

**Sub-Regional Workshop on Environmental requirements, Market  
access/entry and Export Competitiveness of Electrical and Electronic  
Products from China, Philippines and Thailand**

*Project on Building Capacity for Improved Policy Making and Negotiation on Key Trade and  
Environment Issues*

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**Case study on Environmental Requirements, Market Access/Entry and  
Export Competitiveness for Electrical and Electronic Products from  
THAILAND**

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## **Executive Summary**

Major export markets of Thailand's electrical and electronic products are the EU, Japan, and the US. In this report only few environmental and health requirements are briefly described, i.e., the EU waste electrical and electronic equipment (WEEE) and the restriction of the use of hazardous substances in electrical and electronic equipment (RoHS) Directives; the Japanese Home Appliance Recycling Law, Law for Promotion of Effective Utilization of Resources, Chemical Substances Control Law, and Green Purchasing Law, and the US Resource Conservation and Recovery Act, Toxic Substances Control Act, and Occupational Safety and Health Act.

The small and medium-sized enterprises (SMEs) were mostly aware of environmental and health requirements, especially those suppliers of multinational corporations. For local Thai SMEs whose products sell domestically, they were less aware of the requirements, because the local consumer does not require them, despite the existence of some regulations. These local SMEs need technology transfers from the large ones and government assistance in order to enhance their competitiveness in the global market.

Unlike Japan, Thailand has no overseas offices of chamber of commerce. Information would be from overseas government offices to central government offices and to private and independent agencies. Finally, information would be sent to individual producers. This is a good method of information dissemination that is effective and the producer is confident about the correctness of information.

At national level, the Deputy Prime Minister has taken active interest in coping with up-coming obstacles. The Sub-Committee composed of government and private representatives was appointed in order to seek appropriate measures underlying various directives. For overall adjustment, the government studied Thailand's existing laws and cooperated with the private agency to study the impacts, information distribution, industrial standards, and technology development. Additional regulations were drafted and the existing regulations were improved.

Capacity building is needed at company and institutional levels. At company level, technical skills related to individual standards and testing methods need to be intensively trained. At institutional level, knowledge dissemination about environmental management in particular, legislation, human resource development, research and development and managerial skills are need. The country that institutional capacity exists needs to cooperate with neighboring countries and the cooperation ought to be extended to regional level, in order to sustain the future regional development.

Environmental and health requirements are increasingly related to trade, especially where the major sources of revenues come through exports. A country like Thailand needs to prepare to cope with the recurrence of trade and environment problems. Governmental and corporate adjustment measures must be in effect and intertwined.

In the future, international environmental standards and agreements will be increasingly important. Consumers will be seeking more environment friendly products. Producers need to adjust to such global market trends. To solve the national environmental problems, including the problems of trade and environment, will be time consuming. Relevant parties need to understand that environmental conservation and the country's development policies are not in conflict, their objectives can be achieved at the same time. This is to say, environmental preservations at national and global levels can also preserve national exports.

The achievement of such objectives needs a clear government policy direction. National framework of the country development has to be determined by the government and consistent with the national environmental requirements. The policies are then implemented to the defined direction. If Thailand attained higher demands of environmental preservation nationwide in the future, it will result in preserving long-term export competitiveness. This is because international commitments and standards are complied with. The measures that affect producers will then be minimized.

As for producers, some might view environmental and health requirements from consumers as unnecessary product costs, introducing competitive loss in overseas markets. In fact, this needs to be viewed in the long run and based on long-term solutions. The cost of materials, machine, and other production factors for environmental improvements can be spread over time. A competitive loss in the short term may be required to increase exports in the long run. If Thailand-made products have a good image in terms of consumer safety, resource saving, and environmental conscious producers, it will be of value added. When the environmental standards of Thailand's products meet international requirements, obstacle for future trade negotiations with other countries will largely be avoidable.

The resolutions of trade and environment ought to be creatively viewed from both sides--environmental requirements and the need for international trade. Environmental requirements should not be viewed as trade barrier per se. Thailand's products should be thoroughly studied in terms of strengths, weaknesses, opportunities, and threats for producers. For example, good production or production for new market needs to be promoted. Future trade problems of Thailand due to trade and environment can be prevented through the reduction of weaknesses and the insufficiency of environmental preservation

within the country. The sustainability of trade and environment will result in a good quality of life among the Thai population.

OBSERVATION: Revise headings in the table of contents below in the light of the comments in the body of the text.

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## **Part 1 Introduction**

Thailand has a high share of manufacturing export in gross domestic product, which was at 36.46%, 36.26%, and 37.09% in 2000, 2001, and 2002 respectively (figures for 2001 and 2002 are preliminary). Of manufacturing export value, electrical and electronic export accounted for 97.32%, 93.10%, and 87.92% in 2000, 2001 and 2002 respectively.

Globalization of natural resources and environmental preservation affects consumer demands. Consumers can select the price and quality of products they want that were placed on the market all over the world. Product that meets consumer's demand will reach its customer and gains a competitive advantage.

Thailand's major electrical and electronic export markets were Japan, the US, and the EU, collectively accounting for 54.54% , 53.86%, and 51.44% in 2000, 2001, and 2002 respectively. This is the reason why producers need to pay heed to environmental and health requirements in major markets. These factors are important for production.

This report falls into various parts. In addition to the introductory part, Part 2 briefly describes the key environmental requirements and corresponding laws enforced in the major export markets, namely, the EU, Japan and the US. Part 3 reports on how SMEs are aware of information about environmental and health requirements and how effective information was received. The adjustment and the measures that are currently implemented to underlie the environmental and health requirements are analyzed in Part 4. Part 5 identifies pro-active measures and the need for institution building, and the report is summarized in the last part.

This report is expected to be helpful for a country that has a significant export of electrical and electronic products, in order to improve and close an existing gap within the country, This would result in enhancing competitiveness in the global market for the sustainability of electrical and electronics development.

## **Part 2 Identification of Environmental/health requirements in Key Export Markets**

### **European Union Requirement**

The most important environmental regulations of the European Union to electronics industry are the Directive on Waste Electrical and Electronic Equipment (WEEE) and the Directive on Restriction of the Use of Certain Hazardous Substance in Electrical and Electronic Equipment (RoHS). The Directives were published in the Official Journal of the European Communities on 13th February 2003 and came into force on that date. Each EU member state has 18 months to introduce the required national legislation.

#### ***Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)***

The objectives of the WEEE Directive are to reduce electrical waste, increase recovery and recycling and minimize environmental impact in order to improve environmental performance of all operators involved in the life cycle of EEE by using the principle of (extended) producer responsibility (alternatively often also termed product stewardship).

By definition of the WEEE Directive, “producer” means any person who puts electrical and electronic products on the market, irrespective of the selling technique used, including by means of distance communication. “Producers” includes

- . Manufactures that sells their own brands.
- . Resellers under their own brands.
- . Imports or exports.

The WEEE directive covers commercial and domestic equipment, including products manufactured before the directive comes into force. Equipment must fall into one of 10 categories (listed below) and be designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current:

1. Large Household appliances
2. Small Household appliances
3. IT & telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical & electronic tools
7. Toys, leisure & sports equipment
8. Monitoring & control instruments
9. Medical equipment
10. Automatic dispensers

The main context of WEEE Directive is described as following:

1. Separate collection

. The target of waste collected is 4 kg per individual from private households

- Member States to take appropriate measures to minimize the disposal of WEEE as unsorted municipal waste
- Collection points

. The target of waste collected includes all commercial equipment

2. Treatment requirements

All separately collected equipment must go to authorized operators for treatment to remove and dispose of certain materials and components specified in the directive with the minimum standard of the EU.

3. Recovery/recycling

Minimum recovery targets plus combined targets for re-use and recycling are depicted as follows.

<u>Product</u>	<u>Recovery</u>	<u>Reuse/Recycling</u>
Large household appliances	80%	75%
Small household appliances	70%	50%
IT and telecommunication equipment	75%	65%
Consumer equipment	75%	65%
Lighting equipment	70%	50%
Electrical and electronic tools	70%	50%
Toys leisure and sports equipment	70%	50%
Medical devices (with the exception of all implanted and infected products)	The recovery/recycle rate will have to be reached by 31 December 2008	
Monitoring and control instruments	70%	50%
Automatic dispensers	80%	75%
Exception: Gas discharge lamp	-	80%

4. Producer responsibility

The financing obligations for WEEE from households:

- "New" waste (from products put on the market from 13 August 2005)

1) Producers responsible for financing waste management/recycling of their own products

2) Producers can choose to fulfill obligation either individually or by joining a collective scheme as following:

a) Collective financing

Collective financing may be noted as

- i. Flat rate levy or fee on new equipment
- ii. Independent from the real recovery cost
- iii. No incentive for design for recycling

- iv. Fee on new waste to finance waste from old products
- b) Individual financing
  - i. Each producer is responsible for paying for waste management of its own products, but has a choice of the way to fulfill this obligation
    - can pick up the waste from collection points itself
    - can make a contract with a collective system and ask for an individual invoice
    - can pay a flat rate as in a collective financing scheme
  - ii. improved design for recycling will be rewarded
  - iii. Producer pays for waste from its own products at the time the products are returned
  - iv. At the time of sale of a product, a financial guarantee is paid to prevent costs from “orphan products” where the producer can no longer be found
- 3) Financial guarantees
  - a) participation in financing schemes
  - b) recycling insurance
  - c) blocked bank account

- “Historical” waste (from products put on the market before 13 August 2005)

- 1) Collective system
- 2) Visible fee explicitly allowed for 8/10 years
- 3) Retailers to offer 1:1 take-back in shops at purchase of a new product

#### 5. Timetable

- Publication – 13 February 2003
- . Deadline for transposition in Member States – 13 August 2004
- . Collection systems must be operational; treatment and financing obligations enter into force – 13 August 2005
- . Collection and financing targets to be attained – 31 December 2006

#### 6. Information : Producers will have to provide information for:

- . Users - what to do with end-of-life equipment
- . Recyclers - how to dismantle equipment and what hazardous substances it contains
- . Government - on amounts of equipment sold, collected and recycled

### **Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)**

The objective of RoHS Directive is to reduce the environmental impact of WEEE and facilitate their recycling from a technical and economic point of view by restricting the use of certain hazardous substances during manufacture. It is the complementary to the WEEE Directive.

The RoHS Directive covers all products in the WEEE Directive except medical devices and monitoring and control instruments and it also covers electric light bulbs, and luminaries in households. From July 2006, the following substances are banned - lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers except in the following items, appeared in the Annex of the RoHS Directive:

1. Mercury in compact fluorescent lamps not exceeding 5 mg per lamp.
2. Mercury in straight fluorescent lamps for general purposes not exceeding:
  - Halophosphate 10 mg
  - Triphosphate with normal lifetime 5 mg
  - Triphosphate with long lifetime 8 mg
3. Mercury in straight fluorescent lamps for special purposes.
4. Mercury in other lamps not specifically mentioned in this Annex.
5. Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.
6. Lead as an alloying element in steel containing up to 0,35 % lead by weight, aluminum containing up to 0,4 % lead by weight and as a copper alloy containing up to 4 % lead by weight.
7.
  - Lead in high melting temperature type solders (i.e. tin-lead solder alloys containing more than 85 % lead,
  - lead in solders for servers, storage and storage array systems (exemption granted until 2010),
  - lead in solders for network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunication,
  - lead in electronic ceramic parts (e.g.) piezoelectronic devices)
8. Cadmium plating except for applications banned under Directive 91/338/EEC(1) amending Directive 76/769/EEC(2) relating to restrictions on the marketing and use of certain dangerous substances and preparations.
9. Hexavalent chromium as an anti-corrosion of the carbon steel cooling system in absorption refrigerators.
10. Within the procedure referred to in Article 7(2), the Commission shall evaluate the applications for:
  - Deca BDE as opposed to PBDE,
  - Mercury in straight fluorescent lamps for special purposes,
  - Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications (with a view to setting a specific time limit for this exemption), and
  - Light bulbs,

These items are to be amended as soon as possible according to the priority of products and progress on the scientific and technology development.

In addition, the European Union has been developing some other draft directives that may also significantly affect the industry. They include:

1. Draft Proposal of the Directive on Establishing a Framework for Eco-design and End Use Equipment: The draft "new approach" directive harmonizes essential requirements concerning the design of end-use equipment of electrical and electronic equipment. The objective is to improve their overall impact on the environment. First draft published in 2001 and new draft issued in November 2002.

2. The New Strategies of EU Chemical Policy: Consultation process with stakeholders was finished at 10 July 2003 and the Commission proposal to Council and Parliament will be submitted in October 2003. It is expected to be enforced within the EU member states in the course of 2004. The main elements of the new strategies are as follows :

- . A regulation on the Registration, Evaluation and Authorization of CHemicals (REACH) system would replace other pieces of EU Chemical legislations.
- . All substances produced or imported above 1 ton/year, including for polymers considered as dangerous under directive 67/548/EEC (with specific rules) shall be registered.
- . The evaluation of any substances registered irrespective of tonnage is responsibility of the national competent authorities.
- . Substances that are carcinogens, mutagens, and reproductive toxins (CMRs); persistent, bioaccumulative and toxic substances (PBTs); very persistent and very bioaccumulative (vPvB); and endocrine disruptors shall be authorized before placing on the market.
- . Substances submitted to restrictions have to comply with specific requirements before they can be placed on the market.

Furthermore, the electronic industry is also affected by a number of European Directives that are not product or sector specific, but establish safety and environmental requirements to be met by industry as :

1. General security of products (92/59/EEC)
2. Waste and dangerous waste (75/442/EEC, 91/689/EEC)
3. Restriction on marketing and use of certain dangerous substances (76/769/EEC)
4. Packaging waste (94/62/EEC)
5. Protection of workers from the risks related to exposure to chemical, physical and biological agents at work (80/1107/EEC)
6. EU Policy on Integrated Product Policy (IPP)

## Japanese Requirements

Japan's goal was to achieve a socio-economic system with extremely high environment and resource efficiency using environment and economy integration strategies. As a result, the government is approaching the task through legislation and capital allocation.

(Sources: [http://www.meti.go.jp/english/policy/index\\_environment.html](http://www.meti.go.jp/english/policy/index_environment.html))

Japan has formulated and put into force a number of laws promoting the construction of a recycling-oriented society. For the electronic industry, the related legislation affecting Thai exporters are:

1. Basic Law for Promoting the Creation of a Recycling-Oriented Society
2. Law for the Promotion of Effective Utilization of Resources (LPEUR)
3. Law Concerning the Evaluation of Chemical Substances and Regulation of their Manufacture (Chemical Substances Control Law)
4. Revised Waste Management Law.
5. Home Appliance Recycling Law (HARL)
6. Green Purchasing Law (GPL)
7. Containers and Packaging Recycling Law

Among these legislations, the most important laws relating to the electronic industry are the Home Appliance Recycling Law, the Law for the Promotion of Effective Utilization of Resources, the Law Concerning the Evaluation of Chemical Substances and Regulation of their Manufacture, and the Green Purchasing Law

### ***Home Appliance Recycling Law (HARL)***

The Home Appliance Recycling Law was revised in 1998 and it has been enforced since April 2001. The purpose of the law is to take measures to appropriately and smoothly implement collection and recycling of home appliances by retailers, manufacturers and importers, then to secure the appropriate disposal of waste and utilization of natural resources, and consequently to contribute to preservation of life environments and sound development of the national economy. HARL is one of the special measures supporting the Basic Law for Promoting the Creation of a Recycling-Oriented Society. It covers four products that are air-conditioners, television sets, refrigerators, and washing machines and uses a new waste management paradigm, which consists of:

- . Reducing waste by recycling approach
- . Sharing the burden of waste management costs among consumers, retailers, importers and producers. The main element in the law is to obligate the recycling of particular products by the related parties.
- . Disposal stage
  - Retailers shall accept disused products from users and return to producer for recycling. The re-utilization of recovered

materials or parts and reconditioning shall be promoted and a certain recycling rate shall be achieved (60% for air conditioners, 55% for TVs, 50% for refrigerators and washing machines)

- Producers shall properly collect and destroy the catalyst chlorofluorocarbon as integral duty of the recycling process.
- Producers and importers shall set up collection points
- . Technology development in terms of the material, structure and method of disposal shall be made in cooperation with *related industries* to promote easy disposal and recycling of abandoned home appliances.
- . Promotion of long-term use of home appliances by :
  - Studying methods to prolong product life and product repairability
  - Establishing repair systems by training engineers for repair
  - Conducting safety inspection for products used for a long term more often
  - Setting up proper repair fees
  - Studying the enhanced re-use of parts, taking into account product safety.

### ***Law for Promotion of Effective Utilization of Resources (LPEUR)***

The Law for Promotion of Effective Utilization of Resources is a unique piece of legislation because it calls on businesses to implement waste reduction, recycling and reuse activities from the upstream industry, where companies are required to reduce their industrial waste and design environmentally-friendly products, through to the downstream industry, where companies are obliged to recover reusable parts or materials from waste products for the purpose of recycling. It was enacted in May 2000 and enforced in April 2001. The law is designed to help create a recycling-oriented economy by:

- . Requiring further recycling efforts such as obliging businesses to collect and recycle waste products (i.e. “Recycle”)
- . Requiring further reduction of waste through the promotion of resource saving production and long-life products (“Reduce”)
- . Promoting the reuse of parts, etc., recovered from waste products (“Reuse”)
- . Devising measures to reduce industrial waste through the reduction of byproducts and the enhancement of recycling systems.

According to the law, the Japanese government designated 69 product categories in 10 industries to be complied with the law. This law encourages each company to take 3R initiatives in order to promote industry-wide application of 3R (i.e. reduce, recover, recycle/re-use) methods. The Ministry of Economy, Trade and Industry (METI) is responsible for keeping precise track of how much this law encourages companies to take 3R initiatives. It is expected to provide a framework for the creation of a recycling-oriented economic system, while

promoting companies' initiatives, communications between governments and citizens, and positive partnerships between social stakeholders.

### ***Amendment of the Law Concerning the Evaluation of Chemical Substances and Regulation of their Manufacture (Chemical Substances Control Law)***

With the aim of preventing damage to human health caused by environmental pollution from chemical substances, Japan's 1973 Law Concerning the Evaluation of Chemical Substances and Regulation of their Manufacture, etc. requirements prior evaluation\* of certain hazardous properties of new chemical substances intended for industrial use, and also regulates the manufacture, import and use of chemical substances that persist in the environment (i.e. persistent) and are toxic to human health if taken in continuously (i.e. having long-term toxicity to human), such as polychlorinated biphenyls (PCBs) and trichloroethylene.

The Japanese Chemical evaluation and regulation system was reviewed by the Industrial Structure Council, the Health Sciences Council, and the Central Environment Council and as a result it was recommended that the law should be amended. Based on the joint report, the government submitted the Bill for Partial Amendment to the Chemical Substances Control Law to the Diet and the amended law was promulgated on May 28th, 2003.

The major contents of the amended law are as following:

1. Evaluation and regulation of chemical substances focused on their adverse effect on living organisms in the environment
  - (i) Introducing prior evaluation of eco-toxicity.
  - (ii) Introducing regulations against chemical substances with certain eco-toxicity.

Specifically, measures below are introduced:

    - . Persistent chemical substances with certain eco-toxicity
      - Introducing reporting obligation for manufacturing/import quantities of persistent chemical substances with certain eco-toxicity , etc. (*Type III Monitoring Chemical Substances*)
      - For certain chemical substances which may cause damage to flora and fauna in the human living environment, compliance with technical guidelines on appropriate management of chemical substances and labeling as *Class II Specified Chemical Substances is required*. Furthermore, the volume of manufacturing/import may be restricted, if necessary.
    - . Persistent and highly bio-accumulative chemical substances with certain eco-toxicity
      - Manufacturing, import and use of chemical substances that are toxic for top predators (e.g. birds or

mammals) in the human living environment shall be restricted to prevent their release into the environment as much as possible as *Class I Specified Chemical Substances*.

## 2. Measures for persistent and highly bio-accumulative existing chemical substances

Before long-term toxicity or eco-toxicity is identified, persistent and highly bio-accumulative existing chemical substances shall be placed under legal control, according to current status of their manufacturing and use. (*Type I Monitoring Chemical Substances*)

Specifically, the following measures are introduced:

- . Mandatory reporting of actual quantities of manufacturing/import and uses.
- . If a certain potential for risk is presented according to preliminary toxicity evaluation, guidance and advice shall be given to businesses on measures for risk reduction to minimize release into the environment.
- . After risk reduction measures, the manufacturers and importers are, *if necessary*, directed to investigate long-term toxicity. If long-term toxicity is identified, the substance shall be designated as a *Class I Specified Chemical Substance*.

## 3. Reforming prior evaluation system for new chemical substances taking into account their possibilities of exposure

### i. Exemptions when exposure can be controlled

Prior evaluation for new chemical substances could be exempted in the following cases where there is little or no possibility of exposure, provided the following handling methods are sure to be used.

- . Chemical substances to be used as intermediates;
- . Chemical substances to be used for processes, in which the possibilities of environmental release is extremely low, such as in closed systems;
- . Chemical substances for export only (provided the prior evaluation system is well-established in the country of destination)

### ii. Stepwise evaluation of chemical substances with low volume manufacturing/ import

- . New chemical substances with total amount of domestic manufacturing/import quantities equal or less than 1 ton per year continue to be exempted from prior evaluation procedures.
- . If new chemical substances are judged persistent but not highly bioaccumulative, and considered not to present significant risk to human health and living organisms in the environment according to the evaluation based on the information already-known, the chemical substances with a total amount of domestic

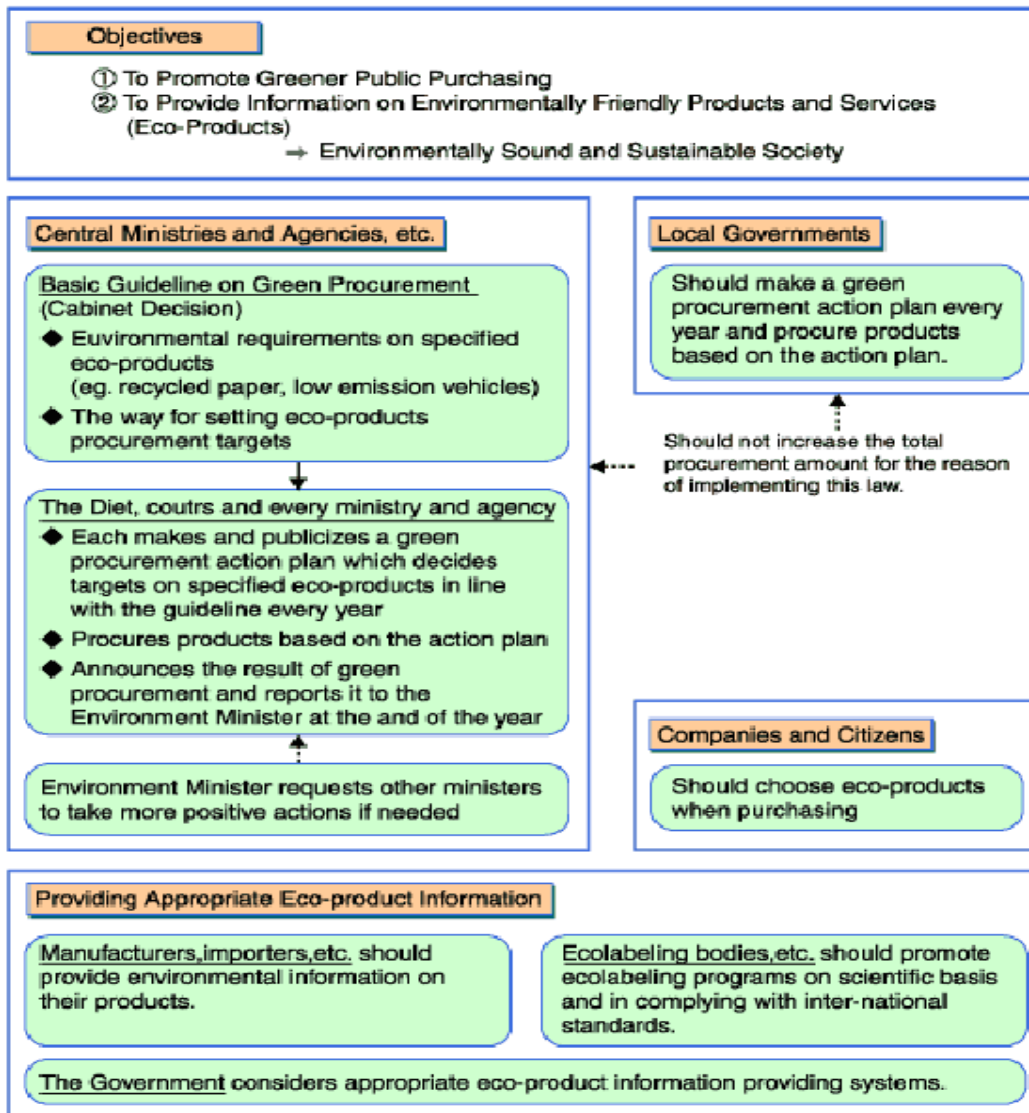
manufacturing/import volume equal to or less than 10 ton could be manufactured or imported without mandatory submission of toxicity data.

4. Introducing obligatory reporting system for hazard information. Under the system, the manufacturers and importers are required to submit self-obtained information indicating that chemical substances they handle possess a hazard listed in the evaluation items under the Chemical Substances Control Law.

### ***Green Purchasing Law (GPL)***

The Green Purchasing Law (Law Concerning the Promotion of Procurement of Eco-friendly Goods and Services by the State and Other Entities) sets forth policies required to promote procurement of eco-friendly goods and services, provision of information, and conversion to demands for other eco-friendly goods and services, by national government, independent administrative institutions, and local public organizations. It is intended to build a society that may keep on growing with less environmental burdens and contribute to securing healthy and cultural life of its people. The law was enforced in April 2001.

## Law on Promoting Green Purchasing



The main part of the law comes into effect on April 1, 2001.

Sources: [http://www.apec-vc.or.jp/net/yamamoto\\_e/page03.htm](http://www.apec-vc.or.jp/net/yamamoto_e/page03.htm)

## USA Requirements

There are many Federal statutes and regulations that apply to the electronic industry. Among these, the Resource Conservation and Recovery Act is the highlight legislation affecting the Thai electronic industry.

### **Resource Conservation and Recovery Act (RCRA)**

Regulations promulgated pursuant to Subtitle C of Resource Conservation and Recovery Act (RCRA) (40 CFR Parts 260-299) establish a

“cradle-to-grave” system governing hazardous waste from the point of generation to disposal. RCRA hazardous waste include the specific materials listed in the regulations (commercial chemical products, designated with the code “P” or “U”; hazardous wastes from specific industries/sources, designated with the code “K”; or hazardous wastes from non-specific sources, designated with the code “F”) or materials which exhibit a hazardous waste characteristic (ignitibility, corrosivity, reactivity, or toxicity and designated with the code “D”).

Many wastes generated by the electronic industry are considered RCRA toxicity characteristic (TC) hazardous wastes due to constituents such as silver, tri-chloro ethylene and lead.

Below are some important RCRA regulatory requirements affecting the Thai electronic industry:

- . Identification of Solid and Hazardous Waste (40 CFR, Code of Federations

Regulation, Part 261) lays out the procedure every generator should follow to determine whether the material created is considered a hazardous waste, solid waste, or is exempted from regulation.

- . Standards for Generators of Hazardous Waste (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an ID number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit

- . Land Disposal Restrictions (LDRs) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Materials must meet land disposal restriction treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Wastes subject to the LDRs include solvents, electroplating wastes, heavy metals, and acids. Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

### ***Toxic Substances Control Act (TSCA)***

The Toxic Substances Control Act (TSCA) of 1976 was enacted by Congress to give EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting or testing of those that may pose an environmental or human-health hazard. EPA can ban the manufacture and import of those chemicals that pose an unreasonable risk.

Also, EPA has mechanisms in place to track the thousands of new chemicals that industry develops each year with either unknown or dangerous

characteristics. EPA then can control these chemicals as necessary to protect human health and the environment. TSCA supplements other Federal statutes, including the Clean Air Act and the Toxic Release Inventory (TRI) under The Emergency Planning & Community Right-To-Know Act (EPCRA);

Other related laws are as following:

- . Occupational Safety and Health Act (OSHA): Congress passed the Occupational and Safety Health Act to ensure worker and workplace safety.

Their Goal was to make sure employers provide their workers a place of employment free from recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions. the requirements related to OSHA also apply to Thai exporters if they would like to import goods to the United States of America.

Other initiative activities launch by government and private sector in voluntary task are:

- . The Electronic Industries Alliance (EIA) Electronics Recycling Project is a grant program that funds regional and state recycling initiatives for end-of life electronics products from household sources. This one-year project complements and supports current recycling efforts for electronic equipment at the national, regional, and local levels and provides useful and important data about the cost-effectiveness of different electronics recycling models. Grants are awarded to governmental entities that are planning electronics recycling events. EIA funds are used to defray the cost of recycling electronic equipment or data analysis

- . The Plug-In To eCycling Campaign is one of many new efforts under EPA's Resource Conservation Challenge, which seeks to increase the national recycling rate to 35 percent and cut the generation of 30 harmful chemicals by 2005.

- . Earth 911 is a non-profit organization which maintains a website with community- specific information on reuse and recycling opportunities. These opportunities include state and local collection programs, charitable organizations, and recyclers that accept used electronics. The website is sorted by zip code and includes resources with information about electronics recycling and the environment

- . Buy-recycled activities of WasteWise Partners in the Computer and Electronics Industry

- . National Electronics Product Stewardship Initiative (NEPSI)

- . Mid-Atlantic eCycling Pilot Project is government and industry collaboration to demonstrate the feasibility of a multi-state, public/private residential electronics collection, reuse, and recycling model that's based on shared responsibility among government, industry, and consumers.

## **Part 3 Awareness on the Issues and Effectiveness of Information Management**

### **Level of awareness of national producers (SMEs)**

National small and medium-sized producers' awareness on environmental and health requirements in electrical and electronic industry can be categorized into various levels—from most understanding to least understanding, not understanding, and also unaware.

In production, producers lack knowledge about harmfulness of substance for production, usage quantity, and substance cost, for making decision to use a substance that does not make an effect on environment and health at a competitive cost.

In product design, manufacturers lack technical knowledge, understanding, and information, causing design limitations and difficulties to change. A Central Office ought to be set up to provide assistance in determining recycling and recovery proportions. Proportions of recyclable and recoverable parts may be defined by weight, mentioned in the EU WEEE Directive..

For original equipment manufacturing (OEM), manufacturer pays less attention to product design unlike original design manufacturing (ODM). That is to say, vendor's environmental consciousness needs to be built up in the OEM, and make small and medium-sized vendors aware of the product design to comply with environmental requirements. If the Central Office can assist the SMEs, it would take some burdens off the vendors. Otherwise, the industry will be confronted with difficulties in further development.

Some manufacturers expected slow adjustments. The government has to provide them with information and enact an effective law. Due to the large variety of electrical and electronic products, some have complied with environmental requirements but some have not. The producer and the market representatives may negotiate prolonging requirements.

In product testing, the standard is not clearly defined and testing personnel are inexperienced. Tools and equipment should be ready at the Central Office for testing, analyzing, and certifying. Moreover, the office needs to provide training for educating instructors and industrial personnel.

In the light of the array of material testing devices available for parts, testing methods ought to be standardized and mutually recognized to prevent the need for multiple testing according to different standards.

At managerial level, meeting environmental requirements in export markets will bear higher costs despite the lack of waste collection mechanism.

The Central Office should be obliged to give guidance on recycling and waste collection by producers and municipalities. The management system needs to gather data on sources of waste and the actors who pay treatment fees. The fees may be collected at the point of purchase of new products and get a discount for returning the old one. In addition to new product fees, visible fees may also be collected from producer who places product on the market by product shares. The former fees would go to the producer The latter fees would go into Funds administered by the government. The Central Office should be directed by both the government and the private sector. The local municipalities are to collect waste and make it available for treatment.

### **Mechanism for gathering, processing, dissemination of information**

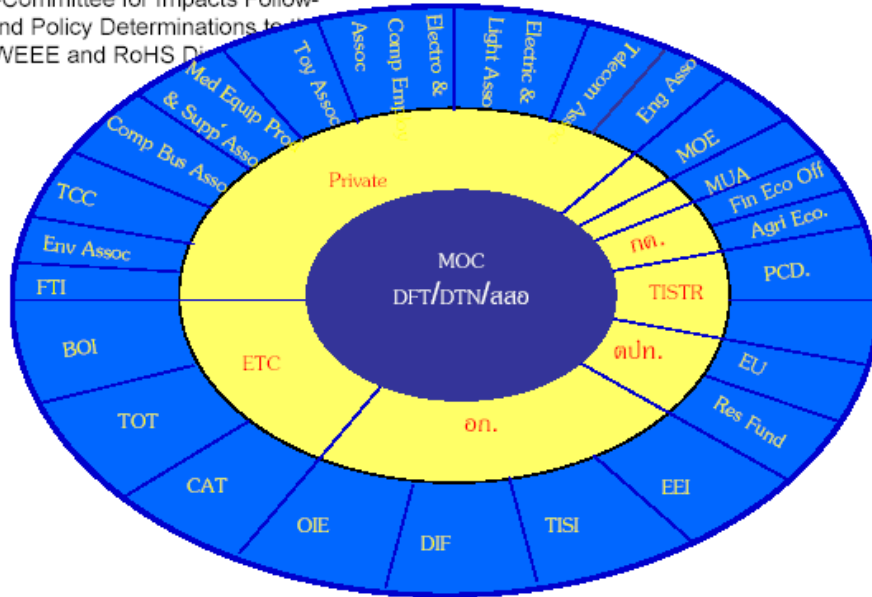
Information on new and forthcoming environmental and health requirements started to spread from the government to the private sector. The overseas offices of the Ministry of Commerce (MOC) report background, major issues, current situation, relevant data, opinions, and draft proposal to the MOC Permanent Secretary. MOC then circulates draft working papers to the government offices, such as the Ministry of Industry, private offices, such as the Federation of Thai Industries (FTI), and professional associations, such as the Thai Medical Equipment Producers and Suppliers, the Thai Toys Industry Association, and the Thailand Computer Association. The draft working papers usually contain information on major issues, current status, related information, procedure, and opinions of overseas offices.

The Office of Industrial Economics (OIE) seeks the Electrical and Electronics Institute (EEI) opinion whether take-back of waste for recovery would affect production costs of producers. OIE sends EEI draft progress reports on positions of various parties, conflictive issues, trend analysis, suggestions, and opinions. Information is also passed on to manufacturers.

MOC usually also informs the Ministry of Industry (MOI) on major issues that are followed on impact analysis, Thai advantages and disadvantages, and exporters' positions. This information serves as a basis for discussions with relevant offices, such as EEI, to determine the positions and solutions for upcoming problems. OIE asked EEI for manufacturers' opinions.

## National Committee on International Economics Policies

Sub-Committee for Impacts Follow-up and Policy Determinations to EU WEEE and RoHS Directives



The Department of Foreign Trade (DFT) called for a meeting to consider impacts of environmental and health requirements to the Thai industry and solutions to the problems. The Pollution Control Department (PCD) also called for a meeting with OIE, the Department of Industrial Works (DIW), DFT, the Department of Trade Negotiations (DTN), the Department of European Affairs, the National Electronic and Computer Technology Center (NECTEC), the Thai Customs Department, the Office of the Board of Investment (BOI), the Federation of Thai Industries, and the Electronics and Computer Employers Association to consider the impacts, preparation, implementation measures, etc. EEI received information from overseas offices together with the meeting conclusions, and they were then posted on its website. Also, DFT informed EEI on the overseas study results on concepts and implementation in different countries, EEI relayed that information to manufacturers.

The Chairman of the National Committee on International Economics Policies has appointed the Sub-committee to follow impacts and identify possible adjustment policies to the environmental and health requirements.

The Thailand Industrial Standards Institute (TISI) informed EEI of the regulations, measures, and standards, announced by WTO members. Thailand's opinions on respective requirements were submitted to the WTO as presumptions to export obstacles. TISI, EEI, and DIW organized a seminar for manufacturers and relevant government offices to inform on important issues, progress, and impacts of the requirements.

## Efficiency and effectiveness

Opinions of electrical and electronic manufacturers towards the WEEE and RoHS Directives can be summarized as follows.

The Directives are a non-tariff barrier to trade, by means of environmental requirements. That however did not contradict WTO rules. It is necessary to give more importance to electrical and electronic waste treatment and the substitution of hazardous substances. A number of countries utilize these requirements to protect their environment and consumers. The objectives are to protect and promote local industry, and reduce import of low quality products.

The problems encountered were identified as follows:

1. Thailand's SMEs that directly or indirectly export to the EU may be facing process-related problems of waste treatment and environment friendly production. Large companies that export to the EU are mostly prepared for the Directives via research and development. Local subsidiaries are expected to profit from technology transfer from parent companies.

2. Manufacturers had doubts about the requirements in EU member countries on the following issues:

- Commodity coverage and details of how to be comply with the requirements
- Treatment fees and distribution of responsibility between importers and manufacturers
- Waste collection and treatment procedure

3. Waste management. Thailand lacks information concerning the potential and capacity of Thailand's treatment plants. Amount of industrial waste in Thailand is underutilized if its raw materials were not taxed and the producer tends to export them, as a result.

4. Problem of low quality products returned from the EU. If such products do not comply with requirements, they will be sold in the developing countries such as Thailand and China. If developing countries like Thailand want to avoid thus becoming a dumping ground for waste or short-lived and inferior quality electrical and electronic products, they need to develop their own environmental and health requirements, reflecting their exigencies, circumstances and priorities

5. Thailand's current production methods still require the use of some hazardous substances.

6. Production costs will increase across countries, therefore, there was little reason to expect redeployment of production capacity.

7. It is important to coordinate between the government and private offices and work closely with the Central Office for consistency of the approach. In addition, the industry prepared itself by means of:

- .Consulting with EU experts to understand the details of waste take-back systems.

- . Exerting pressure on the government to
  - increasing awareness of manufacturers on the problems.
  - supporting research activities to conduct material research for manufacturers. The research results would provide information on substitute substances that can be easily treated.

### **Business adjustment**

Many producers are aware of WEEE and RoHS information, although additional RoHS information is needed to predict the situation. Computer assemblers, air conditioner producers, TV-set producers, radio set producers, microwave oven producers, and recording equipment producers were also aware and understood the requirements that impact business. Likewise, integrated circuit assemblers needed additional information on the requirements from headquarter. Printed circuit board assemblers assumed that the production costs per unit would increase by 5-10%. Transistor producers were aware of the requirements, and the assistance of an overseas consultant was sought for product improvement to comply with the requirements. Higher production costs were due to customers who demanded different raw materials resulting in manufacturing process and technology changes.

With respect to the RoHS Directive, MTEC reported that 38% of the manufacturers were well aware of the requirements. Of these, 74% were directly impacted and 12% were impacted indirectly. Among manufacturers who import raw materials, three quarters of them wanted product improvements and 25% did not.

### ***National early warning system***

A national early warning system is being set up that starts from governmental information dissemination from overseas to local government offices. The government appointed a National Committee, chaired by the Deputy Prime Minister. The sub-committee was subsequently appointed to work on the details.

Information on environmental requirements gathered by MFA and MOC and channeled to TISI of MOI was ultimately provided to manufacturers. This constitutes an early warning system. The National Committee on International Economics Policies, chaired by the Deputy Prime Minister, has appointed the "Sub-Committee for Impact Follow-up and Policy Determinations to the EU WEEE and RoHS Directives." Functions of the Sub-committee were defined as follows.

- To collect opinions and suggestions on the WEEE and RoHS Directives from the government and private offices to formulate Thailand's stand-point on the Directives, and present it to the EU in time.

- To study the expected impacts of the EU Directives and formulate policies and strategies to protect Thailand's trade and industrial development interest, especially those of SMEs
  - To be a coordinating center for relevant offices to uniquely and effectively implement Thailand's adjustment measures
  - If necessary, a working group may be formed or consultants may be employed to further analyse specific effects of implications of the EU Directives.
- Furthermore, opinions and suggestions would be closely and timely provided

The Sub-committee was chaired by the Director-General of the Foreign Trade Department and the Deputy Director-General was the Deputy Chair. The sub-committee was appointed from The Departments of Trade Negotiations, Export Promotions, Foreign Trade, European Affairs, Treaties and Legal Affairs, Office of Industrial Economics, Office of the Board of Investment, National Electronic and Computer Technology Center, Thai Computer Business Association, Thai Medical Equipment Producers and Suppliers Association, Thai Toys Industry Association, Federation of Thai Industries, Electronics and Computer Employers Association, Electricity and Lighting Association, Thailand Environment Institute, Office of Financial Economics, Office of Commission for Higher Education, Office of Vocational Education Commission. The sub-committee employed the Electrical and Electronics Institute to study among the manufacturers and related offices the impacts of the Directives. The study aimed at manufacturers to realize the industrial status, role, obstacle, and suggestion on environmental requirements and lead to the direct and unique underlying measures. Hopefully, impacts are environmental preservation promotions nationwide, regionwide, and worldwide. The study consortium comprised the Thailand Environment Institute, the National Metals and Materials Technology Center, Kasetsart University, and Chulalongkorn University.

The Study topics are listed below.

- Study and analyze the likely impact of the two EU Directives on Thailand's electrical and electronic industry
- Study and analyze the requirements from a legal point of view, in order to acquire the data for negotiations with the EU and assure participation of negotiating partners from other countries
- Study and analyze the impacts on inputs/commodities used by manufacturers of electrical and electronic products
- Study and analyze impacts for law enforcement, the underlying measures of neighboring countries and progress in implementation of the Directives in the EU. Comparative analysis of adjustment measures in other countries and in EU countries themselves would be used for drafting a Thai adjustment framework.
- Recommend underlying measures, using the study results, and formulate a reaction plan both offensively and defensively

### III. Current Adjustment Approach

The Social Research Institute of Chiangmai University was asked by the Pollution Control Department to study economic mechanisms and a draft waste legislation for Thailand.

The Office of Industrial Economics was assigned to keep track of the progress and prepare action plans to cope with WEEE and RoHS. A working group was set up, comprising representatives from various offices in the Ministry of Industry, i.e., the Department of Industrial Works, the Department of Industrial of Promotion, the Thailand Industrial Standards Institute, the Office of Industrial Economic, and the Electrical and Electronics Institute, which would have meetings every three months. The Working Group has formulated strategies for activities in the following areas.

1. Study the impacts: Study, analyze, follow-up, and evaluate the industrial impacts
2. Disseminate information and create awareness:
  - 2.1 To create understanding and disseminate information about the requirements to producers
  - 2.2 To disseminate technical information about various processes necessary to meet the requirements of the WEEE and RoHS Directives.
3. Standardization:
  - 3.1 Define and improve product standards to comply with foreign and international standards. An example was the Ministry of Industry Draft Directive on Types and Quantities of Hazardous Substances in Electrical and Electronic Equipment. By the EU type and quantity definitions of hazardous substances, the products are to cover small and large household appliances, telecommunication equipment, lighting products, electric and electronic tools, toys, sport equipment, electric and electronic entertainment equipment.
  - 3.2 Define a Draft Directive of for WEEE management in Thailand. The example was the Ministry of Industry Draft Directive of Industrial Policies on Electrical and Electronic Products. The share of recycled input into manufacturing of electrical and electronic products was specified as well as labeling of model and manufacturing date to separate the new from the old ones. Another example was the Ministry of Industry Draft Directive of Industrial Standards of Electrical and Electronic Separation and Recycling Factories. Moreover, the Industrial Act of Factory Pollution was also drafted. It will oblige manufacturers to collect post-consumer waste.
4. Technology development: Support production process and technology improvement and adjustment
  - 4.1 Fund raising for research. Implement Demonstration Project for

Promotion of Product Design for Environment by taking the following into consideration

- Dismantling
- Reuse
- Material substitution
- Waste treatment

4.2 Support joint ventures between Thai companies and trade partners to develop and transfer technology for waste treatment, reuse, and substance substitution

4.3 Apply for EU technical assistance in R&D

4.4 Promote improvement of labeling and packaging that contains product information that would be convenient for recovery and reuse including product life time identification

4.5 Support R&D personnel development in technology and substance substitute

The Ministry of Commerce applied for support from the Export Promotion Funds for consultants to study the impacts on the Thai industry and recommend measures to cope with the EU WEEE and ROHS Directives as well as propose draft Thai WEEE & ROHS regulation.

In addition, the projects and suggestions under the “WEEE and other wastes and substances” topic were proposed through the MFA to the Senior Officials Meeting of the Thai-European Commission. Seven meetings were held, the participants were representatives from the Departments of Foreign Trade, Medical Science, Industrial Promotion, Ministries of Industry, Agriculture and Cooperative, Education, Foreign Affairs, University Affairs, National Economic and Social Development Board, Office of the Education Council, Thailand Industry Standard Institute, Office of The Board of Investment of Thailand, Food and Drug Administration, Thailand Research Fund, Thailand Environment Institute, Small and Medium Enterprise Development Institute, Institute for Security and International Studies.

There were a number of recommendations on WEEE and RoHS Directives that Thailand brought to the attention of the EU officials

1. Thailand asked the EU to conform to the WTO principle on non-discrimination and national treatment accounting for equality between the EU member countries and non-EU members.

2. The WEEE and RoHS Drafts create unnecessary trade obstacles to developing countries’ exports and conflicted with the WTO Agreement on Technical Barriers to Trade, Article 12.3.

3. For transparency in implementing the Directives, the EU should have implemented a proper risk assessment of hazardous substances in electrical and electronic products using acceptable scientific evidence from International Organization / Institute as operational guidance.

4. The effect of the Directives will create major burdens and

obstacles for developing countries. A transition period is needed to adjust conformity to the following issues.

4.1 The producer responsibility for waste management appears in Article 7(3) defining the transitional period of five years to comply with the requirements of collection, treatment, recovery, and disposal of WEEE. An extension of this period would be highly desirable for developing countries.

4.2 The target rates of collection, recovery, recycling, and reuse ought to be practically defined and flexible by taking the efficiency and potentiality of the recycling systems in developing countries into account.

4.3 The ROHS Directive that will be in effect in the year 2008 needs technology for substance substitution. Developing countries have relatively low capacity in this field and therefore need the EU assistance in technology transfer, research, and development.

5. EU support in production technology and setting up dissemination centers on the Directives are urgently needed in developing countries. Such technology would provide production potentials to comply with the standards specified in the Directives. The assistance was expected to motivate compliance with the Directives, i.e., technical assistance in research, technology transfer of substance substitution, effective and environment friendly recycling and treatment systems.

6. For historical waste, clear, transparent and just measures are needed. The Directive requires current producer responsibility for historical waste. In practice, it is difficult to separate historical waste from waste generated after the Directive's comes into effect. Since life time of products varies, it would be an excessive burden to put responsibility on producers. Existing producer does not want to treat waste of producer who is not currently producer

7. Local authorities ought to be focal points for waste collection and financial accountability.

8. Selective treatment serves to dismantle liquid crystal displays (LCD), printed circuit boards (PCB), toner cartridges, etc., because of their contents of heavy metals, such as lead, cadmium, mercury, etc. In fact, these products contain less hazardous substances compared to the other components. Such product dismantling costs prior to collection point delivery would be added to the fees that consumer pays, due to time and labor costs in the dismantling process.

9. A broad coverage of electrical and electronic commodities causes product management difficulties irrespective of the recycling and reuse capabilities. In practice, there are problems at the level of operation and management costs. The WEEE Directive should be applied to large household appliance such as television sets, refrigerators, etc., that account for a large volume of current WEEE.

The EU Commission might have looked into details of the Directives as far as final approval of the Directives. Minimal assistance, however, has been provided.

## ***Problems encountered with conformity of environmental and health requirements***

The following government support is needed.

### 1. Tax structure

1.1 Industrial Funds should be set up by the government with annual support from manufacturers; corporate contributions to such funds should be tax deductible.

1.2 In a place like Thailand where environmental demand on product is minimal, value added tax deductible to manufacturer who produces environment friendly product may be rewarded.

1.3 Excise tax exemptions for environment friendly raw materials may be rewarded to producer, because the materials tend to be more costly compared to local materials.

1.4 Production machine imported for environment friendly product may be tax deductible twice as much compared to that for non-environment friendly product

2. Finance. In order to promote environment friendly production, lower interest rates may be acquired for loans from the Export-Import Bank.

### 3. Product standard

3.1 The quality of environment friendly products needs certification from an international acceptable laboratory.

3.2 Environment friendly products need a label visible to the public.

### 4. Treatment

4.1 The construction of recycling and treatment plants is to be supported by the future Complete Waste Management Funds.

4.2 Special credits may be provided by the Export-import Bank for the construction of recycling and treatment plants.

5. Human Resource development. Government support for instructing eco-design and quality function design for environment, the office that is directly responsible may be the Department of Industrial Promotions. Product life cycle impact assessment may also be included.

6. Research and development. Research on substance substitution may be assigned by the government to the National Metals and Materials Technology Center. The Center is to support development of substitute substance for manufacturers at a lower cost.

7. Information. The government should regularly disseminate information on environment friendly products in foreign markets obtained from overseas offices.

### 8. Government policy

8.1 The government policy on environmental requirements should be directed to product sold locally. Manufacturer who sells product domestically and exports product will be prepared for in terms of environmental impacts, product standard, waste treatment, etc.

8.2 The government should try to make more practical progress on harmonization, and equivalence with environmental requirements and

mutual recognition with conformity assessment methods in key target markets.

8.3 Manufacturers of environment friendly product may be entitled to a privilege from the Board of Investment.

## Part 5 Element of Pro-active Approach

Thailand has been implementing regulations on environment and health related standards. At legislative level, national, product, and factory directives were drafted. On the technical side, a product data base has been constructed and coordinated with different countries for product life cycle inventory.

An important project was the Green Label. The project was implemented with the objective of making tangible progress in material recovery and resources preservation. Similar programmes have been implemented in over 20 countries such as Canada, the United States, Japan, France, Singapore and the Nordic countries. These projects are generally at country level, but some are also implemented at regional level. For example, the Thai Green Label for television sets is under negotiation for harmonization and mutual recognition with Japan, Taiwan, Province of China and Korea.

The Thai Green Label Project was begun by the Thailand Business Council for Sustainable Development (TBCSD) in October 1993. Major objectives of this project are

1. To reduce national environmental pollution.
2. To provide consumers with correct and impartial information about environment friendly products.
3. To encourage manufacturers to utilize technology or production methods that have less impact on the environment, and resulting in long-term economic returns.

The Committee and Working Group on the Green Label Project were tasked to

- Determine and approve a project management plan, operation strategy, fees, public relation, and other related tasks.
- Select product categories.
- Determine product approval, including consultation, recommendations, and decisions on determination and duration changes.
- Appoint a working group.

The Committee consists of the MOI Permanent Secretary as Committee Chair, the Permanent Secretary of the Ministry of Science and Technology as Deputy Chair, the President of Thailand Environment Institute (TEI), the **TISI Secretary-General**, and Representatives from Office of the Consumer Protection Board, the FTI, the Thai Chamber of Commerce, the Press Association of Thailand, the Environmental Engineering Association of Thailand, the Public Relation Association of Thailand, the Marketing Association of Thailand, the Thailand Business Council for Sustainable Development, TISI as secretary and TEI as deputy secretary.

The Green Label Project is currently working on television sets, mobile phones and photocopying machines. For the green label on television sets, the Technical Committee has determined the definitions to comply with the Nordic, the EU, the Korean, the Taiwanese, the Japanese, the German eco-labelling programmes, the Montreal Protocol, and the British Standard.

As regards the legislative procedure to issue a green label, a product has to go through the following steps:

Step1. The Project Secretary receives recommendations about product types from interested parties

Step2. The Secretary collects recommendations and evaluates possibilities prior to submission to the Project Committee

Step3. The Committee selects the product type

Step4. The Committee appoints technical committee to study and draft definitions on each product.

Step5. The Secretary proposes a draft definition to the Committee.

Step6. The Committee considers product approval and practical regulations

Step7. The Committee approval will be announced through various media

Electrical and electronic products that have already had green labels requirements in place are fluorescent lamps (TGL-2-99), refrigerators (TGL-3-99), flashlight batteries (TGL-6-96), air conditioners (TGL-7-97), electrical motors (TGL-15-98), computer equipment (TGL-12-97), washing machines (TGL-13-97), electronic ballast (TGL-23-99) and photocopying machines (TGL-27-00).

The process for green label approval of each product needs to go through the following steps.

Step1. The applicant fills out an application form and submits it to TEI.

Step2. TEI examines completeness and correctness of the application form including testing results (if applicable).

Step3. TEI delivers the complete and correct application form to TISI for detailed examination.

Step4. TEI registers the product, approves it and concludes a contract for green label approval with the applicant.

Step5. The applicant can label the applied product within the boundaries specified in the contract that meets the requirements.

The document examination may take up to a month. However, the Green Label fees is less expensive and in effect for three years. Furthermore, the Green Label Committee will make public announcement of the product obtained a Green Label.

In addition, government and private sector representatives made study tours in Japan, Korea, Netherlands, Germany and Belgium. It was gathered that now many countries are testing lead free soldering in electrical and electronic products with SbPb37 on good quality products. In Germany, for instance, various companies cooperate with research institutes and set up an industrial

working group. The Group comprises industrial representative from each field to study the lead free soldering in competition with Japanese approaches.

The Fraunhofer IZM is a German research institute on technology and product design. The lead free interconnection technology in electronic industry has been studied for two years. Over 100 representatives from 65 companies were interested in studying this case. The Electrical and Electronic Institute wish to conduct a two-day workshop on lead free soldering and a lead free demo-line in the near future.

Assessment of potential effect of environmental measures

		Evolution Goals		Inspection Criteria		Importance Priority				
		Access	DP 1	EU	Info. Obj.	Time Costs	LEP	Cost	DP	TEC
Product research, design, improvement	HM				✓	✓				
Production process	HM				✓	✓				
Process quality improvement	HM				✓	✓	✓		✓	
Product standard	MH									✓
Testing, material development	MH				✓	✓				
Product development testing	MH				✓	✓				
Demand driven instruction	LH						✓		✓	
Technical training	MH				✓	✓	✓		✓	
Business management training	LH				✓	✓	✓		✓	
Marketing & market information										
- Market status/Target product-group	HH	✓				✓				
- TBT/Relevant standard	HH	✓	✓							✓
- SCM of Parts / Component	MH					✓				
That WEEE system & management	HH			✓	✓	✓		✓		
Study & consulting LCI / LCA	MH			✓	✓	✓				✓
General coordination										

Demand status: H Current M Short term L Long term Importance status: H Most M Medium L Least

Environmental measures of developed countries will impact manufacturers supply and consumer demand in producing countries.

**Supply side**

1. Manufacturing

1.1 Increased manufacturing costs as a result of

- High prices of manufacturing materials. For example, in intergrated circuits manufacturing electronics parts of hard disk drive (sleeve, shaft), etc., purer water with low conductivity has to be used. Consequently, de-ionized water production using varopis chemicals had to be set up.

- Eco-design or design for environment or DfE yields optimization of product use in terms of natural resources

preservation, reduction of waste, pollution, and hazards. For example, design of smaller units utilizes less material, design of a smaller chips results in lower resistants, and change packaging from foam to paper. This would result in cost increasing for purchasing machine, technology, and manpower in the short run but the production cost savings would be evident in the long run.

DfE should be concerned with the following.

- 1). Design for cleaner technology (both production and use) such as reduction of resource, material and energy use as well as waste generation.
- 2). Design for substitute substances or reduction in use of hazardous toxic or other harmful substances in electrical and electronic products. . For example, refrigerator and air conditioning manufacturers ought to stop using foam blowers for making heat insulator resulting in CFC use, use alcohol as a low risk substance for cleansing of electronic parts, and use oil for absorption of humidity in compressors.
- 3). Design for long-life use of electronic and electrical products conducive to repair and maintenance
- 4). Design for product life time improving product, i.e., product improvement, and design for future use
- 5). Design for reuse and recycling conducive to easily dismantling, reducing the use of composite materials, using recycled materials and second-hand parts. Use of recycled or reconditioned parts in equipment such as copying machines, computers and parts, can result in production cost reductions.
- 6). Easy design in order to reduce production cost and raw materials, durability, easy dismantling for maintenance and reuse may result in
  - Change of technology for a new product designed for environment introduces more investment. In addition, new inventory is needed prior to life cycle assessment.
  - Change of machinery. New machine that was bought to produce a new product may be more costly than adjusting the machine for cleaner technology.
  - Human resource development. Personnel were developed suitable for changes of machine and technology.

1.2 Competitive advantage. Competitive advantages are generally affected by commodity price, quality, and delivery. Product with value added and demanded by consumer would gains competitive advantages, and vice versa.

## 2. Marketing

2.1 Increase of sale's prices. No matter what party in the supply chain treats the waste (i.e. producer, importer or retailer), treatment costs will fully or partly be passed onto consumers.

2.2 Market shares. Products that are not environment friendly would lose market shares to environment friendly once.

2.3 Increase of buying price. Buying a product imported from the EU might be more expensive compared to local product as a result of production and transportation costs.

3. Investment. The EU WEEE treatment would require physical or financial investment by producers, importers or wholesalers. Investment in treatment plants is an alternative to paying fees to existing plants or collection/recycling systems.

4. Public Relations. Providing product details to consumers is necessary to facilitate purchasing decisions and guide on environment friendly products

If one is interested in analysis on the mandatory collection and recycling system in Switzerland for WEEE that has been in operation for two years already, please consult the SWICO

### ***Demand side***

Creating consciousness among consumers on the environmental impact of electrical and electronic products complies with the Rio Earth Summit in 1992 and the WSSD in 2002. There is undoubtedly an tendency towards globalization of green demand. Another impact is the need for detailed information to consumers to guide purchasing decisions. This implies for producers to collect detailed information on environmental impacts of products. Such information concerns:

- Raw materials
- Production processes, including the use of hazardous or problematic substances or chemicals
- Transport
- Product use, including energy consumption or related savings, reparability etc
- Waste treatment, including recoverability of parts and materials and their re-use and recycling

Manufacturers need to systematically collect such information and disseminate it to Consumers. Green demand would also affect procurement policies of the government and the private sector.

## Adjustment Strategy



Adjustment strategy for environment and health requirements impact unprepared producers in international, local, and regional markets. Thai SMEs are heavily impacted in their production processes. The SMEs lack capacity on required changes in the production process, substance substitution, waste management, etc. As suppliers, they need new technology and know-how, and new machinery from producer who orders their products. These need to timely reacted to the requirements. For smart suppliers, they may conduct research and develop their products for niche market.

At national level, environmental rules and regulations for product can hardly find in Thailand, except the voluntary Green Label on product. Few issues will be outlined, namely, legislative framework and center for implementation or central office. The legislative framework is needed in order to make the mechanism work efficiently parallel to international legislative frameworks. A central office is subsequently needed to implement and supervise action plans following the framework. It is fair to say that waste management plays an important role in the EU WEEE Directive. If the Thai WEEE regulations were in effect, the legislative system and existing mechanisms in the private sector were not well prepared to cope with stringent environmental requirements in export markets due to the non-existence of a central office or institution to be directly responsible for WEEE management. Existing regulations did not fully support recycling, because waste could be exported. This would create a difficulty in raw material allocation for waste treatment plant. It is also important to encourage the repair business to increasingly apply second-hand parts. Moreover, the government needs to support personnel development for reuse, modification of technology, widespread R&D in product life cycle assessment, eco-design, etc.

Besides a specific Thai adjustment strategy, pro-active measures would also be desirable at ASEAN level, concerning the networking among national collection and recycling systems. ASEAN would also have politically more cloud to request an extension of adjustment periods Regional recycling plants are also a conceivable option

### **Institutional capacity building**

Thailand needs assistance to build institutional capacity from where the environmental and health requirements are in place, i.e., the EU, Japan, and the US. Capacity needs to be built at individual person and institutional levels. For individuals, technical training in the areas of product life cycle assessment, eco-design, efficient recycling processes, substance substitution, etc., are required for technicians, scientists, and engineers. In addition, testing laboratory need to know the standards to be complied with, and related testing methods, etc. At institutional level, capacity needs to be built in the areas of information dissemination, waste management system/method, legislation, human resource development, research and development, and management, etc.

## ***Implementation guidelines for institutional capacity building***

Thailand has a long tradition of general waste management, but the management of waste from electrical and electronic equipment is a recent challenge. More emphasis needs to be given to awareness rising on the environmental and health impacts in the Thai society. Information to the general public has to go in tandem with putting pressure on executives to foresee the importance of the matter.

### ***Information dissemination on waste management***

#### Pre-existing problems regarding waste management

- Thailand has not been prepared for a recycling-oriented society. As far as product design and development for environment, electrical and electronic waste collection system and treatment facilities, such an existing system and facility have been recently developed. Thailand is far behind the EU and Japan, both system-wise and technology-wise. Thailand should be aimed at recycle for sustainable recycle society. A long existing system is rather informal for waste collector to make a living. Metal and plastic will be dismantled and sell to material recycle business.

- - People are not aware of the necessity for recycling and material recovery.
- Information on recycling is sparsely disseminated.
- There is poor co-operation among relevant government offices and with private sector institutions

#### Key problems

- There is currently not a single institution that plays a pivotal role.
- Lack of skillful personnel who knows and understands waste recycling
- Budgetary constraints
- Lack of much-needed information on generation of E&E waste, its composition and regional production

#### Proposed implementation plan

- The Pollution Control Department (PCD) under the Ministry of Natural Resources and Environment assumes leadership in the campaign of guarded natural resource use in the Thai society
  - Web site creation on resource efficiency, design for recycling/reuse and cleaner production as a source of information dissemination
  - Monthly information dissemination to mass media
  - Draft an action plan on avoidance, reduction, reuse and recycling, with co-operation of relevant professional associations, industrial associations, the Federation of Thai Industries, the Thai Chamber of Commerce, Educational Institution, Ministry of Natural Resources and Environment, Ministry of Industry, Ministry of Information, Communication, and Telecommunication, Ministry of Finance, Ministry of Commerce, Ministry of Public Health, Ministry of Foreign

Affairs, etc.

- The PCD proposes the budget for information dissemination
- Assessment of activities

## **Legislation**

### Pre-existing problem

- Non-existence of a directly responsible agency for WEEE management and related adjustment issues

- No policy concept based on 3R strategy
- Lack of direct environmental law enforcement
- Lack of implementation budget

### Analysis of problem

- Legislative enforcement must be efficiently implemented, regardless of economic focus or environmental focus.

- One office should be solely responsible for natural resources. In practice, industrial materials are responsible by the Department of Industrial Works, the Pollution Control Department is responsible for household wastes. This is an area that the legislative office needs to look into

- Law enforcement personnel needs to be sufficiently recruited in order to make the law efficiently implemented.

### Implementation plan

- There are materials that utilize large amount of domestic energy resources to produce, but they are necessary in the production process such as ferrous metal. Therefore, certain tax import structure should be legislatively revised.

- Ban illegal dumping

- Consider the introduction of recycling fees paid by producers and deposited in the "Natural Resources Preservation Funds" The fees will be returned by retailers/wholesalers who collect from consumer at the point of sale.

- Consider introduction of a mandatory take-back and collection system for WEEE.

- Legislate data gathering on waste generation and processes related to 3R,

- The industrial institute may consider inclusion of environmental requirements in the compulsory standards.

- Environmental data of product may be required to submit to the government office

- Consider the introduction of green procurement policies by government and private offices

- Consider tax privileges to companies for investment in R&D in 3R

## **Human resource development**

#### Pre-existing problem

- Lack of capable personnel for transferring knowledge and technology to students, manufacturers, government and stake holders. Some organization should be directly involved in waste reduction, reuse, and recycling (3R)

- Lack of budget for personnel development and equipment acquisition for learning and training in 3R

#### Key problems

- Knowledge of resources preservation is yet broadly taught. Educational institutes that have already taught this subject do not publicize the importance of resources preservation. Over 10,000 Japanese companies conduct life cycle assessment. The figure shows that those company personnel were able to report their figures with respect to environmental preservation.

- Limited waste 3R technology is transferred to developing countries.

#### Implementation Plan

- Courses in resources preservation should be made part of the education curriculum.

- The Pollution Control Department (PCD) trains educational instructors on the upcoming needs. The Department should also collect data for a national database on types and quantity of waste generated and collected.

- The Electrical and Electronics Institute (EEI) trains manufactures on waste 3R.

### ***Research and development (R&D)***

#### Pre-existing problem

- Lack of personnel and office directly involved. Thai database needs to be constructed, monitored, and maintained.

- Lack of pre-determined research and development budget.

- Lack of equipment to conduct R&D. Expert and facilities for regional cooperation need to be taken into consideration.

#### Key problems

- Lack of government office that is directly involved in R&D on energy and materials utilization..

#### Implementation plan

- Providing financial or tax incentives to the private sector for encouraging R&D in 3R waste

- Prime Minister Awards for the best companies to preserve natural resources are announced annually.

- Establishment of "Resources Preservation Institute" for the development of product life cycle assessment.

- Promoting manufacturers to collect foreground data with the expense of

company's R&D expenditure.

- The PCD coordinates with the Department of Industrial Works (DIW) to set up a pilot recycling plant and develop suitable technology.
- "Resources Preservation Institute" develops recycling technology for the reduction of recycling costs and minimize further treatment, including landfill and incineration.

## **Waste management**

### Pre-existing problem

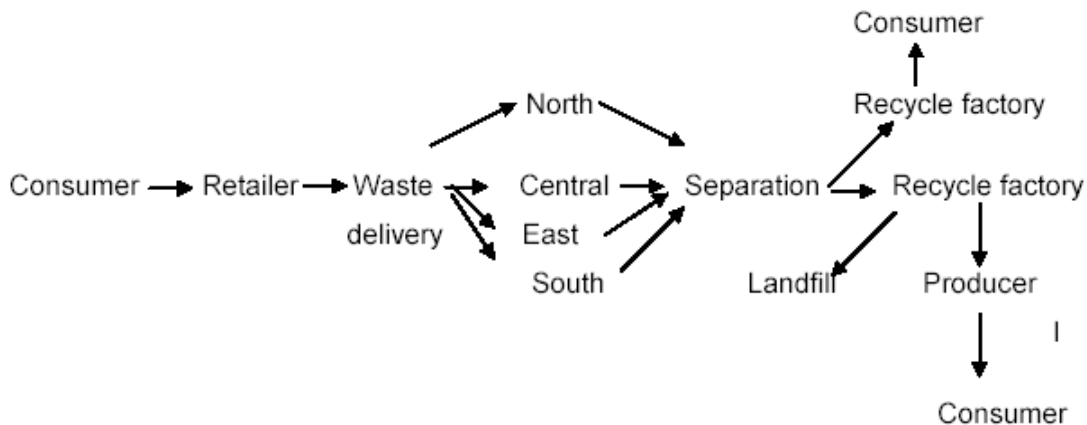
- The E&E wastes are not systematically collected and treated.

### Key problems

- Electrical and electronic waste management underlies the EU WEEE and RoHS Directives and the Japanese concept of a recycling-oriented economy
- Collection system is important, because it can prevent illegal dumping resulting in an environmental problem. As long as the formal system does not exist, the informal system will play a crucial role in the system, resulting in environment and health problems.
- Waste 3R embodied in a treatment system that aims at waste avoidance and minimization should be implemented by existing offices.

### Implementation plan

- Consumer pays for waste treatment ultimately, but producers deposit treatment fees to the Funds according to their market shares.
- Recycling factories located in the area of Industrial Estate Authority of Thailand (IEAT) collect and store waste at the regional IEAT, namely, north, central, and east.
- Waste separation for reuse, recycle, incineration, and landfill
- Waste delivery to recycling factory
- Waste recycling
- Incineration and landfill



## ***Thailand's system for management of WEEE***

1. Appointment of central office under the Ministry of Natural Resources and Environment, namely, "Resources Preservation Institute," its mission may be explained as follows:

- Collection of data on resources utilization in commodities' or input production for individual industries

- Dissemination of resources utilization data among offices and organizations

- Research and develop life cycle assessment software

- Research and develop 3R technology

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2. Setup complete waste management funds (CWM Funds)

3. Devise most suitable means of funding

4. DIW considers deployment of regional recycling plants in IEAT

5. Imposition of collection and/or treatment fees at retail shop. Fees will be spent in the next ten years. At that time, treatment cost will be higher and production cost will be changed. Waste management for the 10-year-old products will be difficult due to the design and material used.

6. Waste treatment procedure

- Waste collection

- Municipalities collect waste, separate into categories utilized in recycling factories

- Waste delivery to recycling factory

- Dismantling parts for reuse appeared in the reuse parts database

- Delivery of reuse parts to assembler

- Dismantling parts for recycled material

- Recycling materials

- Treatment of waste from recycling

7. Product design by manufacturers using design for environment (DFE) coupled with the guaranteed quality, that is

- Design to optimize recyclability of products/components

- Design for easy dismantling without using nuts and screws

- Utilization of a limited number of materials for recycling purposes

Thailand's waste management system for WEEE may be set up to absorb waste from other countries in Indochina. The system may be depicted as follows.



## Detailed activities of overall implementation plan

Activity	Target Group	Year Implemented
<b>Information dissemination</b>		
- Campaign for resources preservation	Public	1-5
- Information dissemination through web site	Researcher	2-5
- Information dissemination to mass media	Subscriber	1-5
- Draft action plan	Government & Private Offices	2-5
<b>Legislation</b>		
- Revision of tax structure for materials using excessive energy (Act)	Manufacturer	2
- Waste electrical and electronic dumping (Act)	Illegal dumping	2
- Obligation of take-back and collection	Electrical and electronic retailer	2 3
- Release of background data ( Law )	Relevant government & private offices	2
- Environment friendly product ( Act )	Manufacturer	2
- Environmental Report ( Act )	Government & private offices	1
- Green procurement (Act )	Government & private offices	1
Investment on R&E for waste 3R ( Act )	Manufacturer	1
<b>Human Resource Development</b>		
- Determination of general courses	Student	1-5
- Instructor's training	Instructor	1-5
- Manufacturer training	Manufacturer	1-5
- Allocation of training software	training	1-5
- Construction of Thailand's database	Manufacturer	1-5
<b>Research &amp; Development</b>		
- Allocation of laboratory, instrument	Researcher	2-3
- Enquiry for oversea assistance	Researcher	1-5
- Manufacturer, promotion to invest in R&D for waste 3R	Manufacturer	1

## Part 6 Summary

### ***Conclusion***

Major export markets of Thailand's electrical and electronic products are the EU, Japan, and the US. In this report only few environmental and health requirements are briefly described, i.e., the EU waste electrical and electronic equipment (WEEE) and the restriction of the use of hazardous substances in electrical and electronic equipment (RoHS) Directives; the Japanese Home Appliance Recycling Law, Law for Promotion of Effective Utilization of Resources, Chemical Substances Control Law, and Green Purchasing Law, and the US Resource Conservation and Recovery Act , Toxic Substances Control Act , and Occupational Safety and Health Act.

The small and medium-sized enterprises (SMEs) were mostly aware of environmental and health requirements, especially those supplying multinational corporations. Thai SMEs whose products are sold domestically are less aware of the requirements, because the local consumer does not demand such features, despite the existence of some regulation. These local SMEs need technology transfers from large ones, who are makers, and government assistance for their indirect export in order to enhance their competitiveness in the global market.

Information would be from overseas government offices to central government offices , and to private and independent agencies. Finally, information would be sent to individual producers. This is a good method of information dissemination that is effective and the producer is confident about the correctness of information.

At national level, TBT measurers and related environmental requirements are dealt with at the level of the Deputy Prime Minister. A Sub-Committee composed of government and private representatives was appointed in order to identify appropriate measures underlying various approaches. For overall adjustment, the government studied Thailand's existing laws and cooperated with the private sector agencies to study the impact, need for information distribution, industrial standards, and technology development. Additional regulations were drafted and the existing regulations were efficiently implemented.

Capacity building is needed at individual and institutional levels. At individual level, technical skills related to individual standards and testing methods need to be intensively trained. At institutional level, knowledge dissemination about environmental management in particular, legislation, human resource development, research and development and managerial skills are need. There are opportunities and merits to cooperate with neighboring countries and the cooperation ought to be extended to the regional level.

## ***Discussion***

The EU environmental requirements significantly affect the Thai electrical and electronic industry, because the EU market accounts for about 18% of total E&E goods export value each year. The same requirement tends to eventually spread to other regions. The Japanese market, to which approximately 20% of Thai E&E goods and components/parts were exported, has already implemented a “recycling” law since April 2002.

The implications of the EU environment requirements are many and severe and vary depending on the magnitude of the requirements and the competency level of each enterprise. The costs of the recycling and waste management systems in developed country are high and are likely to be mostly passed on to manufacturers which will increase competitive pressure on manufacturing cost control especially at the SME level, due to technological support and economy of scales, as suppliers to OEM manufacturers or contract manufacturers or parts/components suppliers.

Large manufacturers or parts/components suppliers, which are affiliated to or branches of the MNCs will be least affected since the technological supports such as the manufacturing process or the design for environment (DFE) can be provided by parent companies abroad, though with additional cost.

More effects obviously will be on those SMEs & joint-venture (JV) companies whose progress in research and technological development in the last few years has not been satisfactory. Know-how and availability as well as costs of the substitutes to replace those materials/chemicals listed in RoHS Directive is the big concern of both the government & the private sector. Knowledge & experience in DfE on recycling and integrated waste management systems has been very limited, since only companies that have own brand names have done so.

The Thai government is well aware of the implications of the EU-WEEE and RoHS directives. The development of these directives has been being closely followed. A high level subcommittee was set up in 2000 under the National Committee for International Trade & Economic Policy (Chaired by Deputy Prime Minister / Ministry of Finance) to follow up, monitor, coordinate, study, and propose an appropriate plan of action to related government units and the private sector. The Subcommittee members comprise high-ranking representatives from the related departments in several ministries and from the concerned industry associations, institutes, and the Federation of Thai Industries. Several seminars and information sessions have been organized to increase awareness of manufacturers, traders, the government officials and also the public. Sub-committee members' activities were planned and assigned.

The Electrical and Electronics Institute together with the Thailand Environment Institute and a few other institutions launched a study project which

was commissioned by the Subcommittee in October 2002. It is expected that the study project will be wound up at the end of 2003 and can provide appropriate recommendations and an action plan for both the relevant government and private sector bodies regarding the EU WEEE and RoHS directives requirements & their implications, appropriated recycling & integrated waste management system, DfE experience & cost implications and product life cycle assessment technique and experience.

In conclusion, Thailand has been aware of development of the EU-WEEE and RoHS Directives and their implications on the Thai economy, especially on the E&E export sector, which represents the highest portion of total export earnings. All the relevant parties, both government & private, have been working together to prepare themselves and develop E&E industry competence & competitiveness in response to the implications from the EU-WEEE and RoHS directives and the forthcoming IPP Directive. However, due to limited progress of technology development in the E&E industry in the past 20 years, Thailand will need some critical and urgent support from the EU and other developed countries, especially in the areas of environmentally sound technology, i.e., eco design, design for recycling. With all these, Thailand will be able to develop its competence and maintain the appropriate export growth to support future sustainable economic development & growth. In addition to the EU WEEE and RoHS Directives, the EU chemicals policy has undergone preparations for related parties in order to be ready for them when it is in effect.