

GREENING SMES WITH ECO-DESIGN TO STEER GREEN GROWTH IN ASIA

By **Thailand Environment Institute**

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PREFACE

SMEs activities in production and service sectors significantly contributes to economic development and employment in the Asian region. It also maintains local cultures and wisdoms by integrating into the productions and services. However, it may cause environmental problems if there is improper management. Therefore, SMEs operators and all relevant parties should work together from planning to operation in order to achieve environmental, economic and social sustainability throughout the supply chain.

Eco-design is one of the concepts that play a crucial role in the planning and operation of environmentally friendly SMEs. Starting from raw material selection, product design, manufacturing with cost-effectively use resources and energy, and causes the least wastes. While also promote the utilization of wastes, reusing and recycling of wastes following the circular economy principle.

Currently, there are numbers of SMEs in various Asian countries have adopted the concept of eco-design, but there are some limitations in terms of policy, finance, knowledge and skill, and innovation. Those limitations are discussed in this document "Greening SMEs with Eco-design to Steer Green Growth in Asia". The document also identified and described the enabling factors and recommendations to enable SMEs to be more effectively implementing the eco-design, which aims to support the development of Asia's green economy in production and service sectors towards sustainability pathway together.

Greening SMEs with Eco-design to Steer Green Growth in Asia was completed, and the researchers would like to thank AIT and UNEP for their partnership and collaboration, as well as the EU and the SWITCH-Asia programme for the financial support. They were greatly recognized for their contribution on data and information, recommendations, and facilitation, such as organizing regional and subregional webinars. The paper was completed successfully with each contribution.



Dr. Wijarn Simachaya
President of Thailand Environment Institute





1. INTRODUCTION

Thailand Environment Institute (TEI), SWITCH-Asia RPAC, and Asian Institute of Technology (AIT) worked closely to develop this paper which aimed to develop a better understanding of how SMEs in Asia are currently implementing eco-design and how those practices can be supported further in order to foster Green Growth in Asia.

SMES – A KEY DRIVER FOR THE ASIA ECONOMY

Long-term green growth cannot be achieved without the participation of the business community. As a consequence, Sustainable Development Goal 12 emphasizes how businesses operate (United Nations, 2018). SMEs play a critical role in Asia's economy, employment, and innovation, and must thus be at the forefront of the transition to green growth. SMEs account for over 97 % of all enterprises, two-thirds of all employment, and 30 to 60 % of GDP (ADB, 2018).

Despite the enormous socioeconomic benefits of SMEs, the manufacturing processes and services offered by SMEs cause significant harm to the environment (Nulkar, 2014). As a result, addressing development and climate change goals at the same time is a critical factor in moving towards a green economy. Eco-design principles and circular business models can be important milestones in this regard. Eco-design is a phrase used to describe an environmentally conscious design that combines ecological and economic objectives (Suijker, 2018). It is a strategic approach to changing manufacturing practices in order to protect the environment by considering the total environmental impacts of a product from the initial stages of design to consumption, disposal, and beyond by reusing as much of the original material as possible.

Eco-design approaches can reduce pollution and resource consumption per person by 25 to 50 %. Some Asian SMEs have already implemented eco-design strategies by selecting

low-impact resources and cleaner processes. A system design for greater eco-efficiency, resource consumption reduction, production lifetime optimization, and considerations for more sustainable communities all assisted in increasing the lifespan of products, among several other things (Hilal, 2013). Asian SMEs should indeed comply with environmental regulations that are enforced at the national and international levels. This attempting makes SMEs feel compelled to do beyond the general required instead of following as voluntary. Therefore, as result, businesses implement eco-design in accordance with ISO14062. It is the environmental management standard involves integrating environmental considerations into product design and development through six steps: planning, conceptual design, detailed design, tests/prototyping, production/market launch, and product modification (Suijker, 2018).

It is important to implement a clear picture of the Asian SMEs-business community in order to suggest appropriate solutions within the Asian context. SMEs pioneers who have already implemented eco-design concepts and circular business models should be recognized. In contrast to linear business models, circular business models various distributed financial returns from environmental protection, societal benefits, and overall well-being. A new generation of businesses is playing an important role in cultivating environmentally-friendly innovation in this environment.



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CONCEPT OF ECO-DESIGN

The discussion paper, which has been based on a review of available literature as well as contributions from eco-design practitioners in selected Asia countries through the project's short survey and feedback inputs from regional dialogue participants in 2020, defined 'Eco-design' as "a proactive approach in designing products and services that minimize resources and energy consumption, resulting in less negative environmental and social impacts throughout their life cycle while measurably improving the environment and social well-being" (TEI and UNEP, 2020)

Eco-design can be a win-win situation for the business that provides the process, the consumer who wishes to make responsible choices, and society as a whole. The key recognized benefits include economic benefits, competitive and reputational benefits, and environmental and ecological benefits. In general, the primary benefits of the eco-design approach are the reduction of raw materials and resources used, the reduction of energy requirements, the reduction of impacts on human health, and the reduction of waste quantities in landfills. Furthermore, eco-design has the obvious benefit of being a cost-effective approach that can effectively reduce costs for

producers and investors through various means. Lower raw material procurement costs, fewer product losses, lower energy costs, lower transportation and distribution costs, and lower end-of-life management costs all seem to be economic benefits in product manufacturing. There are several cases in various businesses where green branding has distinguished companies and provided them with a competitive advantage.

'Eco-design' is identified as "a proactive approach in designing products and services that minimize resource and energy consumption, resulting in less negative environmental and social impacts throughout their life cycle while meeting the users' functional and quality needs."

(TEI and UNEP, 2020)



RESEARCH OBJECTIVE

The paper investigated the eco-design practices of SMEs in Asia, focusing on Southeast and South Asia as fast-growing sub-regions on the following points:

- ✔ A description of the current state and trends in eco-design approaches used by Asian SMEs in production and business operations. Through an analysis of case studies and best practices, the paper discusses how eco-design principles can be an effective tool for achieving sustainability
- ✔ A discussion of limitations and challenges in the creation of truly "green" SMEs
- ✔ Identification of key factors supporting SMEs on eco-design approaches
- ✔ Recommendation on the vital enabling factors that lead SMEs to implement Eco-design successfully



RESEARCH METHODOLOGY

The research methodology consists of a literature review and stakeholder dialogues to gather additional information from government representatives and business operators.

✎ **Literature review:** The initial findings of this paper were developed through analysis of the existing documents including technical articles and papers concerning operations of the SMEs and their eco-design implementation in 18 Asian countries ranging from South Asia¹ to Southeast Asia, including such economically diverse countries as China and Mongolia².

✎ **Regional dialogue:** The regional dialogue focus on the good practices eco-design implementation of SMEs in 8 industrial sectors include agriculture (resource efficient use), alternative energy/development (e-vehicle), construction, electronics, household cleaning/personal use product, packaging, service (tourism and logistic), and textile to share their experience, exchange of knowledge, limitation, and challenges in order to be a guideline for other companies for the benefits of adopting/instilling the eco-design thinking. Moreover, the enabling factors to enhance the application of the eco-design concept have been discussed and explore the way forward to shape up market for green products.

✎ **Sub-regional dialogues:** The sub-region dialogue is divided into 2 events: South Asia and Southeast Asia. These events focus on economic and policy measures to promote and enhance the application of the eco-design approaches in SMEs. This part is a continuation of the regional dialogue to recognize in-depth economic and policy information through expert discussion.

The Paper focuses on eco-design practices and resource-efficiency in 8 business sectors: 1) agriculture 2) alternative energy 3) construction 4) electronics 5) packaging 6) household cleaning products 7) services, and 8) textiles.

Recognizing that green SMEs should not only be an essential component of the economy, but also drive innovation and competition, and thereby help to address economic, environmental, and social challenges in Asia. The Paper also identifies and discusses limitations and challenges for SMEs when it comes to the implementation of eco-design principles in Asia to facilitate the shift towards higher levels of sustainability. Recommendations for enabling factors and further measures to promote eco-design in SMEs are provided.

¹ *South Asia: Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and the Maldives*

² *Southeast Asia: Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, and Vietnam*



2. ROLE OF SMES TO SUPPORT THE TRANSITION TO THE GREEN ECONOMY IN ASIA

Asia is confronted with development challenges such as poverty, climate change, and pollution. While the number of environmentally responsible businesses has increased, governments can play an active role in encouraging green supply chain management through policy and financial measures such as public procurement policies that encourage domestic SMEs to adopt greener practices. Governments create new green financial instruments such as green bonds, green credit, and green insurance to encourage financial investments in projects that protect the environment and enable innovation and investment in green technologies (Khanna, 2020). East Asia's transformation to industrialization, particularly manufacturing, was a success. However, with a few exceptions, it is frequently difficult for developing countries to realize the benefits of rapid urbanization and industrialization. Globalization and technological progress frequently make industrialization a difficult endeavor (ADB, 2018).

SMEs are extremely important in many Asian countries. The definition of SMEs varies in different countries and industries. In general, the number of employees, assets, annual average, turnover, annual revenue, and total capital assets have been used to categorize the business sector in Asia. Furthermore, most SMEs are divided into the following sectors: manufacturing, service, wholesale, and retail (OECD, 2018). In most Asian countries, SMEs predominate in labor-intensive industries such as agriculture, retail, and trade. Therefore, as result, they have a high % of working-age people but a low share of total value-added in most countries. According to regional data, SMEs account for approximately 66.3 % of total employment value. In general, SMEs appear to be underrepresented as exporters, with their share of total exports estimated to be between 10% and 30%. SMEs are more likely to participate in the global value chain as exporters

than as buyers of foreign inputs (OECD, 2018).

Under the pressure of competitive dynamics, SMEs in Asia are currently working hard to become more environmentally responsible by implementing environmental management systems and pollution reduction techniques to reduce the environmental impact of their manufacturing processes. Many SMEs should either comply with higher levels of standardization established by authorized organizations such as the International Organization for Standardization (ISO), Leadership in Energy and Environmental Design (LEED), and other building codes and standards. Furthermore, an eco-label is a good way to identify an environmentally friendly company. An eco-label identifies products or services that have been proven to be environmentally preferable in the long run. These can be part of SMEs' responses to the international commitment to collaborate on the mitigation of climate change through green economy policies.

The indicators of a green economy are based on the Sustainable Development Goals (SDGs) for sustainable production and consumption, such as ecosystem, social, and economic changes, and so on. According to green economy indicators, SMEs entrepreneurs can play a significant role in increasing eco-innovation activities (OECD, 2021). Currently, SMEs entrepreneurs are focusing on developing eco-innovation research and applying it to their operations, resulting in more green jobs. At the same time, SMEs in many sectors, including industry, agriculture, and the energy sector, employ a significant number of people for activities related to environmental protection, such as pollution control, energy efficiency management, and waste management, in order to achieve environmental sustainability and improve people's quality of life (Cecere and Mazzanti, 2017). Evidence from around the



world doesn't really support assumptions that environmental efficiency measures will increase financing costs for SMEs. The statistics indicate that implementing green practices can indeed financially benefit SMEs by significantly reducing manufacturing costs, increasing profits, competitiveness, and flexibility, and providing better access to new markets and funding sources (OECD, 2021). While green businesses are expanding and have the potential to expand further, the private sector must do more to meet global sustainability targets. SMEs are an important part of the global economy, and domestic supply chains can have a significant impact on overall environmental performance.

Green Supply Chain Management is an important strategy for organizations that would like to reduce environmental problems while also looking at cost savings and competitive differentiation. The selection of environmentally friendly suppliers, as well as the changing attitudes of those suppliers who are already involved in Green Supply Chain Management, is an important part of Green Supply Chain Management (Roerich et al, 2014; Diabat, 2011). Green supply chain management is now gaining popularity in emerging economies such as China and other Asian countries. Green supply chain practices include green procurement, the use of the eco-design concept, the expected return on investment, internal environmental management, and customer engagement. However, one of the major challenges for SMEs is a lack of human resources, such as experts for the implementation of the Restriction of Hazardous Substances (RoHS) or compliance with other regulatory frameworks, who can assist with the implementation of Effluent Management

Systems. Other pressing issues include a lack of knowledge, expertise, and financial resources. SMEs in Asia still need to develop proactive environmental strategies, raise environmental awareness, and implement environmental management techniques in comparison to large corporations (Mukesh et al, 2019). Nonetheless, "greening" SMEs can be difficult because entrepreneurs and management are often focused on short-term profitability, income retention, payments, and salaries to ensure market survival. This makes it difficult for them to improve the quality of their operations in terms of environmental performance and CO₂ emissions.

The governments of the Asian region strongly encourage entrepreneurs to operate in accordance with the concept of natural resources and environmental protection. For example, the Indian government has the policy to reduce greenhouse gas emissions from industry and agriculture, and the government of Vietnam also encourages industrial consumption of wind energy and biofuels. The government of the Philippines has promoted the use of geothermal and hydropower in all sectors of telecommunications. Similarly, governments in Asia have adopted appropriate financial tools to assist SMEs in accessing green funds and introducing tax and duty benefits for investments in more sustainable business equipment. Although many Asian governments strongly encourage entrepreneurs to operate in accordance with the concept of natural resource and environmental protection, only a small percentage of Asian financial institutions factor environmental, social, and governance factors into their lending or investment decisions, green and sustainable investments by financial institutions (Khanna, 2020).



3. SITUATION ON ECO-DESIGN FOR SMES IN ASIA

Eco-design is an approach that considers the entire life cycle. Its primary objective is to anticipate and reduce negative environmental impacts since raw materials selection, product manufacturing, consumption, to disposal. Eco-design adheres to certain principles and has established target values aimed at minimizing environmental impact through strict reduction of materials and resources used in product manufacturing. Its ultimate goal is to generate as little waste and pollution as possible while minimizing the negative environmental effects of product distribution. The main idea is to make reuse and recycling easier by developing intelligent designs that make disassembling and recycling relatively simple.

India seems to be a leader in South Asia gauging the status-quo of applying the eco-design concept in various industries. The country is an attractive electronics production hub in this region. The Indian electronics industry has adopted eco-design principles in its manufacturing process to comply with the EU eco-design and RoHS Directive. RoHS contains legal requirements that apply to electrical appliances, communication and information equipment, home appliances, lighting equipment, etc., which are traded within the European Union and are supposed to be exported.

ELCINA is an association that provides incentive and promotion programs to Indian electronics companies. Previously, the organization received several awards for business excellence in quality management, environmental management, business excellence, and excellence in innovation through the electronics sector and PCB manufacturing (Sofia, 2007 Alcina, 2021). Green practices must be integrated into the product lifecycle and supply chain operations of Indian SMEs. Indian businesses must follow

certain key practices for their efforts to be financially beneficial. As a possible consequence, India's major industries are now focusing on reducing energy consumption, water consumption, hazardous substances, waste, and pollutant emissions (Mayank Dev Singh, 2018).

Pakistan is another country that is facing major environmental issues. Therefore, as result, eco-design is one of the tools being promoted in the industrial sectors, with a particular emphasis on manufacturing SMEs. Similarly, evidence in Pakistan shows that implementing eco-design principles reduces environmental degradation, increases production efficiency, and reduces production costs, resulting in a more sustainable society (Naeem, 2018).

Despite the ambiguity surrounding the application of eco-design principles by Bangladeshi SMEs, government policy has emphasized the importance of SMEs operating in an environment-friendly manner. As a possible consequence, SMEs in Bangladesh have attempted to adapt to those principles of environmental sustainability and requested the government to take action to support them by passing appropriate legislation and establishing environmentally-friendly management tools, techniques, and technical assistance by offering free-of-charge training courses for owners and managers, as well as the provision of cash and other incentives to enable SMEs to adapt to green management style and establish a respective programme (Muhammad and Syeedul, 2022).

Eco-design in Southeast Asia is further advanced. The described terms of eco-design, its principles, and mode of operation may not be explicitly in use, but many current practices in Southeast Asia match fairly well with the concept. Obvious examples are;



- ✎ In Thailand, where government policies support BCG models and strong government agencies, such as the Department of Environmental Quality Promotion (DEQP), are in place to accelerate eco-design implementation. G-Upcycle is a label created by the Ministry of Natural Resources and the Environment. This is a certification for products made from recycled materials. It seeks to assist entrepreneurs who create and design products from recycled materials with the objective of promoting eco-design (DEQP, 2021). Thailand has a huge number of SMEs in many industries, including electronics, energy, and construction, among others, that follow the eco-design concept (OSMEP, 2014).
- ✎ In Malaysia, the MyHIJAU SMEs and Entrepreneur Development Programme aims to encourage local industries, including SMEs, to adopt green practices and offer more locally produce green products and services. By the end of the Program, the objective is for participating companies to have successfully integrated the highest standards of green practices and applications into their business operations (2022, MGTC).
- ✎ The Philippines, to reduce production costs and preserve the environment, government has incentivized SMEs to set up environmentally friendly production by improving work efficiency and focusing on clean technologies. This approach requires developing green markets and better networks for green technology suppliers MSMED (2021).
- ✎ In Myanmar, similar trends can be found, though definitive data on eco-design is lacking. In 2017, an eco-innovation capacity-building project for SMEs started to lay the foundation for the promotion of eco-innovation and the development of local capacity (ASEIC, 2017).
- ✎ In Indonesia, the term “eco-design” is not well known, but the Indonesian government has a clear focus on enabling SMEs in the realms of environmentally friendly production and waste recycling, resulting in higher levels of environmental sustainability (GGGI, 2015).
- ✎ In Vietnam, government has implemented a green growth strategy that focuses on three areas: low-carbon growth, green production, and green living, which involve all elements of sustainable production and consumption. Continuously, the government has revised the development policy framework for SMEs, emphasizing long-term growth patterns (Frederik and Annica, 2016).
- ✎ In China, the circular economy philosophy is applied to green SMEs. This normally involves two phases of cleaning production and waste recycling in supply chains. In detail, this means that cleaning productions are mainly carried out in industrial parks, whereas waste recycling projects are mainly carried out in mining projects (Min et al., 2018).
- Furthermore, in the 2010s, the project “Sustainable Product Innovation in Vietnam, Cambodia, and Laos” sought to improve the innovative power of industries as well as the environmental and societal values of products made in Vietnam, Cambodia, and Laos by significantly supporting sustainable product innovation (SPIN) in these three countries. The participation of over 200 national experts from companies/SMEs, sector organizations, consultancy networks, and universities, among many others, is one indicator of successful upscaling and mainstreaming. Organizations in targeted industrial sectors, chambers of commerce, and other intermediary business organizations benefited the most from these activities (Thanh, 2012).

Even if the term “eco-design” is not frequently used, some SMEs in Asia countries have been implementing its approach already. Despite all of the new technologies that use recycled materials, huge amounts of natural resources are still being extracted to produce raw materials. The challenge in that context is to search for raw materials that can be recycled or other useful applications that can be found or that degrade easily at the end of the product’s lifecycle. Then, markets for those materials, as well as appropriate legislation for disposal and usage, may be required in the application of the eco-design concept (Radwan and Morsi, 2018; Marilu, 2020).



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- 1. Design for recycling:** materials used should be biodegradable and products should fit into the biological cycle instead of just applying technical cycles that mean mechanical recycling. Biodegradability is the material's capability of being degraded by purely biological processes.
 - 2. Design for durability:** the objective should be the extension of a product's lifespan meaning to design products that will last longer periods and will not break easily in contrast to products with a built-in fast obsolescence mechanism. Durable products should be re-used over various cycles.
 - 3. Design for reusability:** an extended lifespan can also refer to products that are easy to be disassembled and reassembled and are therefore designed to be repaired.
 - 4. Design for maintenance:** the product with an extended lifespan can also be recycled, and therefore has a closed lifecycle.
- To summarize the findings on how governments of Asian countries have policies and measures to support SMEs in running their businesses with environmental considerations are shown in *Table 1*.

Table 1: Policies and supporting measures for leading SMEs to a green economy

Country	Policies/Measures
Bangladesh	<ul style="list-style-type: none"> Establishment of environmentally friendly SMEs industry and build-up of waste management capacities Training for employees on solid waste management, recycling, composting, and other environmentally friendly methods Training for operators on new technologies
Bhutan	<ul style="list-style-type: none"> The emphasis on healthy eco-systems, carbon neutrality, and climate resilience within the 12th Five Year Plan (2018-2023) Promotion of Alternative renewable energy Creation of an organic logo and green labeling scheme to encourage operators to use these labels Promotion of environmentally-friendly industries
India	<ul style="list-style-type: none"> Passing of the National Action Plan on Climate Change with the major objective to control greenhouse gas emissions Passing of the 13th Five Year Plan (2017-2022) to achieve rapid and sustainable growth
Nepal	<ul style="list-style-type: none"> Development of a public procurement policy to promote consumption and production patterns that are consistent with the country's environmental sustainability objectives Promotion of renewable, clean energy, and energy-efficient technology Passing an Environment-friendly Vehicle and Transport Policy to reduce emissions in the transport sector and increase the usage of electric vehicles
Pakistan	<ul style="list-style-type: none"> Establishment of an Energy Desk, which acts as a one-stop entry point for SMEs for obtaining information, develops skills, and for supporting energy efficiency (EE) and renewable energy (RE)
Indonesia	<ul style="list-style-type: none"> Draft roadmap to promote a green economy with a focus on (1) energy and extractives, (2) manufacturing, (3) connectivity, and (4) renewable energy resources Promotion of clean technology application in industrial production processes for enhancing energy efficiency, creation of a clean technology sector, and better waste management Passing the National Development Planning Agency with a focus on low-carbon development aiming for a gross domestic product (GDP) of more than 6% annually from now until 2045



Country	Policies/Measures
Lao PDR	<ul style="list-style-type: none"> ▪ Draft of the green growth programme's vision 2030 ▪ Passing the National Socio-Economic Development Plan ▪ Passing the National Strategy on National Resources and Environment
Malaysia	<ul style="list-style-type: none"> ▪ Advocating SMEs to be ISO 14001 certified and encouraging consumers to buy environmentally-friendly products
Myanmar	<ul style="list-style-type: none"> ▪ Draft of the Myanmar Climate Change Strategy ▪ Draft of the Action Plan 2017-2030 ▪ Draft of the Green Economy Policy Framework to support a low-carbon-growth strategy and sustainable development
The Philippines	<ul style="list-style-type: none"> ▪ Drafting and passing off: <ul style="list-style-type: none"> ▪ The Clean Air Act of 1999 ▪ The Ecological Solid Waste Management Act of 2000 ▪ The Biofuels Act of 2006 ▪ The Philippine Renewable Energy Act of 2008 ▪ The Climate Change Act of 2009 ▪ The Philippine Green Jobs Act of 2016 ▪ The Philippine Green Public Procurement Roadmap ▪ Green financing initiatives
Thailand	<ul style="list-style-type: none"> ▪ Passing the National Strategy 2018-2037 linked to a green economy ▪ Implementations of a Bio-Circular-Green Economic Model (BCG) as a holistic economic developmental tool to support a 3D economy including concepts, such as a Bio-economy, a Circular Economy, and a Green Economy.
China	<ul style="list-style-type: none"> ▪ Support SMEs to operate by economic principles, such as production processes and waste recycling processes.

Source: Shaswat, 2018; GNHC, 2019; MEA, 2021; RGB, 2021; Niaz, 2014; GGGI, 2017; GNMPE, 2016; SMEDA, 2021; GOI-GGGI, 2015; GBGT, 2021; GB, 2021; MSMED, 2021; NSSO, 2021; Haradham, 2017; Min et. al, 2018

Messages from both “Sub-Regional Dialogues” indicated that Asian SMEs are motivated to implement eco-design approaches in order to reduce negative environmental impacts, carbon dioxide emissions, and energy consumption. At the same time, participants acknowledged that recycling materials has societal benefits and reduces production costs. These advantages are achieved by market differentiation, compliance with regulations, strategic market positioning, customer loyalty, and competitiveness, as well as adding value to their products and services. Many Asian SMEs have already implemented an eco-design concept for product design or service provision in order to protect the environment.

Many eco-design tools are already in use in Asian SMEs, for example, for the selection of low impact resources and processes, the design of eco-efficient systems, the creation of sustainable communities, the optimization of materials and product lifetime, resource

consumption minimization, bio-diversity facilitation, life cycle design, and the ability to easily disassemble products (Hilal, 2013). In this context, the 4Rs-principle (reduce, reuse, recycle, and repair) is regarded as the fundamental foundation of the eco-design approach, which can oversee the development of sustainable business operations in each industrial sector. Overall, eco-design not only emphasizes environmental problems but also actually reduces operating costs for environmental management, resulting in economic, societal, and environmental sustainability.

In terms of existing financial mechanisms to support eco-design for SMEs in Asia, it was found that various measures, including those listed below, are in location in both sub-regions, including China. Although some of those implementations have only recently begun and are not on an enormous scale, there is potential for future expansion.



GREENING SMES WITH ECO-DESIGN TO STEER GREEN GROWTH IN ASIA

1. Design for sustainability

- Grant for sustainable and responsible investment (Malaysia)
- Incentives rewarding eco-friendly products, including green public procurement (Mongolia)
- Exemption from taxes and duties on imported supplies and spare parts (The Philippines)
- Notification of Director-General of Revenue Department (No. 388) regarding Categories, Criteria, Procedures, and Conditions on Exemption of Corporate Income Tax for Expenses against Biodegradable Plastic Products (Thailand)
- Reward and compensation for the design and construction of green buildings (India)
- Incentivizing green construction in the form of tax rebate for a stipulated period (Pakistan, and India)

2. Resources management

- Reduce resource tax such as 20% reduction shall be given to resource tax on crude oil or natural gas exploited from low-abundance oil or gas fields; 30% reduction shall be given to resource tax on high-sulfur natural gas, crude oil produced by tertiary oil recovery, crude oil or natural gas exploited from deep-water or gas fields; 40% reduction shall be given to resource tax on heavy oil or high pour-point oil, or 30% reduction shall be given to resource tax on mineral products exploited from mines at the stage of depletion (China)
- Taxes for natural resource management are unrequited payments for the use of natural resources (Indonesia)
- Fees for using natural resources such as groundwater (The Philippines)
- Investment tax exemption for environment-friendly equipment and resources, and income tax exemption for green service providers to check environmental pollution (Bangladesh)
- Deduction of profits derived from infrastructure related to water (India)
- Subsidies to water, electricity, and fertilizer to farmers who operate environmentally friendly (India)

3. Deployment of green technology

- Tax rebate of up to 15% of the up-gradation expenses for adopting modern environmentally-friendly technologies (Bhutan)
- Investment Incentives Grant to a Qualified Investment Project (QIP) for tax exemption and tax holiday period (Cambodia)
- Credit against tax payable' for investments in certain environmental protection, energy, and water conservation equipment (China)
- The energy supply and utilize renewable energy technologies in rural areas (Mongolia)
- Deduction of profits derived from biotechnology (India)
- Compensation from the multilateral fund of Montreal Protocol (India)
- Carbon tax (Bangladesh)

4. Energy conservation

- Subsidies and Tax Breaks for the New Energy Vehicles (China)
- Investment Tax Allowance for energy efficiency (Malaysia)
- A fund used to provide low-interest loans to energy businesses (Thailand)
- Green fund for promoting green fuel (India)
- The rewarding agency that has successfully adopted energy efficiency policies by providing incentives, recognition, and allowing them to retain some of their cost savings can help facilitate the transition (Nepal)
- Free electricity for one month if their electricity bills show a reduction of at least 20 % in April, May, or June compared to March (Sri Lanka)

5. Sustainable consumption (Use eco-product)

- Price Reduction and Bonus Point for Green Products (China)
- Tax incentive for biodegradable plastic products (Thailand)
- Promote investment in environmental protection, human development, and clean technology and leverage tax, credit, and incentive mechanisms to finance a green economy (Mongolia)
- Environmental taxes (Bangladesh)
- Promote green energy by offering tax benefits for e-vehicle sales (India)



6. Waste management

- China Expands Tax Incentives to Promote Circular Economy (China)
- Plastic bag excise tax in Indonesia (Indonesia)
- EPR regulations for WEEE, ELV, packaging, and batteries (Vietnam)
- Taxing plastic bags and other pollutants Viet Nam's Environmental Protection Tax Law (Vietnam)
- Taxing plastic production: a solution to India's plastic waste crisis (India)
- Tax exemption for collecting and processing or treating biodegradable wastewater (India)
- Levy of taxes and charges for municipal services for a solid waste management programme that will aim at mobilizing communities for adopting the 3R principle of waste management through setting (Pakistan)
- Polluters-pay (Sri Lanka)

Source: LCGGR, 2011; Enviliance ASIA (TH), 2022; Enviliance ASIA (Viet), 2022; ASEIC, 2017; SRI, 2019; Nigel, 2001; Madani, 2022; Dezan, 2011; IISD, 2013; Keiti, 2019; CDC, 2022; Rowena, 2004, MEEPRC, 2019; PAGE, 2014; Dorin and Jullien, 2004; PDA, 2022; Aakriti, 2020; Qadijah 2015; FDI, 2022; Akenji et al 2017; DRCMFT, 2017; PEPA, 2005; Abdul et al, 2021; EDGG, 2018; Najimu et al 2021; Bilal, 2018.



4. GOOD PRACTICES OF ECO-DESIGN IMPLEMENTATION FOR SMES IN ASIA

At present, the rising environmental awareness, especially concerning the problem of environmental pollution and carbon dioxide emissions, caused many entrepreneurs to offer more environmental-friendly products and services to reduce environmental pollution and raise social and environmental sustainability.

Eco-design concept will not only reduce the environmental damage but at the same time have an important impact on trade and exports. By that, environmental measures are trade-related conditions and manufacturers must comply with environmental legislation. Additionally, consumer behavior also plays an important role in influencing producers as new

generations of consumers tend to consume products that are more environmentally friendly (Ryan et. al, 1992).

The eco-design practices studied for this paper are drawn from major manufacturing hubs in the region, such as electronics, textiles, and construction materials, and have a strong relevance for environmental sustainability in production and consumption, as embodied by household consumer products and packaging. The eco-design practices mentioned in Chapter 1 have been chosen as case studies to share experiences in eco-design operations. These sectors are vital to Asian economies, societies, and the environment.

AGRICULTURAL SECTOR

Agriculture is crucial for the development of the region. Agriculture continues to employ one-third of Asia's workforce. However, the sector continues to be characterized by low productivity and earnings. Furthermore, extreme weather events (which are becoming more frequent and

intense) expose many people and vast agricultural areas in Asia to climate-related disasters. Land used for agriculture is shrinking primarily due to urbanization. As a result, effective land use planning is required to foster sustainability.

The case of **Kebai Science from China** combines smart water and fertilizer management systems with renewable energy sources in order to maximize resource efficiency and energy and water management to support farmers. The technology combines internet software and services with high-performance and low-cost agriculture IoT systems and solutions such as wireless sensor network monitoring, wireless network control, and big data processing, among other critical technologies (2022, Kebai).



Figure 1: A Kebai device in the field

Source: <https://agfundernews.com>



Thailand's New Theory of Farming Systems, based on the principles of H.M. King Bhumibol Adulyadej The Great, is an effective strategy to assist Thai people in managing and cultivating their agricultural land in more efficient ways to maximize land utilization. According to a balanced ratio, 30% of the land area is set aside for water reservoirs, 30% for paddy fields or food crops, 30% for trees and other plants or functions, and 10% for residential and other types of buildings. Individuals, SMEs, and the entire community benefit from this land-use strategy. It also promotes food security, long-term sustainability, and self-sufficiency (2019, Rajvaramethi and Klomku).

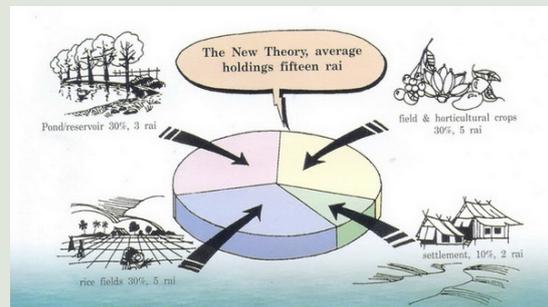


Figure 2: New Theory Farming Systems in Thailand

Source: www.chaipat.or.th/eng/concepts-theories

ALTERNATIVE ENERGY SECTOR

Asia is characterized by rapid population growth and urbanization, which results in high levels of energy consumption linked to economic growth and higher living standards. Because of the

increase in energy consumption, it is critical to use more alternative energy sources such as water, wind, and solar energy.

Using alternative energy can help to reduce environmental pollution. As a result, another case study was chosen: Phase Change Materials (PCM), an Indian company that has developed a thermal energy storage system. The company **Pluss Advanced Technologies Private Limited** created this system. The company created various types of PCMs with an emphasis on eco-design in order to meet a various needs.

The company's products provide various environmental and community benefits. There is, for example, an energy storage drying system that promotes rural employment by assisting farmers in increasing their income and reducing food waste. Another product is a cooling device that applies passive cooling technology and does not require any additional electrical supply. It is rechargeable in a standard refrigerator and is used in the medical treatment of infants. It is

designed for long-term use and is intended to provide a simple method of assembly with no additional requirements or pre-conditions. A thermostable active plate made from a set of cold-formed and welded steel sheets eliminates noise and pollution (Pluss Advanced Technologies Pvt Ltd, 2019).



Figure 3: Phase Change Materials application

Source: <https://pluss.co.in/thermotab/>



CONSTRUCTION SECTOR

Construction is one of the largest industrial sectors in both developing and developed countries in terms of investment, employment, and GDP contribution. At the same time, construction materials and construction activities have an impact on many areas, such as resources consumption, emit air and water pollution, and demand for water/electricity. Moreover, the expansion of urban areas

occupies more land, leading to deforestation and biodiversity loss. Thus, eco-design principles and certificates for promoting green construction materials and green buildings have a long history, with the passive-house standard being developed as one of the pioneers in Germany in the 1980s and 1990s. Since then, Green-building certification standards have already spread globally.

One of many examples of eco-friendly building materials the construction material developed by **PGF Insulation Sdn. Bhd. in Malaysia** is selected as a case study. The company offers a mineral glass wool insulation, which contains up to 80% of recycled glass cullet, manufactured by an innovative new binding technology that incorporates a natural anti-formaldehyde ingredient reducing the overall formaldehyde exposure of human beings. It does not contain any ozone-depleting products (ODP) in its manufacturing process and includes ultra-low volatile organic compounds (VOCs). Once installed, the high-performance glass mineral wool provides fire safety, acoustic insulation, and a highly effective barrier to heat flows. The

benefits include maintaining the desired room temperature, this product reduces the need for an additional cooling or heating system, hence lowering the amount of CO₂ emitted to the atmosphere (PGF Insulation, 2016).



Figure 4: Mineral glass wool insulation
Source: <https://www.ecowool.com.my/>

Another case is the **Confederation of Indian Industry (CII)** aiming at creating and sustaining environmental conditions. The organization works proactively on transforming Indian Industry's contribution to national development. CII has founded the Indian Green Building Council (IGBC), which offers a wide array of services including the development of a new green building rating programme, certification services, and green building training programmes. Furthermore, the eco-design strategy has been applied by GreenPro ecolabel certification to support IGBC. There are many SMEs in the construction sector that have adopted the eco-design concept referring to the result of GreenPro certification criteria. Among examples of products adapting an eco-design concept by GreenPro covering the use of sustainable raw materials, resources

efficient and clean manufacturing processes, improvements of performance during its lifespan, and design for recyclability, there were cement, high-performance glass, and carpet product criteria, which are taken into account (GreenPro, 2019).



Figure 5: Confederation of Indian Industry building
Source: [Source: The Earthbound Report](#)



ELECTRONICS SECTOR

The electronics sector manufactures electrical components for a variety of products ranging from industrial electronic equipment to consumer electronics devices. Mobile phones, televisions, and circuit boards are all common items in the electronics industry. Telecommunications, computer networks, electronic components, industrial electronics, and consumer electronics are all parts of the electronics sector. In that context, the eco-

design approach aims to raise awareness of product-related environmental issues, develop eco-design tools for the electronics industry, and improve the performance of priority products in terms of energy savings and environmental impacts reduction in the product life cycle stages since production, consumption, and post-consumption until electronic waste management processes.

The case of **L&E Solid State CO., LTD**, a manufacturer of Light Emitting Diode (LED), offers semiconductor devices that can emit light when an electric current pass through it. The product is certified with a Thai Green Label which carries out a life cycle assessment. The certifying criteria requires the avoidance of harmful substances used in plastic parts and other raw materials such as forbidden the containing of chlorochloral-paraffins, heavy metals, heavy metal compounds, and flame retardants (Thai Green Label, 2017).



Figure 6: Light Emitting Diode
Source: <https://www.lighting.co.th>

The case study of **Karma Recycling**: this is one of the leading trade-in operators and redistributors of mobile devices in India. It is software and services that help consumers, retailers, and OEMs to manage large-scale buyback and trade-in programmes, promoting the idea of reusing gadgets (like mobile phones) instead of just disposing of them and reducing e-waste that way. The company's philosophy starts with the assumption that a device that lost its usefulness for one person may be useful for somebody else. Thus, the company applied an eco-design approach turning e-waste with negative environmental impacts into new products which stimulate the economy by



Figure 7: Karmarecycling application
Source: <http://www.karmarecycling.in/about-us.php>

recycling electronic devices. Karma also runs store exchange programmes for electronic manufacturers and retail chains across the country (Karma, 2022).



GREENING SMES WITH ECO-DESIGN TO STEER GREEN GROWTH IN ASIA

HOUSEHOLD CLEANING PRODUCTS SECTOR

Asian consumers' behavior influent such a huge global impact because they account for half of the world's consumption growth. Due to the general region's susceptibility to climate disruptions, sustainability and the environment are among Asian consumers' top concerns.

They are willing to change their consumer behavior and preferences in order to consume more responsibly and sustainably. As a consequence, manufacturers will need to adapt their products and manufacturing processes to market trends.

The good practice case study presented in this sector involves a company called **S&P Bioenergy Co., Ltd, Thailand** which operates all its business activities in a way that they are not harmful to the environment aiming to reduce the negative impacts on the ecosystem. At the same time, the company strongly focuses on the happiness of the stakeholders and upholds the principle that profits do not only exist for business purposes but should as well serve people and the planet in general. Therefore, the eco-design concept has been applied to the "SUPP" cleaning products throughout its entire life cycle starting from sourcing raw materials that only have non-toxic compounds and are more than 90% biodegradable. This includes the usage of recyclable packaging and a non-toxic dye with label. The company also runs recycling projects for making sure that products' packages after being used as their initial purpose have taken back to recycle (SUPP cleaning, 2022). Thus, the company



Figure 8: SUPP eco-friendly cleaning products

Source: <https://www.supp-cleaning.com/EN/>

can reduce the virgin packaging materials and minimizing waste material caused by their products' packages.

Shampoo Bar Kathmandu, Nepal is a product made of 100% coconut oil which is delivered to customers in recycled metal containers and with all ingredients sourced directly from local herb producers and with minimal packaging required. The "even greener" manufacturing process includes the packaging too. The process is designed in a way that requires only a tiny amount of glue by reducing the size of plastic stickers and making them as small as possible. Its packaging is made of sustainable material and is 95% biodegradable (Kathmandu, 2022).



Figure 9: Shampoo Bar Kathmandu

Source: <http://theshampoobarkathmandu.com/in-nepal/>



PACKAGING SECTOR

Each type of packaging consumes a large number of resources, including energy, water, chemicals, petroleum, minerals, wood, and fibers. Packaging manufacturing frequently generates large amounts of air emissions, including greenhouse gases, heavy metals, and particulates, as well as wastewater and/or sludge containing toxic contaminants. As a

result, concerns about sustainability must play a larger role in the packaging process for both consumers and manufacturers. Currently, manufacturers create packages that meet the needs of consumers, who prefer more environmentally friendly, transparently manufactured, and standardized products.

An eco-design practice by SMEs of the packaging industry presented is a company called **Paper Bubble Wrap, India** cushioning operated by PACKMILE PVT. The hexagonal cells of the packaging material seen in the picture create an interlocking web that protects the product while being transported. The product idea aims to reduce the material for wrapping and filling the inside space within the packages by imitating a beehive, thus, saving volume, money, and time used for packaging. The time needed to package is reduced significantly up to 25-50% because there is no taping needed anymore and the package can be torn easily. Up to 80%, less volume is occupied by the packaging containers compared to a traditional bubble wrap. Moreover, the product is 100% recyclable, compostable and biodegradable (Pack mile, 2021).



Figure 10: Paper bubble wrap
Source: <http://www.packmile.com/bhive/>

Eka Global manufactures lightweight, clean, and safe packaging and containers. The company creates and distributes innovative longevity packaging solutions that enable consumers to live healthier lifestyles. Eka aims to be a leader in innovative packaging that extends the life of food through outstanding “innovation,” with its main strength being packaging research and development. Currently, the company’s packaging can contain food and keep it outside the refrigerator for two years. If such systems can be integrated into the daily lives of global consumers, they can help saving energy on a large scale by reducing the energy required for refrigerators (Eka, 2022).



Figure 11: Longevity Packaging
Source: <http://www.eka-global.com>



SERVICES SECTOR

Services especially tourism play a key role as well concerning the growth of the Asian economy. The services sector links to many other business sectors. However, to move towards a green economy, the services and tourism sector needs some severe strategic adjustments concerning the ways operations

and well managed activities. Therefore, learning and training courses on environmentally-friendly services were created. Tourism services are presenting their environmental policy and adapting to use fewer resources, thus, reducing waste and emissions.

The case study presented in this section is the **Low-carbon tourism programme by the Asian Institute of Technology**. It focuses on ideas for a world heritage city and the programme is run by the Urban Innovation and Sustainability School of Environment, Resources, and Development. Here eco-design aims to change patterns of travelling by simple methods because tourism with low levels of carbon emissions starts from choosing a sustainable destination, sustainable transportation, eco-friendly accommodation, and supporting the local economy by not wasting water and avoiding plastic use. Activities causing low levels of carbon emissions encourage tourists to spend more time outdoors without the reliance on motorized vehicles. Moreover, indoor energy consumption is discouraged as well to minimize resource consumption at the hotel. Among others, this goal is to be achieved by providing incentives, such as discount coupons for those outdoor activities.



Figure 12: Leaflet of the low-carbon tourism programme

Source: https://www.researchgate.net/publication/331338242_Assessing_impacts_of_implementing_low-carbon_tourism_programme_for_sustainable_tourism_in_a_world_heritage_city

The average carbon dioxide emissions from air conditioners and transportation can be reduced and cost savings of around 5-10% are feasible compared to general tourist behavioral patterns (Vilas,2019).

Another interesting example of good eco-design within the services sector is the **Zero Carbon Resorts in Palawan, Philippines**. The resorts apply eco-design practice by applications and making use of green technology embodied in the concept of the 3Rs. In order to minimize the carbon footprint of the resorts and improve the environmental condition, solar energy, rainwater harvesting, waste recycling & management, have implemented in the resort. These operations are in accordance with the eco-design concept. This does not only contribute to natural resource conservation but also



Figure 13: Zero Carbon Resorts

Source: <https://www.switch-asia.eu/project/zero-carbon-resorts-zcr/>

increases their business profitability (Jazztin, 2019).



TEXTILE SECTOR

The textile industry contributes close to 10% of global GHG emissions and about 20% of global water pollution. The international NGO “Environmental Coalition on Standards” (ECOS) has strongly lobbied the European Commission (EC) to apply the principles of eco-design to textile products. The organization makes the point that the legislation should stimulate sustainable design for durability,

reusability, and recyclability in textiles (Huang, 2017). Today some entrepreneurs use the approach “3 CIRCLES - circular fashion” aiming at collaborative consumption and communities which implement the main principles of eco-design to avoid waste and pollution, keep materials and products in use as long as possible and regenerate the natural system.

The case study in this sector is “**Wear Forward project in the Philippines**”. The objective of this project is to revolutionize fashion and mindsets by building a proactive, progressive, and purpose-driven community that embraces circular fashion. The project also encourages collaborative consumption through clothing as a service that provides an AI-powered circular fashion marketplace and virtual wardrobe while making a profit and improving the planet and the lives of people. The eco-design approach has been applied to the textile industry based on sourcing natural organic materials to ensure low or no adverse environmental impacts while manufacturing and consumption (Wear Forward, 2021).



Figure 14: Wear forward core value
Source: <https://www.wearforward.com/>

AMMA Natural Textiles, a social enterprise in Sri Lanka, located in the highlands of Sri Lanka, produces naturally dyed textile products and promotes sustainable working conditions and environmentally-friendly products. Using food remains, plants, and vegetative debris to create textile dyes is a feasible and sustainable way to challenge traditional environmentally harmful modes of manufacturing. Moreover, the people involved in this project continue to strive to reduce their carbon footprint by incorporating carbon-neutral methods of production like hand weaving into their manufacturing processes (AMMA, 2022). Moreover, AMMA aims to avoid the release of chemicals from bleaching, printing, and dyeing processes which is one of the most environmentally harmful stages of the garment production chain.



Figure 15: Naturally dyed textile products
Source: www.ammasilanka.com/blogs/news/



5. LIMITATION AND OPPORTUNITY TO ENHANCE THE ECO-DESIGN OF SMES IN ASIA

LIMITATIONS AND CHALLENGES TO ECO-DESIGN OF SMES IN ASIA

Although there are cases of eco-design practice for SMEs in each sector, most SMEs still face some limitations in implementation. It affects not only the enterprise itself but also the whole supply chain. Therefore, perception and understanding of limitations are indispensable to prevent and reduce those limitations as follows;

- ✔ Policy and regulation
- ✔ Financial mechanism
- ✔ Technology and innovation
- ✔ Education and skills of entrepreneurs and workers
- ✔ Gender and vulnerable groups

Policy and regulation

The concern of SMEs operating in the manufacturing and service sectors has become a critical factor in governments developing specific policies. Development of environmentally friendly policy and regulation is the first steps in establishing a direction for entrepreneurs to operate in accordance with the overall goals. With clear and precise policy, it will result in direct and indirect financial and educational support for eco-design. However, some countries are struggling with eco-design due to policy uncertainty and some countries' policies prioritize economic benefits over environmental protection, resulting in less outstanding eco-design implementation (ADB, 2021). The most of policies that support SMEs provide only short-term assistance. Furthermore, the most of policies that support SMEs provide only short-term assistance. The most of policy implementation success assessments are quantitative, such as the number of businesses that have received assistance, the number of manufacturers who have been trained, and the number of projects implemented.

To overcome policy limitations, conceptual development of eco-design should be concentrated on enabling policies and regulations in order to facilitate other operating

mechanisms. The well-formulated policy will lead SMEs to successfully implement eco-design. However, the development of such policies and regulations requires the integration of three important pillars including economic, social, and environment. Government should introduce public procurement policies and eco-labeling certification to support SMEs to practice more environmentally friendly manufacturing. The promulgated policy and regulations should also enable SMEs that adopted the practice to access the "green market", a functioning mechanism of the green supply chain. As a result, all key actors in the green supply chain will be involved in the policy development process, which lead to an effective eco-design implementation.

Moreover, governmental policies concerning the promotion of innovation development, marketing, and investment among SMEs should pertain to the following characteristics: 1) Empowerment of SMEs to add value for products and services that will further enable them to compete in the international market. Encouraging SMEs to adopt a more sophisticated technology will allow them to acquire greater competitiveness, which added more value to their products and services; 2)



Reshaping policies according to present economic challenges, to strengthen the country's economic drives. By adopting digital technology, the country can transform its economy into a digital one with enhanced efficiency and value-added gross domestic products. As a result, the country can retain its

advantage to compete with the rest of the world. At present, marketing channels are essential tools that expedite SMEs to seize business opportunities. 3) As per the investment policy, SME Banks strengthen the capacity of SMEs in creating jobs and generating incomes for the local community (Amnatwipavee et al, 2020).

Financial mechanism

Financial problems are a major obstacle faced by many SMEs, including a lack of financial support policy and insufficient funds for investment. In addition, some countries experience insufficient funds and do not have access to official financing for investment, expansion, or working capital due to the lack of an accounting system or official collateral to rely on the loan shark to pay high interest (Lissara, 2021). It was also found that some banks were more focused on major lenders than SMEs due to higher returns and repayment rates (MSMED, 2021). There is also a large amount of empirical evidence that SMEs use financial services from financial institutions in the system less than large enterprises. (Beck and Demirguc-Kunt, 2006). Due to SMEs do not access services from financial institutions in the system, many SMEs have to spend personal funds or retained earnings first because the cost is lower than obtaining a loan from a bank. Therefore, the lack of capital is a barrier for SMEs, but what makes SMEs in some countries struggle more is the institutional structure. If comparing countries with the same income level, SMEs in countries with good legal systems for businesses and financial institutions can access more capital financing (Beck et al., 2006). It can conclude that financial anxiety is the biggest obstacle. In particular, the lack of funds to improve the environment of the establishment in accordance with international standards. However, most entrepreneurs still believe that the implementation of eco-design and environmentally friendly production still need a higher budget and longer payback period which does not cause as much value as it should (Pasupa et al, 2012; Lindahl, 2007, Klinpikul and Srichandr, 2010).

Accordingly, finance is a key factor that affects other mechanisms including technology and innovation, research, and development. Therefore, in many Asian countries such as China, India, and Thailand, financial support has been a crucial tool that allows SMEs to conduct environmentally-friendly businesses. The financial incentives such as tax exemption, tax income reduction, soft loans from financial institutions, alternative capital sources, improved rules and regulations, infrastructure development that support business enterprises, and availability of basic payment facilities such as Prompt Pay or QR code contribute to the reduction of financial transaction fees. However, tax instruments should be enforced on enterprises that created negative environmental impacts. For instance, a higher tax should be applied to products that are harmful to the environment. Furthermore, Green bonds should be established to support environmentally friendly products and environmental conservation or solving climate change.

Guidelines to promote sustainable production in SMEs, to be in line with the United Nations Sustainable Development Goals should encompass the realms of energy, transportation, waste management, building and construction, and water consumption (Asia House, 2021). On the other hand, governmental agencies, financial institutes, start-up consultants, and social enterprises should educate SMEs on finances and investments. This measure is anticipated to raise entrepreneurs' awareness and understanding of their business and its impacts on the environment.



Technology and Innovation

For eco-design to occur, it is necessary to consider recycle and reuse, as well as responsible production. This production, based on the principle of reducing, reusing repairing, and recycling, helps product development through efficient processes and clean technologies, generating savings and putting the company in the spotlight (Franciany and Cleonir, 2021). However, technology limitation is the most common in most countries, for example, entrepreneurs are the least concerned about alternative technology and products. SMEs in some countries still use outdated equipment and technology. As a result, the efficiency of the production process and the rate of recycling raw materials into the production process are quite low (Min et al, 2018). It is worth noting that some countries in Asia tend to do little research and development due to low human capital, lack of research infrastructure, and the lower technological capacity of SMEs. In addition, the shortage of funds is a major obstacle to technological competitiveness (ADB, 2016). Besides, the use of technology or innovation depends on elements within the company such as policies that focus on the environment, process improvements to reduce production, quality management, technology necessity, the cost-effectiveness of technology and the return, and supplier's joint venture that contribute to the efficiency and productivity of technology (Franciany and Cleonir, 2021).

Nowadays, eco-design has influenced several industries in Asia including construction, packaging, electronics, energy, agriculture, etc. The key principles of technology or innovation in

eco-design that should be considered include; reducing the creation and utilization of toxic materials, increasing recyclability, reducing energy consumption, increasing the use of renewable resources, increasing product durability, and reducing material needs for products and services. The promotion of technology or innovation may commence with educating younger generations to provide a strong foundation for further development. In addition, local technology centers should be established in different areas of the country to assist local entrepreneurs in effectively planning and implementing policies concerning local industries. For this purpose, local technology centers, local industry associations, and universities can be engaged to construct a local hub of innovation. Another important approach for SMEs to acquire knowledge of technology or innovation is to learn from large companies that purchase their products. In this regard, government agencies may act as intermediaries to facilitate technology transfers and other connections between large companies and SMEs (ADB, 2016).





Education and skills of entrepreneurs and workers

Education and Labor skills are the main concern in South and Southeast Asia. Education is one of the factors in improving labor skills. Knowledge of eco-design is available in many ways such as through training, seminars, and workshops both domestically and internationally. In addition, most SMEs entrepreneurs lack understanding of the concept of eco-design. As a result, sustainable design is inefficient. Although there is currently some teaching and learning about sustainable design, but still limited and only in some organizations due to the lack of specialists (Pasupa, 2012; Lindahl, 2007; Klinpikul and Srichandr, 2010). The lack of technical skills is an additional obstacle that prevents SMEs from taking advantage of environmentally-friendly operations opportunities. Many SMEs lack the technical capacity to identify, evaluate, and implement more advanced technical options that might allow them to reduce environmental impacts. As a result, they tend to prioritize technology that they are already familiar with and rely on their suppliers' recommendations for new technical solutions. However, in order to assess the new options, they still need a certain level of technical skill and knowledge (Vasileios et al, 2015).

To encourage eco-design to be more applied to SMEs, government and private agencies involved should organize ongoing training courses for capacity building. Professionals who are specialized in eco-design in various industries such as electronics, construction, and packaging can be engaged to deliver such training that enhances operational knowledge.

In addition, knowledge of the consumption of environmentally friendly products should be



established for consumers. For example, using environmental labels to indicate the environmental friendliness of the products. An environmental label is given to a product that produces less impact on the environment. This information allows consumers to appreciate the product that emphasizes the values of the environment and purchase such products that can reduce the environmental impact caused by their consumption.

Therefore, products that are made according to the eco-design principle are an integral part of the environmentally friendly production process. Entrepreneurs will also benefit from such a process as the use of resources and energy, and waste generating will be reduced as well. However, research and dissemination of modern technology should be commensurate to or compatible with the local community as the raw materials and labor in SMEs often come from local communities.



GREENING SMES WITH ECO-DESIGN TO STEER GREEN GROWTH IN ASIA

Gender and vulnerable groups

Within the enterprise, women and men face several challenges, including the informal economy, restricted access to financial resources, a shortage of liquidity, etc. According to global statistics, the economic activity and employment of women are much lower than for men. Women's economic activity varies depending on the type of business; it is more developed in the agriculture and service sectors, but less so in the industrial sector. Due to the political and economic importance of employment over profits, women's labor market participation ratios are higher. Women's labor market participation rates have been approaching those of men in recent decades, however, there are still major inequalities. The reason is that the divorce rates are rising, birth rates are declining, the household output is growing, and women are getting more education (Marina et al, 2014).

At present, female entrepreneurs in Asia have increased, as higher economic activities also raise employment rates. However, only 1 in 3 entrepreneurs are female due to various issues including lack of social support including a traditional understanding of women's role in business. As a result, the governments of each country must further enhance women's rights (Marina, 2014).

Gender and Vulnerable groups should be equally involved in all groups because they are

the key players in production and consumption. Rights and equality in the workplace should be recognized in the organization. However, many organizations fail to support and promote equality and work environments that facilitate the expression. As a result, LGBT employees may receive less support and under-express their full potential. By enabling opportunities and fostering diversity, highly skilled and talented employees, irrespective of their sexual orientation will be attracted to work for the organization. More than 80% of employees are considered to prefer working for a company that has a policy that encourage workforce diversity and does not discriminate basis of gender (NYC, 2019). In today's business, organizations with diverse workforces gain a more competitive edge as the diversity allows the organization to better engage with the greater international market.





ENABLING FACTORS TO ENHANCE THE ECO-DESIGN IMPLEMENTATION OF SMES IN ASIA

By reviewing several research papers and collecting opinions from participants of two regional dialogues, this paper, the research team synthesizes the data and proposes six areas to enhance the eco-design implementation of SMEs in Asia follows.

- ✔ Clear policy and institutional frameworks
- ✔ Government supports
- ✔ Financial mechanism scales up and accessibility
- ✔ Green market development
- ✔ Capacity building for SMEs entrepreneur and worker

Clear policy and institutional frameworks

The national strategy for SMEs, a focused industrial policy for SMEs with an emphasis on eco-design, can increase investment in R&D, promote internal innovation, and promote industrial technology transfer. Furthermore, in order to achieve the goals of eco-design operations of SMEs, the government's coordination with stakeholders should be underpinned by the capacity to develop and implement innovation policy instruments, as well as the government's ability to ensure effective coordination among relevant stakeholders.

The primary building blocks of a proactive SMEs strategy in order to have eco-design in SMEs include the institutional framework for eco-

design SMEs. A fundamental mechanism for organizing and coordinating policies around development is the development strategy. The institutions in charge of coordinating and implementing interventions for SMEs are the focus of a set of indicators.

With the global trend of focusing on the environment, governments of many countries launch policies to promote environmentally-friendly production and consumption. As a result, entrepreneurs, especially SMEs, have to adapt to global trends. If SMEs do not follow these policies, it may affect their business survival. For example, unable to export due to trading partners having policies or environmental measures.

Government supports

Technically supports: measures to technically support eco-design in SMEs are aimed at advising eco-design operations such as the establishment of incubators, science and technology parks, eco-design centers, and technology transfer offices. Moreover, increasing communication channels for more public-private consultations; this channel support is essential in the development of a policy framework that supports SMEs.

Non-technically supports a complement to more conventional support for science and technology. It also captures whether institutional measures are in place to facilitate the diffusion

of innovation in the business sector. Policy settings acknowledging that innovation has both technological and non-technological aspects perform well in this sub-dimension. The commercialization of new products often requires new marketing models, and a new production technique will increase productivity if it is supported by the firm. Governments can also perform an important role to promote the diffusion of innovation by increasing enterprises' capacity to adapt existing technologies, i.e. through skills development and mentoring programmes.



Financial mechanism scales up and accessibility

A financial mechanism is vital for SMEs because they can receive funding to remain operational in eco-design. Several incentives that are operating in some countries are the good driving force as detail shown in Chapter 3. That should be shared and expanded further.

Government incentives that finance eco-design operators under environmental management measures such as tax cuts, and funding for eco-design operators. On the other hand, entrepreneurs who operate regardless of the

environment will have to pay more taxes. However, there is a possibility that some SMEs do not have access to government financial mechanisms. Therefore, the key to enabling SMEs to access government financial supporting mechanisms are business strength and clarity of action plans. On the part of the government, the rules and regulations on credit for each type of SMEs shall be revised as appropriate.

Green market development

The green market is a mechanism that connects environmental producers and consumers. This also creates an alternative approach for responsible trade and sustainable consumption. Moreover, green marketing also attempts to produce, promote and recycle products that are friendly to the environment (Zuzana, 2016). In some countries, there are activities to encourage SMEs to manufacture products that meet both internal and external markets' quality standards along with promoting consumer behavior to be more environmentally conscious, such as

consuming eco-friendly products and purchasing eco-labeled products, which will also help to promote the green market as well.

The development of the green market can link to the government's Green Public Procurement Plan, which has been found to expand the market for environmentally friendly products or eco-product. Furthermore, to expand the green market widely, communication and shipping technology, including online payment systems, are being applied.

Capacity building for SMEs entrepreneur and worker

Building the capacity of entrepreneurs and workers through skill development and education necessitates the assistance of the government and relevant agencies for both entrepreneurs and workers to have operational potential. Particularly nowadays, environmentally friendly production or environmentally friendly service operations necessitate more specialized knowledge. Education and the development of

labor potential are just as important as the other areas mentioned above. It is also important to include the development of women's potential because there are more female entrepreneurs owning businesses, higher rates of female recruitment in some occupations, and the appointment of more female employees as supervisors, among other things.



6. CONCLUSION

TRANSITION SMES TO GREEN ECONOMY IN ASIA

SMEs in Asia are important green economy players. They are the core of the economy providing employment, production, trading, and services for each country. With the changing environment including the increasing pollution

problems, most Asia countries have formulated policies towards a green economy to aim for economic, social, and environmental sustainability. In most Asia countries;

- ✔ The governments in the Asian region strongly encourage entrepreneurs to operate in line with the idea of the protection of natural resources and the environment.
- ✔ There are policies or measures to encourage SMEs to operate green businesses to reduce greenhouse gas emissions that eco-design principles can be applied.
- ✔ The financial mechanisms or measures have been existed to support the implementation of eco-design in SMEs for various stages of product life cycle.

ECO-DESIGN APPROACHES ADOPTED IN ASIAN SMES

Eco-design approaches can lead SMEs to be greener businesses. The eco-design concept, that SMEs in Asia have applied, are varied from design for recycling, design for durability, design for reusability, and design for maintenance. The selected eco-design practices in 8 industrial sectors are summarized as follows;

- ✔ **Agriculture sector:** Eco-design applied in the agriculture's sector-major purpose is to maximize resource consumption and optimize land, water, and energy management.
- ✔ **Alternative energy sector and Electronics sector:** the major alternative energy comes from renewable energy being applied in every business as a way of reducing environmental pollution. The eco-design approach applied in this sector is in the part of the design for maximizing efficiency, prolonging life, and low power consumed. In addition, design on principles of 4Rs (Reduce, Reuse, Recycle, and Repair) is also being applied to cope with Waste of Electronic and Electric Equipment (WEEE) management.
- ✔ **Construction sector** by introducing practices and technologies, as well as designing more sustainable products that are more efficient in terms of resource and energy use, have a lower environmental impact and provide better value for living and working conditions. SMEs in this sector adapted eco-design concepts covering the use of sustainable raw materials, resource-efficient manufacturing processes, improving product performance during use, and designing for recycling cleaning product sector. Eco-design concept has been applied to cleaning products throughout their entire life cycle beginning with the selection of raw materials that only have non-toxic compounds and are able to biodegrade at least 90%. Recyclable packaging is required.
- ✔ **Household cleaning product sector,** eco-design concept has applied to cleaning products through its entire life cycle starting from the selection of raw materials that only have non-toxic compounds and are



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able to biodegrade not less than 90%. The recyclable packaging is required.

- ✔ **Packaging:** the major eco-design concept for packaging is the design to be assembling of and disposed of easily, using fewer materials as composition. The important is the performance that has to keep the product's property as same as before being stored under the package.
- ✔ **Service sector:** Eco-design application to this sector starts from developing environmental policy and adapting to consume fewer resources with the concept of the 3R's, which lead to waste reduction and pollutants emission.
- ✔ **Textile:** Eco-design application to this sector is based on sourcing natural organic materials in order to ensure low or no adverse environmental impacts while manufacturing and consumption.

Alternative energy sector and Electronics sector shall be prioritized

in order to promote Eco-design approaches as renewable energy and electronics can be applied in every business.



LIMITATIONS AND CHALLENGES FOR SMES TO APPLY ECO-DESIGN

This paper highlighted the limitations and challenges of policy and regulation, financial mechanisms, technology and innovation, education and skill, and gender and vulnerable groups. Internal and external factors that govern the characteristics of SMEs, such as environmental commitment, and external factors that come as a result of an intervention (normally from the government), such as financial incentives, are examples of limitations that occur. The limitations are as follows;

- ✔ **Environmental-friendly policies and regulations** are voluntary and the current success assessment of policies reveals the mostly quantitative and short-term conditions. There is no integration between institutions.
- ✔ The **financial mechanism** is a major problem for SMEs to implement eco-design. The limitations found are ranging from insufficient support, difficulty accessing, and high interest. Not only this but also most entrepreneurs still believe that the implementation of eco-design and environmentally friendly production need a higher budget and longer payback period which does not cause as much value as it should.
- ✔ SMEs in some countries still use outdated **equipment and technology** leading to low efficiency of the production and the rate of recycling raw materials.
- ✔ The lack of **research infrastructure and the lower technological capacity** of SMEs to focus on the environment, process improvements for clean production, quality management, technology necessity, the cost-effectiveness of technology and the return, and supplier's joint venture that contribute to the efficiency and productivity of technology
- ✔ **Education and skills of entrepreneurs and workers**, most SMEs entrepreneurs lack an understanding of the concept of eco-design and lack the technical capacity to identify, evaluate, and implement more advanced technical options that might allow them to reduce environmental impacts.
- ✔ **Gender and vulnerable groups** raise employment rates due to a lack of social support and promote equality and work environments that facilitate the expression.



ENABLING FACTORS AND RECOMMENDATIONS

Eco-design principles can be an effective tool for SMEs shifting toward green economy and achieving higher levels of sustainability. The key enabling factors that support eco-design in SMEs are policy and regulation, and financial mechanisms.

- ✎ The policy and regulation are the most important initial measures preceding the guideline. The government should have established a framework, including institutional arrangements, for service centers that support both technical and non-technical SMEs in fully operating eco-design. Technical services such as incubation, science, and technology are examples of sources of knowledge and technical information for SMEs. The establishment of those service centers is a continuation of a strategy that contributes to the long-term development of eco-design for SMEs by providing non-technical support services such as demand-side policies that encourage domestic SMEs to adopt eco-design in their operations, including supply chain management. This is yet another way to help SMEs implement eco-design more concretely.
- ✎ The financial mechanism is how a business receives the funding necessary for it to remain operational. Innovative financing mechanisms for SMEs have enabled access to previously unavailable sources of funds for sector investments, which, when combined with more realistic pricing of services, has improved the financial sustainability of sectors such as power, water, sanitation, forestry, and transportation.

- ✎ The differences between different sectors are analyzed in terms of their implications for sustainable development. Financial incentives will be provided to SMEs for performing eco-design at various stages of the life cycle, such as design for sustainability, resource management, green technology deployment, energy conservation, sustainable consumption, and waste management.
- ✎ In Asia, tax incentives are the most attractive to SMEs. A tax incentive or environmental tax relief is a government initiative that reduces the amount of tax paid. In other words, a beneficial tax incentive encourages behavior that results in additional social benefits which would not have been created without the subsidy.

The concretely implementing policy and regulation and financial mechanism

**can lead to enabling factors in
other aspects as well, such as
technology and innovation,
education and skill, etc.**





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