ASEM
SMEs
Eco-Innovation
Center

ASEM Eco-Innovation Consulting Projects for SMEs Best Practices in Indonesia (2011)

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ASEM SMEs Eco-Innovation Center
(ASEIC)

Executive Summary

Understanding the significance of fully exploiting the potential for eco-innovation and green entrepreneurship among small and medium sized enterprises (SMEs), the ASEM SMEs Eco-Innovation Center (ASEIC) has developed a green growth scheme which encourages SMEs to actively respond to the emerging green growth paradigm for the world economy.
With the main goal of strengthening 'green competitiveness' of SMEs, ASEIC has collaborated with UN organizations such as UNIDO and the UNEP International Resource Panel, global consulting firms and environmental experts around the globe to develop comprehensive strategies and measurable action plans for spreading greener production and management processes, as well as identifying green business opportunities.

In 2011, ASEIC launched its first "ASEM SMEs Eco-Innovation Consulting Project" in four ASEM member states - Indonesia, Malaysia, Thailand and Vietnam - with a total of 33 SMEs. The project consisted of customized consulting services for product, process and system innovation in the participating SMEs. These services helped to improve their overall environmental performance, from process optimization and environmental management, to the development of green business frameworks.

At the end of the consultancy, each company was provided with a set of customized eco-innovation guidelines to be implemented for the long run, including business frameworks for developing green products, services and technologies.

The 2011 "Eco-innovation Consulting Project" focused on two pillar programs: "Diagnosis & Implementation" and "Training & Education". ASEIC used quantitative and qualitative instruments to assess the environmental performance of the participating SMEs. Based on the assessment, both short and long-term environmental management and cleaner production strategies were established for implementation.

During the consultancy, ASEIC also provided training and education to raise awareness about the long-term cost effectiveness and profitability of green management in business.
At the end of the consultancy, each company was provided with a set of customized eco-innovation guidelines to be implemented for the long run, including business frameworks for developing green products, services and technologies.

Recognizing that SMEs are now facing new business opportunities as well as tremendous challenges with the introduction of eco-innovation, assistance from the global community is necessary to encourage SMEs to effectively utilize eco-innovation opportunities, and to help compensate for their lack of information, capability and financing mechanisms.

Therefore, the 2011 "ASEM SMEs Eco-innovation Consulting Project" generated holistic and multifaceted implementation plans for realizing eco-innovation: sharing environmental management and cleaner production strategies, and providing customized green business models. Through this project, ASEIC will continue to engage SMEs in global green growth initiatives, and encourage the innovation and sustainability of SMEs at any stage of the product or service lifecycle.

Background Information

The ASEM SMEs Eco-Innovation Center (ASEIC) aims to promote eco-innovation for small and medium-sized enterprises (SMEs) in Asia and Europe. Its establishment was endorsed by the leaders of ASEM member countries at the 8th ASEM Summit in Brussels, Belgium. ASEIC seeks to serve as an international platform where growing environmental regulations and eco-innovation practices are shared and new business opportunities are created. ASEIC is currently funded by the Small and Medium Business Administration (SMBA) of the Republic of Korea and its office is located in Seoul.

In order to enhance cooperation between Asia and Europe in the area of green growth, ASEIC is mandated to carry out the following activities in three key areas:

Knowledge Sharing

- Establish a web portal for SMEs of ASEM member countries by providing updated global environmental policies, laws, regulations, best practices, issues and news which are relevant to SMEs.

Eco-Innovation Projects

- Provide eco-innovation consulting services for SMEs in Asia and Europe
- Support projects for local development through appropriate technology sharing
- Develop SMEs Eco-Innovation Index (SEI) and evaluate the status of eco-innovation performance of SMEs in Asia and Europe.

Communications

- Establish global partnerships with international organizations
- Hold international conferences designed to exchange the best policies and business practices for ASEM member countries
- Strengthen economic and institutional partnerships among ASEM member countries

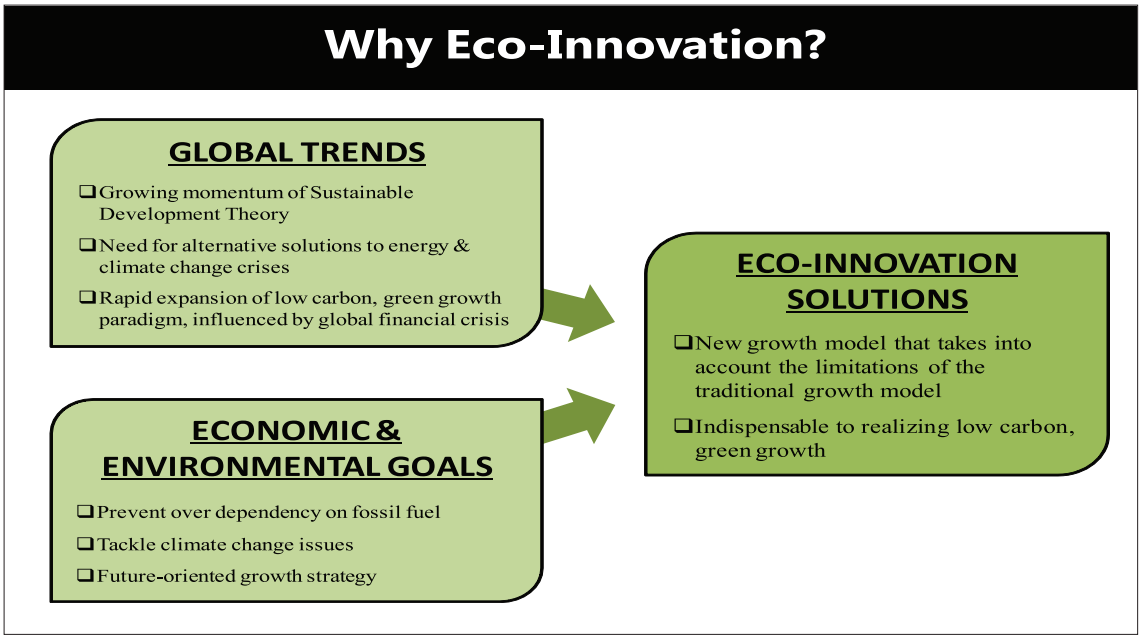
ASEIC supports SMEs in member countries to design and implement local and national strategies on green growth. In doing so, ASEIC is strengthening institutional collaboration with several stakeholders such as the Global Green Growth Institute (GGGI) and the Asia-Europe Foundation (ASEF).

On 10 January 2012, ASEIC signed a Memorandum of Understanding (MoU) with GGGI to synergize efforts to support developing countries in adopting eco-innovative technologies. ASEIC also intends to work with ASEF to further advance green growth in ASEM member countries.

Global Outlook on Eco-innovation

Sustainability and green growth continue to gain momentum in the international community as solutions for revitalizing the stagnating world economy as well as preventing further environmental & economic loss from climate change.

Against this backdrop, eco-innovation has become a concept of great significance to policymakers and businesses.



The term "eco-innovation" was first coined in 1996 by Claude Fussler and Peter James in *Driving Eco Innovation: A Breakthrough Discipline for Innovation and Sustainability* as "new products and processes that provide customer and business value while significantly decreasing environmental impacts". Since then, many definitions of eco-innovation have emerged.

In 2004, the European Union (EU) introduced the Environmental Technology Action Plan (ETAP) to promote the development and implementation of eco-innovation. According to ETAP, eco-innovation is "any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources." [1)]

1) European Commission (EC), Environmental Technologies Action Plan; available < http://ec.europa.eu/environment/ etap/index_en.html>.

The Organization for Economic Cooperation and Development (OECD) describes eco-innovation as "the contributions of business to sustainable development while improving competitiveness", analyzing eco-innovation activities in three dimensions - targets, mechanisms and impacts.[2)]

To incorporate eco-innovation in SMEs, the EU established the Eco-innovation Platform (Eco-IP) under the "Europe INNOVA Initiative". The EU's eco-innovation programs for SMEs emphasize the development of environmental technologies. Similar to the EU, the OECD implements eco-innovation programs for SMEs under the "OECD Project on Green Growth and Eco-innovation". The OECD eco-innovation program for SMEs aims to foster both technological and non-technological innovation in SMEs.

Although the concept of eco-innovation is slightly different among organizations, there is a common goal for its implementation - to drive businesses to institute greener processes and management activities, and utilize new business opportunities that are both economically and environmentally beneficial.

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2) Organization for Economic Cooperation and Development (OECD), "Eco-Innovation in Industry: Enabling Green Growth" (2010).

ASEIC's Concept of Eco-innovation

The global transition to low carbon and green economy is encouraging companies to adopt eco-innovation in their business activities. SMEs, however, have not been able to fully exploit the opportunities emerging from eco-innovation. They face barriers and challenges including lack of financing, knowledge, resources and technology - all of which make pursuing eco-innovation difficult. More importantly, most SMEs simply don't know about the benefits of eco-innovation and don't have an implementation plan to embrace it.
With this perspective in mind, the "Eco-Innovation Consulting Project" adopted a holistic, multi-faceted approach to foster green growth & sustainability among SMEs.

Although eco-innovation is an evolving concept, the prevailing scope of eco-innovation incorporates both technological and non-technological innovation.
Accordingly, ASEIC conceptualizes eco-innovation as "the development of innovative products, services, processes, or management which aims to optimize the use of energy and resources, and promote business opportunities while preventing or minimizing environmental impact".
Moreover, to generate a diverse range of outcomes, ASEIC has established specific targets and activities within four specific types of potential innovation: process, system, marketing, and management.
The figure below summarizes the category for eco-innovation:

ASEIC conceptualizes eco-innovation as "the development of innovative products, services, processes, or management which aims to optimize the use of energy and resources, and promote business opportunities while preventing or minimizing environmental impact"

Process Innovation

Eco-innovation in process refers to cleaner production, eco-efficiency, and environmental regulations compliance, which result in incremental and radical changes in the production process.

As the most basic type of eco-innovation, process innovation aims to save production costs, minimize negative environmental impact, and conserve energy & resources. ASEIC' s 2011 project conducted a thorough audit of the participating companies' production processes, providing short and long-term implementation plans for cleaner production and eco-efficiency.

In addition, the companies were given an environmental data management tool to efficiently monitor the company' s environmental performance.

System Innovation

System innovation is institutional reform that considers the environment in the company' s corporate strategy. This type of innovation allows the organization to control its operations and improve its environmental performance by publishing periodic sustainable report, establishing comprehensive and systematic management guidelines, and providing effective internal and external communications channels regarding the organization' s environmental performance.

To this end, the project conducted an educational seminar on environmental management, assisting the SMEs in developing environmental management system appropriate for their organization.

Marketing Innovation

Marketing innovation refers to the application of eco-friendly design and environmental labeling. Product design is crucial to the organization' s production and sales outcome. The project provided companies with simple eco-design tools and guidelines for implementation.

To raise awareness of the various global and national mechanisms available for green marketing, the project provided a comprehensive educational session on eco-labeling and carbon labeling to managers of participating SMEs, and those from other nearby businesses.

Management Innovation

Management innovation was introduced as the most advanced form of innovation. Management refers to the development of the company-wide business strategies that create new business opportunities.

At the final level of eco-innovation, management innovation aims to increase CSR activity through improving the importance of environmental awareness and developing partnerships with local community.

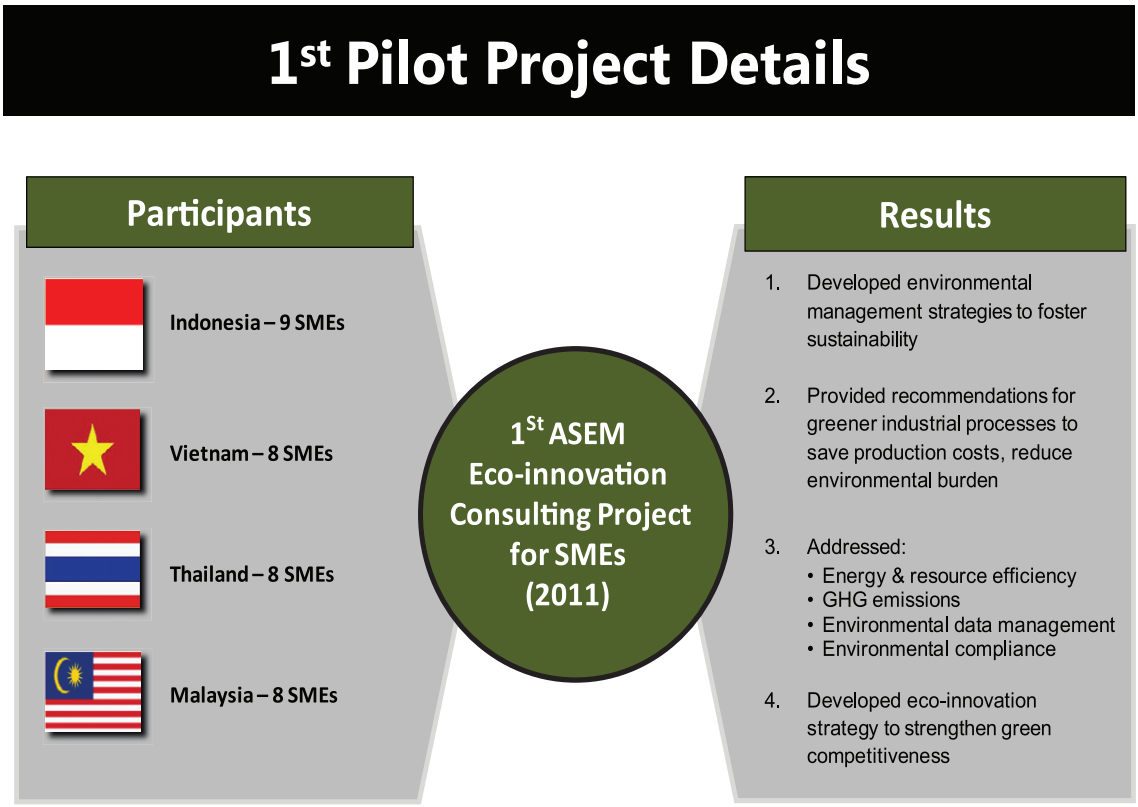
Based on the assessment, each participating SME was provided with a customized green business model that could be implemented in the long run.

Summary of 2011 ASEM SMEs Eco-Innovation Consulting Project

In 2011, ASEIC collaborated with UN organizations such as UNIDO and UNEP international resource panel, global consulting firms and environmental experts around the globe to launch its first "ASEM SMEs Eco-Innovation Consulting Project" in four ASEM member countries - Indonesia, Malaysia, Thailand and Vietnam - with a total of 33 SMEs.

The project consisted of customized consulting services in process, system, marketing and management innovation. Comprehensive strategies and measurable action plans for eco-innovation were developed to improve overall environmental performance, from process optimization and environmental management, to the development of green business strategies. Both quantitative and qualitative instruments were used to assess the environmental performance status of the participating SMEs.

In addition, on-site training and education were provided to raise awareness of the linkage between eco-innovation and growth. At the end of the consultancy, each company was provided with a comprehensive eco-innovation consulting guideline to be implemented in the long run.



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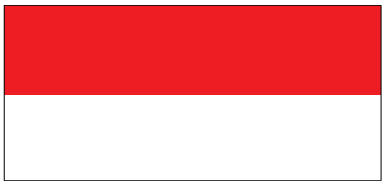


Country Status

Economy & Industry

Indonesia performed strongly in 2011 with GDP growth at 6.4% and is projected to expand 6.2% in 2012. Both domestic and international economic indicators influence the outcome of Indonesia's economic performance. Domestic indicators including job growth, strong performance of the manufacturing sector and increased private consumption contributed to the expansion of the economy.

On the other hand, the lower growth projection for 2012 reflects the impact of the turbulent global economy and the uncertain economies of Indonesia's major trading partners.

Table 1. GDP Growth of Indonesia (2010-2012)

		2010	2011	2012
GDP	Total	6.1	6.4	6.2
	Agriculture	2.9	3.3	3.8
	Industry	4.7	5.2	4.8
	Services	8.4	8.6	8.0
Consumer price index*		6.3	4.1	5.6
Budget balance**		-0.6	-2.1	-1.5
Major trading partner growth 6.8		3.3	3.3	

Note: *Q4 on Q4 inflation rate.
**2011 figure is approved revised Budget and 2012 is the Government's Budget
Source: World Bank, Indonesia Economic Quarterly, Dec 2011.

SMEs

According to the Central Bureau of Statistics and the Ministry of Cooperative and Small and Medium Enterprises, SMEs account for 90% of total firms and employment in Indonesia. The majority of SMEs are involved in the agricultural and the trade, hotels & restaurants sector, with 51% and 28% respectively. The manufacturing sector only accounts for 6% of the entire number of SMEs in Indonesia.

Table 2. Census of establishments and enterprises

Sector	Micro	Small	Medium	Large	Total
Agriculture	26,398,113	1,079	1,677	242	26,401,111
Mining	258,974	2,107	260	80	261,421
Manufacture	3,176,471	53,458	8,182	1,309	3,239,420
Electricity, gas & water supply	10,756	551	315	125	11,747
Construction	159,883	12,622	1,854	245	174,604
Trade, hotels & restaurants	14,387,690	382,084	20,176	1,256	14,791,206
Transport & communication	3,186,181	17,420	1,424	319	3,205,344
Finance, rent & services	970,163	23,375	3,973	599	998,110
Services	2,149,428	27,525	1,796	197	2,178,946
Total	50,697,659	520,221	39,657	4,372	51,261,909

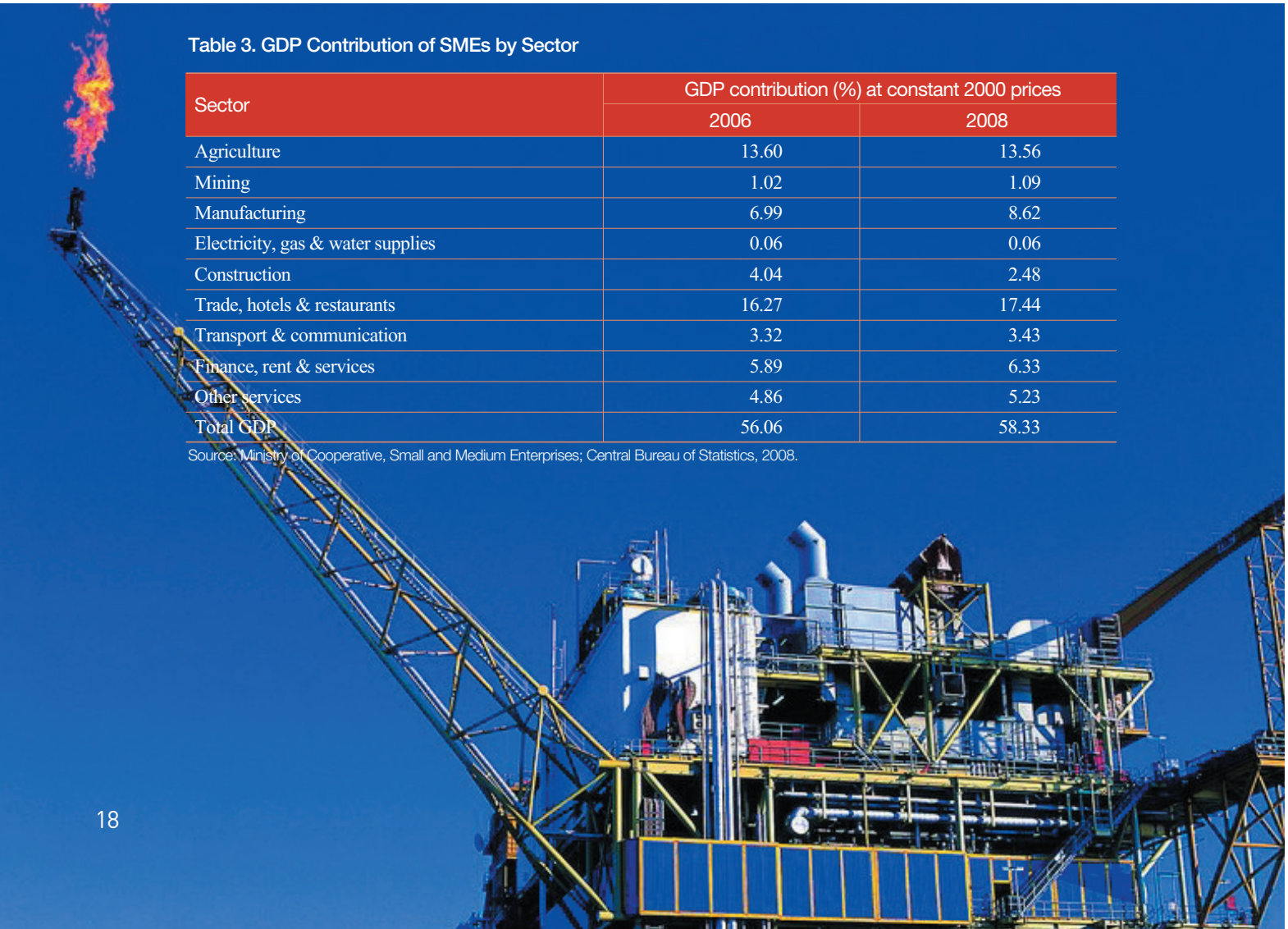
Source: Ministry of Cooperative, Small and Medium Enterprises; Central Bureau of Statistics, 2008.

The GDP share of SMEs and large enterprises in 2008 was approximately 58.33% and 41.67% respectively. Although the GDP share of the manufacturing sector accounts for just 8.62% of total GDP, its rate of growth was the highest, reflecting the improving performance of the manufacturing sector.

Table 3. GDP Contribution of SMEs by Sector

Sector	GDP contribution (%) at constant 2000 prices	
	2006	2008
Agriculture	13.60	13.56
Mining	1.02	1.09
Manufacturing	6.99	8.62
Electricity, gas & water supplies	0.06	0.06
Construction	4.04	2.48
Trade, hotels & restaurants	16.27	17.44
Transport & communication	3.32	3.43
Finance, rent & services	5.89	6.33
Other services	4.86	5.23
Total GDP	56.06	58.33

Source: Ministry of Cooperative, Small and Medium Enterprises; Central Bureau of Statistics, 2008.



Status of Environment & Energy

Indonesia's fossil fuel consumption has increased in tandem with the growing economy. According to the International Energy Agency (IEA), from 1990 to 2009, CO_2 emissions level reached 376.3Mt - a 164.7% increase from 1990.

Indonesia's dependency on natural resources makes the nation highly vulnerable to the effects of climate change. Yet with population growth, depletion of natural resources has become a major environmental concern for the government. In addition, as the largest archipelago in the world, 65% of the total population lives near coastal areas - leaving more than half of the population vulnerable to flooding and other natural disasters exacerbated by climate change and sea level rise.

Under the BAU scenario, the World Bank predicts that Indonesia will incur economic costs of approximately 2.5% to 7% of GDP by 2100, a figure significantly above the world average of 0.6%.

Table 4. Economic Costs of Climate Change

Source of Degradation	Economic Cost ($ bn 2007)	Annual GDP Loss (%)
Climate change	Increasing over time	2.5 - 7.0 (by 2100)
Water, sanitation and hygiene	7.7	2+
Outdoor air pollution	3.9	1.2
Indoor air pollution	1.6	0.4
Forest degradation	N/A	N/A
Soil degradation	$562 million (Java, 1985)	0.13
Coastal and marine environment	N/A	N/A

Source: World Bank, Country *Environmental Analysis*, "Investing in a More Sustainable Indonesia", 2009.

Indonesia's fossil fuel consumption has increased in tandem with the growing economy. According to the International Energy Agency (IEA), from 1990 to 2009, CO2 emissions level reached 376.3Mt - a 164.7% increase from 1990.

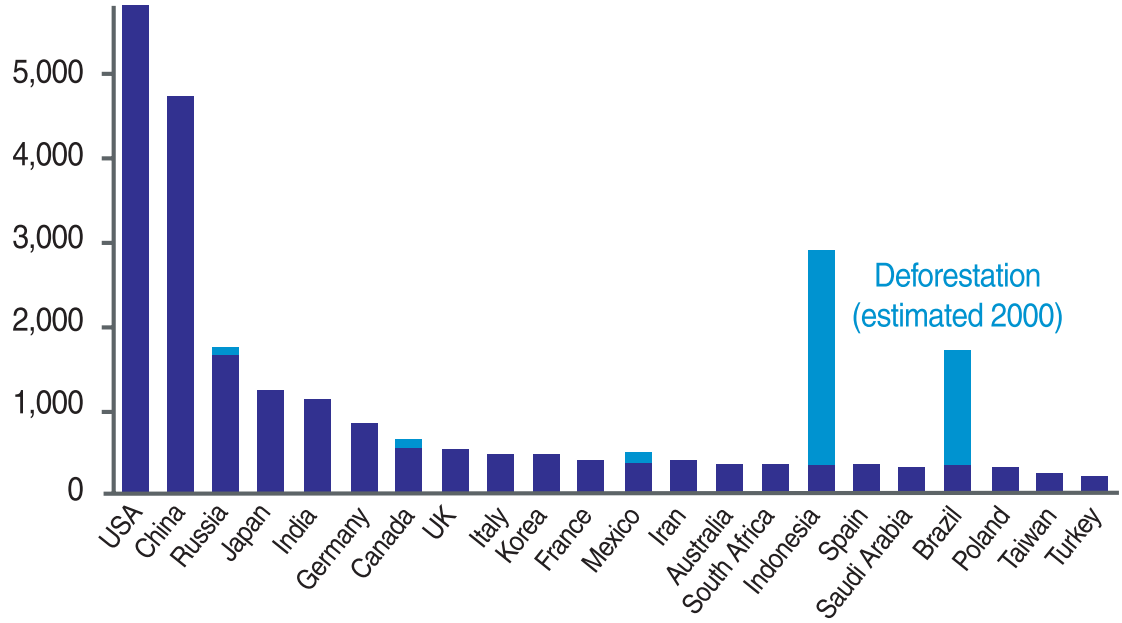
Table 5. Emissions from Fossil Fuel Consumption

CO_2 Emissions (Mt)	1990	1995	2000	2005	2007	2008	2009	% change 90-09
Coal/peat	17.6	26.0	47.3	85.8	127.7	103.6	110.6	529.7%
Oil	96.1	130.2	158.0	186.2	178.0	176.6	186.5	94%
Natural gas	28.5	45.9	58.8	64.4	59.8	63.2	79.1	177.6%
Total	142.2	202.1	264.0	336.4	365.5	343.5	376.3	164.7%

Source: International Energy Statistics (IEA), "CO_2 Emissions from Fuel Combustion Highlights", 2011.

Since 2004, Indonesia has ranked among the top 25 global CO_2 emitters. Yet, this figure only accounts for emissions from fossil fuel combustion. When considering emissions from deforestation and land use, it is projected that Indonesia's rank will rise to among the top 10 emitters.

Figure 1. Top 25 Global CO_2 Emitters in 2004



Source: International Energy Agency, 2007.

Although oil-based production and consumption accounts for the largest proportion of CO_2 emissions, depletion of oil reserves and the rising price of oil have reduced emissions from oil consumption from 99% in 1984 to 31% in 2004.[3] Nevertheless, emissions per capita and emissions intensity have increased - an outcome fostered by a large scale-up in the use of coal.

When considering emissions from deforestation and land use, it is projected that Indonesia's rank will rise to among the top 10 emitters.

According to the International Energy Agency (IEA), Indonesia produced a total of 246Mt and exported 203Mt of coal in 2009, ranking second among the net exporters of coal.[4] The main user of coal is the power industry followed by the cement, textile, pulp, metallurgy and other industries.

3) World Bank, Country Environmental Analysis, "Investing in a More Sustainable Indonesia", 2009.

4) International Energy Agency, World Energy Outlook, 2009.

National Indicator for Green Growth: Towards a Low Carbon Development

At the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), Indonesia launched a National Action Plan for Climate Change. Subsequently, Indonesia published its blueprint for integrating climate change mitigation and adaption into the national long-term and mid-term development plan and budgeting process.

The National Council on Climate Change was appointed as the main government agency for coordinating intra-governmental action for climate change, including the promotion of low carbon development. Moreover, the government has adopted various policies that tackle climate change issues incurred by different sectors of society.

Table 6. National Policies for Green Growth (sectoral approach)

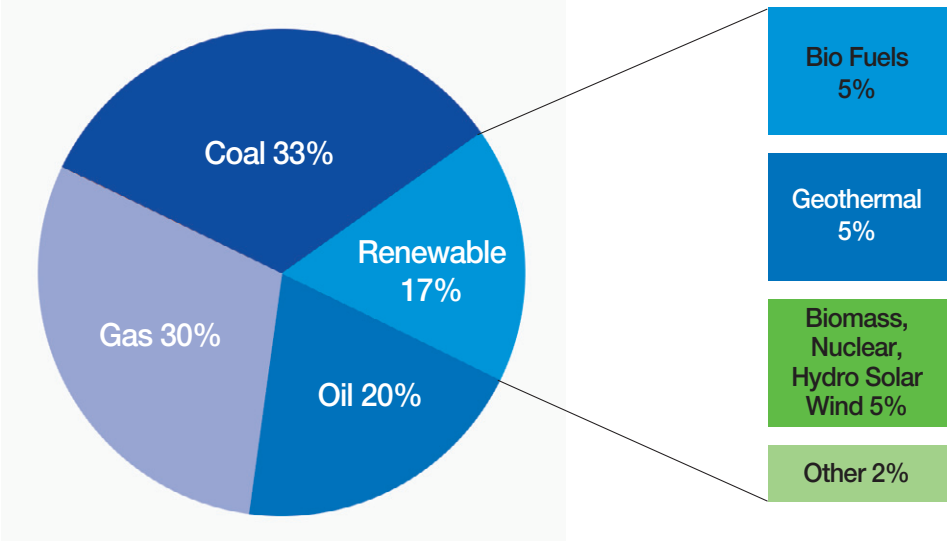
Sector	Policies
Energy	• Under the Green Energy Policy (2004), government has developed a scheme to maximize the use of renewable energy as well as the efficient use of energy and clean energy technology such as clean coal technology, fuel cell and nuclear energy.
Industry	• The major GHGs generated from industrial processes include CO_2, CH_2, N_2O and PFCs, in which emissions from CO_2 accounts for 93% of total emissions. Yet, there are no existing regulations or policies controlling GHG emissions from industrial processes. The Decree of the State Minister of Environment/Kep. MENLH No.129 (2003) controls emissions standards for industrial processes, but it only controls emissions from hydrogen sulfide (H_2S) and hydrocarbon gases, and does not cover CO_2 and/or other GHG emissions.
Forestry	• Under the Forestry Strategic Plan (2005-2009) and the Ministerial Decree No.P.04/Menhut-II/2005, Indonesia has launched a long-term framework for mitigation of climate change in the forestry sector. The strategies include combating illegal logging, revitalization of the forestry sector, conservation and rehabilitation of forest resources, empowerment of the forest community, and stabilization of the forest area for promoting sustainable forest management.
Agriculture	• There is no specific policy in the agriculture sector for climate change, but the National Development Planning Agency (BAPPENAS: Badan Perencanaan dan Pembangunan Nasional) is implementing key mitigation programs that would encourage low carbon efficient farming, contributing to the development of the green economy.

Source: Ministry of Environment, Republic of Indonesia, *"Indonesia Second National Communication under the United Nations Framework Convention on Climate Change"*, November 2010.

During the Copenhagen Climate Change Conference in 2009, Indonesia's President confirmed the country's commitment to reducing carbon emissions by 26%, and up to 41% with international support, by 2020.

Indonesia is abundant with both non-renewable and renewable resources. As one of the largest producers and exporters of coal, Indonesia is highly dependent on coal production and consumption. Accordingly, the government's national energy mix target under the Presidential Decree (Perpres No5/2006) on National Energy Management includes the goal of increasing the use of coal from 24% to 33% in the national energy mix target. Unlike natural resources, renewable resources have not been exploited to the fullest. Consequently, the government intends to increase the use of renewable energy by 17%.

Figure 2. National Energy Mix Target



Source: World Bank, *Low Carbon Development Option for Indonesia: Phase 1 Status Report and Findings*, November 2008.

During the Copenhagen Climate Change Conference in 2009, Indonesia's President confirmed the country's commitment to reducing carbon emissions by 26%, and up to 41% with international support, by 2020.[5] In addition, the Second Medium Term Development Plan (2010-2014) includes specific green economy programs including development of clean technology, sustainable agriculture, sustainable forestry management, energy efficiency, renewable energy usage, clean technology support, waste management, and green infrastructure development.

5) Ministry of Environment, "Indonesia Second National Communication under the United Nations Convention on Climate Change (UNFCCC)", November 2010.

Eco-Innovation Success Stories

Consumption and disposal of energy & resources is the greatest environmental concern for majority of SMEs in newly-industrializing nations.
In Indonesia, the project primarily focused on the technological aspects of eco-innovation, specifically the greening of the production process utilizing both simple and advanced cleaner production options.

Success Story 1: Create Green Business Opportunity

Encouraging sustainable production and management activities of SMEs is integral to green growth, as they account for a large part of global consumption of energy and resources. The key driver of green growth is eco-innovation, including cleaner production, sustainable management, and the development of green products and technology.
Nevertheless, SMEs are constrained by lack of resources, knowledge and capacity. Understanding the significance of fully exploiting the potential for eco-innovation and green entrepreneurship among SMEs, the project strived to identify green business opportunities for the participating companies.

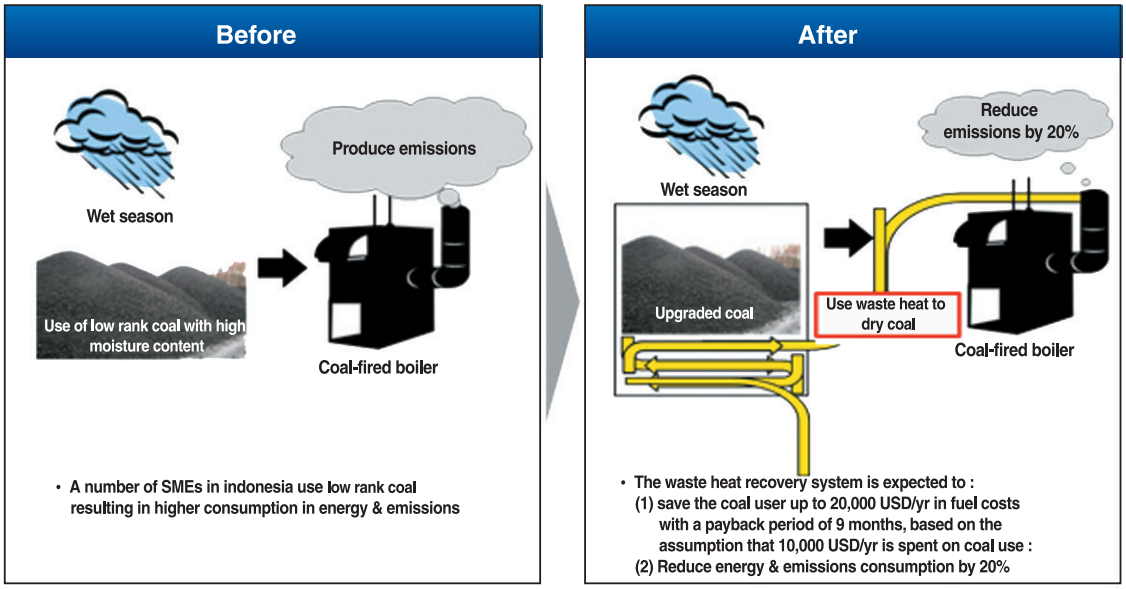
Development of Waste Heat Recovery System for Drying Low Rank Coal

SMEs in Indonesia frequently use coal-fired boilers in their facilities. During the wet season, coal is left on the ground without protection. The low rank coal (LRC) has high moisture content, resulting in unnecessary consumption of energy and resources.

The consulting team recommended that the companies install a Waste Heat Recovery System (WHRS) to recover waste heat from the chimney of the coal-fired boiler to dry the existing low rank coal to an upgraded coal with low moisture content and high calorific value.

Figure 1 summarizes the concept of the Waste Heat Recovery System.

Figure 1. Application of the Waste Heat Recovery System



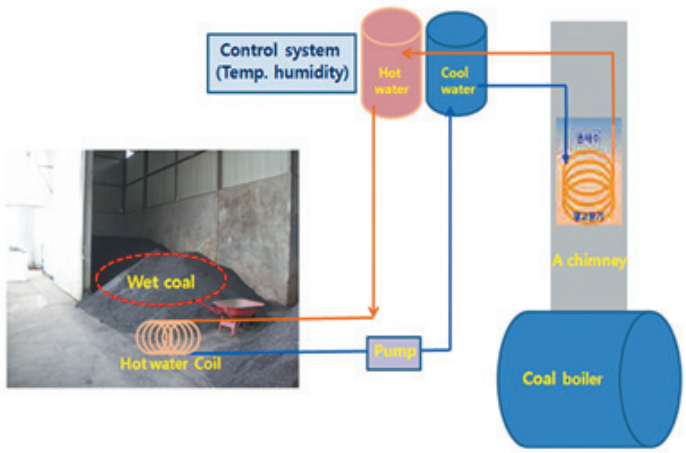
Business Development Framework

PT. Space Technology (Space Tech), an OEM manufacturer in the field of electrical, mechanical engineering and manufacturing conveyor, was identified as the company with the capacity to develop and distribute the Waste Heat Recovery System.

The project recommended that Space Tech develop and distribute the Waste Heat Recovery System with Eco-Frontier serving as an advisory.

Table 1 summarizes the business development framework for Space Tech.

Table 1. Business Development Framework (Summary)

Name of the System	• Waste Heat Recovery System for Drying Low Rank Coal (WHRS)
Description	• The maximum area required for the system is 100 m^2. • The temperature required for producing hot water is 40-90°C with flow rate of 5~30 m^3/hr. • A non-driving power system is applied, and water is the heating medium.
Method	• Waste heat is collected from the heat released from the chimney of the coal-fired boiler; therefore, the WHRC should be installed on the bottom part of the chimney. • Warm water passes through the pipe, and waste heat is recovered in accordance with the thermal conduction and convection theory of heat transfer. • The diameter of the pipe is unknown, but it is expected to be approximately 20mm. 
Expected Outcome	• The System will dry low rank coal on the ground, which as a result, is expected to improve the efficiency of the boiler as well as reduce both energy use and emissions by 20%.

Conclusion

The development and distribution of the Waste Heat Recovery System is projected to reduce the overall level of emissions and production costs as well as increase energy efficiency. Upon the successful implementation of the project, Space Tech can expect to have the following sales output over the next 3 years.

Table 2. Expected Order Volume and Price of the Waste Heat Recovery System

	Volume	Unit Price	Total Price
2013	25	$15,000	$375,000
2014	50	$14,000	$700,000
2015	80	$13,000	$1,040,000

Note: The stated order volume and price of the Waste Heat Recovery System is only an estimate; therefore PT. Space Technology should conduct thorough market research upon the success of the pilot project to develop an accurate order volume and price table.

Consumers are expected to benefit from both reduction in environmental burden and economic costs. The Waste Heat Recovery System will increase the value of the company's coal, and improve fuel efficiency by 20%. An organization that spends 100,000 USD per year on coal consumption can expect to reduce annual consumption costs by 20,000 USD.

The development and distribution of the Waste Heat Recovery System is projected to reduce the overall level of emissions and production costs as well as increase energy efficiency.

Based on the assumption that the unit cost of the Waste Heat Recovery System is 15,000 USD, the payback period is estimated to be nine months. In terms of reducing environmental impact, the organization is expected to reduce 2,000t in CO_2 emissions per year.

Success Story 2: Cleaner Production & Good Housekeeping

The term "Cleaner production" was coined in 1990 by the United Nations Environment Programme and is defined as "the continuous application of an integrated preventative environmental strategy to processes, products and services to increase inefficiency and reduce risks to humans and the environment."[6] Cleaner production is the most basic criteria for realizing eco-innovation, and includes everything from simple good housekeeping practices to the application of green technology.

Among the cleaner production criteria, good housekeeping is particularly suitable to SMEs since they can be implemented relatively easily at low costs. Accordingly, the project offered good housekeeping strategies the participating companies could implement to conserve energy & resources.[7] Among the participating companies in Indonesia, PT. Hasura Mitra Gemilang (Hasura), a manufacturer of plastic parts for electronics and automobiles, had the highest implementation rate.

6) United Nations Environment Programme, Division of Technology, Industry, and Economics; available http://www.unep.fr/scp/cp/.

7) Good housekeeping measures aim to improve an organization's industrial process by preventing the loss of materials, minimizing wastes and conserving energy use.

Table 1 illustrates a summary of the good housekeeping recommendations made for Hasura.

Table 1. Summary of Cleaner Production Recommendations for Hasura

Criteria	Before	After	Expected Result
Energy efficiency	Insufficient use of natural light	Increase use of natural light	• Reduce electricity consumption • Save approximately 740 USD/yr assuming total of 3kW of electric lights is used 11hrs/day, 250days/yr
	Does not control load capacity of motor used for the compressor and cooling tower	Install inverter to control load capacity	• Optimize use of motor and control electricity use • Reduce energy use by 25% • Save approximately 1,750 USD/yr assuming a 40hp motor is operated 11hrs/day, 250 days/yr
	Poor management of compressor room	Install ventilation system in the compressor room, and install a door to separate the compressor from the surrounding area	• 5% annual improvement in efficiency • Save approximately 130 USD/yr assuming that a 15hp motor is operated 11hrs/day, 250days/yr
	Pre-heating time of catapult is 30 minutes	Reduce pre-heating time to 25 minutes	• Save approximately 120 USD/yr
Resource efficiency	Absence of coolant filtration system	Install coolant filtration system	• Save approximately 1,800 tons of circulated water and 180 USD annually
	Use one way faucet	Replace with existing faucet with a two way faucet	• Reduce water consumption by 20%
Waste management	Waste is not properly separated and recycled	Proper storage and separation of non-recyclable and recyclable wastes	• Reduce waste management costs • Increase use of recycled materials

Energy efficiency

Undesired energy consumption is one of the most commonly identified environmental concerns for SMEs. One example is the excessive use of electric lights.

The project recommended that Hasura expands the use of the natural sunlight in the factory to reduce dependency on electric lights. Upon implementation of the cleaner production recommendation, Hasura is expected to save costs up to 749 USD per year based on the assumption that six 500W light fixtures were used 11 hours a day, 250 days in a year.

Figure 1. Energy Efficiency Example: Use of Natural Light

Resource efficiency

Resource efficiency is one method of reducing energy consumption and waste generation.

Prior to the project, Hasura did not use a coolant filtration system for the circulating cooled water, resulting in the presence of suspended solids in the cooling water system. This has resulted in higher energy costs, from loss of heat transfer efficiency to increased pumping capacity.

The project recommended that Hasura install a coolant filtration system to facilitate greater efficiency of the cooling water system. Based on the recommendation, Hasura is expected to save 1,800 tons of circulated water, reducing water costs up to $180 annually.

Figure 2. Resource Efficiency Example: Coolant Filtration System

Before	After
	

The application of simple good housekeeping measures will reduce Hasura's annual electricity consumption by 30,444kWh and water consumption by 1,800 tons.

Waste Management

Proper disposal of wastes is economically and environmentally efficient. Wastes should be separated according to their nature, and reused or recycled to their maximum. The project advised Hasura to designate a separate area for different types of waste with appropriate labeling. Based on the recommendations, Hasura is expected to reduce waste disposal costs as well as valuable material inputs.

Figure 3. Waste Management Example: Waste Separation & Recycling

Before	After
	

Conclusion

The application of simple good housekeeping measures will reduce Hasura's annual electricity consumption by 30,444kWh and water consumption by 1,800 tons. Cumulative savings in costs is expected to be 2,740 USD and 180 USD respectively. Based on the current emission factor of Indonesia, Hasura is expected to have a reduction of 24tCO.

Conclusion

Today, small and medium-sized enterprises (SMEs) form the backbone of most of ASEM member states' economies. In Europe alone, SMEs represent 99 percent of all businesses, providing jobs to more than 100 million people. In Asia, SMEs constitute the lifeblood of many industries. Eco-innovation offers SMEs opportunities to save costs, expand to new markets, create new jobs, and reduce pressure on the environment.
Against this backdrop, ASEIC was established to ensure that SMEs play a vital role as dynamic developer and adopter of eco-innovation in the world economy.
In 2011, ASEIC launched its first "Eco-Innovation Consulting Project" to provide SMEs with opportunities and mechanisms to strengthen their green competitiveness by integrating eco-innovation in the company's entire business operations.

In Asia particularly, eco-innovation is still a new phenomenon. The greatest challenge among governments is how to foster an environment that enables SMEs to easily explore and pursue their innovative ideas at a much lower risk. The most common barriers are lack of access to finance or venture capital, inadequate information, poor management skills, and the protection of intellectual property rights. The project aimed at assisting SMEs in overcoming these hurdles to empower their green competitiveness.

The scope of eco-innovation in the project was diverse - reflecting the different needs of the participating countries. In Indonesia, high energy price was the biggest concern for SMEs. Accordingly, greening production processes, from simple housekeeping measures to advanced facility improvements, were the primary focus of eco-innovation in Indonesia. Similarly in Thailand, process innovation was prioritized. In Vietnam, SMEs were mostly concerned with allocating finance for new facilities. Accordingly, the eco-innovation consulting prioritized enhancement options that could be implemented at low costs. In Malaysia, however, the needs of SMEs were much more diverse, requiring an integrated approach to eco-innovation.

Limitations of this project include low awareness of the "ASEM SMEs Eco-Innovation Consulting Project" by the SMEs, the short time period given for the consultancy, and the challenge of allocating funds to implement some of the costly eco-innovation options recommended by the consultants. Despite these barriers, the impact of the "Eco-Innovation Consulting Project" should not be underestimated - the participating companies implemented more than half of the recommendations made by the consultants, and were able to benefit economically, socially and environmentally.

Based on the experiences of the first pilot project, future "Eco-Innovation Consulting Projects" will strive to pioneer green growth and sustainability among SMEs.

Annex:

1. Introduction of Participating Agencies

Eco-Frontier Co. is a global brain & business group dedicated to sustainability and green growth. Since its founding in 1995, Eco-Frontier has provided consultancy on green growth & sustainability policies, environmental management, sustainable finance, carbon credit trading, and green technology development for nearly 1,000 leading private and public organizations. Its headquarters is located in Seoul, Republic of Korea, with overseas branches and affiliates in Malaysia, Indonesia, China, U.S. and the U.K. Moreover, Eco-Frontier is actively engaged in global green initiatives as the official Korean partner of UNEP FI and UN PRI. In recent years, its business has expanded to developing business frameworks and investment schemes for overseas renewable energy projects. Based on its expertise and experience in developing green business strategies, Eco-Frontier provided customized eco-innovation solutions to the participating SMEs in Indonesia and Malaysia.

ECOEYE Co., Ltd was incorporated in 2003 and is based in Seongnam City, South Korea. ECOEYE mainly provides professional services on the clean development mechanism, emissions trading, value engineering, sustainability reports, integrated environmental management systems, eco-design, and green marketing. In this project, ECOEYE provided consulting services and education to participating SMEs in Thailand and Vietnam as the main service provider. Also, ECOEYE recruited local multinational consulting firms specializing in energy, environment, cleaner production, and sustainable development with good international networks.

Prof. Sangwon Suh

Prof. Sangwon Suh (University of California, Santa Barbara) is an expert of the environment (LCA, Cleaner production) and the UNEP International Resource Panel. In this project, He educated the Vietnamese and Thai SMEs in collaboration with ECOEYE. He also provided work for the development of a broader international network.

The United Nations Industrial Development Organization (UNIDO) is a specialized agency of the United Nations. Its mandate is to promote and accelerate sustainable industrial development in developing countries and economies in transition, and work towards improving living conditions in the world's poorest countries by drawing on its combined global resources and expertise. UNIDO experts were responsible for providing information and education in this project.

Vietnam Cleaner Production Center (VNCPC) was established on 22 April 1998 within the framework of the project VIE/96/063, signed by the Ministry of Education and Training (MOET) and the United Nations Industrial Development Organization (UNIDO). The VNCPC delivers to service providers and to industries high quality services such as cleaner production assessments, financial engineering, technology advice, and training and information. In this project, VNCPC provided support to the training workshop and it also works for the development of a network between necessary Korean and Vietnamese institutions and industries.

Eco Design Consultant Co., Ltd. (EDC) is the first private sustainable consultancy in Thailand since 2000. EDC provides practical industrial engineering, economic and ecological sustainable business advice. The sustainable series training are informed by Industrial Engineering (IE), Economic Value Added (EVA) and Life Cycle Thinking (LCT), The role of EDC in this project was to provide full support for the recruitment of participant for the eco-innovation consulting service and scheduling, training workshops, and the development of a broader network between appropriate Korean and Thai institutions and industries.

OWW Consulting located in Malaysia has become a leading international provider of Corporate Social Responsibility (CSR) solutions and Socially Responsible Investment (SRI) research in Asia Pacific, Europe and the Middle East. In this project, the role of OWW Consulting was recruitment for eco-innovation consulting.

2. List of Participating SMEs

A. Malaysia

Company name	Main products
Exis Tech Sdn. Bhd.	Semiconductor manufacturing equipment
Malaysian Agri Group of Companies (Myagri)	Agricultural fertilizers
Coscolab Sdn. Bhd.	Cosmetics and beauty products
Tex Cycle Technology (M) Bhd.	Waste disposal, recycling
IPALM (Malaysia) Sdn. Bhd.	Biomass(pellet, briquette)
K-Plastics Industries Sdn. Bhd.	Plastic bottles
Sweetkiss Food Industry Sdn. Bhd.	Chocolate and confectionery
F&B Nutrition Sdn. Bhd.	Coffee cream, condensed milk

B. Indonesia

Company name	Main products
PT. Ajidharmamas Tritunggal Sakti	Silica glass fiber
PT. Hasura Mitra Gemilang	Electrical and electronics, automobile parts (plastic parts)
PT. Indonesia Daeyang Korea	Styrofoam packing material
PT. Innoware Indonesia	Plastic containers
PT. Kones Taeya Industry	Sports balls
PT. Ostec Indonesia	Electrical and electronics, automobile parts (plastic parts)
PT. SeAH Precision Metal Indonesia	Steel tube, wire, capacitor
PT. Sentralindo Teguh Gemilang	Paper Box
PT. Space Technology	Generators and other industrial goods

C. Thailand

Company name	Main products
Tipco Biotech Co., Ltd	Fruit extracts(Juice, Cosmetic Raw Materials)
Leonics Co., Ltd	Solar Components
CNC International	Nonwovens
Chaiwachara Autoparts Industry Co.,Ltd	Rubber Products
Image_Interholding Co.,Ltd	Leather Sofa
TSP Metal Work Co.,Ltd	Metal products (agricultural)
Prevalence Industrial Co.,Ltd	Remote Control
Thai Motor Chain Co.,Ltd	Motorcycle chain

D. Vietnam

Company name	Main products
Golden Gate	Ceramics
Hagenco	Garment
MinhcuongMC	Cranes and industrial structures.
Duc Giang Garment Corporation	Garment
Hong Nam Mechanical Joint Stock Company	Cranes and industrial structures.
DONG Anh Electrical Equipment Manufacturing Joint Stock company (EEMC)	Transformers
Dong Phat Joint Stock Company	Thread
Nhat Quang Steel	Galvanized steel products

3. ASEM Members

Asia
(17)

COUNTRY	CAPITAL
Republic of Korea	Seoul
Lao People's Democratic Republic	Vientiane
Mongolia	Ulaanbaatar
Malaysia	Kuala Lumpur
Myanmar	Naypyitaw
Socialist Republic of Vietnam	Hanoi
Brunei Darussalam	Bandar Seri Begawan
Singapore	Singapore
Republic of India	New Delhi

COUNTRY	CAPITAL
Republic of Indonesia	Jakarta
Japan	Tokyo
People's Republic of China	Beijing
Kingdom of Cambodia	Phnom Penh
Kingdom of Thailand	Bangkok
Republic of the Philippines	Manila
Islamic Republic of Pakistan	Islamabad
ASEAN Secretariat	

Europe
(28)

COUNTRY	CAPITAL
Hellenic Republic	Athens
Kingdom of the Netherlands	Amsterdam
Kingdom of Denmark	Copenhagen
Federal Republic of Germany	Berlin
Republic of Latvia	Riga
Romania	Bucharest
Grand Duchy of Luxembourg	Luxembourg
Republic of Lithuania	Vilnius
Republic of Malta	Valleta
Kingdom of Belgium	Brussels
Republic of Bulgaria	Sofia
Kingdom of Sweden	Stockholm
Kingdom of Spain	Madrid
Slovak Republic	Bratislava

COUNTRY	CAPITAL
Republic of Slovenia	Ljubljana
Republic of Ireland	Dublin
United Kingdom of Great Britain and Northern Ireland	London
Republic of Estonia	Tallinn
Republic of Austria	Vienna
Italian Republic	Rome
Czech Republic	Prague
Republic of Cyprus	Nicosia
Portuguese Republic	Lisbon
Republic of Poland	Warszawa
French Republic	Paris
Republic of Finland	Helsinki
Republic of Hungary	Budapest
European Commission	

The Third Group
(3)

COUNTRY	CAPITAL
Australia	Canberra
Russian Federation	Moscow

COUNTRY	CAPITAL
New Zealand	Wellington

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