



Green Economy Guideline Manual

2014



Electrical &
Electronics





MEET ISKANDAR MALAYSIA

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Foreword

Malaysia's commitment to sustainable development is articulated through its national development plans including the "Tenth Malaysia Plan, The New Economic Model" which underlines the long term development framework for Malaysia. At the Earth Summit in 1992, Malaysia pledged to keep at least 50% of its land area as forest cover, and has maintained its commitment with forest cover in 2012 being at 56.4% of total land area.



Leaders of governments at the United Nations Conference on Sustainable Development (Rio+20, Rio de Janeiro, 2012) resolved to act on addressing challenges in achieving sustainable development through the development of 'Green Economy' in their countries. The Government of Malaysia at Rio+20 reaffirmed its commitment to sustainable development, and its voluntary reduction commitment (announced at the 15th meeting of Conference of Parties, Copenhagen, 2009) of greenhouse gas emissions intensity of GDP by up to 40% by 2020, compared to 2005 levels. Our Prime Minister has also launched our Low Carbon Society Blueprint (at the 18th meeting of Conference of Parties, Doha, 2012) as our commitment to building a green economy at Iskandar Malaysia.

Climate change is no longer a myth but a reality that affects all of us. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) has stated that an increase of 0.85°C in the global average surface temperature could wreak havoc upon our environment. Earlier in 2014, Malaysia experienced one of its worst dry spells, triggering the Malaysian cabinet to consider calling a state of emergency in 15 areas in Malaysia that had not experienced rainfall in more than 20 days.

We have developed this Green Economy guidelines (GEG) manual which provides a checklist for businesses to address areas of procurement, operations and supply chain management in order to minimize impact on the environment. The development of these guidelines included consultations with ministries and government agencies, business associations, local bodies, international agencies and IRDAs own business teams.

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The goal of the GEG manual is to help businesses and industries to study, evaluate, adopt and inculcate environmentally sustainable economic behavior leading to building a prosperous, resilient, robust and globally competitive green economy in Iskandar. This is in line with IRDA's vision of becoming a "Strong and Sustainable Metropolis of International Standing". The LCS Blueprint has 3 main themes - Green Economy, Green Community and Green Environment. This manual is an output of the first theme and focuses on the **electrical & electronics industry**.

We hope businesses in Iskandar in the electrical & electronics industry will find these guidelines relevant and useful in evaluating and adopting more innovative and sustainable practices, contributing to Green Economy in Iskandar.

In closing, I would like to thank and congratulate all parties involved in the production of this manual. I would also like to make a special mention of the advice and support given by the Working Group to the IRDA team and consultant Ernst & Young's Climate Change and Sustainability Services team in putting together this manual.

Y. Bhg. Datuk Ismail Ibrahim
Chief Executive IRDA

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Glossary

AFV	Alternative Fuel Vehicles
BEMS	Building Energy Management Systems
BREAM	Building Research Establishment Environmental Assessment Method
CAGR	Compound Annual Growth Rate
CFL	Compact Fluorescent Lighting
CNG	Compressed Natural Gas
EDISON	Electric vehicles in a Distributed and Integrated market using Sustainable energy and Open Networks
EEP4S	Siemens' Energy Efficiency Program for Suppliers
EHS	Environmentally Hazardous Substance
ErP	The Energy-related Products Directive
ESG	Environmental, social and governance
E&E	Electrical and electronics
GBI	Green Building Index
GDP	Gross Domestic Product
GGP	Government Green Procurement
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
HRV	Heat Recovery Ventilation
HVAC	Heating, ventilation and air-conditioning
ICT	Information and communications technology
IM	Iskandar Malaysia
IRDA	Iskandar Regional Development Authority
KeTTHA	The Malaysia Ministry of Energy, Green Technology and Water
LCA	Life cycle assessment

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LDV	Light Duty Vehicle
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
LEP	Light-emitting plasma
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MATR	Malaysia Automotive Technology Roadmap
MHE	Mechanical Handling Equipment
NAP	National Automobile Policy
PC	Personal computer
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RoHS	Restriction of Hazardous Substances Directive
VOC	Volatile organic compound
WEEE	Waste Electrical and Electronic Equipment Directive

Electrical and Electronics Industry

1. Industry Overview

The electrical and electronics (E&E) industry relates to the production and consumption of electronic equipment intended for consumer use, including audio and video equipment, electronics and other electrical equipment and components (Dow Jones Industry Classification). This includes manufacturing, distribution, consumer use, disposal and recycling of consumer electronics products. The industry plays a vital role in the world economy, accounting for approximately 1.5% of the Gross Domestic Product (GDP) (BMI, 2014; World Bank, 2014). The growth of this industry has consistently outpaced overall economic growth over the past decade and there is a strong interrelationship between growth in the value of the consumer electronics sector and GDP.

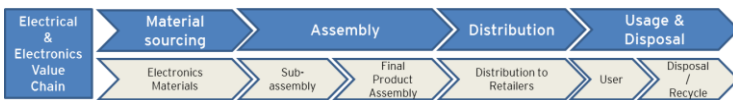
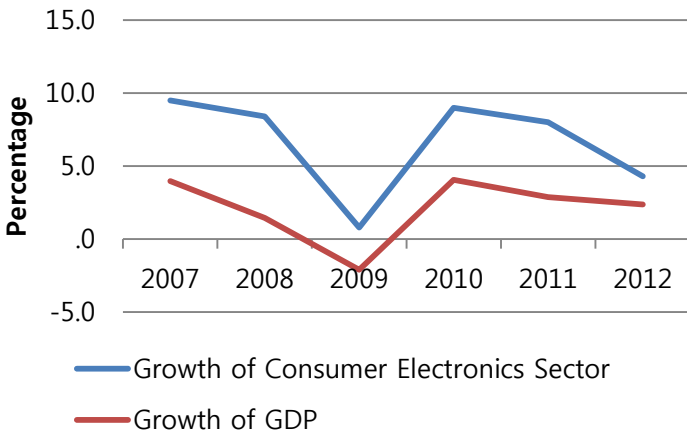


Figure 1: Typical value Chain of E&E Industry



**Figure 2: Growth in Consumer Electronics Sector and GDP
(BMI, 2014; World Bank, 2014)**

Environmental concerns are exacerbated by a rapidly growing consumer electronics sector. The sector is expanding at a Compound Annual Growth Rate (CAGR) of 5.9% and is expected to increase steadily at a CAGR of 5.6% from 2014 to 2018. Sales market value for the sector is also expected to increase by 25%, from USD1.2 trillion in 2014 to approximately USD 1.5 trillion in 2018 (Figure 3).

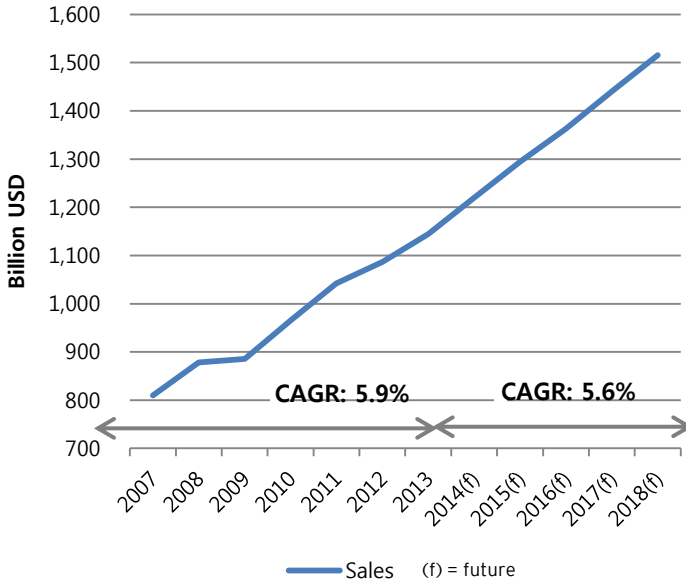


Figure 3: World Consumer Electronics Sales Value (BMI, 2014)

It is important to highlight the role of rapidly growing Asian market globally. From 2007 to 2018, it is forecasted that the market growth for the sector will be at a CAGR of 8.1%, expanding faster than the rate of global growth and the proportion of Asian market is at the average of 40.1 %. The share of the Asian sector is growing, with developing economies, such as Malaysia, looking to expand their consumer electronics sector.

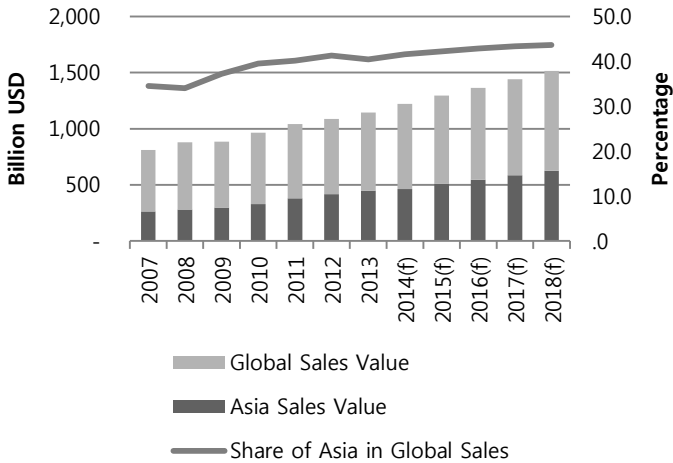


Figure 4: Share of Asia in the Global Consumer Electronics Market (BMI, 2014)

As a result, the government is committed to developing the industry by facilitating investment in the industry. In the Tenth Malaysia Plan (2011-2015), the government outlines its strategies to boost investment in key economic growth engines or the National Key Economic Areas (NKEA), of which the education industry is part of, to become a high-income economy by 2020. To achieve this goal while maintaining a sustainable fiscal environment, 92% of total investments in NKEA are expected to be contributed by the private sector (PEMANDU, 2010).

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Aligned with Malaysia's national strategies, Iskandar Malaysia (IM) aims to be the center of excellence for the E&E industry with a focus on leading technology and high growth sub-sectors namely advanced E&E, renewable energy, automotive and rail, aerospace, security and defence and medical devices. In support of this, the Iskandar Regional Development Authority (IRDA) has devised strategies to boost the growth of this industry. Technology clusters, supporting infrastructures and industries and training centers, are several strategies that IRDA has identified (Iskandar Regional Development Authority, 2011).

Businesses have started to realize the competitive advantage that IM has to offer. The E&E industry forms the majority of the manufacturing sector contributing 38% of the total manufacturing workforce. It is also a significant industry that accounts for RM4.8 billion of total value-added. Moreover, in terms of committed investment (Figure 5), the manufacturing sector, of which the E&E industry is categorized under, is already one of the largest contributors. This shows the confidence that businesses have in setting up operations in IM.

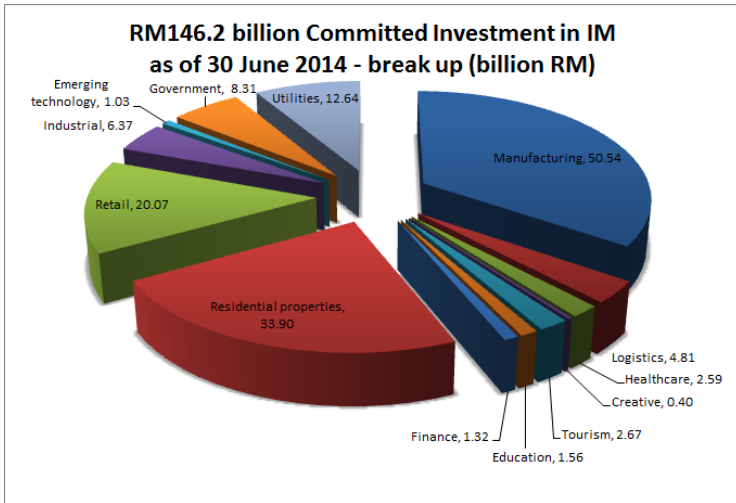


Figure 5: Cumulative committed investment in IM (Low & Kasmuri, 2014)

1.1. Environmental Impacts

Consumer electronic products have many phases in their lifecycle and different environmental impacts associated to each phase. As a result, businesses should consider the environmental impacts at every stage of the product's life cycle. This includes associated environmental impacts from raw material procurement to industrial production processes and recycling of disposed products. Environmental concerns associated with the consumer electronics sector often stem from energy use, greenhouse gas (GHG) emissions and waste.

In order to estimate the GHG emissions from the sector, this guideline looks at direct GHG emissions from end-user devices, which has seen their demand increase at a CAGR of 6.1% from 2002 to 2011 and accounts for 1.1% of the global GHG emissions in 2011. The rate of emission growth is expected to slow down from 2011 to 2020, to a CAGR of 2.3%, due to expected efficiency gains and switches to smaller devices, such as from personal computers (PC) to laptops and tablets. However, its industry-related emissions will still account for 1.2% of the global GHG emissions in 2020 (Figure 6).

In addition, according to an article by *American Journal of Humanities and Social Sciences*, emissions from manufacturing and using of PCs alone are expected to double over the next 12 years as middle-class buyers in emerging economies go digital (Al-Khoury, 2013). It is therefore important for E&E businesses to adopt green practices for sustainable development.

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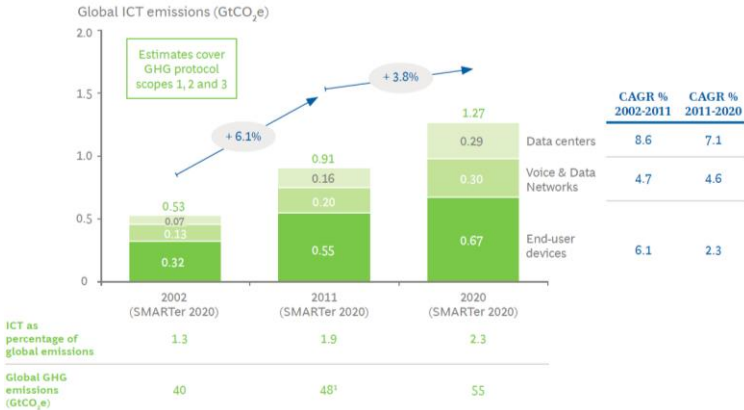


Figure 6: Breakdown of GHG Emissions from End-User Devices (GeSI, 2012)

Aside from GHG emissions and energy use, the issue of electronic waste (e-waste) should be addressed in the consumer electronics sector. It is estimated that approximately 50 million tonnes of e-waste are produced every year (Sthiannopkao, 2012), and this is expected to rise by 500% over the next decade in some countries, such as India (UN, 2010). Currently, the US is the leading producer of e-waste with 3 million tonnes each year, followed by China, producing approximately 2.3 million tonnes each year (UNEP, 2012). In 2008, Malaysia generated 688,000 tonnes of e-waste, and this is forecasted to increase to 1.11 million tonnes in 2020 (DoE, Malaysia, 2010). It is estimated that

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only 15% to 20% of e-waste produced are recycled, with remainder going to landfill or incinerators (USEPA, 2012).

The e-waste issue is a major health concern for communities, as widespread use of bromine- and chlorine-based compounds in many different electronic applications release dioxins and other harmful chemicals into the atmosphere during disposal, especially during burning and smelting of e-waste (CHEMSEC and CPA, 2009). Burning of e-waste also produces unwanted carbon emissions, while recycling e-waste can be energy-intensive.

Given the current industry trends, additional actions need to be taken to mitigate issues related to energy use, GHG emissions and e-waste of the consumer electronics sector over the medium to long term. This is especially crucial to IM, where the E&E industry has been earmarked as one of the nine key sectors for economic growth. E&E is also Malaysia's leading manufacturing sector, contributing approximately 55.4% of Malaysia's total manufactured exports in 2009. E-waste, E&E-related emissions and energy use are thus of exceptional significance to Malaysia's overall sustainability goals.

Various environmental regulations, in areas such as energy (ErP: The Energy-related Products Directive), recycling

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(WEEE: Waste Electrical and Electronic Equipment Directive), and hazardous substances (RoHS: Restriction of Hazardous Substances Directive & REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals), along with consumer concerns and demand for green products are putting pressure on businesses to design eco-friendly products.

In order to identify opportunities for environmentally friendly operations (“greening”) in the consumer electronics sector, this guideline concentrates on identifying and prioritizing greening options that are pursued by the leading companies in the sector.

Companies	Key Green Initiatives
Samsung Electronics Co., Ltd.	<ul style="list-style-type: none">• Eco-conscious, energy-efficient products• Recycling DIRECT program
Sony Corp.	<ul style="list-style-type: none">• Road to Zero Footprint• Environmental Management System• Take Back Program
Panasonic Corp.	<ul style="list-style-type: none">• Eco-design: extending product lifespan• Use of recyclable materials for manufacture
Toshiba Corp.	<ul style="list-style-type: none">• Facility efficiency through solar power• AFV Fleet• Reducing hazardous waste

LG Electronics, Inc.	<ul style="list-style-type: none">• Eco-design: ECONAVI• Collecting e-waste
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Table 1: Leading E&E companies and their key green initiatives

The following sections will concentrate on identifying areas of intervention and the potential options to mitigate the impacts identified in the section above.

2. Identifying Green Growth Opportunities

2.1. Areas for intervention

This guideline looks at a typical consumer electronics sector value chain to identify areas for intervention. Areas of intervention can be divided into 4 major areas, from (1) facility efficiency, (2) waste (e-waste and packaging), (3) distribution and (4) energy consumption.

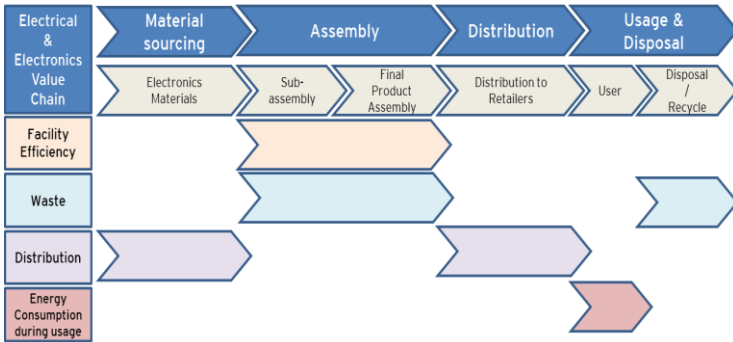


Figure 7: Typical Value Chain and Potential Areas of Intervention in the E&E Industry

In general, emissions from the usage stage dominate, accounting for around 50% - 80%, where the stages related to production range between 10% - 35% and packaging and

transport account for 5% - 15% (Stevens, 2008).

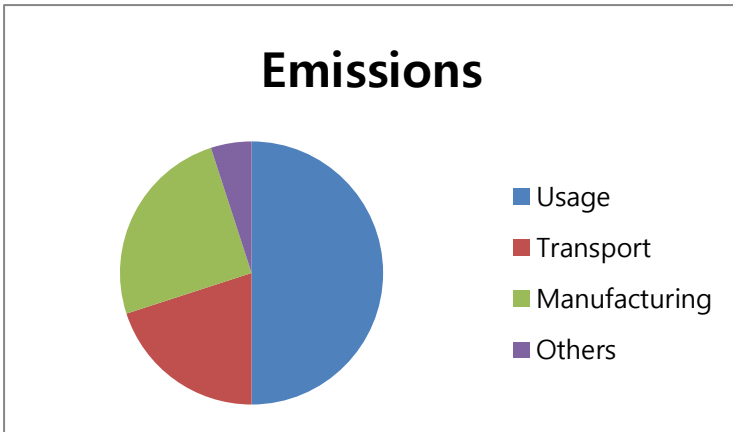


Figure 8: E&E Emissions breakdown

Taking into consideration that more than 50% of the emissions from the consumer electronics sector comes from usage, and the fact that 15% of the global residential electricity consumption comes from consumer electronics, addressing energy efficiency in appliances is crucial (IEA, 2009). Looking ahead, energy use of these devices will double by 2022 and threefold by 2030 under IEA Business-As-Usual scenario unless policy measures are introduced (IEA, 2009).

EY has carried out an industry analysis of GHG emissions on companies such as Samsung, LG and Sony (Samsung, 2013;

LG, 2013; Sony, 2013). Taking an industry average of Scope 1, 2 and 3 emissions, the analysis reveals that more than 50% of emission comes during the user phase, 15% during transportation (Scope 3) and 25% during manufacturing stage (Scope 1 and Scope 2). The user phase contributes the highest amount of GHG emissions, suggesting this is an area with the most emissions-reducing, profit opportunity.

2.2. Potential Options

Based on the identified areas and analysing options pursued by leading corporations in the sector, this guideline suggests the following measures to be implemented in order to mitigate the environmental issues identified in the previous section.

This guideline has divided the potential actions into two different sections: (a) product-related and (b) production / operation issues. Key issues, such as consumer energy use and e-waste, can be effectively addressed from the initial designing stages of the product. The Green Electronics Council proposes that 90% of a product's environmental attributes comes from design (CEA, 2012). Eco-design can be defined as "starting off right" considering environmental impact of the product throughout its lifecycle from the outset of the design phase (CEA, 2012).

However, in order to eco-design a product, a full assessment of the product's lifecycle is required. Companies should carry out life cycle assessment (LCA), which analyses a product from cradle-to-grave, in order to assess the environmental impacts associated with the stages of the product's life. LCA's require expertise and effort, but can serve as a basis to identify areas of intervention.

3. Recommended Actions for Strategic Direction and KPIs

3.1 Facility Efficiency

Improving energy efficiency in manufacturing facilities can play a significant role in minimizing environmental impact considering its contribution to GHG emissions in the industry, accounting for approximately 10% - 35%.

This can be achieved by implementing a range of technologies, from improved heating, ventilation and air-conditioning (HVAC), lighting efficiency, monitoring (enabled by Building Energy Management Systems (BEMS) and Smart Metering) to implementing sustainable building designs.

3.1.1. HVAC Efficiency

Action: Installing efficient HVAC systems

According to Carbon Trust a 1°C decrease in internal building temperature results in 10% energy consumption savings which would automatically lead to decrease in GHG emissions (CarbonTrust, 2002). Recommended actions that can improve energy efficiency include (University of Twente, Unilever, 2013):

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- **Insulation:** If some rooms are too hot or too cold, inadequate air sealing or insufficient insulation could be the cause. Cavity wall insulation is used to reduce heat loss by filling the air space with material that inhibits heat transfer. It is often used in doors, which are the primary culprits of air leaks in the building. Adding additional insulation (double-glazing) around the interior of the building and installing air curtains will also contribute to reducing energy usage.
- **Infrared Assessment:** To identify areas of energy wastage, infrared imaging is a valued tool in identifying problems related to energy loss, inadequate insulation, inefficient HVAC systems, radiant heating, water damage on roofs, and much more. Conducting an infrared inspection on leak tightness and coldness infiltration can detect potential areas for additional insulation. Professional energy auditors can be employed to carry out this process.
- **Heat Recovery Ventilation (HRV):** HRV is an energy recovery ventilation system which uses heat exchangers to heat or cool incoming fresh air,

recapturing 60%-80% of the conditioned temperatures that would otherwise be lost. Instead of opening a window for ventilation, the HRV system is able to provide fresh air without any heat loss or gain. In climates such as Malaysia with warm, humid weather, HRVs can also remove humidity before it enters the air ducts to keep the interior comfortable and prevent the HVAC system from having to work harder.

- Alarm for warehouse doors: Alarms of annunciators indicate when doors are open and prevent unwanted heat loss or gain. This simple yet efficient measure has proven to be very cost effective in many cases.
- Green façade and roofs: Vegetation or plant cover on roofs over a water-proof membrane is known to reduce building heating and cooling needs. In addition, it can retain rainwater for other uses if an efficient drainage system is installed. This measure qualifies for Leadership in Energy and Environmental Design (LEED) points.

Action: Maintaining efficient HVAC systems

Dirt and neglect are the top causes of heating and cooling system inefficiency and failure. It is important to have a qualified technician perform regular maintenance on the HVAC system every year. Maintenance activities include (US EPA, 2009):

- Lubricate moving parts. Electrical devices that lack lubrication can cause friction in motors and increase the amount of electricity consumption. Lack of lubrication can also cause equipment to wear out more quickly, requiring more frequent repairs or replacements.
- Check the condensate drain in the air-conditioner. If plugged, stagnant water in the drain may damage the hose, affect indoor humidity levels, and breed bacteria and mold.
- Inspect, clean, or change the air filter in your central air conditioner. A contractor can demonstrate how to do this for company maintenance staff to do so on a more regular basis.
- Clean the air-conditioner blower components and

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coils. Proper airflow over the coils allows your system to run efficiently, reducing energy costs and lengthening equipment lifespan.

- Check the central air conditioner refrigerant charge and adjust it if necessary to ensure it meets manufacturer specifications. Too much or too little refrigerant charge can damage the compressor, reducing the shelf life and increasing costs.

Action: Glazing

Transparent and clear glass panes used in buildings are prone to increase the heat gain inside buildings and hence additional air conditioning (higher capital and operating costs) becomes necessary. Proper selection of glazing properties helps improving energy efficiency in buildings as a good glazing will reduce solar heat gain from both direct and diffuse solar radiation (Building Energy Efficiency



Image 1: Self shading and Dynamic shading system at ST Diamond Building

(Source: asiagreenbuildings.com)

Technical Guideline for Passive Design, 2013). Better glazing efficiencies can be achieved by taking into consideration the following key factors (and other considerations as deemed appropriate for the building)

- Choosing the glazing with appropriate visible light transmission, low solar heat gain coefficient
- Single and double glazing low-E value coatings
- Reduction of glazing area, where possible

Action: Wall Insulation

Malaysia has a mild climate with outdoor dry bulb temperatures reaching 26.9°C during day time and 24°C during night time. Heat is both conducted from the outside into the building and as well as from inside of the building to the outside. While the impact of insulation on building energy reduction may not be very significant, the effect on reduction in peak cooling load is certain. A feasibility study on the economics of insulation materials should be done before embarking on the installation of insulation systems (Building Energy Efficiency Technical Guideline for Passive Design, 2013).

Action: Roof Insulation

Energy efficiency brought about by different types of roofs varies for each type, operating hours and the space immediately below the roof. Ideally an insulated roof during day time to prevent heat gain and non-insulated roof during night time to cool the building would be the most appropriate one for Malaysian climate. However, business needs (office / hospital / warehouse / cold storage), occupant comfort, wind velocity, rains, etc. are the key decisive factors in determining the roof type and materials used. In a simulation study carried out while developing *The Building Energy Efficiency Technical Guideline for Passive Design (2013)* suggests that provision of 25mm of insulation provided maximum incremental savings. Keeping in mind that electricity tariffs in Malaysia are bound to increase with time, businesses need to evaluate the energy consumption, return on investment, business needs of roof insulation and proceed accordingly.

Action: Zoning and Infiltration control

Zoning is the process of positioning air-conditioned spaces in a building in a coherent fashion such that wastage of conditioned air is minimized. In general it is done by locating

rooms according to the leakage flow of air-conditioned air from the coldest room will benefit other spaces before it completely escapes out of the building.

Zoning the most air-conditioned areas at the core of the buildings surrounded by comparatively lesser air-conditioned areas, optimizing window areas, converting glazed areas to opaque, etc. are among the widely practiced techniques to achieve energy efficiency.

Infiltration is the process of out-door air entering the air-conditioned space introducing sensible and latent (moisture) heat into the building, which increases the energy requirements. Sealing cracks in walls, window panes, controlling window/door operation with sensors, door pumps, and air curtains could be adopted to minimize infiltration losses. Please refer the *Building Energy Efficiency Technical Guideline for Passive Design (2013)* for case studies on various scenarios of simulation conducted for more information on avoiding infiltration losses.

3.1.2. Lighting Efficiency

Action: Daylight harvesting

Malaysia being located close to the equator, with lesser

seasonal variation has reliable day light available for about ten hours a day. Natural daylight harvesting is amongst the most efficient method to improve energy efficiency in buildings because diffused light is not much affected by the sun appearing in the sky/hiding behind the clouds. To achieve better utilization of daylight harvesting, appropriate tropical climate daylight harvesting techniques need to be deployed to gain the optimum benefits.

- Utilizing daylight to combine with artificial lighting is a simple, efficient way to reduce lighting.
- Analyzing the location, layout and orientation of windows (west / east), Incorporating skylights into roofing and utilizing transparent weather-resistant material that can maximize natural light passage is one of the key measures to maximize use of daylight.
- Skylights that can be operated to open and close can additionally lead to savings in energy used for ventilation or cooling.
- Solar heat gain minimization, glare protection, deep daylight penetration, uniform daylight distribution, etc., needs to be investigated thoroughly, and addressed before implementation of a well-designed

daylight harvesting system to optimize performance.

Action: Switching to energy-efficiency lighting

In 2010, the British Broadcasting Corporation carried out a quantitative energy analysis and identified solid-state light-emitting plasma (LEP), light-emitting diode (LED) and fluorescent lighting (BBC, 2011) as the most energy-efficient sources without compromising on performance.

LED is one of today's most energy-efficient and rapidly-developing lighting technologies. LEDs are “directional” light sources, which mean they emit light in a specific direction unlike traditional light sources which emit light and heat in all directions. For this reason, LED lighting is able to use light and energy more efficiently in many applications. Residential LEDs use at least 75% less energy, and last 25 times longer, than incandescent lighting (US Department of Energy, 2014).

As a cheaper alternative, high efficiency Compact Fluorescent Lighting (CFL) consumes only 25% of the energy of an incandescent bulb and lasts nine times as long, or up to 7 years (Tufts University, 2014). Aside from its lower cost, CFL bulbs are known to be versatile. They can be applied nearly anywhere where incandescent lights are used, and are particularly suitable for area lighting.



Figure 9: Comparison of Lighting Types

Action: Optimizing lighting performance

Many minor steps can be taken to improve lighting performance. For example, regular cleaning of light bulbs can also improve energy efficiency, as two years' worth of accumulated dust can reduce luminosity by as much as 50% and increase operating costs by 15% (Carbon Trust, 2007).

Utilizing daylight in combination with artificial lighting is another simple yet efficient way to reduce energy costs. Analyzing the location, layout and orientation of windows (west / east) can maximize the natural light passage.

To supplement this, motion sensors can also help to optimize

lighting usage in a facility. Sensors switch off lights when an area is not occupied, and may also dim lights according to the required output (University of Twente, Unilever, 2013).

Action: Shades

Shades are primarily used to reduce solar heat gain, widely practiced across the world and Malaysia as well. External shades are being replaced by advancements in glazing technologies and internal shades are still the most economical solution (but with regular maintenance / replacement). Different types of horizontal and vertical shades are utilized; however thermal comforts, brightness control, glare protection, privacy, view out, and durability are the key factors that need to be considered before the installation of shades. Please refer the *Building Energy Efficiency Technical Guideline for Passive Design (2013)* for more information on application of shades, various pros and cons.

Action: Applying for building certifications

Industry associations can play a vital role in providing guidelines and standards on building energy measures. In Malaysia, companies can consider applying for the Green Building Index (GBI), which assesses new and existing

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buildings for their environmental performance according to a range of key criteria.



Image 2: NTT MSC Technology Center, a Malaysian ICT facility certified by the Green Building Index (Green Building Index, 2012)

IM has set out in its Green Building Road Map to utilize the GBI as a rating tool for buildings in the region to promote sustainability in the built environment. In July 2013, a luxury condominium in IM, Molek Pine 4, became the second residential project in the country to achieve the highest GBI rating.

Key Performance Index	Objective	Ease of implementation
Energy savings from measures to increase efficiency	Higher	Easy
Cost savings from measures to increase efficiency	Higher	Easy
Amount and % of reduction in carbon emissions in weight	Higher	Moderate

Building certifications (e.g. GBI)	Lower	Moderate
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3.1.3. Improving Energy Efficiency in Warehouse Operations

Aside from managing energy consumption in facilities, it is important to optimize efficiency in operations that takes place in warehouses. In this section, this guideline looks extensively at maximizing efficiency in Mechanical Handling Equipment (MHE) as warehouse operation is mainly enabled by MHEs.

Optimizing warehouse layout can reduce distance travelled and energy used by MHE. Also, avoiding peak charging hours for electric forklifts can reduce energy consumption. Utilizing hydrogen fuel cell forklift can be a viable option to reduce electricity use in warehouses, as it requires shorter charging hours and as the battery performance degradation is lower than electric forklifts. Therefore, fuel cell-powered forklifts are more productive and shorter charging hours provide electricity cost savings (Inbound Logistics, 2008).

Key Performance Index

Key Performance Index	Objective	Ease of implementation
Energy savings from MHEs	Higher	Moderate

In this section, this guideline provides measures to reduce energy consumption in facilities and to lower GHG emissions. Areas to target are HVAC and lighting, where most of the energy is consumed.

Facility efficiency is principal to a green economy, and this is acknowledged by both the Malaysian Federal government as well as IM. Malaysia follows the Low Carbon Cities Framework & Assessment System, developed by the **Ministry of Energy, Green Technology and Water (KeTTHA)**, which recommends specific carbon reduction solutions in buildings and infrastructure. Malaysia has also launched the **GBI** to rate commercial and residential buildings. Both buyers and builders of green buildings stand to benefit from this scheme. Some of the benefits that businesses could enjoy include:

- Investment Tax Allowance for purchase of Green Technology Equipment
Businesses could receive tax allowance of up to 100%

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of qualifying capital expenditure in relation to approved green technology projects or acquisition of green asset

- Income Tax Exemption on the use of Green Technology Services and System

Businesses could receive tax exemption of up to 100% for a period of 5 years in respect of the use and provision of green technology services and systems

More information on incentives can be found at GBI website, KeTTHA website and Malaysia Budget 2015 speech by YAB Dato' Sri Mohd Najib Tun Abdul Razak. Relevant website links can be found at the end of the manual.

IM aims to be an internationally recognized sustainable metropolis, and has imposed a building rating system alongside GBI for their new developments to identify and monitor building sustainability. Businesses should refer to **IRDA's Low Carbon Society Blueprint and Actions for a Low Carbon Future** that promote adoption of green building designs and features. Some of the benefits that businesses stand to receive from the policies include:

- An adjustment to tax rate on fixed asset tax
- Tax incentives on green development
- Low interest loans for energy-efficient building

projects

- Subsidy for adopting photovoltaic power (Iskandar Regional Development Authority, 2014)

More information on incentives available from IRDA can be found at www.irda.com.my.

3.2. Waste

The issue of waste for the E&E industry is divided into (1) e-waste and (2) packaging waste. Environmentally friendly research and design can significantly reduce e-waste by removing hazardous substances from design, extending product lifetime and maximizing recyclability of products. In addition, take-back programs should be promoted in order to maximize use of recycled parts. Packaging waste can be minimized through sustainable packaging initiatives.

3.2.1. Reducing E-Waste

Action: Adopting eco-design by removing hazardous substances from product

Businesses should assure compliance with hazardous substance regulations. Regulations such as WEEE and RoHS advise to refrain from using certain materials, such as

bromine, chlorine and heavy metals. Bromine and Chlorine substances are widely used, around 25% to 30%, by weight of the electronic waste are generated by plastics and only 10% is currently being recycled according to (CHEMSEC and CPA, 2009).

It is essential for businesses to identify the proportion of hazardous substances in the product and keep track of chemical composition in

their products to move away from using products with hazardous chemicals.

There are a range of substitutes that can replace bromine and chlorine such as metal hydroxide and



Image 3: E-waste disposed improperly (Source: Wikipedia commons)

thermoplastic copolyester, which can be used for wires and cables. Moreover, new polyamide can be used to produce connectors and sockets. However, environmental impacts of the substitutable materials will need to be fully assessed and evaluated according to individual manufacturing processes

to verify whether the substitutes have improved environmental profiles.

In Malaysia, the Environmentally Hazardous Substance (EHS) Notification and Registration Scheme was implemented in 2011 under the Environmental Quality Act to identify and regulate substances of concern in the country. Companies have to work with the government to ensure that EHS produced are safely disposed of. Businesses are expected to comply with EHS regulations and should seek to decrease or remove EHS from their operations through process or product refinement. More information regarding the EHS Notification and Registration Scheme can be found on the Malaysian Department of Environment webpage under the EHS section, www.e-ehs.doe.gov.my.

Action: Adopting eco-design to extend product lifetime

Manufacturing stage accounts for 10% - 35% of the emissions in the consumer electronics sector and involves use of chemicals and raw materials. Shorter life cycles contribute to these environmental impacts and these impacts are only partially offset by efficiency of new devices during usage (Greenpeace, 2012). Also, shorter lifecycles lead to larger quantities of e-waste. Therefore, extending lifecycle of products will reduce need for another product for consumers,

and eliminates the need for any additional production, contributing to GHG emission reduction and waste of resources.

According to ECMA International, various measures can be implemented to extend product lifecycle of electronic products (ECMA, 2008). Industries should promote use of common mechanical packages, parts and components that which are applicable to multiple models or generations of the same product. Also, products should be upgradable (function, technology), customizable, easy to repair and maintain.

Extending lifetime of products closely involves design and R&D division, in increasing compatibility of technological measures. Devices should be upgradable in terms of software so that it avoids consumer from purchasing a new model. Samsung's approach towards extending product lifecycle aims to eliminate the necessity of additional production, thereby cutting down on GHG emissions and preventing the waste of resources (Samsung, 2013). For instance, its drum washing machine motors is certified for 20-year lifecycle and the evolution kit for TV allow consumers to enjoy the latest features in older versions of TVs, by installing new features onto the older version. The kit eliminates the need for another TV purchase.

Businesses can take part in the *Extended Producer Responsibility* through disclosures in servicing requirements, design lifetime and warranty (Wilhelm, 2012). By ensuring that product lifetime is maximized, secondary markets and consumer awareness of eco-friendly products would help boost the industry further.

In 2008, SIRIM Berhad was mandated by the Government of Malaysia under the Ninth Malaysia Plan to create the National LCA project. This project aims to promote the life cycle thinking approach in sustainable consumption and production as mentioned in Section 2.2. Malaysia is promoting awareness of environmental impacts of product systems and uses LCA to compile data on carbon footprints, GHG emissions and energy consumption. LCA looks at every single step of a product, from its raw material stage, to manufacture, distribution and disposal/remanufacture. This data is then reviewed to improve on the product's life cycle, innovate methods to reduce emissions and increase remanufacture capability of the product. Producers can thus look into extending product lifetimes and maximizing recyclability of their products to meet the standards encouraged by the National LCA project.

Action: Maximizing product recyclability

Recyclability can be enhanced by designing products to use recyclable materials. Parts and components should be easily separable and disassembled by commonly available tools. Companies should (ECMA, 2008):

- Avoid using non-recyclable composites / coatings, adhesive composed stickers or foams on plastic parts and metal inserts in plastic parts for easier disassembly
- Reduce welds, adhesives and glued joints for easier disassembly
- Document and disclose information on disassembly methods, identifying re-usable parts, hazardous substance, disposal precautions
- Utilize same polymer in products, limiting number of plastics used which can increase compatibility.

Action: Promoting green procurement policy in sourcing for materials

Promoting green procurement through supply chain management can minimize use of hazardous waste. Businesses should track and monitor their procurement process, to control for any hazardous substance from suppliers parts and materials. Encouraging suppliers to

declare materials information, verifying and assessing suppliers through on-site evaluations, audits, education and trainings is essential. It is important to establish a process to keep track of the materials used in the products.



Figure 10: Samsung's green procurement overview
(Samsung, 2013)

Green Procurement Process

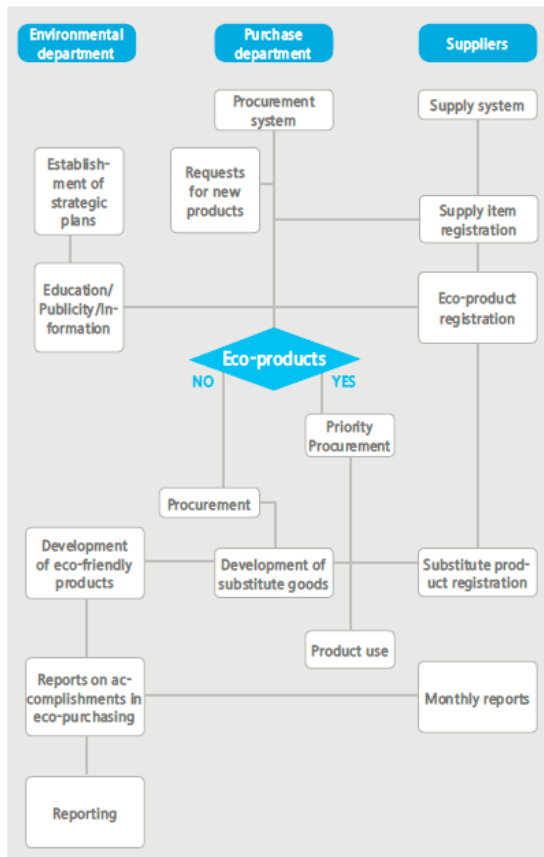


Figure 11: Samsung’s green procurement process
(Samsung, 2013)

Action: Initiating Take-back program

Recycling issues can be addressed by:

- Improving recyclability of products from initial design stage (action 3);
- Recycling e-waste that has been produced.

Take-back program increases rate of recycling and thereby reduces materials used for manufacturing by recollecting products that has been disposed. The program is a campaign to collect used devices for recycling use, where customer involvement is crucial. Businesses can play a role in consumer education to raise awareness on the existence of the programs and rewarding customers for recycling. It is argued that subsidies are effective in products that are hazardous and costly to recycle (Atasu, 2008).

In addition, proactive action from industries towards the program is essential as the waste take-back requires voluntary consumer action. Samsung's e-waste take back program, *Samsung Recycling Direct*, is a voluntary recycling program where consumers can request take back simply by calling Samsung call centre (Samsung, 2013).

As another example, to improve recyclability of products, LG is actively promoting e-waste take back system, collecting nearly 50 million pounds recycled material in the US. Globally the program covers 75 regions in 44 countries. Prior to using recycled plastics into products, LG carries out their own reliability and stability tests. Their plastic reuse is up to 5,617 tonnes in 2013, continually increasing from 3,298 tonnes in 2011 to 4,980 tonnes in 2012. Also, the entity plans to continuously expand use of plastics over time, and establish systematic management system (LG, 2013).

The Association of Computer and Multimedia Industry of Malaysia (PIKOM) and Malaysia's Department of Environment have installed more than 400 e-waste collection points for recycling. The Malaysian government actively supports e-recycling with this programme, and consumers as well as businesses should cooperate to maximize recyclability and minimize waste. The locations for e-waste collection points can be found on DoE's website, www.doe.gov.my.

Key Performance Index

Key Performance Index	Objective	Ease of implementation
% of hazardous substances (outlined in WEEE and RoHS) used in products	Low	Easy
% of products with bromine and chlorine contents	Low	Easy
Existence of supplier monitoring scheme	High	Easy
Number of assessments (site-visits or any time of audits) done on supplier	High	Easy
Length of product warranty	High	Easy
Length of time replacement parts are available	High	Easy
Average lifetime of manufactured products	High	Easy
Proportion (%) of	High	Easy

recyclable parts used in products		
Number of consumer awareness programs on take-back programs held	High	Easy
Proportion of take-back return points to number of retail points	High	Easy
Proportion of products returned from take-back program to products sold	High	Easy
Proportion of recycled material used for new product from take-back program	High	Easy

3.2.2. Reducing Packaging Waste

Sustainable packaging initiatives can make a substantial contribution to carbon abatement across the supply chain. Packaging initiatives aims to reduce the amount of packaging used for each product, remove hazardous materials from the packaging, and make packaging easy to recycle. The actions

outlined in this section will comprise of reducing volume, weight and recycling.

Action: Light-weighting and reducing volume

This action directly reduces energy used to transport which can lead to direct cost savings. For instance, if a company uses 25% less plastic or cardboard per unit, it will be able to fit 25% more product per pallet, resulting in fewer shipments and lower transportation costs (Inbound Logistics, 2009).

There are a variety of estimates available on the weight of consumer packaging, which is typically put at around 5% of the total weight of consumer goods shipments (WEF, 2009). The carbon abatement of eliminating packaging is significant in the production phase of the lifecycle - at up to 125 MtCO_{2e} per year globally (WEF, 2009).

Samsung uses plastic shrinking packaging, where a product is wrapped with a buffer material followed by low-density polyethylene shrink film and compressed with heat. This packaging method reduces weight of packages by 44% compared to paperboard packaging (Samsung, 2013).

Furthermore, in the product development phase, LG electronics strives to improve product performance while

reducing size and weight. Through R&D, a weight reduction of approximately 7% (12kg) while maintaining transportation capacity has been achieved for 2013 refrigerator model.

Action: Selecting alternative material that can be recycled

When companies are considering packaging options, they often turn to the lightweight materials such as paperboard, aluminum, and plastic. Paperboard, plastic and aluminium are lightweight and are able to protect finished items. Also, paper, cardboard

and plastics reduce waste going to landfills. Corrugated cardboard is a very popular product used for efficient exterior packaging,



Image 4: Sony EMCS (Malaysia) recycles 90% of cardboard waste (Sony, 2013)

mainly due to its strength, light weight, and recyclability. The corrugated cardboard consists of organic material, paper and starch glue, and can be up to 80% recycled (Murray, 2014).

Paper, cardboard and plastics are recyclable packaging materials which reduces waste going to landfills. Samsung

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has adopted eco-friendly vinyl packaging materials which are biodegradable. Starting with robotic vacuum cleaner battery packaging, Samsung is planning to expand the use of these packaging materials to other products (Samsung, 2013).

Another example from other industry leader that is exemplary is Subaru. Subaru assembly plant in Indiana, US, sources parts from Japan. These parts are protected by molded polyurethane foams which can be reused for subsequent distribution. This delivers cost savings up to USD1.3 million per year and a reduction of approximately 2,000 tonnes of CO₂ (Parcel Industry, 2009).

Key Performance Index

Key Performance Index	Objective	Ease of implementation
Initiatives for sustainable packaging	High	Easy
Use of reusable, recyclable material	High	Easy
Percentage of packaging recycled / reduced	High	Easy
Weight / volume reduced for each packaging	High	Easy

This section on waste has outlined seven potential options in order to mitigate the issue of e-waste and packaging waste. In all, packaging measures offers both environmental impact mitigation and direct cost savings and is therefore a hugely practical initiative for businesses to consider. Through research and development initiatives, innovations in efficient packaging must be pursued considering its benefits.

Malaysia has a National Strategic Plan for Solid Waste Management that emphasizes the 3R's- Reduce, Reuse and Recycle. Furthermore, in line with its National LCA Project, Malaysia seeks to transform the recycling industry into a remanufacturing industry to improve the life cycle of products and materials.

More information on waste management can be found at www.lcamalaysia.sirim.my. and www.kpkt.com.my.

3.3. Transportation, Distribution & Logistics

Contribution of GHG emissions during logistics process in consumer electronics sector is approximately 5% - 15%.

Action: Increasing Utilization of Alternative Fuel Vehicles

Increasing utilization rate of Alternative Fuel Vehicles (AFV) can mitigate the GHG impacts and pose direct cost fuel cost savings in the sector.

According to UPS, Liquefied Natural Gas (LNG) is one of the most promising alternatives to conventional diesel-powered trucks for long-haul (UPS, 2012). LNG vehicles offer fuel costs almost half those of traditional diesel vehicles, with lower emissions and are becoming more affordable as more of them are manufactured (UPS, 2012). The current market for LNG vehicle is mature and is commercialized (Table 2) (Intelligent Energy Europe, 2010). Therefore, industries should consider investing in LNG vehicles considering its market status and clear economic incentive.

Two types of AFV's in common usage: gas-based systems (LNG/LPG/CNG) and hybrid vehicles. These types of vehicles leverage existing technologies and infrastructure, and

(particularly for gas-based vehicles) have an extensive history of development. Second generation biofuels represent an alternative fuel, rather than vehicle type, which would integrate easily with existing vehicles and infrastructure: however, the technology to efficiently produce second-generation biofuels remains in development. Electric and hydrogen fuel cell vehicles represent a significant departure from existing vehicle technologies, and are being rapidly commercialized. Cost, range and infrastructure currently limits uptake; however, companies should monitor progress in these areas as the technologies are under further development to maximize fleet efficiency.

Consideration should also be given to the specific transportation and regional infrastructure (availability of refueling infrastructure) when determining the viability of AFV's. Companies should evaluate different fuel/technology options available and choose the most appropriate option for their operations.

Type of AFV	Innovation Type	Current Status	Barriers
Liquefied Petroleum Gas Natural Gas (CNG, LNG)	Incremental	Mass commercialization	Infrastructure
2 nd Generation Biofuels	Incremental	Demonstration	Fuel supply
Hybrid Vehicles	Incremental	Mass-commercialization	Cost of battery
Electric Vehicles	Radical	Pre-commercialization	Range Infrastructure
Hydrogen Fuel Cell Vehicles	Radical	Pre-commercialization	Vehicle cost Infrastructure

Table 2: Market maturity of different types of AFVs (Intelligent Energy Europe, 2010)

Action: Increasing LNG vehicle utilization

As an alternative fuel source, the LNG technology has a number of attractive advantages for the logistics sector. Fuel is generally at a lower cost and is widely available; the technology is a proven alternative for long-haul diesel trucks, and current market for LNG vehicle technology is mature and commercialized (Table 2). In some markets, government has

played a role in facilitating the uptake of this technology, through reducing fuel excise duties on alternative fuel, improving infrastructure (charging station and network) or subsidizing AFV purchases (South Korea subsidizes electric vehicle purchase up to 40% of the value of the vehicle).

Action: Operating electric light duty vehicles (LDV)

The market for electric-powered vehicle is relatively mature, where only charging infrastructure and range are the main limitations. Electric LDVs are especially well suited for the stop-and-go of pick-up of passengers and delivery operations. With regards to the range issue of electric vehicles, operating LDVs within regional-boundary is a viable option.

Action: Implementing technological innovations

Technological improvements can be a cost-effective approach to promote efficiency and comprises measures such as aerodynamics improvement, eco-chip tuning, speed limiting, additives and telematics systems. For instance, extending the allowable trailer length from 28' to 33' when used in a twin-trailer configuration allows 18% more freight to be hauled on the same trip, maximizing load factor (FedEx, 2013).

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Moreover, Panasonic uses technology to transform cooking oil into biodiesel fuel and utilizes it for vehicles involved in the production, procurement and marketing activities. In Tokyo, 100% of vehicles run on biodiesel. Toshiba is increasing its proportion of AFVs in fleet, and reduced CO₂ emissions by 550,302 pounds using a mix of hybrid and fuel-efficient vehicles.

Key Performance Index

Key Performance Index	Objective	Ease of Implementation
CO ₂ Emission / distance travelled (CO ₂ / t / km)	Lower	Difficult
Proportion of AFV / hybrid in fleet	Higher	Easy
Average distance covered by AFV / hybrid vehicles	Higher	Easy
Utilization rate of AFVs	Higher	Easy

This section on increasing utilization of AFVs and technological improvements in the vehicles provide a significant opportunity. However, external factors, including technological maturity, barriers to implementation and

government support and regulation, should be carefully assessed before adoption, especially in the case of AFVs.

At the federal level, Malaysia has introduced incentives in its National Automobile Policy (NAP) to increase the use of hybrid and electric vehicles, such as tax exemptions for AFVs and development of infrastructure to support a green-fuelled automotive industry. This forms part of the Malaysia Automotive Technology Roadmap (MATR), an action plan to meet the objectives of NAP 2014 by supporting industries and businesses with renewable energy technological investment and adoption.

IRDA also plans to support MATR by promoting renewable energy-fuelled transportation within its region. These incentives for Malaysia's hybrid and electric vehicles extend to the IM region and allow better management of the sustainability of transport operations within IM. Businesses and stakeholders should use these action plans as a guideline to reducing carbon emissions from transportation, thus working towards achieving IM's and Malaysia's green transportation goals. IM looks to develop green transport infrastructure as well as energy-efficient and renewable energy transport. Using these alternatives can not only reduce carbon emissions, but can also offer cost savings.

More information on incentives available to businesses can be found at www.irda.com.my. and www.kettha.gov.my.

Action: Initiating modal switch

Companies must focus on utilizing the most fuel-efficient mode of transport or combination of modes to reduce GHG emissions, considering emission intensities of different modes of transport. GHG emissions in shipping, when expressed in terms of emissions per tonne-km, is the most efficient transport mode, in the region of 1% to 2% of those of airfreight per tonne-km (WEF, 2011). Therefore, optimizing mode of transport, especially switching:

- from Intercontinental air to ocean freight;
- from short haul air to road transport;
- from long distance road freight to rail or waterways

Toshiba (Toshiba, 2013) has switched their shipment of goods from aircraft to rail and has reduced CO₂ emissions during transport by 23 kg per PC. Sony (Sony, 2013) is also adopting modal shifts that create less carbon footprint where viable.

Key Performance Index

Key Performance Index		Objective	Ease of Implementation
Intermodal transfers:	Proportion of Intercontinental air to ocean freight;	Lower	Easy
	Proportion of short haul air to road transport;	Lower	Easy
	Proportion of long distance road freight to rail or waterways	Lower	Easy

While a modal shift is ideal, the large upfront investments required to realize this plan makes it a challenging proposal. However, businesses can look to IRDA to help green its transportation. Through Low Carbon Cities Policy, IRDA encourages businesses to adopt a greener transportation mechanism. Some of the benefits that the policy offers are:

- Tax rate adjustments to fixed assets
- Tax rate adjustment to energy-efficient vehicles (Iskandar Regional Development Authority, 2014)

More information on incentives available by IRDA can be found at www.irda.com.my.

3.4. Energy Consumption during Use Phase

Action: Designing Energy Efficient Products

The main objective of this action is to reduce power and energy consumption during usage. This can be achieved by adopting various energy saving technological features, such as installing power saving LEDs. Energy saving mode is one of the key generic options in developing energy efficient products (ECMA, 2008):

- 1) Operational Modes (On-Maximum, On-Normal, On-Idle): Devices should perform intended actions in different energy saving modes
- 2) Energy Saving Modes (Low-power, Sleep, Stand-by modes): Switching one mode to another automatically when inactive
- 3) No Load Mode: External power supplies or chargers are connected to an electrical supply, but are not connected to electronic equipment, for instance, phones not charging when plugged in.

However, these technologies are the most basic approaches to reducing emissions in the consumer use phase. As mentioned above, the organization should conduct LCA to better understand and research innovative approaches to reducing energy consumption. It is the organization's initiative to strive for energy efficiency; the role of R&D department is crucial in developing innovative energy efficient products and designs.

Guidelines for designing energy efficient products (product specification requirements) are published by associations such as ENERGY STAR,

LG electronics is an example of how companies can comply with the government's environmental standards, developing a 5-year Technological Road Map and set specific environmental goals (in the areas of energy efficiency, increase in the use of recycled material etc) for each product category (LG, 2013). These milestones are continuously monitored and evaluated through internal KPIs comprising eco-product development ratio and energy efficiency improvement ratio, to satisfy international regulations such as the RoHS, ErP. Products undergo an 'Eco-Assessment', where products are evaluated on its environmental performance. LG's approach to energy efficient products aims to achieve reduced power consumption and reduce stand-by power.

EPEAT and getting products certified from these programs is

essential as not only it minimizes regulatory risk and environmental impacts, but also allows to meet growing consumer demand on green products. The number of EPEAT-qualified products sold has been increasing since 2007, at a rate of approximately 10% yearly (CEA, 2013).

Minimum energy performance standards and performance labels have been widely implemented in the consumer electronics sector, with more consumer electronics companies getting certified for energy efficiency. Governments have been supporting these initiatives through financial incentives, such as discounts, rebates and awareness increasing programs.

The Government of Malaysia launched its nationwide eco-labelling scheme in 2012. KeTTHA, in collaboration with the government-owned industrial certification and innovation organization, SIRIM Berhad (www.lcamalaysia.sirim.my), launched the MyHijau label in an effort to improve eco-design innovation and promote environmentally friendly goods and services. This label informs consumers that products are energy efficient. The government also offers fiscal incentives as a part of their National Green Technology Policy, which aims to minimize energy consumption while maximizing

economic potential. More information on this policy can be found on the KeTTHA website, www.kettha.gov.my.

Action: Install energy-efficient equipment

Energy-efficient equipment contributes significantly to the cost-savings in business operations. As explained above, energy-efficient equipment, such as HVAC equipment and servers, stands to reduce energy consumption to a large extent. This energy savings definitely translates into cost savings for businesses.

However, energy-efficient equipment is not limited to only instruments like HVAC equipment and servers. Significant energy consuming equipment such as escalators, elevators, motors and pumps are also

Example of energy-efficient escalator

Hitachi's VX Series escalators have automatic switch-off system that switches itself off when not in use. It also has a load detection system that promptly adjusts its conveyor speed to optimize usage. The combined energy-saving features enable the escalator to register up to 48% in energy savings when compared to conventional escalators (Hitachi, 2014)

potential areas for cost-savings.

There are many ways to identify energy-efficient equipment in the market. One of the easiest ways is to look for energy-efficient marker in the equipment, such as the ENERGY STAR tick marks. Energy-saving certifications, such as ENERGY STAR, assure consumers of the energy efficiency of the product. However, consumers should still conduct due diligence on the value proposition and energy savings of equipment before any purchase.

Key Performance Index

Key Performance Index	Objective	Ease of implementation
% of R&D spending in developing energy efficient products	High	Easy
% of R&D human resources in developing energy efficient products	High	Easy
Lifetime energy savings from energy efficient measures	High	Easy
% of products with certifications	High	Easy

% of new products meeting the certification requirements	High	Easy
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Energy consumption during use-phase is significant in the lifecycle of consumer electronic appliance. Governing authorities will regulate minimum energy performance standards and work with industries to develop long-term policy objects regarding technology. Companies can contribute by conducting LCA and researching on innovative technologies to specifically include eco-design features in their product for consumer energy efficient use.

More information on incentives available to businesses can be found at www.irda.com.my. and www.kettha.gov.my.

3.5. Water Management

Water availability is increasingly becoming a global issue. The United Nations Environment Program has identified water shortage as one of two major environmental issues that the globe is facing today (Monash University Malaysia, 2014). Water-rich Malaysia, too, is not impervious to this impact of climate change on water security. The *New Straits*

Times has reported that the Klang Valley water rationing in June 2014 has affected 3 million consumers. This incident is not localized either; other areas, such as Gombak, Kuala Lumpur and Petaling, were faced with the same predicament.

As it is, Malaysia registers as one of the high water consuming populations in the region. At an individual level, *Business Insider Malaysia* has estimated that Malaysians use 226 litres per person per day. This is significantly higher than Singaporeans, who register 154 litres per person per day, and Thais, who register 90 litres per person per day. Malaysians need to reduce their water intensity level by 37% to achieve the recommended 165 litres per person per day. One of the reasons to explain this water intensity level is the low to free water tariffs that create a wasteful habit. This habit

Businesses should play key role in conserving water because water scarcity directly affects their operations. During Malaysia's water crisis in early 2014, *Bloomberg* has reported that Malaysia's Top Glove Corporation had expected a cost increase as much as 10 times due to water shortages. *Bloomberg* has also found that another electrical products company in Malaysia had lost a RM40 million order due to uncertainty in water supplies.

could translate into increased wastages in work environment as well. Not only do businesses suffer from paying additional costs, the sheer volume of water consumed by industries exponentially worsen the situation, leading to accelerated water scarcity.

Action: Re-using greywater for flushing and irrigation

Greywater systems recycle water by collecting water that has been used for one purpose, and then using it for another, thus reducing the amount of fresh water required, and therefore reduces the volume of wastewater produced

Key Performance Index

Key Performance Index	Objective	Ease of implementation
Water intensity	Lower	Easy
Utilisation of greywater	Higher	Moderate

3.6. Monitoring and Reporting

Action: Development/Adoption of green technologies

The Information and communications technology (ICT)-enabling effect involves the introduction or improvement of ICT to reduce environmental impact and/or greenhouse gas emissions. For instance, the development of video conferencing has reduced the need for corporate air travel as meetings can be done through video conferences. An analysis by Global e-Sustainability Initiative found that ICT is crucial to mitigating climate change and could enable emissions reductions of 7.8Gt CO₂e, or 15% of GHG emissions (GeSI, 2012). Adopting and developing ICT can help with environmental initiatives and cutting costs.

Action: Create a “carbon budget” during monthly/annual strategic meetings

Companies can create a carbon budget to ensure that they meet carbon emissions targets. This sets a goal for their employees as well as discloses the company’s interest in reducing emissions. A detailed carbon budget comes with a clear emissions reduction plan for the long-term which can provide direction/guidelines for staff. A carbon budget sets short-term emissions goals and allows for frequent

monitoring and review compared to an emissions target over a period (Gilbert & Recce, 2006).

Action: Measuring and monitoring environmental indicators

A Building Energy Management Systems (BEMS) is a computer-controlled automation system which aims to create the safest, most comfortable environment possible at the lowest possible cost. On average, BEMS save about 10% of overall annual building energy consumption, and more than half of all buildings in the US larger than 100,000 square feet have one (Brambley, 2005). This is achieved through:

- Building system automation: This can be done according to time, type of day, or environmental conditions. For example, the BEMS can control lighting to avoid unnecessary use of energy outside normal working hours or when ambient daylight levels are adequate (Sustainable Energy Authority of Ireland, 2014).
- Provide energy monitoring and management information. BEMS provides users with easily available data on energy flows, consumption, trends and overall building performance. Companies such as

Siemens even have professionals at their operations center to evaluate the data collected and create comprehensive reports to identify ways to improve energy usage and achieve additional savings.

Key Performance Index

Key Performance Index	Objective	Ease of implementation
Number of records of energy consumption	Higher	Moderate

3.7. Educating and Training Employees

Employees are the drivers of businesses on the ground. A well-intentioned environmental strategy from the management without the support of the employees to implement it correctly would subvert the effectiveness of the strategy. Similarly, eco-friendly equipment in the hands of an untrained employee will be ineffective. Hence, it is essential to have an educated and trained workforce that shares the management's concerns and ambitions to build a green and sustainable business.

Businesses should embark on strategic programs and initiatives to build on their capacity for improving

environmental performance. Activities to educate and train the company's employees on environmental issues, such as climate change, could motivate employees to be more involved and committed to greening the company and thereby contributing to green economy in IM. For example, an understanding of the deleterious health effects of GHG enables employees to support the management's goal to reduce GHG emissions. Employees could become more dedicated and actively participate in sustainable development activities realizing that their welfare is directly affected by such emissions.

It is essential for employees to be made aware that they too have an impact on the environment. Firms could introduce a system that reveals to employees their impact on the environment. For instance, Woh Hup Pte Ltd in Singapore has implemented an environmental management system that monitors on a daily basis the energy, water and generated by the company. These figures are on display in prominently visible areas, such as lift lobbies and pantries, so that employees are reminded of their daily environmental footprint. Individual electric meters were also issued to staff to monitor personal electrical consumption per day. In this manner, employees could relate to their environmental

performance, monitoring in real time the impact of their consumption or savings.

Employees could also participate in seminars and conferences as a way for sharing and learning opportunities. For instance, Universiti Utara Malaysia organized the International Conference on Management and Business Sustainability on 18-19 August 2014 that aimed to facilitate exchange of ideas to attain sustainability through business transformation (Universiti Utara Malaysia, 2014). Alternatively, business owners could conduct in-house training with the assistance of IRDA's environment team or other experts such as the Malaysian Green Technology Corporation to customize training specifically to business operations.

Ultimately, businesses should aim to have a workforce educated and trained in sustainability topics as a matter of business strategy. With adequate awareness and training, employees would be better equipped to contribute to developing successful solutions. Finally, businesses are the beneficiaries of the cost-savings and subsequent profits generated by such an environmentally-conscious workforce.

Key Performance Index

Key Performance Index	Objective	Ease of implementation
Number of hours of sustainability training per employee	Higher	Easy
Number of training sessions organized by company	Higher	Easy

3.8. Compliance to Local Regulations

As a commercial entity present in Malaysia, businesses should as a first and essential requirement abide by the rules and regulations of the country. Compliance to regulations is a non-negotiable requirement before businesses can fully benefit from this guideline to further improve on the sustainability and green initiatives of business operations.

Malaysia has numerous prevailing national standards and also international standards that businesses are encouraged to adopt. Compliance to authorized standards acknowledged by the Malaysian government is complementary to the recommended actions proposed in this manual. Some examples of recommended standards that businesses are encouraged to comply with are the MS1525, ISO14001,

ISO18001 and ISO50001. In addition, businesses can also look to have their products certified MyHijau and disclose their GHG emissions performance through MYCarbon reporting.

The MS1525 is a code of practice pertaining to energy efficiency and use of renewable energy for non-residential buildings. Developed by the Department of Standards, Malaysia, this code primarily focuses on energy efficiency in buildings. In general, the code distinguishes between passive measures and active measures that building owners could adopt. Passive measures consist of recommendations relating to architectural and passive design strategies and the building envelope. Active measures correspond with lighting, power and distribution, air conditioning and mechanical ventilation and energy management systems. The adoption of the recommendations in MS1525 would help businesses to eventually reduce energy consumption and minimize use of non-renewable energy sources while maintaining a safe, healthy and comfortable environment for building occupants.

Businesses may also adopt the international standards from the International Standard Organization (ISO) as an alternative to the Malaysian Standards. The ISO is not only

an independent non-governmental membership organization; it is also the world's largest voluntary developer of international standards, covering more than 19,500 standards across all industries. Common ISO standards that businesses adopt are the ISO 14000 (environmental management), ISO 18000 (occupational health and safety) and ISO 50001 (energy management system). This manual encourages business to consult and consider the ISO standards in addition to the Malaysian Standards.

Moreover, businesses with green features built into their products can look to be certified under MyHijau for enhanced consumer confidence and to demonstrate their commitment to sustainable development. The MyHijau Mark is an internationally-recognized environmental and ecological label. Products labelled MyHijau can be featured in the MyHijau directory which helps businesses to promote their environmentally-friendly goods (Malaysia Green Technology Corporation, 2013).

Businesses could also seek disclose their GHG emissions performance through MYCarbon. The Ministry of Natural Resources and Environment Malaysia has instituted the MYCarbon Programme, which acts as the National Corporate GHG Reporting Programme for Malaysia. The advantage of

engaging in a reporting exercise includes creating the awareness in business owners of the importance of measuring and reporting on emissions. This could also eventually lead to efforts put into management of the measureables, such as GHG emissions or energy use, creating better products, services and operations.



3.9. Case Study

3.9.1. Siemens AG (Siemens AG, 2014)

Founded in Berlin in 1847, Siemens AG is now one of the largest electrical and electronics companies globally with 370,000 employees based in 190 countries. Recently, the company has developed an Environmental Portfolio that offers environmentally-friendly technologies and products and is aimed to achieve RM143 billion in revenue by 2014. In 2012 alone, the Environmental Portfolio led to a reduction of 332 million tons of carbon dioxide emissions and is on track to meet its ambitious goal.

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In addition, Siemens' sustainability roadmap extends well beyond environmentally-conscious products as it has embedded best practices in every area of its business. For its efforts, Siemens was commended as an *Industry Group Leader* in the Dow Jones Sustainability Index 2013, recognizing it as the most sustainable industrial company for the 6th time in a row. In addition, Siemens was also conferred the award for "Sector Mover", having the greatest improvement in 2012.

The Siemens Sustainability Program comprises of the three strategic fields of (1) Business Opportunities, which focuses on its aforementioned Environmental Portfolio, (2) Walk the Talk, which involves internal management systems and resource efficiency, and (3) Stakeholder Engagement, which drives constructive dialogue, partnerships, and joint ventures that create value. Selected examples of Siemens AG's environmental initiatives in these fields will be summarized below (Siemens AG, 2014):

a) Business Opportunities: Products and services from Siemens' Environmental Portfolio typically have a three-fold advantage: (1) they benefit customers, who benefit from low energy costs and higher productivity; (2) they benefit future generations, whose living and environmental conditions are

improved; (3) and they benefit Siemens itself, by enabling the company to tap attractive markets and generate profitable growth.

One of Siemens' product lines is in electric cars. Currently, Siemens is supporting efforts in Denmark, where the EDISON (Electric vehicles in a Distributed and Integrated market using Sustainable energy and Open Networks) project on storing wind energy in electric cars is in development. In addition to building electric cars, Siemens is supplying the charging infrastructure where the cars may charge their storage batteries from energy generated from Danish wind farms.

b) Walk the Talk:

Energy Management - The Siemens Switzerland Regional Company is one of the first corporations in the country to receive ISO 50001 certification. As an internationally recognized standard, ISO 50001 defines the requirements for establishing a systematic and structured energy management system. Based on the potential opportunities identified from the energy management system, Siemens Building Technologies implemented HVAC room automation systems tailored for individual usage. In addition, a Green Building Monitor was installed to track energy consumption

and foster responsible resource usage among employees. These measures have resulted in a 50% reduction in energy consumption.

Waste Management - In 2010, 7.7 million smartphones were sold in Germany alone. These phones contained a total of 230 kilograms of gold, over 2.3 tons of silver, and 85 kilograms of palladium - an obviously significant amount of precious metal. However, recycling these resources is difficult when an individual cell phone only contains less than 0.4 grams of precious metals, which is mixed with other materials when the phone is shredded at the end of its shelf life. To address this, Siemens takes future recyclability into account as early as the product designing stage. Going one step further, the company has also set up an R&D centre to developing automated systems for recycling electrical components.

c) Stakeholder Engagement: Siemens' Energy Efficiency Program for Suppliers (EEP4S) offers suppliers environmental and energy efficiency checks and helps them to identify opportunities for reducing the consumption of energy and other resources. In doing so, Siemens utilized its own competencies from its environmental program and

portfolio of eco-friendly products. Since its introduction in 2011, 1,923 supplier sites have taken part in the EEP4S.

In addition to these initiatives, Siemens also owns and operates The Crystal in London, the only building in the world to achieve BREEAM (Building Research Establishment Environmental Assessment Method) Outstanding and LEED Platinum ratings. Designed to run purely on electricity, The Crystal uses solar power, ground source heat pumps, and energy-efficient LED lighting. No fossil fuels are burnt in the building. The Crystal is also home to an exhibition which showcases environmental trends, challenges, and solutions to build sustainable cities.

3.7.2. Sony (Sony Corporation, 2014)

Sony has been a leading player in the electronics manufacturing industry for a long time. Its history with environmental initiatives, too, has spanned many areas from operations, product development to corporate social responsibility. This case study looks into some of the impactful initiatives that Sony is currently engaged in.



Image 5: Sony's 4 environmental principles

Sony aims to achieve zero environmental footprints from its product life cycle and business activities. To fulfil this objective, Sony utilizes the advance technology that it is famous for and also develops a robust environmental management plan and governance.

Sony Group Environmental Vision strives to realize a long-term goal via the “Road to Zero” plan. This plan sets mid-term targets that the company has to achieve by 2050. The targets are (a) climate change, (b) resource conservation, (c) management of chemical substances and (d) biodiversity.

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a. Climate change

On the climate change front, Sony sets several mid-term GHG emissions targets:

- Technology development: develop technologies that improve self-sufficiency ratio on the energy supply and develop ICT that supports low-carbon society
- Product planning and design: reduce annual product energy consumption by 30% compared to FY2008
- Procurement: determine GHG emissions from suppliers and develop industry-wide common reporting format
- Operations: reduce total GHG emissions by 30% compared to FY2000
- Logistics: Reduce total CO₂ emissions by 14% compared to FY2008

Sony has invested in numerous technologies that help to achieve these goals. One prototype on development enables users to identify electric power fees on a per-device basis. Another product that Sony has marketed is the CP-S300E/S300W, which is a home energy saver equipment that enables users to store energy and use energy efficiently.

Other than mitigating climate change impacts through its products, Sony has also implemented measures to reduce GHG emissions from operations sites. Production

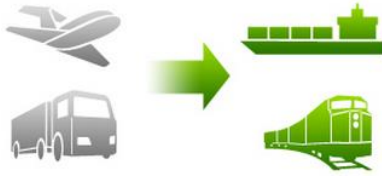


Image 6: Sony implements modal shift for transportation (Sony, 2013)

adjustments and consolidation of sites, among other energy reduction measures, have allowed Sony to reduce its CO₂ emissions from site by around 332,000 tonnes in 2012. Moreover, gas

abatement equipment installed at its semiconductor and LCD plants further reduced the emissions of PFCs and other GHG gases by 10,000 tonnes in 2012.

b. Resource conservation

Sony concentrates its resource conservation efforts into recycling. Sony adopts the concept of individual producer responsibility where producers are responsible for their product over their life cycle, including after use. Therefore, Sony collects its products that have reached its end use and recycle them. In 2012, Sony recovered 85,000 tonnes of end-of-life products.

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Sony also develops products that are easily recyclable. It develops a guideline that covers crucial points for consideration in creating environmentally-friendly products, for example, making units easy to disassemble and marking out positions of screws and number of screws for easy tracking on disassembly. Sony tracks this recyclability through feedback received from its Green Cycle Corporation which recycles home electronics.

c. Management of chemical substances

The use of chemical substances is governed by the Sony's environmental management plan. The plan covers chemical use on production sites as well as on products.

Sony limits the use of chemicals on manufacturing and non-manufacturing sites. Chemicals are assessed by Sony, graded "high" or "low" in terms of application and are categorized properly for management.

For use in products, Sony distinguished chemical use into three key areas:

- Research and Development (R&D)
Sony invests in R&D of alternative materials to replace chemicals of high concern.

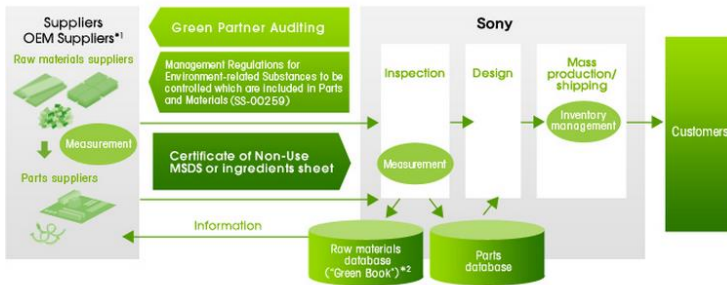
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- Product planning and design

At this stage, Sony aims to eliminate *Environment-related Substances to be Controlled* of very high concern and BFRs/PVC within specified use.

- Procurement

Sony targets to comply with “product planning and design” plan in its procurement policy.



*1 Companies that manufacture OEM (original equipment manufacturer) products on behalf of Sony

*2 For direct suppliers, the Green Book was made available via its electric procurement system in autumn 2003

Image 7: Sony's system for managing chemical substances in products (Sony, 2013)

d. Biodiversity

Sony's mid-term target for protection of biodiversity spans across procurement and operations. Sony will conduct biodiversity assessment prior to resource extraction and harvesting. Sony introduced the Green Star program in 2011

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as a mean for assessment of biodiversity. The program embarks on a progressive approach to conserve the environment with considerations to unique characteristics of the vicinity and the local community.

On its operations, Sony strives to respond to the needs of local communities by conducting environmental activities. One example is the Kohda site that housed the Sony forest. The site is grown with trees that originate from the area. They are grown to replace and further add trees that have been cleared to be made factory grounds for Sony. More than just an area for trees, the site becomes a local attraction for its observation deck and obstacle course.

4. Social Responsibility

The promotion of sustainable business practices, respect for labour and human rights and transparency through disclosure are increasingly expected from responsible businesses. Democratic freedoms, ethical behaviour and good governance, the rule of law, property rights and a thriving civil society create fertile conditions for private sector led growth. The absence of such safeguards takes individuals out of markets, reduces innovation, restricts access to opportunity and drives political instability and conflict.

Forbes has reported that human capital is an increasingly scarce resource in a global economy. It is deemed by many experts as the most important segment of a business' value chain. In the war for talent, companies with excellent human rights track record are consistently ranked high on Employer Branding surveys. This helps in attracting and retaining this key resource, contributing to lower rates of staff turnover and higher productivity, and increasing employee motivation.

Businesses should also note that institutional investors, pension funds and equity firms are increasingly taking ethical factors such as human rights into account in their investment

decisions. More than 1,260 signatories with USD45 trillion Assets under Management have adopted the United Nations Principles for Responsible Investment (www.unpri.org), including the Harvard University Endowment. This represents an opportunity for businesses to highlight their human rights credentials in an increasingly enlightened and cautious market.

4.1 Human rights, labour standards and ethical behaviour

Respect for human rights is no longer a good to have but a prerogative of every aspiring country. Businesses that neglect human rights are also liable to boycotts, litigations and backlash by increasingly vocal and militant stakeholders. As reported by *Business Insider*, multinational corporations like Nike have been accused of exploiting low cost labour and have faced public pressure to introduce better working conditions and a minimum wage (Nisen, 2013). Businesses cannot ignore the impact that non-governmental organizations, civil society and social media can effect. Instead of being reactive, businesses should anticipate any aspects of their operations that may infringe on human rights and proactively work towards avoidance of such violations.

In line with the principles outlined by the United Nations

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Global Compact (www.unglobalcompact.org) and the International Labour Organization (www.ilo.org), IRDA fully supports international standards for human rights, enshrined in the charter of Ministry of Human Resources (www.mohr.gov.my).

International labour standards are aimed at promoting opportunities for women and men to obtain decent and productive work, in conditions of freedom, equity, security and dignity. In today's globalized economy, international labour standards are essential components in the international framework for ensuring that the growth of the global economy provides benefits to all.

Malaysia too believes that everyone is entitled to their inalienable rights to invest, live, work, worship and play with dignity and respect. This is in accordance with IRDA's vision of building a "Strong and Sustainable Metropolis of International Standing".

Outlined below are the UN Global Compact principles for businesses to support and enact within their sphere of influence, applying the following 10 core values in areas of human rights, labour standards, the environment and anti-corruption.

Human Rights

- Principle 1: Businesses should support and respect the protection of human rights (enshrined in the Malaysian constitution, please refer to <http://www1.umn.edu/humanrts/research/malaysia-a-constitution.pdf>);
- Principle 2: ensure that they are not complicit in human rights abuses across their supply chain.

Labour

- Principle 3: Businesses should uphold the freedom of association and recognise the right of employees to collective bargaining;
- Principle 4: remove all forms of forced and compulsory labour;
- Principle 5: abolish the use of child labour; and
- Principle 6: eliminate all forms of discrimination in hiring and employment practices

Environment

- Principle 7: Businesses should adopt a precautionary approach to environmental issues;
- Principle 8: undertake initiatives to incorporate greater environmental stewardship in its operations; and
- Principle 9: encourage the development and diffusion of environmentally friendly technologies.

Anti-Corruption

- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

IRDA strongly encourages businesses to consider this important aspect and take an enlightened approach to adopt the framework in everyday business decisions and practices.

Key office holders should come together to formulate a human rights policy for the business to comply with and make it publicly accessible on mediums such as websites or on the annual report. Top management and HR professionals

should take a proactive approach in educating every employee to abide by the values defined in the human rights policy.

4.2 Disclosure Requirements

Sustainability disclosure is the act of communicating organizational performance on financial, environmental, social and governance (ESG) activities. It is practiced by many leading businesses to communicate their ESG progress to stakeholders and lend credibility to their commitments to sustainable development.

Across the globe, more enlightened stakeholders are raising concerns over businesses' non-financial performance and are demanding them to disclose their ESG performance with greater transparency and detail. In certain regions, such sustainability disclosure is a legal requirement. With effect from 31 December 2007, companies listed in Bursa Malaysia are required to include a description of the corporate social responsibility activities or a statement to that effect in their annual reporting (Listing Requirements of Bursa Malaysia Appendix 9C, Part A, Paragraph 29). Bursa Malaysia supports businesses by providing training for companies and

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offers guidance for sustainability reporting (Sustainable Stock Exchange Initiative, 2013).

Many businesses are accustomed to file mandatory sustainability disclosures such as annual reports and quarterly 10-Qs or in the form of non-financial reports such as pollutant and emissions reports for those in heavy industries. There are also established voluntary disclosure frameworks such as the Global Reporting Initiative (GRI) and the Carbon Disclosure Project which businesses adopt in their corporate social responsibility or sustainability reports. There is also a trend of companies aligning financial and non-financial information in a single integrated report.

For businesses that are in their nascent stage of reporting their ESG impacts, they can get in touch with IRDA to learn more on disclosure requirements and report information on the basic triple bottom line performance. This ensures that the disclosed information is complete, consistent, useful and reliable.

The business expression, “If you can measure it, you can manage it” holds true. The process of developing a sustainability disclosure unlocks opportunities for a business to gain insights into its operations and supply chain, identify

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and mitigate risks and uncover potential cost savings and growth. Businesses that regularly publish sustainability disclosures are recognised on established indices such as the Dow Jones Sustainability Index and FTSE4Good. Businesses that disclose ESG performance not only receive tangible and intangible benefits as mentioned, but also pave the way for a greener economy in Iskandar.

To achieve a more sustainable electrical & electronics sector, we have identified the following indices that businesses should monitor:

- Initiatives and targets for environmental performance;
- Direct and indirect energy consumption
- Energy saved due to conservation and efficiency improvements;
- Initiatives to reduce indirect energy consumption and reductions achieved;
- Total direct and indirect GHG emissions;
- Initiatives to reduce GHG emissions and reductions achieved;
- Initiatives to mitigate environmental impacts of

products and services, and extent of impact mitigation;

- Initiatives to improve public awareness on climate change issues

Requirements outlined above are based on the Key Performance Indices indicated in the above sections and aligned with the GRI indicators.

4.3 Responsible Procurement

Responsible Procurement ensures that business commitment to good corporate responsibility is reflected in how they select and work with suppliers. Responsible businesses encourage other companies that they do business with to meet the standards of ethics, business integrity and environmental practice expected of them. This would include adherence to high standards on Health & Safety, Fair Business Practices, Environmental Protection, Human Rights, and Local Community Development.

Businesses need to develop a model to bring about meaningful change within the supply chain by way of identifying gaps in the suppliers' ethical business practices, and collaborating with them to develop tangible improvements.

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Internationally, leading countries have also embarked on sustainable procurement guidelines across their ministries to ensure that labour rights and environmental concerns are respected. Recognizing the importance of Government Green Procurement (GGP), the Malaysian government has taken initial steps to boost demand for green products and services.

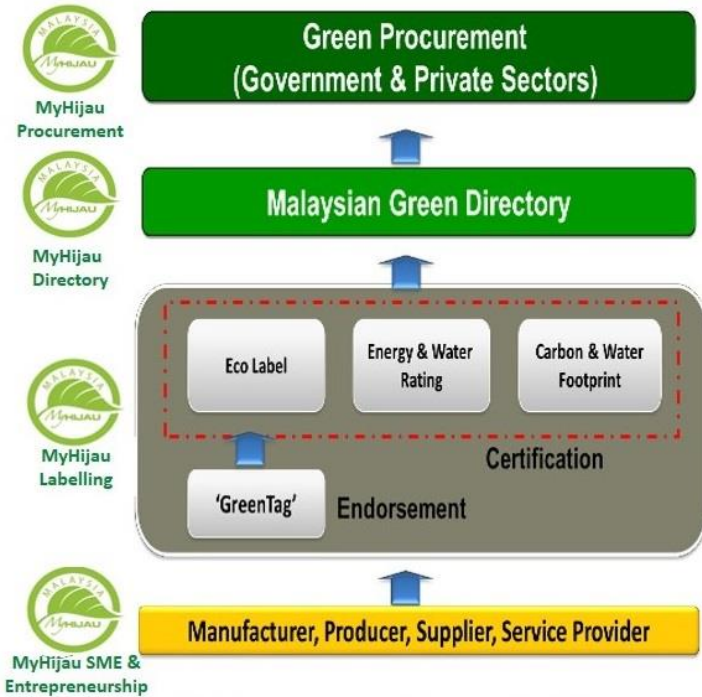


Figure 12: Malaysia Government Green Procurement (Greentech Malaysia, 2013)

As the long-term action plan laid out for Malaysia intends for GGP to be implemented at all levels of government by 2020, this sets an exemplary model for private sector companies to follow suit and enjoy potential business opportunities.

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Common products which companies and organizations have adopted green procurement policies for include recycled paper, renewable energy sources, VOC-free paints and adhesives, etc. Businesses can also cascade their procurement policy to suppliers/contractors to achieve a widespread effect of green procurement.

Leading firms are conducting life-cycle assessments to identify materials in their products that may pose significant environmental, health and safety risks. With this information, firms can re-design their products to prevent or mitigate such risks, which forms a logical part of effective supply chain management practices. Companies operating in Iskandar Malaysia could strive to have at least 10% of their purchases in the initial years, and move towards 100% green procurement in the years to come.

A series of case studies that describe how organizations from different countries have approached the verification of social criteria at various stages of the tender process is available at this link: <http://www.sustainable-procurement.org/resources/tools-and-guidance/>. Each study looks into how the compliance of direct suppliers is monitored and how this applies to the rest of the supply chain. Procurement professionals and other key

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stakeholders could learn from the experiences of their counterparts to develop or improve their systems.

Another similar report that provides an overview of responsible procurement in the private sector globally is the *Green Purchasing: The New Growth Frontier* by the International Green Purchasing Network (http://www.igpn.org/DL/Green_Purchasing_The_New_Growth_Frontier.pdf)

The ideas generated and lessons learnt from these cases can provide additional incentives, goals, and tools for other companies to further advance their environmental purchasing policies.

5. Conclusion

Considering the significance of the sector and in the global economy, the need for mitigating its impacts on the environmental impacts is high. This is especially substantial in Malaysia and IM's context, considering their plans for E&E industry development. In accordance with Malaysia's sustainability goals and Sustainable Iskandar, environmental health cannot be compromised for economic growth. Policies and directives such as tax exemptions for renewable energy technologies and e-waste collection points have been introduced to green the E&E industry. However, stakeholders and businesses need to cooperate with these schemes to achieve the set sustainable goals. This guideline highlights the role of eco-design (product itself) in addressing the environmental issues associated with the sector along with other actions producers can employ to minimize impact of its operations.

Useful Links

Bursa Malaysia regulations on sustainability disclosures

http://www.bursamalaysia.com/misc/system/assets/5949/regulation_rules_main_market_bm_mainchapter9.pdf

BSEEP Building Energy Efficiency Technical Guideline for Passive Design

<http://www.mgbc.org.my/news/bseep-building-energy-efficiency-technical-guideline-for-passive-design/>

Green Building Index

www.greenbuildingindex.org

Iskandar Regional Development Authority

www.irda.com.my

Low Carbon Cities Framework and Assessment

<http://esci-ksp.org/wp/wp-content/uploads/2012/04/Low-Carbon-Cities-Framework-and-Assessment-System.pdf>

Low Carbon Society Blueprint

http://2050.nies.go.jp/cop/cop18/SPM_LCS%20Blueprint_Iskandar%20Malaysia.pdf

Ministry of Energy, Green Technology and Water

www.kettha.gov.my

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The Green Purchasing: The New Growth Frontier

http://www.igpn.org/DL/Green_Purchasing_The_New_Growth_Frontier.pdf

Sustainable Procurement Resource Center

<http://www.sustainable-procurement.org/resources/tools-and-guidance/>

The 2015 Budget Speech

<http://www.thestar.com.my/News/Nation/2014/10/10/Budget-2015-full-speech-text/>

Appendix

SIC	36	Electronic and other electrical equipment and components, except computer equipment
SIC	3612	Power, Distribution, and Specialty Transformers
SIC	3613	Switchgear and Switchboard Apparatus
SIC	3643	Current-Carrying Wiring Devices
SIC	3644	Noncurrent-Carrying Wiring Devices
SIC	367	Electronic Components And Accessories
SIC	5063	Electrical Apparatus and Equipment Wiring Supplies, and Construction Materials
NAICS	334419	Other Electronic Component Manufacturing
NAICS	3359	Other Electrical Equipment and Component Manufacturing
NAICS	335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
NACE	31	Manufacture of electrical machinery and apparatus n.e.c.
NACE	31.6	Manufacture of electrical equipment n.e.c.
NACE	31.62	Manufacture of other electrical equipment n.e.c.
NACE	32.1	Manufacture of electronic valves and tubes and other

electronic components

NACE	32.10	Manufacture of electronic valves and tubes and other electronic components
NACE	51.86	Wholesale of other electronic parts and equipment

Table 3: Consumer Electronics Industry Classification

(Factiva, 2014)

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About IRDA

The Iskandar Regional Development Authority (IRDA) is a Malaysian Federal Government statutory body tasked with the objective of regulating and driving various stakeholders in both public and private sector towards realizing the vision of developing Iskandar Malaysia into a strong and sustainable metropolis of international standing

The Division provides strategic advice on environmental planning, development and management, carries out research and works in partnership with external agencies to promote a green growth economy for Iskandar Malaysia. In addition, the Division builds capacity, collaborates to integrate Climate Change programmes, statutory requirements related to the environment and supports green growth aligned to national commitments.

For further details, please contact the Head of Environment Division, IRDA.





Iskandar Regional Development Authority (IRDA)
#G-01, Block 8
Danga Bay, Jalan Skudai
80200 Johor Bahru
Tel: +607 233 3000
Fax: +607 233 3001