appropriate accounting tools for measuring sustainable development objectives

In 2002, EMCP Programme Lot 1 launched its Sustainable Development Indicators Initiative, a four-year program to develop and promote a focused set of national, regional and county indicators in China that are credible, relevant and well accepted. The goal of this project is to create an analytical framework for organizing and developing indicators for sustainability and to propose a set of experimental indicators that will help determine whether current economic activities are affecting China's long-term ability to maintain a healthy society, economy and environment. The target audience for these indicators is the informed public and decision makers in both the private and public sectors. Implementation is undertaken in demonstration projects in humid coastal areas and semi-arid areas to provide assistance to central and local authorities.

Institutional development will be strengthened through awareness raising and networking, capacity building and preparation of supportive training materials. Activities in these fields will include organisation of fora and conferences, development of networks, offering training courses and study visits, provision of advisory services, development of training materials or special studies. Capacity building measures may also address training institutions, if their capacities in environmental education and training are found in need of strengthening.

For further information: <http://emcp.acca21.org.cn/en/index.htm>

Sri Lanka: Capacity Building for Competitiveness and Qualified Employment, GTZ (INTEGRATION)

Year: 2004 - 2007

Key Words: SME policy advisory, strengthening of SME competitiveness

Within this overall programme, INTEGRATION has been commissioned with the implementation of the second component "Value Chain Promotion" (VCP). The component goal was formulated as follows: The integration of SMEs into internationally competitive Value Chains is enhanced. The concept of the component was structured in three results:

- Result 1: Competitiveness and value addition in selected VCs improved and SMEs linked
- Result 2: Adequate and improved services to the SMEs integrated into VCs provided
- Result 3: Conducive environment for the development of competitive VCs constructed

Value chains in four carefully selected sub-sectors will be promoted on an exemplary basis:

Organic products, Alternative tourism, Spices, Rubber.

At the micro level a systematic approach has been developed with all stakeholders consisting of formation of core groups, mapping of the VCs, elaboration of action plans and implementation of prioritized activities with regard to competitiveness, value addition and linkage promotion. At the meso level support to the design and implementation of promotional programmes organized by the public or the private sector is rendered. At the macro level the component is advising on key policies for VC promotion and SME integration in close cooperation with the International Trade Centre (ITC), Geneva. Fields of interventions are e.g. tariffs, incentives for SMEs, regulatory framework, export policies, attraction of foreign investments, organic agriculture law, etc.

China: Management of Obsolete Pesticides, GTZ (INT in Arge with IP)

Year: 2004 - 2009

Key Words: MIS on obsolete pesticides

China is the second largest producer of pesticides worldwide. The yearly output from 2,000 producers of pesticides amounts to approx. 40,000 tons of active substances. Currently, 11,000 different pesticides are registered. The quantity of obsolete pesticides and contaminated packaging is increasing year by year, while no system is in place to efficiently manage the development.

The project aims for collection, storage and destruction of these pesticides. To avoid future accumulation of obsolete pesticides, a system is to be designed and strategies are to be developed, followed by the implementation of the designed solution on a large scale. Three pilot provinces are covered by the project: Hubei, Jiangsu and Jilin.

The creation of a cadastre of obsolete pesticide disposals, the incineration of the stocks and the future-oriented control of pesticide production (look-ahead) in line with the environmental legislation are regarded as the most visible results of the Project.

The complexity of the project, as well as its considerably large scale, is demonstrated by the project duration of 60 calendar months.

China: Strengthening of Dongying Environmental Protection Bureau, GTZ (INTEGRATION)

Year: 1999 - 2001

Key Words: Environmental Information System, eco-efficiency, capacity building, public awareness raising

The Project was aimed to record, analyse and increase the reliability of all data relevant to environmental quality in the Dongying area. The information forms the basis for the identification of those companies principally responsible for pollution. Within the Municipal Environmental Protection Bureau a section was established to support enterprises by implementing Cleaner Production Technologies (CPT) to abate pollution. Model activities have been undertaken to raise environmental awareness of decision makers as well as of the public (information boards on environmental issues, organisation of workshops, documentaries etc.).

The following activities were implemented:

- Establishment of an Environmental Information Management System for the municipal EPB including sampling / analysing / verifying / reporting of environmental data with the focus of wastewater, air pollution and solid waste
- Establishment of an environmental monitoring system for the City of Dongying with focus on air quality and wastewater discharge
- Execution of eco-efficiency audits in several Chinese SMEs (e.g. paper, micro refineries, textile, chemical, fibre board) including the generation of consumption indicators and individual benchmarks (CP targets)

- Establishment of an information exchange network on eco-efficiency within the industrial sector
- Execution of training on
 - Cleaner Production (Eco-Efficiency) Awareness and Assessment
 - Environmental Management
 - Environmental supervision of industrial sites
- Establishment of regulations to use the pollution levy fund for financing pollution prevention measures
- Strengthening the activities of the EPB in the field of environmental awareness raising of decision makers as well as of the public
- Organisation of four information study tours to Germany, Netherlands, Belgium

China: Environmental Management for SMEs, Component 2 of the SEPA-GTZ Program "Policy Advisory Service and Environmental Management", Tianjin (INTEGRATION)

Year: 2003 - 2005

Key words: Capacity building, training of enterprise' staff in eco-efficiency tools and basics of environmental accounting, elaboration of a regional and national dissemination strategy

The specific objective of component 2 "Environmental Management for Enterprises" is the development of suitable environmental management tools for small and medium-sized enterprises in Tianjin province. Accordingly, the component focuses on the adaptation and conduction of adequate training programs to support Chinese SMEs to face today's market challenges and to work more efficiently while emitting less pollution. The training concept applied is based on the "Profitable Environmental Management PREMA[®]" programme developed by GTZ-P3U.

The objective of the training on environmental cost accounting is to increase the enterprise's efficiency in terms of utilization and conservation of material and resources, to improve its organizational capability to both react to and initiate changes and to increase its environmental performance. Within the training SMEs' entrepreneurs and/or staff from production and cost accounting departments are familiarized with a method of allocating corresponding costs to material flows to identify the most costly and environmentally crucial weak points. A detailed cause analysis and the related development of measures not only lead the companies to increased efficiency but also to cost savings and first indicators for benchmarking and performance evaluation. The training and the network meetings are group-oriented activities to enlarge the exchange of experiences between up to 10 participating enterprises. Individual consultancy units (on-site visits) and follow-up activities of trainers and international/national sector experts complement the training programme with sector-relevant expertise.

To ensure a sustainable application of the training a supportive and dissemination structure is being build up involving intermediaries from different associations and organisations with well-established contacts to the target groups (enterprises, multipliers, trainers) and will be proposed to China State Environmental Protection Administration (SEPA) for nation-wide dissemination.

For further information: <http://www.sepa-gtz-environmental-program.org.cn>

China: Advisory to the China Leather Industry Association CLIA, UNIDO (INTEGRATION)

Year: 1998 - 2000

Key words: Technology Transfer, Pollution Control, Environmental Information Centre

The objective of the project was to assist the leather industry in China to expand without causing unnecessary degradation of the environment, to provide a practical, viable and cost-effective solution for safe disposal of tannery sludge including recommendations to the Chinese Government on legislative and administrative measures to promote and sustain the solutions selected.

In a first step a comprehensive study on «Safe Disposal of Tannery Sludge» with detailed comparison of technical and costing parameters was elaborated including proposals for appropriate technologies for the Chinese tanneries. In a second step a number of technologies including sludge drying, utilisation of sludge in cement block production and composting have been tested. The positive results have been published in a video and a composting manual available in both English and Chinese.

In co-operation with the Chinese counterpart organisation China Leather Industry Association (CLIA) a Technology Transfer Centre (TTC) was established which is directly connected to CLIA and serves as a focal point and information data exchange service centre in the field of pollution control in the China leather sector.

The centre's range of services included:

- Collection and exchange the market and technology information on pollution control of leather industry
- Availability of expertise and achievements to China's leather industry
- Organization of seminars and workshops.
- Issue of relevant policy and national environmental control standards made by the Chinese government.
- Provision of information on domestic and overseas environmental control equipment and technology suppliers.
- Arrange contacts between tanneries and suppliers.
- Dissemination of information on pollution control in the leather sector (www.clia-ttc.com)

1.2.2. Regional Experience

Thailand: Environmental school project at Assumption College, Thonburi, Bangkok (Knoten Weimar)

Year: 2002 -2004

Key words: Capacity building, education, biological treatment, composting, management concepts, Public-Private-Partnership

This project was initiated by KNOTEN WEIMAR and carried out as a Public Private Partnership funded by Deutsche Entwicklungsgesellschaft mbH (DEG). In a first phase an Integrated Waste Management Concept was developed, followed by several awareness campaigns among the staff and the children of the school. The separate collection system for biological degradable and recyclable materials was introduced in a second step. In co-operation with a German SME a composting site was built and equipped. KNOTEN WEIMAR has assisted the teachers of the school to integrate environmental subjects into the curriculum for the entire school. This successful project has been recognised as a pilot project to introduce environmentally related contents into the curriculum of other schools in Thailand.

Thailand: Integrated Urban Environmental Management Plan in the city of Lamphun (Knoten Weimar)

Year: 2004 – continuing

Key words: Capacity building, education, management concepts, good governance, sustainable development of infrastructure

The aim of the project is to design and implement a model for Integrated Urban Environmental Management (IUEM) that provides a sustainable conservation, rehabilitation and management of water, and waste program for the Municipality of Lamphun. The target groups are respectively: 1) Mayor and civil servants from the municipality of Lamphun. 2) People's representatives of the municipal council. 3) Citizens of Lamphun 4) Senior civil servants from central government agencies. The main activities, using a participatory approach, will include studies for defining 'needs and constraints' associated with Lamphun's IUEM, consultancy, reviews and analysis of operating IUEM towards the design and implementation of the IUEM plan, and its evaluation, dissemination, reporting, and publication. In addition, the approach utilises current European-sourced knowledge and experience through an association with Sorgues and Wettenberg municipalities, and Bauhaus-University Weimar.

Thailand: Feasibility study for a waste management concept for the Chon Buri province (Knoten Weimar)

Year: 2001

Key words: Management concepts, good governance, sustainable development of infrastructure

KNOTEN WEIMAR has conducted a feasibility study in co-operation with a German SME to identify scope of work and weak points of the existing waste management system in province Chon Buri. The main focus was on utilisation of biogas and appropriate technologies for Thailand. The project was partly funded by the Ministry of Science, Technology and Environment, Thailand.

Cambodia: Capacity Building and Policy Reinforcement in Cambodia in the Field of Waste Management (Knoten Weimar)

Year: 2004 – continuing

Key words: Capacity building, education, good governance, sustainable development of infrastructure

The aim of the presented project is to encourage the Ministry of Environment to formulate and apply environmental policies in the Kingdom of Cambodia and the development of environmental awareness of the Cambodian population in the mid-term. The target groups are executives and civil servants of the Ministry of Environment and provincial and municipal environmental departments as well as farmers, staff of Cambodian governmental and non-governmental organisations working in the field of waste management and agriculture and individuals. The main activities of the presented projects are development of training material, performance of training and workshops for the different target groups, drafting of legal guidelines on waste management, drafting of concepts for public participation in waste management, development of quality assurance standards for compost application, on-the-job-training, technical assistance and backstopping, dissemination and publications.

2. Implementation Concept

2.1. Eco-efficiency in the agricultural sector

According to official reports published by the Bank of Thailand, the Thai economy expanded well in 2003, growing by 6.7%, compared to 5.4% in 2002. The main impetus to growth in 2003 resulted from the continued increases in private consumption and **exports**. The Private Consumption Index grew by about 5.1% and export value rose at a high rate of 18.6%. The Manufacturing Production Index grew by 12.3% (8.5% in 2002) This was due to the expansion in both domestic-oriented industries such as vehicles, petroleum and beverages and export-oriented industries such as integrated circuits (IC), food and block rubber. In the **agricultural sector**, favourable climate brought about an increase in major crop production by 7.8%, compared with 0.0% last year. The increase in major crop production, together with the marked increase in major crop prices, resulted in a historically high increase in farm income by 25.6%.¹

The agriculture sector is still first in terms of employment (approx. 60%), but contributes only approx. 13% to Thai GDP.

The agro-industry is facing serious problems, resulting in the erosion of its market share. One of the main factors include the decreasing product quality due to over-use of chemicals (including antibiotics, pesticides, fertilizers etc.) leading to a high level of toxicity. Furthermore, intensive water use and direct discharge of untreated wastewater (with high organic content) is another main environmental issue.

- **Shrimp Farming**

At present southern Thailand has about 40% of the area under shrimp farming on the east coast of the Gulf of Thailand and the west coast of the Andaman Sea. Economic loss resulting from disease has been the major problem in shrimp production in Thailand. This is largely due to environmental pollution and poor management techniques. Among the diseases encountered in shrimp farms, bacterial and viral infections are the most common, usually associated with poor management or environmental conditions. Shrimp export encountered problems with chemical residue found at the beginning of 2003. This coupled with an expansion of shrimp farming, especially in China and Vietnam, led to a continued fall in the price of shrimp, despite the Thai government's subsidy programme and campaign to encourage domestic consumption of shrimp.

Marine shrimp farming in Thailand can be classified into four categories: extensive (traditional), semi-intensive, intensive and super-intensive. Extensive shrimp farming is characterised by ponds of irregular shape and size varying from 5 – 10 ha. In semi-intensive shrimp farming, ponds have rectangular shape with an area of about 1 – 6 ha. Intensive

¹ Source: Bank of Thailand, Thailand's Economic and Monetary Conditions in 2003, Executive Summary

shrimp farming requires high financial and technical inputs as mechanical aeration is required to increase oxygen supply. Pond size varies from 0.16 – 1 ha. The pond construction for super-intensive is the same, only technical inputs are advanced and the stock density is higher than 80 postlarvae/m². Main environmental impacts with potential for eco-efficiency include mangrove removal, intensive use of fresh water, impact on coastal water quality through effluent, bad management (e.g. over-use) of chemicals and drugs (e.g. antibiotics).

- **Mulberry Paper**

Mulberry products are mainly produced in Northern Thailand due to the availability of the raw material and existing infrastructure from the bark of the local sa-tree (*Broussonetia Papyrifera* Vent). The industry consists of five medium-sized producers (machine-made paper) and a larger amount of SMEs (with hand-made paper). Besides the raw material generation (tree planting and growing) the mulberry paper production provides a wide range of intervention for eco-efficiency including energy efficiency (e.g. during soaking and boiling), water treatment and recycling.

- **Palm Oil**

In the Asia-Pacific region, Thailand is currently the third biggest palm oil producer but is still far behind leading producers Malaysia and Indonesia in terms of output. During the past ten years, the country has managed to double annual production to around 6 million tons, representing an annual growth rate of 9.5 %. The Thai government announced that it wants to increase palm cultivation from two to 10 million rai (approx. 1.6 million hectares) within the course of the next 25 years. As an incentive the government plans to pay rubber farmers who switch to palm oil production an average of THB 6,800 per rai.³ Palm oil production has a great impact on the environment, due to high water use and effluent with high organic content. It is estimated that in 2002, a total of 1.8 million tons of solid waste / by-products and 2.5 million m³ of wastewater were generated⁴. Besides the improvement potential in palm tree farming (e.g. use of fertilizer), eco-efficiency potentials during the production process include energy efficiency (e.g. for oil separation), higher product utilisation rate (more efficient separation techniques) and wastewater recycling and treatment.

- **Starch**

Thailand is the largest producer of tapioca starch in the world, which represents about 9% of global starch production. Tapioca, also called cassava or manioc, is the third most important crop after rice and sugar cane in Thailand. About half of the output is used for animal feed while the other half is used to produce tapioca starch through a wet milling process. It is anticipated that Thai production of tapioca will increase to more than 20 million tons a year and the production of tapioca starch will grow to more than 2 million tons within the next three years⁵. The roots of the tapioca are boiled, ground into powder or dried before proc-

² Source: Shrimp Culture in Thailand – Present Status and Future Directions for research by Siri Tookwinas, Coastal Aquaculture Division, Department of Fisheries, Bangkok

³ Source: <http://www.foodnavigator.com/news/>

⁴ Source: INDUSTRIAL ECOSYSTEMS IN THE CRUDE PALM OIL INDUSTRY IN THAILAND by Orathai Chavalparit

⁵ Source: THE ALFA LAVAL INTERNATIONAL CUSTOMER MAGAZINE [No 13, Nov, 2004]

processing. To turn tapioca into starch, the roots are first placed in a hopper for drying and cleaning to remove sand and stones. They are then cleaned with water and partly peeled, chopped and put into a rasper to produce a thick starch slurry. Unwanted particles, pulp and water are removed in the extraction phase. The starch slurry is then put through high-speed separators or hydro-cyclones to pre-concentrate, wash and concentrate the slurry. From this concentration phase the slurry enters the peeler centrifuges to further remove humidity, and is then fed to the dryer – resulting in commercial starch. There are about 60 medium to large starch factories in Thailand generating between 20 – 50 m³/Mg starch of wastewater, containing a high concentration of organic pollutants. Eco-efficiency potential includes the optimisation of extraction process, pre-concentration process and reduction of water consumption during the starch washing process.

- **Fruits & Vegetables**

Northern Thailand produces a variety of vegetables with exports of processed beans, ginger, corn and pickles. The production chain includes farming, post-harvesting and processing. Important fruits of Thailand include **mango**, which is grown in all regions but the area of concentration is in the northeast. At present, mango production has been significantly developed and overseas demand has steadily increased both in the forms of fresh and canned fruit. **Longan** has been grown in Thailand for over 100 years with the area of concentration in the north. About 80% of fruit production is consumed domestically as fresh longan and the rest is exported as fresh and canned longan. **Lychee**, a fruit grown in Thailand over the same period as of longan, has its major producing areas in the north, too. Thailand exports fresh and canned lychee to Hong Kong, Malaysia, Singapore and the United States. **Mangosteen** is limited to the south and the east due to the suitability of climatic conditions. Its production is mainly for domestic consumption. Mangosteen is also exported as fresh and frozen fruit to Hong Kong and Japan. The major **durian** producing areas are concentrated in the eastern region. Durian is exported as fresh and frozen fruits to Malaysia and the United States. Vegetable & fruit production has large environmental impacts due to the (over)use of fertilizer and pesticides which affects the quality of the product. In addition, wastewater derives from raw material cleaning, pickling brine and tools and equipment cleaning, and the effluent from processing plants has a high content of organic substances. In addition, a large amount of organic waste containing raw material residues is produced. The eco-efficiency potential is given in water savings and reuse measures; however these have to be addressed carefully due to hygiene standards. The energy efficiency focus is on filling and sterilisation processes, as these are energy intensive production steps.

2.1.1. Main problems related to eco-efficiency in the agro sector

Eco-efficiency in the Thai agro sector is still on a basic level compared with the importance of the sector within Thai industry and the status of direct competitors on the international market such as China, Vietnam and other SE Asia countries. The main areas of concern are briefly described below.

Limited awareness of eco-efficiency

As the 'polluter pays principle' is newly introduced in Thailand there is little understanding and acceptance of this principle by SMEs⁶ currently. Furthermore, natural resources are still widely considered as public property and are seen as available and 'free-of-charge' for anybody. Consequently, there is limited awareness among SMEs (and the general public) on issues of environmental protection and sustainable resource planning and use. For example, the agro-industry is one of the biggest energy consumers in Thailand, however its energy efficiency is significantly low and alternative energy sources - such as biomass - are not utilised to their potential.

Stake holder value versus long-term strategy

Most SMEs work within a supply chain for larger companies (e.g. multi national or large national food producers) and competition is stiff among the suppliers. Business decisions are not pro-active ones, mainly made as a reaction towards requirements of these 'clients'. As long as there is no requirement for eco-efficiency and/or more environmental friendly products, it will be difficult for individual SMEs to apply changes in that direction. Indications are given that in some of the suggested sectors (e.g. EU restrictions on shrimps with a traceable amount of antibiotics and other chemicals) these requirements do appear, however this has to be analysed carefully. In addition, the reactive behaviour of SMEs lead to the fact that there is no long-term strategy; solutions with short-term benefits are appreciated only. This makes it difficult to develop new markets with new products (e.g. 'green products').

The absence of strategic long-term planning is aggravated by a relatively high fluctuation of employees especially during and after harvesting seasons. This high fluctuation makes many SMEs hesitant to invest in long-term human resource development. Thus, many production processes are often managed by in-experienced personnel trained to simply operate machines and not to understand the respective process.

Informal networks define the need

SMEs in Thailand are part of an informal 'business relation network'⁷. Products and knowledge offered (e.g. consultancy on eco-efficiency) from outside this 'network' are rarely accepted. SMEs tend to inquire about solutions (e.g. advice on eco-efficiency) from within their 'network', even if these solutions are of lower quality.

⁶ In Thailand SMEs are defined as small enterprises with 10 – 50 workers and fixed assets of up to 2 million THB and medium enterprises with 50 – 200 workers and fixed assets of between 2 – 10 million THB. However, there is an important and large 'third' group of SME, namely micro-SMEs with less than 10 workers.

⁷ As Thailand is a high-context-culture with less importance of content.

Political and administrative line of command unclear

Environmental protection legislation and enforcement is relatively young in Thailand and different governmental institutions such as DIW and the PCD are struggling over competences on environmental issues (e.g. managing pollution levy fund). Thus, political decisions made by such institutions are often influenced by rivalry rather than effectiveness to protect the environment.

R&D capacities insufficient

Products of the agro-industry face stiff regional competition because of low added value, limited product variety and high production costs (compared to e.g. China & Vietnam); SME's lack of research and development (R&D) capacities to overcome such obstacles.

SMEs are not the bankers most loved baby

SMEs are facing financial constraints because the banking system tends to prefer large transactions with large entities that lead to higher internal synergy, whereas many "small" loan applications from SMEs lead to higher administration costs by the banks. Furthermore, existing financing schemes generally focus more on the installation of new production facilities than on upgrading of existing ones or investing in human resource development.

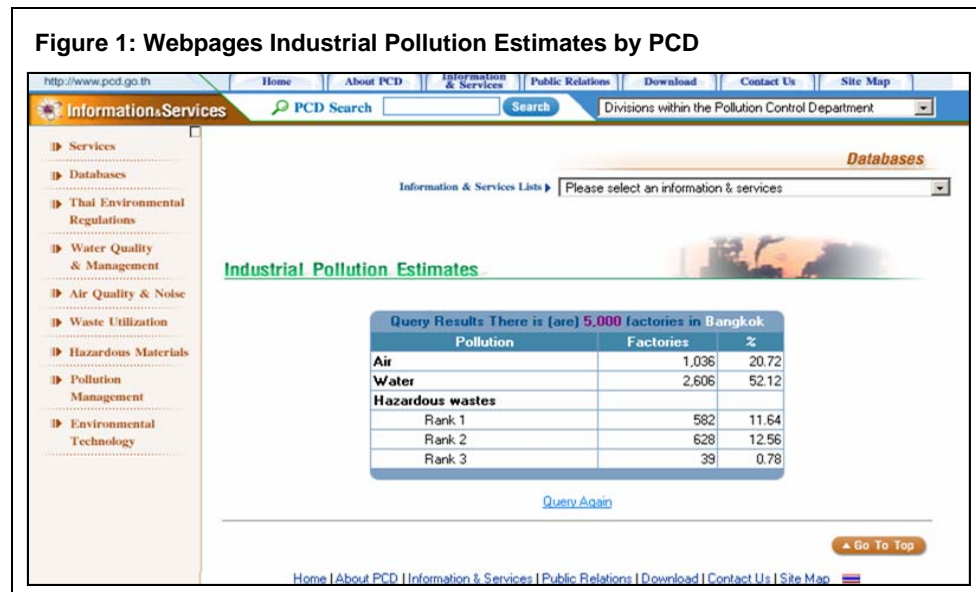
2.1.2. Institutional framework

There is a large number of government institutions, industrial associations, non-governmental organisations, donor funded programmes and projects as well as research institutes (such as universities), which are involved in activities concerned with SME development. Naturally, these institutions have different interests, are part of different 'networks' and sometimes even compete (e.g. for governmental or donor funding) against each other. In addition, there is always a certain degree of mistrust towards governmental institutions by owners/managers/staff of SMEs even if services offered by these units are designed to support SMEs.

Most governmental institutions have limited human resources to cope with the large amount of units to be monitored. In addition, limited expertise and experience of officers make it difficult to judge, which units are supplying reliable data (e.g. on waste water discharge and pollutant concentration) and how to define 'cleaner' or more 'eco-efficient'. A low rate of law-enforcement often fails to ensure a constant and long-term data-flow thus adding to the reliability problem.

2.1.3. Existing MIS in Thailand

A considerable number of donor projects have contributed to the establishment of MIS/GIS databases in Thailand. However, information available (e.g. 'Thailand on a Disc' provided by the Thailand Environment Institute) or the industrial pollution estimates (provided on the WebPages by the Pollution Control Department, Ministry of Natural Resources and Environment) contain limited (useful) information only.



An example is presented in Figure 1⁸. The information provided illustrates that out of 5,000 factories in Bangkok, 1,036 (or 20.72%) emit air pollution and 2,606 (or 51.12%) emit water pollution. It remains unclear if these factories comply with the emission standards, the amount of pollution emitted and based on which criteria they are selected. For example, due to this information it has to be concluded that 47.88 % (or 2,394 factories) do NOT release water emissions, which is very unlikely (as each production process causes emissions to water and air as well as solid waste). It could be assumed that the emissions of these factories are significantly lower, however no information is provided in that respect. Furthermore, information is provided on hazardous waste, ranking factories into three different categories. Again, no information is provided on the criteria for these categories (amount of waste, degree of harm, etc.). According to the WebPages of TEI, the dataset of 'Thailand on a Disc' includes information on: topography, transportation networks, rivers, surface water, soil, geology, land use, political boundaries, socioeconomic data, forest reserves, national parks, wetland sites, etc. It remains unclear if information on pollution and/or the current environmental status of a region, water body etc. is included.

All this information is available in public however not tailored to the information need of different target groups. Such information requirements should comprise:

Public target group:

- What is the environmental status of my neighbourhood?
- What is the harm to the environment caused by pollution?
- What is the harm caused by pollution to me?

⁸ The comments provided are limited to the English content of the WebPages only.

- What are the reasons for industry to pollute the environment?
- Who is causing the pollution?
- WHAT CAN I DO ABOUT IT?

Governmental target group:

- What is the current environmental status of the region?
- What are the most harmful pollutants?
- Who is emitting what amount of pollutant?
- Who is exceeding emission standards and why?
- WHAT DO I HAVE TO DO ABOUT IT?

Political decision makers

- What is the current environmental status of the country (or region)?
- How will the environmental status be in the (near) future?
- What are the implications on economic growth?
- HOW CAN THE FRAMEWORK BE ADJUSTED TO REDUCE ENVIRONMENTAL DAMAGES WHILE NOT HAMPERING ECONOMIC GROWTH?

To summarize, based on our preliminary evaluation on environmental information accessible, the existing approach on MIS in Thailand provides limited information not tailored to the information needs of each group of potential users.

2.1.4. Data Management in SMEs

Data management in most SMEs is organized sector wise and is limited to information needed to comply with certain requirements (e.g. by the 'clients' on declaration of quality of products or by the tax office on sales revenue for income tax payments). Transparency and exchange of data is often limited creating double work and an inoptimal decision basis. Limited human resources contribute to low quality and quantity of data. For example, investment decisions are based on cash flow figures (bank statements) rather than on revenue forecasts. Furthermore, data is classified into different categories such as financial data (e.g. sales, tax, profits etc.), production data (e.g. raw material use, product output, energy consumption), human resources data (e.g. number of employees, salaries etc.) to be used for different purposes (e.g. fulfilment of payment request, order of new raw material etc.).

Unfortunately, data storage is not centralised and scattered within the SME as well as not being available in digital form. Thus, long-term planning tools that could potentially use analytical cross-references of data from different categories are not well established or used. The process of combining economic and ecological production data to strengthen eco-efficiency aspects in analysis, strategy and planning is hampered by current data storage approaches.

2.2. Project Objective

According to the Terms of Reference, the objective of this project (as part of the overall Thai-German programme on Enterprise Competitiveness) is defined as follows:

Objective	Comprehensive policies and measures of governmental agencies and all stakeholders to facilitate eco-efficiency of SMEs are enhanced
Impact Indicators	<ol style="list-style-type: none"> 1. Industrial pollution databases (namely air, water, soil, waste) for selected sectors are effectively used. 2. No. of factories that use environmental data and information to improve their efficiencies are increased. 3. No. of qualified consultants are increased

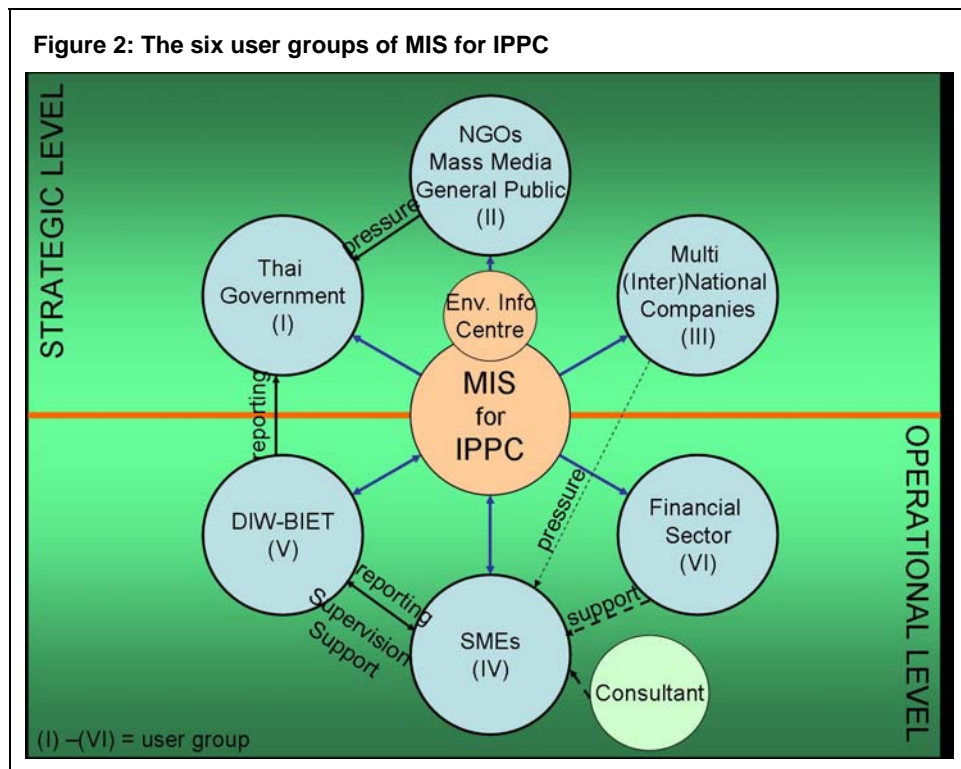
Main tool is the development, introduction and sustainable use of a Management Information System to support SMEs in their endeavours to enhance their economic and ecological efficiency and their competitiveness on the national and international market.

2.2.1. Remarks on the design and implementation of a MIS for IPPC

A management information system (MIS) shall provide necessary information for the user to decide on the solution best-suited for the problem to be addressed. Generally, decisions can be separated into **strategic** decisions (with a long-term view and impact e.g. fostering the development of certain industrial sectors and/or technologies, which are generally less polluting or more eco-efficient) and **operational** decisions (short-term e.g. increasing auxiliary material utilisation due to better dosage/handling). Both strategic and operational decisions are distinct from each other and need to be based on different information. However, most data needed to produce the necessary information are identical for both the strategic and the operational level.

Consequently, a MIS providing information on industrial pollution prevention and control (IPPC) is divided in two distinct but interrelated levels. On the **strategic level** it provides information to the government (user-group I) on a general level to monitor the achievements of government objectives. This includes the eco-efficiency performance of the entire industrial sector, to judge its impact on the environment and its economic benefit (e.g. GDP) in relation to its cost.

The MIS for IPPC should provide (via the Environmental Information Centres) information to the general public (user-group II) to demonstrate what action should be taken by each individual to improve the environmental performance of industry (e.g. through the demand of more environmentally friendly products).



Large (multi)national companies (user-group III) purchasing from SMEs should be provided with information on eco-efficiency performance of their supply-chain and, based on the market demand, request for more environmentally friendly (preliminary) products.

On the **operational** level, information is provided to the owner/manager/staff of SMEs (user-group IV) demonstrating eco-efficiency performance (in financial terms) of the SME (or process steps) and in comparison with benchmarks (based on market demand from clients or based on legal requirements). Independent consultants might support the SMEs in identification of suitable measures to achieve the set benchmarks.

For DIW-BIET government officers (user-group V) it provides information on the environmental performance of each supervised factory to decide what action has to be taken (e.g. in case of non-compliance with set benchmarks). The financial sector (user group VI) might use information of the MIS to determine the environmental risks involved in the investment by their client through benchmarks comparing eco-efficiency of their clients.

However, the main limitation to a MIS is the availability of (raw) data and data collection/measuring/monitoring which cannot be done simply to satisfy the requirements of a MIS itself as this would be too costly. Consequently, an affordable application of a MIS for IPPC is a compromise between information needs (by the different user groups) and data availability.

Where does the (raw) data come from?

- a) Of course, the main sources are the individual SMEs (which use data/information itself for better management) by applying business specific eco-efficiency indicators and provide data to external sources (such as DIW-BIET) in the form of generally applicable indicators (through environmental reporting)
- b) Environmental monitoring data gathered by the DIW-BIET and other related departments / institutions
- c) 'External' sources such as public suppliers (of energy and water), bureau of statistics; industrial associations etc. have data, which is useful for a MIS for IPPC.

Data processing (transfer data into information)

Data processing depends very much on the information need (what kind of information has to be produced) and (raw) data availability. Consequently, very little can be said about this step at the moment. Outlines of data processing will be discussed after the information need assessment has been conducted and will be presented to the user-groups for feedback.

2.2.2. Target groups

The target groups of the overall programme are owners/managers/staff of small and medium sized enterprises (with focus on selected sectors within the agro industry). Consequently, this project will interact on this level. Government officers (in particular from DIW-BIET and other related institutions) but also (private) business consultants are mediators between the target groups.

2.3. Remarks on the ToR

After careful review of the Terms of Reference and based on our experience working in Thailand and Asia, we would like to discuss certain points to be monitored continuously during the implementation of the project (and programme). First countermeasures are indicated in the following. All of the points mentioned will be also included in the project's M&E System.

The successful implementation of eco-efficiency assumes that efforts towards environmental protection (e.g. wastewater reduction) are linked with direct financial benefit for the unit (company). However, in most Asian countries - and Thailand is no exception, the framework in terms of resource prices (water, energy, pollution levy etc.) does not support this. It is noted that in Thailand, prices for energy are a considerable cost factor for companies, but water and pollution are not, yet. DIW has started to implement the 'polluter pays

principle' focussing on organic pollution (measured as biochemical oxygen demand⁹); however, related pollution levies might not be high enough to trigger investments in pollution abatement measures. Consequently, the MIS for IPCC on the OPERATIONAL level for SMEs has to identify these eco-efficiency indicators, which are linked with considerable direct cost savings.

Possible implication:	Possible countermeasures:
<ul style="list-style-type: none"> • SMEs are not interested in pollution abatement due to low financial benefits • Priorities by government on pollution (e.g. abatement of COD emission) are not congruent with priorities by SMEs (e.g. reduction of electricity consumption) • Administrative implementation and monitoring structures for pollution-related government directives and regulations for SMEs are too weak to ensure regulation compliance 	<ul style="list-style-type: none"> • Linking eco-efficiency indicators with financial benefits on the operational level • Adoption of levy systems to guarantee compliance of governmental objectives and financial benefits • Adoption of accompanying measures (e.g. soft loans) to support minimal financial benefit • Establishment of a reward system for SMEs that provide pollution related data in a standardized form

In addition, **strict enforcement** of environmental laws and regulations is not fully assured due to lack of resources. Even governmental officers often do not have all legislation necessary for their daily work on their desks.

In Thailand, the **non-transparency of decision making** (on each level) plays a considerable role in that respect. Even if means for better enforcement are at hand, implementing agencies might be reluctant to use these efficiently as they might have to justify their actions (e.g. on what basis levies or fines have been charged and collected).

Possible implication:	Possible countermeasures:
<ul style="list-style-type: none"> • Government officials will not use the provided tools efficiently 	<ul style="list-style-type: none"> • Full transparency in all steps. • Government officers as well as other stakeholders will be continuously supplied with updated data.

⁹ Biochemical oxygen demand is a measure of the quantity of oxygen used by micro organisms (e.g., aerobic bacteria) in the oxidation of organic matter

The pollution levy does often not correspond to the degree of environment damages and the cost necessary for prevention and refurbishment.

Possible implication:	Possible countermeasures:
<ul style="list-style-type: none"> Pollution levies are paid as a 'lump-sum' which will not be changed even if the SMEs reduces pollution burden 	<ul style="list-style-type: none"> Elaboration and introduction of levy system reflecting the real “environmental consumption” and adopted to governmental objectives

Lack of financial resources is one important reason why SMEs are not able to increase their eco-efficiency significantly. On the other hand, eco-efficiency measures at factory level often comprise technical up-grading of equipment and technology. The value added related to environmental aspects is comparably low compared to investments in effluent treatment plants, etc. A pollution levy fund should be used mainly to support projects, where pollution abatement measures are otherwise not financially viable¹⁰.

Involvement of the financial sector is critical for broader achievements in eco-efficiency. Financial institutions should be made aware of the fact that more eco-efficient SMEs are 'healthier' clients as others; SMEs have to be enabled to provide 'certified' information demonstrating their reduction of costs by improving eco-efficiency (leading to increased competitiveness).

Possible implication:	Possible countermeasures:
<ul style="list-style-type: none"> SMEs can not improve eco-efficiency significantly due to financial constraints 	<ul style="list-style-type: none"> Involvement of the financial sector in the stakeholder dialogue Strong cooperation with the programme component "Financial services to KMUs" PN 99.2160.2001.00 Use eco-efficiency indicators as selection criteria for 'green' credit lines

Furthermore, the roll-out of the IPPC-MIS on a national level covering all important sectors can only be successful, if professional IT players are involved. Therefore, a substantial financial commitment by the Thai counterpart organisation to support MIS is essential.

¹⁰ Following the Guiding Principle laid down in the ToR "Market orientation as the basic philosophy"

Possible Implication:	Possible Countermeasures:
<ul style="list-style-type: none"> • Established MIS does not provide sufficient information due to lack of data • Involved stakeholders withhold/do not share data (as 'information equals power') 	<ul style="list-style-type: none"> • Ensure commitment by the Thai counterpart on financial (and human) resources • Centralise MIS system to reduce costs of hosting and maintenance • Intensive participation of all stakeholders to minimise barriers and to enhance 'networking'

Policies and related measures are successful only if they **take the needs of the involved stakeholders and right-holders¹¹ into consideration**. Besides prominent stakeholders - such as governmental bodies responsible for environmental protection, economic development and the industrial sector - careful consideration has to be given to less prominent stakeholders. For example, representatives from large (inter)national companies (as most SMEs produce as part of a supply-chain); major export partners (such as the European Commission [as Thailand is a major trading partner of Europe¹²], the United States, Japan and others) are less important prominent stakeholders. Furthermore, as explained above, the involvement of the financial sector is crucial as they play an important role in any business decision. Public utility providers should be involved as well as they might be able to provide data on energy/water consumption by their clients (SMEs).

Possible Implication:	Possible Countermeasures:
<ul style="list-style-type: none"> • Information need of less prominent stakeholders, but important right-holders are neglected • Information interest of different stakeholders conflict with each other 	<ul style="list-style-type: none"> • Analyse stakeholder and right-holders including their information need carefully • Conduct a continuous stakeholder dialogue • Focus on information which is of mutual interest

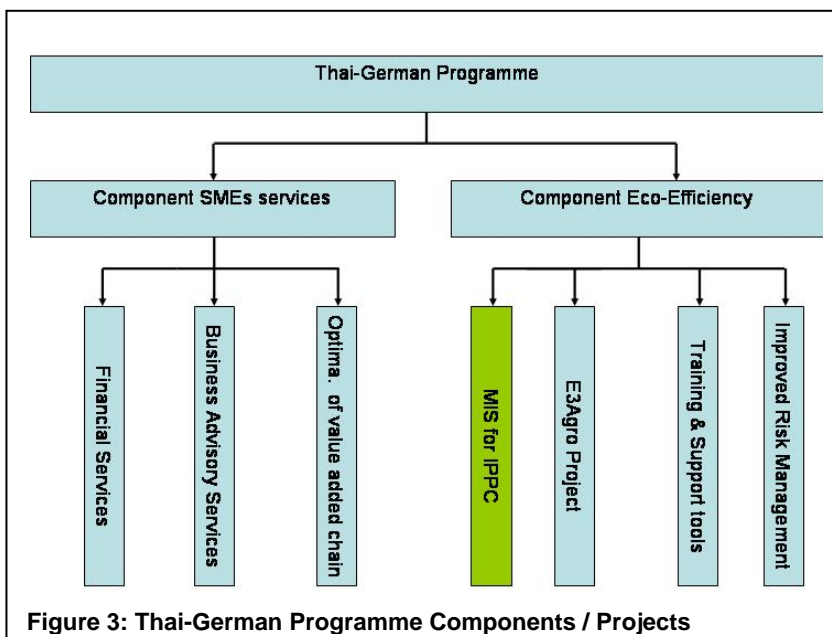
¹¹ Prominent and less prominent stakeholders that have a disproportional influence in decision-making due to top-down organizational structures

¹² For detailed information, please refer to http://europa.eu.int/comm/external_relations/thailand/intro

2.4. Methodology and task breakdown

As mentioned in the Terms of Reference, this project is part of the overall Thai-German cooperation programme and its implementation takes place within that context. Careful consideration has to be given to how this project should and can interact with other activities (initiated by the programme) and external projects/programmes.

The limited resources allocated to this project make it necessary to clearly describe "points of intersection", defining what the project has to deliver and what the project can expect from the programme as input and/or support. In addition, the consultant has provided some suggestions on the concept (refer to chapter 2.7 Conceptual alternatives).



of intersection", defining what the project has to deliver and what the project can expect from the programme as input and/or support. In addition, the consultant has provided some suggestions on the concept (refer to chapter 2.7 Conceptual alternatives).

Based on the tasks and resources available we propose to divide the project duration into

three different stages: Inception – Implementation – Follow-up measures.

- Inception:** Due to communication specifics of and within Thai culture, the consultant is well aware that starting communication and cooperation with the counterpart through an outright presentation of its ideas on how to implement the project could be misinterpreted as paternalism and might not be received well by the counterpart organisation. Thus, during the inception stage the ideas of the counterpart, his internal/external 'network', as well as his expectations/interests with regard to the outcome of the project will be examined carefully and be complemented by the technical assistance. As required in the ToR (chapter 5) the 'Core Activities' described are going to be reviewed by the consortium and the Thai counterpart during that stage. This task will include a workshop to inform all relevant stakeholders about the goal of the project and results to be achieved. To prepare this workshop the consultant and the Thai counterpart have to clarify the stakeholders to be invited. The list of invitees is both political concerning the monitoring of SME and strategic concerning the results to be achieved within this project. In the course of the identification of the stakeholders, a stakeholder analysis will be conducted. The mutual understanding in the nomination who will be a stakeholder in the

framework of this project is an important issue for the success of the project concerning the co-operation with governmental bodies and SMEs.

The tender documents specify certain fields of expertise (i.e. MIS, programming of tools, training, legal framework, sector specific expertise) for local Thai national consultants and experts. However, this expertise is somehow overlapping with expertise existing in the Thai counterpart organisation (DIW-BIET and DIW-IIC). Thus, during inception stage careful discussions are held with the Thai counterpart to identify the necessary external expertise needed.

The inception stage results in the annual work plan describing tasks for the implementation stage.

- **Implementation stage:** Based on the annual work plan(s), which describe activities (as well as important sub-activities), defining milestones, responsibilities and (human) resources needed, each responsible person (task manager) is requested to breakdown his work into monthly work plans. The ownership (and responsibility) of each tasks lies within the Thai counterpart. The TA consultant is responsible providing the specific know-ledge transfer enabling the counterpart organisation to implement the project successfully. Based on that, each specific mission carried out by the national and international short-term consultants as well as by the long-term consultant will be agreed on by both sides and designed to complement the knowledge of the Thai counterpart. Implementation is monitored by the Thai project director and the long-term consultant jointly. Deviations will be discussed and countermeasures applied to achieve the milestones set in the annual work plan.

During that period (approx. months 3 to months 21), the technical assistance input is concentrated. It is envisaged that the long-term consultant (Chief Technical Adviser) is on-site in Thailand for approx. 2 weeks each month. It is felt important, that continuous support is provided to the Thai counterpart and in particular, for the coordination within the programme and with external projects. However, this has to be seen as a general rule, as of course the project management reacts flexibly to new developments / upcoming events (e.g. scheduled meetings and conferences). For the second annual work plan, the achievements will be reviewed and task planning continued as well as countermeasures (if necessary due to deviations) incorporated.

- **Follow-up measures:** It is anticipated that during this period, (three months prior to project termination), the main tasks have been accomplished or the Thai counterpart has been enabled successfully to complete the remaining tasks. Focus will be on the assessment, whether the completed tasks (e.g. the MIS for IPPC) achieve the results anticipated and if not, what additional fine tuning tasks/adjustments might be necessary. Furthermore, this stage will include an evaluation of 'lessons learnt' during implementation and the preparation of suitable dissemination material (e.g. a CD-ROM will contain all relevant project documents).

A brief description of how the stipulated results to be achieved is presented below.

Result 1: The government developed and implemented data management procedures and information systems for effective use to reduce the command and control activities of the government

Key Performance Indicators

1. No. of categorized database (incl. sub-categories, namely relevant parameters) and defined benchmark indicators in the environmental information centre
2. No. of central and local agencies, SMEs and public who access to the industrial pollution data and information (including definition of access authorization).

• **Definition of performance indicators**

A large amount of research work has been carried out in relation to environmental performance indicators¹³, finding methodological convergence on the need of a core set of consolidated indicators (generally applicable indicators) as well as sector and/or business specific indicators (business specific indicators). Because environmental impact of businesses can be analysed at multiple levels (process, production site, business unit, and firm) and has multiple dimensions (energy use, resource use, emissions, environmental management), data needs are potentially large. It is of utmost importance to concentrate on the most relevant elements of corporate environmental performance (generally and within one industrial sector) to reduce data collection and analytical efforts.

The sub-sectors suggested in the Terms of References (palm oil, starch, shrimps, fruit & vegetable as well as mulberry paper) are applicable to develop the right methodology for Thailand on environmental performance indicators and benchmarks. Within these sectors, the production processes are quite similar and consequently, quite comparable. This might differ in other industrial sectors and has to be considered in case of an industrial wide roll-out of the methodology.

• **Generally applicable indicators and business specific indicators**

The European Commission has applied the following main environmental performance indicators as describe below¹⁴ for monitoring industrial sites with focus on IPPC:

¹³ World Business Council for Sustainable Development (WBCSD) / Global Reporting Initiative (GRI) / MEPI project (Measuring Environmental Performance of Industry) funded under the Fourth Framework Programme (Environment and Climate) of DGXII of the European Commission

¹⁴ Source: REMAS (linking environmental management and performance). More information can be obtained under <http://remas.ewindows.eu.org/REMAS/en/home.htm>

EP 1 Compliance

- I. Number of instances of formal enforcement action taken during the last calendar year.
- II. Number of permit/licence condition breaches in the last calendar year.
- III. Number of successful prosecutions against the company in the last calendar year.
- IV. Number of administrative fines in the last calendar year.
- V. Number of incidents in the last calendar year that resulted in significant environmental harm.

EP 2 Conduct

- I. Total substantiated complaints in the last calendar year.
- II. Total number of substantiated complaints unresolved in the last calendar year.

EP 3 Process efficiency

- I. Raw Materials

EP 4 Process efficiency

- I. Water

EP 5 Process efficiency

- I. Energy

EP 6 Releases to Air

- I. Particulate emissions / dust emissions
- II. Sulphur dioxide
- III. Total oxides of nitrogen
- IV. Carbon dioxide / greenhouse gases
- V. Others

EP 7 Releases to Water

- I. Chemical Oxygen Demand / Biological Oxygen Demand
- II. Total suspended solids
- III. Total mineral oil content
- IV. Heavy Metals
- V. Others

EP 8 Releases to Land

- I. Total solid waste generated
- II. Total hazardous waste generated

These indicators describe the performance of a company in terms of its environmental management as well as of its performance in terms of raw material utilisation and emissions to the environment. Aggregation of data from a significant number of companies within one sector provides information on the environmental impact of this industrial sector. For example, the Thai government announced recently that it will increase palm oil plantations

from 2 to 10 million rai¹⁵ in the next 25 years¹⁶. Based on the indicators above (e.g. EP6 / EP7 and EP8) it can be estimated how this development would affect the environment. This enables the government to set down a road map for the palm oil industry in the form of benchmarks (e.g. COD emissions per Mg palm oil or energy consumption per Mg palm oil etc.) leading this industrial sector towards eco-efficiency. If palm oil mills are requested to reduce their COD emission or energy consumption by approx. 6.67% per year, the absolute environmental influence of this sector would not increase within the next 25 years. The financial sector includes these benchmarks in their risk assessment and provides loans preferable to investments in palm oil production that include necessary eco-efficiency measures.

The data set on these general applicable indicators would be complete with business specific indicators, which illustrate the characteristics of the sector (e.g. use of antibiotics in shrimp farming or use of pesticides in fruit & vegetable farming

Each individual data set is to be provided either by the company itself in the form of environmental reporting (in case there is an incentive scheme in place) or to be collected by the government officers and/or authorised auditors. They would be able to compare data provided and in terms of significant deviations between comparable SMEs (in terms of production technology, output, product quality etc.) to determine if detailed supervision is necessary.

However, the outline of general applicable indicators to be established by this project will depend very much on the information need of the stakeholders (respectively user-groups of the MIS for IPPC).

In most publications, 'Eco-efficiency' is defined as¹⁷:

$$\text{Eco-efficiency} = \frac{\text{product or service value}}{\text{environmental influence}}$$

However, this definition leads to indicators focussing on the environmental performance of a company and/or industrial sector. These indicators are more suitable for information on the strategic level of the MIS as it allows comparing individual performance across different sectors (e.g. production of X Mg of palm oil causes 1 kg of BOD emission compared to the production of Y Mg of mulberry paper causing 1 kg of BOD emission). In case the numerator is expressed in value-added¹⁸ terms (as an equivalent for 1 Mg of product), the indicator illustrates clearly which production processes are more 'valuable' (higher value-added per environmental influence) than others.

¹⁵ 1 rai equals 6,25 hectare

¹⁶ Source: www.foodnavigator.com, article: Thailand races to compete with Asian palm oil giants, issued 25/6/2004

¹⁷ World Business Council for Sustainable Development, measuring eco-efficiency – a guide to reporting company performance, Hendrik A. Verfaillie and Robin Bidwell, June 2000

¹⁸ Value added is defined as total value of sales minus cost of materials

Nevertheless, they are less meaningful for owners/managers/staff of SMEs. On the operational level, the MIS should provide information where **potential** is not utilised yet.

INTEGRATION suggests using business specific eco-efficiency indicators on SME level, which express:

$$\text{Eco-efficiency potential} = \frac{\text{cost caused by environmental influence}}{\text{product or service amount}}$$

This type of indicator shows a high eco-efficiency potential, in case costs caused by environmental influence (e.g. discharge of wastewater) are high per product or service unit. On the contrary, they will indicate a low eco-efficiency potential in case costs caused by environmental influence are low.

A company paying a low discharge levy on a high amount of wastewater (i.e. by paying a lump-sum) has a lower eco-efficiency potential than a company with a lower discharge amount, but higher discharge fee (by reflecting municipal treatment costs).

Thus, levels and areas of necessary political intervention to align political and industrial interests can be indicated. In addition, it fully supports the monetary valuation of all environmental influences, which certainly will be considered in business decisions.

Consequently, the project has to stimulate 'policies' that trigger attention to resources with 'no financial value' yet and market demand on 'sustainably produced' products by (inter)national companies buying from SMEs in Thailand.

No.	Indicator (specific per 1 Mg of paper)	Unit	Amount		Potential		Contribution to total production costs	
			Current	Benchmark	Absolute	Relative	Current	based on Benchmark
1	Specific water consumption cost	CNY/Mg	31	12	-19	-61%	1%	0,4%
	Specific water consumption	Mg/Mg	102	39	-63			
2	Specific coal consumption cost	CNY/Mg	360	240	-120	-33%	11%	8%
	Specific coal consumption	GJ/Mg	37	25	-600			
3	Specific COD discharge cost	CNY/Mg	25	0,7	-24,3	-97%	1%	0,02%
	Specific COD discharge amount	kg/Mg	28,4	0,8	-27,6			
4	Specific dust emission cost	CNY/Mg	1,7	0,6	-1,1	-67%	0,05%	0,02%
	Specific dust emission	kg/Mg	6,1	2	-4,1			
5	Specific SO ₂ emission cost	CNY/Mg	6,5	3,3	-3,2	-49%	0,2%	0,1%
	Specific SO ₂ emission	kg/Mg	15	8	-7			
6	Specific electricity consumption cost	CNY/Mg	532	500	-32	-6%	16%	17%
	Specific electricity consumption	kWh/Mg	1064	1000	-64			
7	Specific raw material consumption cost	CNY/Mg	1500	1275	-225	-15%	44%	43%
	Specific raw material consumption	Mg/Mg	1,3	1,1	0,2			
8	Specific labour costs	CNY/Mg	455	455	-	0%	13%	15%
	Specific labour input	em hr/Mg	96	96	-			
9	Specific auxiliary material costs	CNY/Mg	505	505	-	0%	15%	17%

Figure 4: Production costs reflecting eco-efficiency potential of a small paper mill in China (before / after implementation of specific eco-efficiency measure)

Figure 4 shows an example of eco-efficiency indicators for a paper mill in China, established with support of INTEGRATION. It compares the current status of different consumption indicators with benchmarks to be achieved by applying specific measures to demonstrate eco-efficiency potential. Even if there is a greater saving potential in water consumption (61%) and COD discharge (97%), the company will tend to focus on energy saving measures (i.e. coal and electricity consumption) and raw material utilisation, as potentials in financial terms are significantly higher (especially when taking the accompanying reduction effects in SO₂ and dust emission into account). Consequently, the government has to act by adjusting the framework (e.g. increasing pollution levy on COD) in case it expects the SME to reduce COD emissions.

In addition, the business specific indicators shall illustrate a transparent and reliable picture on the production costs. Still, costs related to environmental influences are covered in the overall production costs (overheads or fix costs), not related to certain production steps and/or products (e.g. costs for COD emissions should include not only pollution levy but also costs for the material causing COD (e.g. raw material, product, auxiliary material remaining in wastewater)). This might give the wrong information to the management about what they base their decisions on. INTEGRATION has introduced (in cooperation with GTZ P3U) the PREMA[®] concept on Environmental Cost Accounting for SMEs for the first time in China (Tianjin / Hangzhou / Guiyang) to address that problem properly.

Generation of indicators and benchmarks

The formulation of indicators and corresponding benchmarks follow the following steps in principle:

1. Sectoral review of data/information available to identify relevant environmental influences
2. Generation of set of variables (e.g. no. of companies, turnover, electricity consumption, oil consumption, (wet)land use etc.)
3. Data collection via interviews / questionnaires / actual measuring
4. Data standardization
5. Generation of indicators
6. Data analysis and development of benchmarks.

One possibility for the development of benchmarks is presented in Figure 5. It comprises three benchmark levels to be achieved within a certain time:

CP Classifications	Level One	Level Two	Level Three
I. Requirements on production process & equipment			
	<ul style="list-style-type: none"> - Production capacity is over 2.5 million-ton crude oil /year - Correct division of drainage system. Both uncontaminated rainwater and uncontaminated industrial wastewater entirely enter the assumed clean water system; - Separate drainage system and pretreatment facility for special highly concentrated wastewater (such as sulfur bearing wastewater and alkali ferrous wastewater); - Floating roof tank for storing light oil (crude oil, gasoline, diesel oil and naphtha); - Sulfur recovering facility installed; - Crude carbolic acid and naphthenic acid in the waste alkali are recovered; - All waste catalyst is properly and effectively disposed 		
II. Indicator of resource and energy utilization			
1. Comprehensive energy consumption, (Kg standard oil/ton raw material)	≤80	≤85	≤95
2. Volume of water supply (ton water/ ton crude oil)	≤1.0	≤1.5	≤2.0
3. Reuse rate of cleaned water, (%)	≥65	≥60	≥50
III. Indicator of pollutant emission			
1. Oil, (kg/ton crude oil)	≤0.025	≤0.2	≤0.45
2. Sulfide, (kg/ton crude oil)	≤0.005	≤0.02	≤0.045
3. Volatile phenol, (Kg/ton crude oil)	≤0.01	≤0.04	≤0.09
4. COD, (kg/ton crude oil)	≤0.2	≤0.5	≤0.9
5. Amount of industrial wastewater per ton crude oil (ton water/ ton crude oil)	≤0.5	≤1.0	≤1.5
IV. Indicator of product			
1. Gasoline	50% output complies with II standard of World Fuel Specifications	Comply with GB17930-1999 Product Technical Specifications	
2. Light diesel oil	30% output complies with II standard of World Fuel Specifications	Comply with GB252-2000 Product Technical Specifications	

Figure 5: Excerpt of: China National Cleaner Production Standard -Petroleum Refinery Industry (HJ/T126-2003)

- **Benchmark level I:** To be achieved by applying 'best available techniques'
- **Benchmark level II:** To be achieved through technology update
- **Benchmark level III:** To be achieved by the units applying 'good house keeping measures' / 'best management practices'.

INTEGRATION has supported the Chinese National Government (State Environmental Protection Administration) in the formulation of indicators as well as benchmarks for different purposes. Further information are attached in **Annex 4, Working Samples**.

- **Breakdown of benchmarks into different levels**

The breakdown of benchmarks into different levels is important to motivate SMEs in pursuing these benchmarks. In addition, improvement of eco-efficiency is not a one-time activity; it has to be seen as a continuous application. For several sectors relevant for the project, different information/benchmarks already exist (e.g. 'RSPO Draft Criteria for Sustainable Palm Oil' issued by Roundtable Sustainable Palm Oil on www.sustainable-palmoil.org or 'Better Management Practices for Shrimp Farming' by the Network of Aquaculture Centres in Asia-Pacific www.enaca.org), which will be considered.

- **Start small and grow continuously**

Many MISs exist in Asia (and in Thailand) which have limited success, as MIS are only as good (by providing the right information addressing the information need of the user: context-content relationship) as the data stored in the MIS. Ambitious design of databases capable of providing any information, which might be needed often overlook data availability as well as the costs related to data collection and maintenance of data (updating). The first step is to have **existing data** available in digital form. This might start with a table using a spreadsheet programme (such as MS EXCEL®). This digital table can be easily transferred into a database. Furthermore, it should start with processing general environmental parameters (easy to obtain/measure), before moving on to more specific ones.

- **External data sources (general applicable indicators)**

In many countries, the central bureau of statistics does have data with environmental relevance available. Legislation, sub-legislation and technical instructions are normally sources for environmental standards. Since there are other environmental projects running within this program these data should be available from existing reports.

- **Stakeholder analysis with focus on right-holder**

As mentioned earlier, the identification and involvement of the right stakeholders, the understanding of their expectations and needs is crucial for the sustainability of the project. During the implementation of the project, continuous feedback discussions will be arranged to obtain commitment from every stakeholder. In accordance with Thai cultural communication specifics it should be considered to involve “**Phu Song Khunawut**” (well-known and highly respected independent personalities) to gain their official support for the project.

Result 2: Government and industry are jointly introducing combined environmental management, monitoring, information and reporting systems in SMEs of selected industrial sectors to improve environmental performance and efficiency of SMEs

Key Performance Indicator

1. No. of SMEs, who implement the combined measures and transfer environmental data to the governmental agencies

- **Short-term achievements and long-term goals**

Small and medium sized businesses focus **on short-term achievements** and do not consider long-term developments. Thus, all measures provided to SMEs in relation to eco-efficiency have to achieve visible short-term financial benefits. SMEs will implement electricity saving measures and monitor their electricity consumption closely if at the end of each month the electricity bill is lower than before. If SMEs do not have any data management system to start with, it will be counter-productive to introduce a system that focuses on environmental data. By starting with data related to raw and auxiliary material consumption (e.g. antibiotics used in shrimp farming, bleaching agents in paper production etc.), illustrating the impact on production costs and product quality, SMEs will be willing to accept new practices.

- **Step-by-step approach / road map for implementation**

Very often, SMEs are overwhelmed with 'new approaches', provided with lengthy guides/manuals and requested to fill-out detailed tables and questionnaires. As lack of human resources is a key issue in all SMEs, it is of utmost importance to guide SMEs through 'new developments' systematically. SMEs need to be approached with little tasks, which can be fulfilled with little effort. This means an initial questionnaire handed over to entrepreneurs should have rather one page than ten pages. Clear sub-ordinate targets have to be defined and agreed with SME as well as a clear realistic period for implementation. However, data collection/measuring/monitoring cannot be done simply to satisfy the requirements of a MIS itself but should mostly consider processed data already existing in SMEs¹⁹ (e.g. invoices for electricity, water, raw materials, invoices for repair services, design data of equipment etc.).

- **Benefit of environmental reporting / incentive schemes**

SMEs do not have an automatic interest in reporting on their performance to governmental units, as there is often no benefit gained. This does not only concern environmental issues but also extends to other areas, for example 'reporting' on sales revenue to the tax offices. Here, correct reporting of figures is achieved due to strict enforcement. Consequently, SMEs have to be convinced that environmental reporting will work to their advantage by providing incentives such as:

¹⁹ The financial framework of the TA contract does not allow a large data collection/measuring campaign with the mentioned industrial sectors

- primary beneficiary for subsidies/soft loan provided by the pollution levy fund or other 'green credit lines'
- less frequent monitoring and inspections on site by competent authorities
- appreciation by local authorities e.g. by issuing of eco-label/ award (e.g. Green Food Label for vegetables & fruits).

- **Outline of environmental reporting**

To reduce workload (and avoid errors during transfer into digital form) INTEGRATION suggests introducing environmental reporting through WebPage Access (on-line standardised template), providing the following information:

- a) General information on the company
- b) Environmental targets (SMART = **S**pecific - **M**easurable - **A**ttainable - **R**elevant - **T**rackable)
- c) General applicable indicators (e.g. BOD emission)
- d) Sector / business specific indicators (e.g. raw material utilisation rate)
- e) Environmental action programme describing what shall be achieved during the next reporting period [e.g. annual].

- **Benchmarks combined with measures**

Benchmarks alone do not help SMEs to improve their eco-efficiency. More importantly, the right measures have to be introduced, describing how the benchmarks can be achieved. INTEGRATION supported the Chinese National Government in the development of sector specific self assessment guides, which introduce measures (focussing on aspects of technology, production management, knowledge enhancement, raw material substitution, product innovation etc.)²⁰.

- **Dissemination strategy**

To attract interest in eco-efficiency benchmarking and environmental reporting, a dissemination / promotion strategy is developed. The focus is on describing direct benefits achieved by SMEs that have introduced eco-efficiency (through e.g. Success Story Tellers). Furthermore, the involvement of different stakeholders such as the financial sector and large multi-national companies (as clients of SMEs) will play an important role in dissemination. It is not advisable to have governmental units as a frontrunner for this dissemination as SMEs might be suspicious of their intentions, as it might be perceived 'command & control' activities in a new package ("The same old stuff with a new label").

²⁰ An outline is provided in Annex 4, Working Samples.

Result 3: Specialized consultancy services for management information systems to support industrial pollution prevention and control, environmental monitoring and environmental management are available

Key Performance Indicator

1. No. of qualified consultants/experts

• Use existing consultancy service

In Thailand (as well as in other parts of Asia) there is no sufficient market for consultant services focussing on environmental related issues alone. Even larger international consultancy companies offer combined services (most consultancies for environmental management systems according to ISO 14001, offer quality management, occupational health and safety management, product safety certification etc.). The project has to provide its developed tools (including necessary training) to consultants, which have a good market penetration (are part of the 'network' of the SME) and understand the provided tools as an additional benefit for their business. From particular interest for cooperation are consultants who work with SMEs on business related issues such as accounting, cash flow management, production process management, quality management etc. In addition, companies/design institutes providing 'cleaner technologies' could be involved, as they have a natural interest in eco-efficiency. They could be supported with information about which company has applied that technology and what economic as well as environmental benefits have been achieved.

However, as the Thai counterpart is a government agency, this has to be considered carefully. Government agencies should not 'recommend' certain suppliers, only technologies (offered by several companies) to allow fair market competition. As the environmental information centre is envisaged to be more independent, its technology section could contain advertisements of suppliers providing eco-efficient technologies²¹.

• Training-on-the-job / action learning methodology

Training is designed as a combination of theoretical knowledge transfer and practical application (learning-by-doing). INTEGRATION has excellent experiences with applying the PREMA[®] approach on SMEs in Asia, with the focus on environmental cost accounting. The combination of workshops (with a group of approx. ten enterprises) and individual consultancy service is a successful methodology. Each workshop starts with a train-the-trainer module, where the following workshop for owners/manager/staff of SMEs will be prepared.

Under the supervision of licensed GTZ P3U[®] trainers²², consultants are made familiar with the training objective, necessary tools etc. In the following SME-group workshop, the consultants directly apply this knowledge. The training session ends with a feedback/evaluation discussion, where the consultants reflect on the SME-group workshop and

²¹ INTEGRATION has supported the China Leather Industry Association to build up the Technology Transfer Centre. Part of the Centres' funding is generated through advertisement by technology suppliers on the Centres' Web Pages.

²² INTEGRATION is able to provide staff who are officially licensed trainers and members of the PREMA network.

evaluate their performance. Furthermore, to ensure a certain quality-level, it is intended to include the trained consultants in the PREMA® network.

• **Combine new approaches with existing ones**

The elaboration of guides/manuals should focus less on development of new ones rather than complementing existing ones. The GTZ in Thailand has elaborated Environmental Management Guides for several sectors (such as palm oil, starch as well as pulp & paper) relevant for this project. These guides should be updated and be complemented with eco-efficiency indicators. In addition, quite a lot of material is available (through internet research) in the English language which should be screened and made available in Thai language (if suitable). However, a standardized method for data collection (in digital form) seems to be lacking and will be developed by the project.

INTEGRATION has devised such data collection sheets for the development of eco-efficiency indicators, which are applied for the evaluation of loan applications of a Cleaner Production Revolving Fund²³.

4	Basic environmental data				
4.1	Water				
4.1.1	Consumption				
1	Annual water consumption	m ³ /a	122.400	198.900	
2	Daily water consumption	m ³ /d	680	585	On page 30 of the FS report: the company has its own wells
3	Specific water cost	CNY/m ³	0,30	0,30	On page 72 of the FS report
4	Annual water cost	CNY/a	36.720	59.670	
5	Percentage of water cost to total cost		0,90%	0,26%	
6	Specific water consumption	Mg/Mg	102	39	
7	Domestic water consumption amount	m ³ /a	0	8.160	According to the company's introduction: before the construction of the project, the workers are all nearby farmers who eat and board at home. So the amount so little that it can be neglected
8	Domestic water consumption amount		0%	4%	
9	Production water consumption amount	m ³ /a	122.400	190.740	
10	Production water consumption amount		100%	96%	
4.1.2	Loss and discharge				
1	Use of production wastewater		30%	80%	Data "before" is provided by the company; data "after" is assumed by the evaluator
2	Water in the water circulation	m ³	203	370	Data "after" is given in FS report
3	Discharge of domestic wastewater	m ³ /a	0	8.160	
4	Discharge of production wastewater	m ³ /a	121.500	157.420	
5	Total wastewater discharge	m ³ /a	85.050	39.644	
6	COD discharge concentration	mg/L	400	100	Data "before" is provided by the company; data "after" is given in FS report; discharge with meeting relevant standard
7	COD discharge amount	kg/a	34.020	3.964	
4.2	Energy				
4.2.1	Electricity consumption				
1	Total electricity consumption	kWh/a	1.276.800	5.100.000	500 grams coal is used to generate 1 kWh electricity
2	Total generated electricity	kWh/a	0	0	
3	Purchased electricity	kWh/a	1.276.800	5.100.000	
4	Specific purchased electricity cost	CNY/kWh	0,50	0,50	
5	Specific generated electricity cost	CNY/kWh	0,00	0,00	
6	Total electricity cost	CNY/a	638.400	2.550.000	
7	Percentage of electricity cost to total cost		16%	11%	
8	Coal consumption per kWh electricity	kg/kWh	0,40	0,40	
9	Electricity consumption expressed by coal consumption	Mg/a	511	2.040	
10	In terms of SO ₂	Mg/a	4	16	
11	In terms of dust emission	Mg/a	1	5	
12	Specific electricity consumption	kWh/Mg	1.064	1.000	
4.2.3	Coal				
1	Coal consumption	Mg/a	2.160	6.120	
2	Specific coal cost	CNY/Mg	200	300	
3	Total cost	CNY/Mg	432.000	1.836.000	
4	Coal consumption cost to total cost		11%	8%	
5	Specific coal consumption	Mg/Mg	1,80	1,20	
6	Average caloric value	Cal/kg		4.100	4000 - 4100
7	Dust emission	Mg/a			No information
8	Dust emission of the whole company	Mg/a	7,29	10,22	The emission of flue gas will reach relevant standard after treatment according to P48 of FS report. Based on GB13271-2001, the results of calculations of dust and SO ₂ are: 200 mg/m ³ and 900 mg/m ³ with flue gas amount 3,262 Nm ³ /h
9	SO ₂ emission of the whole company	Mg/a	18,46	40,28	
10	Specific SO ₂ emission	kg/Mg	15,38	7,90	
11	NO _x emission of the whole company	Mg/a	-	-	

Figure 6: Excerpt of a basic data collection sheet

²³ An example of eco-efficiency indicators and related evaluation of loan applications is provided in Annex 4, Working Samples..

- **Stimulate market demand for consultants**

Consultants are interested in training courses only if a market demand for enhanced consultancy service exists or at least develops. Consultants are involved in the following activities:

- Eligible SMEs for loans provided by the pollution levy fund, environmental award and/or environmental label must employ the certified consultants
- Applications by SMEs for these incentives should be evaluated (and ranked) by these consultants.

These measures will ensure that a demand for consultants is ensured and consequently, consultants will be interested in participating in the training provided by the project. It is noted by the consortium that DIW has outsourced certain monitoring/supervision/evaluation tasks to certified private auditors and monitors. These persons are another main mediator group for the project. However, as providing advice to and evaluation of the SME should never be done by the same person/company a strict distinction between providing sovereign tasks and consultancy services is advised.

Result 4: Industrial Environmental Information is accessible for the public and SMEs. The public has the possibility to access and actively participate in decision-making on industrial development

Key Performance Indicator

1. Frequency of use of the information in the centre

The tool envisioned to implement the expected result of the project is a **Public Information Centre on Thai Urban and Rural Environments (PICTURE)**. The structural organisation of such a centre will have to be adapted to the envisioned goals of 'PICTURE' as described above. It is therefore crucial to define key-expressions of the vision formulated for result 4.

- **Definition of the user-group (general public)**

Definition of user groups is a necessary pre-condition for the optimal design of 'PICTURE'. The available information has to be properly and specifically prepared through information design to create appropriate interfaces for the user groups in order to make 'PICTURE' an interesting and regularly used data-source.

The following sub-target-groups are envisioned to enhance the possibility of actual active use of 'PICTURE':

- ⇒ **NGOs**, i.e., independent organisations that rely largely on detailed and correct data to formulate their objectives, strategies and activities.

For example: A country-wide known NGO called 'Magic Eyes' takes a specific look at environmental pollution through households and industries alike. Their logo can be seen everywhere in Thailand and their campaigns are well received by the industry. They hold regular, well attended half-day seminars with selected guest-speakers where high-level representatives from the industry participate.

They have close links to Chulalongkorn University, the 'top' university in the country and a very well developed Web-Information-Infrastructure.

- ⇒ **Youths.** Organisations for youths and run by youths play an active part in Thailand's social life. There are many activities initiated by these groups, which are often very environmentally conscious and/or tightly linked with the country's temples and religious organizations. Their activities could be greatly extended by access to precise data. Data available on the net regarding this target-group is almost exclusively in Thai. The Ministry of Interior, the Ministry of Industry and other government organizations actively support youth-groups.
- ⇒ **Schools.** Many schools in Thailand, especially up to O-level, are active in environmental issues and awareness campaigns. Access to 'PICTURE' will allow them to better link such educational activities to a nation-wide perspective for the future generation of decision-makers. For example, it is customary for most Thai schools to engage in at least one of the following environment related activities:
 - Trip & camping projects (to educate about the environment)
 - Environmental essay contest
 - School cleaning technologies and techniques
 - Environmental school training projects
 - International environmental cooperation projects.

'PICTURE' could assess these activities and provide content/context related data from the central database to enhance specific aspects of a schools policy focus. This task is made easier by internet access that most schools already provide nation-wide.

- ⇒ **Universities.** Undergraduate and graduate students will welcome a central environmental industrial data-source for their course-work and thesis. 'PICTURE' can also potentially improve preparation of courses by professors.
- ⇒ **Consumers.** Many consumers follow weekly publications of consumer magazines regularly. Background data on industries and products will be a welcome addition. Some of these consumer organizations already have internet features and could find 'PICTURE' an interesting addition to their services or data-sources.

- **Definition of user-group SMEs**

The main industrial user-group for the industry with regard to 'PICTURE' are agro industry related SMEs. One part of the SME sector that is specific to Thailand can already be described here: the very small or root-SME (rSME)²⁴ with up to approximately 10 employees often recruited from direct or indirect family. At least 50 % of all SMEs in Thailand are rSMEs. They often unite themselves in organizations and networks and are mostly located outside of industrial zones or estates. 'PICTURE' could easily increase their access to information tailor-made for the agro-industrial sector. Such networks often receive extensive government support.

- **Definition of active participation and decision-making**

Thailand's current government is not necessarily used to People Participation as a general policy. Traditionally, many activities of the people are concentrated in NGOs and the government is putting pressure on independent organizations to fall in line with 'official' policies and support the government more i.e. criticize less. In such a scenario, new venues have to be found for the wider public to actively participate on environmental issues concerning industry.

Active participation will have to include the print and other news media, which are often important interfaces between environmental issues and government officials or bureaus. As the official 'Environmental Complaints Structure', like for example in Germany the Umweltbundesamt, is only rudimentarily developed in Thailand, the media are the most common mediator between environment concerns of the public and the government.

The strong top-down structure of Thailand's decision-making processes makes it difficult for public participation. Public hearings, compulsory EIA (**E**nvironmental **I**mpact **A**ssessment) and SIA (**S**ocial **I**mpact **A**ssessment) and other measures are in place to bind the public to the policy-making process of the administration. However, recommendations forwarded by such tools are not binding. 'PICTURE', therefore, considers decision-making beyond tools in place as an affair of the individual that can have equal or even more impact than policies.

- **Structure of 'PICTURE'**

'PICTURE' will be based on the following **physical structure**:

- ⇒ A permanent physical location in at least one related agency. This could for example be the DIW or the Ministry of Environment and Resources
- ⇒ The IC should be web-based
- ⇒ The IC should have a call and assistance centre
- ⇒ The IC should be service and event-based, for example through training, seminars and other services.

To enhance the participatory character of 'PICTURE', the following **alliances** beyond the government and industry sectors should be considered:

²⁴ Root-SMEs (rSMEs) are also called/very similar to Micro-SMEs. The major difference is that rSMEs often have intact direct social and communal links to the physical environment in which they produce. Thus they might be more open to issues of eco-efficiency and need less incentives for active participation, when compared to Micro-SMEs.

- ⇒ News media
- ⇒ Consumer organizations
- ⇒ Youth organizations
- ⇒ Universities and institutes.

The **organisational structure** of 'PICTURE' should aim for:

- ⇒ Partial or complete independence from government organisations. In the latter case, continued close cooperation with government organizations must be maintained
- ⇒ Administrative structures that allow third-party financing
- ⇒ Independent book-keeping
- ⇒ Partially or completely independent PR
- ⇒ Independent advertisement rights for the web-based interfaces. (For example, 'PICTURE' could offer an environmental product web-interface offering advertising opportunities for environmentally conforming producers)
- ⇒ Independent editing of information, for example through participation of newspapers, periodicals, institutes and universities.

The **information structure** of 'PICTURE' should consider the specific needs of sub-target-groups through providing appropriate interfaces with congruent data-selection and information presentation on the following information-categories:

- ⇒ Policy section
- ⇒ Consumer section
- ⇒ Statistics section
- ⇒ Technology section.

Thus, active participation in decision-making can be increased through focused and user-specific information dissemination, for example through the following sub-categories:

- ⇒ Policy section (people-participation oriented):
 - Inform about ongoing projects of the public and private sectors
 - Initiate internet referenda
 - Have three discussion groups for: public/public private/public private/private
 - And others
- ⇒ Consumer section (behavioural change oriented)
 - Promote environmentally friendly agro products to enable people to decide on environmental policies through their product choice while shopping
 - Product testing/analysis
 - Publicise environmentally friendly home appliances
 - And others

- ⇒ **Statistics section (behavioural change oriented):**
 - Short-list best/worst environmental performers
 - Introduce a monthly performance index (for public viewing)
 - Show environmental impact of different lifestyles
 - And others

- ⇒ **Technology section (decision-making support, options):**
 - Publicise latest available technologies for the industries
 - Publicise environmentally friendly management techniques
 - Publicise international cooperation options, technology transfer
 - And others.

2.5. Time schedule

The following timetable illustrates a tentative working and staff schedule for the project implementation. A detailed workplan will be elaborated after the start of the project and an operation planning workshop will be implemented combining all relevant stakeholders and resource persons such as the Thai-German programme directors and the project partner DIW.

Table 2.5 Work plan

2.6. Themes intersecting the other components / GTZ P3U

As this project is part of a larger cooperation programme, it is necessary to identify fields where special attention has to be paid to a close cooperation between the different components of the programme. Based on the information available, the consortium has identified the following fields and possible cooperation partners:

MIS, eco-efficiency indicator and benchmark development

- It is noted by the consortium, that DIW has established a GIS providing data on hazardous waste management. Special attention will be paid to how and to what extent this system can be linked with the MIS for IPPC.
- The 3EAgro-Project (Energy & Eco-Efficiency in Agro-Industry, implemented by the Department of Alternative Energy Development and Efficiency, Ministry of Energy) is elaborating indicators/benchmarks on energy efficiency and biomass utilisation. It has to be ensured that indicators/benchmarks developed by both projects follow the same methodology and can complement each other, wherever possible.

Policy advice, incentive scheme, direct responsibility regulation

- It is noted by the consortium, that within the Thai-German cooperation project 'Prevention and Control of Industrial Air Pollution in Thailand', DIW has developed a new legal framework for control and prevention of air pollution. This policy stipulates that air pollution prevention and control will be a task of the polluting industries and consultants / consultant companies, not of the controlling governmental agencies. Incentive schemes are in place to foster the implementation of air pollution abatement measures. It goes without saying that the regulations and scheme to be developed by this project will follow the same principle and incorporate the 'lessons learnt'.

Sector specific concept development and dissemination

- It has to be determined whether the 3EAgro-Project and this project focus on the same (e.g. in case of palm oil and starch) or on different sectors.
- It is anticipated that sector concept and dissemination follow the PREMA[®] approach developed by GTZ P3U. For the adjustment of its modules to be applied in Thailand as well as to complement the existing modules with information on MIS / indicators / benchmarking, input by GTZ P3U has to be utilised.

Training

- It is understood by the consortium that within the Eco-Efficiency Component other implementing agencies such as the PCD/DEQP/ECDA are developing Training Courses and Supporting Tools on Eco-Efficiency. Programme management should ensure that all guides and manuals complement each other.
- As mentioned elsewhere, curricula will follow the PREMA[®]-training concept designed by GTZ P3U, in particular the module 'Environmental Cost Accounting'. Consequently, input by GTZ P3U is required to elaborate the necessary adjustments in close cooperation with the project.

2.7. Conceptional Alternatives

The Terms of Reference provide a comprehensive and detailed description of environmental and economical challenges SMEs of the Agro-Industry are facing. In the following chapter we would like to highlight some specific aspects, which might be worthwhile to be considered in project implementation.

2.7.1. Involvement of the Financial Sector

As mentioned in chapter 2.2, the involvement of the financial sector is of great importance for a broader acceptance of eco-efficiency indicators and benchmarks in Thailand. The main problems for the banking sector with regard to environmental issues are:

- Loan officers often find it difficult to appraise environmental risks related to investments
- Loan officers are also unfamiliar with the use of environmental benchmarks, which could be used as an evaluation grid to judge these environmental risks
- Most loan applications (for investments in eco-efficiency measures) elaborated by SMEs are of poor quality, not describing the project to be financed in a 'language' understood by the loan officers (as it is often too technical).

Consequently, the introduction of a training programme with regard to financial issues for both the loan officers and the SMEs seems to be worthwhile.²⁵

2.7.2. Distinction between sovereign tasks and support services

The Terms of Reference describe the envisaged MIS as an instrument that on one hand provides services to SMEs to encourage eco-efficiency and on the other hand improves effective law enforcement (via environmental reporting). Experiences in Asia and Europe show that this is very difficult to achieve at the same time within one system. It is very unlikely that SMEs provide reliable detailed data on their performance, in case this information can be used by supervising governmental agencies to check on their compliance (e.g. with environmental legislation). In this case, the corresponding governmental agency responsible for monitoring those SMEs does not have any possibility to draw on the data included in that database.

Therefore, INTEGRATION suggests a clear separation between the provision of a tool for benchmarking and a tool for providing environmental reporting to the supervising governmental agency. The former one should be provided by an independent organisation (e.g. the relevant industrial association). However, governmental agencies could be entitled to request aggregated (and made anonymous) data on the performance of the sector (e.g. water consumption in a specific production step). This could be compared with data individually provided by SMEs through environmental reporting.

²⁵ Currently, INTEGRATION is implementing a similar training programme for credit officers in China on how to incorporate environmental issues in loan applications and for SMEs to address the need for SMEs to elaborate better 'bankable' investment proposal.

A separate WebPortal provided by the supervising governmental agency (i.e. DIW) would provide tools for the environmental reporting. Here, the SMEs can decide what data to provide, according to the legal requirements set on environmental reporting.

The 'Umweltzentrum Umwelt Wirtschaft IZU' as part of the 'Bayerisches Landesamt für Umweltschutz' has established the 'b u d a - Service: Betriebliche Umwelt-Daten Analyse Ihr Umwelt- und Kostencheck'. This WebPortal (www.buda.de) provides support to SMEs from different industrial sectors (printing house, bakeries, car repair shops etc.) in the form of tools to measure their (environmental) performance. In this system, each user (SME) can input his individual data and the BUDA provides information in the form of benchmarks from aggregate data, which is made anonymous, provided by other SMEs of the same sector. This ensures that only the SME can see his performance level compared to others and enables the SME to include sensitive data (e.g. detailed production consumption data) which is necessary to identify improvement potentials.



Figure 7: WebPortal BUDA

Further information on BUDA is attached in Annex 5.

2.7.3. Focus on one industrial sector (in-depth approach)

The Terms of Reference describe that the focus of the programme is on several industrial sub-sectors of the agro industry, namely palm oil, starch (tapioca), fruit & vegetable and mulberry paper. In addition, the Guiding Principles of the programme suggest examining the possibilities of extending to other sectors (such as automobile, electrical & electronics supplies). In the context of a more holistic approach, it is suggested to begin the project implementation with one sector. This allows a more in-depth analysis of the situation of the sector structure and the specific challenges SMEs of this particular sector are facing.

More precise data collection and analysis as well as more specific indicators and reliable benchmarks could be elaborated, which would stimulate the interest of SMEs in participating in eco-efficiency performance activities as more tailor-made solutions can be provided.

During the inception stage, a 'starting' sector would be selected by applying a set of criteria and the sectors ranked accordingly. These criteria include (but are not limited to):

- Structure of the sector (e.g. numbers of SMEs, geographical location and clustering, stakeholder composition)
- Relevance of the sector (e.g. in the form of political and economical importance, development potential)
- Environmental relevance (e.g. contribution to overall environmental pollution in Thailand and/or a specific area)
- Demonstration character (e.g. potential of eco-efficiency cost potentials, ability to transfer the results to other sectors, ability to compare production processes within the sector)
- Relevance to other programme components.

After the selected MIS approach has been successfully proven in this sector, it is used as a model applied to the other industrial sectors according to the ranking (importance).

2.7.4. Broaden the use of MIS for IPPC on the operational level for SMEs

Experience in Europe shows that only one (holistic) management information system should exist on the company level, rather than separate ones addressing different management issues. Furthermore, product quality goes hand in hand with the use of raw and auxiliary material (e.g. antibiotics applied in shrimp farming). Therefore, IPPC information has, besides a strong relation to quality management (including HACCP (Hazard Analysis and Critical Control Point) and FIS (International Food Standard), links to **occupational health and safety (OHS)** aspects. In addition more and more companies, in particular large ones, look into **social responsibility (SR)** issues and include specific requirements in their efforts of 'greening' their supply chain. Most SMEs in Thailand are part of such supply chains. Consequently, the MIS should support them in addressing these concerns. In addition, incentives provided by the government to certain SMEs have to be seen in greater context. A company applying eco-efficiency does not automatically comply with other laws and regulations, in particular occupational health and safety and social responsibility issues. It would be fatal to award a SME for great achievements in eco-efficiency while at the same time that SME has significant deficits in these areas.

The ToR reflect less on product quality management and the abovementioned. However, this broadening of the MIS on the operational level should be considered. It is noted by the consortium that the programme does have activities which focus on product quality improvement and supply chain and/or value added production chain and the Programme Management should consider carefully, how and to what extent these activities could complement each other. Nevertheless, coordination between all these different parts of the programme will be quite challenging, in particular as there is no permanent contact person foreseen within the financial framework of the TA contribution.

2.7.5. Public Private Partnership Approach

PPPs can be supported in different ways:

- **Consulting:** The environmental situation can only be improved if physical implementation of eco-efficiency measures is done by SMEs. Result 3 and result 4 provide the necessary tools. As mentioned in the ToR (chapter 7.2), InWent Capacity Building International supports the Fraunhofer Institute in the development of a easy to use EPI system for SMEs in Asia. The developed software (based on MS ACCESS®) has been applied in six enterprises in Asia (including Thailand). It is the intention of the Fraunhofer Institute to establish a local distribution system for the EPI. For this purpose a supportive training programme will be conducted by Fraunhofer Institute including:
 - Provision of software (including installation)
 - Training of company staff in the use of the application and eco-efficiency (5 workshops of 2 days)
- **Technology:** Eco-efficiency measures in most cases include technical upgrading of equipment and introduction of new process technologies. Areas, in which a partner could be identified and matched.

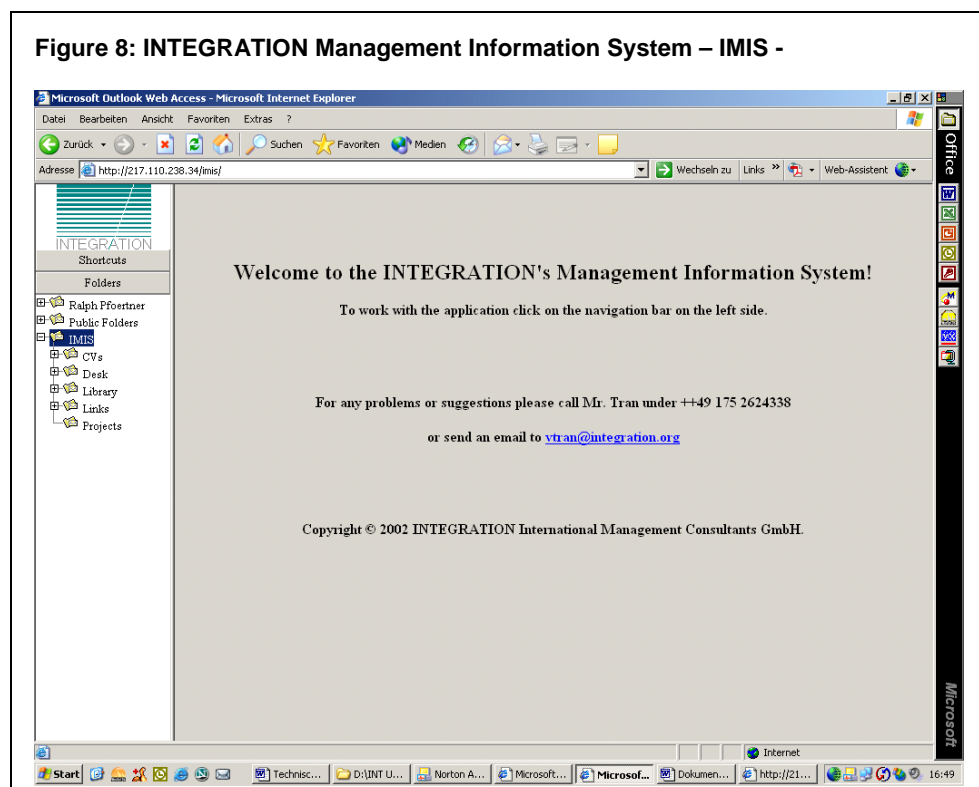
2.8. QMS, M&E and Impact Monitoring

Quality management (QMS), monitoring & evaluation (M&E) and impact monitoring include measures

- for continual control of impacts
- for accompanying project implementation monitoring and evaluation (M&E) and
- for supervision and assurance of the quality of implementation (QMS).

Impact control includes the identification of the direct and indirect impacts on the target groups by the project measures, examines discrepancies through the M&E system and continually accompanies the project implementation. The collective INTEGRATION QMS system regulates the process of single activities (e.g. personnel missions), creation of reports and finally the filing system.

2.8.1. Quality Management (QMS)



The quality management system covers process control of single project measures such as organisation and control of personnel missions, report creation and special project activities, for example procurement. To support the project execution an intranet will be set up on INTEGRATION's own server, where all project relevant internal and external reports,

studies, publications and special documents will be saved. All project participants have access to the intranet at all times via an access code. The intranet is part of INTEGRATION's own management information system (IMIS), which is also provided for the project implementation.


For each measure a QM-sheet („Evaluation of task planning / implementation“) will be created, in which the most important tasks, the respective timeframes and milestones are set. The sheet will be signed by the responsible person after every work step concluded and entered in the intranet. Therefore all participants can inform themselves anytime about the respective status of a task.


- **Process control and supervision of inquiries and missions**

The process control and supervision of missions essentially takes place with help of the abovementioned QM-sheet. For the implementation of research and the editing of topic related or organisational inquiries a revision time of 48 hours is aimed for from the receipt of the request until the first reply. The reply contains tasks concerning the necessary further steps and in addition to the confirmation of receipt also a clear timeframe, by when and which results are expected. These time guidelines are binding and are entered as milestones in the QM-sheet.

- **Quality monitoring of the outputs achieved**

The mission evaluation takes place by the consultant himself, the employer and partner authority, the receiver of the consultant as well as the consortium. The results of the evaluation are compiled on the QM-sheet („Evaluation of services“) and made accessible to all project participants over the intranet. The results of quality monitoring are taken into consideration in the choice of further short-term experts.

		Appendix 2: EVALUATION OF TASK PLANNING / IMPLEMENTATION		Page 1 of 1 C3	
Checklist Phase 2: Task planning and implementation					
Type:		Personnel mission <input type="checkbox"/>		Research <input type="checkbox"/>	
Project name: Project no.:				Date	Sign.
1	Order/task (Short description):				
1.1	Form	verbal	<input type="checkbox"/>	written	<input type="checkbox"/>
1.2	Date				
1.3	Corresponding to the technical tender	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
1.4	Corresponding to the financial tender	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
1.6	Deadline:				
1.7	Project leader INTEGRATION (Initial):				
	Signature backstopping				
<i>Entry in status review</i>					
2	Completion				
2.1	Person assigned:				
2.2	Completion by:				
2.3	Special comments:				
	Signature backstopping				
<i>Entry in status review</i>					
3.	Release				
3.1	Report submission:				
	On time:	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	If not, reasons:				
3.2	Report handover to donor:				
	On time:	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
	If not, reasons:				
	Signature backstopping				

 INTEGRATION	Appendix 3: EVALUATION OF SERVICES	Page 1 of 1 <div style="text-align: right;">C8</div>
Checklist: Evaluation of services		
Type: Personnel mission <input type="checkbox"/> Research <input type="checkbox"/> Project name: Project no.:		Date Sign.
Short description of task:		
Assessor: Expert pool partner:		
		Date Sign.
1	Backstopping evaluation	
1.1	Task description fulfilled Yes <input type="checkbox"/> No <input type="checkbox"/>	
1.2	If not: why not? what is missing? Explain with keywords.	
	Signature backstopping BS	
2	Expert pool evaluation	
2.1	Task description fulfilled: Yes <input type="checkbox"/> No <input type="checkbox"/>	
2.2	If not: why not? what is missing? Explain with keywords.	
	Signature expert pool EP	
3	Partner/donor evaluation	
3.1	Task description fulfilled: Yes <input type="checkbox"/> No <input type="checkbox"/>	
3.2	If not: why not? what is missing? Explain with keywords.	
	Signature partner PP	
4	Donor evaluation	
4.1	Task description fulfilled: Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.2	If not: why not? what is missing? Explain with keywords.	
	Signature donor AG	
5	Service receiver evaluation	
5.1	Task description fulfilled: Yes <input type="checkbox"/> No <input type="checkbox"/>	
5.2	If not: why not? what is missing? Explain with keywords.	
	Signature service receiver LE	
Entry in status review		

2.8.2. Monitoring & Evaluation (M&E)

Monitoring and evaluation form a sustaining element in the implementation of the assignment. They adopt the following functions:

- Control of the implementation (finding digressions from the target corridor, introduction of corrective measures, etc.)
- Identification of critical factors in the implementation as well as external factors that can negatively affect the project
- Monitoring and evaluation as part of the communication strategy and publicity.

The M&E system will be established and implemented together with the partner as a joint control instrument. The aim is the steering of the project to the goal and indicators within the given target corridor. The system exists in close combination with impact monitoring, which the realisation of the direct and indirect impacts of the project is based on.

Elements of the M&E system are the indicators and outputs mentioned in the tender. The individual elements are assigned milestones, which are quantitatively defined along a time axis. The milestones cover:

- tasks per time period
- assessment interval
- source and
- measures in the case of digression.

Following the anticipated **elements of the M&E system** are stated and possible measurement units given. The detailing and fine tuning takes place in the scope of operation planning.

Indicators:

Element: No. of categorized database (incl. sub-categories, namely relevant parameters) and defined benchmark indicators in the environmental information centre
Quantification: Increase in the number of databases and benchmark indicators from x to y per year; e.g. at least 3 generally applicable indicators are agreed by all stakeholders by project month 6, at least Y business specific indicators for each selected sectors are agreed by all stakeholders by project month 12, at least Z draft benchmarks for each selected sector are available by project month 12, all established indicators and benchmark are revised/adjusted by project months 22.
Correcting measures if deviation: Analyse the causes, set new deadline for attainment
Element: No. of central and local agencies, SMEs and public who access the industrial pollution data and information (including definition of access authorisation)
Quantification: Increase in the number of stakeholders accessing data from x per year to y; e.g. no. of registered users for the MIS Web Portals increases X% each month (starting from project month 12), no. of visitors to the PICTURE-WebPages increases X% each month (starting from project month 17).
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment

Element: No. of SMEs who implement the combined measures and transfer environmental data to government agencies.
Quantification: Increase in the number of SMEs completing the tasks from x per year to y; e.g. no of environmental performance reports received by DIW, increase X% each month (starting with project month 12).
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment.

Element: No. of qualified consultants are increased.
Quantification: Increase in the number of consultants from x to y in early 2007; e.g. at least three consultants per selected sector provided consultancy services to at least two SMEs (with proven eco-efficiency improvements) by using the guides/manuals provided by the project by project month 22.
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment.

Element: Frequency of use of the information in the centre.
Quantification: Increase in the number of visits/requests for information from x per year to y in early 2007
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment

Essential achievements:

Element: Creation of new databases and benchmarking indicators in the environmental information centre
Quantification: Increase in the no. of databases and quantifiable benchmarking measures from x to y
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment

Element: Eco-efficiency concept development and implementation in SMEs in selected industrial sectors
Quantification: Increase in environmental data gathered, processed and reported by SMEs in selected sectors
Correcting measures if deviation: Strengthen promotional activities emphasising financial benefits

Element: Integration of industrial pollution data from SMEs into the environmental information centre and governmental agencies as feedback system from SMEs
Quantification: Aggregated eco-efficiency indicators/benchmarks for each sector based on reliable data
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment

Element: Training of consultants in concepts of implementing eco-efficiency measures and MIS in SMEs
Quantification: No. of consultants trained in MIS for environmental applications (x in 2005, y in 2006)
Correcting measures if deviation: Strengthen activities in this area, set new deadline for attainment

Element: Set up and promotion of public information centre.
Quantification: No. of visits & information requests
Correcting measures if deviation: Strengthen promotional activities, set new deadline for attainment

Monitoring takes place with support of a dedicated PC database. The abovementioned elements are defined together with the partner at the start of the project in the framework of work plan creation. An important decision criteria is also that the time and resource expenditure is kept as limited as possible.

The report creation takes place half yearly or yearly in a suitable format. The project has a steering instrument at its disposal, which continually analyses the project status with regard to the set goals, indicates eventual deviations and provides corresponding adjustment mechanisms for the minimisation of digressions.

2.8.3. Impact monitoring

In contrast to the M&E system, impact monitoring documents the effects brought about by the project. Aside from the direct impacts (direct use of MIS) on the target groups, the indirect effects is also interesting, whose association to the project can certainly not take place, as well as the further expected impacts. Measurement factors are here the expected impacts in the abovementioned areas:

Direct impacts:

- Improvement of environmental data available to government, SMEs and other stakeholders.
- Increase in use of MIS for environmental applications by SMEs
- Improve the capabilities of government agency staff and consultants in MIS for environmental applications

Indirect impacts:

- Improvement of SME's environmental performance
- Improvement of SME's economic performance
- Improvement of co-ordination at sector policy level

Other expected impacts:

- Improvement of SME global competitiveness
- Improvement of compliances.

Also as in the M&E system, quantitative targets are developed at the beginning of the project for each element together with the partner. The current situation will be determined in the scope of a baseline survey, which will be implemented directly after the start of the project. In this case it is about:

- the amount of environmental data currently available to government, SMEs and other stakeholders.
- the number of existing MISs available suitable for SMEs with emphasis on industrial pollution data management, benchmarking, environmental and eco-efficiency performance indicators, environmental accounting and data plausibility checking systems.
- the advantages and disadvantages of such systems.
- the number of SMEs currently using such systems.
- the number of SMEs able to afford such systems.
- the number of SMEs aware of and if aware, their capacity to use such systems.
- the number of SMEs employing the services of qualified consultants in eco-efficiency and MIS for environmental management applications.
- the number of government agency staff and consultants with specific qualifications/skills in this area.


In addition, other impacts to which the project contributes are considered in the impact monitoring systems, for example:

- **Poverty:** The increase of eco-efficiency will strengthen the regional (e.g. Vietnam, China, Malaysia) competitiveness of the selected sectors (e.g. shrimp farming and palm oil production) and consequently foster economic growth, which results in a higher work force demand and increase in income in rural areas.
Indicator: Employment and/or average workers/farmers income of selected sectors does increase significantly higher compare to previous period
- **Decoupling from economic growth and environmental pollution**
Indicator: The ratio between production output value of the selected sectors and total pollution amount (defined by at least one main parameter e.g. biochemical oxygen demand) in a defined period decreases significantly more than the relevant ratios of other sectors.
- **Protection of natural resources:** As eco-efficiency in the agro industry is concerned with farming (to grow raw materials), impact on soil and water bodies is expected (in particular in relation to use of fertilizers, pesticides, drugs).
Indicator: The ratio between the total use of fertilizer, pesticides, drugs in selected industrial sectors and production output.

By means of a spot check, the development of a random sample of SMEs will be observed once yearly by a small standardised questionnaire. That way, on one hand an up to date conclusion of eventual necessary modifications of project activities is possible and on the other hand trends are determined with regard to project impacts of measures, which are not completed by the end of the project (e.g. ongoing data collection) and therefore also their effects cannot be completely evaluated.

At the end of the project a repeat of the baseline survey will be undertaken. Therefore the qualitative and quantitative figures are available for the assessment of the project impacts.

For impact monitoring a QM sheet („Impact monitoring“) based on ISO 9001 will also be created.

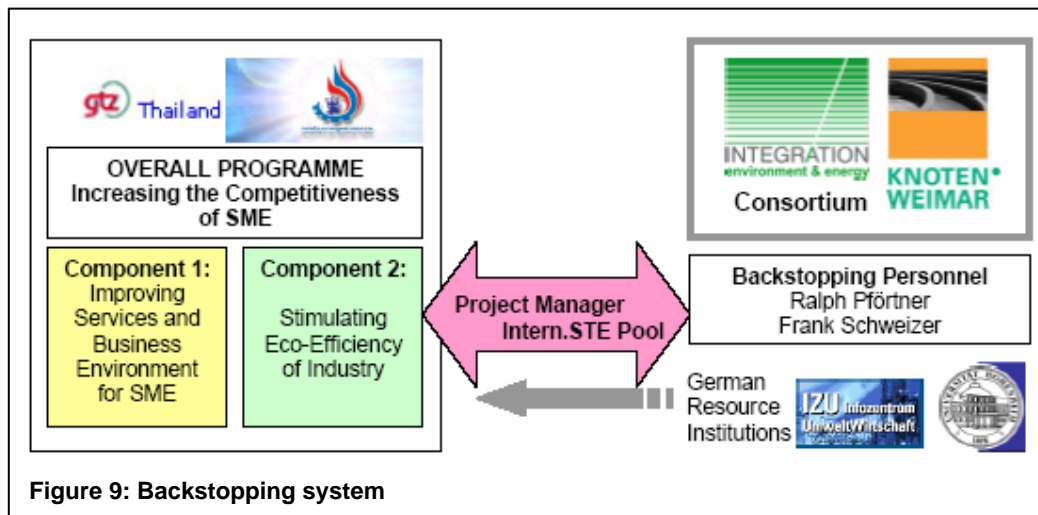
 INTEGRATION	Appendix IMPACT MONITORING	Page 1 of 1 C1	
Project name: Project no.: Status:			
	Goal level indicators: Industrial pollution databases (namely: air, water, soil, waste) for selected sectors are effectively used. Status: No. of factories that use environmental data and information to improve their efficiencies are increased. Status: No. of qualified consultants are increased. Status:		
	Component 1 indicators: No. of categorized database (incl. sub-categories, namely relevant parameters) and defined benchmark indicators in the environmental information centre. Status: No. of central and local agencies, SMEs and public who access the industrial pollution data and information (including definition of access authorisation). Status:		
	Component 2 indicator: No. of SMEs who implement the combined measures and transfer environmental data to government agencies. Status:		
	Component 3 indicator: No. of qualified consultants/experts. Status:		
	Component 4 indicator: Frequency of use of the information in the centre. Status:		
	Signature backstopping	BS	
Entry in status review			

2.8.4. Reports

Corresponding to the Terms of Reference, documentation of the scale and quality of the achievement accomplished as well as the current project status takes place with regard to the achievement of objects in the framework of the yearly progress report creation to the GTZ. At the same time special reports on defined themes are foreseen for example M&E, baseline survey, impact analysis, etc.

3. Technical Backstopping

In the following diagram the backstopping system of the INTEGRATION-Knoten Weimar consortium is depicted:



The **INTEGRATION** office in **Gräfenberg** will look after the overall coordination and backstopping of the project.

This includes

- the ongoing reconciliation and coordination with the Thai-German Programme Directors of the GTZ and the project partner DIW in Bangkok,
- the responsibility for control of resource use and financial planning in agreement with the GTZ office in Bangkok,
- regular written and verbal report presentation to the GTZ headquarters in Eschborn and the GTZ office in Bangkok,
- communication with the project office,
- the composition of progress and intermediate reports,
- coordination and organisation of personnel missions,
- planning and implementation of further training measures for technical and management experts in agreement with the Thai-German Programme,
- the organisation and implementation of procurement,
- the provision of technical know how for special investigations,
- the technical support of the Project Manager and the short-term experts employed,
- the coordination of planned measures with others for the implementation of important tasks, coordination with other organisations, such as InWEnt and other international donor organizations,
- GTZ contractual transactions including settlement,
- the provision, transfer and settlement of project resources.

Aside from the organisation of an internal project monitoring and evaluation system, also founding elements of the internal company QMS will be used for quality assurance. This includes the decision process, documentation of administrative actions, quality assurance of reports and documents as well as a continual, process accompanying supervision of the quality of outcomes. These procedures inform promptly of the respective project status and allow a fast reaction to eventual shortcomings in the implementation. INTEGRATION Environment & Energie GmbH is certified to ISO 9001.

3.1. Personnel

For implementation of high quality and continuous backstopping specialised and experienced consultants from the home offices of INTEGRATION in Gräfenberg and Knoten Weimar will be provided. All people mentioned are available for the total duration of the implementation. With the Environmental Information Centre (IZU) in Augsburg – part of the Bavarian Environmental Office - we have agreed on personnel exchange, assistance in counterpart training and study trips to Germany (see email in Annex 4).

The following back stoppers introduced combine the technical competence of the consortium and ensure that the intended long-term expert is ideally supported. Furthermore we can rely on the assistance on demand of the short-term experts offered by us who have promised technical support and also concerning the agreed mission timeframe.

For administrative and technical backstopping we propose:

Ralph PFÖRTNER (INTEGRATION)

Born 1957, **Managing Director of INTEGRATION environment & energy GmbH, experienced back stopper of long-term projects on behalf of the GTZ and EU for over 17 years.**

Mr Pförtner is currently active as a back stopper for component 2 of „Environmental management for enterprises“ in the GTZ programme „Policy advisory service and environmental management for enterprises in China“ and in the GTZ programme „Rural Infrastructure and Vocational Training Tibet“. He is also a back stopper for the GTZ project „Sustainable use of hydropower resources, Ecuador“ as well as the environmental EU projects „LIEP“ and „EMCP“, both in China.

From October 2003 until September 2004 Mr. Pförtner was responsible for the InWEnt training programme „Forward-Looking Management Strategies“, which trained staff of Chinese environmental protection and research institutes.

His technical strengths lie in communication, environmental management, CEFE, socioeconomic analysis and impact monitoring.

Mr Pförtner is the central **contact person for the consortium** and will be in charge of **administration and logistics** as well as the **preparation and delegation of short-term experts.**

Languages: German, **English**, Chinese

Frank SCHWEIZER (Knoten Weimar)

Frank Schweizer, **Managing Director of KNOTEN WEIMAR with working experience of more than 20 years as environmental consultant.** He has been working in over 25 countries on behalf of (GTZ, KfW, CDG [InWent], Worldbank, EU). The foci of KNOTEN WEIMAR is the training of specialist and management personnel in connection with technology transfer and the promotion and support of KMU in potential international markets. Mr. Schweizer is presently responsible for the following environmental projects of KW:

- since 05/03 Environmental School Project / Thailand (DEG)
- since 01/04 Integrated Urban Environmental Management Plan in the city of Lamphun / Thailand (EU)
- since 04/04 Integrated Waste Management Concept Sekhukhune / South Africa (Province Limpopo)
- since 04/04 Integrated Waste Management Concept Vembe / South Africa (Province Limpopo)
- since 05/04 Training of staff of the Hungarian Environmental Ministry (Fichtner)
- since 01/04 CP and Policy Reinforcement in the Field of Waste Management / Cambodia (EU)

Mr. Schweizer will be the **environmental backstopper with substantial Thailand experience.**

Languages: German, **English**, French

The CVs of all experts proposed for backstopping in the tender are in **Annex 3, „CVs of backstopping personnel“**.

3.2. Infrastructure (Technical Facilities)

The office of the lead partner INTEGRATION in Gräfenberg has all necessary computer and communications equipment at its disposal. For project management, the standard software package from Microsoft is available as well as project management software. The office can fall back on a complete desktop publishing infrastructure for professional creation of information, dissemination and training material.

INTEGRATION maintains its own internet server, where its intranet is also installed.

3.3. Knowledge and Information Management

We understand knowledge and information management to be not just processing, documentation and making available knowledge from the project for others but also the identification and mobilisation of „best practice knowledge“ for the programme. Both exist in close combination for technical backstopping of the consortium.

The knowledge management system consists of three components:

WinISIS: a centrally administered text database of summaries of articles, books, magazines, etc. available in the library;

WIKI: an editable information system for registered participants for obstacle free collection and discussion of information.

Through these components two essential aspects of knowledge management are served:

- Access to information about available documents and literature
- Access to a decentralised, interactive, real time, participatively created, thematical encyclopaedia.

and

Active Information Exchange: a direct exchange between the contractor and GTZ.

3.3.1. WinISIS

The consortium will begin immediately after commissioning with the construction of an archive of relevant documents, studies and reports. The software used will be WinISIS, which by this time is standard software utilised in the GTZ, the Windows version software CDS/ISIS created by UNESCO General Information Programme.

WinISIS is a menu driven system for saving and making information available, especially for the database supported administration of text data. One of the great advantages of the system is the open design, which makes the integration of an unlimited number of databases possible, which can furthermore consist of different data elements. Once configured, it can also be operated by users with very limited computer knowledge. Thus this system is particularly suited for deployment in the range of tasks demanded here.

With WinISIS summaries of documents, articles, books, etc. available in the library are managed.

An essential factor for the acceptance success of an information system is its user friendliness. A great deal of potential from useful approaches is lost due to this fact not being considered. To guarantee a possible widespread acceptance of the information system, existing barriers must be identified and overcome. Such a barrier is the fact, that WinISIS is conceived for an internal network without expansion. To make access to the information saved accessible to as many participants as possible, we regard it useful to publish the ISIS databases created on the internet. We suggest publishing the ISIS database on the internet.

3.3.2. Wiki²⁶

Aside from the centrally run information system WinISIS, we believe the introduction of a Wiki as a decentrally developed information system is useful. It is an open system, which creates the possibility in a participative way to the contributors, to introduce their knowledge to an interactive, thematical encyclopaedia.

The specialty of a Wiki is, that it allows each registered participant with internet access to add his information contribution to the database and therefore make it immediately available to the community in the internet. The contributions can be modified, supplemented or discussed by each registered participant, whereby all changes are comprehensible with timestamps and reference to the author.

Each author can edit existing pages as well as insert new ones. These are linked with each other or they contain links to external web pages. Starting from a simple thematical base structure they develop a network structure of information in this way. Different search functions including a full text search facilitate efficient orientation. Information is available immediately without the necessity of an administrator.

²⁶ Definition Wiki

Wikis, also **WikiWikis** and **WikiWebs**, are collections of pages available in the World Wide Web, which cannot only be read by users but can also be changed [online](#). They are therefore open [Content Management Systems](#). The name comes from *wikiwiki*, the [Hawaiian](#) word for "fast". Like usual [hypertext](#), the individual pages and articles of a Wiki are connected via [links](#). The pages change immediately on the screen. There is as a rule an editing function for that, which opens an input window, in which the text of the article can be edited. **Source:** <http://de.wikipedia.org/wiki/Wiki>

3.3.3. Active Information Exchange

Knowledge and Information Management needs to be based on regular exchange of experience of GTZ personnel and consulting partners, including the systematic identification and evaluation of specific project experience and concepts for product development, discussion and contribution to strategic sector policies and monitoring of regional demand of technical services, products and identification of knowledge requirements.

The consortium therefore proposes to cooperate closely with the GTZ **sector network TEEWAS** (Transport, environment, energy, water Asia) and to take part in the sector network meetings.

In addition it is proposed to initiate a **debriefing** of the international project manager prior to the end of his assignment.

4. Involvement of local resources

As mentioned elsewhere, the selection of local experts must be discussed carefully with the Thai counterpart organisation, as it should complement the existing expertise within the counterpart organisation and in addition, match the expertise provided by the international short-term consultant.

The **recruitment procedures** shall follow the basic principles of fair and open competition and shall be conducted in a transparent manner. Furthermore, it must be in line with the regulations stipulated by the GTZ for recruitment of national consultants as well as additional regulations set by the Programme Management.

For each field of expertise, specific terms of reference will be elaborated by the project as well as a profile of the professional requirements (by the Thai Project Director and the Chief Technical Adviser jointly). The ToR will be structured as follows:

1. Background information
2. Mission objective
3. Mission results/deliverables
4. Task description
5. Reporting
6. Timing (including provision of person-days)

As requested in the tender documents, a preliminary **list of expertise needed and tasks** have been identified.

Management Information Systems for Industrial Pollution Prevention & Control

Tasks include (but are not limited to):

- Study of existing MIS in Thailand, existing eco-efficiency indicators as well as benchmarks
- Stakeholder and right-holder analysis of MIS for IPPC
- Drafting of generally applicable indicators and benchmarks

Database design for MIS

Tasks include (but are not limited to):

- Drafting Performance Requirements Specification for MIS for IPPC
- Drafting User-Interface Requirements Specification
- Database programming according to the specifications

Marketing of Environmental Information Centre (P I C T U R E)

Tasks include (but are not limited to):

- Contribute to the design of a public relations strategy to promote PICTURE
- Design webpages and user interface for PICTURE

Sector expertise (shrimp, saa-paper, fruit & vegetables, starch, palm oil)

Tasks include (but are not limited to):

- Contribute to the elaboration of business specific indicators (including verification of data provided by other sources)
- Contribute to the design of the sector concepts including dissemination strategy
- Contribute to the dissemination of the sector concepts
- Support SMEs in the identification of eco-efficiency potential
- Contribute to the design of 'data collection sheet'
- Contribute to the sector-specific design of 'environmental performance report'
- Contribute to the revision/adaptation of training curricula
- Contribute to the revision of manuals/guidelines
- Contribute to training of consultants on MIS for IPPC and eco-efficiency in SMEs

Policy Development

Tasks include (but are not limited to):

- Research on market-based instruments, incentive scheme, direct responsibility regulations existing in Thailand
- Conduct stakeholder analysis
- Draft policy recommendation paper
- Discuss policy recommendation paper with stakeholders

Support for M&E and Impact Monitoring

- Conduct baseline / annual and final survey on M&E indicators as well as impact indicators

Possible institutions, which are of interest and might be able to provide the necessary expertise include:

Universities, such as:

Prince of Songkla University (PSU)

- Faculty of Environmental Management
- Faculty of Agro-Industry
- Coastal Resources Institute (CORIN)

Kasetsart University

- Faculty of Agro-Industry

Chiang Mai University

- Faculty of Agro-Industry

Research Institutes, such as

- Thai Tapioca Development Institute
- National Food Institute Thailand
- Kenan Institute

Industrial Associations such as

- Thai Tapioca Flour Industries Trade Association
- Thai Tapioca Starch Association
- Palm Oil Mill Industry Association
- Thai Frozen Food Association
- Thai Marine Shrimp Farmers Association

NGOs such as

- Thailand Environment Institute
- Environmental Engineering Association of Thailand

Further local institutions will be identified and selected for cooperation during project planning and according to the results of the workplan as a joint task of the project team (GTZ, DIW, contractor).

More detailed information based on a web research of the above mentioned local resource institutions are compiled in **Annex 4**.

5. Personnel

5.1. International long-term expert

For the project manager and intermittent long-term expert we propose

Mr. Tobias Becker

Mr. Becker (Dipl.-Ing.) has nearly 14 years professional experience, as part of his advisory job he has been working on MIS in two major long-term projects (one on behalf of GTZ, one for the EU). He has a total of eight years experience working as an advisor to government agencies and industry in international cooperation. Mr. Becker's English is excellent, he has very basic Thai language knowledge due to regular private stays in Thailand in recent years.

His verifiable professional experience covers the fields:

- ✓ Industrial Environmental Management
- ✓ Industrial Pollution Management
- ✓ Eco-efficiency in SMEs
- ✓ Environmental accounting
- ✓ Information Management in industries from China

Since 1997 Mr. Becker has been a permanent INTEGRATION staff member and is currently the **Division Manager for industrial environmental management** (cleaner production and ISO 14001).

Mr. Becker studied **Chemical Engineering** with a focus on water supply and wastewater treatment (industrial as well as municipal) at the Polytechnical University in Krefeld, Germany. Furthermore, he was trained as an environmental auditor according to EMAS (Environmental Management Accreditation Scheme).

Mr. Becker started his professional career as a consulting engineer on industrial waste treatment. His work included conducting weak point analyses and generation for pollution prevention as well as treatment systems in various industries.

Afterwards, he gained experience as a project manager, responsible for a **laboratory information management system (LIMS)**, whose purpose was to manage sampling/analysing/verifying and reporting of environmental data for provision to governmental agencies and private industrial clients.

Since 1997, Mr. Becker has been working permanently in Asia (based in P.R. China, with experience as a short-term expert and international workshop lecturer in Indonesia and Vietnam). Between 1997 and 2001, he was the **Team Leader of the GTZ Project 'Technical Assistance to the Environmental Protection Bureau Dongying City'**. The project focussed on the establishment of an Environmental Information Management System for the municipality. As an advisor he supported the local counterpart in the establishment of eco-efficiency services for SMEs (establishment of a consultancy section within the municipal EPB). He led several cleaner production audit teams in different industrial areas (e.g. paper, micro-refinery, textile, chemical and wood processing). This included the establishment of **benchmarks on eco-efficiency** for these industries. Furthermore, he developed an **incentive scheme for industry** to foster eco-efficiency (provision of financial subsidies from the pollution levy fund to conduct training and audits and implement measures in the enterprises).

Since 1999, Mr. Becker has acted as the **EU Co-Director for the “Liaoning Integrated Environmental Programme, Lot F Cleaner Production”**, funded with € 12.5 million by the EC (EuropeAid). This is part of an overall programme, which consists of seven different components (total funding € 43 million), covering different aspects of environmental management. Mr. Becker is responsible for the coordination between different components (Energy, Industrial Restructuring and Cleaner Production), focussing on industrial environment management. As part of the overall programme strategy, Mr. Becker developed an Action Plan on eco-efficiency (Liaoning Cleaner Production Action Plan), which was incorporated into the Provincial 5-Year-Plan of the Liaoning Government. This included the development of eco-efficiency indicators and benchmarks for three different industrial sectors, as well as corresponding manuals describing eco-efficiency measures for achieving the stipulated benchmarks. These indicators and benchmarks were adopted by the Chinese National Government and issued as technical standards by the China State Environmental Protection Administration in 2003. Another part of this project is the establishment and management of a cleaner production revolving fund with a total credit line of 180 million CNY (equal to approx. € 18 million). Mr. Becker designed the technical evaluation procedures for loan applications including eco-efficiency benchmarking. This tool allows the Provincial Government to rank investment proposals according to their environmental benefit / investment cost ratio.

Mr. Becker is a **professional advisor to governmental bodies and the industry**. His relevant experience includes the necessary tasks of the project manager as described in the ToR. More detailed information can be obtained from his CV.

During the past eight years working as a GTZ project manager and EU Co-Director, Mr. Becker was responsible for numerous **organizational tasks** which included:

- Organization of coordination meetings, workshops and international seminars, as well as preparation and implementation of study tours to Germany/Europe/Asia
- Coordination with other programme components (LIEP consisted of seven components altogether)

- Administration of the entire financial planning
- Elaboration of ToR, recruitment of international and local experts including subcontracting, briefing and de-briefing, approval of deliverables
- Elaboration and adjustment of the operation plan and overall and annual working plans
- Preparation of regular project progress reports
- Purchase of equipment.

After **eight years of living in Asia**, Mr. Becker is very familiar with the Asian culture and working conditions (both in governmental agencies and private businesses). Even if he has not worked in Thailand, he spent several months there in recent years on private business.

He is very **familiar with the different instruments of technical cooperation**, in particular with the requirements set by the GTZ (including procurement, accounting, reporting). Due to his six years working experience as a component leader of a larger TA programme (working language English), he is very familiar with the challenges of good coordination between different stakeholders (such as different TA contractors, different counterpart organisations and donors). His ability to lead and work in teams can be shown by the fact that he has worked in Liaoning with 10 permanent project staff and managed to lead a multidisciplinary team of local and international experts (total 120 M/M).

As outlined in the time schedule Mr. Becker will be available as intermittent long-term expert.

The CV of Tobias Becker is attached in Annex 1.

5.2. International short-term experts

The technical assistance provided by the consortium includes the provision of international and national expertise. The international short-term consultants will cover the following fields of work professionally:

5.2.1. General tasks of the STEs

Management Information Systems for Industrial Pollution Prevention & Control

Tasks include (but are not limited to):

- Study of market-available MIS for SMEs and governmental agencies with focus on IPPC and emission inventories
- Design of information systems and databases for industrial emission inventories (including Performance Requirements Specification)
- Design of generally applicable eco-efficiency indicators and benchmarks
- Contribution to Stake and Right-holder analysis for MIS on IPPC
- Capacity building for governmental officers on MIS
- Provide information on modern environmental management approaches for governmental agencies to foster eco-efficiency (including 'MIS as a tool for EMS')
- Contribute to the development of business specific indicators and benchmarks
- Contribute to the development of sector concepts on MIS for IPPC

Policy development

Tasks include (but are not limited to):

- Research on market-based instruments, incentive scheme, direct responsibility regulations existing in Europe
- Contribute to stakeholder analysis
- Contribute to drafting policy recommendation paper
- Discuss policy recommendation paper with stakeholders

Establishment of Environmental Information Centre (P I C T U R E)

Tasks include (but are not limited to):

- Development of a communication strategy on 'IPPC and public participation'
- Design of Environmental Information Centre
- Contribute to the dissemination strategy on IPPC/MIS sector concepts

5.2.2. STE Pool

The project manager will be supported by international short-term experts. We therefore have identified a limited number of specialists in the fields of Management Information Systems, Environmental Management, Policy Development, Economic Instruments, Incentive Schemes and Training:

Field of Work	International STE
Management Information Systems for Industrial Pollution Control	Andreas Koetter Mandar Parasnis Barbara Thome
Policy Development	Dr. Peter Richter Mandar Parasnis Joerg Schweizer
Establishment of Environmental Information Centre (P I C T U R E)	Karl Segschneider Barbara Thome Mandar Parasnis

The project manager and GTZ/DIW shall jointly review and specify the tasks of the international STE's through elaboration of specific ToRs. The assignments of the determined short-term experts will be supported by Thai national experts, consultants and ministerial officials in order to guarantee relevant know-how transfer and capacity building on the job.

In addition to the selected MIS experts we can provide specialists for the **Agro-Industry** on request through cooperation with University Hohenheim. The relevant experts contacted are Dr. Albert Fischer (Professor for Meat Technology and Thailand specialist of Uni Hohenheim), Dr. Kottke (Professor for Food Process Engineering) and Dr. Werner Mühlbauer (Professor for Agricultural Engineering)

If necessary, we can offer further experts from our extensive expert pool, who can cover further specialized fields of work.

A personnel overview of our proposed international short-term experts is presented as follows.

Andreas Koetter

MSc. in Environmental Science (University of Nottingham), BSc. in Agriculture, born 1960, independent consultant and specialist in the fields of Environmental Cost Management (ECM), EMS and waste management. Based on his experience Mr. Koetter designed a web-based application, called BUDA (see further information in chapter 2.7.2 and Annex 5), as a tool especially for SMEs to analyse their eco-efficiency and to enable them to compare their own environmental standards and environmental costs with benchmarks. Mr. Koetter has been working on behalf of GTZ already to introduce ECM in developing and reform countries (1998). He speaks fluent English.

Mr. Koetter will be involved as short-term expert and advisor in the field of **MIS design and implementation, merging of MIS and EMS, data management and evaluation, training on MIS.**

Mandar Parasnis

M.Tech. in Environmental science (IIT Bombay), born 1969, information specialist and Environmental Engineer with key qualifications in the field of IT applications in Environmental Management, Cleaner Production, Pollution Prevention and Eco-efficiency. Mr. Parasnis has been working for the Asian Institute of Technology (AIT) in Bangkok and for the Thailand Environment Institute (TEI), presently he is working as Environment Program Officer for the Asian Productivity Organization (APO). He is experienced in setting up Environment Information Centres, information and data management as well as conducting training. Mr. Parasnis has a working knowledge of Thai and English language proficiency.

Mr. Parasnis, whom we have been working with very successfully as a consultant before, will be available as international STE in the field of **MIS and database design and implementation, merging of MIS and EMS, data management and evaluation, training on MIS.** Due to his long working experience he will also be able to provide valuable input in the field of **policy development and design of an environmental information centre.**

Dr. Peter Richter

MA Macro-Economics, PhD Economics (Free University of Berlin), born 1946, specialist in macro-economic analysis, planning and policies, sector policies and private sector and SME promotion schemes. Dr. Richter has a long track record working as a GTZ advisor. After a seven year assignment in Guatemala he has been acting as project manager since 2002 in the Value Chain component of the GTZ program “Capacity Building for Competitiveness and Qualified Employment in Sri Lanka”. His outstanding reputation as policy advisor on the macro-economic level will be an asset for the MIS project in Thailand. Dr. Richter speaks fluent English.

Dr. Richter is available as short-term expert especially for **drafting policies, economic instruments and incentive schemes** for the Thai SMEs.

Joerg Schweizer

MSc. in Mechanical Engineering (University of Applied Sciences Karlsruhe), MBA (University Frankfurt), born 1944, has been working for over thirty years as International Sales and Application Engineer. Mr. Schweizer has been appointed as Managing Director for the German Centre for Industry and Trade in Singapore, and is the former CEO and currently Senior Advisor of the German Institute of Science and Technology (GIST) in Singapore. This institute has a strong collaboration with German and international industries, universities and research institutions. Mr. Schweizer is based in Singapore and has an excellent intercultural appreciation of Asian culture in business.

Based on his long-standing experience in South east Asia, Mr. Schweizer will be available as a short-term expert and resource person for **drafting of policies, economic instruments and incentive schemes** but also for **training development and exchange with academic institutions** in Germany on the envisaged training abroad for Thai counterparts.

Karl Segschneider

MA Human and Environment Management (Chiang Mai University), born 1960, specialist in intercultural and environmental communication. Mr. Segschneider has been working in the UPMP as well as in the Phitsanulok Waste Management Project of GTZ. His recent assignments included work for WTO and Heinrich Boell Foundation, RISE-AT, GTZ-P3U, TGI, GTCC and DIHK. His focus lies in strategic service development within the institutional and cultural Thai context. Mr. Segschneider lives in Thailand and speaks Thai fluently.

Mr. Segschneider will be available as short-term consultant to carry out tasks with regard to the **establishment of the Environmental Information Centre (PICTURE)** and **motivation and incentive schemes for SMEs**.

Barbara Thome

MSc Ing. Agrar (Technical University of Munich), born 1965, Project Coordinator for the Environmental Information centre (IZU) in Bavaria and former staff of B.A.U.M. (German Environmental Management Association). Ms. Thome is a specialist in the design, implementation, publication and operation of the Bavarian Environmental Information Centre IZU in Augsburg, which is a service for SMEs. (More information is available on the internet platform www.izu.bayern.de and possible cooperation between IZU/LfU and the MIS project can be found in Annex 5). With B.A.U.M. Ms. Thome was responsible for the design and production of multi-media tools and the management of the Dept. for Communication and Media.

Ms. Thome speaks English and will be especially responsible as a short-term expert (in agreement with her employer IZU) for the **MIS design and implementation** and the **establishment of the Environmental Information Centre (PICTURE)**. She also will act as resource person and link to IZU and the Bavarian Ministry of Environment.

CVs of the international short-term experts are attached in Annex 2.

6. Attachments

ANNEX 1: CV Project Manager: Mr. Tobias Becker

ANNEX 2: CVs international short-term experts

ANNEX 3: CVs backstopping personnel

ANNEX 4: Appendices & References

- Local Resource Institutions
- Information on IZU
- Information on BUDA
- Working Samples (benchmarks, manuals) of INTEGRATION
- INTEGRATION Project Sheets and Company Brochure