

**Popular Book**

# The Role of Business Incubators in Developing Green Technology-Based SMEs



Ministry of Cooperative and SME,  
Indonesia



Asia-Pacific  
Economic Cooperation

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## **FOREWORD**

This book is written as the part of outcome from The International Workshop and Training “the Role of Business Incubators in Developing Green Technology-Based SMEs” conducted by APEC Small and Medium Enterprise Working Group at Yogyakarta, Indonesia on 27-29 September 2011. The intention is to provide a practical manual on the guidelines for business incubator management to implement plans to nurture new green technology-based SMEs, and information about examples of successful green technology based SMEs, most of them are incubatees from business and technology incubators in the APEC member economies.

There are many shortcomings in the content, part of it is the limited success stories from only some of the APEC member economies, however, if the book could be always updated along with the growing interest and concern of APEC member economies. The development of nurturing green technology based SMEs by business and technology incubators is also dependent on the willingness and commitment of the APEC member economies and their communities as a whole, especially the stakeholders of the green technology based SMEs.

The producer sincerely thanks the contributors of this book, especially the participants and speakers of the aforementioned International Workshop and Training who have been collecting the success story of the green technology based SMEs, or even the successful SMEs by themselves.

In closing, it is greatly expected that this book could raise the interest and concern of all of us to give our hands in assisting the green technology based SMEs development in the APEC economies and anywhere else to make our world greener and greener.

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## I. INTRODUCTION

Green Technology means eco-friendly resource utilization technology e.g. renewable energy, and clean energy. Some APEC member economies have developed good strategies to develop green technology-based firms and can serve as role models for other APEC member economies and also non-APEC economies, which are still at the initial stages of developing capacity to nurture and develop green technology-based SMEs. Business Incubation can be an important instrument to develop new green-based technology firms, but needs to be adapted to the special requirements. In the last decades, some APEC member economies have developed good course of strategies in developing green technology-based firms; while other APEC member economies are still at the initial stage in developing its capacity to nurture and develop green technology-based SMEs.

The International Workshop and Training “the Role of Business Incubators in Developing Green Technology-Based SMEs” recently held in Yogyakarta, Indonesia, recognizing the importance and effective role of SMEs as a significant source of prosperity and employment and a major contributor to innovation, is aiming at developing recommendation for business incubator management in nurturing the development of newly green technology-based firms, strengthening the network and capacity of technology business incubator managers in the Asia Pacific region in order to provide better services to newly technology-based SMEs (its tenants), and offering opportunities for newly green technology-based SMEs (incubators’ tenant) to find a new market and establish business partnership in the region.

The International Workshop and Training “the Role of Business Incubators in Developing Green Technology-Based SMEs” has come up with outcomes and recommendations and a set of guidelines for business incubator management to implement plans to nurture new green technology-based SMEs.

### **1.1. State of The Art in Developing Green Technology-Based SMEs**

The presentation of the participants had given the information and description of what was done in their respective economies concerning the SMEs activities. In order that the incubation of green technology based SMEs to succeed, participants appreciated that business environment and general awareness needs to be addressed, as well as consideration of the topic assumed good basic technology business incubation practices need to be in place in addition to specific actions to address the unique and special needs of green technology based SMEs.

#### **CHILE: Chilean Incubator System**

The Chilean Government has supported the development of business incubators in Chile and since 2003 has a grant program to create and develop incubators as a way to provide assistant for the entrepreneurs. The Government support started as a Pilot project in 2001, then a Creation & Development in 2003, followed by the establishment of New Incubators in 2009, Development of the New Model in 2010 preparation for Incubators 3.0. While in 2009 Design of Evaluation tool, Implementation of Evaluation Tool and System of Valuation was prepared.

There are twenty five (25) incubators in Chile, and they have challenges to develop success business such as; Poor Technology transfer; Small company investment in R&D; Start-ups focused on local markets; Strict regulations; Young local VC industry; Risk averse culture; whether the model works. The University, Private Sector and Government formed a linkage in the implementation of the incubators establishment. While for Green Business they have also challenges i.e. insufficient information about costs and prices for Green business SME; technologies and business model compatible with global escalation is required; alliances and networks (government, community, entrepreneurs) in order to surpass the cultural economic resistance to change is required; connecting SME to be specialized in networks and early-stage financing; building and strengthening technical abilities inside the incubators so they could lead or participate.

## Some Green & Success cases

### **RECYCLA**

- Recycla is a leader and pioneer company in recycling e-waste and a social business that hires people under social exclusion or risk, train them and recover them for the society.
- Recycla look for a triple bottom line: economic, environmental and social  
In its activities Recycla is supported by Octantis

### **SOLAR CHILE**

- Solar Chile wants to convert the high solar irradiation found in the desert into a competitive and sustainable source of energy.
- Their objective is to provide clean and reliable energy to energy off takers, primarily large coppers mines, through long-term power purchase agreements.
- This entrepreneurship is supported by Fundacion Chile.

### **GREEN START UP**

- This was organized by two business incubators
- Involved in the activity of the ministry of environment and the big private companies
- Has a very successful experience where the incubators work together and set main issues in the public agency.

## **CHINA: Green Technology Strategic Role**

Green Technology (GT) assumes a strategic role in achieving green growth by laying the basic foundation for the establishment of low carbon-green industry. As the industrial structure changes in line with the environmental protection trend, GT becomes the critical driver in achieving a beneficial balance between environmental protection and economic growth. Green Technology Industry involves eight area i.e. Photovoltaic Power Generation, , Wind Power Generation, Bio Energy, Next-Gen Lighting (LED), Heat Pump, Green IT, Waste to energy, and Waste Recycling

Chinese incubators have been constantly practicing and promoting the development of Green Technology. The Internal network consists of incubators and incubated enterprises which formed an internal communicating and sharing platform in the industry chain, in the External network there are government support, investment, agency services, science and technology support and start undertaking supporting network, which builds resource integration service advantages to provide a series of specialized value-added services in depth of green Technology SMEs. The comprehensive operation of both internal and external network reduce the start-up costs and reduced the risks of Green Technology SMEs, thus increase the SMEs survival and success rate and push forward their development.

Currently China is establishing a consistent business incubation system integrated with pre-incubation, incubator, business Accelerator and Sci-Tech industrial Park for forming the Green Technology business incubation chain as well as striving to well develop the industry of Green Technology.

### **INDONESIA: Development of Green Technology-Based Small and Medium Enterprises (SMEs) in Indonesia**

Indonesia is a vast archipelago of 17500 fertilized islands, with a total population of 237.556.363 and 6.15% annual GDP in 2010. The structure of its economy covers Agriculture, Industry, Manufacturing Services, Household consumption, General Gov't consumption and Import of goods and services.

Financing and Tax incentive policy for SMEs is given in the form of Provision of non-collateral micro loan with low interest rate and Grant of tax incentive.

Memorandum of three Ministers (Cooperative and SMEs, Research and Technology, and National Education) and Provision/or promotion of high quality infrastructure, HR, financing, etc. are the Policy to encourage Development of Green SMEs such as through technology incubators, science and technology parks e.g. Solo Techno Park, I-STP Serpong, Jababeka techno-park, Cikarang techno park. The current Policy status is on Green Energy Target. In the National Energy Policy for example Biofuel Producers, use molasses as raw material base to produce Bioetanol. The 1<sup>st</sup> generation production of cooking stove had a high risk during fuel

refilling while the stove became corroded. When the association of Indonesian Bio-ethanol entrepreneurs redesigned it and use bio-ethanol as the fuel the stove problem was solved.

Green technology products: Targeted tech-based SMEs (Firms) need a more comprehensive public support

Institutional Instrument: Ministries and government agencies lead the process; Cross sectored institutions required to orchestrate policy; Implementing institution with comprehensive support and services to green SMEs not yet available; Financial and non-financial.

Green technology products development:

- Roadmap green technology-based product development; Selection of core technology to be mastered; energy resources; energy efficiency improvement, environmental protection and recycling of resources; zero pollution economic activities; annual target.
- Business areas to be focused; Primary sector e.g. biomass energy, low rank coal based power plant, low speed wind power, tidal, efficient motor, lighting.  
Secondary sector i.e. finished products; Role of SMEs in the specific SCM; component of suppliers etc.

Key Issues:

- Classical View of Green concept: emphasis more on environment, less economy/engine for business growth
- Number of (green) tech-based SMEs low: Innovation and absorption capacity
- Domestic potential and export opportunities: localized technology/domestic market to incubate the green products-incentive policies; SCM – role of SMEs at certain chain.
- Institutional infrastructure: Integrated support: Green management program for SMEs; Green Technology program for SMEs

- Research, Technology, Innovation, Business; Long term strategy—Role of the government to drive the process is essential; encourage open innovation.

#### Financing Instrument:

- Annual investment to nurture and grow green tech SMEs: Public fund; capacity building; Support incubation program; support for global marketing/promotion; Public procurement; Percentage of Gov't Ministry and Agencies with certain amount of budget for SMEs R&D.
- Private: Viable green business; credit insurance by the government for selected Green Innovation SMEs
- Reorientation of related national budget 2011-2014: consolidated for green innovation SMEs vs. Subsidies for low priorities unclear program objectives --- nuclear plant, etc.
- Optimization of CSR Fund: Private company; State owned company- 5% of net profit (2.5% as grant for capacity building and 2.5% as partnership fund soft-loan)

#### Green Tech SMEs/Start up and Green Growth

- Plan for accelerating development and promotion of Green Start Ups in 2010 - 2014; mid and long term plan prioritized in NTBFs development; Old business—trading mindset.
- NTBF and Supply Chain; alliances, partnership/cooperation (domestics and overseas) e.g. radar, electric cars ->parts, components etc
- No tech-based SMEs/start up; become market for imported technology-based products.
- 

#### Nurturing Green Tech SMEs/Start Ups

- Development and Strengthening of Technology Business Incubators: Infrastructure, capacity building of incubator management; Technopreneurship Development; Risk Funding grant on competition basis.
- Designated Universities and research institutes to promote green tech SMEs/start-ups

- Initiate establishment of (Green) SME Center, providing supports on: infrastructure for testing, prototyping/product development (can coop with other designated institutes) Consultancy; Trainings; funding.

#### Policy Directions

- Mitigation of climate change & energy independence: Effective mitigation of greenhouse emissions; strengthening the capacity to adapt to the climate change; Increase the use of renewable energy.
- Creating new engines for economic growth: Development of Green technologies; the greening of existing industries and promotion of green industries; advancement of industrial structure; public supports for green economy.
- Improvement in quality of life and enhanced international standing: Greening the land, water and building green transportation infrastructure; bringing green culture into daily lives, becoming a role model for the international community as a green leader.

#### Green Management needs:

- Public Awareness i.e. Paradigm shift, Competition, Green innovation award, etc.
- Promotion and nurturing i.e. Capacity building and Investment
- Certification and Benefits i.e. Cost sharing, Certification rating and credit rates, Mandated R&D, Public procurement.

#### Concluding Remarks

- Green SMEs tech/product areas still focus more on primary sector (low added value –as input to secondary industry: renewable energy production; green agriculture products; CO<sub>2</sub> gas emission reduction; less on green tech-based products.
- Need a paradigm shift of green concept from purely related to disaster mitigation and environmental protection to green tech as an engine for economic growth: Develop and nurture tech-based firms/entrepreneur----

incubation and entrepreneurship program; level of technology content→level of value added of the products ---profit ---tax---welfare.

- There is a need to have an integrated policy setting and policy implementation: Clear policy direction for a Green Growth Strategy of one institution; support green technology/products by SMEs—incentives at early stage; use domestic market to incubate priorities green tech areas; clear implementation strategy—one institution: target and consistent commitment
- Open innovation a proposal: APEC to facilitate exchange of green tech/business amongst its members (in addition to capacity building programs); business/investment matching forums, thematic green tech/product expo, etc.

### **Some Green success case**

#### **PT. Endugo Enzymes International**

- Convert Biomass to Ethanol using empty fruit bunches, fibers; Fibers and shells; Rice straws/husks; Cane bagasse; Sweet sorghum; Energy grass-Cassava.

Endugo Tech. developed over a decade of R&D, Started in 1998 – 2005 with research, in 2005 -2007, they worked on lab. scale, put bench scale in 2007 – 2009, established a pilot plant in 2009-2010 and continue on commercially in 2011. ESI is now developing various projects in Asia for the commercial deployment of the ENDUGO 2<sup>nd</sup> generation cellulosic ethanol technology. First commercial plant in China operational end in 2012.

#### **Green High-Tech and the Role of SMEs**

- Use less physical material vs. conventional Radar (bigger, heavier, more expensive-non green – licensed to large state owned enterprise.
- Opportunity for SMEs- Supplies of various parts/components to ISRA manufacture in Indonesia and overseas.
- Electric fuel treatment, fuel saving instrument
- Radar-FM-CW licensed to SOE
- Ozone based tech. product for liquid water processing for hospital water recycle
- Electric golf car, design industry for hospital/recreation/resource

## **MALAYSIA: Development of Green Technology Based SMEs**

It was the Prime Minister of Malaysia's vision to promote Malaysia as the regional hub for green technology and to reduce the economy's CO<sub>2</sub> emission. The negative impacts from the development affected the quality of life, such as Loss of income from polluted resources; Health costs for individual and government; Loss of ecosystem services and clean-up costs for government.

The Government thinks that failure to incorporate climate change mitigation and adaption into development policy has great potential to undermine future economic growth whereas the degree to which climate change will intensify depends on the development trajectory (low carbon development or business as usual (BAU) high emissions scenario), to overcome this the Government encourage win-win policy initiatives that can yield co-benefits; Mitigation efforts to curtail GHG, increase carbon sinks; Adaption to increase adaptive capacity, reduce vulnerability, and build resilience.

The Government Initiatives has Four Focus Sectors i.e. Transportation; Energy; Building; and Water&Waste Management. In April 2009, the Ministry of Energy, Green Technology and Water (KeTTHA) was established to replace the Ministry of Energy, Water and Communications, with its Policy Statement "Green Technology shall be a driver to accelerate the national economy and promote sustainable development". There are four pillars in the Government initiatives on National Green Technology Policy i.e. Energy; Social; Environment; and Economy, with five strategic thrusts i.e. Strengthened the institutional frameworks; Provide a conducive environment for Green Technology development; Intensify human capital development in Green Technology; Intensify Green Technology research and innovations; Promotion and Public awareness.

KeTTHA also restructured National Energy Centre to Malaysian Green Technology Corporation otherwise known as GreenTech Malaysia to become a Focal Point for Green Technology Development in the economy. KeTTHA working with the Ministry of Finance MOF develop a mechanism for Green Procurement to be implemented in

government agencies, KeTTHA is also working with the Standards and Industrial Research Institute of Malaysia (SIRIM) to develop standards, certifications, and labelling mechanism including green procurement manuals and procedure to enable government and private sector embark on green purchasing. KeTTHA working with the Ministry of Transport and the Ministry of International Trade and Industry develop the infrastructure roadmap for the use of the electric vehicles in Malaysia. The purpose of green procurement and eco-labeling is towards materials efficiency, quality enhancement and waste reduction

Green Technology Financing Scheme: Effective January 2010, Government provides RM1.5. billion soft loan; Up to RM50 million for producers and RM10 million for users of green technology; 2% interest subsidy by the Government; 60% Government Guarantee, It is expected that 140 companies will be benefited from the scheme with GreenTech Malaysia administrate all the application. This provision of fund is for any suitable technology for the identified project criteria, provided it is a proven technology.

Challenges:

- Changing mindset, attitude and habits of the public
- Lack of knowledge and expertise among professionals and regulators in green technology;
- Duplication of tasks and jurisdictional implications; and
- Political will.

The Way Forward:

- Green compliance becomes the accepted standards for the products and services;
- Increase commercialization of research, development and innovation;
- Increase participation of local SMEs into global market
- Increase utilization of green technology to optimize resources
- Significant reduction in energy consumption in the economy through application of green technology
- More active awareness promotion and publicity on green technology education
- Adoption of green values in life.

### **Some Green success case**

The SME Innovation Award, identify suitable and capable SMEs that are eligible to be placed on a Fast Track Programme (FTP)/Green Lane Policy to shorten time-to-market by providing ready access to capital risk, including for technology acquisition. The premier award to recognize the most innovative SME, out of six (6) sectors, including Green Technology.

Nexus SDN BHD is the 2011 winner for Green Technology Category with its Biofuel & Renewable Energy and Bio-refinery Facility & Solutions; Fully licensed green bio-refinery (currently producing biodiesel, glycerol and biopolymer material) and has successfully validated and commercialized its fully automated and continuous 1MOBILE plant in the production of bio-diesel (using waste fish oil) to generate power and transportation in Viet Nam.

### **MEXICO: Mexican Strategies Focussed on SME to support Green Technology Innovation.**

Mexico has the possibility of maintaining in harmony the world that surrounds it, while it to follow his path of growth. The adoption of a series of measures, relatively simple, could keep under control the harmful effects of climate change caused by carbon emissions, which have unleashed more and more cyclones, droughts and rises in sea level. In addition, the adoption of these policies would contribute to the pace of vigorous growth. Mexico has made adaptations which mitigate the impact of climate change in the following areas:

1. Energy: Meeting the current demand would increase the total CO<sub>2</sub> emissions by 230%. But the adoption of green technologies, like wind, biomass, geothermal, could significantly reduce this impact. Various regulatory and policy reforms will be necessary to expand the use of renewable energy.
2. Oil and gas: A study made by the institute of energy in Mexico, notes that there is great potential to reduce carbon emissions in this sector. Some measures are: reducing leakage in gas distribution, increasing the efficiency of refineries, emphasizing the potential for cogeneration of six Pemex's refineries and its petrochemical plants.

3. Energy consumption: The control policies of efficiency in the commercial, industrial and residential sectors will be critical to achieve by limiting CO<sub>2</sub> emissions. These include making more stringent standards for lighting, refrigeration, air conditioning and building construction
4. Transport: It is the fastest growing sector in terms of energy consumption and generation of carbon - 90% of the total. Several measures of intervention will be necessary to stop this trend, including: optimizing transport routes, creating a rapid bus system, raising energy efficiency standards for vehicles.
5. Agriculture: It is one of the principal areas of reducing emissions. Interventions in this field would be across reforestation, commercial plantations, and measures to reduce emissions due to deforestation.

#### Challenges:

Moving to a greener economy may be more difficult for SMEs than large firms, although SMEs can be more flexible than large businesses in adapting to the fast changing market environment.

The willingness and capability of SMEs to adopt sustainable strategies or seize green business opportunities generally meet with size-related resource constraints, skills deficits and knowledge limitations, not to mention the crucial business of survival, especially in the aftermath of a grave crisis.

Small innovative firms are often the main engines for technological innovation which are subsequently adopted and develop by larger firms. The encouragement of such SMEs to develop new technologies that can support sustainable and environmental-friendly manufacturing, networking and job opportunities through for example clustering and related activities, could be another subject of discussion among high-level policy makers.

Large share of the firms in manufacturing industries, are involved in sustainable manufacturing and eco-innovation. Costs and lack of competencies and information could restrain these firms from taking up actions that would not only improve their overall performance but that could also have positive effects for employment generation and the greening of the society.

## Strategy

Green growth policies need to be embedded in a coherent, integrated strategy covering demand and supply aspects, both economy-wide and at the sectoral level. This will ensure that green growth is not just a short-term response to the crisis but a transforming dynamic for both production processes and consumer behavior.

To promote a “Green Mexico” the Mexican Government has its Main Policies and Programmes, which are part of the policies of climate change mitigation include: improvement of air quality in cities, reduction of emissions, and transference of pollutants. The topics are shared into four main programmes: Elimination and reduction of substances that deplete the ozone layer; Industrial regulation and registration of emissions and pollution transfer; Air quality and transportation; Elimination and reduction of substances that deplete the ozone layer (SAO). The Clean Transport programme, a voluntary national project is a transportation programme established and developed to support the sustainability and competitiveness of transport sector.

In 2010, Mexico joined the global celebration of the planet’s biological wealth, to face two (2) major threats i.e. climate change and biodiversity loss, which important to create and strengthen the conditions that guarantee the welfare and viability of ecosystems, which help to confront the climate change. The special climate change programme also includes clear objectives and strategies of adaption based on the conservation of our ecosystem.

In Forest Resources, PROARBOL is the name of the main program to support the forest sector, undertaken by the Mexican government is a mechanism program to reduce the rates of poverty and marginalization that exist in most forest areas through the management and use of natural resources Its main objective has been to generate development and maximize the quality of life of populations living in areas of greater marginalization. It promotes the participation of owners and possessors of land with forestry potential in forest and arid regions.

This program aims to contribute to sustainable development in Mexico; through a set of environmental waste policies based on promoting changes in patterns of production and consumption, doing preventive actions like minimizing the generation of waste, and increasing the reuse and the recycling.

There are also State Programmes that are tools that support the planning and development of state public policies on climate change, that involve relevant factors to formulate environmental policies. The environmental sector offers technical assistance to Mexican states that have decided to develop and implement in their state programs that are addressed to climate change like: actions of coordination and supervision activities; capacity building; technical assistance, including funding fundraiser nationally and internationally; reduction of the scale of climate scenarios; and the regionalization of the assessment of vulnerability.

### **Mexican Companies' Green Actions**

- Building Sector: Green Housing- the type of construction based on the premise of caring the environment by substantially reducing the consumption of traditional energy and households. Some advances are electricity savings, conservation of the temperature inside to avoid the waste of heating equipment and environmentally friendly building materials.
- Transport Sector: Increased use of hybrid –ecological trucks – These units reduce 30% of the fuel consumption. Some companies have already green trucks operating among its distribution fleets.
- Passenger Transport: In 2009, the Mexico City Government introduced 145 new units of low – emission public transport to replace thousands of polluting trucks. The Mexican Government acquired thirty (30) natural gas trucks that will reduce carbon monoxide emissions. ADO, a foreign passenger transport company in Mexico, introduced two ecological buses to its fleet, which have Euro 5 engines and Blue Tec Technology to reduce polluting emissions by up to 50%.

### **Sustainable Energy:**

- Create pilot plant to improve water: The UNAM through the Institute of Marine Science develops a pilot plant to improve the discharge water and other water bodies such as dams, lakes and reservoirs in the economy.
- Green energy to Mexico: The UNAM and Sonora's University seek to install a producer energy plant using the solar concentration technology. This project use glasses or mirrors to concentrate a large amount of sunlight into a small beam.

- Mexico will begin producing ethanol from algae in 2014: The Company BioFields got the authorization from the Federal Electricity Commission (CFE) to build a pilot plant for CO<sub>2</sub> capture within the thermoelectric and demonstrate the viability of ethanol technology, which can produce biofuel from blue-green hybrid algae.

#### Green Telephone

- Makers of mobile phones are trying to eliminate the use of toxic substances in the manufacture and recycling of old equipment.
- Nokia is working with programs that minimize the impact on the environment. In their product's design, they have created the Nokia 3110 Evolve (the ecological model) with a large component of recycled materials.

#### Green Refrigeration Technology

- Green freeze technology developed by Greenpeace International consists in the use of alternative natural gas in cooling systems and insulation, which does not destroy the climate or the ozone layer.

#### Green Technology in Automotive

- The «Promotion and Development Law of Bio Energy» is a Mexican government's program of 2008. Since then, Mexico has explored and provided funds to develop the production of biodiesel in the south of Mexico.
- In the case of electric vehicle recharging stations, Mexico City Government might implement them in 2011 at shopping malls, coffee shops and other public places.

#### Green Flights

- Aeromexico will become the first airline in the economy to conduct so-called «Green Flights» in order to reduce pollutant emissions. The idea is to save fuel.

#### Green Strategy

- Barcel is part of a global program that Grupo Bimbo called "committed to the environment" introduced to the market its new 100% biodegradable packaging which is returning to earth in a maximum period of five years, compared to the four centuries it takes to degrade the conventional plastic. The wrappers are made of polypropylene foil with a pro-degrading additive.

## **PAPUA NEW GUINEA : Development of Green Technology-Based SMEs**

PNG economy is an agro-based economy and agriculture plays a dominant role with products: coffee, cocoa, copra, palm kernels, tea, sugar, rubber, sweet potatoes, fruit, vegetables, and vanilla; shell fish, poultry, and pork. PNG has industries on: copra crushing, palm oil processing, plywood production, wood chip production; mining of gold, silver, and copper; crude oil production, petroleum refining; construction, tourism. PNG has a traditional and cash economy in which the Traditional economy covers mainly subsistence & semi subsistence farming, supporting 87% of the population, while Major Economic Sectors cover Agriculture, Forestry, Fisheries, Mining & Petroleum, Retail & Wholesale, Building & Construction, Banking & Finance, Transport and Telecommunication, followed by its Main export which are mineral, petroleum (gold, silver, copper & crude oil), agricultural products, timber, coffee, palm oil, cocoa & copra, and the Major imports are machinery & transport equipment, manufactured goods, fuels, processed food & chemicals.

In identifying and defining the SME sector in PNG there are characteristics in Informal sector as well as in formal sector. The characteristics in the Informal sector cover: unregistered business; self employed and members of the family; labor intensive; low skill levels; low capacity requirements, supply mostly local markets; depend mostly on own savings and loans from family and money lenders, while in the Formal sector the characteristics cover: registered business unit; mainly family owned and self employed; managed by owners; used hired labor; higher capital intensity; financed mainly from retained earnings.

The Department of Commerce & Industry (DCI) has initiatives to establish a Regional Centre of Technology & Innovation (RCTI), a new establishment to promote and introduce appropriate technologies to rural farmers; Small Business Development Corporation (SBDC) to develop entrepreneurial support services for PNG enterprises; and Industrial Centre Development Corporation (ICDC) to develop industrial estates and land resources to support establishing industries. The Industrial Centre Development Corporation (ICDC) has already two activities going

on i.e. Business Growth Centre Programs (BGC), in the establishment of two (2) Regional BGC , Malangan Industrial Centre and Ula Mona Industrial Centre, and Proposed additional Centres for 2011 i.e. Minj BGC, Mapric BGC, Tol BGC and Madang Tourism BGC.

Green Growth Concept with its Green Growth Policies and programmes covers: Introduction of Green Growth for SMEs, Environmental Sustainability & Climate Change Policies, Review of SMEs Policies, Resource and Capacitate Environment & Conservation and Office of Climate Change and other stakeholders.

Opportunity and Challenges:

In the opportunity there are abundance of natural resources and availability of human resources, while there are challenges in terms of lack of local participation, lack of technological expertise, lack of information, lack of access to credit and policy incoherence.

Way Forward

To follow this up Government Departments should work together, Cooperation between Government and Private Sector and an Effective dialogue and facilitation is imperative – working together attitude.

## **PERU: Promotion of SMEs**

In the Promotion of SMEs Peru has Project entitled Energy Efficiency to SMEs with the objectives as followed: (1) To increase market opportunities for SMEs in Peru, (2) Promote savings in energy use through efficient methods and equipment and (3) Improve productivity rates.

For the services identifying critical area of energy use, training in the use of energy efficiently and implementation of improvements in the efficient use of energy are carried out. The Strategy of Promotion is the establishment of Business incubators with a green SME line of work through Promoting technology-based companies that develop tools for efficient use of renewable energy and Promotion of traditional economic sectors to take measures for the efficient use of energy sources.

## **PHILIPPINES: State of the Art on the Development of Philippine Green Technology-Based MSMEs**

Small and medium enterprises (SMEs) are defined, under the Magna Carta for Small Enterprises (Republic Act 6977 enacted 1991) as any business activity or enterprise engaged in industry, agribusiness and/or services, whether single proprietorship, cooperative, partnership or cooperation whose total assets, inclusive of those arising from loans but exclusive of the land on which the particular business entity's office, plant and equipment are situated, must have values falling under a pre-set hierarchy. Micro, small and medium enterprises (MSMEs) are sometimes not appreciated for their invaluable contribution to the Philippines economy.

Micro-enterprise/s, effectively serve as seedbeds of Filipino Entrepreneurial talents, largely from the informal sector, which government wants to be integrated with the mainstream economy, through the rationalization of bureaucratic restrictions, the active intervention of the government specially in the local level and the granting of incentives and benefits to generate much-needed employment and alleviate poverty.

The MSMEs are mostly domestic oriented rather than export-oriented due to their limited management & financial capabilities, while the MSMEs faced problems such as lack of information, low productivity due to lack of access to new technology, weak technological capabilities, and failure to engage in innovation and research and development activities.

The MSMEs comprise of 99% of Total establishments and contribute 62% to employment, generated 35% of Total annual sales, w/60% export contribution but has only a 25% share of total revenues, mostly into wholesale/retail business, next into manufacturing and services industries. In improving Global Competitiveness, tech transfer law of 2008 is implemented, beside technology entrepreneurship and "Filipinnovation" that covers the strengthening of human capital, supporting business incubation and acceleration efforts, regenerating the innovation environment and changing the Filipino mindset. The MSME Development Plan 2010-2016 consists of two (2) plans, (1) the Implementation Approach that covers; Local & regional

competitiveness, Sector competitiveness, and Market system Development and (2) Thematic areas that covers Migration of local and regional competitiveness, Gender in Sector competitiveness, CSR and Climate Change in Market system.

Climate Change /Green Growth (MSMED Plan 2010-2016) is seen as a great threat for the Philippines but it can bring business opportunities to MSMEs. Adopting Green Growth strategies making the MSMEs more competitive, MSMEs can also produce goods and services that respond to the demand for “Green Products” which are in high demand abroad and which MSMEs can penetrate.

Green Philippines Agenda seeks to: Promote healthy Ecosystem and environment as critical mechanism for creating a robust agribusiness regime; establishing globally competitive urban, industrial and services centres and developing premiere ecotourism hubs. Synergy between Green Growth Strategies and MTPDP (Medium Term Philippine Development Plan) 2010-2016: Green Tech – based MSMEs

Some Green Success Case

COCOTECH: Produces Geo-textiles from waste coconut husks, pioneered the application of bioengineering using cocofiber nets (coconets) in slope protection, river and shoreline rehabilitation and erosion control. Showcase on small scale value-adding, rural employment generation and environmental sustainability and revival of coconut industry

BAMBOO TAXI or ECO1 created by Mayor Rustico Balderian of Tabon-Tabon, Leyte, assembled by youth in the town of Tabon-Tabon, Leyte, replaces motorcycles/jeepney that are polluters, except for the chasis built for twenty (20) passenger and made of bamboo, can run for eight (8) hours on a gallon of 100% Coco-Diesel. It has positive environment impact.

BAMBIKE – Bamb Ecological Technology, Inc. Building the Greenest Bikes on the Planet. Bambike builders (AKA Bambuilders) Nel, Ferdie, Ramil, James and Fred are incredibly skilled craftsmen and work full-time at the Bambike Workshop, inside the community where they live. All are members of a Community Development Program called Gawad Kalinga (GK). Bambike shares GK’s vision of a poverty free Philippines and contributes to the cause by hiring GK villagers, providing them with sustainable livelihoods.

GREEN TECH ECO CENTRE (GTE) and Electric Trike or eT4, Transfer electric tricycle technology to locals of Puerto Princesa City, Palawan.

Enhance the skills of local tinsmiths, welders, auto painters, auto mechanics, auto electricians, upholsterers, trimmers, assemblers and fiberglass makers.

EU SWITCH SMART Cebu, an SMEs for environmental accountability, responsibility and transparency, aimed at increasing the competitiveness of 400-450 Small and Medium sized Enterprises (SMES) engaged in the furniture, fashion accessories & gifts, toys & houseware sectors in Cebu by promoting clean production, development of eco-friendly products and entering the Green Markets in Europe and Asia.

SALLY'S Handicraft manufactured capiz hanging decor and necklace made from laminated capiz shell.

FILIPINO Creazione de Mano manufactured Denise side chair made of all natural materials.

MC Spa Essentials, Inc manufactured Natural aloe vera hotel amenities.

ALICE' Blue Candle manufactured tropical candle collection infused w/exotic tropical scents/fragrances.

DALUYON Beach Resort is the member of the Frontier Group W/C consists of selected representative SMEs that implement the recommended energy saving measures and green technologies, adopted the solar hot water supply system, installing water meters, installation of energy monitoring device for consumption and cost awareness, installed Louver ventilation for better natural air circulation and prevent mold/fungi growth, waterless urinals installed in all public w/over 150,000liters of water saved per urinal.

EASTASIA, managed and operated by pioneers in the non-revenue water control and reduction, EastAsia initially developed systems for water conservation, expanded into telemetry/remote sensing for meteorology, environmental monitoring and disaster mitigation.

SAFEWASTE, INC., a locator in a TRC-Technology Center that uses non-burn technology in the microbial destruction of pathogens found in infectious waste. Non burn technology is the autoclave known as biomedical waste treatment unit, a pressurized-vessel that utilizes moist heat or steam in achieving disinfection or microbial destruction. Seizing new trade opportunities w/export opportunities offered

in a greening global economy becoming significant and expanding with domestic and foreign demand for green goods and services, such as: organic food, ecotourism, solidwaste and water recycling, environmental consulting, green buildings, efficient lightings, sustainabnle timber/wood products and many more.

### **SINGAPORE: Development of Green Technology Based SMEs**

To develop Green Technology, the Minstry of Trade and Industry cooperate with many companies in Singapore that work on various field of subjects such as : Develop Singapore's research capabilities, Regulate anti-competitive activities, Promote industry development and foreign investment attraction, Promote a competitive and reliable energy industry, Promote international trade and internationalization of Singapore-based enterprises, Ensure supply of industrial facilities and industrial space, Develop and promote Sentosa Island, Promote and develop tourism industry and Promote enterprise development and quality & standards.

The current Singapore Cleantech Industry is working on research and management of Water , Solar, Clean Environment, Biomass/ Biofuels, Green Transportation, Green Buildings, Smart Grid/ Storage, Carbon Services, Wind, Nuclear, Marine Renewable, and Fuel Cells. In an SME driven Environmental Technology Industry, 85% of the industry are made up of SMEs and they contribute 43% of the industry output.

Strategies to Sharpen SMEs Competitiveness: to sharpen SMEs competitiveness the strategies consists the field of manpower, Research and Development, Infrastructure, and Associations for Outreach that look into: Clean tech Post graduate programmes, Specialised clean tech training courses, Providing technology partners for technology innovation, Setting up test bedding hubs, Setting up green incubators, Standards and Conformance Structure, and Working closely with established associations

In the Research and Development, the Spring Singapore Enabling Enterprise, The Centre of Innovation for Environmental and Water Technology and the Ngee Ann polytechnic launched a cooperation in July 2008, to assist SMEs in applied research and accelerated commercialization through providing : Technical Feasibility Studies, Product and Process Development and Prototyping, Training Workshops and Networking Sessions and Overseas Business/ Study Trips.

Research and development examples:

EVEREADY Manufacturing develop regional first of its kind infra red automated plastic waste sorting machine

NEWEarth Development of tech to recover industrial waste and incineration ash as construction materials

MERCURY SYSTEM Development of first of its kind Aqua deck automatic water treatment system

DAYEN AQUABLU Develops region's first tangential Ultra-violet reactor for pure water

Infrastructure – Clean tech Park, Large-scale integrated “living laboratory” for test bedding and showcasing of system-level clean technology solutions, and Core nucleus of clean tech activities - epi-centre for research, innovation and commercialization in clean technology.

Clean Tech Region aims on Fully integrated incubator targeting scalable technologies that can be deployed in Asia, to nurture 21 innovative startups by 2012 and provides: Industrial Deployment Centre and Tropical Test Bedding Sites, Business planning and operations support, Mentoring by SEAS, Training workshops and networking centres, Network of contacts and capital resources, and Business support services.

Associations for Outreach lead Funding for Associations – Funding to set up secretariat office and Associations serves to provide: Perform Industry Studies, Organize Sharing Sessions/ Conferences, Facilitate Industry Projects, Plan Overseas Trips, Develop web portal for information sharing, Organize Local Trade and Exhibition Shows.

## **THAILAND: Development of Green Technology Based on SMEs**

In the Development of Green Technology based SMEs, The Office of Small and Medium Enterprises Promotion (OSMEP) carried out the activity with the following mission: Recommending SMEs promotion policy and formulating SMEs promotion master plan and action plan for the overall, sectoral and area approaches and recommending the amendment of SMEs related laws and regulations; Forging, supporting, operating and coordinating the cooperation in the public and private sectors, domestically and internationally, as well as, monitoring and evaluating the operation results to ensure the efficiency; Developing the National Center of SMEs Database and Early Warning Information which is comprehensive, accurate and up to date and conducting study, analysis, research and situation report for the use of policy formulation on SME promotion and services; Developing SME promotion systems and conducting pilot projects, integration projects and ad hoc projects to jointly promote SME with other relevant agencies; Utilizing SMEs Promotion Fund which efficiently managed as a tool of SMEs promotion.

While the OSMEP vision is to develop Thai SME's capability to have a balanced and sustainable growth and to become the primary driving force of the Thai economy; Equality distribution of wealth and income between urban and rural areas; Equilibrium development in economic, social and environment, adequate consideration and responsiveness for global shifting. The SME Promotion Strategies are: Developing enabling factors to support Thai SMEs; Building and strengthening Thai SMEs competitiveness; Promoting a balanced growth for regional Thai SMEs; Strengthening Thai SMEs' capability for international economic integration.

To implement the Green Technology Development Program, the Ministry of Industry has "Green Industry" Program to ensure that industrial growth has well balance with environment and social welfare, promote awareness and benefits of and encourage employing various "Green Industry" practices including clean technology, eco product, green label and econ label, and certify "Green Industry" for industrial units. The Ministry also provide Incentive with specific criteria and administrated by agencies such as Dept. Industrial Works, and Board of Investment. For example An

exemption of industrial factory annual fee (5 years) provided that they are certified by ISO 14001 or ISO 18001 and use waste or over raw materials to produce biogas; Exemption of import duties on machinery, exemption of juristic person's income tax (8 years), reduction of income tax with the criteria that they are alternative energy/saving energy business or environment –friendly material and product business administrated by the Board of investment; Exemption of import duties on machinery, Exemption of juristic person's income tax (3 years, Reduction of income tax with the criteria that they propose investment plan for changing machine to save energy, employ alternative energy and reduce impact to environment.

### **Green success case**

Dr. Singh's is a lecturer in the Faculty of Architecture, Kasetsart University. The environment is a major consideration. The garbage was found in 30-40% of the world's waste comes from construction.

OSISU produces functional art that integrates local crafts and skilled carpentry with contemporary aesthetics. Each model of OSISU is pure passion, hand-crafted from materials left to waste at construction sites or discarded from manufacturing processes. OSISU's creations exemplify a commitment to environmentally responsible design while meeting functional requirements. Our design innovation adds value to overlooked resources and extends life cycle of natural materials. With works ranging from the design office, Housing furniture, tables, chairs, bags to small change and a saucer of water. Today, Dr. Singh also defines themselves as "designers" and not a conventional designer.

### **VIET NAM: Development of GT-based SMEs**

In introducing the green technology, examples are given in terms of recycling, reducing, reusing, and even trading. Ideas to help minimize dependency on fossil fuels, non renewables resources and scarce supplies are being introduced. The use of forest resources has increased drastically, while the forest replantation increased very slow. The coal industry has also been increased and compared to the domestic use the export is higher. The source of power for electricity is through wind, small hydro, solar and biomass.

## 1.2. Barriers in Developing Green Technology-Based SMEs

The main barriers identified across all economies are:

- 1. New company financing** Green technology commercialisation takes more time than other sectors, and has both technology and market risks that need to be addressed, with specialised financing mechanisms and incentives. Depending on the specific economy context, these mechanisms might entail a combination of taxation incentives, to spur R&D and investment, early stage financing from government, later stage private angel investment and venture capital financing and leverage of Corporate Social and Environmentally Responsibility programs. Incubators need to develop expertise to prepare their clients for financing (investment readiness) and to develop their own business ecosystems and specialist financing mechanisms.
- 2. Technical barriers.** Economies are at very different stages of development. Some are developing technology to address green problems and opportunities; others seek technology from other economies to adapt to their local needs. Potential exists to merge existing and new technology; and for some economies enforcement of patent laws is important. Technology transfer is as important as commercialisation of indigenous technology, requiring incubators to develop both sets of specialist knowledge and to be able to lever networks between different economies. Lessons learnt from technology transfer are that it needs intensive technical assistance; financial support for initial production; new initial markets; and stability of product quality, all of which incubation in this sector will need to address.
- 3. Placing the importance of green technology on national agendas.** For many developing economies awareness of the importance of green technology is only germinal, unlike in many developed economies. Some have national green development strategies, others do not. Given the need for multiple players to act in unison at a national level, incubators need to facilitate dialogue, develop national networks and advocate for national green development plans and specific mechanisms to address asymmetries, gaps and ecosystem developments to allow green technology based SMEs to grow.

**4. Lack of competitive market demand.** Without a price on carbon, or mechanisms for including the cost of environmental remediation in current prices, or environmental standards to regulate sector development, new green technologies can be uncompetitive and therefore far more risky. Governments have a key role to play in creating new markets, by use of their regulatory powers and policy mechanism. For instance:

- a. Building standards regarding energy and water use and to minimise carbon footprints can spur the development of new technology SMEs commercialising new building products, techniques and services.
- b. Removing fuel subsidies, which distort market mechanisms, can spur the development and competitiveness of new transport technologies and indeed technologies in other sectors benefiting from such subsidies.
- c. Green certification schemes can enhance emerging green markets, giving consumers and business customers' assurance as to the green credentials of what they buy.
- d. Feed in tariffs, to create initial local markets for renewable energy, for which Denmark, Europe and similar economies in the APEC region (Australia for instance) are examples.

Even though there is no global agreement on carbon prices yet, Clean Development Mechanism (CDM) and Carbon Credits offer opportunities for SMEs.

Incubators wanting to work in this space need to improve their knowledge and understanding of these mechanisms, so that they can introduce SMEs to the opportunities and to prepare themselves for future developments, which are likely to build on the current Kyoto mechanisms.

**5. Lack of consumer demand.** Consumer demand for green technologies and services in many economies is only germinal. Participants advocated education at all levels of the education system, from young to older, as a foundation for growing awareness in the future, combined with awards and certification to recognise and create role models.

## **II. GUIDELINES, STRENGTHENING, AND CAPACITY BUILDING OF GREEN TECHNOLOGY BASED SMEs**

With a range of capabilities, ranging from people running leading green business incubators, to people with minimal business incubation capability, the overall capability gaps and strategies were addressed as followed: Assuming basic business incubation capability upon which to build the main capability revolve around:

- a. Inadequate knowledge of green markets, technologies, financing difficulties and mechanisms and associated trends.
- b. A lack of specialised professionals, who might only be available from international sources or in larger corporations.
- c. Only a small number of green incubators globally, although this may be a new area of growth, as evidenced by the World Bank's infoDev Climate Innovation Centre (CIC) Program, which is in the process of developing a CIC in Viet Nam.
- d. A shortage of specialised green business infrastructure, for which a role model may be Singapore's new Eco-business park

Very limited knowledge, at least amongst the participants, of Clean Development Mechanisms and Voluntary Offset Mechanisms, even though they can assist the development and commercialisation of green technologies, as noted earlier. Since 2003, Japan has been supporting CDM capacity building in Asian economies, as the main market along with Europe, to help the establishment of institutional arrangements and procedures, and the building of capacity for implementing the CDM.

Further information is summarized in Table 2.1. A further guideline for incubators is to address their information and capability gaps (Table 2.2).

**Table 2.1. Proposed guidelines, barriers, strategies and institutions responsible to take action**

<b>Proposed guidelines</b>	<b>Specific barriers</b>	<b>Strategies to overcome barriers</b>	<b>Who needs to take action</b>
1. Develop, and help green technology based SMEs access, specific financing mechanisms and incentives.	Financing Difficulties	<ul style="list-style-type: none"> <li>• Tax incentives</li> <li>• Government financing initiatives</li> <li>• Private finance</li> <li>• Corporate Social &amp; Environment Responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• Government / Legislators</li> <li>• TBIs</li> <li>• Chambers of Commerce/Business</li> <li>• APEC, World Bank</li> <li>• Angel Investors / Venture Capitalists</li> </ul>
2. Assist entrepreneurs to overcome specific technical barriers.	Technical barriers	<ul style="list-style-type: none"> <li>• Merge technology – new with existing</li> <li>• Technology transfer</li> <li>• Enforce protection of patents</li> </ul>	<ul style="list-style-type: none"> <li>• TBIs and Accelerators</li> <li>• Universities</li> <li>• Technological (R&amp;D) centres</li> <li>• Patent office</li> </ul>
3. Advocate for and engage with national green development strategies	Lack of importance of Green industry in National Agenda	<ul style="list-style-type: none"> <li>• International Alliances</li> <li>• Government Policies and Strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Government / Legislators</li> <li>• APEC</li> <li>• United Nations</li> </ul>
4. Advocate for, and help green technology based SMEs, capitalize upon, specific mechanisms to develop competitive markets for green technology and services	Lack of competitive Market Demand for Green	<ul style="list-style-type: none"> <li>• Government regulations e.g. Green Certifications</li> <li>• Government green procurement</li> <li>• Recognition /award/ certification</li> <li>• Consultancy – specific by focus area</li> <li>• Training on Clean Development Mechanism</li> </ul>	<ul style="list-style-type: none"> <li>• Government / Legislators</li> <li>• Chambers of Commerce/Business</li> </ul>
5. Advocate for initiatives to raise consumer awareness and help entrepreneurs capitalize upon growing consumer awareness	Lack of consumer demand for green	<ul style="list-style-type: none"> <li>• Education from young</li> <li>• Recognition /award/ certification</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Education</li> <li>• NGOs</li> </ul>

**Table 2.2. The gaps of the incubation capability and strategies to address gaps**

<b>Incubation capability gaps</b>	<b>Strategies to address gaps</b>	<b>Responsibility: incubation or other bodies</b>
1. Lack of Knowledge on Green market / technology / financing	<ul style="list-style-type: none"> <li>• Specialized consultancy/ Mentors</li> <li>• More forums / Trade fairs / seminars</li> <li>• Participation from players</li> </ul>	<ul style="list-style-type: none"> <li>• TBIs</li> <li>• Constituents / Citizens</li> <li>• Government</li> <li>• World Bank</li> </ul>
2. Lack of Green Professionals	<ul style="list-style-type: none"> <li>• Networking / linkages, within and between economies</li> <li>• Alliances with corporations / associations</li> </ul>	<ul style="list-style-type: none"> <li>• Incubators</li> <li>• Companies / Business Chambers &amp; Associations</li> <li>• World Bank</li> <li>• Universities</li> </ul>
3. Lack of Green incubators participants / incubatees	<ul style="list-style-type: none"> <li>• Government incentives to foster green incubators</li> <li>• Alliances with corporations</li> </ul>	<ul style="list-style-type: none"> <li>• TBIs</li> <li>• Constituents / Citizens</li> <li>• Government</li> <li>• World Bank</li> </ul>
4. Lack of Infrastructure specific to green technology	<ul style="list-style-type: none"> <li>• Networking / linkages</li> <li>• Alliances with corporations / associations</li> <li>• Eco-Business Parks</li> </ul>	<ul style="list-style-type: none"> <li>• TBIs</li> <li>• Government</li> <li>• World Bank</li> <li>• Companies / Business Chambers &amp; Associations</li> </ul>

Incubation never succeeds in isolation and relies upon broad and deep networks. For incubation of green technology based SMEs, incubators need to involve themselves in, or facilitate, a range of networks. Again, to ensure a market orientation, participants considered the issue in the context of the services needed by green SMEs, as summarised below (Table 2.3).

**Table 2.3. Services required by Green SMEs and strategies for service delivery**

<b>Services needed by Green SMEs</b>	<b>Strategies for service delivery</b>	<b>Responsibility: incubation or other bodies</b>
Availability of supportive policies: Green industrial policy	<ul style="list-style-type: none"> <li>• Establishing consultative mechanism amongst the stakeholders</li> <li>• Establishment of related coordinating body</li> <li>• Provision of favorable tax regime</li> <li>• Government procurement</li> </ul>	<ul style="list-style-type: none"> <li>• Governments (e.g, SMBA/SBC type),</li> <li>• Association (involving all main <i>stakeholders</i>)</li> </ul>
Facilitation of access to market	<ul style="list-style-type: none"> <li>• B2B networking;</li> <li>• Business matching forums,</li> <li>• Green tech-based products expo/fair/exhibition, e-marketing</li> <li>• Establishment and use of marketing hub</li> </ul>	<ul style="list-style-type: none"> <li>• Chambers of Commerce,</li> <li>• Ministry of Industries and Trade, APEC</li> <li>• TBIs</li> </ul>
Facilitation of access to financing	<ul style="list-style-type: none"> <li>• Investment matching, Provision of funding schemes, R&amp;D funding on GT</li> <li>• PPP mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>• VCs,</li> <li>• Banks,</li> <li>• Government</li> <li>• Angel Investors</li> <li>• TBIs</li> </ul>
Facilitation of access to technology	<ul style="list-style-type: none"> <li>• Building innovation networks</li> <li>• Establish favorable technology transfer mechanisms (group of IP and business experts)</li> <li>• Promoting favorable interaction mechanism amongst the academia and industry</li> </ul>	<ul style="list-style-type: none"> <li>• APEC,</li> <li>• Governments</li> <li>• Academia</li> <li>• Pool of experts</li> <li>• TBIs</li> </ul>

**Table 2.4. Expected roles of stakeholders in incubators' development**

<b>GOVERNMENT</b>	<b>RESEARCH AND DEVELOPMENT INSTITUTIONS AND UNIVERSITIES</b>
<ul style="list-style-type: none"> <li>- <i>Providing affirmative actions</i> to support green business through policy and regulation;</li> <li>- Improving business environment;</li> <li>- Supporting the development of clusters and business partnership; and</li> <li>- Promoting and disseminating innovation/technology.</li> </ul>	<ul style="list-style-type: none"> <li>- Sources of innovation and technology;</li> <li>- Promotion and dissemination of innovation and technology;</li> <li>- Implementing partners for government programs; and</li> <li>- Providing training for technology adoption.</li> </ul>
<b>PRIVATE SECTOR</b>	<b>CIVIL SOCIETY ORGANIZATION</b>
<ul style="list-style-type: none"> <li>- Source of funding, innovation and product/system development through corporate social responsibility;</li> <li>- Promoting and disseminating innovation/technology;</li> <li>- Implementing partners for government programs; and</li> <li>- Developing clusters and market linkages.</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Promotion and dissemination of innovation and technology</i></li> <li>- Implementing partners for government programs;</li> <li>- Facilitating the link to market and financial sources; and</li> <li>- Providing training, coaching and consultation.</li> </ul>
	<b>PUBLIC-PRIVATE PARTNERSHIP</b>
	<ul style="list-style-type: none"> <li>- Research and development; promotion and dissemination, local capacity development, institutionalization of innovation, and network development.</li> </ul>

### **III. SUCCESS STORIES OF GREEN TECHNOLOGY BASED SMEs**

#### **CHILE 1**

**Company Name: mRisk**

**Incubator Name: Fundación Chile**

**Economy: Chile**

Fundación Chile is a non-profit private corporation whose partners are the Government of Chile and BHP-Billiton – Minera Escondida. Its mission is to introduce high impact innovations and to empower human capital, in order to increase Chile's competitiveness, by promoting and developing the economy, through technology transfer and in alliance with local and global knowledge networks.

mRisk was born in 2008 as a Spin Off in Fundación Chile, the first company started by their Environment & Water Resources division. This division has many years of collaborative work with important stakeholders in the mining industry and mRisk was born from one of their main sustainability issues - environmental data management. mRisk helps the Chilean mining industry to control and reduce its impact on the environment, providing specialized environmental information management services. All of the Chilean major mining companies now trust mRisk for their sustainable information management.

The major products are T3 and TORESA. Both are unique integral online software solutions to help the sustainability departments mining companies control all of their environmental data and to fulfill their compliance obligations. The main competition is software on the international market, which only covers a part of what mRisk products do. So, instead of acquiring six or seven different software packages, their clients can manage all of their data with TORESA or T3.

The products were launched in a partnership with a client who implemented the first platform. After the launch they increased their marking presence at the principal

mining and environmental events in South America. As a Fundación Chile's startup, Fundación Chile provided the initial capital to form the company, after which it took one year and a half to become fully self-sustainable. Now the company enjoys wide insertion in all the Chilean major mining companies and they are expanding to Peru, Colombia and Argentina.

The products are patented in Chile and the only obstacle they foresee is potential problems in doing so overseas. When mRisk began, the environmental management departments in the mining industry weren't as important as they are today. But over the years green thinking has grown in Chile and mRisk helps its clients to acknowledge the relevance of environmental issues, by giving their sustainability information more visibility within the organizations and making easier the access to data.

The company benefits from the knowledge of Fundación Chile and their experience with many spin offs before mRisk. As Juan Carlos Muñoz says, "So the business incubation process was definitely easier for us being inside Fundación Chile."

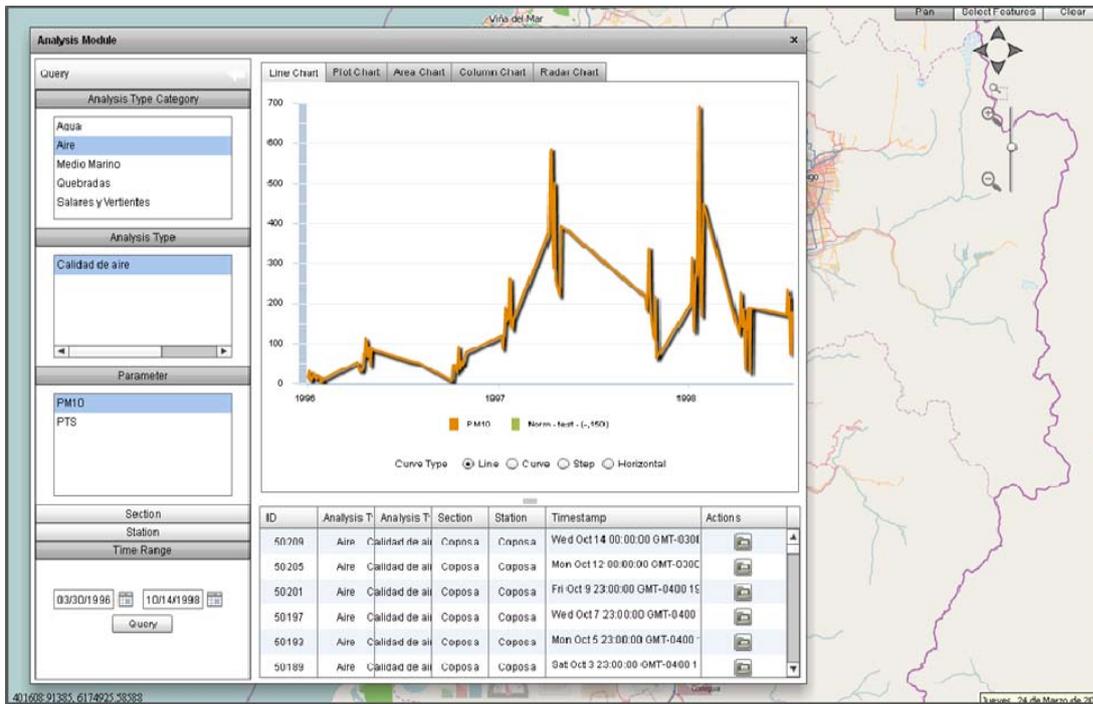
Their main lesson is to listen to your customers and constantly detect their needs. mRisk wanted to help them to be more environmentally sustainable, so had to learn a lot from them and their main problems in this field.

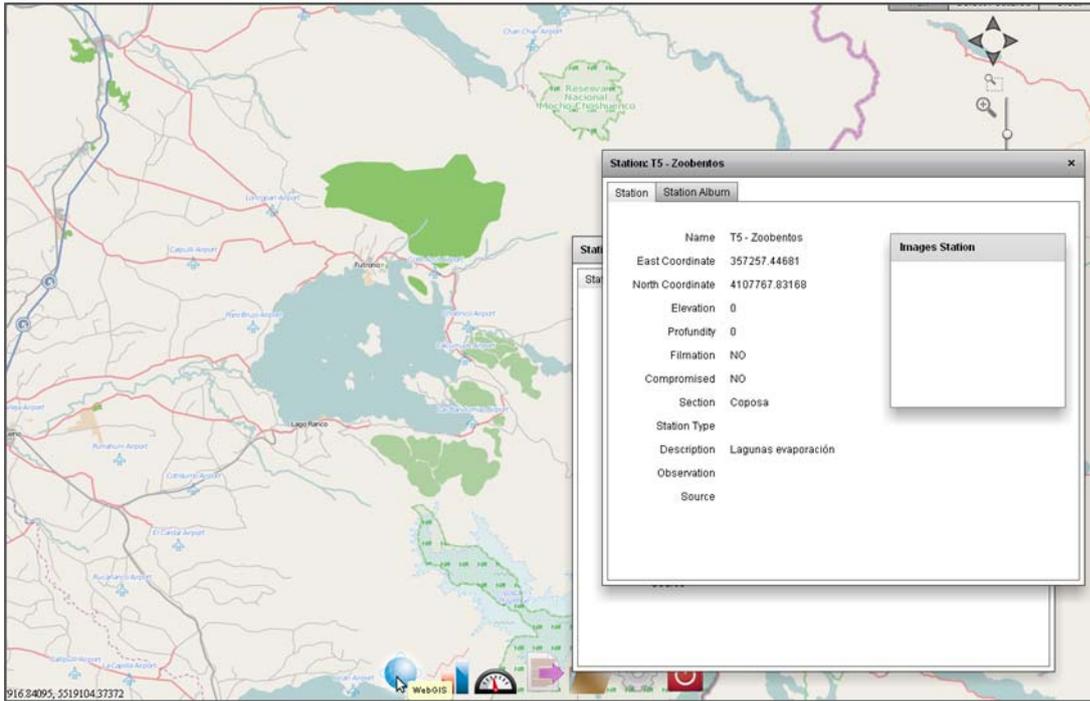
**Name of company, address, name of owner**

- mRisk
- Parque Antonio Rabat Sur 6165, Vitacura. Santiago, Chile
- Owners: Fundación Chile & Juan Carlos Muñoz.

**Logo and photographs**







**mrisk** **mRisk clients**

## **CHILE 2**

**Company Name: Optiflamma S.A.**

**Incubator Name: Idealncuba – Incubadora de Empresas de Alta Tecnología**

**Economy: Chile**

Optimaflamma's main product is a combustion optimization system for improving the performance (efficiency) and reducing pollution. It is based on the use of optical sensors for flame analysis, with applications in industrial boilers and ovens, with a gas or petroleum burners. The system includes optical sensors and actuators, and a control system that tunes the air/fuel ratio optimally. Auxiliary instrumentation can be connected (for example, flow sensors), to monitor the process. Also, Optiflamma S.A. capitalizes upon its highly qualified human resources and offers diagnostic services, training, maintenance, integration and after sales assistance.

OptiFlamma grew out of research in 1993 under the auspice of Universidad de Concepción (UdeC), Chile, in cooperation with University of Liège (ULg), Belgium, further developed in a research project funded by FONDEF D03i1106, "Development of Control systems for combustion Equipment , by means of on-line Photonic Analysis of Flames" ("Desarrollo de sistemas de control de combustión en equipos de combustión, mediante análisis fotónico en línea de la llama") and completed in September of 2007. The product has a patent application in Chile and the EEU and was exclusively licensed by the University to Optiflamma S.A.

The main researcher, Dr. Oscar Farías, based his thesis on an optimal control system for combustion, using the radiometric signal emitted by petroleum flames. This led to the first prototype using a radiometer as flame sensor. Subsequent investigation involved other photonic devices such as CCD cameras and photodiodes, with applications in gas, petroleum and biofuels flames.

The technology was developed with a research project funded by FONDEF D03i1106. Funds were obtained for the commercialization of the results and from Innova Bío-Bío to boost the technical and administrative capabilities of the company for expansion nationally.

The biggest challenge was market acceptance of the innovative product and its reliability. The Company overcame this with improvement, adaptation, development and improvement of some technical aspects of the field equipment, providing qualified staff and ensuring reliability.

IdealIncuba is the Business Incubator of the University of Concepcion - Chile, with the main goal of supporting the creation of new companies, businesses and services in different areas of knowledge, based on the work made by university researchers, degree thesis students, projects, innovations and technologic developments from external sector, from independent professionals and companies as well. The company benefited from business incubation in terms of company support and infrastructure services as well as important guidance at commencement.

**Name of company, address, name of owner**

**Optiflamma S.A.**

Adress: Delfina Cruz 127, Parque Residencial Collao, Concepción, Chile.

Administrative office: IdealIncuba building, Barrio Universitario  
S/N, Concepción, Chile

Name of owners:

- Alejandro Esteban Concha Astudillo
- Oscar Francisco Farias Fuentes
- Luis Emiliano Arias Parada
- Daniel Jerónimo Sbarbaro Hofer
- María Luz Espinosa Fuentes

**Logo**



### **CHILE 3**

**Company Name: Probionature Ltda**

**Incubator Name: . IDEAINCUBA**

**Economy: CHILE**

Probionature Ltda produces probiotic food additives based upon university research. It is the founders first enterprise and initially targets the salmon industry in Chile and internationally. This is a competitive industry globally for which research gives an advantage. The first product, an additive for salmon food, was developed in the framework of a research project, whereby a Norwegian company, one of the four largest global suppliers of food for the salmon industry, with presence in Chile was invited to cooperate in the field testing. They are now interested in securing first and exclusive access to the product. The product is in the process of patenting. The IP belongs to University of Concepcion, who has filed for the patent and has granted the company a license to the IP as an spin-off company.

The company has just started operations, after winning a seed capital grant from InnovaBioBio, a regional innovation promotion agency, related to Corfo and is not self sustainable yet. The strategy is not to invest in own manufacturing facilities, since this is not the core business, but to create the conditions for scaling up nationally and internationally.

The next stage of the company is to produce probiotic solutions in the area of pharmaceutical products for external use (dressings for advanced wound treatment containing probiotics). A measure of success will be to reach the milestone of selling to a final product manufacturer, or to produce it directly in the company, for the Chilean or international market.

The company was conceived from the beginning as global market oriented, since the family of products it has at its finger tips is state of the art globally. A key challenge for the founders is creating a global presence with a location in Chile and without significant investment in offices in other economies and expatriating people.

IdealIncuba is the Business Incubator of the University of Concepcion - Chile, with the main goal of supporting the creation of new companies, businesses and services in different areas of knowledge, based on the work of university researchers, degree thesis students, projects, innovations and technologic developments from external parties, independent professionals and companies. The incubator was a valuable guide, helping identify and solve the critical aspects in developing the business, such as, IP protection, strategy assessment, negotiation, grant applications, and identification of manufacturers.

With leading innovation at the core of the venture, big issues are the core business focus and business model design. The structural configuration needs to be well thought through, based on existing skills and knowledge, and combined with awareness of what they need to learn to make it all possible, along with analysis of the value chain to determine the best stages for profit margins and timing and investment constraints. In the beginning they did not have enough money, so had to pay more in variable costs rather than invest in equipment or facilities, outsource as much as possible, so long as it was not critical or core business and especially when they had access to certificated, renowned, and quality suppliers. At the moment they are more working capital oriented, and when they know the market and their strengths better can consider a scaled up investment.

**Name of company, address, name of owner**

Probionature Ltda.

Gob. Juan Henríquez 1044, Lomas de San Andrés, Concepción, CHILE

Erica Castro, Rodrigo Bórquez, Mauricio Osorio, Javier Ferrer

## **CHILE 4**

**Company Name: Zefarms Tika Natural Chips**

**Incubator Name: Santiago Innova Corporation**

**Economy: Chile**

The death of her baby son motivated Carolina Echeñique to start her first business, Zefarms Tika Natural Chips, as a way of channeling her love and energy and to overcome the emptiness left by the loss of her baby. She now produces a range of natural chips, unique because of inputs from the south of Chile, giving varied color combinations, free of additives and saturated fats. The gourmet character of her chips gives clear product differentiation from competing potato chip and other snack products.

The products of the company are:

- SNACK TIKA NATURAL CHIPS – PATAGONIA: Crispy Chips made with two varieties of sweet potatoes, two kinds of colored potatoes and beetroots. specially selected from our southern land of Chile. Simply Irresistible!. Gluten Free, No Preservatives, Low Sodium
- SNACK TIKA NATURAL CHIPS – FURIOSAS: Delicious Chips made from Yunka Furiolas, whose sweet creation is blessed by her cousin the beet. We just add a pint of black pepper. Unique natural red chips. Gluten Free, No Preservatives, Low Sodium.
- SNACK TIKA NATURAL CHIPS – MERKEN: Unique Chips made from white sweet potatoes of the Central Valley of Chile, never used before in the Industry. With a delicate touch of Merken, the traditional spice of the Mapuche people native to our southern land, gives exquisite smoke earth natural flavor. Completely unforgettable. Gluten Free, No Preservatives, Low Sodium.
- SNACK TIKA NATURAL CHIPS – ZAPALLO: Colorful and delicate chips made from squash sweet potato. With no need to add anything else , we created elegant orange Chips, with a pint of a sweet natural taste. Inevitably addictive. Gluten Free, No Preservatives, Low Sodium.

The launch of the first products was done via gourmet shops and direct to niche customers. The current clients are gourmet food shops, supermarkets, and all kinds of other shops in Santiago, Chile's regions and abroad. Reliant upon personal and family funds, it took the business 18 months to be self financing.

The success of the company measures up across the increase in sales, expansion of clients and markets, diversification of products, and in consolidation of the team. As a new business run by a woman, the most important challenge at the start was gaining the confidence of distributors. This was overcome by dedication, passion and by distributors seeing and appreciating the results. Carolina was helped by the Santiago Innova incubator, a private non profit corporation created in 1995 by the Municipality of Santiago of Chile. It is a multi sector urban incubator and since its creation the institution has given support to 825 new business and it has created 255 companies. Incubation was a very important learning experience for Carolina, helping form the company and making everything more rapid, since the incubator helped obtain resources from the government to start the business. The Incubator contributed physical space, a professional complete team and important networks of contacts.

The company already has begun its internationalization, with sales of the products in France. For this there are two strategies, the first representation by distributors and then licensing production.

Carolina advises other young people who want to start a business "To have confidence in themselves, believe in their dreams, be constant and knock all the doors that are necessary. Likewise, ask for help and listen to the advice of people with more experience".

**Name of company, address, name of owner:** Zefarms Tika Natural Chips; Las Araucarias 9080, Galpón H y J, Quilicura, Santiago – Chile. Carolina Echeñique Pellegrini. [carola@tikachips.com](mailto:carola@tikachips.com) <http://www.tikachips.com>

## Photos



**Entrepreneur**



**Products**



**Incubator**

## DENMARK

### **Incubator Name:**

Aalborg University: <http://www.aau.dk/>

**Economy:** Denmark

### **Three examples of successful greentech SMEs initiated from Aalborg University**

**Serenergy A/S, Majsmarken 1, DK-9500 Hobro, Denmark, Founded by Anders Korsgaard and Mads Bang, both Ph.D.'s from Aalborg University. Web: <http://serenergy.dk>**

Serenergy was founded in 2006 by leading researchers at the Institute of Energy Technology at the University of Aalborg in Denmark. Their state-of-the-art Serenus product line is based on newly patented technology developments resulting in highly competitive performance. Their products are used in a broad range of markets and applications, from backup power and residential heat & power generation to mobile power generation and motive power for transport applications. Serenergy is based in Hobro, Denmark.

Serenergy designs, manufactures and sells fuel cell stacks and fuel cell power modules for system integrators. Serenergy is a leading manufacturer of fuel cell stack modules featuring HTPEM (High Temperature Polymer Electrolyte Membrane) technology. Our fuel cell stacks transform hydrogen feedstock and oxygen from the air into electricity - with zero CO<sub>2</sub> emissions. The only waste products from the fuel cell reaction are water and heat. The company prides itself on providing high quality customer solutions with zero-emission fuel cells.

Captions: automotive fuel cells

Airborne fuel cells



**EMD International, Niels Jernesvej 10, DK-9220 Aalborg, Denmark. Founded by Per Nielsen, Ph.D. from Aalborg University. <http://emd.dk>**

EMD is a software and consultancy company supplying economies worldwide with software and consultancy services within the field of project design, planning and documentation of environmental friendly energy projects, particularly wind energy projects.

EMD has its main office located in Aalborg, Denmark and regional sales offices in Germany, France, Spain, United Kingdom, USA, Turkey and China. The company has a total staff of 20 - 25 employees.

An important task for EMD is continuously to update and improve their software packages for project design and planning of wind energy projects, CHP projects, etc. in close cooperation with the many companies worldwide, which daily use their software. EMD participates in various ongoing research and development activities within the renewable energy sector and this ensures that the EMD software continuously is upgraded with the latest knowledge and experience available within the area.

The result is user-friendly, flexible and reliable software developed based on the latest knowledge and experience within the area and according to the demands of our many users worldwide.

The consultancy team at EMD is internationally recognized for its independent expertise within wind energy as well as within development of co/tri-generation projects. As wind consultants, EMD has a long worldwide experience. Consultancy jobs have been performed in Canada in the North to Australia in the South and from Japan in the East to USA in the West. EMD performs over 200 consultancy jobs each year within wind energy for both private companies and banks, as well as longer-term project assignments for DANIDA, World Bank and other international institutions.

Since 1998, the wind consultancy team at EMD has conducted wind resource assessment, micro-siting and bankable annual energy production assessments on over 700 wind farm projects worldwide with an planned capacity of more than 35,000 MW.



### WindPRO

The world's most comprehensive software package for design and planning of wind farm projects. Recognized and used by all leading turbine manufacturers, developers, engineering companies, utilities as well as local planning authorities worldwide.

### Wind Energy

EMDs wind consultants benefit from taking part in WindPRO development - and WindPRO development benefits from the work of the wind consultants. This synergy makes the services offered both unique and well-recognized world-wide.



### energyPRO

A complete modelling software package for combined techno-economic design, analysis and optimisation of both fossil and bio-fuelled cogeneration and trigeneration projects as well as other types of complex energy projects.

### Co-/Trigeneration

Independent consultancy services within preparation of detailed feasibility analyses, study appraisals and second opinion analysis for many different types of distributed energy projects, in particular cogeneration and trigeneration projects.

**Xergi, Hermesvej 1, DK-9530 Støvring, Danmark. Founded by Frank Rosager, Ph.D. from Aalborg University Web: <http://xergi.com>**

Xergi specializes in biogas - from development of technology to delivering turn-key plants. They support their customers in developing their project, design and engineer the plant and manage procurement and construction.



Xergi focuses on maximizing return on investment for its customers by delivering plants that are flexible, reliable and easy to operate.

With more than 20 years in the biogas industry, Xergi has supplied a large number of different technical solutions based on the composition of biomass to be digested. Applying different areas of expertise is important to ensure a successful project. Knowledge of the biological processes as well as mechanical and electrical engineering know how are important elements for choosing the best design solution for a biogas plant. They have completed many projects outside Denmark and have international project experience.

## **INDONESIA 1**

**Company Name: ORSOLINDO**

**Incubator Name: I-CELL Business and Technology Incubator of ATMI, Surakarta**

**Economy: Indonesia**

ORSOLINDO was established to help society and the government of Surakarta City solve the city's waste problems. Beginning as City Waste Tenants, the firm entered the I-Cell incubator and conducted research into making organic granular fertilizers from household waste. Research involved investigating alternative ways of making such fertilizers. The firm had assistance from PI-UMKM BPPT, departments of city government, universities and I-CELL management, with funding support from government. Thereafter City Waste Tenants, with the support of investors, established the firm known as ORSOLINDO in January 2010. The name stands for "Organic Solo Indonesia." The company produced its first product in the form of a granular organic fertilizer by using organic waste matter. Three additional fertilizer products have been added to the original. Fertilizer products are marketed to a variety of consumers to meet needs in gardening, agriculture and the reclamation of soil contaminated by coal mines.

Given that there are other makers of organic fertilizers, ORSOLINDO has been expanding its products and services to serve an array of needs and remain competitive. The firm produces organic compost, provides consulting services, and sells compost makers and motorcycle powered waste transportation equipment. It also holds and manages solid and liquid waste from private homes, industry and commercial sectors including restaurants, and it recycles plastic. While fertilizer production currently is one ton per day, the firm will eventually attempt to expand services to serve other cities.

Plastics recycling includes recycling of PET (PolyEthylene Terephthalate), which is commonly found in water, soda and cooking oil bottles and in food packaging, and PP (Polypropylene), a ubiquitous product used in food packaging, medicine bags, plastic bags, cups and other products. ORSOLINDO sells recycled plastic waste into chips to be sold to exporters at Surakarta, Surabaya and Jakarta, and is planning to expand production of recycled plastic in other forms.

Current customers for fertilizer include, besides Surakarta City, Unitek Borneo, Balikpapan, KALTIM, PT. Freeport, Timika, and flower and plant producers, other farmers and housewives. Customers for recycled plastic include T. Majestic Buana, Jakarta; CV. Omega Indoplast, Surabaya; and others.

The firm's vision also encompasses supporting community awareness and building citizen participation in waste management, including lessening the production of waste at the source.

In addition to its headquarters, ORSOLINDO has one plant in operation and is currently building another. It is working to inform itself of better business practices and is focusing on human development and employee confidence building.

**Contact details:**

Orsolindo, Bone Barat Utama Street, No. 10, Banyuanyar, Surakarta 57137

Captions for photos: Semi-organic nitrogen fertilizer; waste separation equipment; motorcycle powered waste collection equipment; and compost makers



## **INDONESIA 2**

**Company Name: P.T. Bio Pacific Energy, Jakarta**

**Incubator: Incubator Business IPB**

**Economy: Indonesia**

Founded in May 2009, P.T. Bio manufactures renewable biomass-based fuel additives; the additives are biodegradable and lower greenhouse gas emissions, conserve fuel and thus meet more stringent environmental standards. The company's additives are based on essential oils – used widely as flavor enhancers and in cosmetics, pharmaceuticals and aromatherapy – but which can also be used as fuel additives. The essential oils used by P.T. Bio have a chemical composition similar to petrol and diesel fuel. They assist in oxygenating fuel, to improve combustion in the engine chamber; have a detergent quality that helps clean fuel systems; and reduce engine temperatures and emissions. According to P.T. Bio, they contribute to a 20 percent savings in fuel consumption and also cost savings in engine maintenance. Another advantage is that the raw materials used are not food crops.

P.T. Bio trademark registered products OCTANE-N and CETROL-N15 can be used for motor vehicles (including buses and trucks), power plants, boilers, heavy equipment and marine engines. One milliliter of additive is mixed with one liter of fuel. While starting with automotive users, who currently mix the additives into fuel themselves, the company strategy is based on broadening its customer base to others including marine and mining users and partnering with the fuel industry.

Based on 2010 data, the company reports annual Indonesian fuel consumption of 40 million kiloliters. Assuming P.T. Bio could obtain a 10 percent market share, the firm could sell 4 million liters of additives annually. Estimating a 35 percent profit margin, this would result in revenues of \$32.9 (US) in sales.

In addition to the additives' contributions to a cleaner environment and more efficient fuel use, the firm says their production would bring economic value to underutilized or nonproductive land – and to poverty alleviation – through farming essential oil

crops. P.T. Bio estimates, at full capacity, it could assist in putting 27,000 hectares of land into production.

Challenges the firm faces include convincing the market to adopt additives, increasing production of essential oils required to scale up, and attracting investors.



### INDONESIA 3

**Company Name: PT Pulus Wangi Nusantara**

**Incubator: Incubator Center for Agribusiness and Agroindustry, Bogor Agricultural University (IPB), Bogor,**

**Economy : Indonesia**

### **Zero Waste Vetiver Production**

PT Pulus Wangi Nusantara is a vetiver production company supported by the IPB

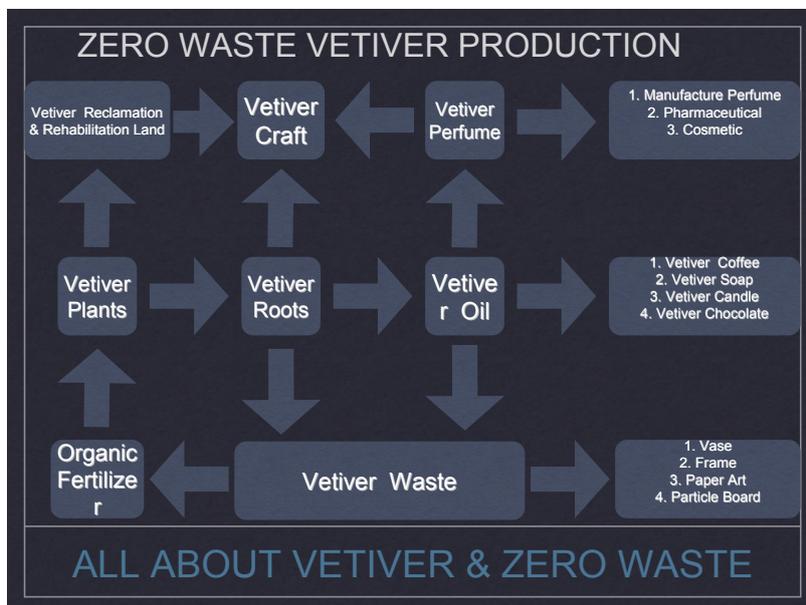


Agribusiness Incubator at Bogor Agricultural University. Vetiver

is grown in India, Java, Haiti and Reunion for use in perfume, agriculture and bioengineering industries. The industry started in 1918, and employs around 10,000 people in Indonesia, but out of 7,450 tons of vetiver per year, the industry traditionally produces



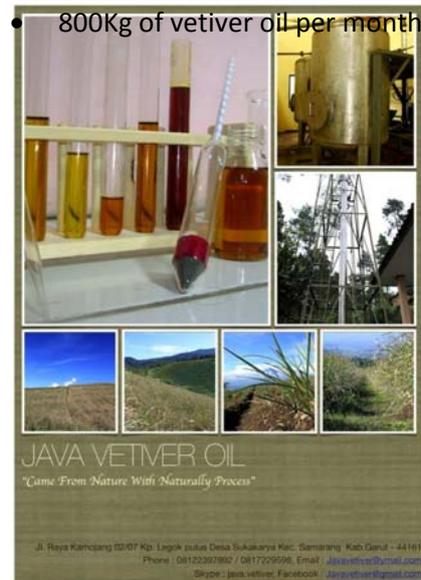
5,960 tons of waste, which is burnt, contributing to global warming. This led to the concept of zero waste vetiver production.



The vision of the company is to be:

The market leading company and source of vetiver reference in the world. Develop Eco-friendly product, maintaining and developing the concept of partnership and cooperation across the business chain to deliver value to stakeholders.

The business produces a range of products as a part of the zero waste strategy, including:



- Vetiver seeds
- A range of products out of vetiver waste, including vases, organic fertilizer, photo frames, particle board and art paper.

New products are under development including soap, coffee, aromatherapy chocolate, candles and oil.



The zero waste approach gives the business a unique competitive advantage, as well as a number of markets to exploit. Not only the business benefits. Using waste vetiver for fertilizers gives farmers a cheap and organic fertilizer. The business and its suppliers provide economic development opportunities for others to replicate along with associated job creation and sources of additional income for local people, all at the same time as reducing carbon emissions when compared to traditional vetiver production.

Numerous partnerships have contributed to the success of the business, also illustrating how difficult it is to develop a new green technology business. They include 4 universities and one vocational college, six government ministries and agencies and 8 NGOs. The main challenges faced are:

- Limited access to technology.
- Difficulties undertaking research & development
- Access to capital resources.
- Peoples' awareness about healthy live and not damaging the environment.

Collaboration with incubator has helped overcome some of the difficulties, developing the business and new products.

More information can be found at:

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**FACEBOOK** : [javavetiver@gmail.com](mailto:javavetiver@gmail.com)  
**SKYPE** : JAVA.VETIVER

## **INDONESIA 4**

**Company Name : PT. ENDUGO ENZYMES INTERNATIONAL**

**Incubator : LIPI**

**Economy : Indonesia**

### **Enzyme and Ethanol Production from Cellulose Materials**

The commercial prospect of second generation bio-ethanol with sustainable raw material at a competitive price is one of the main factors driven the owner, Jaegopal Hutapea, to enter into this venture. The company used the second generation ethanol technology to produce the ethanol from non food products : common water hyacinth (*Eichhornia crassipes*) economically, the first in the world. Since 1998 we have conducted the Research on the cellulosic technologies has been conducted since 1998, and in 2007 the first production was realized from the cellulosic materials. The introduction of the technologies into various economies have been done for the fast 3 years as well as the construction of the 4 ton ethanol plant in Silangit, North Sumatera.

The commercial products include (1) Enzymes used to produce bio-ethanol, (2) bio-ethanol, and (3) investment package. ENDUGO Enzymes (protected technology) has successfully converted cheap and abundant feedstock (biomass) to ethanol. We provide high quality Enzymes and also ethanol. PT. EEI also enter into a business model where it invites other SMEs and/or inventors into the business by offering complete investment packages on bio-ethanol production (franchising, consultancy, and other types of business partnership) for other SMEs and/or investors—business offers business to potential business partners. This business model will accelerate the growth of the company.

The uniqueness of the business model is SME building other SMEs' businesses; an SME targeting export market from the start with a protected technology; acquire technology from local and international market (technology providers) to endure our business is using latest technology innovation.

The main competition comes from firms producing enzymes for converting biomass to ethanol and bio-ethanol producers. The following competitive and comparative advantage will ensure PT. EEI win the competition.

- The ESI ENDUGO cellulosic ethanol technology offers fully integrated solution for the production of ethanol from any waste biomass source including Agricultural and Forest residues as well as from dedicated Energy Crops e.g. giant king grass and sweet sorghum.
- The ENDUGO enzymes generate ethanol yields that are on-par with the world's best technologies available today.
- Our main competitive and comparative advantages lie in lower operating costs and lower capital, more specifically due to:
  - (A) Highly robust enzymes that remains biologically active in rich sugar and alcohol slurries
  - (B) Less process water used means higher concentrations of alcohol thus reducing energy inputs of steam for distillation
  - (C) Lower process temperature for each stage means less steam inputs to maintain desired operating temperature
  - (D) Shorter residence for each stage time means less inputs of steam and electricity
  - (E) Physical degradation of feedstock, an all organic, non-chemical process, with zero-waste, no need for expensive waste treatment plant
  - (F) A ONE-STOP fully integrated design of a fully automated ethanol plant engineered and manufactured by ESI China-based technology partner, China Partner
  - G) A value-engineered, high quality ethanol plant with shorter delivery at a lower price.
- PT. EEI has secured strategic alliances (in China and Australia) with two international firms to ensure our access to main market and technology in the world.
- Given the market needs for bio-ethanol products and the trends of many economies to Go Green, it is forecasted that the supply of the bio-ethanol will still be lower than the demand in the next five to ten years. The following chart describes the demand for bio-based energy including bio-ethanol.

## ENGUGO Technology developed over a decade of R & D

*It takes years to become a success...*



ESI is now developing various projects in Asia for the commercial deployment of the ENDUGO 2<sup>nd</sup> generation cellulosic ethanol technology... first commercial plant in China operational end 2012.

The company clients are those using bio-ethanol in their operation— transportation companies, industry, bio-diesel gas stations, etc.; SMEs; and investors. We plan to expand our business to overseas market on a B-to-B basis. As such, PT. EEI has established strategic business partnership with EcoScience Jiangsu – Cellulosic Ethanol in China and EcoScience Investments Pty,Ltd . in Australia and EcoScience Investments Pte. Ltd in Singapore.

From the beginning, PT. Endugo Enzymes International has been designed to enter global market, both for its products and also for its business partner. PT. EEI adopt a business model where it offers bio-ethanol investment package for other SMEs and investors from local and overseas. Its owner has a wide experience in business development in difference areas. The core technology of this product has been patented (PCT, including Australia, and other economies). And any new technology that adds value to our business will be given appropriate protection strategy.

The company has developed cooperation with Center for Innovation, Indonesian Institute of Sciences-LIPI since 1998. This opens access to new knowledge, technology, and scientists. It was through continuous collaboration with LIPI's scientists, the identified commercial prospects of technology being developed.



Demonstration Plant at Pilot Scale in Silangit, North Sumatera, Indonesia



Water Hyacinth (*Eichhornia crassipes*)—abundant and cheap raw materials for ethanol thanks to ENDUGO Enzyme

Contact Person :



Chairman: Jaegopal Hutapea

Jl. Cikunir Raya No. 75, Bekasi selatan, INDONESIA

Telp. : (021) 82435562

Fax : (021)82435563

E-mail : [batak54@gmail.com](mailto:batak54@gmail.com), [nelsonsih@gmail.com](mailto:nelsonsih@gmail.com)

## **MALAYSIA**

**Company Name: Success Nexus Sdn Bhd**

**Incubator: Malaysian Technology Incubation system**

**Economy: Malaysia**

**Malaysian Bio Fuel Company**

Success Nexus Sdn Bhd (SN) was incorporated in September 2002, as a Malaysian company, with international shareholders/partners from Europe and North America. SN is a green bio-refinery, currently producing bio diesel, glycerol and bio-polymer material, fully licensed by the Malaysian Industrial Development Agency, MITI and Ministry of Primary Industry & Commodities at the Lumut Port, Perak, Malaysia.

SN was conferred BioNexus Status in 2007, under Malaysian Biotechcorp, MOSTI, and was awarded 2 Green Certificates for the Lumut bio-refinery project in 2010, by Malaysian Green Technology Corp, KETTHA for RM 60.0 million. Recently, on May 10th, 2011, SN was awarded 1-Innocert and Green Technology Sector Winner by SME Corp, MITI.

SN's green mission is to be a leader in the production and distribution of alternative bio-fuel & bio-product(s), using inedible waste oils/animal fats as the main source of raw materials. SN's bio-refinery activity and green technology complies with UNFCCC CDM program for the reduction of GHG emission. SN is a registered CDM applicant with UNFCCC CDM, since May 2010, and its CDM application is currently in progress.

SN's long-term aim is to be a sustainable & renewable green fuel/energy solutions provider, continuously involved in R&D&C activities for new innovations, such as:

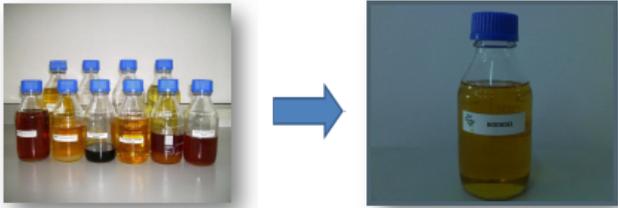
- (a) Transformation process of glycerol into a valuable intermediate chemical product, such as dichlorohydrine (bio-polymer chemical material which is green and bio-degradable) and other high valued bio-products;
- (b) Winterization of waste oil-based bio diesel economically;
- (c) Searching to optimize production via a single/heterogeneous catalyst in bio fuel production; &

(d) Sourcing and identification of other alternative raw materials for bio-fuel/bio-product(s) production.

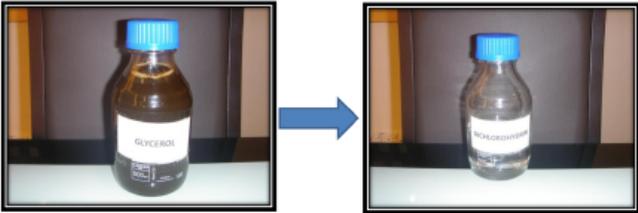
**PRODUCTS**  
**BIO-DIESEL USING MULTI-FEEDSTOCKS**

**1. Biodiesel Process – MYIPO 20092054**

**Multi-Feedstock (PFAD, Jatropha oil, fish oils, etc)**      **BIODIESEL**



**2. Glycerol Process – MYIPO 20093117**

$$\text{HO-CH}_2\text{-CH(OH)-CH}_2\text{-OH} \xrightarrow[100-110\text{ }^\circ\text{C}]{2\text{ HCl, HOAc}} \text{Cl-CH}_2\text{-CH(OH)-CH}_2\text{-Cl}$$


**By Product, Glycerol**      **Glycerol Dichlorohydrin**

SN has successfully validated and commercialized its fully automated and continuous plant for the production of bio-diesel (using waste fish oil), for generation of power and transportation in Viet Nam - 1MOBILE. The plant was launched by Malaysian Minister of Science, Technology & Innovation, Datuk Seri Dr. Maximus Ongkili at Cao Lanh City, Dong Thap Province, Viet Nam. The bio-diesel produced and used in Viet Nam complies with EN 14214 standards.



### **Mobile Solution Plant – Bio-Diesel and Power Generation**

Since its inception, the most challenging task has been to secure financial support from commercial banks, government or development financial institutions (DFIs) in Malaysia. Commercial institutions are simply too risk adverse, especially in the context of the current financial crisis worldwide.

While specialized government institutions (such as SME Corp., MITI, Biotechcorp. MOSTI, Green TechCorp., KETTHA, etc) coach, nurture, promote and provide grant assistance to green bio-entrepreneurs like SN in Malaysia, commercial financial institutions and/or DFIs lack depth of understanding about the green tech industry.

Despite these challenges, SN has sought alternative options, such as downsizing industrial scale bio-refinery product production to a community scale, leading to the community scale 1Mobile Plant for bio-fuel and renewable energy.

Please refer to SN website – [www.successbiofuel.com](http://www.successbiofuel.com) for more information.

## **MEXICO**

**Company Name: HB COMERCIALIZADORA S.A. DE C.V.**

**Incubator Name: Innovation Fund**

**Economy: Mexico**

The Ministry of the Economy and the National Council for Science and Technology (CONACYT) created a Public Trust Fund called the Innovation Fund (Fondo de Innovación Tecnológica SE-CONACYT) in 2007. This is the first Fund in Mexico focused on subsidizing innovation projects for small and medium enterprises. The Main Characteristics of the Innovation Fund are:

- Funds are granted by Call for Proposals (1 or 3 per year).
- The project is presents online by each company and the fund is granted to them directly.
- The evaluation process is conducted by specialists in the sector.
- From 2007 to 2011: over 90 million USD were granted to subsidized over 400 Mexican SMEs
- The 2011 Call for Proposal just ended, last September 2011.

HB COMERCIALIZADORA S.A. DE C.V. a small company from the state of Yucatán, Mexico was supported by the fund with a grant of \$1,316,019.50, matched by \$1,424,919.50 from the company, for a project with a total cost of \$2,740,939.00. The company has developed technology to extract fiber material from tetrapack and tetrabrik to create two products:

- Paper, with correct properties
- Reengineering processes to obtain sheets of poli aluminum according to regulations

For many years tetrapack and tetrabrik containers remained on piles of trash, or were burnt, harming the environment. Aluminum when oxidized tends to generate erosion problems at the surface of the Earth and contaminates groundwater, causing health problems. When the plastic is burnt, full combustion is not achieved, so this action generates not only monoxides but suspended particles in the air, having an impact on human health as well as affecting the growth of flora and fauna.

HB COMERCIALIZADORA S.A. de C.V. developed a technology for separating compounds contained in these containers that can further be used to produce new products for human consumption, avoiding environmental contamination problems and at the same time generating consumables to be used in new products. The company and its technology will stimulate recycling and associated environmental benefits in Mexico.

- Offering recycled paper to the market. Nowadays, two third of the raw material needed to produce paper comes from recycled paper.
- Recycled paper demand that is growing everyday. Worldwide, 176 million tons of cellulose are consumed, 80% of consumption is concentrated in 11 economies. United States being the main consumer with 29.6% of the total, followed by China with 8.9% and Japan with 7.2%.
- Wider use of recycled paper means less deforestation.
- The use of recycled paper involves less use of water, electricity and chemical products needed to transform cellulose into paper.
- The use of recycled paper from disposable containers will decrease burning or confinement, that in turn will decrease environment pollution.
- The application of waste in consumption products that can later be recycled again. Paper can be recycled three to eight times, though cellulose is needed. The technology developed by HB Comercializadora, furnishes this last raw material.
- Alternate products to manufacture sheets and furniture that do not depend 100% on wood and on cardboard sheets with tar.

## **PHILIPPINES 1**

**Company Name: GSMetrix Technology Solutions, Inc**

**Incubator: Ayala Technology Business Incubator (AyalaTBI), Diliman, Quezon City 1101**

**Economy: Philippines**

Ayala TBI runs TechBootCamps, their flagship project training teams and startup companies in the basics of idea generation, product development, business plan, funding, and pitch and investor presentations. Alumni teams that have finished TechBootCamps are either pipelined into incubation facilities at the University of the Philippines campus or continue as part of the virtual network of AyalaTBI. In 2009, AyalaTBI started running boot camps to train startups in green technology.

Climate change and its damaging effects in the form of flash floods, flooding, landslides and inundation of areas, create grave implications for many Philippine industries by harming livelihood activities. Irreparable damages often occur, affecting entire communities and regions and large industry sectors like farming and fishing. Foremost is agriculture, where such events result in decreasing yields. Even worse, major disasters result the loss of lives and properties due to unpreparedness.

Challenged by these problems, GS Metrix developed an integrated product and service delivery platform of environmental technologies meant to serve as information sources for immediate and proactive decision-making. GSMetrix develops software and hardware tools to monitor microclimate information from landslide, climate and water quality monitoring, as well as weather station monitors and sensors used in fishponds and farms. These tools use wireless sensor network technologies for data gathering and decision making. GSMetrix is an expert in instrumentation and control; environmental monitoring is its core business. This specialization has allowed it to tap into the unserved yet expanding market of industries looking for this technology. The company has shown exponential benefits of up to 300% percent for industries turning to environmental monitoring.

Founded, in 2009, GSMetrix provides hardware tools to its clients, which communicate with infrastructure at GSMetrix facilities. This is then accessed by clients online. The model results in recurring income from client subscriptions for access to modeling and monitoring tools.

While a patent is pending for the equipment, GSMetrix management is considering licensing its technology as a model for firm growth. Its client base has expanded to include a wide array of stakeholders in environmental technologies. Fishing and farming clients and other businesses, government institutions and civic organizations comprised the initial target market. Localized effects of climate change also have pressured local governments to be proactive in facing weather-related challenges and enhancing their capabilities to take action.

The start up company was first financed via bootstrapping through pooling resources of its team. A combination of marketing strategies was adopted via piloting and demonstrating the sensors' capabilities in targeted establishments that needed the service. This proved a surefire way of getting customers to test the products. Given that the firm's potential for growth has been established, the pressing need now is getting manufacturing or licensing on track.

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## **PHILIPPINES 2**

**Company Name SafeWaste Inc**

**Incubator: Mabalacat Techno Center Mabalacat, Pampanga**

**Economy: Philippines**

Formed in 2007, SafeWaste, Inc. utilizes a non-burn technology (an autoclave) for the destruction of microbial pathogens found in infectious waste. SafeWaste operates an autoclave known as the biomedical waste treatment unit, a pressurized vessel that utilizes moist heat or steam in achieving disinfection and microbial destruction. SafeWaste commenced its services for use by healthcare institutions in Pampanga with zero clients, but by the end of the year, a majority of the province's healthcare facilities had become customers.

The company launched by quietly visiting all health care facilities in Angeles City, meeting with top management and making them aware of their responsibility to have their infectious waste segregated and treated prior to disposal. This responsibility is mandated by law.

The husband and wife team, Alastair Kane and Indira Kane, financed the company, which became self-sustaining after two years.

As of March 1, 2010, SafeWaste transferred its facility to the Mabalacat Techno Center. The company now provides services to private and government institutions of Pampanga and Bulacan.

SafeWaste has been recipient of numerous awards. In July 2008, the Green Philippines – EcoProfit program, a European Union funded project, audited the company by sending experts from Austria to inspect the facility. In 2009, Green Philippines issued SafeWaste ECOPROFIT Certification upon the firm's achieving European Union standards. An award from DENR-EMB, accreditation from the European Union's Green Philippines Program and recognition by the UNDP stand as testimonies of the company's success. SafeWaste won its Green Philippines Islands of Sustainability Award in 2011.

The company measures its success through the trust and confidence of its growing client base of 200, including government regulating agencies. Both clients and government agencies tasked with the implementation of environmental laws

recommend the services of SafeWaste, because they have faith in the credibility of the company.

The Kanes also take pride in the number of people influenced by the company to change from old ways of managing their waste and who are now segregating at the source to minimize waste generation. In past, this “management” included dumping infectious waste indiscriminately without treatment.

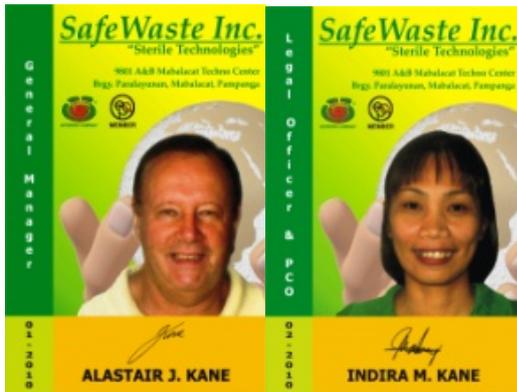
SafeWaste management overcame this obstacle by being persistent, with the aim of protecting public health and the environment from infectious hazards. The company conducts awareness training programs for their clients to help them understand their duties and responsibilities for infectious waste management.

“Its not easy to change, but it is better to change now before it is too late,” is SafeWaste’s corporate slogan, which effectively warns would-be customers.

The firm’s long list of clients are comprised of tertiary, secondary, and primary hospitals, medical centers and laboratories including dialysis centers, lying-in clinics, funeral parlors and industries that manage their own clinics.

The Kanes are pleased to share lessons learned in the business, noting that “even if your business is new” and unfamiliar, and despite being classified as an SME, patience and persistence, honest work and “faith in your capability and capacity will help your business succeed.” It’s not the size of the company that matters,” they say, “but the drive of management to prevail over the odds it is facing that can lead to its success.”

Captions for photos below: autoclave, the treatment, storage and disposal facility, and founders Alistair and Indira Kane.



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## **THAILAND**

**Company Name : Wongpanit co.ltd**

**Incubator: -**

**Economy: Thailand**

Wongpanit has been operating recycling works for 37 years, since 1974 and has opened a complete waste management site, for the general public and for recycling training. To date over 6,000 trainees have been trained. Recognizing the value of waste, Wongpanit has publicized recycling to all communities, government and the private sector, including factories in Phitsanulok, Bangkok and other Provinces in order to set up recycling centers and seek an appropriate waste solution.

Dr Somthai Wongcharoen, the owner of Wongpanit, started by learning the business from a local shop that buys garbage and waste in Phitsanulok province. This was a family business with a monopoly and did not disclose information, so he studied how to run the business by himself. He started with capital of 1,000 Baht, 1 bag of candy and an old pickup truck, to get him around all the villages in nine sub-districts in the province of Phitsanulok. Now, after an investment of more than 50 million baht, the business has six acres of land and, recycles commercial and industrial waste, can handle 80,000 to 100,000Kg a day, is ISO 14001 compliant and employs over 200 people, creating a network for the purchase of garbage from the community. The business has 22 branches in Thailand and one in Laos, as well as a network of more than 500 affiliates nationwide

Wongpanit buys recyclable waste (paper, plastics, metals etc) from households, the community, retailers, convenience stores, department stores and manufactures and provides waste collection for both hazardous and non-hazardous materials. As one of the most experienced and qualified companies in waste management, they emphasize converting waste to the value-added products. Wongpanit, with GPS equipped trucks and lorries, provides a safe logistic system for waste transportation, tracking and monitoring each truck.

Wongpanit conducts a training course every three months. The training is designed for those who want to start their own recycling business, or a waste buying center. They also provide training and lectures for government organizations , the public and private companies.

To ensure the public that Wongpanit's solid waste processing activities are environmentally friendly, they have established the following environmental policies:

- A survey of environmental impacts must be conducted before starting any activities inside and around the factory. In case an impact is found , solutions must be prepared and carried out before starting any activities
- All of company goals and objective ultimately lead to creating awareness and social responsibilities in preserving the environment
- All employees should share the same vision of protecting the environment and should be willing to accept the policies as well as to convey the company's messages to public.
- All of activities must comply with local acts, laws and international policies such as the Kyoto protocol , the basel convention ,WEEE.

## Photos



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## **VIET NAM**

**Company Name: KHL Consult**

**Incubator: Hi Tech Business Incubator Hanoi**

**Economy: Hanoi**

### **Action Plan for Wind Turbine Incubation**

The long term goal is to provide wind turbines to produce energy for all resident areas located in coastal and island areas and to help the economy grow by limiting the need for expensive network transmission from remote electricity generation plants. Short term goals (5 year) are to produce 50,000 – 100,000 small and medium wind turbine per year for domestic use and export, generating sales of 5 million USD/per year

Achievements to date include:

- Completion of research for new wind turbine technology to produce energy;
- Product testing;
- Registered for patent protection;
- Recently set up a company to manufacture and market the product;
- Acceptance as an incubatee by the Hi-Tech Business Incubator in Hanoi;
- Approved financial support of 10,000 USD.

## ***CONTACT***

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