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Role of Laboratories for Adapting Product-related Environmental Regulations(PRERs)

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Abstract

This paper examines how a country which has been successful in creating agglomeration of a manufacturing industry has faced various types of product-related environmental regulations. Then the paper shows how the government and testing laboratory have taken measures to adapt to PRERs overseas in response to the needs by firms affected by regulations. In reaction to the introductions of PRERs overseas, Malaysia also has introduced equivalent policies domestically, proving that PRERs have spread to Malaysia.

Keywords: environmental policy, trade and the environment

JEL classification: F18, O2

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ROLE OF LABORATORIES FOR ADOPTING PRODUCT RELATED ENVIRONMENTAL REGULATIONS (PRERs)

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Abstract

This paper examines how a country which has been successful in creating agglomeration of a manufacturing industry has faced various types of product related environmental regulations. Then the paper shows how the government and testing laboratory have taken measures to adapt to PRERs overseas in response to the needs by firms affected by regulations. In reaction to the introductions of PRERs overseas, Malaysia also has introduced equivalent policies domestically, proving that PRERs have spread to Malaysia.

SECTION 1. INTRODUCTION

1.1 Overview of Malaysia's Key Economic Sectors

The Economy of Malaysia is a growing and relatively open state-oriented and newly industrialized market economy. In 2012, the Economic Planning Unit of the Prime Minister's Department estimated the GDP per capita at US\$9,983 as against the World Bank report of US\$10,381. In this respect, Malaysia can be considered a middle-income economy when compared to Japan and Indonesia with GDP per capita for 2012 at US\$46,720 and US\$3,557, respectively.

Since independence in 1957, Malaysia's key economic sectors have evolved from being predominantly reliant on mining and agriculture to an economy that depends more on manufacturing and subsequently towards a more multi-sector economy. Malaysian export related industries had been one of the main contributors for its economic growth. The country had been experiencing trade surplus beginning from 1998 as depicted in Tables 1 and 2 on Malaysian major exports and imports. The trade surplus was sustained through continued growth in exports of both manufactures and commodities namely liquefied natural gas (LNG), palm oil, machinery, appliances and parts, rubber products, crude petroleum, chemicals and chemical products, iron and steel products as well as processed food. Currently Malaysia is one of the world's largest exporters of semiconductor components and devices, electrical goods, solar panels, and information and communication technology (ICT) products.

Table 1: Compilation of exports over fifteen-year period

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| PERIOD | GROUP | | | | | | | | | | TOTAL |
|--------|----------------------------------|------------------------------------|--------------------------------|-----------------------|-----------------|--------------------|--|----------------|-------------------------------------|---------------|---------|
| | Electrical & Electronic Products | Palm Oil & Palm Oil Based Products | Timber & Timber-Based Products | Liquefied Natural Gas | Crude Petroleum | Petroleum Products | Articles of Apparel & Clothing Accessories | Natural Rubber | Other Manufactured Goods & Articles | Other Exports | |
| | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | |
| 1997 | 90,123 | 14,108 | 5,297 | 6,259 | 7,069 | 2,820 | 6,556 | 2,971 | 26,184 | 59,505 | 220,890 |
| 1998 | 124,089 | 22,663 | 4,551 | 5,952 | 7,535 | 2,643 | 9,007 | 2,829 | 33,814 | 73,481 | 286,563 |
| 1999 | 153,408 | 19,511 | 5,650 | 7,002 | 9,306 | 4,014 | 8,559 | 2,343 | 34,927 | 76,839 | 321,560 |
| 2000 | 180,613 | 14,506 | 5,758 | 11,422 | 14,245 | 7,232 | 8,575 | 2,571 | 40,393 | 87,954 | 373,270 |
| 2001 | 154,229 | 15,077 | 3,959 | 11,119 | 11,160 | 7,591 | 7,855 | 1,886 | 39,434 | 81,975 | 334,284 |
| 2002 | 160,196 | 20,835 | 4,201 | 9,888 | 11,600 | 6,679 | 7,599 | 2,492 | 41,425 | 92,516 | 357,430 |
| 2003 | 210,724 | 27,691 | 16,622 | 13,358 | 15,659 | 8,292 | 7,815 | 3,582 | 42,452 | 51,691 | 397,884 |
| 2004 | 241,687 | 30,625 | 19,899 | 17,215 | 21,856 | 12,059 | 8,897 | 5,210 | 55,428 | 68,376 | 481,253 |
| 2005 | 265,197 | 29,264 | 21,157 | 21,340 | 29,654 | 15,128 | 9,384 | 5,787 | 60,330 | 78,994 | 536,234 |
| 2006 | 281,346 | 32,822 | 23,102 | 23,675 | 31,983 | 18,404 | 10,419 | 8,235 | 70,871 | 88,383 | 589,240 |
| 2007 | 266,686 | 45,668 | 22,521 | 26,936 | 32,865 | 19,730 | 10,849 | 7,334 | 77,674 | 94,036 | 604,300 |
| 2008 | 255,561 | 66,538 | 22,705 | 41,475 | 43,582 | 29,093 | 12,096 | 8,111 | 85,972 | 97,879 | 663,014 |
| 2009 | 230,077 | 50,695 | 19,407 | 29,018 | 25,360 | 19,400 | 11,004 | 4,459 | 76,228 | 86,869 | 552,518 |
| 2010 | 249,907 | 62,223 | 20,331 | 38,742 | 30,765 | 25,542 | 12,480 | 9,210 | 90,252 | 99,371 | 638,822 |
| 2011 | 236,535 | 83,396 | 19,834 | 49,963 | 31,982 | 33,038 | 13,975 | 13,278 | 101,107 | 111,440 | 694,548 |

Source: Department of Statistics, Malaysia, Compiled By: MATRADE

Table 2: Compilation of imports over fifteen-year period

| PERIOD | GROUP | | | | | | TOTAL RM (Mil) |
|--------|---------------------------------|-------------------------------------|-----------|----------|---------------------------------|---------------|-------------------|
| | Machinery & Transport Equipment | Other Manufactured Goods & Articles | Chemicals | Food | Mineral Fuels, Lubricants, etc. | Other Imports | |
| | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | RM (Mil) | |
| 1997 | 132,930 | 40,345 | 15,379 | 10,084 | 6,413 | 15,785 | 220,935 |
| 1998 | 143,825 | 36,944 | 16,275 | 10,514 | 6,992 | 13,575 | 228,124 |
| 1999 | 153,971 | 41,340 | 18,790 | 10,873 | 7,489 | 16,013 | 248,477 |
| 2000 | 195,728 | 50,255 | 22,371 | 11,393 | 14,973 | 16,738 | 311,459 |
| 2001 | 169,609 | 45,028 | 20,704 | 12,277 | 14,706 | 17,906 | 280,229 |
| 2002 | 187,969 | 47,506 | 21,761 | 12,439 | 14,368 | 19,046 | 303,090 |
| 2003 | 195,329 | 48,607 | 22,764 | 12,728 | 17,520 | 19,591 | 316,538 |
| 2004 | 232,491 | 67,064 | 31,786 | 16,482 | 25,117 | 26,692 | 399,632 |
| 2005 | 248,768 | 70,566 | 33,896 | 17,780 | 34,938 | 26,924 | 432,871 |
| 2006 | 266,663 | 81,867 | 36,813 | 19,968 | 41,546 | 31,291 | 478,148 |
| 2007 | 267,350 | 88,205 | 40,796 | 23,416 | 44,248 | 38,030 | 502,045 |
| 2008 | 254,283 | 95,784 | 45,622 | 27,969 | 56,804 | 39,342 | 519,804 |
| 2009 | 222,364 | 78,619 | 39,406 | 26,732 | 35,688 | 31,861 | 434,670 |
| 2010 | 261,591 | 97,628 | 47,860 | 30,253 | 52,691 | 38,805 | 528,828 |
| 2011 | 256,131 | 110,955 | 53,873 | 34,492 | 67,487 | 51,296 | 574,234 |

Source: Department of Statistics, Malaysia, Compiled By: MATRADE

As illustrated in Figures 1 and 2, Malaysia’s manufacturing sector including the Electrical and Electronic sector is very much involved in component or intermediary good manufacturing.

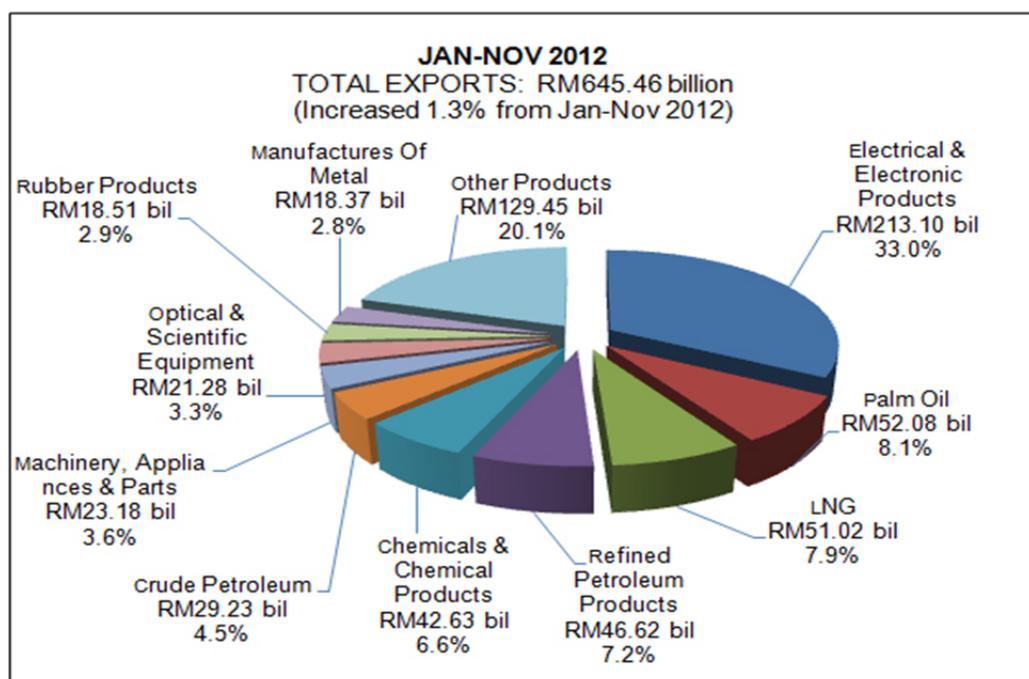


Figure 1: Top ten major export (January – November 2012) (Source: Department of Statistics, Malaysia, Compiled By: MATRADE)

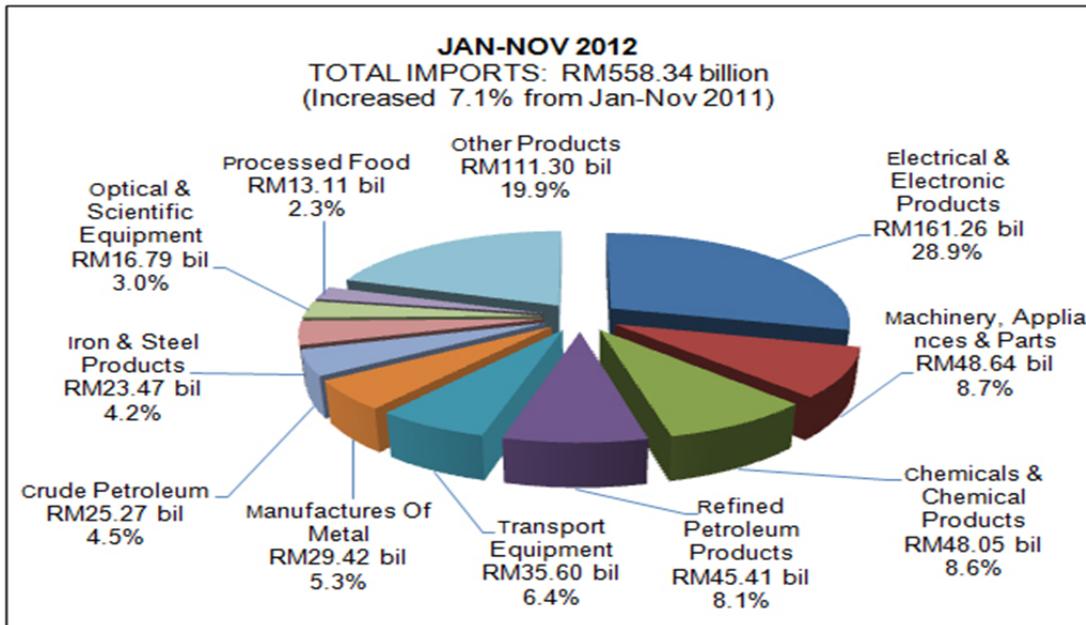


Figure 2: Top ten major imports (January – November 2012) (Source: Department of Statistics, Malaysia, Compiled By: MATRADE)

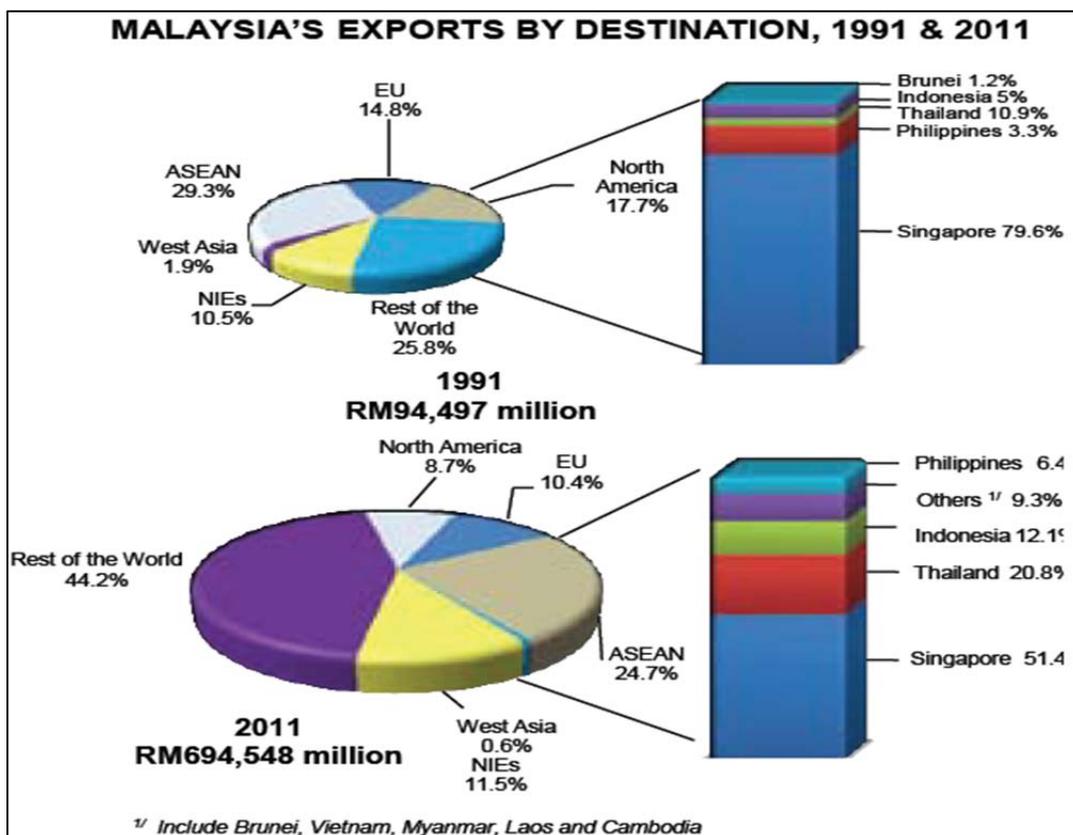


Figure 3: Malaysia's export by destination (Source: The Malaysian Economic in Figures 2012, Economic Planning Unit)

Malaysia has sought to diversify her exports and export destinations as shown in Figures 3 and 4 over the last twenty years. The manufacturing sector remains the largest exporting sector with electrical and electronic remaining dominant sub-sector followed by increase in chemicals and chemical products. The contribution from palm oil industry also has increased.

In terms of exports by destination, as shown in Figure 3, most of Malaysia trading partners are currently within the ASEAN region and the rest of the world predominantly China and Japan, with a shrinking percentage going into the US and Europe market as compared to twenty years ago. In 2011, the distribution of foreign direct investment (FDI) home countries investment in Malaysia are led by Japan (29.6%) followed by USA (7.4%), Singapore (7.3%), Germany (5.7%), Taiwan (4.1%) and the rest of the world. Malaysia at the current population of around 30 million is a relatively small market, and most MNCs who are operating in the country are operating primarily export-oriented manufacturing. Based on these figures, it can be inferred the Malaysian firms who are in the value of the MNCs need to be well integrated into a production network that comply to global requirements.

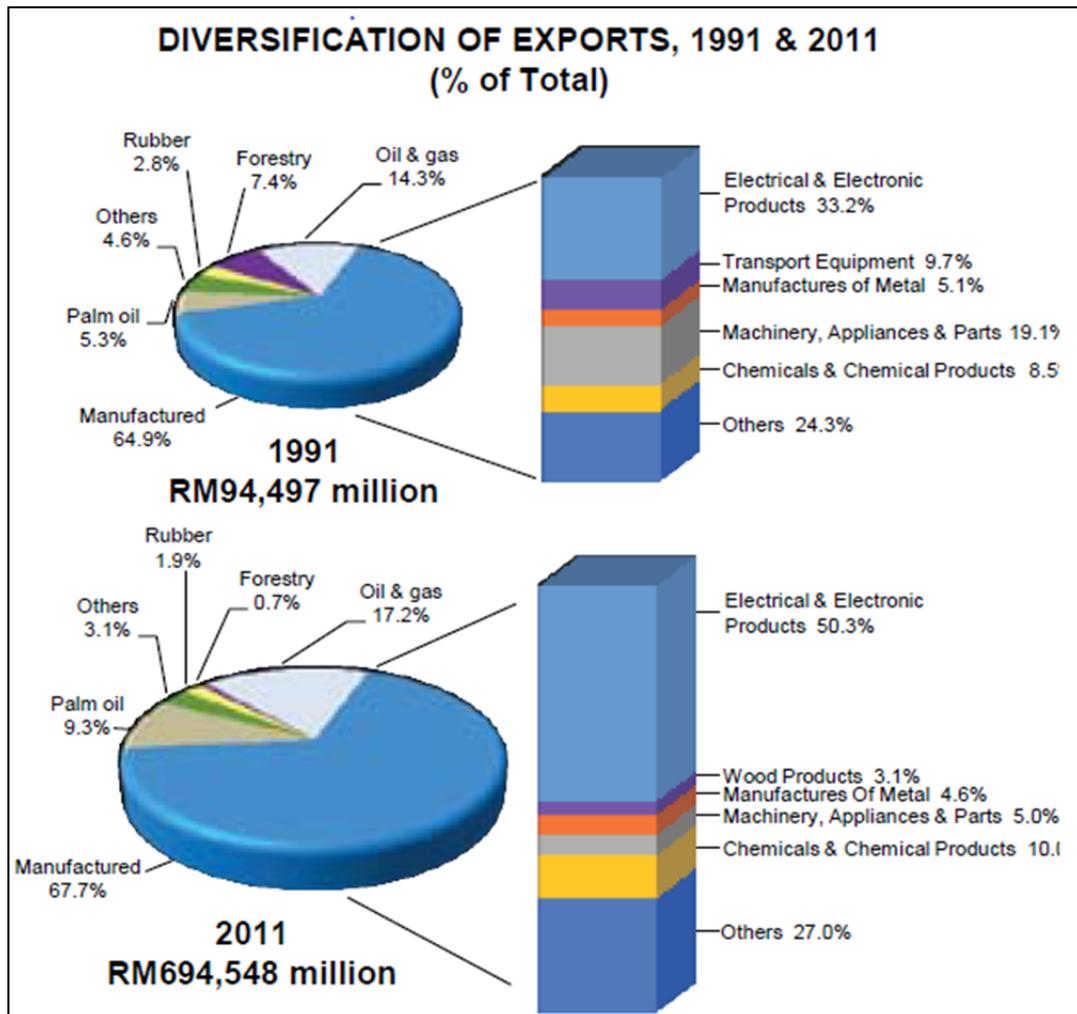


Figure 4: Malaysia's diversification of export in 2011 as compared to 1992 (Source: The Malaysian Economic in Figures 2012, Economic Planning Unit)

Malaysia ranks 16th as a Top Prospective Host Economy in the World Investment Report 2013 published by the United Nations Conference of Trade and Development (UNCTAD). The Malaysian Government has recognized a number of areas which need to be strengthened to attract FDI, among them to build further on its existing competitive position as an outsourcing destination for transnational companies in the electronics, automotive, machinery manufacturing, and oil and gas industries, as well as to also become a key player in the aerospace, medical, defense and

photovoltaic industries.[‡] Figure 4 shows Malaysia's increase in export of manufactured goods in particular electrical and electronic goods.

Hence, it is evident that many of the regulations that are initiated in the OECD countries particularly the European Union have ripple effects in being adopted or adapted by other developed nations, and also the newly industrialized economies, which in turn have direct bearing on export-oriented countries like Malaysia.

Although Malaysia is considered a fast growing economy, it is also evident it does have a strong domestic market due to its relatively small population of 28 million. Hence it is important for the industry sectors in the country to take heed to regulatory developments in export destinations, and one very conspicuous area is the emergence of Product Related Environmental Regulations.

1.2 Performance Related Environmental Regulations

The increasing emphasis of Governments in most developed economies is to populate their markets with goods with improved environmental performance characterized by attributes as listed herewith:

- Energy efficient
- Reduce greenhouse gases emission
- Reduce resource consumption
- Reduce hazardous and toxic substances
- Reduce ozone depleting substances
- Reduce emissions to air and water
- Environmentally preferable packaging e.g. biodegradable
- Increase recycled content
- Increase renewable resources such as bio-based products
- Forest stewardship

Fast-growing and developing economies have to produce goods (products and services) that will fulfill the above properties, and more importantly is able to produce objective evidence with respect to their claimed performance. This is where data generated by validated test methods become a key factor in ensuring the goods that claim improved environmental performance really do perform as claimed.

Testing laboratories are becoming an important component of industrial competitiveness for exporting firms, especially when their target markets are regulated with Product Related Environmental Regulations (PRERs). Due to increasing number of PRERs in the developed and fast growing economies, testing and inspection service is now an important economic sector in itself, contributing indirectly to the economy by providing test data of materials, components and products; and also directly in terms of employment and a source of revenue to the national economy.

With deeper understanding on the causes and effects of environmental issues, more countries are introducing various forms of PRERs leading to more types of testing required as evidence of

[‡] http://etp.pemandu.gov.my/Global_Recognition-@-UNCTAD

compliance. The testing requirements are direct operating cost to manufacturers which is unavoidable when they want to expand their markets.

This paper discusses the following issues.

- Types of support provided by SIRIM since the introduction of PRERs such as RoHS and REACH, not only of the European Union but also countries such as China, including her contribution towards standardization of testing methodologies.
- Policies implemented by the Malaysian Government in response to the PRERs of the importing countries.
- Roles of private and government testing laboratories
- Achieving compliance to PRERs through accreditation and certification schemes

This paper has 6 sections as follows.

:

- Section 1: Introduction
- Section 2: SIRIM Services to Support PRERs Requirement of Industry
- Section 3: Government Policies to Support Industry's Compliance to PRERs
- Section 4: Profile of Testing Laboratories in Malaysia
- Section 5: Accreditation and Certification Schemes Related to PRERs
- Section 6: Recommendations

SECTION 2. SIRIM SERVICES TO SUPPORT PRERs REQUIREMENT OF INDUSTRY

2.1 SIRIM Testing Services

The organization chart of SIRIM Berhad is shown in Annex 1. Within the SIRIM group, testing services is conducted mainly at SIRIM QAS International Sdn Bhd. (SIRIM QASI) and the Research and Technology Innovation (RTI) Division. SIRIM QASI is a subsidiary of SIRIM Berhad and its main business is conformity assessment carried out in the form of certification, inspection and testing. Most of the testing activities carried out at SIRIM QASI is to support compliance requirements of its product certification activities, which include the SIRIM Ecolabelling Scheme.

The RTI Division of SIRIM also house many research laboratories that are well-equipped with high-end analytical equipment that are suitable for both research activities and also be used to provide testing services. A number of the research laboratories are accredited to ISO 17025, and also OECD GLP compliant for the laboratories that conduct ecotoxicology tests, environmental fate tests and genotoxicology tests.

Annex II list all the testing services that are available in SIRIM, many of which can be adapted or produced results relevant to show compliance to PRERs.

2.2 SIRIM Standards Development Activities

SIRIM has been historically a major player in the development of Malaysian Standards, and continue to do so even after its corporatization in 1996 although a number of other organizations were also invited to become Standards Writing Organization (SWO) by Department of Standards Malaysia, the government agency enacted to play the role of national standards development in the country. As at

2013, SIRIM manages 23 number of industry committees as shown in Annex III, each of which oversee technical committees and working groups responsible for the development of Malaysian standards or provide feedback and input to international standards initiated by ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) where Malaysia plays a participating role.

Two technical committees namely TC207 and TC 9 have been responsible for the development of Malaysian standards in the area of environmental management and environmental standardization of electrical and electronic products and systems, respectively. TC 9 is the mirror committee for IEC TC111 Standards on Environmental Standardization for Electrical and Electronic Products and Systems. Both committees are managed by SIRIM through its Standards Research and Management Centre.

The standards developed through TC 9 are directly relevant to the compliance requirements of RoHS and WEEE (EU Directive on Waste from Electrical and Electronic Equipment). Since its formation in 2009, TC 9 has actively seek to adopt a number of IEC standards as Malaysian Standards as shown in Annex IV. The main reason for the committee's decision was the lack of reference documents to conduct the necessary tests or assessments needed to show compliance to RoHS and WEEE. As discussed in the following section, producing test results for RoHS compliance when EU first announced the directive, and enforced a year thereafter was dependent on the individual laboratories to develop their own methods.

2.3 Test Methods Development for PRERs Compliance

There was a gap between the introduction of RoHS in 2006 and the TC111/IEC standards in 2009. In the absence of the TC111 standards, many in-house methods were developed to produce the data required under to comply with RoHS directive. Although the same equipment was used by different laboratories, the actual sample treatment such as digestion of the samples or the sample size differs from laboratory to laboratory. In fact, there were test reports that showed analysis of RoHS samples using test methods intended for sludge analysis or even wastewater analysis. There was also the issue of testing on homogenous samples as defined according to RoHS regulated limits. Hence in the early days when RoHS-compliance was first required, it can be said the laboratories and the manufacturers faced very challenging times due to absence of standards for reference or guidance.

Hence the establishment of TC111 standards was much needed to provide international harmonization and acceptance of test results, especially as more countries such as China, Korea, Japan and even some of the ASEAN countries are beginning to develop their respective regulations that are similar to EU-RoHS.

Aside from more countries intending to introduce RoHS-related regulations, there is also the challenge of test methods development to cater to increasing number of new chemicals that are added to the market. Although there are already standards such as the IEC 62321 series (Part 1 – Part 8) that detail out test methods pertinent to the current EU-RoHS list, there will be more additions as technology evolved and new chemicals are developed. Hence the decision of TC 111 to establish a new work item titled “Test Method Development – Guide for Substance Selection” that was recently closed for voting in early August 2013. The guidance document was intended to provide a process for logically filtering, prioritizing and selecting candidate substances for development of

test method standards. The initiative to come up with the said document was the realization that there is a need for the development of reliable and acceptable test methods that are acceptable for conformity assessments. There was also the realization that development of reliable test methods meant the method should be technically correct (i.e. provide reliable analytical results); appropriate for the samples to be analyzed, tested and vetted by technical experts, and is unbiased in its application. Such criteria are fulfilled generally by test methods developed under international organizations such as IEC, ISO, ASTM and JIS. However, only limited substances can be covered, hence it is appropriate that the guide for substance selection for test method development be developed.

The TC111 standards are in fact evolving very fast and are reflective of EU's move toward multi-criteria assessment of products. The latest of the standard IEC TR 62726 Ed. 1 on Guidance on Quantifying Greenhouse Gas Emission Reductions from the Baseline for Electrical and Electronic Products and Systems that just went for a round of voting towards end of September 2013 showed environmental standardization of electrical and electronic products (EEPs) have expanded from considerations on hazardous substances to greenhouse gas management. Although categorized as a technical report (TR), the development of the document is most timely as it can be used as quantification guidance for GHG emission reductions of EEPs.

SECTION 3. GOVERNMENT POLICIES TO SUPPORT INDUSTRY'S COMPLIANCE TO PRERS

3.1 Equivalent PRERs in Malaysia

Malaysia has PRERs that are enforced or coordinated by a number of agencies under different Ministries. Figure 2 is a chart of the EU directives with PRERs elements, and the corresponding regulations that are enacted in Malaysia. Although the intention of the Malaysian regulations or schemes may have similar intentions, the scope of enforcement or coverage may differ especially with reference to specifying quantitative values or limits permitted for a product or system. In some cases, e.g. energy efficiency and registration of hazardous substances, the schemes are still at voluntary stage with built-in incentives to motivate participation of the manufacturers.

It has to be highlighted that the Malaysian PRERs or PRERs-related initiatives were not developed in respond to external factors such as supporting the industries to meet the emerging PRERs in the developed countries. However many of the PRERs were based either on international or selected good examples of certain countries' best practices or good policies worthy of adopting and adapting for enhancing safety and environmental protection and conservation in the country.

Each of the Malaysian legislative or 'voluntary' PRERs will be described briefly herewith:

3.1.1 End-of-Life Vehicle Policy

The Ministry of International Trade and Industry (MITI) had announced in early November 2013 that the government is expected to re-introduce the end-of-life vehicle (ELV) policy when the revised National Automotive Policy (NAP) is rolled out in mid-January 2014 after approval of the cabinet that likely to take place in December 2013. The ELV policy will likely be in the form of a mandatory annual comprehensive inspection of vehicles aged five years and

older, where vehicles that failed the inspection need to be sent for repair until they pass the inspection. There will be a need to build sufficient inspection centers before ELV can be implemented.

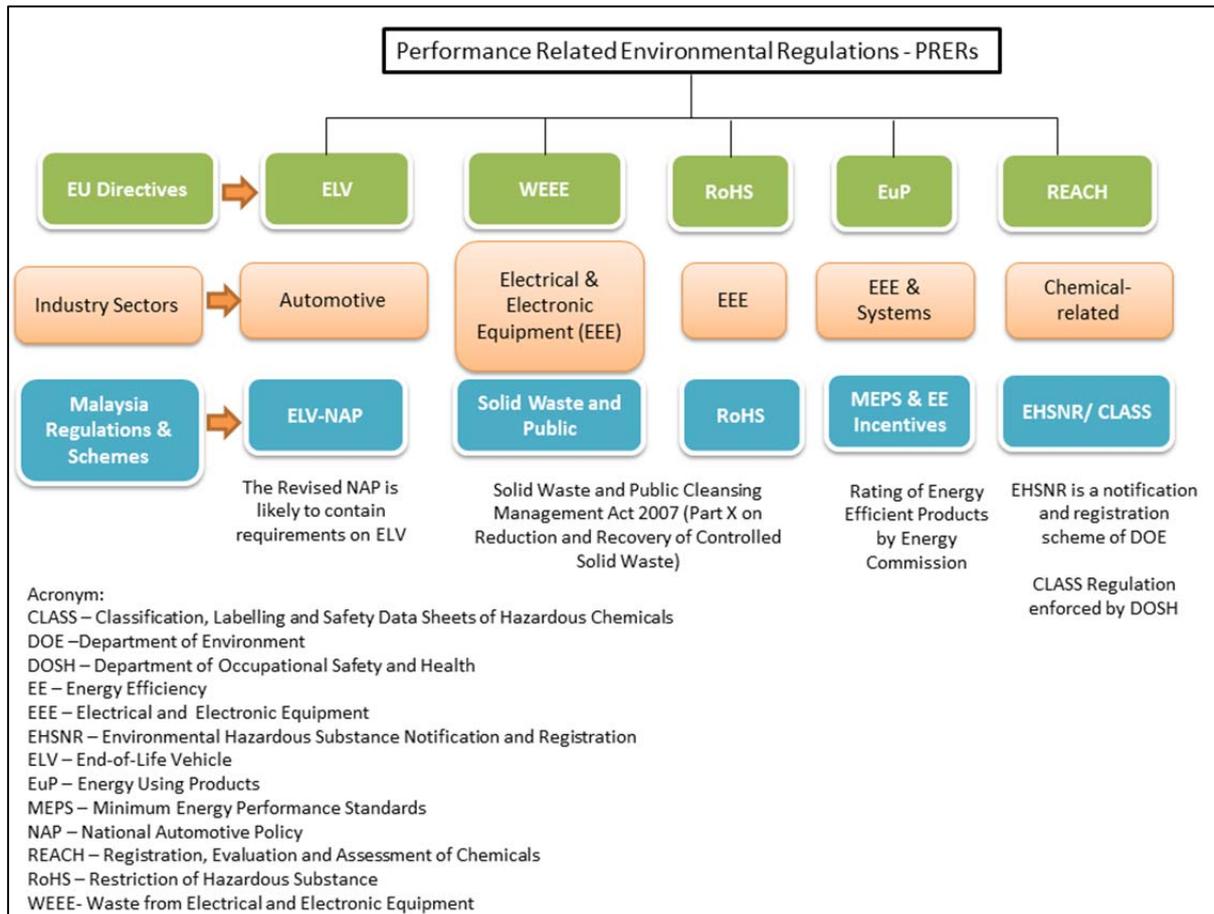


Figure 5: EU directives with PRERs elements, and the corresponding regulations in Malaysia.

3.1.2 Solid Waste and Public Cleansing Management Act

The Solid Waste and Public Cleansing Management Act 2007 is an act to provide and regulate the management of controlled solid waste and public cleansing for the purpose of maintaining proper sanitation and for matters incidental thereof.

Controlled solid waste means any solid waste that can be classified as commercial, construction, household, industrial, institutional, imported, public and those prescribed from time to time. With this broad coverage, it can be implied that the aspirations of EU directives such as WEEE and RoHS are addressed and represented for example by Part X of the Act.

Part X of the Act is on Reduction and Recovery of Controlled Solid Waste where use of environmental friendly material; use of specified amount of recycle materials for specified products; use of any method or manner that will reduce adverse impact of the solid waste on the environment, or for the purpose of enhancing 3R (reduce, reuse and recycle). The Act also provides the possibility of establishing take back system for specified products or good after use.

3.1.3 Energy Efficient Products

The Energy Commission of Malaysia is responsible for regulating the energy sector particularly electricity supply and piped gas supply industries. The Commission's role in energy efficiency is enshrined in the Efficient Management of Electrical Energy Regulations 2008. To further promote the efficient use of energy in the country, the Energy Commission introduced the Minimum Energy Performance Standards (MEPS) and Energy Efficiency (EE) incentives. Testing standards and performance criteria for eight (8) products and materials have been established to enable these products to be rated according to some index values or to attain performance that qualifies them for EE incentives.

The eight products and materials are: refrigerators, domestic electric fans, ballasts for fluorescent lamps, electric lamps, air conditioners, televisions, high efficiency motors and insulation materials.

3.1.4 EHS Notification and Registration Scheme (EHSNR)

The Environmental Hazardous Substance Notification and Registration (EHSNR) Scheme is operated by the Department of Environment (DOE) and has as its objective to collect information from the industry about the hazardous substances that are in the Malaysian market, covering those manufactured locally or imported. Based on the information submitted by industry, DOE will establish the Malaysian Chemicals Register.

The notification requirement will be phased over a number of years, and the first phase will include substances that are defined as environmentally hazardous substances (EHS) under the Environmental Quality Act (1974). The official definition for EHS is a substance that is included in the EHS Reference List or if not on the list, must be assigned a hazard category under the GHS Classification Scheme that is implemented by the Department of Occupational Safety and Health Malaysia.

3.1.5 CLASS Regulation

The Occupational Safety and Health (Classification, Labeling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 (CLASS Regulation) was published on 11th October 2013 in the Federal Government Gazette, and marked the notification of the regulation which will be enforced (made mandatory) in 2015. The CLASS Regulation was developed with reference to the Third Revised Edition of the UN Globally Harmonized System (GHS) Classification and Labeling of Chemicals.

The classification of substances will be carried out in accordance with the Industry Code of Practice (ICOP CLASS), while labeling and Safety Data Sheet should be prepared in dual language i.e. Malay and English language. The CLASS regulation is only applicable only to chemicals used in the work place and industry and does not cover consumer products.

3.2 Government Initiatives to Support SMEs for PRERs Compliance

3.2.1 New Economic Model of Malaysia

In 2010, the Government of Malaysia through Performance Management and Delivery Unit (PEMANDU) within the Prime Minister's Department has embarked on an Economic Transformation Program (ETP) as a strategy to compete successfully in the global economy and achieve high-income status. Through this initiative, 12 National Key Economic Areas (NKEA) has been identified as the key growth engines. NKEA will drive activities that have the potential to directly and materially contribute a quantifiable amount of economic growth to the Malaysian economy. The private sector leads ETP implementation with the Government as facilitator.

The 12 NKEAs will be anchored by 131 Entry Point Projects (EPPs), defined by initiatives with identified potential investors, well developed implementation plan and funding requirements clearly articulated. In addition to these EPPs, 6 Strategic Reform Initiatives (SRI) were launched in July 2011 with the aim to improve the business environment while boosting Malaysia's global competitiveness.

a) NKEA Electronics and Electrical: Eco Industrial Design Center (EIDC)

On 31 May 2012, SIRIM was requested to lead the NKEA initiative to set up an Industrial Design Centre of Excellence with the focus on providing services to SMEs in industrial design and rapid prototyping. EIDC was intended to provide the Electrical and Electronic (E&E) industry (specifically SMEs) access to design and prototyping capabilities in-terms of product conceptualizing, detail design, analysis including virtual and physical prototyping. Coupled with considerations on environmental performance that will be evaluated using tools and techniques such as Life Cycle Assessment (LCA), Material Flow Cost Accounting (MFA), EIDC will be able to provide:

- Assistance to SME from E&E sector to move up the design and manufacturing value chain (from OEM to ODM), by providing affordable, approachable services in the areas of conceptual & design developments using CAD (Computer Aided Design), CAE (Computer Aided Engineering) and RP (Rapid Prototyping)
- Assistance to local industries in the production of environmental-friendly products through eco innovation; hence enhancing the industries for global competitiveness
- Create a pool of industrial designers thorough talent development programs in collaborations with local training Institutes.

b) NKEA Agriculture: Unlocking value from Malaysia's biodiversity through high-value herbal products

Malaysia aims to capitalize our biodiversity advantage and the emerging global preference for natural products. A single agency, the Herbal Development Office (HDO) under the Ministry of Agriculture and Agro-based Industry has been tasked to oversee both upstream and downstream activities of the herbal industry. Herbal cultivation parks are being developed to ensure adequate and consistent supply of raw materials. Commercial-scale extraction facilities with a capacity of 1,000 kilograms per week will be built. Good

practices that come with the agriculture and processing technologies, namely Good Agriculture Practice (GAP) and Good Manufacturing Practice (GMP) are extensively promoted.

Further downstream, HDO looks at laboratories to supply reliable technical data for product registration. Development funds have been disbursed to upgrade existing laboratories in SIRIM, Institute of Medical Research and Melaka Biotechnology Corporation to meet the requirements of non-clinical safety data according to the principles of OECD Good Laboratory Practice (GLP). Out of the three laboratories SIRIM and Malacca Biotechnology Corporation have been certified to carry out *in vitro* GLP studies. Institute of Medical Research is currently being inspected for its *in vivo* GLP toxicity studies.

3.2.2 Consultation and Dissemination

The Ministry of International Trade and Industry (MITI) who is responsible to promote Malaysia's exports of manufactured products and services, and enhance the competitiveness of the manufacturing sector, is the Ministry that alerts the industry of new developments in the foreign market.

For example, to address REACH, a National Steering Committee was set up in 2008. This joint committee co-chaired by the Ministry of International Trade and Industry (MITI) and Chemical Industry Council of Malaysia (CICM), comprise representatives from the related government agencies as well as industry associations. Agencies within MITI, namely MIDA, MATRADE and SME Corp, posted in their websites the REACH pre-registration tagline to alert Malaysian exporters to EU. A public announcement via an advertorial titled 'Industry's Compliance to REACH – New European Union Chemical Regulation – No Registration, No Market' was published in a local newspaper on 9 June 2008. A series of workshops and seminars to provide specific guidance on REACH were organized in Kuala Lumpur, Penang and Johor. These events doubled up as a forum gathering views and comments on the direction of REACH implementation in Malaysia.

For products that are directly related to palm oil, rubber or other commodity crops, the Ministry of Plantation Industries and Commodities through its respective agencies such as Malaysia Palm Oil Board and Malaysia Rubber Board will coordinate as well as lead in addressing the compliance requirements for .example the EU Renewable Energy Directive (EU-RED) that require compliance to greenhouse gas savings quantum before locally produced biodiesel could be exported to the EU.

SECTION 4. PROFILE OF TESTING LABORATORIES IN MALAYSIA

In Malaysia, both public and private laboratories are subjected to the same quality management system, i.e. compliance to ISO 17025 Laboratory Quality Management System to produce accredited test reports required by government departments such as Department of Environment. Public laboratories are operated by government agencies and departments such as the Malaysia Chemistry Department, and the laboratories under the Ministry of Health. These laboratories are not obliged to receive samples directly from companies and in fact will only conduct tests for government agencies,

for use in regulatory enforcement, and sometimes for court cases. Private laboratories are free to receive samples from all parties that are from both public and private organizations, including SME companies.

4.1 Laboratory Accreditation Scheme of Malaysia (SAMM)

The Laboratory Accreditation Scheme of Malaysia (SAMM) was set up by the Government of Malaysia on 15 August 1990 under the purview of a Malaysia Accreditation Council. On 28 August 1996, Department of Standards Malaysia (STANDARDS MALAYSIA) was established under the Standards of Malaysia Act 1996 and takes over all national accreditation activities in Malaysia. For testing and calibration activities, STANDARDS MALAYSIA is signatories to the Asia Pacific Laboratory Accreditation Cooperation Mutual Recognition Arrangement (APLAC MRA) and the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA).

SAMM covers seventeen (17) scopes of accreditation activities including the following disciplines:

- Chemical. Chemical testing and analysis on products and materials.
- Biological. Biological, microbiological and biomedical, testing and measurement, including examinations of foods, drugs and pharmaceuticals.
- Electrical. Testing of electrical components, instruments and equipment including commercial and industrial equipment and household appliances.
- Thermal. Thermal characteristics of building materials, fire testing such as tests evaluating fire resistance, ignitability, flammability etc., of products and materials.
- Mechanical. Mechanical/physical and metallurgical testing of material and products. Includes tests such as tensile, rupture, elongation, elasticity, hardness and fatigue on materials.
- Toxicity. Testing for chemical products, manufactured products, cosmetic and skin care products, medical devices and also wastes and environmental samples.
- Electromagnetic Compatibility (EMC). Testing for electromagnetic compatibility including electromagnetic disturbance test and immunity test.

As of 31 October 2013, Standards Malaysia has listed in its website a total of 399 active accredited testing laboratories under SAMM. Out of these, laboratories having accreditation scope for Chemical (276), Mechanical (132) and Biological (52) tops the list.

Examples of local accredited laboratories.

a) Malaysia Chemistry Department

Malaysia Chemistry Department is a government agency under the Ministry of Science, Technology and Innovation Malaysia. A list of twelve Malaysia Chemistry Department laboratories under SAMM is presented in Annex V (Table 3). These laboratories conduct public testing, mainly for government agencies.

An Environmental Health Division provides services for safeguarding public health in terms of food and drinking water as well as for the protection and conservation of the environment. Another division the Industry and Trade Tariff Classification conducts analysis and advice services to various government agencies to back enforcement activities, protect government revenue, protect consumer and ensure worker safety.

b) SIRIM Berhad

SIRIM is a registered company fully owned by the government of Malaysia. A list of the ten laboratories in SIRIM under SAMM is presented in Annex V (Table 4). These laboratories offer testing services for both the government and private. The Chemical and Consumer Section of SIRIM QAS International Sdn Bhd provides heavy metal (Cadmium, Lead, Mercury and Chromium IV) and flame retardants (PBBs and PBDEs) test for RoHS. The Environment Research Technology Centre provides analytical, biodegradation and aquatic ecotoxicity test.

c) SGS Laboratory Services (M) Sdn Bhd

SGS is a renowned private entity with a network of offices and laboratories in over 50 countries. A list of its ten laboratories in Malaysia under SAMM is presented in Annex V (Table 5). SGS is capable of providing the full package for RoHS and REACH registration.

4.2 OECD Principles of Good Laboratory Practice (GLP)

OECD in a letter dated 10 April 2013, informed Malaysia becoming a full adherent to the OECD Council Acts related to the Mutual Acceptance of Data (MAD) in the Assessment of Chemicals. Malaysia is the sixth country after Argentina, Brazil, Singapore, South Africa and India to join the Chemicals Program related to MAD with all the rights and obligations of member countries.

The National Pharmaceutical Control Bureau (NPCB) Ministry of Health and Department of Standards (STANDARDS MALAYSIA) Ministry of Science, Technology and Innovation, had been designated as the Malaysian Compliance Monitoring Authorities (CMA) by the Malaysian Government. The types of test items differentiate the two CMAs. NPCB is the CMA for non-clinical safety testing for pharmaceutical products, cosmetics, veterinary drugs and food additives. STANDARDS MALAYSIA is the CMA for industrial chemicals, pesticides, feed additives and biotechnology (non-pharmaceutical) product.

Test facilities under NPCB and STANDARDS MALAYSIA's GLP Compliance Programs are listed in Annex VI Table 6 and Table 7, respectively.

SECTION 5. ACCREDITATION AND CERTIFICATION SCHEMES RELATED TO PRERS

In Malaysia, Department of Standards Malaysia is the national standardization organization of the country and as of , SIRIM is the main Standards Development Agency that both manage as well as oversee the writing of standards by Technical Committees and Working Groups as well as Standards Writing Organizations (SWOs). The development of standards, whether international, regional, national, association, or company level is deemed a needed activity to promote economic growth. It is only with the availability of standards that conformity assessment schemes can be developed. Conformity assessment schemes range from certification of management systems such as the environmental management system (ISO 14001), product certification that covers meeting specifications related to quality, safety and environmental performance, such as the SIRIM Ecolabelling Scheme and a Carbon Footprint Labelling Scheme that is in the pipeline.

SIRIM through her subsidiary company, SIRIM QAS International Sdn Bhd (SIRIM QAS International) operates all of the above mentioned schemes, and has also grouped the schemes listed below under its sustainability services:

- Eco-labelling Scheme
- Validation and Verification of Clean Development Mechanism (CDM) Projects
- Roundtable Sustainable Palm Oil & RSPO Supply Chain
- Forest Management & Chain-of-Custody
- ISO 14001 Environmental Management System
- ISO 5001 Energy Management System
- Energy Efficiency
- Photovoltaic Module Evaluation

SIRIM QAS International is one of the dozen or more certification bodies that have been accredited by Standards Malaysia. To encourage more applications for certification, SIRIM QAS International have started packaging a number of related schemes to reduce cost of investment on the part of the company. For example, a company can apply to have product certification and product ecolabelling at one time, thus saving auditors' fees. Schemes that have direct relevance to PRERs and are in greater demand will be briefly described herewith.

5.1 Environmental Management System (ISO 14001)

In Malaysia, the Environmental Management System (EMS) certification is offered by several international or foreign certification bodies and SIRIM QAS International. However SIRIM QAS International still commands the largest number of licenses issued for EMS certified companies. As of to-date, 650 companies have been certified to EMS 14001, the largest sector being Chemical and Material which represents 28.6% of the total.

5.2 SIRIM Ecolabelling Scheme

SIRIM Ecolabelling Scheme is a scheme owned entirely by SIRIM and operated through SIRIM QAS International. The Scheme is a Type I environmental labeling as categorized under the international standard ISO 14024 that is voluntary, multiple-criteria-based third party program that awards a license to use an environmental label on products indicating their overall environmental preferability within a product category.

The SIRIM Ecolabel is currently awarded to 40 local companies covering around 300 product models and brands, mostly in the building materials sector such as paint and cement. The testing required as evidence on the product environmental performance can be conducted in SIRIM or any private laboratories that are accredited.

5.3 Carbon Footprint Labelling Scheme

SIRIM is in the preparatory stage to run a pilot carbon footprint labeling scheme beginning from early 2014 and has target to achieve about 50 carbon foot printed-products by end of that year. The European Union is supporting SIRIM through the Switch Asia Fund to provide capacity building to the local companies and operation of the pilot programme specifically in the building materials sector. The life cycle assessment capability that is required to do carbon footprint of the product was first

established in SIRIM from around mid-2005 through capacity building projects provided by the Government of Japan through its ODA (Official Development Assistance) initiatives such as training courses and attachment of experts through AOTS (Association of Overseas Technical Scholarships), JETRO (Japan External Trade Organisation) and JEXA (Japan Expert Service Abroad) programmes.

The other schemes listed in the sustainability services have relatively small number of applicants as they are specialized schemes applicable to specific sectors and programmes.

SECTION 6. RECOMMENDATIONS

PRERs are new to the industry in particular SMEs as most countries, particularly in developing economies, only have laws related to emissions and discharge from factories. The notion of having to take care of the environmental performance of their products and services are challenging to manufacturers. Moreover, most SMEs do not understand the measurement of product environmental performance, and regulations like REACH and RoHS are not easy to read, especially if they are not strong in the English language. These regulations are complex and the type of tests needed is sometimes not commonly done for e.g. ecotoxicology and genotoxicology.

Although the regulations affect the manufacturers directly, the laboratories have to be aware of the regulations too in order to prepare their laboratory facilities and competencies, including getting the necessary accreditation and recognition for their test reports to be accepted. Laboratory service is a demand-driven service so the business potential has also got to be assured before the necessary investments are made.

With more PRERs emerging in different parts of the world, it is no longer just the manufacturers who have to keep tap on the latest development but also the laboratories. One of the latest developments in the EU that will become a PRER in future and expected to have a high impact on the industry is the Environmental Footprint. The Official Journal of the European Union Non-Legislative Acts 2013/179/EU: Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate life cycle environmental performance of products and organizations has in fact triggered other concerns to the industry. This recommendation has been widely circulated in most communications under the caption of Environmental Footprint (EFP) that is intended to profile environmental performance of products beyond that of Carbon Footprint (CFP), which is covering impact categories besides greenhouse gas emission and climate change.

SIRIM has only just started to introduce CFP labeling for the industry and the preparations needed, including capacity building and information dissemination are investment-intensive. To have to migrate to a bigger scope such as environmental footprint will be another challenge that the organization will have to take in order to help the local industry sustain their export market.

The emergence of more PRERs especially coming from the developed countries do create financial as well as manpower burdens for companies in Malaysia especially for export-oriented companies who export to more than one country. Some strategies that can be considered are presented briefly herewith.

In the case of testing requirements, companies should mandate provision of test data from upstream suppliers of raw materials, auxiliary materials and parts. By implementing good

manufacturing practices to ensure avoidance of any form of contamination during production stage, the companies can be more confident that their final products produced from PRERs-compliant raw materials or parts will be PRERs-compliant, e.g. RoHs of different countries.

Companies especially the SMEs need to establish good record-keeping of inventories and data generated from testing or evaluation reports. Many of the PRERs of different countries bear similarities in terms of target substances and methodologies. Most differ only in the number of substances to be monitored or measured, and also the permissible limits. Having a stable and good quality management system such as ISO 9001 (not necessary to achieve certification) where procedures and records are mandated items to be monitored, it will also make it easier to extract the necessary information for submission to the different countries and schemes. This is one way to reduce the burden of regular testing or time taken to extract information for submission to PRERs requirements including labeling schemes.

The REACH directive does encourage sharing of information e.g. the Substance Information Exchange Forum (SIEF). Data sharing will help reduce the financial burden of testing requirements. However the challenge will be on the confidentiality and trade secrets among competing companies producing the same chemicals or products. The involvement of the respective industry associations as platform for data sharing could enhance confidence and trust among the companies with common data requirements. A good example is the Malaysia Oleochemical Manufacturers Group (MOMG) who has helped to form consortium among members to enable joint registration of their chemicals to meet the REACH requirements.

Finally it should be mentioned that if the PRERs are really beneficial for environmental protection and conservation, their compliance should be viewed as something positive. The private sector, in particular the SMEs should be provided with the necessary support of capacity building and technical infrastructures to enable them attain compliance while still sustaining profit margin. The three pillars of sustainability from the aspects of environment, economic and social development should be balanced so as not to sacrifice the needs of the future generation.

Annex II. Testing Services Available in SIRIM Berhad

Non-Clinical Testing

| No. | Type of Test/ Testing Facilities | Applications |
|-----|---|--|
| 1. | Health Hazard <ul style="list-style-type: none"> • Acute Oral Toxicity • Balb/c 3T3 NRU Cytotoxicity • In Vitro Skin Corrosion Test • In Vitro Skin Irritation Test • Skin Sensitization: Local Lymph Node Assay • In Vitro 3T3 NRU Phototoxicity Test • Skin Absorption: In Vitro Method • Bacterial Reverse Mutation Test • In Vitro Mammalian Chromosome Aberration Test | Compliance to registration requirements (specifically for safety assessment) Industrial Chemicals Cosmetics Pesticides Pharmaceuticals |
| 2. | Effects on Biotic Systems <ul style="list-style-type: none"> • Algae, Growth Inhibition Test • Daphnia sp., Acute Immobilisation Test • Fish, Acute Toxicity Test • Terrestrial Plant Test Acute toxicology | |
| 3. | Degradation and Accumulation Testing <ul style="list-style-type: none"> • Ready Biodegradability • Ultimate Biodegradability • Partition Coefficient Pow | |
| 4. | Physical Chemical Testing <ul style="list-style-type: none"> • pH • Boiling Point • Melting Point • Specific Gravity • Flash Point • Relative Density • Flammability • Vapour Pressure • Solubility • Dissociation Constant • Hydrolysis | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Chemical and Consumer Products Testing

| No. | Type of Test/Testing Facilities | Applications |
|---|---|--|
| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 | Atomic Absorption Spectrometry Inductively Coupled Plasma – Optical Emission Spectrometer Carbon and Sulphur Analyzer Gas Chromatography Gas Chromatography – Mass Spectrometer Environmental Chamber Salt Spray Tester Ion Chromatography UV-Visible Spectrophotometer High Performance Liquid Chromatography Xenon Arc Accelerated Weathering Chamber Controlled Temperature and Humidity Chamber Digital Bursting Tests Equipment Flammability Testing Equipment Flash Point Tester UV-Accelerated Weathering Machine Tester Rotating Disc Electrode Atomic Spectrometer Digital Density Meter Mercury Analyzer Cathodic Disbonding Tester Universal Testometric Machine Martindale and Taber Abrasion Tester | <p>Non Industrial Product Lab:</p> <ul style="list-style-type: none"> • Fertilizers • Detergents • Toys • Herbal Products • Cosmetics/Skincare Products • Traditional Medicine • Pharmaceutical Products • Food Wares • Beverages • Cocoa Products • Flour • Food and Health Supplements • Fat and Cooking Oil • Dairy Products • Meat Products (Poultry, Marine Products) • Sauces • Spices • Sugar and Sugar Products • Water Filter • Water Treatment Chemical <p>Industrial Product Lab:</p> <ul style="list-style-type: none"> • Fabrics and Apparels • Carpet and Carpet Underlay • Geotextiles • Paper and Fiber Products • Decorative Paints • Varnish • Roadmarking Paints • Thermoplastics • Reflective Sheetings • Automotive Parts • Fuel Oil • Engine Oil • Metalworking Fluid • Fuel Additive • Cement and Concrete • UPVC Pipes • Building Materials • Adhesive, Aluminium Foil Laminated |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Material Characterization

| No. | Type of Test | Applications |
|-----|---|---|
| 1 | Thermal Analysis <ul style="list-style-type: none"> • Simultaneous Thermal Analyser (Ambient to 1600°C) • High Temperature Dilatometer (up to 2000°C) • Differential Scanning Calorimeter (DSC) • Dynamic Mechanical Analyser (DMA) • Thermal Mechanical Analyser (TMA) | Diverse types of solid and liquid materials |
| 2 | Composition Analysis <ul style="list-style-type: none"> • X-ray Diffractometer (XRD) • Fourier Transformed Spectrophotometry (FT RAMAN) • Double Beam UV/VIS/NIR Spectrometer • X-Ray Photoelectron Spectroscopy (XPS) • Inductive Couple Plasma – Optical Emission Spectroscopy (ICP-OES) • Oxygen & Nitrogen Analyzer • High Performance Liquid Chromatography (HPLC/SEC. LCMS) | |
| 3 | Physical and Mechanical Properties <ul style="list-style-type: none"> • Vickers Macrohardness Tester • Rockwell Hardness Tester (Automatic scale conversion: Vickers, Brinell, Superficial Rockwell and strength) • Specific Gravity Meter • Particle Size Analyser (0.2 to 2000 microns) • Universal Testing Machine (1K, N10KN, 50KN, 100KN, 250KN) • Nano Indenter • BET | |
| 4 | Corrosion Analysis <ul style="list-style-type: none"> • Salt Spray Chamber (corrosion rate test) • Temperature/Humidity Chamber • Moisture Analyzer • Glove Box | |
| 5 | Imaging and Surface Analysis <ul style="list-style-type: none"> • Field Emission Scanning Electron Microscope (with EDAX and WDX) • Environment Scanning Electron Microscope (with EDAX) • Scanning Transmission Electron Microscope (STEM. 200KV) • Scanning Tunneling Microscope (STM) • C-Scan • Optical Microscope (max. up to 1K) • Stereo Microscope • Pin-On-Disk Tribometer • Atomic Force Microscope | |
| 6 | Structural Analysis <ul style="list-style-type: none"> • Metallography Equipment (hot and cold mounting, grinders, polisher and cutter) • Friction Test (Dry Friction Test and Friction Assessment Screening Test) • Vibrating Sample Magnetometer (VSM) | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Mechanical Testing

| No. | Type of Test/Testing Facilities | Applications |
|---|--|---|
| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 | Climatic Cold temperature Dry heat Cyclic heat with humidity Steady state heat with humidity Thermal shocks Solar radiation Dust and IP test Pressure test Thermal-vibration Dynamic Vibration Shock Drop/Impact Endurance Penetration Compression Mechanical reliability | Mechanical Products <ul style="list-style-type: none"> • Water meter • Stop cocks • Pillar and bib taps • Butterfly-, gate-, sluice- and check-valves • Burglary safe • Lighting column • Portable ladder • Mobile tower Personal Protective Equipment <ul style="list-style-type: none"> • Motorcyclist helmet • Visors • Rain coat • Safety goggles • Safety shoes • Bicycle helmets • Industrial helmets • Personal protective gears (antiriot helmet, antiriot shields) Gas Appliances <ul style="list-style-type: none"> • LPG regulator • Gas hoses • Gas cooker • LPG valve • Gas valve • Laboratory burner or portable burner • Commercial and industrial cooker Packaging <ul style="list-style-type: none"> • Drums • Jerricans • Intermediate bulk container • Bag//sacks • ISTA testing • Boxes • UN Marking test Reliability Testing <ul style="list-style-type: none"> • Electrical and electronic parts & components • Environmental simulation (mechanical and climatic) |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Mechanical Testing (ctd.)

| No. | Type of Test | Applications |
|-----|--|--|
| 1 | Universal Testing Machine (+-100kN) – This machine designed for the tension, compression, transverse and bending test on metallic materials and others | Vehicle Components <ul style="list-style-type: none"> • Interior components • Exterior components • Accessories component • Fixtures components |

Physical Mechanical Testing

| No. | Type of Test | Applications |
|-----|---|--------------|
| 1 | Universal Testing Machine (+-100kN) – This machine designed for the tension, compression, transverse and bending test on metallic materials and others | |
| 2 | Micro-Vickers Hardness Tester (Load range: 0.05 to 2000 gram-force) – capable to measure the hardness of any identical structures | |
| 3 | Specimen preparation for microstructure analysis – cutting, mounting in hot and cold, grinding and polishing | |
| 4 | Laser Particle Size Analyser (0.04 to 2000 microns). This instrument capable of analyzing particle size of suspended powders over the range 0.04mm tp 2mm | |
| 5 | Pin-On-Disk Tribometer – the determination of friction and wear behavior of almost solid state material | |
| 6 | Scratch Tester – for characterizing hard-coated materials, with a typical coating thickness exceeding 1 um | |
| 7 | Pull Off Adhesion Tester – measures the force required to pull a coating from its substrate | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Plastics Testing

| No. | Type of Test/ Testing Facilities | Applications |
|-----|--|---|
| 1 | <p>Thermal and Spectroscopic Analysis</p> <ul style="list-style-type: none"> - Material, contamination and failure analysis - Thermal profile, glass transition temperature (T_g), heat of fusion, crystallinity, specific heat capacity (C_p), oxidative induction time (OIT), curing analysis and kinetic studies - Material composition, filler content, carbon black content, onset of degradation - Coefficient of thermal expansion, stiffness and damping, softening temperature | <ul style="list-style-type: none"> • Plastic and composite materials • Polymer characterization and analysis • Aerospace composites material testing • Plastic product failure analysis |
| 2 | <p>Physical and Mechanical Properties</p> <ul style="list-style-type: none"> - Tensile, flexural, compressive and tear properties - Izod, Charpy and tensile impact at both ambient and sub-ambient temperatures, dart drop impact - Shore A and D, Rockwell and IRHD Hardness - Fatigue and dynamic mechanical evaluation - Strain measurements and Poisson ratio determination using strain gauges - Density of solids, foam and powder - Rheology and melt flow - Haze, light transmittance, opacity and colour change - Carbon black dispersion | |
| 3 | <p>Environmental Conditioning</p> <ul style="list-style-type: none"> - Heat ageing, heat cycle, heat reversion, shrinkage - Temperature and humidity conditioning - Accelerated weathering - Environmental stress cracking resistance (ESCR) | |
| 4 | <p>Others</p> <ul style="list-style-type: none"> - Surface and volume resistivity and breakdown voltage - Flammability (UL94), smoke density and limiting oxygen index (LOI) - Heat deflection temperature (HDT) and Vicat softening temperature - Moldflow simulation analysis for injection moulding (flow, cool, warp and shrink) - Oxygen transmission rate (OTR) and water vapour transmission for packaging films | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Civil and Construction Testing

| No. | Type of Test | Applications |
|-----|---|-------------------------------|
| 1 | Automatic Vicat Apparatus | Adhesive & Admixture |
| 2 | Cement Testing Apparatus to MS & EN Standards | Aggregates |
| 3 | Sanitary Ware Testers | Building Panels & Partition |
| 4 | Charpy Impact Tester Complete with Temperature Bath for Sub-Zero Temperature | Ceiling Suspension System |
| 5 | Hydraulic Structural Test Frame | Cement |
| 6 | Universal Testing Machines (10KN, 50KN, 200KN, 500KN, 1000KN, 2000KN and 3000KN) | Concrete Admixtures |
| 7 | Compression Machine | Concrete Pipes, Poles & Piles |
| 8 | IPT Pipe Hydrostatic Tester | Ceramic Tiles |
| 9 | Rockwell, Vickers, Brinell Hardness Testers | Conduits |
| 10 | Glass Impact Tester | Doors & Windows |
| 11 | Temperature Humidity Chambers | Drainage & Sewerage Products |
| 12 | Complete Facilities for Raised Access Floor Testing | Fasteners |
| 13 | Engineered Strong Floor – 14m x 9m | Floor Hardeners |
| 14 | Double Climatic Chambers for Thermal Resistance Measurements & Weathering Effects | FRP Septic Tanks |
| 15 | Universal Hardness Tester | Grating & Manholes |
| | Reverberation Rooms for Building and Room Acoustic Testing | Gypsum |
| 16 | Temperature Hot-Cold Cyclic Tester for Pipes & Fitting | Highway Guardrails |
| 17 | Single Portal Frame – 2000KN Capacity | Insulation Materials |
| 18 | Melt Flow Apparatus | Lifting Devices |
| 19 | Equipment for Testing of Hardened Concrete | Manhole Covers & Frames |
| 20 | Equipment for Testing of Hardened Concrete | Masonry |
| 21 | Equipment for Testing of Water Tanks/Vessels | Mechanical Testing |
| 22 | UV-VIS-NIR Spectrophotometer | Metallic Materials |
| 23 | Acoustics Test (Wall/Panel/Door/Ceiling) | Metallurgy |
| | | Natural Stones |
| | | Pipe & Fittings |
| | | Plasters |
| | | Playground Equipment |
| | | Pavers |
| | | Precast Building Components |
| | | Precast Concrete Products |
| | | Raised Access Floors |
| | | Reinforcing Steels |
| | | Road Reflectors |
| | | Roofing Materials |
| | | Safety Glass |
| | | Sanitary Wares |
| | | Soil |
| | | Steel Bars |
| | | Steel Water Tanks |
| | | Structural Elements |
| | | Structural Steels & Sections |
| | | Temporary Structures |
| | | Thermal Resistance Test |
| | | Tile Adhesive |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Civil and Construction Testing (ctd.)

| No. | Type of Test | Applications |
|-----|--------------|---|
| | | Water Proofing Welded Joints Wire Products, Wire Rods & Wires Wire Ropes & Chain Slings Wood-based Products |

Fire Testing

| No. | Type of Test/ Testing Facilities | Applications |
|-----|---|--|
| 1 | Horizontal Fire Resistance Test Furnace | Fire Resistance Tests for Non-loadbearing and Loadbearing Horizontal Elements of Construction - Flooring System - Roofing System - Suspended Ceiling System - Beam - Roller Shutter Assemblies (Horizontal) - Ducting System |
| 2 | Vertical Fire Resistance Test Furnace | |
| 3 | Indicative Fire Resistance Test Furnace | |
| 4 | Non-Combustibility Test Apparatus | |
| 5 | Surface Spread of Flame Test Apparatus | |
| 6 | Cyclic Movement Endurance Test Apparatus | |
| 7 | Facilities for Performance Testing of Portable Fire Extinguishers | |
| 8 | Hydrostatic Test Apparatus | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Fire Testing (ctd.)

| No. | Type of Test | Applications |
|-----|--------------|---|
| | | <p>Indicative Fire Resistance Tests on Products/Systems</p> <ul style="list-style-type: none"> - Iron Mongeries - Horizontal Building Elements - Vertical Building Elements - Penetration Seals <p>Reaction to Fire Tests</p> <ul style="list-style-type: none"> - Non – Combustibility Test - Surface Spread of Flame Test - Fire Propagation Test <p>Active Fire Protection System for Performance Tests</p> <ul style="list-style-type: none"> - Portable Fire Extinguishers (Water, Foam, Dry Powder and CO₂) - Fire Reel Hoses - Fire Hose Reels - Landing Valves - CO₂ Valves |

Electrical and Electronic

| No. | Type of Test/ Testing Facilities | Applications |
|-----|----------------------------------|----------------------------------|
| 1 | Endurance Test | Lighting & Accessories |
| 2 | Luminaire Testing | - Luminaires |
| 3 | Surge Test | - Ballast |
| 4 | Fan Testing | - Exit Sign |
| 5 | Impulse Generator | - Emergency Light |
| 6 | High Current Injector | - Street Lantern |
| 7 | Short-Circuit Generator | - LED, Lamp Holders |
| 8 | Battery Tester | |
| 9 | Ageing Test Chamber | IT & Office Equipment |
| 10 | Temperature Rise Test | - Mobile Phone |
| 11 | Dielectric Strength Test | - Fax Machine |
| 12 | Touch Current Test | - Single Line Telephone |
| 13 | Low Temperature Chamber | - Personal Computer |
| 14 | Ionic Radiation | - Laptop/Notebook |
| 15 | Glow-Wire Tester | |
| 16 | Earth Continuity Tester | Laboratory & Measuring Equipment |
| 17 | Winding Resistance Measurement | - Low Voltage D.C Power Supply |
| 18 | Humidity Chamber | - Equipment for Measurement |
| | | - Control Equipment |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Electrical and Electronic (ctd.)

| No. | Type of Test | Applications |
|-----|--------------|---|
| | | Electrical Fire Protection Devices - Fire Alarm Panel - Manual Call Point - Fire Alarm Bell Domestic Appliances - Socket Outlet - Fan Audio-Video Equipment - Television - Video - Amplifier and Audio Equipment - Video Player and Recorders Radio and Hi Fi Wiring Accessories - Switches and Dimmers - Plug Socket Outlet - Appliance Connector - Adapters - Circuit Breakers - RCCB & SPD - Switched Fused - Photoelectric Control Units - Cable Reel Energy Efficiency - Power Supply Component and Materials - Ball Pressure Test - Glow Wire Test - Needle Flame Test - Burning Test Cable & Wires - Low Voltage and Medium Voltage Cables - Flexible Cables - Branch Cables - Aluminium Conductors for Overhead Transmission - Copper Bar and Strip - Earth Rods Cable Management - Cable Ladder & Tray - Trunking - Conduit - Busduct - Earth Rods IP Test Third Parties for Witness Test Service |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Energy Efficiency

| No. | Type of Test/ Testing Facilities | Applications |
|-----|--|------------------------------|
| 1 | Temperature Humidity Chamber | Refrigerator |
| 2 | Data Acquisition | Air Conditioner |
| 3 | Balanced Ambient Room Type Calorimeter | Television |
| 4 | IEC Dynamic Broadcast Content Video Signal | Lamp |
| 5 | Integrating Sphere | Ballast for Fluorescent Lamp |
| | | Domestic Electric Fan |

Radio Frequency & Electromagnetic Compatibility

| No. | Type of Test/ Testing Facilities | Applications |
|-----|--|---|
| 1 | 3G/GSM Test System | <ul style="list-style-type: none"> • Radio and Telecommunication Product • Information and Technology Equipment • Industrial, Scientific and Medical Product • Audio Video Product • Lighting Apparatus • Household Appliances • Electrical and Electronic Sub Assembly (Vehicle Component) • Electrical and Electronic Equipment in Military Related Application |
| 2 | Telephony Test System | |
| 3 | Radio Test System - Shielded Room - 3 m Semi Anechoic Chamber - 5 m Fully Anechoic Chamber - 10 m Open Area Test Site | |
| 4 | EMC Emissions Testing - Radiated Emissions: - 3 m Semi Anechoic Chamber - 5 m Fully Anechoic Chamber - 10 m Open Area Test Site | |
| 5 | - Conducted Emissions - Continuous Disturbance Voltage - Discontinuous Disturbance Voltage - Power Disturbance - Harmonic Current - Voltage Flickering and Fluctuation | |
| 6 | EMC Immunity Testing - Radiated Immunity - Conducted Immunity - Electrostatic Discharge - Burst/Electrical Fast Transient - Surge - Voltage Dips and Interruption - Power Frequency Magnetic Field - Immunity System for Audio Video - Transient for Automotive - Bulk Current Injection | |

Annex II. Testing Services Available in SIRIM Berhad (ctd.)

Microbiological Test

| No. | Type of Test/ Testing Facilities | Applications |
|-----|-------------------------------------|---------------------------------------|
| 1 | Aerobic Plate Count | FDA Bacteriological Analytical Manual |
| 2 | Yeast & Mould Count | FDA Bacteriological Analytical Manual |
| 3 | Antimicrobial Finishes | ASTM E2149/ISO 22196 |
| 4 | Antimicrobial Preservative Efficacy | USP 51 |
| 5 | Microbial Identification | Molecular Techniques |

Annex III. Industry Committees for Standards Development

| No. | ISC | Sector |
|-----|-----|--|
| 1 | A | Agriculture |
| 2 | B | Chemicals and Materials |
| 3 | D | Building, Construction and Civil Engineering |
| 4 | E | Generation, Transmission and Distribution of Electrical Energy |
| 5 | F | Mechanical Engineering |
| 6 | G | Information Technology, Telecommunications and Multimedia |
| 7 | H | Petroleum and Gas |
| 8 | I | Halal Standards |
| 9 | J | Plastics and Plastics Products |
| 10 | K | Packaging and Distributions |
| 11 | L | Road Vehicles |
| 12 | M | Fire Safety and Prevention |
| 13 | N | Rubber and Rubber Products |
| 14 | O | Organizational Management |
| 15 | P | Iron and Steel |
| 16 | Q | Textiles and Apparels |
| 17 | R | Medical Device and Facilities for Healthcare |
| 18 | S | Electrical Equipment and Accessories |
| 19 | T | Tourism, Exhibition and Hospitality Services |
| 20 | U | Food and Food Products |
| 21 | W | Occupational Health and Safety |
| 22 | Y | Quality Management and Quality Assurance |
| 23 | Z | Environmental Management |

Annex IV. Adoption of TC 111 Standards in Malaysia

| No. | Title of Standard | Remark |
|-----|--|---|
| 1 | IEC 62321-1 Ed 1.0 Determination of certain substances in electrotechnical products – Part 1: Introduction and overview | Adopted as MS IEC 62321:2010 in June 2010, subsequent splitting of the initial IEC standard into 8 parts was not followed as the process of producing MS standards is lengthy and need to go through approval of Minister of Science, Technology and Innovation |
| 2 | IEC 62321-2 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 2: Disassembly, disjunction and mechanical sample preparation | |
| 3 | IEC 62321-3 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 3-1: Screening electrotechnical products for lead, mercury, cadmium, total chromium and total bromine using x-ray Fluorescence Spectrometry | |
| 4 | IEC 62321-3-2 Ed. 1.0 Determination of certain substances in electrotechnical products – 3-2: Screening of total bromine in electric and electronic products by combustion-ion chromatography (C-IC) | |
| 5 | IEC 62321-4 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 4: Determination of mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS | |
| 6 | IEC 62321-5 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 5: Determination of cadmium, lead, and chromium in polymers and electronics and cadmium and lead in metals by AAS, AFS, ICP-OES and ICP-MS | |
| 7 | IEC 62321-6 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 6: Determination of polybrominated biphenyls and polybrominated diphenyl ethers in polymers and electronics by GC-MS, IAMS and HPLC-UV | |
| 8 | IEC 62321-7-1 Ed. 1.0 Determination of certain substances in electrotechnical products – Part 7-1: Determination of the presence of hexavalent chromium (Cr(VI)) in colourless | |

| | | |
|----|---|--|
| | and coloured corrosion-protected coatings on metals by the colorimetric method | |
| 9 | IEC 62321-7-2 Ed.1.0 Determination of certain substances of electrotechnical products – Part 7-2: Determination of hexavalent chromium (Cr(VI)) in polymers and electronics by the colorimetric method | |
| 10 | IEC 62321-8 Ed. 1.0 IEC 62321-8 Ed.1 – Determination of certain substances in electrotechnical products – Part 8: Determination of specific phthalates in polymer materials by mass spectrometry | |
| 11 | IEC 62542 Ed. 1.0 Environment standardization for electrical and electronic products and systems – Standardization of environment aspects – Glossary of terms | |
| 12 | IEC 62545 Ed. 1.0 Voting result on 111/86/NP (-PAS): Environmental information on Electrical and Electronic Equipment (EIEEE) | MS IEC 62545:2011 was adopted even during draft stage, subsequently when there was no consensus at international level and the IEC was converted to PAS (Publicly Available Specification), the MS standard remained status quo in Malaysia. |
| 13 | IEC/TR 62725 Ed. 1.0 Quantification methodology of greenhouse gas emissions (CO ₂ e) for electrical and electronic products and systems | |
| 14 | IEC/TR 62726 Ed.1.0 Quantification Methodology of greenhouse gas emission (CO ₂ e) reductions for electrical and electronic products and systems from the project baseline | |
| 15 | IEC/TR 62824 Ed. 1.0 Guidance on consideration and evaluation on material efficiency of electrical and electronic products in environmentally conscious design | |
| 16 | IEC 62321 Edition 1.0 (2008-12-11) Electrotechnical products – Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers) Stability Date: 2012 | |
| 17 | IEC 62430 Edition 1.0 (2009-02-23) Environmentally conscious design for electrical and electronic products Stability Date: 2012 | |
| 18 | IEC 62430 | |

| | | |
|----|--|--|
| | Edition 1.0 (2009-02-23) Version Oficial En espanol – Diseno ecologico de products electricos y electronicos Stability Date: 2012 | |
| 19 | IEC 62474 Edition 1.0 (2012-03-22) Material declaration for products of and for the electrotechnical industry Stability Date: 2015 | |
| 20 | IEC/TR 62476 Edition 1.0 (2010-02-18) Guidance for evaluation of product with respect to substance-use restrictions in electrical and electronic products Stability Date: 2013 | The committee recommended adoption of MS 62476:2011 as it was considered useful to support RoHS testing. |
| 21 | IEC/TR 62596:2011 Electrotechnical Products – Determination of Restricted Substances – Sampling Procedure Guidelines | Adopted as MS 62596:2011 as it was considered useful to support RoHS testing |
| 22 | IEC/TR 62635 Edition 1.0 (2012-10-19) Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment | |
| 23 | IEC 62430:2009 Environmentally Conscious Design for Electrical and Electronic Products | Adopted as MS IEC 62430:2010 as it was seen to be useful to introduce ecodesign concept in the country. |

Annex V. Examples of Laboratories under SAMM

Table 3: Malaysia Chemistry Department Laboratories under SAMM

| No | SAMM | Laboratory | Field |
|----|--------|--|-----------------------------|
| 1 | No 61 | Jabatan Kimia Malaysia, Selangor | Chemical, Heat, Temperature |
| 2 | No 93 | Jabatan Kimia Malaysia, Makmal Negeri Perak, Perak | Chemical |
| 3 | No 131 | Jabatan Kimia Malaysia, Makmal Negeri Johor, Johor | Chemical |
| 4 | No 132 | Jabatan Kimia Malaysia, Makmal Negeri Terengganu, Terengganu | Chemical |
| 5 | No 133 | Jabatan Kimia Malaysia, Makmal Negeri Pulau Pinang, Penang | Chemical |
| 6 | No 134 | Jabatan Kimia Malaysia, Makmal Negeri Pahang, Pahang | Chemical |
| 7 | No 135 | Jabatan Kimia Malaysia, Makmal Negeri Sarawak, Sarawak | Chemical |
| 8 | No 136 | Jabatan Kimia Malaysia, Makmal Negeri Sabah, Sabah | Chemical |
| 9 | No 137 | Jabatan Kimia Malaysia, Makmal Bintulu, Sarawak | Chemical |
| 10 | No 232 | Jabatan Kimia Malaysia, Makmal Negeri Melaka, Melaka | Chemical |
| 11 | No 557 | Jabatan Kimia Malaysia, Cawangan Kedah / Perlis | Chemical |
| 12 | No 579 | Jabatan Kimia Malaysia, Makmal Cawangan Sibul | Chemical, Microbiological |

Annex V. Examples of Laboratories under SAMM

Table 4. Laboratories in SIRIM under SAMM

| No | SAMM | Laboratory | Field |
|----|--------|---|-------------------------------------|
| 1 | No 85 | Civil and Construction Section (CCST – Testing Group), SIRIM QAS International Sdn Bhd, Selangor | Mechanical |
| 2 | No 86 | Electrical and Electronics Section (EEST- Testing Group), SIRIM QAS International Sdn Bhd, Selangor | Electrical Testing |
| 3 | No 87 | Chemical and Consumer Section, Testing Services Department, SIRIM QAS International Sdn Bhd, Selangor | Mechanical, Chemical |
| 4 | No 195 | Environment Technology Research Centre, SIRIM Berhad, Selangor | Chemical |
| 5 | No 219 | Mechanical and Automotive Section (MAST – Testing Group), SIRIM QAS International Sdn Bhd, Selangor | Mechanical |
| 6 | No 231 | Fire Protection Section (FPST – Testing Group), SIRIM QAS International Sdn Bhd, Selangor | Thermal Testing |
| 7 | No 299 | Radio Frequency and Electromagnetic Compatibility Section (FREMCT), SIRIM QAS International Sdn Bhd, Selangor | Electrical Testing |
| 8 | No 313 | Joining Technology and Inspection Programme, SIRIM Berhad, Selangor | Mechanical, Non Destructive Testing |
| 9 | No 377 | Electrical and Electronics Section (EEST- Testing Group), SIRIM QAS International Sdn Bhd, Penang | Mechanical, Electrical |
| 10 | No 474 | Plastics Technology Group, Advances Polymer and Composite Programme, SIRIM Berhad, Selangor | Mechanical, Thermal Testing |

Table 5: SGS Laboratory Services (M) Sdn Bhd under SAMM

| No | SAMM | Laboratory | Field |
|----|--------|---|------------------------|
| 1 | No 175 | SGS Petrotechnical Inspection (M) Sdn Bhd, Labuan | Chemical |
| 2 | No 287 | SGS Laboratory Services (M) Sdn Bhd, Selangor | Mechanical, Chemical |
| 3 | No 382 | SGS Laboratory Services (M) Sdn Bhd, Johor | Chemical |
| 4 | No 531 | SGS Laboratory Services (M) Sdn Bhd, Selangor | Mechanical, Chemical |
| 5 | No 532 | SGS Laboratory Services (M) Sdn Bhd, Penang | Chemical, Microbiology |
| 6 | No 611 | SGS Laboratory Services (M) Sdn Bhd, Sarawak | Chemical |

Annex VI. Examples of Laboratories under SAMM

Table 6: Test facilities under NPCB's GLP Compliance Programs
(as of November 2013)



| | | | |
|-------------|--|--------------|---------------------|
| bpfk | GOOD LABORATORY PRACTICE COMPLIANCE PROGRAM | Document No: | PKPB/300/105 |
| | LIST OF GLP COMPLIANT TEST FACILITIES | Issue Date | 1 July 2012 |
| | | Version | 3 |
| | | Replace | Version 2 |
| | | Page | 1 of 1 |

These Test Facilities are entered in the NPCB|GLP Compliance Monitoring Program and shall be periodically inspected.

YEAR : 2013

| TEST FACILITY & ADDRESS | REGISTRATION NUMBER | SCOPE | AREA OF EXPERTISE | DATE OF CERTIFICATE | CONTACT PERSON |
|--|---------------------|--|-----------------------------------|--------------------------------|--|
| Environmental Technology Research Centre (ETRC), SIRIM Berhad 1, Persiaran Dato' Menteri, Seksyen 2, P.O.Box 7035, 40911 Shah Alam, SELANGOR. | GLP 001 | Pharmaceuticals Cosmetics Veterinary Drugs Food Additives | Mutagenicity | 27 th February 2012 | Dr. Chan Sau Soon Tel: 03-55446564 |
| Melaka Biotechnology Corporation Lot 7, MITC City, Hang Tuah Jaya, 75450 Ayer Keroh, MELAKA. | GLP 002 | Pharmaceuticals Cosmetics Veterinary Drugs Food Additives | Mutagenicity | 3 rd June 2013 | Hasnizawati Bte Mohd Dahlan Tel: 06-2313622 |
| Info Kinetics Sdn Bhd Suite 126, Kompleks Eureka, Universiti Sains Malaysia, 11800 Minden, PULAU PINANG. | GLP 003 | Pharmaceuticals Cosmetics Veterinary Drugs Food Additives | Analytical and Clinical Chemistry | 7 th May 2012 | Dr. Lee Toong Chow Tel: 04-6589220 |

Annex VI. Examples of Laboratories under SAMM (ctd.)

Table 7: Test facilities under STANDARDS MALAYSIA's GLP Compliance Programs
(as of November 2013)



LIST OF GLP COMPLIANT TEST FACILITIES (As of 22 January 2013)



| NO | TEST FACILITY ADDRESS & DETAILS | CONTACT PERSON | CATEGORY OF TEST ITEM* | AREA OF EXPERTISE* | RECOGNITION FROM | CERTIFICATE NO. |
|----|---|---|--|---|------------------|-----------------|
| 1. | Acumen Scientific Sdn Bhd. Plot 256, Tingkat Perusahaan 5, Kawasan Perusahaan Prai 2, 13600 Prai, Pulau Pinang, Malaysia. Tel: +604-3883777 Fax: +604-3987880 Email: inquiry@acumen.com.my liang-ming.yeow@acumen.com.my | Mr Yeow Liang Ming | i-Pesticides | 1-Physical-chemical testing | 02-09-2010 | GLP 001 |
| 2. | Sumitomo Chemical Enviro-Agro Asia Pacific Sdn Bhd. Lot 62A, Persiaran Bunga Tanjung 1 Senawang Industrial Park, 70400 Seremban, Negeri Sembilan, Malaysia. Tel: +606-6793711 Fax: +606-6793698 Email: muneyserit@sumitomo- chem.com.my / seegh@sumitomo- chem.com.my | Dr. Mune y Serit / Ms. See Geok Heon | i-Pesticides | 1-Physical-chemical testing | 02-09-2010 | GLP 002 |
| 3. | Toxicology Laboratory Melaka Biotechnology Corporation Lot 7, MITC City, Hang Tuah Jaya, 75450 Ayer Keroh, Melaka, Malaysia. Tel: +606-2313622 Fax: +606-2323276 Email: hasnizawati@mib.gov.my / soo_ping.too@mib.gov.my | Ms Hasnizawati Mohamed Dahlan / Ms. Too Soo Ping | i-Pesticides | 3-Mutagenicity Testing | 01-08-2011 | GLP 003 |
| 4. | Environment Technology Research Centre SIRIM Berhad, 1, Persiaran Dato' Menteri, Section 2, P.O. Box 7035, 40911 Shah Alam, Selangor, Malaysia. Tel: +603-5544 6564 Fax: +603-5544 6590 Email: putri@sirim.my | Ms. Putri Razreena Abd. Razak | i-Industrial Chemicals ii-Pesticides | 3-Mutagenicity Testing 4-Environmental Toxicity Studies on Aquatic Organisms 5-Studies on behaviour in water, Soil and Air | 10-08-2011 | GLP 004 |

*Note:

***Category of Test Item**

Following code to be use:

- i- Industrial Chemicals
- ii- Pesticides
- iii- Feed Additives
- iv- Biotechnology (non-pharmaceutical products)

***Area of Expertise**

Following code to be use

- 1- Physical-chemical testing
- 2- Toxicity Testing
- 3- Mutagenicity Testing
- 4- Environment Toxicity Studies on aquatic and terrestrial organisms
- 5- Studies on behaviour in water, soil, air, bioaccumulation
- 6- Residue studies
- 7- Studies on effect on Mesocosms and Natural Ecosystems
- 8- Analytical and clinical chemistry testing
- 9- Other studies: to specify