Strengthening innovation-driven inclusive and sustainable development

Asia-Pacific Tech Monitor

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Climate friendly technologies

Perspectives on financing and investment

Plus

- Technology News and Events
- Tech Ventures & Opportunities
- Business Coach

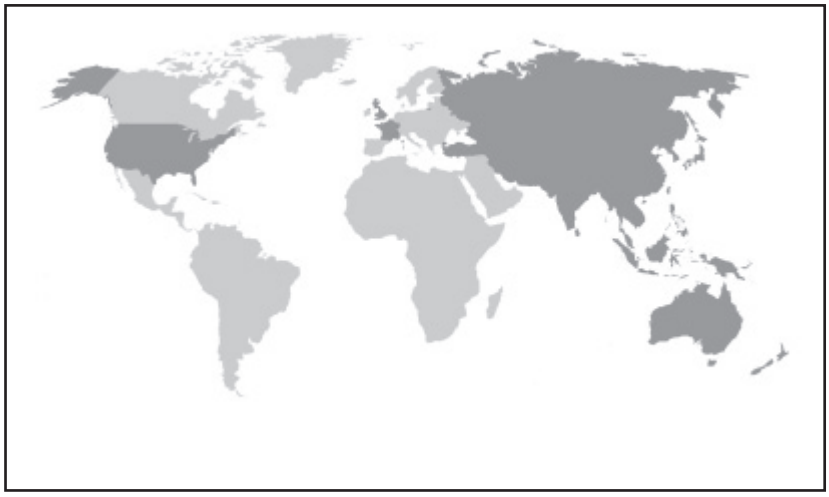
APCTT
Asian and Pacific Centre for Transfer of Technology

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

The **Asian and Pacific Centre for Transfer of Technology** (APCTT), a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives to: assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

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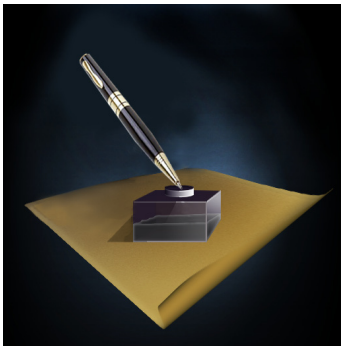

Introductory note

Greenhouse gas (GHG) emissions and climate change are known to have significant adverse impacts on the environment, human societies and economies. Towards mitigating the impacts of climate change, nations continue to discuss ambitious targets for reducing the GHG emissions. An important Sustainable Development Goal – SDG 13 – adopted as a part of the Agenda 2030 aims at taking urgent action to combat climate change and its impacts. The recently concluded UN Climate Change Conference in Paris (COP21) leading to the Paris Agreement on Climate Change provide a pathway forward to limit temperature rise to well below 2 degrees Celsius and to mobilize finance, technological support and capacity building for developing countries. It is therefore imperative for countries to harness the benefits of technology supported by robust funding mechanisms and instruments at global, regional and national levels. This is particularly important for the developing, least developed, landlocked and small island countries.

Today there are many climate-friendly technologies available that are known to have the potential to reduce carbon intensity at every stage of the energy supply chain — energy generation, storage and transmission, and end-user efficiency. There is ample evidence to show that these technologies offer potential benefits which include reducing GHG emissions, eliminating energy dependency, alleviating energy supply shortages, reducing energy consumption, improving energy efficiency, decreasing vulnerability to energy price volatility, reducing energy investment costs and developing low-carbon products and services. Without the widespread deployment and diffusion of these technologies, global efforts to stabilize GHG emissions and prevent dangerous levels of warming could be severely undermined. While improving energy security by reducing reliance on fossil fuels, these technologies could also play a vital role in the sustainable growth of economies offering potential to create new job opportunities and eradicate poverty.

The wide-scale diffusion of climate-friendly technologies is considered difficult as long as they have to compete with cheaper energy generated from fossil fuels. In addition to appropriate policy, regulatory and institutional reforms, there is need to establish innovative financial and market mechanisms that can enable faster market diffusion of these technologies. National policies should, therefore, aim at creating better market conditions to attract finance and investment for promoting climate-friendly technologies, particularly in the developing and least developed countries. Specific strategies could include rationalizing fossil-fuel subsidies, incorporating environmental external costs into energy pricing, introducing regulations to tackle market failures and barriers, providing financial incentives and financing mechanisms, promoting research and development (R&D), protecting intellectual property rights (IPR) and creating enabling environments for accelerating technology transfer and investment promotion.

Many developing countries in the Asia Pacific region may need assistance (e.g. financial and technical) to gain access to and absorb the necessary technologies to reduce their GHG emissions. In addition, capacity building, effective enabling environments, international R&D cooperation, detailed needs assessments, and developing local skills and supply chains are some critical measures that are necessary to help these countries to increase investment in climate-friendly technologies and thus adapt to and join the low-carbon path.

This issue of Asia-Pacific Tech Monitor highlights and discusses the challenges, opportunities and strategies to promote investment and access and utilize finance for developing, acquiring, deploying and diffusing climate friendly technologies in the Asia-Pacific countries.

Nagesh Kumar
Officer-in-Charge, APCTT-ESCAP

Technology Market Scan

ASIA-PACIFIC

CHINA

State Council offers science, technology plan

China issued a national plan for national science development on Thursday, giving academics and inventors more incentives. The plan by the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council introduces mechanisms to motivate researchers and foster innovation with 32 specific measures.

It was designed to encourage enterprises taking a dominant role in the country's sci-tech development, reforming existing research institutes to encourage innovation and technology transfers and establishing incentive mechanisms to attract more talent.

Current evaluation mechanisms should be overhauled to allow financial capital to be proactive in inspiring new findings and applied technology, it said.

Moreover, it stipulates the particular responsibilities of more than 40 related government departments that will coordinate to implement the reforms.

The State Council published a guideline in May that requires universities, research institutes and other public institutions to retain the posts, as well as part of the welfare contribution, for 3 years for researchers who quit to start their own business. The implementation plan also includes new policies to change the traditional evaluation system for scientists, assessing the performance of researchers using different criteria according to their fields.

http://www.chinadaily.com.cn

New models to boost innovation, entrepreneurship

China will accelerate its exploration of new models to promote innovation and entrepreneurship, said the central government in a statement. The government will step up the establishment of relevant platforms, support crowdsourcing, encourage private capital to invest in innovators and widen funding channels, according to a guideline released by the State Council, China's cabinet. Inventors and innovative start-ups should make the most of opportunities generated from the Internet and the government should remove barriers and lift restrictions that stifle new ideas and business, the guideline said.

Science parks, innovation bases and incubator projects will be encouraged to build new online innovation platforms. Leading Internet firms should also share resources with innovators and e-commerce platforms were urged to lower their thresholds for start-ups. The government will promote crowdsourcing in high-tech enterprises, research institutes and manufacturers, and encourage crowdsourcing in service providers in transportation, couriers, finance, medical treatment and education. The guideline also said large companies should assist innovators in upstream and downstream industries, and associations should intensify their support to small firms.

Moreover, small- and micro-sized firms can turn to crowdfunding to widen financing channels and the government will look into regulation that protects borrowers, according to the guideline. The guideline promised that the government will grant easier market access to start-up companies by cutting red tape and improving supervision.

http://www.chinadaily.com.cn

High-tech manufacturing rises 10.4%

The added value of China's high-tech manufacturing sector rose 10.4% in the first 8 months of the year, outpacing industrial growth by 4.1% points, according to a reform watchdog. Entrepreneurial passion has been ignited as policy support widens with added intellectual property protection and the establishment of industry guidance funds and incubators, said Lian.

The percentage of entrepreneurs among fresh graduates rose by nearly 100% in 2015, whereas 15% of overseas returnees chose to start their own businesses, according to data.

http://www.chinadaily.com.cn

Technology transfer platform

Suzhou and Shanghai Yangpu Venture Company signed a cooperation agreement on September 6 to build Suzhou Branch of Eastern Centre of national technological transfer. After the completion of the platform, it will become a bridge linking Suzhou and Shanghai and it is also helpful to Suzhou-based enterprises in going global and to attract foreign enterprises to come to Suzhou.

Eastern Centre of national technological transfer was co-built by Shanghai Municipal Government and Ministry of Science and Technology. Suzhou Branch aims to build a regional technological transfer platform gathering technological trading service, technological financing innovation, technological transfer, intellectual property service and big data of technological transfer.

http://english.anhuinews.com

INDIA

Technology acquisition and development fund

The Government has notified a scheme for enabling Technology Acquisition and Development as per the National Manufacturing Policy 2011 (NMP) through patent pool and licensing; reimbursement of direct patent acquisition cost; incentivizing production of equipment for controlling pollution, reducing energy consumption and for water conservation through interest and capital subsidies; and incentives for energy and environmental audit, waste water treatment, rain water harvesting, renewable energy and green buildings.

The objective of TADF is to provide funding support for the acquisition and development of clean and green technologies.

- Industries/companies/organizations willing to avail the funding support should be eligible as per the specifications/definitions/eligibility criteria for what can be categorized as 'Clean and Green Technology' as devised by a committee called the Green Manufacturing Advisory Committee (GMAC) comprising representatives from the

Ministries/Departments of the Central Government concerned and select external experts. The criteria will be consistent with the objective of the National Action Plan on Climate Change and the strategy for inclusive sustainable development. The criteria will be reviewed by the GMAC periodically as technology being dynamic and evolving constantly.

- Any unit seeking subsidy under this scheme should certify that it has not obtained or applied for subsidy for the same purpose or activity from any other Ministry or Department of the Government of India or State Government.

In case of industrial areas/establishments/institutional units located outside the NIMZ, GITA will ensure the compliance of clean and green parameters and implementation of incentive scheme and will provide a copy of compliance/implementation report to the concerned District Industrial Centres of the State Government.

In case of NIMZ, the Special Purpose Vehicle concerned will be enjoined with the responsibility of ensuring project compliance with the above-mentioned criteria set up by the Committee and also put up the cases for incentives after due diligence. The onus of proving 'cleaner'/'greener'/'energy efficient' will be on the claimant subject to third party certification by an agency/expert drawn from a panel approved by the GMAC. The claimant will provide clear, objective information on the product/technology throughout the lifecycle from manufacture to disposal.

The mode of technology acquisition includes:

- outright purchase of technologies with/without the engagement of a consultancy
- joint venture with counter parts for relevant technology
- purchase of active intellectual property right (IPR) which meets buyers' requirements
- creation of "Technology Pool/Patent Pool"

The extent of financial support for technology acquisition includes:

- Financial support up to Rs. 20.00 lakhs or 50% of the cost of technology/patents/industrial design, whichever is lower will be provided to industry for acquiring technology patented up to a maximum period of 5 years prior to the date of submission of the project from individuals, organizations located in India, and anywhere in the globe, who are legitimate technology owners.
- Technologies/patents/industrial design acquired centrally from various sources, as a pool, will be licensed to selected companies, at mutually agreed values and terms and conditions.

https://www.thedollarbusiness.com

Pharma contract manufacturing on the rise

The past few decades have been very productive for India, as it took a major leap from pharmaceutical production, to include contract manufacturing. According to the President of the Indian Drug Manufacturers' Association (IDMA), S.V. Veerramani, the overall pharma contract manufacturing industry is growing at 20%, providing a burgeoning opportunity for small and medium enterprises, reports Brand India Pharma. The current market value is estimated at 50% of the domestic production, which roughly translates to $5.3 billion. Multinationals hold a generous 20–25% stake in the domestic pharmaceutical market.

For the basic manufacture of medical products and drugs, India has a far superior edge over nations such as China, Viet Nam and Ireland, due to resources including manpower, technically knowledgeable work force, and World Health Organization-Good Manufacturing Practice-approved production premises. A substantial 40% lower cost of operation and production is clearly the highlight for multinationals to consider India for their outsourcing needs.

With the advent of multinational pharmaceutical organizations, and their rapidly growing presence in the country, the concept of contract manufacturing has steadily evolved and quickly adapted, so as to encompass services such as basic manufacturing of medicinal products, formulation development, stability studies and various stages of clinical trials. In addition, scale-up of drug syntheses and late clinical trial studies have also been profitable protocols in this sphere. The Drug Technical Advisory Board has agreed to grant a waiver to Phase III studies of certain drugs in India, which are from the regulated markets of the USA and European Union. This step is an incentive for many pharmaceutical organizations to focus on India, as the cost savings could be enormous.

Also it is estimated that patented drugs worth $85 billion in potential annual sales in the USA would be off patent during the period 2014–2020. Price competitiveness and manufacture of these generic drugs in the most cost-efficient manner would be the key drivers boosting the prospects of the Indian players as India is known to have the world's best known low-cost manufacturing centres, with the highest number of US Food and Drug Administration (USFDA)-approved manufacturing plants outside the US.

The government is also looking at incentivizing the upgradation of Schedule M facilities to WHO-GMP complaint units with the help of soft loans, which would lead to additional 1000 units being certified WHO-GMP compliant, further corroborating the manufacturing processes.

http://www.thepharmaletter.com

PHILIPPINES

Innovation centre set up

The Philippines has announced a plan to build a national innovation centre – taking cue from Silicon Valley in the US, Block 71 in Singapore, and MaGIC in Malaysia. Government agencies, including the Department of Science and Technology and the Department of Trade and Industry are collaborating with start-up accelerator IdeaSpace for this effort.

With initial funding of PHP 30 million (US$665,000) from the government and counterpart funding of up to PHP 15 million (US$332,000) from private sector and

academe, the innovation centre will have two locations – both of which will be near the country's premier universities.

The Philippine innovation centre will foster technology advancement and start-up ecosystem growth. Valencia said the hubs will be set up near key academic institutions to imbibe the spirit of innovative and entrepreneurial thinking among students, to tap into a wellspring of engineering and technology talent from these universities, as well as to address the growing interest of students in founding their own start-ups.

The centre will also serve as a venue for government agencies and academic institutions to promote products, facilitate transfer of their R&D results, and establish connections with the investment community. The creation of the innovation hub will be a critical component in boosting the Philippines' ranking in the Digital Evolution Index, which ranks countries in terms of their readiness for the quickly expanding digital economy.

https://www.techinasia.com

REPUBLIC OF KOREA

IPR trade deficit surges

Republic of Korea's trade deficit in IPRs towards the US, including patent licensing fees, amounted to 2.86 trillion won (US$2.42 billion) in the first quarter of this year, which is a new record. The highest deficit is attributable to the fact that Samsung Electronics and LG Electronics paid Qualcomm for a large amount of smartphone patent royalties during the period.

The amount of money paid by local companies to overseas companies that hold intellectual property like patents, design rights, and trademark rights was US$4.97 billion, according to statistics on the nation's intellectual property trade deficit during Q1 2015 published by the Bank of Korea (BOK) on August 26. In contrast, exports of patents and software copyrights were only US$2.66 billion, half the amount of imports. As a result, the nation reported US$2.31 billion of trade deficits in the intellectual property area in Q1.

The manufacturing sector posted US$2.14 billion of losses in the field, led by the electrical and electronics industry. The US topped the list of the nation's trade deficits in the intellectual property area, since local companies paid US$2.66 billion to US firms for the use of intellectual property, seven times as much as exports of intellectual property to the US, which were US$410 million. Due to the trade imbalance, the country recorded US$2.42 billion of losses in IPRs during its trade with the US.

The number is the highest ever since 2010, when the BOK started to compile related statistics. It is due to the fact that local smartphone makers' payments of patent royalties to Qualcomm were concentrated during the period. Industry analysts estimate the amount of royalties paid by local IT companies to the world's largest mobile chipset maker to be 2 trillion won (US$1.7 billion) per year. Currently, the Korea Fair Trade Commission is examining whether or not Qualcomm is abusing its patent rights.

http://www.businesskorea.co.kr

Smart innovation in manufacturing sector

Smart innovation based on the Industry Innovation Movement program is gaining speed in the domestic manufacturing sector. The purpose of the movement is to assist in the innovation of subcontractors based on cooperation among the government, economic organizations, large corporations and their contractors.

In the second phase of the movement, from August 2014 to August 2015, a total of 2,027 small and medium enterprises joined the program. Each of them was granted 20–40 million won (US$17,152–$34,304) and production and business management consultants were allocated as advisors for a higher level of business efficiency, cost reduction and better customer service. During the period, the 1,238 firms that took part in the program as partners of large corporations recorded an improvement of an average of 64.3% in defect rate, delivery schedule compliance, and the like. This percentage is equivalent to 82 billion won (US$70 million), or 70 million won (US$60,032) per firm in reduced costs.

The third stage, which kicked off last month, focuses on the expansion of ICT-based smart factories. Such facilities were built in 152 companies in the second phase, but the number is slated to be increased to 340 in the third. At the same time, 32.2 billion won (US$27.6 million) is invested in 1,428 firms during the 1-year period for the optimization of production processes, better quality and energy control, and other things.

Also, the Standard Innovation Activity Roadmap is drawn up so that the participants can analyze their innovation capabilities and plan on annual action plans on their own. Consulting services continue to be provided even for the firms that joined the first or second stage but did not join the third.

http://www.businesskorea.co.kr

Venture financing led by private sector

The Financial Services Commission released a plan to facilitate the financing of small and venture firms on July 19. The idea is to boost their self-sustainability by means of private sector-led investment. The Republic of Korean government has invested a large amount of public funds for a couple of years to enrich the domestic startup ecosystem. As a result, the size of investment in venture firms and the number of start-ups have greatly increased. However, some experts have pointed out that there is still a long way to go when it comes to the self-sufficiency of the ecosystem and the revitalization of venture capital in more diverse industrial fields.

According to the commission, the Small and Medium Enterprise Establishment Investment Association and the Korea Venture Fund raised 80 million won (US$69,049) for them in 2012, but the amount skyrocketed to 2.5 trillion won (US$2.16 billion) last year. The amount of new venture investment increased from 1.2 trillion won (US$1.0 billion) to 1.6 trillion won (US$1.4 billion) during the same period, and the government's new investment in the sector has amounted to 1.3 trillion won (US$1.1 billion) since 2013. This has resulted in an increase in the number of newly established venture firms from 74,162 to 84,697 between 2012 and 2014.

Nevertheless, the domestic venture investment ecosystem still relies heavily on government funds. The government accounted for 27 percent of financing to that end in 2007, and the percentage rose to 40.3% last year, but investment by private-sector entities continued to decrease during the period.

It is also pointed out that the government has failed to raise the rate of survival of investees due to its concentration on the supply of funds. As of 2013, the ratio of start-ups that remained in business for 3 years reached 57.6% in the United States, 55.4% in Israel, and just 41.0% in the Republic of Korea.

http://www.businesskorea.co.kr

SINGAPORE

ASEAN's first international patent authority

Singapore has joined China, India, Japan and the Republic of Korea as an international patent authority recognized by the World Intellectual Property Organization. From 1 September 2015, local and global businesses and inventors may fast track their applications for patent protection in multiple markets via Singapore, as the nation begins operations as ASEAN's first International Patent Search and Examination Authority under the Patent Cooperation Treaty (PCT). Administered by the World Intellectual Property Organisation, the treaty enables innovators and businesses to seek patent protection in 148 countries through a single international patent application. Singapore is the fifth in Asia (after China, India, Japan and the Republic of Korea) and joins a select group of 19 IP offices worldwide that have been appointed as International Authorities for the PCT.

Patent applicants to Viet Nam, Mexico, Brunei, Japan and Laos will be the first to gain access to Singapore's new service offerings as an International Searching Authority and International Preliminary Examining Authority in the coming months. Patent applicants could also enjoy rebates of up to 75% when making a PCT application through the Intellectual Property Office of Singapore. Singaporean businesses and inventors, in particular, will benefit from the ease and cost-effectiveness of filing locally to enter the PCT system. This arrangement is expected to immediately benefit some 1,000 PCT applications originating in Singapore yearly that were previously filed through other IP offices.

http://www.asianscientist.com

SRI LANKA

Spending on R&D

Sri Lanka lags in innovation and technological adoption in the Global Knowledge Economy Index of the World Bank, said the Asian Development Bank's Outlook for 2015. The Global Competitiveness Index of the World Economic Forum ranks Sri Lanka behind other countries in university–industry collaboration in research and development (R&D), PCT patents and applications, corporate R&D spending, and the quality of science research institutions.

Sri Lanka's spending on R&D equalled 0.16% of GDP in 2010. This is low even compared with its South Asian neighbours, with India at 0.81% in 2011, Pakistan at 0.33% in 2011, and Nepal at 0.30% in 2010. Sri Lanka's component of high-tech products in total manufactured exports was 0.9% in 2012, far below the 6.2% average for South Asia, 8.4% for lower–middle-income economies, and 20.6% for upper–middle-income countries. Private investment in R&D needs to be encouraged by removing institutional and regulatory bottlenecks and improving infrastructure, including those pertaining to information and communication technology.

The environment for innovation could be improved by establishing proof-of-concept labs and patent-application grants, introducing innovation voucher schemes and incentives for collaboration between firms and universities, and investing in knowledge-based capital supported by copyrights, trademarks, and brand equity.

http://www.dailynews.lk

THAILAND

Innovation district initiative revealed

The National Innovation Agency (NIA) aims to transform the Yotee district in Bangkok into an 'innovation district' similar to that in Singapore in the hope that it will serve as a platform that will boost the birth of new innovative ideas and start-ups in Thailand within 2 years.

Pun-Arj Chairatana, the NIA's new director, said for decades that governments, universities and traditional firms had tried to encourage the transfer of know-how and technology by encouraging more foreign direct investment (FDI) through the luring of Board of Investment (BOI) privileges but these efforts had proved somewhat of a failure. "We are offering these BOI privileges partly because we want a direct technology transfer from foreign firms and we have been trying this approach for three or four decades already hoping that we can have technology from FDI but in reality we have so little from that approach," he said.

"A city can act as a magnet for innovators such as the attractiveness of Bangkok or Chiang Mai for the past 10 years, and they are already accommodating IT start-ups or foreign talent who moved from around the world to live there,» he said. Pun-Arj said Yotee was perfect to turn into a innovation district as the NIA was located there and the agency already had an innovation park which would be used as the centre of the innovation district. He said the NIA was already working with state-owned CAT Telecom, with them working with hospitals and universities in Yothin to develop hospital service and medical innovations.

"The NIA already has an innovation park here so we are |trying to develop an innovation district so that people from the medical innovation and digital technology sectors can mingle and work with other key players to develop an innovation district," he said.

"Next year, there should be some tangible evidence (of this happening) and we expect this to become a reality within 2 years based on the new platform of area-based innovation instead of the linkage between firms and universities, which is currently too little and too long." The BOI's latest science technology and innovation privileges offered to foreign firms and joint ventures focus on innovation activities in

the Kingdom such as the 300% research and development tax privilege, he said. The government's tax privilege for start-ups should also increase the level of research and development and innovation activities in the country, he added.

http://www.nationmultimedia.com

VIET NAM

Incentives to foreign investors

Viet Nam gives big incentives for FDI enterprises with the expectation that they will perform technology transfer in the country, but the fact is that only 20% of foreign firms were engaged in technology transfer in the past 5 years. Dr. Nguyen Thi Tue Anh, deputy director of the Central Economic Management Institute (CIEM), said that there are many factors affecting the competitiveness of enterprises, including technology. Surveys conducted in recent years show that technology of Vietnamese enterprises has improved but improvement is low in comparison with the world and other regions.

According to the survey 'Competitiveness and technology at the enterprise level in 2010–2014' by CIEM and a research team from the University of Copenhagen (Denmark), Vietnamese enterprises can realize the benefits of technological innovation, but they lack the capacity and resources to implement it. Among many reasons, the survey indicates that financial constraint is essential. It said that there is a lack of skilled labor and access to equipment.

Viet Nam has rolled out the red carpet to welcome foreign investors, with the hope that they will transfer new technology to local firms. However, up to 80% of technology transfer in the past 5 years came from local firms.

Dr. Neda Trifkovic, from the University of Copenhagen, a member of the survey group, pointed out that in 2009, only 1% of technology was transferred from foreign-invested enterprises to domestic enterprises. The figure was 10% in 2013 and 35% in 2011 and 2012. But then, it fell to about 30%. "This trend can be explained mainly by the competitive nature of the relationship between domestic and foreign enterprises. The phenomenon of hampering local businesses is a concern because the strategy of domestic firms is often to rely on copying and adapting the experience of foreign enterprises, while foreign firms will not easily reveal their secrets," said Dr. Trifkovic Neda.

With the actual situation of technology transfer between foreign-invested enterprises and domestic firms mentioned above, the Deputy Ambassador of Denmark to Viet Nam, Christian Brix Moller, said that Viet Nam has high expectations for foreign firms in technology transfer, but in fact, local enterprises often transfer technology to each other more than foreign firms do to local ones. "This is a very noticeable point for the policymakers of Viet Nam to consider in FDI attraction policy because Viet Nam has long emphasized technology transfer of foreign-invested companies to domestic enterprises," he noted.

Another notable point in technology transfer between foreign-invested firms and domestic enterprises in Viet Nam is related to the mobility of Vietnamese workers. The surveyed businesses said that the skills and experience of employees is an important source of technology transfer. Eighty-four percent of employees in the foreign-invested firms are Vietnamese, 15.5% are foreigners and 0.5% are returnees. The survey shows that the effect from technology transfer in Viet Nam did not come from foreign sources, but from domestic enterprises in case transfer of workers is considered a channel of new technology.

Viet Nam gives big incentives for FDI enterprises with the expectation that they will perform technology transfer in the country, but the fact is that only 20% of foreign firms are engaged in technology transfer. It means that Viet Nam has given excessive incentives for these firms.

http://english.vietnamnet.vn

Biotechnology studies strengthened

Three national centres for biotechnology will be established in the country as part of a recently approved plan for developing a network of facilities serving the sector by 2025. The centres will be equipped with modern and comprehensive facilities in line with international standards and a capable workforce – between 200 and 500 persons each – to effectively serve biotechnology studies at the national level as well as trial production and practical applications.

From 2016 to 2020, a centre will be built in the central region and two centres for the north and south will be developed from the Institute of Biotechnology under the Viet Nam Academy of Science and Technology and the Centre for Biotechnology in Ho Chi Minh City. In addition, improvements will be fostered within ten other national-level biotechnology laboratories in terms of advanced facilities and human resources.

http://english.vietnamnet.vn

Finance comes for high-tech incubator

Minister of Science and Technology Nguyen Quan officially launched a fund to support the Innofund technology incubator on September 25. Innofund is a key part of the Business Incubators Policy Project (BIPP) project. It will mainly provide non-refundable financial support to feasible projects from organizations and individuals in the application of high technology and start-ups and projects in science and technology. Innofund will provide finance for each project ranging from EUR15,000 ($16,791) to EUR45,000 ($50,375).

The launch is part of the BIPP project, worth a total of EUR4.4 million ($4.92 million), of which EUR4 million ($4.47 million) was sourced from the Belgium Government's non-refundable official development assistance, while the remaining amount will be sourced from Viet Nam's reciprocal capital. According to Minister Quan, Viet Nam has about 50 technology incubators at universities, enterprises, and high-tech park, such as the Hanoi University of Science and Technology, the FPT Group and the Hoa Lac High Tech Park.

http://english.vietnamnet.vn

INTERNATIONAL

Engineered antibody neutralizes dengue serotypes

A multinational research team comprising scientists, engineers and drug developers has joined forces to develop a viable dengue therapeutic that targets all dengue serotypes. Their results, published in Cell, come as welcome news at a time were that an estimated 400 million people are infected with dengue each year. Researchers from the Singapore-MIT Alliance for Research and Technology (SMART), Duke-NUS Graduate School of Medicine (Duke-NUS), National University of Singapore (NUS) and Nanyang Technological University (NTU) have collaborated with the Massachusetts Institute of Technology (MIT) and a biotechnology company, Visterra, to develop a single treatment for all four serotypes of dengue.

The team started with a naturally occurring antibody that reacted only against limited number of types of dengue virus. Using that antibody as a scaffold, the team engineered a new antibody that reacts against all four types of dengue virus. The engineering was made possible by computational methods developed in MIT and SMART. This was then confirmed and validated using a detailed crystal structure of the antibody–virus protein complex obtained at NTU, which also provided insights into how the antibody engaged the virus to produce the desired effect.

Using a variety of systems developed in the SMART laboratories in the Campus for Research Excellence and Technological Enterprise (e.g., the SMART humanized mouse model), Duke-NUS and NUS, the team then showed that this novel antibody has the potential to neutralize dengue virus and prevent signs of disease. Another important feature of this antibody is that it acts on a part of the virus that is not normally targeted by the normal human immune response. This is important as the antibody would not need to compete with but would instead augment the overall natural immune response against dengue virus.

http://www.asianscientist.com

New method to trap cancer cells

An international team has discovered a new way to potentially 'fence in' a tumor and help stop cancer cells spreading, according to a study released by Cancer Research, UK. The study shows that Tumors cause cells, called fibroblasts, to stiffen the surrounding tissue so that cancer cells can grip it, which allows them to tunnel through to the blood stream and spread around the body.

Researchers from Francis Crick Institute and the University of Copenhagen said that using experimental drugs, they were able to stop the fibroblasts from stiffening the tissue around tumors. Thus, the healthy tissue trapped the cancer cells, blocking their movement away from the tumor.

They tested the new approach on mice and the results showed that targeting fibroblasts reduced the movement of cancer cells from the tumor to the lungs and liver through the blood stream. Since most deaths from cancer are caused when cancer cells travel to new sites in the body and grow as secondary tumors, this new method may lead to better ways to control the disease and save more lives, according to the researchers.

http://news.xinhuanet.com

ASIA-PACIFIC

AUSTRALIA

Growing mini-kidneys from skin cells

Australian scientists have successfully developed a method that allows mini-kidneys to be grown from stem cells in a lab – an achievement that could help with drug research, as well as one day possibly providing assistance to those in desperate need of a kidney transplant. Using stem cells derived from human skin cells known as fibroblasts, the team 'encouraged' the cells to form a miniature organ, Melissa Little, a professor at the University of Queensland, told Mashable Australia. The research was published in Nature.

"It's a bit like cooking, but we spend a lot of time getting the ingredients right," she added. Typically, the mini-kidneys take 18 days to develop. Once grown, the mini-kidneys are visible without a microscope at between half-a-centimetre and 1 cm in width. A human kidney, on the other hand, is about the size of grapefruit, Little said.

An adult kidney also has around 1 million nephrons – the structures that perform the important filtering function of the kidney – while the researchers' creation contains around 50–100 nephrons. The lab-generated organs are also missing the waste drainage outlet that is vital to kidney function in an adult. Rather, the mini-kidneys are similar to those found in a foetus around the early second trimester. "We estimate that they are equivalent to a 10- to 13-week foetus," Little said. "It's got all the cell types present at that stage of development."

A mini-kidney could be grown from the cells of someone with kidney disease – for example, so doctors could run tests and better understand the individual›s illness. Alternatively, drugs could be tested on the lab-created organ to find which medications would be most effective for the patient.

http://mashable.com

CHINA

Mosquitoes that prevent spread of dengue

Amid researchers and medical experts' longtime search for new ways to control the spread of dengue, one of the most deadly diseases caused by viral transmission facilitated by mosquitoes, there's an innovative approach from China: The country has established the world's largest mosquito factory – sterilized mosquitoes – that is, releasing 1 million into the environment every week.

The researchers at the so-called 'factory', located in the northwestern Guangzhou province, breed a symbiotic bacteria called Wolbachia in the mosquito responsible for the spread of the disease, called Aedes albopictusa. The Wolbachia is known to live inside the cells of an insect only and has the ability to kill the dengue virus cells that the Aedes mosquito carry.

The researchers believe that releasing such 'sterilized mosquitoes' into the environment helps dilute the population of the mosquitoes that carry dengue virus. Xi Zhiyong, the team leader of the project and a medical professor at the Sun Yat-sen University says that the bacteria targets the virus by stopping its replication inside the mosquito. Zhiyong further added that since the bacteria cannot survive inside human bodies, mosquitoes carrying the bacteria pose no harm to humans.

http://www.ibtimes.com

INDIA

Biotechnology patents

The Biotechnology Department of the Gauhati University (GU) has secured two patent rights on the products and processes of the formulations it has developed as mosquito repellents and larvicides. Two more patents are awaited on two other antimalarial formulations. The products and processes developed by the GU department were the results of the studies it carried out on the medicinal plants of the NE region on the basis of ethno-traditional knowledge.

The Biotechnology Department has devoted itself to controlling mosquitoes that are carriers of vector-borne diseases like malaria, filaria (elephantiasis) and dengue and it has developed some formulations which have acted as mosquito repellents for filaria and dengue and also as larvicides, said Prof. M.C. Kalita, who has been heading teams of researchers since 1998 in this field.

On the basis of ethno-traditional knowledge, the GU Biotechnology teams have collected and screened over 50 plants that have such medicinal qualities between 1998 and 2009. Seven of those plants were found to have been containing both repellent and larvicidal qualities, said Prof. Kalita.

The first patent right was obtained for the method of extraction of essential oils from the *Cymbopogon winterianus* plant using the clevenger cleisen apparatus for protection against pests, while the second one is for a method of extraction of bioactive compounds from the *Ipomea cornea* plant using solvents for protection against pests, he said.

Since 2011, a project, in collaboration with the Regional Medical Research Centre (formerly Indian Council of Medical Research), Dibrugarh, has been under way on plant-based drug development against malarial parasites (*Plasmodium falciparum*, a major causative agent of cerebral malaria). The project is funded by the Union Department of Biotechnology.

The drug is at the formulation stage and it is expected to be developed by the end of this year. An application has been submitted to the Patent Authority of India in 2014, seeking patent rights over this formulation. Work on the further characterization of drug molecules of the other plants is also on, said Prof. Kalita.

http://www.assamtribune.com

Fluorescence *in situ* hybridization (FISH) test to diagnose malaria

FISH test for diagnosing malaria has been developed by the researchers from US and Mangaluru, using an LED light source, suitable for malaria-endemic countries. Dr. Jyotsna Shah and her team of researchers at ID-FISH Technology Inc, Palo Alto, California, in collaboration with researchers at IGeneX Inc, California; Johns Hopkins University, Maryland; Kenya Medical Research Institute, Nairobi; Nova Meditech and Research Centre, Mangaluru; Kasturba Medical College Hospital, Mangaluru; National Institute of Health, Maryland, have developed the FISH method for detecting malaria infection in blood.

In Mangaluru, Dr. Kakkilaya, Aravinda Rao, biochemist at Nova Diagnostic and Research Centre, contributed by designing and performing experiments and analyzing data, while Dr. Shaila T Bhat and Dr. Ruchi Sinha of KMC Hospital provided materials and analysis tools. This novel method uses fluorescent dye-labelled RNA-specific probes that bind to the malaria parasites and the brightly coloured parasites are detected under a fluorescence microscope. The test takes about an hour and is 98.2% sensitive compared to 89.9 and 81.1% of the Giemsa-stained smear and rapid tests, respectively.

Researchers also successfully evaluated an LED light source with a blue-green filter set that can be attached to a standard light microscope with ×100 objective to read FISH-processed smears. Dr. Kakkilaya said that this simple and cost-effective method will be a boon to India. In 2013 alone, 198 million people were affected by malaria causing 5.84 lakh deaths worldwide.

http://www.deccanherald.com

Patent for novel stem cell drug

Bengaluru-based Stempeutics Research has been granted a process patent for its stem cell-based drug Stempeucel by the State Intellectual Property Office of the People's Republic of China. Stempeutics said that it has become the first company in the world to be granted a patent by the Chinese patent office.

Backed by the Manipal Education and Medical Group and drug maker Cipla, Stempeutics makes stem cell-based drugs or regenerative medicine. It enables living, functional tissues to repair or replace tissue or organ function lost due to age, disease, damage or congenital defects.

The company said that the drug will initially be used for the treatment of Critical Limb Ischemia as it directly addresses the root cause of the disease, unlike other drugs which typically treat the symptoms and not the disease itself.

In March, Stempeutics was granted a US process patent for its stem cell-based drug Stempeucel by the United States Patent and Trademarks Office. Till now, it has invested about Rs 180 crore on the research and development of the drug. The company plans to generate revenues for the first time by selling the drug in India this year and in China in the next 24 months. It has already submitted its applications to Drug Controller General of India to obtain marketing authorization approval for Stempeucel and is waiting for the approvals.

http://articles.economictimes.indiatimes.com

JAPAN

"See-Through" brain developed

Scientists at the RIKEN Brain Science Institute in Japan have developed a new method for creating transparent tissue that can be used to illuminate 3D brain anatomy at high resolutions. Published in Nature Neuroscience, the work showcases the novel technology and its practical importance in clinical science by showing how it has given new insights into Alzheimer's disease plaques.

The new technique creates transparent brain samples that can be stored in ScaleS solution for more than a year without damage. Internal structures maintain their original shape and brains are firm enough to permit the micron-thick slicing necessary for more detailed analyses. On these tests, according to Dr. Miyawaki, ScaleS passed with flying colors providing an optimal combination of cleared tissue and fluorescent signals, and Dr. Miyawaki believes that the quality and preservation of cellular structures viewed by electron microscopy are unparalleled.

The team has devised several variations of the Scale technique that can be used together. By combining ScaleS with AbScale – a variation for immunolabeling – and ChemScale – a variation for fluorescent chemical compounds – they generated multicolor high-resolution 3D images of amyloid beta plaques in older mice from a genetic mouse model of Alzheimer's disease developed at the RIKEN BSI by the Takaomi Saido team.

After showing how ScaleS treatment can preserve tissue, the researchers put the technique to practical use by visualizing in 3D the mysterious 'diffuse'"" plaques seen in the postmortem brains of Alzheimer's disease patients that are typically undetectable using 2D imaging. Contrary to current assumptions, the diffuse plaques proved not to be isolated, but showed extensive association with microglia – mobile cells that surround and protect neurons.

Another example of ScaleS's practical application came from examining the 3D positions of active microglial cells and amyloid beta plaques. While some scientists suggest that active microglial cells are located near plaques, a detailed 3D reconstruction and analysis using ScaleS clearing showed that association with active microglial cells occurs early in plaque development, but not in later stages of the disease after the plaques have accumulated.

http://www.genengnews.com

REPUBLIC OF KOREA

Immunotherapy to treat bronchial asthma

A Republic of Korean research team has successfully developed immunotherapy to treat bronchial asthma and defined the mechanism for the treatment. On September 14, the Ministry of Health and Welfare announced that a joint research team from Chonnam National University and the Institute for Basic Science succeeded in curing asthma-induced mice by injecting flagellin, a protein that forms the filament in a bacterial flagellum and asthma treatment materials that combine asthma-causing allergy antigens into the group of experimental mice.

The research team found out that such a treatment could have similar effects on humans through non-clinical testing that uses dendritic cells extracted from the blood of asthma patients suffering from house dust mite allergy and T cells, a white blood cell that plays an important part of the immune system. Dendritic cells let T cells recognize the penetration of allergy antigens by gobbling up and cutting the antigens short. Those cells can also give directions to T cells as to how to respond.

The research team already has a patent at home and abroad for immunotherapy using flagellin, and proved that the method is safe and stable in the non-clinical testing, which is in its final stages of completion. There is no cure for asthma, and steroids are used to treat the disease. However, the use of steroids for a long time causes side-effects. The newly developed immunotherapy is expected to have far-reaching influence, since it could be used to treat various types of allergic diseases, including atopic dermatitis and food allergies. The research findings were first published online by the *Journal of Allergy and Clinical Immunology*, a medical journal published by Elsevier.

http://www.businesskorea.co.kr

Cancer-blocking nanocomplex

A local research team has successfully developed a technology for a nanocomplex that can safely deliver an immunity-boosting substance to immune cells. The research findings are expected to help cancer treatment become more effective and contribute to the prevention of cancer recurrence. Lim Yong-taek, professor at the School of Chemical Engineering at Sungkyunkwan University, and Park Young-min, professor at the School of Medicine at Konkuk University, announced on June 25 that their research team succeeded in developing a technique for a nanocomplex that protects an immunity-boosting substance so that it can be safely delivered to immune cells around cancer cells.

The research team connected an anionic polymer (hyaluronic acid) with an immunity-boosting substance in an arboriform shape and put a cationic polymer (poly-l-lysine) on it. They were able to maximize the delivery efficiency of the nanocomplex inside cells by creating a monocomplex using the forces of attraction between positive and negative ions. The substances that were used were all friendly to the human body.

http://www.businesskorea.co.kr

SINGAPORE

New technique to observe nano–bio interactions

Researchers at the National University of Singapore (NUS) have developed a technique to observe, in real time, how individual blood components interact and modify advanced nanoparticle therapeutics. The method, developed by an interdisciplinary team consisting clinician-scientist Assistant Professor Chester Lee Drum of the Department of Medicine at the NUS Yong Loo Lin School of Medicine, Professor T. Venky Venkatesan, Director of NUS Nanoscience and Nanotechnology Institute, and Assistant Professor James Kah of the Department of

Biomedical Engineering at the NUS Faculty of Engineering, helps guide the design of future nanoparticles to interact in concert with human blood components, thus avoiding unwanted side-effects. This research was published online in the journal *Small*, a top multidisciplinary journal covering research at the nano- and microscale, on 10 September 2015.

The NUS team, together with external collaborator Professor Bo Liedberg from the NTU, showed highly reproducible kinetics for the binding between gold nanoparticles and the four most common serum proteins: human serum albumin, fibrinogen, apolipoprotein A-1 and polyclonal IgG.

The researchers first immobilized the gold nanoparticles to the surface of a SPR sensor chip with a linker molecule. The chip was specially modified with an alginate polymer layer which both provided a negative charge and active sites for ligand immobilization and prevented non-specific binding. Using a 6 × 6 microfluidic channel array, they studied up to 36 nanoparticle–protein interactions in a single experiment, running test samples alongside experimental controls.

Testing different concentrations of each of the four proteins, the team found that apolipoprotein A-1 had the highest binding affinity for the gold nanoparticle surface, with an association constant almost 100 times than that of the lowest affinity protein, polyclonal IgG. The multiplex SPR system was also used to study the effect of modification with polyethylene (PEG), a synthetic polymer commonly used in nanoparticle formulations to prevent protein accumulation. The researchers found that shorter PEG chains (2–10 kDa) are about three to four times more effective than longer PEG chains (20–30 kDa) at preventing corona formation.

http://www.news-medical.net

EUROPE

GERMANY

Biophysical treatment method for dialysis patients

Researchers at Charité – Universitätsmedizin Berlin have developed a biophysical treatment method that allows up to 50% more toxins to be removed from the blood of dialysis patients. Use of this technology may result in patients with kidney disease seeing a considerable reduction in the length of dialysis sessions. An initial patent application for this technology was filed in 2011. Now, an international medical technology manufacturer has paid a seven-figure sum to secure ownership of the relevant know-how.

Originally developed at Charité, this innovative method breaks new ground in the area of dialysis technology. It utilizes the effect of alternating current fields to remove toxic substances from the blood. Many substances that are produced naturally in the body during the course of normal metabolism become toxic, particularly once their levels in the blood increase. In persons whose kidneys are diseased, and no longer capable of filtering out toxic substances, these levels will continue to increase and, without intervention, that person will die. Until such a time as an affected patient can undergo a kidney transplant, the only option is to undergo regular dialysis.

A proportion of the toxins that need to be eliminated binds to the proteins. However, conventional dialysis techniques have so far been unable to filter out toxins in protein-bound form. "After a long period of development, we have achieved a promising breakthrough," says Prof. Dr. Walter Zidek, Head of Charité's Department of Nephrology and Endocrinology, adding that "this new technology makes it possible to separate toxic substances from proteins. It achieves this by guiding them through an alternate current field of a specific frequency and strength." Prof. Zidek goes on to explain that "once the connection between toxins and proteins has been broken, the toxins can be removed from the patient's blood using conventional dialysis technology, and the patient's overall burden of toxins reduced."

Since first being patented by Charité, the underlying process has undergone further and intensive development, and the technology has now been sold to a large, international medical technology manufacturer. The new technology has considerable potential for application within the health-care industry of the future.

http://www.news-medical.net

Proteins from rice – raw materials instead of waste

As a part of the EU project BIORICE, researchers at the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT in Oberhausen are currently working together with other European partners to develop a process that can harness this valuable raw material. "We have taken a by-product that generated additional expenses and converted it into a valuable commodity that can be used in foodstuffs and cosmetics," says Fraunhofer UMSICHT scientist Dr. Jürgen Grän-Heedfeld. "For this material, that is something new and unique."

First, the Italian project partners at the University of Bologna split the proteins into fragments called peptides. "We separate these peptides according to size, which is to say we sort them," says Grän-Heedfeld. To do this, the researchers use various membranes that work like filters. First they filter the peptides, which are suspended in an aqueous solution, through a membrane with a pore diameter of 0.2 µm. The larger undigested proteins, which can be seen with the naked eye, cannot pass through the membrane. The solution that has passed through is clear, as the peptides contained within are too small to be seen by the human eye. Next, the scientists filter this solution through three additional membranes with different pore diameters, which results in peptides of four different sizes. The advantage of this method is that it employs only physical separation methods without the use of any chemicals, so that the end product is completely pure. By now, the scientists have already successfully increased the scale of the process. Instead of the original 15–200 mm, they are now working with solution volumes of up to 20 l.

In a subsequent step, the scientists dry out the four separated solutions that remain after filtration. To do so, they perform an established and non-damaging process known as freeze-drying, which is also used

for the berries found in breakfast cereals, in addition to spray drying. During freeze-drying, a vacuum extracts moisture from the product and the water vapor is frozen onto a condenser. This process is extremely gentle, but also very energy intensive. The spray-drying process is somewhat rougher on the proteins, but also faster. Here, a nozzle sprays the solution into a current of hot air that dries the protein particles in just fraction of a second. What is then left over is the pure peptide, which looks something like powdered milk. "In this way, we can easily manufacture peptides in quantities of 100–200 g in the laboratory," explains Grän-Heedfeld. The main challenge entails preventing thermal damage and keeping the peptides stable. These are natural products that can easily become discolored or even moldy. "The manufacturing process involves many parameters, and setting them properly requires a great deal of experience and expertise," says Grän-Heedfeld.

The peptides produced using this process are a completely new product, since nothing else currently on the market is derived from the same raw material. Yet to the human body they are already quite familiar. After all, when we eat rice, our stomach breaks it down into even smaller amino acids, which is to say into the building blocks of peptides and proteins.

At the end of the peptide production chain is an SME enterprise headquartered in Switzerland and Italy which will bring them to market. However, before reaching supermarket shelves as ingredients in creams and nutritional supplements, the peptides must still undergo a number of tests and analyses, primarily with regard to their tolerability and effectiveness.

https://www.fraunhofer.de

NORTH AMERICA

CANADA

Stem cell Parkinson's treatment

Researchers at the University of Saskatchewan are teaming up with colleagues at Harvard Medical School in Boston to use stem cells to treat Parkinson's disease. Parkinson's disease attacks the cells in the brain that create dopamine, a chemical that carries action signals through your brain.

Dr. Ivar Mendez of the Saskatchewan Brain Repair Program at the Saskatoon University says when this happens, it causes the loss of function, but new research is hoping to restore those.

The process involves taking stem cells from a patient's skin or blood, and converting them into a brain stem cell which is rich in dopamine neurons. Once they are injected into the brain, the dopamine is released and the broken links begin to be repaired.

Currently, a dopamine chemical is injected into the body with heavy immune suppression so that the body will accept the chemical. In the new method, because a person's own cells are used, the theory is that their body will accept the treatment more easily.

Mendez began transplanting cells that produce the neurotransmitter dopamine into patients in the late 1990s while he was at Dalhousie University. All ten patients implanted with these cells improved significantly. Dr. Ole Isacson of Harvard says if they are successful in this research project, the cells being injected will help restore some function in patients within the first 9 months of treatment.

http://www.thestar.com

USA

Hybrid chip device for reliable Ebola detection

A team of researchers led by scientists at the University of California Santa Cruz has developed chip-based technology, which they hope will allow for the reliable detection of Ebola and other viral-based pathogens. The new device uses direct optical detection of viral molecules and can be integrated into a simple, microfluidic device for use in field situations where rapid, accurate detections of Ebola infections are needed to control outbreaks.

The current gold standard for Ebola detection relies on RT-PCR methods for amplification of viral genes. While this method has been a proven diagnostic technique for infectious diseases like Ebola, it requires the use of specialized equipment and laboratory settings that are often incompatible with field setups.

The findings from this study were published recently in Nature Scientific Reports through an article entitled 'Optofluidic analysis system for amplification-free, direct detection of Ebola infection.'

When the investigators tested the new system in the laboratory, they observed sensitive detection of the Ebola virus, without any false positive detection of two related viruses – Sudan and Marburg. Moreover, the device was able to accurately quantify the Ebola virus over six orders of magnitude.

This hybrid device integrates a microfluidic chip for sample preparation and an optofluidic chip for optical detection of individual molecules of viral RNA. [Joshua Parks]

The system combines two small chips, a microfluidic chip for sample preparation and an optofluidic chip for optical detection. Dr. Schmidt's laboratory has been developing optofluidic technology for over a decade and decided to collaborate with researchers at UC Berkeley to design the microfluidic chip portion of the device, which is composed of a silicon-based polymer with microvalves and fluidic channels to transport the sample between nodes for preparation steps.

The device detects Ebola viral RNA by binding to a matching sequence of synthetic DNA oligonucleotide attached to magnetic microbeads. The microbeads are collected with a magnet, non-target biomolecules are washed off, and the bound targets are then released by heating, labeled with fluorescent markers and transferred to the optofluidic chip for optical detection.

http://www.genengnews.com

Financing for low-carbon technology transfer through bilateral cooperation

Recent progress and case studies of the joint crediting mechanism

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Abstract

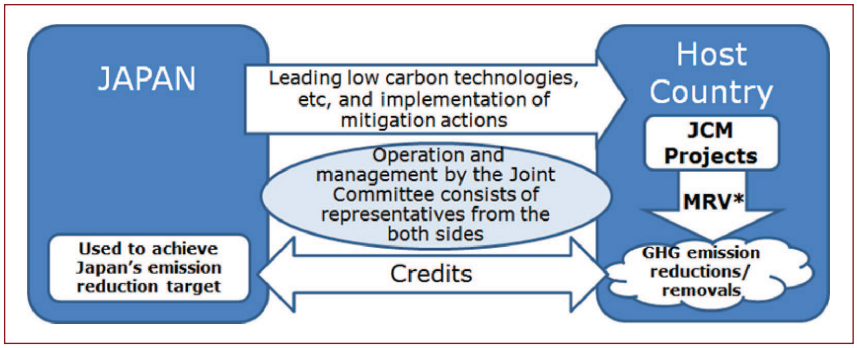
Low-carbon technology is regarded as a key to address climate change, and demands for transferring such advanced technologies to developing countries are largely growing to promote reductions of greenhouse gas emissions. Participation of the private sector to diffuse/scale up such technology is necessary and how to involve the private sector should be addressed. Given such challenges, the government of Japan has proposed the Joint Crediting Mechanism (JCM). This paper focuses on various supporting schemes under the JCM by the Ministry of the Environment, Japan, with three case studies under Financing Programme for the JCM Model Projects. The case studies illustrated the effectiveness of the support in lowering the initial investment cost and enhancing capacity of the project participants to operate sustainably with their maximum performance.

Background

Low-carbon technology is regarded as a key to address climate change, and demands for transferring such advanced technologies to developing countries are largely growing so as to promote reductions of greenhouse gas (GHG) emissions. Given the rapid economic growth of developing countries, further support for accelerating such transfer could enable them to "leapfrog" directly to adopt advanced, cleaner and more efficient technologies. Such technology transfer in turn would contribute to sustainable development of those countries in a long term. Addressing climate change has been discussed under the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) process, providing an overall framework for intergovernmental efforts to tackle challenges caused by the climate change. Parties to the COP have taken decisions on the development and transfer of technologies addressing climate change at each session of the COP since 1994 (Haselip and Trærup 2015; Kypreos and Turton 2011). The consistent demands for technology transfer from developed countries to developing countries originate in Article 4, paragraph 5 of the Convention, which states that "developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly, the developing country Parties, to enable them to implement the provisions of the Convention". Regarding the recent development of the negotiations under the UNFCCC, at its 17th session of the COP (COP17) in December 2011 in Durban, a subsidiary body to develop a new agreement applicable to all Parties was established, and the agreement is to be adopted at the COP21 in December 2015, to come into effect and to be implemented after 2020. This body is called Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), where developing countries require enhanced support including technology development and transfer in order to achieve ultimate objectives of the UNFCCC.

For the purpose of analysing what is missing from the arena of technology development and transfer, technology development cycle could be used, which divides a technology development and transfer process into four stages namely research and development (R&D), demonstration, deployment/scale up and commercialisation (Avato and Coony 2008). The R&D phase tries to solve technical problems and to apply to new technologies and products. Demonstration projects then aim to testify if such new technologies and products could be applicable in the real world or in a larger scale. Further, deployment/scale up and commercialisation could occur when private sector investment increases by believing that fundamental technical barriers are resolved and commercial potential becomes apparent for them (Avato and Coony 2008). However, such belief of ideal conditions for the private sector is rarely met in developing countries due to various challenges such as different business and policy environment compared to developed countries. Participation of the private sector in the later stages of the technology development cycle, in particular the diffusion/scale-up phase, therefore involves great challenges and how to better facilitate such participation has to be addressed.

As a means to facilitate such participation of the private sector and in turn to enhance diffusion of low-carbon technologies from developed to developing countries, there are various financing schemes to support demonstration and diffusion of



Source: GoJ (2015a)

Figure 1: Basic concepts of the JCM

technologies. Among the schemes all over the world, the government of Japan (GoJ) has proposed the Joint Crediting Mechanism (JCM) as a means to facilitate the diffusion of leading low-carbon technologies in developing countries (GoJ 2015a). Japan has held consultations for the JCM with developing countries since 2011 and has established the JCM with 14 countries (as of August 2015). Those countries are namely Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia and Chile. The JCM is designed based on the concepts of: (*a*) facilitating diffusion of leading low-carbon technologies, products, systems, services and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries; (*b*) appropriately evaluating contributions from Japan to GHG emission reductions or removals in a quantitative manner and use them to achieve Japan's emission reduction target; and (*c*) contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals (see Figure 1; MOEJ 2015). Based on these concepts, each of JCM partner countries establishes a Joint Committee (JC) with Japan, consisting of representatives from both the sides. The JC is responsible for developing and revising the rules, guidelines and methodologies, making decision for project registration and discussing the implementation of the JCM.

In the Japan's intended nationally determined contributions (INDC) towards post-2020 GHG emission reductions aim at 26% by Japan's fiscal year (FY, from April to March) 2030 compared to FY 2013 (25.4% reductions compared to FY 2005), and the JCM is articulated as one of the means to achieve the target (GoJ 2015b). In detail, the Japan's INDC states that the JCM is not included as a basis of the bottom-up calculation of the Japan's emission reduction target, but the amount of emission reductions and removals acquired by Japan under the JCM would be appropriately counted as Japan's emission reductions. The JCM is not just an isolated effort of Japan but is one of the various approaches based on Decision 1/CP.18 of the COP under the UNFCCC. The JCM has been jointly developed and implemented by the partner countries and Japan, and Japan intends to contribute in elaborating the framework for such approaches under the UNFCCC.

Having recognised the importance of effective supports for accelerating technology transfer to developing countries, this paper introduces supporting schemes under the JCM to facilitate technology transfer to developing countries together with three case studies. The case studies, in particular, illustrate the state of progress of the JCM at a project level. Based on practical experiences on the ground from the case studies, conclusions and lessons are drawn for further reference in developing countries.

Introduction of financing schemes

The GoJ has launched and implemented various supporting schemes for the JCM, which include financing programmes, demonstration projects, a trust fund, feasibility studies and capacity building programmes. Purposes of the schemes are to assist the private sector to participate in the JCM by supporting implementation of their projects, measurement and reporting of GHG emission reductions achieved by the projects under the JCM, and various other activities. These supporting schemes are conducted by related central ministries, agencies and international assistance organisations. This section summarises such supporting schemes by the Ministry of the Environment, Japan (MOEJ) including several financing programmes and feasibility study. The main focus is on a Financing Programme for JCM Model projects as the programme has led critical achievements in development and concrete implementation of low-carbon technology transfer projects to date.

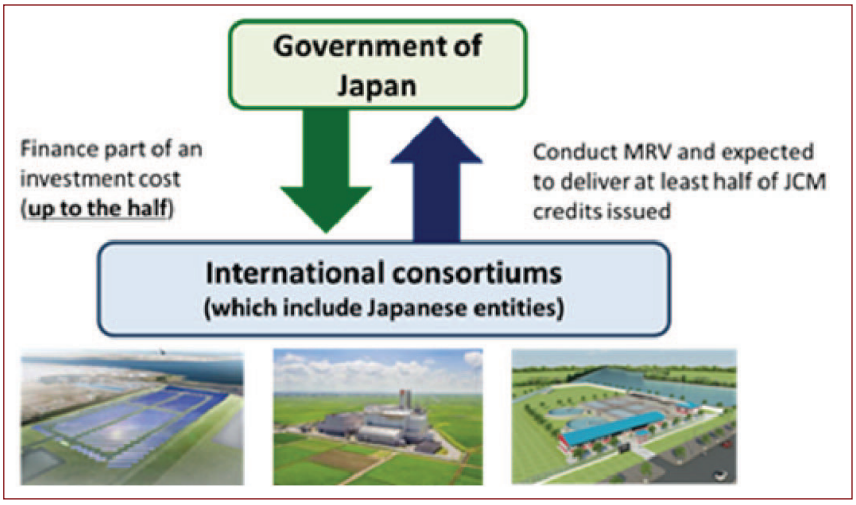
Financing Programme for JCM Model projects

In order to support the implementation of candidate projects for the JCM, the MOEJ has launched the "Financing Programme for JCM Model projects" in 2013. This financing programme aims to implement projects that reduce energy-related CO_2 emissions mainly in the JCM partner countries with advanced low-carbon technologies by supporting a part of the initial investment cost (up to half). In turn, the GoJ seeks obtaining at least half of the issued JCM credits so as to achieve the Japan's GHG emission reduction target. International consortiums, which include Japanese entities, have to be established to implement the projects, to receive the funds, to conduct measurement, reporting and verification (MRV) and to deliver the JCM credits issued (Figure 2). The budget of the financing programme for FY 2015 is JPY 2.4 billion (approximately USD 20 million) per year for 3 years until FY 2017 (JPY 7.2 billion in total). Through this financing programme since FY 2013 as of August 2015, 40 projects in 12 countries in total has been selected as JCM Model Projects, consisting of 17 in Indonesia, 5 in Viet Nam, 4 in Thailand, 3 in Bangladesh and Palau, 2 in Mexico, 1 in Cambodia,

Kenya, Malaysia, Maldives, Mongolia and Myanmar respectively.

Meanwhile, participants of the JCM Model Projects are required to register their projects as the JCM projects. Application for the registration of the projects requires the participants to apply JCM methodologies approved by the JC, with which they calculate the GHG emission reductions achieved by the implementations of the projects. As of August 2015, totally 18 methodologies in 5 countries have been approved. Applying these approved methodologies, seven projects have been registered as the JCM projects with the decisions of the JCs (Table 1). Among a number of projects under implementation, three projects under this financing programme are introduced as case studies in the later section.

Global Environment Centre Foundation (GEC), a public interest incorporated foundation, has been an executive body of the Financing Programme for JCM Model Project under the MOEJ since the establishment of this programme. GEC has conducted public offering of JCM Model Project, examination and screening of proposed projects, progress management of each project and inspection of installed equipment at the commissioning phase. Feasibility of technology introduction and superiority of the technology are reviewed through the screening phase by GEC, and if selected as the JCM Model Projects, leading low-carbon technologies would be transferred to JCM partner countries under the programme. GEC also has managed some of the schemes introduced below, and further information including details of the ongoing financing projects and results of feasibility studies could be found in its website (GEC 2015a).



Source: GoJ (2015a)

Figure 2: Outline of the Financing Programme for JCM Model projects by MOEJ

Table 1: List of JCM registered projects (as of 31 August 2015)

Country	Reference number	Project title	Registration date
Indonesia	ID001	Energy Saving for Air-Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller	31 October 2014
Indonesia	ID002	Project of Introducing High Efficiency Refrigerator to a Food Industry Cold Storage in Indonesia	29 March 2015
Indonesia	ID003	Project of Introducing High Efficiency Refrigerator to a Frozen Food Processing Plant in Indonesia	29 March 2015
Palau	PW001	Small Scale Solar Power Plants for Commercial Facilities in Island States	21 April 2015
Mongolia	MN001	Installation of High-Efficiency Heat Only Boilers in 118th School of Ulaanbaatar City Project	20 June 2015
Mongolia	MN002	Centralization of Heat Supply System by Installation of High-Efficiency Heat Only Boilers in Bornuur soum Project	30 June 2015
Viet Nam	VN001	Eco-Driving by Utilizing Digital Tachograph System	4 August 2015

Source: MOEJ (2015)

Other financing schemes to support implementation

Collaborative financing programme supported by JICA and other governmental affiliated financial institutes

This scheme was launched in 2014, aiming to finance the projects that have the better efficiency of reducing GHG emissions in collaboration with other projects supported by Japan International Cooperation Agency (JICA) and other governmental affiliated financial institutions, and in turn acquiring the JCM credits. The budget for FY 2015 is JPY 1.8 billion (approximately USD 15 million) per year by FY 2018 (JPY 7.2 billion in total).

ADB Trust Fund

Having been launched in 2014, this scheme is to provide financial incentives for deploying the advanced low-carbon technologies to ADB-financed projects, which are superior in GHG emission reductions but require the high investment cost. The budget of this fund for FY 2015 is JPY 1.8 billion (approximately USD 15 million). One project entitled "Smart Micro-Grid System for Preparing Outer Islands for Sustainable Energy Development (POISED)

Project in Maldives" has been selected as the first project under this scheme so far and expected to be registered as the JCM project.

JCM REDD+ Model Projects

The MOEJ launched JCM REDD+ Model Projects in FY 2015 with a view to support implementation of projects for "reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries (REDD+)". As like the above-mentioned financing schemes, the GoJ aims to seek obtaining the JCM credits from the emission reductions and removals under these JCM REDD+ Model Projects and to use the credits to achieve the Japan's GHG emission reduction target. The total budget for the FY 2015 is JPY 80 million (approximately USD 662 thousand) and two projects have been selected under this scheme.

Schemes to support feasibility studies

The MOEJ also has supported feasibility studies so as to increase candidate projects for the JCM into its pipeline. The studies could include elaboration of project implementation plans, investment plans and development of MRV methodologies for JCM project formation. There are three types of the studies and applicants for conducting the studies could choose appropriate schemes depending on maturity and scale of their project plans and ideas. The first type is a JCM Planning Study (JCM PS), which is to make solid project plans to develop JCM Model Projects in the next fiscal year. Such plans should include detailed financial, construction and operational plans for implementation of the JCM Model Projects. Also elaboration of the MRV methodologies should be conducted to ensure the study to be registered as the JCM projects. The second one is a JCM Feasibility Study (JCM FS) to survey potential projects/activities which could be implemented under the JCM in future. The third one is a Large Scale JCM FS, aiming to survey the feasibility of potential large-scale JCM projects including city-to-city collaboration so as to utilise knowledge and experiences of the Japanese city and regional low-carbon development.

Case studies

Examples of JCM Model Project which lead to technology transfer are introduced in this section with a view to provide on-the-ground information of the projects and to gain some lessons from the experiences. Each case summarises an overview and progress of the project, technical information of the technologies being installed, and how technology transfer to local counterparts is planned or actually occurring.

Introducing high-efficiency refrigerator to a food industry cold storage in Indonesia

This JCM Model Project aims to save energy by introducing a high-efficiency refrigerator to the two different plants in Indonesia (GEC 2015b). A project participant from Japan is Mayekawa Mfg. Co., Ltd (Mayekawa), and those from Indonesia are PT. Adib Global Food Supplies (PT. Adib) and PT. Mayekawa Indonesia. Mayekawa is one of the most advanced companies in manufacturing industrial refrigeration compressors. PT. Adib is a food supplying company owning a food industry cold storage and a frozen food processing plant in West Java Province, Indonesia, and PT. Mayekawa Indonesia is a subsidiary company of Mayekawa.

Mayekawa introduced a high-efficiency natural refrigerant (NH3/CO2) cooling system named NewTon which realised more advanced energy-saving functions and safety in comparison to conventional refrigerators. On the top of the installation of such hardware technology, Mayekawa and PT. Mayekawa Indonesia have conducted on-the-job training (OJT) and provided a manual on operation, maintenance and safety measures of the facilities introduced to PT. Adib. A number of staffs of PT. Adib have participated in the OJT and learned about the facilities using a manual provided both in English and Indonesian languages for better understanding. In addition, a non-hardware type of supports including maintenance services after installation of the facilities are to be provided by PT. Mayekawa Indonesia, thereby the cooling systems installed are expected to continuously operate under optimal conditions.

Two different plants have been, respectively, registered as JCM projects (Reference IDs are ID002 and ID003) by the JC between Indonesia and Japan in March 2015 (GoJ 2015c, d). Saving energy leads to reduce electricity consumption, and as a result these projects are expected to reduce GHG emissions from electric power plant for 140 tCO2e (ID002) and 25 tCO2e (ID003) per year, respectively.

Such advanced cooling systems have not been diffused in developing countries including Indonesia because of its high investment cost and unrealised demands in the local market. Such difficulties were addressed with an effort made by MAYEKAWA to transfer the technology as well as with a support of the financing program for JCM Model Projects which lowered the initial investment cost.

Power generation by waste-heat recovery in cement industry

This JCM Model project aims to generate electricity by recovering the waste heat released from cement production plant in Indonesia (GEC 2015c). A project participant from Japan is JFE Engineering Corporation (JFEE) and the project participant from Indonesia is PT. Semen Indonesia (Persero) Tbk. JFEE is an engineering company which has advanced original technologies including technologies of waste heat recovery (WHR) power generation. PT. Semen Indonesia (Persero) Tbk is the largest cement manufacturing company in Indonesia and with this project the company aims to replace electricity currently purchased from PT. PLN (Persero) with electricity generated by the system to be installed. With the system, PT. Semen Indonesia expects to reduce huge electricity consumption of the cement plant given continuous increase of the electricity charge so as to avoid negative impacts on their business. Originally, this project was developed through the JCM PS in FY 2013. After the completion of the study, JFEE applied to the Financing Programme for the JCM Model Project in FY 2014 and then was selected.

The technology to be introduced is a WHR system consisting of boiler, turbine generator and cooling tower for the existing cement production plant of PT. Semen Indonesia, located in Tuban, East Java, Indonesia. The WHR system utilises waste heat exhausted from the cement production process without any use. The WHR boilers generate steam using the waste heat, and the steam is fed to the steam turbine generator to generate electricity. In pursuit of ensuring technology transfer on the ground, JFEE invited the engineers of the Tuban cement production plant to Japan through the JCM PS. The engineers joined a lecture of designing the WHR systems and visited a major equipment fabrication. During their visit, JFEE and the engineers from Tuban also worked together for establishing simple and reliable monitoring methods of GHG emission reductions, which are employed in the JCM methodology. Through such capacity building activities and during the course of the project, operation and monitoring methods of the WHR system have been effectively transferred to the Indonesian side.

As a progress, this project is at an installation phase, and commissioning would be completed in FY 2016. The JCM methodology applicable to this project has already been approved by the JC between Indonesia and Japan (Reference number is "ID_AM001") (GoJ 2015e). Applying the methodology, this project is expected to reduce GHG emissions for approximately 122,200 tCO2e per year.

The installation of the WHR system has not been occurred widely in Indonesia while such technology has been a standard in many of developed countries. This is partly because ancillary facilities including the WHR systems are not for production facilities that could expand their business. Thus, the installation of the WHR systems could not have been a priority for private companies in Indonesia with their projection to meet the growing demand in future. Given the conditions, the JCM Model Project incentivises the installation of the WHR system by lowering the initial investment cost as well as explaining long-term benefits from reducing energy consumptions, complemented by training support under the JCM PS.

Introduction of amorphous high-efficiency transformers in power distribution systems

This project aims to introduce amorphous high-efficiency transformers to power distribution systems of Electricity of Viet Nam Southern Power Corporation (EVN SPC) and expects to reduce transmission losses of the systems (GEC 2015d). A project participant from Japan is Yuko-Keiso Co., Ltd. and the project participant from Viet Nam is EVN SPC. Yuko-Keiso Co., Ltd. is an engineering company which is in charge of overall project management and technical support. In addition, Electrical Equipment Company (THIBIDI) is a Vietnamese enterprise specialised in manufacturing and supplying various kinds of transformers and it manufactures amorphous high-efficiency transformers and delivers them to EVN SPC. The amorphous alloy is produced and supplied by Hitachi Metals, Ltd.

Approximately 1,618 amorphous transformers are planned to be introduced to the power distribution systems. There are two sources of power loss in transformers: load losses and no-load losses. Load losses are losses of electricity due to resistance in the electrical winding of the transformer while no-load losses are losses of electricity due to transformer core magnetising of energising. Amorphous metal core reduces the no-load losses and improves energy efficiency of transformers compared with conventional steel type (i.e., silicon steel) core. In considering to effectively transfer the technology, EVN SPC and THIBIDI were invited to a study tour to Japan and visited an amorphous core factory. This tour was planned with a view for the Vietnamese companies to deepen their understanding of the advanced technologies, and in turn to build local capacity for manufacturing amorphous high-efficiency transformers in Viet Nam. In reality, the THIBIDI was able to manufacture the high-efficiency transformers by utilising amorphous alloy supplied by Japanese company. Such cooperation and supports with provision of not only hardware but also non-hardware technologies including training, knowledge sharing and capacity building would contribute to sustainable development in Viet Nam. While such study tour was conducted, the project is at a phase of installing the transformers, and is expected to complete in FY 2016. A JCM methodology applicable to this project has been proposed by methodology proponents (Yuko-Keiso Co., Ltd. and Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.) and under consideration by the JC between Viet Nam and Japan as of August 2015 (Reference number is "VN_PM006") (GoJ 2015f). GHG emission reductions by this project are expected to be approximately 623 tCO2e per year.

Transfer of the amorphous transformers, which have higher energy efficiency, has been challenging because the transformer with silicon steel core has been commonly installed in Viet Nam due to its low price. Moreover, power companies in Viet Nam have tendering specifications for no-load losses when procuring transformers and a requirement of this specification is not high. Thus, it tends to result in the silicon steel core, which is less efficient compared to the amorphous one, to be selected. Given the situation, the financing programme for JCM Model Project supported EVN SPC to install the amorphous transformers with the lower cost and as a result achieving reduction of electricity losses and in turn GHG emissions. Building the local capacity has also contributed to form better understanding of the benefits to install such advanced technology too.

Conclusions and the way forward

In addressing climate change, low-carbon technology transfer is of critical importance to obtain concrete mitigation impacts on GHG emission reductions. Given the challenges for involving the private sector in enhancing diffusion of the technologies, provision of effective financing schemes appears to be necessary. As introduced above, the JCM has been successful in increasing its number of projects in a short period of time, since its establishment in 2013 and some have been already registered as the JCM projects by the JC between partner countries and Japan. Financing supports for the diffusion/scale-up phase of technology cycle could be one of the effective ways to enhance participation of the private sector that has advanced low-

carbon technologies, including Financing Programme for the JCM Model Projects.

The case studies illustrated how such support contributed to effective technology transfer to the developing countries, complemented by the efforts for enabling sustainable operations on the ground. Without any support, the initial investment cost of such advanced technologies would be higher compared to the cost of technologies commonly employed in developing countries. Thus, project participants in developing countries tend to choose technologies with the lower initial investment cost, producing more GHG emissions. However, with the effective use of the financial support, the initial cost of the investments in advanced technologies are reduced and therefore such technologies have better chance to be installed. Moreover, the effectiveness and advantages of the technologies could be better understood by participants in developing countries through the support as well as actual experiences of reduction in electricity cost and as a result further diffusion/scale up could be facilitated. Such benefit could be even greater when combined with non-hardware type assistance for technology transfer, including various types of training and knowledge sharing supports. In each of the three case studies, project participants in developing countries experienced the training support by those holding technologies so as to transfer operational knowledge and experiences including study tours, OJTs and operation manuals. Such support could enable those participants to operate sustainably with maximised performance to reduce GHG emissions.

Given the progress of project development under supporting schemes for the JCM, the advanced low-carbon technologies are expected to diffuse and scale up more rapidly in developing countries when facilitating better involvement of the private sector. Such efforts towards enhancing technology transfer would result in significant GHG emission reductions and further contribute to solid sustainable development in a long term.

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Unitary air conditioning in Asia

Market trends and potential of climate-friendly and energy-efficient alternatives

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Abstract

The global demand for refrigeration and air conditioning (RAC) has grown rapidly in the last decades resulting in increasing greenhouse gas (GHG) emissions with high global warming potential (GWP). By 2030, the cooling sector could be responsible for up to 13% of global GHG emissions (GCI, 2014). Unitary air conditioning (UAC) appliances make up the largest share of global RAC market with the highest contribution to GHG emissions from the sector. They are a key target area in decoupling GHG emissions from future RAC markets. This article provides insights on the GHG mitigation potential that can be achieved in the Asian market through energy-efficient split air conditioning systems that use natural refrigerants with negligible GWP.

Introduction

Driven primarily by population growth, an increasing middle class, changing lifestyles and rising ambient temperatures, the global demand for refrigeration and air conditioning (RAC) has grown rapidly in the last decades. Increasing consumption and production trends are especially apparent in many developing countries and emerging economies in Asia.

As the demand for cooling rises, the resulting greenhouse gas (GHG) emissions – both from electricity consumption as well as emissions of refrigerants with high global warming potential (GWP) – are also growing rapidly. By 2030, the cooling sector could be responsible for up to 13% of global GHG emissions (GCI, 2014). Unitary air conditioning (UAC) appliances make up the largest share of global RAC market volume. Among the RAC subsectors, they also have the highest contributions to GHG emissions from the sector. They are, therefore, a key target area in decoupling GHG emissions from future RAC markets.

This article provides insights on the GHG mitigation potential achievable in the Asian market through energy-efficient split air conditioning (SAC) systems using natural refrigerants with negligible GWP. It summarizes current market developments and introduces and compares the technology alternatives. The roles of Minimum Energy Performance Standards (MEPS) and of different refrigerants are also highlighted. Latest developments in the large UAC markets in India and China are presented to illustrate the market introduction of climate-friendlier alternatives. Finally, recommendations on how to accelerate the transition away from high-GWP refrigerants and towards climate-friendlier and less energy-intensive air conditioning in Asia are provided.

Unitary air conditioning

UAC is a subsector of RAC technologies predominantly used by households and in commercial buildings such as offices, hotels and stores. Among the different units covered by the UAC subsector,[1] SAC units account for approximately 76% of the market volume (BSRIA, 2015) and are the focus of this article. Cooling capacities (i.e., the ability to remove heat) are on average between 2 and 5 kW.

The efficiency of SACs is given as energy efficiency ratio (EER) – that is, the total cooling capacity in watt per energy consumption in watt (calculated using a defined inside and outside temperature at full cooling capacity). The EERs of current UACs in the market typically range from 2.5 to 4, with the latter indicating higher efficiency. To account for different cooling needs and systems which do not run at full capacity, the seasonal energy efficiency ratio (SEER) is used. SEER is calculated using a defined inside temperature and a range of outside temperatures. Currently, the EER is still more commonly used or provided, especially in countries with little variation in ambient temperature. In general, these performance ratings allow for universal quantification and energy comparison of cooling systems. Deviant measurement conditions should, however, be taken into account when comparing EERs from different countries (CLASP, 2011). The EER serves as a metric for MEPS, which are regulatory measures that specify the level of energy efficiency that needs to be satisfied by appliances entering the market.

The increased use of UACs contributes considerably to the rapidly growing GHG emissions in the RAC sector. On one

[1] Other appliances in the UAC subsector included in this analysis: moveable ACs, window or through-the-wall ACs, self-contained units, ducted split units.

hand, indirect emissions come from the combustion of fossil fuels to generate electricity to cover the energy demand of ACs. On the other hand, direct emissions result from the leaks of refrigerants with high GWP such as hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). These leaks usually occur during AC manufacture, operation, service and improper disposal at the end of the product life cycle.

The most commonly used refrigerants for SACs in developing countries are HCFC-22 and HFC-410A. Due to their ozone-damaging characteristics, HCFCs just as their predecessors chlorofluorocarbons (CFCs) are phased out globally under the Montreal Protocol. The most commonly used refrigerant substitute is still HFC-410A an HFC blend. Both HCFC and HFC substance groups are highly damaging to the climate, with GWP values for HCFC-22 and HFC-410A at 1,760 and 1,924, respectively (IPCC, 2013).

Market overview and GHG emissions in the Asian UAC subsector

As the level of affluence increases in most parts of Asia, more and more people are able to afford cooling to deal with high ambient temperatures. This is especially evident in urban areas where people live in close quarters with little space for natural ventilation. Not only is Asia a key market for the UAC systems, some of the major manufacturers are also based in this region.

In 2012, the production capacity for UAC units was estimated to be at 225 million units (Glöel *et al*., 2014). The exceeding production capacity over the annual sales volumes reflects market expectations from producing companies for a continuously growing demand in the UAC subsector (Gloël *et al*., 2014). The most significant UAC-producing countries are found in Asia and SE Asia, making up 90% of the world's UAC production capacity. The growing demand for UAC units is also shown by increasing sales figures. In 2014, for instance, about 64 million units were sold globally and this figure is predicted to increase by more than 4 times by 2030. About 47% of the units sold in 2014 were in Asia, with the biggest sales found in China, Japan and India (Figure 1).

According to estimates of the Green Cooling Initiative (2014), the global UAC

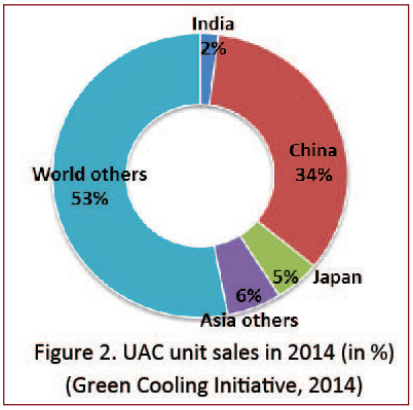

Figure 2. UAC unit sales in 2014 (in %) (Green Cooling Initiative, 2014)

Figure 1: UAC unit sales in 2014 (in %) (Green Cooling Initiative, 2014)

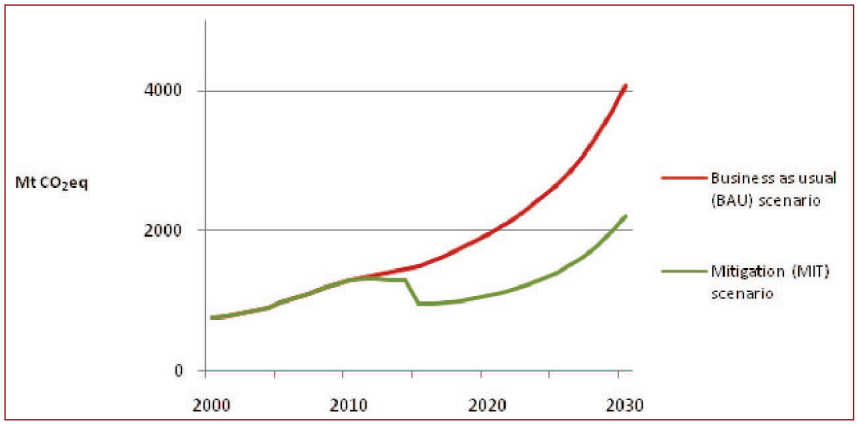

Figure 2: Emissions in the UAC subsector (in Mt CO_2eq) (Green Cooling Initiative, 2014)

subsector emitted about 1,300 Mt of CO_2 eq in 2010. Of the total emissions, approximately 20% stem from direct emissions and 80% from indirect emissions. Under a business as usual (BAU) scenario, the global emissions are expected to be more than triple by 2030 (GCI, 2014). Around 60% of the emissions in 2010 come from Asia and by 2030, the share of emissions from Asia is expected to increase to 74% under the BAU scenario. With the use of climate-friendly and energy-efficient alternatives, a total of about 1,870 Mt of CO_2eq in the UAC subsector can be avoided globally in 2030 compared to the BAU scenario (Figure 2).

Climate-friendly and energy-efficient UAC alternatives

SACs make the major share of UAC systems, which bear a large potential for energy and GHG savings. A climate-friendly SAC is defined here as a device that uses refrigerants with negligible GWP (1-3) and with high energy efficiency to minimize the resulting direct and indirect GHG emissions.

Manufacturers can significantly reduce the direct emissions by changing the refrigerant and the design of a UAC model during product planning stages. Commonly used refrigerants such as HCFC-22, HFC-410A and HFC-32 can be replaced with HC-290 which has a significantly lower GWP (Table 1). However, as HC-290 is flammable, safe production and use of respective appliances need to be ensured by using gas detection devices, separating electrical and refrigerant-containing components, and limiting refrigerant charge quantity in the AC unit according to international safety standards. Due to the flammability of HC-290, there are currently no HC-290 split ACs with capacities higher than 1.5 TR.[2] Installation and servicing should be carried out by factory-trained technicians and service personnel extensively trained on safety procedures (Rajadhyaksha *et al*., 2015).

Reducing indirect GHG emissions is mainly subject to improving the level of energy efficiency, which depends on the refrigerant, climatic conditions and cooling capacity. Optimizing the main components such as compressor or heat exchanger also significantly increases the

performance efficiency of UAC systems (Gloël *et al*., 2014). An integrated inverter allows systems to run at part load by altering the compressor speed, enabling them to match changing cooling needs over different seasons. Combined with additional building control systems that automatically adjust devices to the desired cooling comfort, this can result in additional electricity and cost savings.

Moreover, several studies (e.g., Wang *et al*., 2015 and Rajadhyaksha *et al*., 2015) show that the use of hydrocarbon refrigerants can provide greater energy efficiency. Their specific thermodynamic properties enable better performance, especially at high ambient temperatures. Results of the latest energy performance assessments undertaken by the SAC manufacturers Godrej & Boyle in India (Rajadhyaksha *et al*., 2015) and Haier in China (Haier, 2015) indicate that HC-290 split AC units with capacities of 1 and 1.5 TR have higher EERs than similar-sized units running with HCFC or HFC refrigerants. More specifically, they found that:

- In India, HC-290 split AC models sold in the market with a capacity of 1 TR (3.37 kW) and 1.5 TR (5 kW) have an EER of 3.72. According to India's national labeling scheme, this corresponds to the highest performance rating of five stars. In comparison, similar units using HCFC-22, HFC-410A or HFC-32 have been tested and resulted in EERs ranging from 3.51 to 3.6 (Rajadhyaksha *et al*., 2015).
- In China, HC-290 AC models from Haier with a capacity of 1.5 TR (5 kW) and an EER of 3.78 are available in the market. Comparable HCFC-22 models with 1.5 TR (5 kW) have an EER of 3.48 (Haier, 2015).

Establishing climate-friendly UACs in the region: country cases

India

The constantly rising use of air conditioning in India is apparent and can be partially attributed to the growing middle class in the region. This trend puts increased stress on the electricity grid, to which the government has responded with measures for promoting energy efficiency. One of these measures is the introduction of MEPS in the AC sector. Also, a product-specific labelling scheme (i.e. one to five stars) informs consumers about efficiency, with one star indicating the MEPS to enter the market. In January 2012, legislation came into force to raise the energy efficiency standards by about 8% for split air conditioners for the same rating category by January 2014. The current MEPS, valid until December 2017, allow units with an EER of 2.7 or higher to enter the Indian market. Figure 3 shows the MEPS of the previous years as well as the EER for the product weighted average (according to sales) and for the best available product.

In 2012, the demand for UACs was estimated at 3.4 million with two-thirds being SACs (Gloël *et al*., 2014) and an annual growth rate of around 10%. About 95% of the SACs have cooling capacities of 3.5 kW and 5.0 kW. According to research of the Lawrence Berkeley National Lab (2014), the number of installed SACs in India will grow from 4 to 116 million, increasing electricity consumption from 8 terawatt hours (TWh) in 2010 to 239 TWh in 2030. Consequently, SACs represent the technology with the largest emission reduction potential resulting from higher energy efficiency and the use of a natural refrigerant.

Fixed-speed SACs with HC-290 and an EER of 3.7 are already available in the Indian market (Rajadhyaksha *et al*., 2015). Labelled with five stars, they are among the most energy-efficient units available. According to Godrej and Boyle (2015), more than 180,000 of these units have been sold so far and a similar technology with an inverter is planned to be introduced to the market in 2016.

According to estimates by GCI (2014), the UAC sector in India was responsible for approximately 146 Mt CO_2eq p.a. in 2014, a figure expected to increase to

Table 1: Refrigerant status, GWP, energy efficiency and cost (adapted from Jaiswal *et al*., 2015)

Refrigerant	GWP	Energy efficiency	Refrigerant cost	Subject to patent
HCFC-22	1760	High	High	Yes
HFC-410A	1924	Low	High	Yes
HFC-32	677	High	Medium	Yes
HC-290	3	High	Low	No

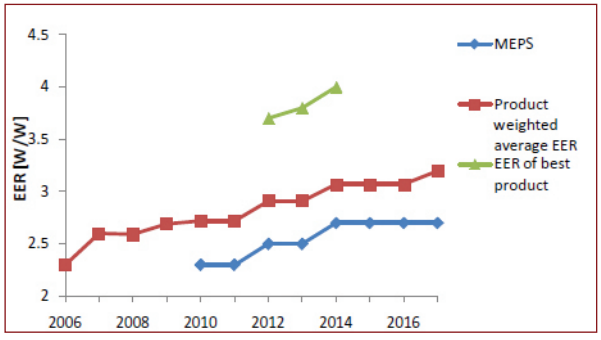

Figure 3: SAC efficiency development in India (adapted from BEE database, 2015 and Mehtani, G., 2013)

[2] A ton of refrigeration is a unit of power to describe the heat-extraction capacity of refrigeration and air conditioning equipment. It is defined as the heat absorbed by melting 1 ton of pure ice at 0°C (32°F) in 24 h. One TR is equal to around 3.5 kW.

up to 477 Mt CO_2eq p.a. in 2030. A more accelerated transition from F-gas refrigerants to HC-290 with an EER higher than 3.72 could lead to a reduction of approximately 43.5 Mt CO_2eq p.a. of direct emissions and about 199 Mt CO_2eq p.a. of indirect emissions by 2030. This is equivalent to almost half of the projected BAU emissions. This mitigation potential can be realized with the introduction and enforcement of more ambitious MEPS in combination with a phase-down of HFCs as refrigerants and the progressive introduction of HC-290.

China

The number of UAC units sold in China was estimated at 27.6 million for the year 2015 (GCI, 2014). At the same time, China is the largest producer and exporter of this appliance worldwide. Moreover, the installed stock of split ACs is projected to grow from approximately 250 million in 2010 to approximately 350 million in 2030 (CLASP, 2013).[3] Consequently, under a BAU scenario, energy consumption and associated direct and indirect emissions will grow rapidly. If the emissions follow the BAU course, the annual electricity consumption will increase from approximately 290 TWh in 2010 to approximately 360 TWh in 2030 (CLASP, 2013). This corresponds to a 24% increase in the annual electricity consumption over 20 years. As for the emissions, estimates by the Green Cooling Initiative (2014) show that they were at approximately 582 Mt CO_2eq p.a. in 2014 and could increase to 2,220 Mt CO_2eq p.a. by 2030 in a BAU scenario. Introducing more climate-friendly and energy-efficient SAC systems can result in emission reductions up to approximately 426 Mt CO_2eq p.a. for direct emissions and approximately 419 Mt CO_2eq p.a. for indirect emissions, resulting in an emission reduction of 38%.

In order to slow down growing energy demand, the Chinese government has introduced mandatory comparative energy labels in 2005 covering several product types including SACs (Energy Efficient Strategies and Maia Consulting, 2014). Figure 4 shows the trend in MEPS for SACs of previous years as well as the weighted average EER (number of units produced × EERs of respective unit) and best available product offered.

As indicated, the average energy efficiency of air conditioners has improved in recent years since the introduction of MEPS. For fixed-speed air conditioners, the standard was implemented in 1989 and revised in 2004 with the latest version being implemented in 2010. Compared to the version from 2004, the minimum requirement has been increased significantly by 0.6, which means that the former class 2 limit of the energy label at an EER of 3.10 was set as the new MEPS in the cooling capacity range 4.5–7 kW.

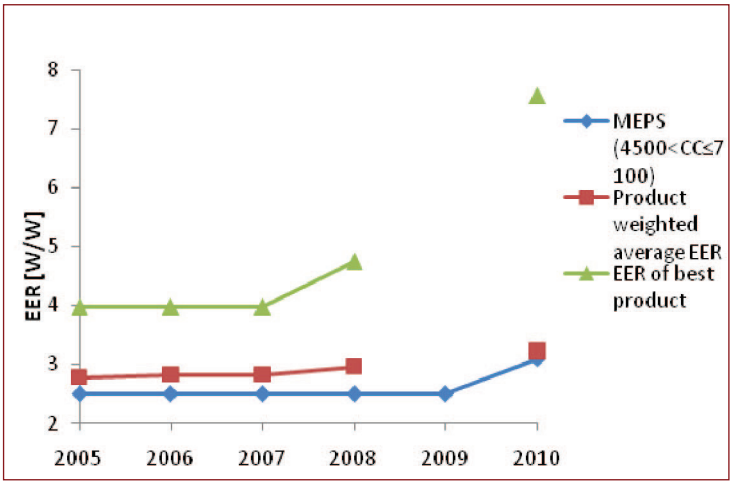

Figure 4: SAC efficiency development in China (adapted from Cooling benchmarking study, 2011 and Chinese energy standards)

Moving forward: recommendations

Climate-friendlier and energy-efficient SAC options are already available in Asia's largest SAC markets. They have also been proven to be commercially viable, providing the foundation for respective technology transfer and spill-over effects to other Asian markets such as Thailand and Indonesia. Current international negotiations of parties to the Montreal Protocol indicate a high likelihood for a global HFC phase down in the short term.[4] Shifting towards the refrigerant HC-290 with optimal efficiency features and maximum climate benefits also bear a key advantage for local SAC manufacturers. Converting the production now to hydrocarbon refrigerants instead of HFCs could save them costly changes in the future. In addition, unlike HCFCs or HFCs, hydrocarbons are free of any patent rights and are already used for other purposes in many Asian markets. Producing companies are, therefore, well advised to advance on efficiency improvements in combination with the most climate-friendly refrigerant HC-290.

The successful market penetration of highly energy-efficient and climate-friendly SACs can be enabled by setting the right framework conditions. MEPS and labelling schemes, for example, are crucial and complementary measures for this purpose. Through the introduction and enforcement of MEPS, less-efficient products are eliminated in the market. MEPS work hand in hand with labelling schemes, which inform end users about energy-efficiency levels and thus push for their continuous improvement. Japan, China, India and the Philippines, for instance, already have mandatory MEPS for room split AC in place, while in Indonesia and Thailand, these are still under development (CLASP, 2014).

In order to be effective, MEPS and labeling schemes require proper monitoring and periodical review to keep up with the latest efficiency developments. Penalties such as

[3] Values derived from figures 1 and 2 in CLASP, 2013.
[4] See: http://www.ictsd.org/bridges-news/biores/news/countries-eye-hfc-amendment-to-the-montreal-protocol.

imposing a fine or take-back requirements for manufacturers with improperly labeled appliances can be effective enforcement instruments to discourage incorrect product performance classifications. Further, the government itself can expedite the market introduction of climate-friendly appliances through mandatory government green procurement schemes oriented at top labeled appliances.

Introducing concepts that account not only for energy efficiency but also for the overall GHG footprint over the lifetime of an appliance could be used in a systematic approach for encouraging higher energy efficiency and lower climate impact. The concepts of total equivalent warming impact (TEWI) and life cycle climate performance (LCCP), for example, ensure that the GHG footprints of the refrigerants used are also accounted for. For instance, appliances with a lower TEWI or LCCP relative to their EER can be rewarded with an EER bonus for setting the MEPS and labeling classifications.

The establishment of independent SAC performance testing facilities and standardized certification of manufacturers, installers, and service technicians are also critical requirements for a stable market access. In turn, this can lead to an improved skill force and enhanced quality of technologies. Finally, moving towards climate-friendly and energy-efficient RAC entails long-term social and economic benefits. By minimizing harm to the environment, the well-being of the immediate community is enhanced. The transition toward climate-friendly and energy-efficient UAC market, therefore, is a promising building block for Asia's growing economies on their path to decoupling GHG emissions from economic development.

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Climate Investment Funds

Clean Technology Fund

The $5.3 billion Clean Technology Fund (CTF) is a funding window of the CIF. It is empowering transformation in middle income and developing countries by providing resources to scale up the demonstration, deployment, and transfer of low carbon technologies with a signicant potential for long-term greenhouse gas emissions savings.

CTF concessional financing, channeled through partner multilateral development banks, is boosting investor condence and attracting signicant co-financing from other sources by:

- Driving down technology costs
- Supporting first-movers
- Bridging financing gaps
- Creating markets
- Innovating private sector finance

The CIF continues to test new modalities to address barriers that hinder private sector participation in climate action. The Dedicated Private Sector Programs (DPSP) were created under the CTF to finance large-scale private sector projects with greater speed and efficiency in response to market demand, while maintaining country priorities. To date, a total of $508.5 million has been allocated to programs in geothermal power, mini-grids, mezzanine finance, energy efficiency, solar PV, and early-stage renewable energy.

Strategic Climate Fund

The Strategic Climate Fund (SCF) is one of the two funds of the Climate Investment Funds. It serves as an overarching framework to support three targeted programs with dedicated funding to pilot new approaches with potential for scaled-up, transformational action aimed at a specific climate change challenge or sectoral response.

Targeted programs under the SCF include:

The Forest Investment Program (FIP), approved in May 2009, aims to support developing countries' efforts to reduce emissions from deforestation and forest degradation by providing scaled-up financing for readiness reforms and public and private investments. It will finance programmatic efforts to address the underlying causes of deforestation and forest degradation and to overcome barriers that have hindered past efforts to do so.

The Pilot Program for Climate Resilience (PPCR), approved in November 2008, was the first program under the SCF to become operational. Its objective is to pilot and demonstrate ways to integrate climate risk and resilience into core development planning, while complementing other ongoing activities.

The Program for Scaling-Up Renewable Energy in Low Income Countries (SREP), approved in May 2009, is aimed at demonstrating the social, economic, and environmental viability of low carbon development pathways in the energy sector. It seeks to create new economic opportunities and increase energy access through the production and use of renewable energy.

Through its targeted programs, SCF is designed to:

- Provide experience and lessons through learning-by-doing.
- Channel new and additional financing for climate change mitigation and adaptation.
- Provide incentives for scaled-up and transformational action in the context of poverty reduction.
- Provide incentives to maintain, restore and enhance carbon-rich natural ecosystems, and maximize the co-benefits of sustainable development.

For more information, access:

Web: https://www-cif.climateinvestmentfunds.org

Case analyses of low-carbon technology transfer from the co-benefit perspective

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Abstract

This article presents two case analyses of low-carbon technology transfer between Japan and China. One technology is waste heat recovery power generation in cement kiln (WHR system) and the other is co-processing of wastes using cement kiln, namely the CKK system (Conch Kawasaki Kiln System). The WHR system has significant co-benefit in the reduction of air pollutants and carbon emissions. The co-benefit of CKK technology is the improvement of local social welfare. There is no financial barrier for the application of WHR, whereas policy barriers exist for the diffusion of CKK technology. It is expected for the CKK system to enjoy preferential electricity pricing policy and tax reductions as are available for general waste-to-power facilities. The success in the transfer of target technologies may be attributed to the symbiotic business model comprising the related companies.

Introduction

China has been experiencing rapid economic growth while suffering from severe pollution. The pressure on greenhouse gases (GHG) emissions reduction has been also increasing in China. Correspondingly the Chinese government made considerable efforts in energy saving and pollution reductions. By 2015, energy consumption per unit gross domestic product (GDP) is to decrease by 16% and CO_2 emission per GDP is to decrease by 17% from 2010 levels. The emissions of major pollutants are to drop significantly (State Council, 2011). According to the 'US-China Joint Announcement on Climate Change' issued on 12 November 2014, China intends to peak in CO_2 emissions in around 2030 and make the best efforts to peak earlier (Xinhua News, 2014).

For a long time, air quality management and climate change mitigation have been treated as two distinct issues. However, more and more research has shown that measures for conventional air pollutant control and GHG emissions mitigation are more closely related than previously thought. Climate policy and pollution control policy explicitly factor into these synergies (Li *et al*., 2012). Considering the high priority for China to simultaneously resolve local pollution problems and global climate challenges and aiming to facilitate discussions on co-benefit strategies, this research carry out case analyses of international technology transfer and highlights good practices in the transfer and expansion of technologies with co-benefit effects from Japan to China.

Based on the review of the first adoption of target technologies in China, managers and technical experts in the technology adopting and supplying companies were interviewed to clarify their experiences and barriers for technology introduction and operation. The co-benefit effects of the technologies in carbon mitigation and pollution reduction were roughly estimated. Accordingly, policy suggestions are proposed for overcoming the barriers in the wider adoption of target technologies.

This article is arranged as follows. Section 2 explains how the two cases were selected, as well as the research activities. Sections 3 and 4 individually describe the two case studies in detail – that is, the features of the target technology, the first adoption by the company, the diffusion status of the technology, estimation of the technology co-benefit and the findings from hearing interviews. Section 5 summarizes the results of hearing interview to the technology supplier in Japan. Lastly, Section 6 gives a short summary.

Selection of the cases and research activities

This analysis selected two technologies with co-benefit effects as the research targets. Both technologies are used in the cement industry and originated from Kawasaki Heavy Industries, Ltd. (KHI) of Japan. One is waste heat recovery power generation in cement kiln (WHR system), and the other is the co-processing of wastes using cement kiln, namely the CKK system (Conch Kawasaki Kiln System). The two technologies are at different diffusion stages. Among which, the WHR system has been widely applied in China's cement industry, especially for the large plants that employ the new suspension pre-heated dry process (NSP). The CKK system is at the early phase of application in China. This analysis identifies the experiences enabling smooth diffusion of the WHR system and the difficulties involved with expansion of the CKK system, and provide meaningful evidence for co-benefit technology transfer.

The geographical locations of the two companies firstly adopting the target technologies are depicted in Figure 1. Both companies are subsidiaries of Anhui Conch Cement Company Ltd., namely Conch Cement, with headquarters in Wuhu city of Anhui Province. Case 1 is the WHR system, adopted by Ningguo Cement Plant (hereinafter NGP), located in the county-level city of Ningguo. Case 2 is the CKK system adopted by Tongling

Figure 1: Geographical location of the case studies

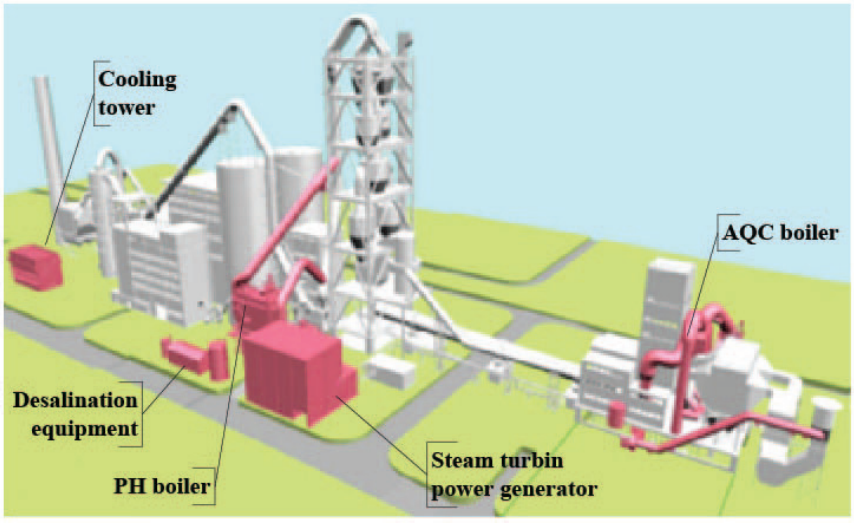

Figure 2: Technological process of WHR system (adapted by author from KHI, 2013)

Conch Cement Limited (hereinafter TLC), based in Tongling city.

The site visits and interviews in China were coordinated by China Cement Association (CCA). Before the visit, a list of questions was prepared for the technology adopting companies. To conduct a complete observation for the transfer and application of the target technologies, an additional visit to the technology supplier in Japan was arranged. The hearing interview with the manager in charge of target technologies in Japan was coordinated by Hyogo Environmental Advancement Association (HEAA) due to its link with the target expert.

Case 1: waste heat recovery power generation in cement kiln (WHR system)

Technological process and characteristics of WHR system

The technology process of the WHR system is simply depicted in Figure 2. In clinker production utilizing the new dry-type process, a mass of waste heat contained in cooler exhaust gas and pre-heater exhaust gas is recovered, respectively, by an air quenching cooler (AQC) boiler and pre-heater (PH) boiler. The superheated steam produced in these boilers is used to drive turbines, which then transform heat into mechanical energy and finally drive the power generator to produce electricity for use in cement production.

There are several features of the Kawasaki-Conch WHR system. Firstly, flashing technology is adopted in the thermodynamic system to achieve high efficient heat recovery. Another feature is the adoption of a low-pressure parameter design. The system can recover low-quality waste heat and achieve the lowest outlet gas temperatures as possible. Thirdly, a mixed steam type condensing turbine/generator is used. For a 5,000 t/d clinker production line, the actual power generation capacity can reach 9.5–10 MW. The fourth advantage of this system is the use of a horizontal PH boiler, which ensures high heat exchange efficiency by a mechanical hammering dedusting device, and requires less maintenance compared with vertical boilers.

Adoption of WHR system by NGP

In August 1995, the former China National Planning Commission and Japan New Energy and Industrial Technology Development Organisation (NEDO) signed an agreement for WHR system demonstration and committed the project implementation to NGP and KHI. This WHR system was equipped for a 4,000 t/d line in NGP as a pilot project involving Sino-Japan cooperation for integrative energy utilization and was the first case in China's cement industry. Construction commenced on 18 October 1996 and operations started on 6 March 1998. The designed capacity of this WHR system is 6.48 MW with an annual electricity generation of 54,000 MWh. A photo of the project signboard is shown in Figure 3.

Since the start of operation, this pilot WHR system has been running smoothly maintaining an actual capacity of 7.2 MW. The project is appreciated by the governments and experts of Japan and China owing to its outstanding social and economic benefits, and it plays a positive role in the diffusion of WHR technology in China.

Diffusion of WHR system in cement industry

Conch Cement took the lead in constructing a large-scale WHR system after the successful pilot project in NGP. By

importing the advanced technology of KHI and key parts of PH boilers, Conch Cement and KHI constructed ten WHR systems with a total power generation capacity of 163 MW for 18 clinker production lines in 7 subsidiary factories by January 2005. For further diffusion of the WHR system, KHI and Conch Cement consecutively established three joint ventures during 2006 to 2009, as listed in Table 1.

The first one is Anhui Conch Kawasaki Engineering Co., Ltd. (ACK), which was set up in December 2006. This engineering company focuses on the design, procurement and installation of energy-saving and environmental facilities, with WHR systems as a core product. The other two companies are equipment manufacturers; one is Anhui Conch Kawasaki Energy Saving Equipment Manufacturing Co., Ltd (CKM), established in October 2007, and the other is Anhui Conch Kawasaki Equipment Manufacturing Co., Ltd (CKE), established in August 2009. As a result, the WHR system has been largely adopted in subsidiary plants of Conch Cement and other cement companies in mainland of China and outside China. Details of WHR diffusion by ACK are given in Table 2.

At the end of August 2013, a total of 256 clinker production lines based in 23 provinces and municipalities of China had been equipped with WHR systems. The number of power generation systems is 183, with a total power generation capacity of 2071.96 MW. There are also 11 WHR systems established for 19 clinker production lines abroad, most of which are based in other Asian developing countries. Their total power generation capacity is 152.01 MW.

Figure 3: Signboard of WHR pilot project in NGP (taken by author)

Table 1: Joint ventures established by KHI and Conch Cement

No.	Name and abbreviation	Date established	Main products	Investors and shares
1	Anhui Conch Kawasaki Engineering Co., Ltd. (ACK)	December, 2006	Design, procurement and installation of energy saving and environmental equipment	KHI: 50% China Conch Venture Holdings Limited: 50%
2	Anhui Conch Kawasaki Energy Saving Equipment Manufacturing Co., Ltd. (CKM)	October, 2007	Boiler, vertical mill and energy saving and environmental equipment	KHI: 50% China Conch Venture Holdings Limited: 50%
3	Anhui Conch Kawasaki Equipment Manufacturing Co., Ltd. (CKE)	August, 2009	Cement manufacturing equipment, i.e., NSP (New Suspension Preheater) and AQC (Air Quenching Cooler)	KHI: 50% Anhui Conch Cement Company Limited: 50%

Co-benefit effects of WHR system in NGP

During the site visits, actual operation results of the pilot WHR system in NGP from January to October 2014 were collected. The average electricity generation per ton of clinker production was stable at 35.81–38.89 kWh. The total electricity generation fluctuated monthly due to changes in the production amount of clinker; the highest was in the month of October with a total of 5271.9 MWh electricity being generated; the lowest was in July with a generation of 2579.2 MWh. During the first 10 months of 2014, a total of 46855.3 MWh was generated. If this figure was annualized, the electricity generation in 2014 would be 56226.4 MWh, and based on an average NGP electricity price of 0.70 Yuan/kWh, the economic benefit is around 39.36 million Yuan.

For estimation of the co-benefits of this pilot WHR system in NGP, the pollutants selected for the calculation are SO_2, NO_x and PM2.5 because these pollutants severely affect municipal air quality in China. Using the electricity generated in 2014 and the emission factors of CO_2 and air pollutants of East China grid, the co-benefits of the WHR system can be simply calculated. As a result, the pilot WHR system in NGP can avoid CO_2 emissions of

Table 2: Status of diffusion of WHR system by ACK (at the end of August 2013)

No.	Area	No. of production lines	Production line scale (t/d)	No. of power generators (Sets)	Total capacity (MW)
1	Anhui	50	270,200	29	443.26
2	Gansu	3	14,500	3	22.3
3	Guangdong	10	62,000	6	108
4	Guangxi	10	47,500	6	85.5
5	Guizhou	20	75,600	16	139.3
6	Hebei	18	74,500	15	179.3
7	Henan	7	40,000	6	75.6
8	Heilongjiang	3	15,000	2	27.1
9	Hubei	3	12,000	2	20
10	Hunan	12	58,500	10	103.3
11	Jilin	11	38,500	6	67.6
12	Jiangsu	19	89,000	11	158.1
13	Jiangxi	7	27,500	5	46.9
14	Liaoning	7	32,500	5	57
15	Inner Mongolia	3	15,000	3	21.7
16	Shandong	10	42,000	7	70.7
17	Shanxi	4	19,500	4	34.2
18	Shaanxi	13	57,000	9	105.1
19	Sichuan	11	49,000	11	87.6
20	Yunnan	17	48,000	14	84.2
21	Zhejiang	2	10,000	2	17.3
22	Chongqing	12	46,500	8	78.9
23	Xinjiang	4	23,200	3	39
Subtotal in China		**256**	**1,167,500**	**183**	**2071.96**
24	Parkistan	6	28,000	3	41.94
25	Thailand	7	42,000	4	70.3
26	Turkey	2	4,870	1	8.72
27	Myanmar	1	4,000	1	6.2
28	Viet Nam	3	20,600	2	24.85
Subtotal in abroad		**19**	**99,470**	**11**	**152.01**
Total		**275**	**1,266,970**	**194**	**2,223.97**

Sourced from: http://www.conchventure.com

43,496.7 tCO_2/a. Meanwhile, the reduction of SO_2 emissions is 98.4 t/a, the avoided emissions of NO_x is 91.1 t/a, and the reduction amount for PM2.5 is 17.43 t/a.

Findings from the hearing interview in NGP

After the study tour of the pilot WHR system in NGP, a meeting was arranged with the company managers and technical staffs. The discussion mainly covered the history of the pilot WHR project in NGP, and experiences for the adoption of this technology.

For the implementation of the pilot WHR system in NGP in 1990s, the former National Planning Commission (restructured and named National Development and Reform Commission (NDRC) as of March 2003) and the former National Building Materials Bureau (NBMB) were responsible for this project in cooperation with NEDO at the Japan side. At the business level, KHI and NGP cooperated for the installation and operation of the WHR system. KHI was responsible for the installation of equipment and training of the local staff. NGP provided support

such as in the construction of civil facilities. From the economic viewpoint, the investment of the pilot WHR system was not attractive at the beginning due to the low price of coal and electricity. The price of coal was around 90 Yuan/t and the price of electricity was only 0.08 Yuan/kWh at that time. Currently, the price of coal is about 500 Yuan/t and electricity is around 0.5 Yuan/kWh in Ningguo city. Along with the increase in energy prices, the WHR system provided economic savings.

The equipment of the pilot system has been operated and maintained well. A total of around 0.85 billion kWh of electricity was generated over the past 16 years. As confirmed by NGP, the WHR system has encountered no problems with technology and maintenance. The power generation amount of the WHR system is around 40 kWh/t clinker. Investment in the WHR system was about 6,000 Yuan per kW. The total initial cost was 25–30 million Yuan for a WHR system with a power generation capacity of 3.5–4.2 MW. Due to the technology maturity and advantage in profitability, the WHR system was quickly diffused throughout the cement industry of China during 2007 to 2012. Subsidies from the government – for example, rewards for energy saving and income from the CDM projects, were useful for promoting the rapid diffusion of this technology.

One barrier mentioned by the interviewees for the adoption of WHR system in other areas of China is the difficulty in connecting to the regional power grid. Normally, electricity generated by the WHR system is used by the cement companies internally and would not be sold externally. However, the system has to be connected to the external power grid before it starts running. In some regions of China, power grid departments are reluctant to approve connection of the WHR systems of cement companies to the grid. This delays the construction and operation of related WHR systems in cement companies of the region. The joint venture, ACK, has been making efforts to export this technology to cement companies abroad, like India, Pakistan, Brazil, Thailand and Viet Nam, where over 20 WHR facilities have been established to date. Another possible direction for application of the technology is to use it in other sectors.

Case 2: co-processing of wastes using cement kiln (CKK system)

Technological process and characteristics of CKK System

The CKK system was developed jointly by KHI and Conch Cement. It is an environment-friendly waste gasification system. The technological process of the CKK system is depicted in Figure 4.

The CKK system is the first in the world to add a waste incinerator to an existing cement plant and combine the cement production and waste treatment processes. In this system, municipal solid wastes and/or sludge are gasified in the gasification furnace. The generated gases are injected into the cement production processes to effectively utilize the heat energy. Amounts of fossil fuels like coal used in cement kilns can be reduced and CO_2 emissions can be mitigated accordingly. The slag generated in the gasification furnace is used as raw material for cement production and, therefore, the final disposal of fly ash and slag from conventional waste incineration facilities is not necessary. In addition, the dioxins generated from waste treatment are completely decomposed in the cement kiln, which obviates the need for procuring specific equipment for the treatment of hazardous materials.

Besides the control of dioxins and recycling of slag, heavy metals are solidified into cement clinker within the national standard while these pollutants need to be treated by separate equipments in the mechanical grate incinerator (MGI) facility. It is usually difficult to control odorous pollutants in MGI, whereas under the CKK system, the garbage pit is enclosed and in a negative pressure state the odorous pollutants are sent to a gasification furnace for combus-

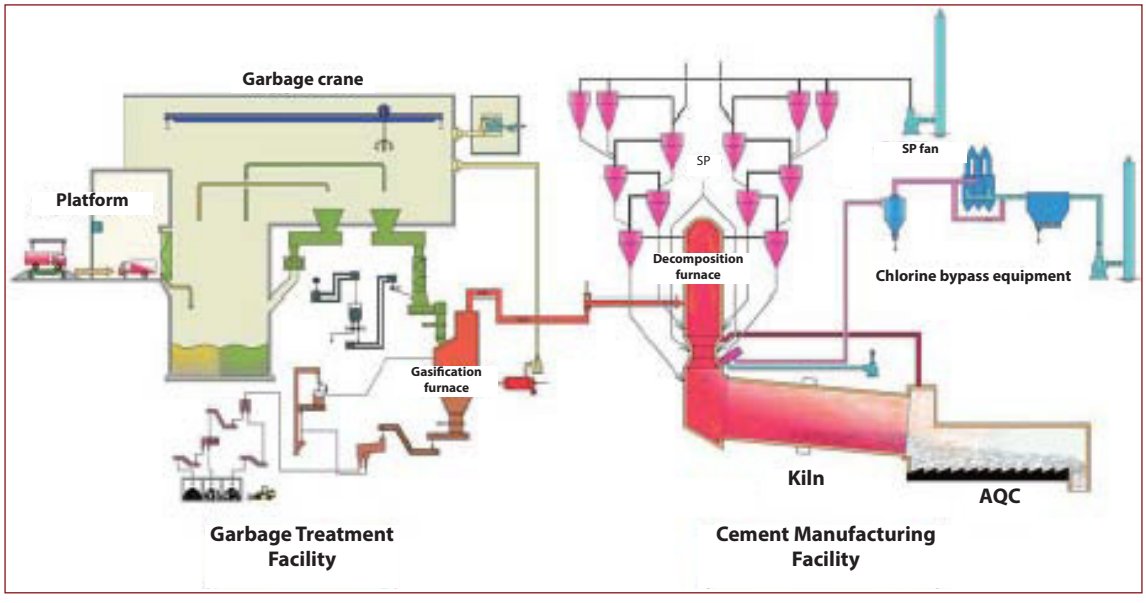

Figure 4: Technology process of CKK system (adapted by author from JASE, 2014).

tion. Leachate can be soundly processed in the CKK system. The leachate is injected into the gasification furnace or cement kiln and the organics are completely decomposed. In an MGI plant, leachate has to be treated by a sewage treatment station.

Since the waste treatment of the CKK system is built on the existing cement plant, the area needed is much smaller than an MGI plant with the same scale. The initial investment and operation cost of a CKK system are lower than MGI plants. For an MGI facility with a treatment capacity of 300 t/d, the investment is around 150 million Yuan. For the first application case in TLC, the actual investment was around 90 million Yuan. The operation cost for municipal solid waste treatment in an MGI plant is around 80 Yuan/t currently in China, while for a CKK system it is about 60 Yuan/t.

Adoption of CKK system in Tongling Conch Cement Ltd.

The CKK system was firstly adopted in TLC as a demonstration project. It was intended to utilize two TLC cement kilns, each having a production capacity of 5,000 t/d, for the treatment of 600 tons of municipal solid wastes per day. The final treatment amount is 0.2 million tons per year. Initial investment was estimated at around 150 million Yuan and operational costs for the treatment of per ton of waste are about 70 Yuan with a total cost of about 220 Yuan. The construction of the first CKK facility started in October 2008. This system, with a treatment capacity of municipal solid waste of 300 t/d was put into operation on 10 April 2010.

Tongling municipal government is responsible for the collection and transportation of municipal solid wastes to TLC. TLC is in charge of the storage, shredding and gasification of the wastes. Initially, the daily treatment amount was less than 300 t due to insufficient supply of municipal solid waste from the city. Since the second half of 2013 and along with the increase in waste collection, the daily treatment amount is around 310 t under stable operation.

Efforts to diffuse CKK system in China

The advantages of the CKK system have been gradually recognized in China. Some additional CKK systems have been planned, approved or under construction. The adoption status of CKK systems in China is given in Table 3. Among which, Guiding Conch built a CKK system with daily treatment capacity of 200 t. Unlike TLC, this project was financed by Guiding County government and has been operated by Guiding Conch since October 2013. The actual waste collection amount is around 100 t/d and the system is under intermittent operation with a daily treatment amount of 200 t. Another 14 CKK projects were at the agreement-signing stage with local governments at the end of 2014, either in the process of approval or in construction. The total treatment capacity of all 16 projects currently in approval, constructed or operation is 3,600 t/d.

Co-benefit effects of CKK system

The co-benefit effects of the CKK system can be estimated in comparison with other optional treatment of municipal solid wastes. There are normally three methods: sanitary landfill, incineration and composting. Sanitary landfill is the main

Table 3: Adoption status of CKK systems in China

No.	Province	Construction location	Capacity (t/d)	Status	Time
1	Anhui	Tongling (Phase I)	300	Operating	April 2010
2	Guizhou	Guiding	200	Operating	October 2013
3		Zhunyi	400	Signed agreements with the local governments and under approval or construction	
4		Guiyang	300		
5		Shuicheng	200		
6		Xishui	200		
7		Tongren	100		
8	Gansu	Pingliang	300		
9	Guangdong	Yangchun	200		
10	Chongqing	Zhongxian	200		
11	Hunan	Qiyang	300		
12		Shuangfeng	200		
13		Shimen	200		
14	Sichuan	Nanjiang	200		
15	Guangxi	Fushui	300		
16	Yunnan	Baoshan	200		
In total			3,600		

Note: In addition, around 8 CKK system projects are under application or planning in provinces of Guangxi, Hunan, Anhui, Shaanxi, Guangdong and Guizhou.

approach for the treatment of municipal solid wastes in China. Of the total amount treated, the share of sanitary landfill is around 72% and the share of incineration is 25% (Dai, 2014).

Information sourced from the Conch Cement website indicates that a CKK system with a treatment capacity of 600 t/d may avoid methane emissions from the landfill equivalent to 150,000 tCO_2 per year. For the pilot CKK system in TLC with a capacity of 300 t/d, its effects in CO_2 emissions reduction is about 80,000 tCO_2/a compared with a landfill of the same amount of municipal solid wastes.

There is no quantitative estimation of the co-benefit of the CKK system in comparison with MGI facility. However, according to a performance comparison of the TLC production line over 15 months before the CKK system was introduced and 46 months since the system started operation, clinker production was reduced by 6.72 t/h, electricity consumption per ton of clinker was increased by 2.85 kWh, standard coal consumption was reduced by 1.36 kg/t clinker, and waste heat recovery power generation was increased by 2.02 kWh/t clinker. Due to the high moisture of municipal solid wastes in Tongling city, the reduced coal consumption in cement kilns is almost balanced by the increase in electricity use for clinker production. The energy saving of the CKK system is realized as an increase in power generation of the combined WHR system. As confirmed by TLC, the benefit of the CKK system is mainly the contribution to social welfare due to the sanitary disposal of municipal wastes.

Findings from the hearing interview at TLC

An interview meeting was arranged with the manager and technical experts of TLC to hear about their experiences in operating the CKK system and opinions for the diffusion of this technology.

As of 26 November 2014, the CKK system in TLC treated a total of 460,132.8 tons of municipal solid wastes. The local government pays 185 Yuan per ton of municipal solid waste. The capacity of the CKK system in TLC for sludge treatment is 100 t/d (80% wet weight). The price for sludge treatment is only 135 Yuan/t currently and much lower than actual costs. The new price, assumed to be 316 Yuan/t is under negotiation with the government. Practical operation of the CKK system in TLC for over 4.5 years indicates various advantages of this technology, that is, ability to adapt to different waste composition, decomposition of dioxins, leachate treatment, control of odorous substances, recycling of waste and so on.

The CKK system has advantages in economic performance, too. As mentioned earlier, the total investment for TLC was 124 million Yuan including the common facilities for the second phase project. The investment for Guiding plant was 77–78 million Yuan with a capacity of 200 t/a. There are two business models for the CKK system application so far. One is the company self-investment like the CKK system in TLC. The other is a project invested in by local government – for example, the CKK system in Guiding Conch of Guizhou Province. In this case, the cement company is in charge of the operation for waste treatment and the local government pays only the operation fee to the cement company.

There do exist management and policy barriers for the adoption of the CKK system in China. Although certain policies have been issued to encourage the use of cement kilns for the treatment of wastes, there are lack of specific and operational policies. For example, the co-processing facilities are not included in municipal infrastructure plans. It is also difficult for the waste co-processing project to pass environmental impact assessments. Municipal solid wastes and sludge in China are currently managed by the administrative region, imposing geographical limits on the nearest treatment of wastes, especially for the operation of treatment facilities near borders of adjacent administration areas. An additional problem is the insufficient supply of wastes and sludge. Government departments in charge of municipal solid waste and sludge differ according to area. Cement companies have to negotiate with each of the cities in question. Some local governments do not authorize cement companies to handle wastes, and even for those that receive permission, the municipal department responsible for waste collection and transportation may be reluctant to supply sufficient wastes to the co-processing facilities due to benefit considerations. The fourth difficulty for cement companies to adopt the CKK system is that they cannot obtain sufficient economic compensation. The cost for the co-processing of municipal solid waste is around 130 Yuan/t, but many local governments would pay less than 100 Yuan/t. The cost for treating sludge exceeds 300 Yuan/t while payments currently are much less than this.

Some other barriers also exist. For instance, experts in charge of examining environmental impact assessment reports are reluctant to support these new kinds of project. Awareness of local governments is low. In consequence, it takes time to persuade these key stakeholders to recognize the advantages of waste co-processing in cement kilns. Another limitation is the location of cement companies. In northeast China, cement plants usually stop production for about 4 months over winter. During this period, countermeasures have to be considered for the waste storage or treatment by alternative approaches.

The interviewees in TLC expressed high expectations for the CKK system to enjoy preferential electricity pricing policy and tax reductions for the general incineration of municipal solid wastes. According to the 'Notice of National Development and Reform Commission on Improving the Price Policy of Municipal Solid Waste Incineration Power Generation' (NDRC, 2012), these facilities are paid by the grid electricity converted from the amount of municipal solid wastes transported into the plant. Each ton of municipal solid waste is tentatively converted to 280 kWh and the benchmark electricity price is 0.65 Yuan/kWh (including tax). This price is much higher than that of the grid electricity generated by coal-fired power plants with desulfurization systems. In addition, referring to MOF, SAT & NDRC (2008), the waste co-processing equipment, such as the gasification furnace and shredding

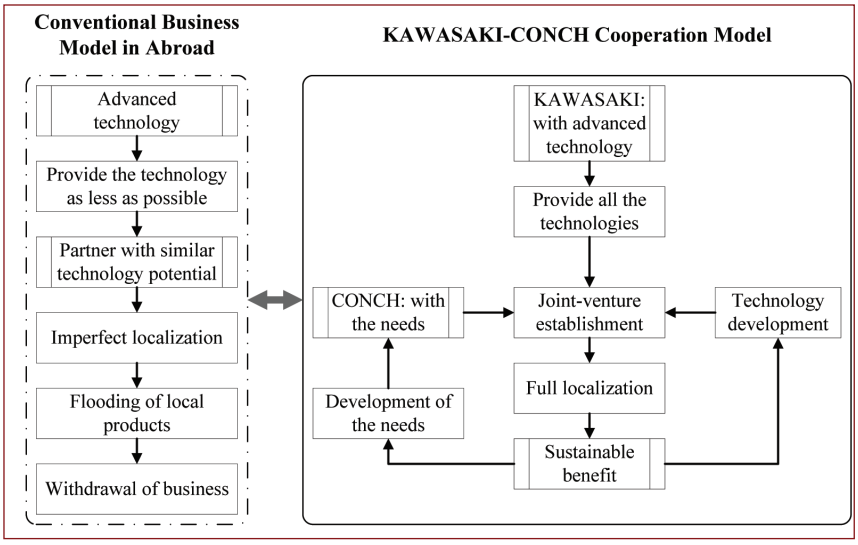

Figure 5: Business model of Kawasaki-Conch cooperation (adapted by author from KHI, 2013)

machine, should be eligible for the preferential tax policy but is still excluded. If included as a policy target, 10% of the investment for these equipments may be deducted from the corporate income tax. Providing these economic incentives would likely encourage cement companies to invest in the CKK technology.

Viewpoint of technology supplier in Japan

In order to obtain the opinions of the supplier of target technologies, an interview was arranged with the responsible manager of KHI. The results are as follows:

As mentioned earlier, KHI and Conch Cement established joint ventures to promote the application of energy-saving technologies, including the two technologies in this research. In the beginning, there was strong resistance to the technology cooperation internally at KHI. However, the final decision to provide the technology was attributed to the strong leadership of KHI top management at that time. Figure 5 shows the successful model of cooperation between KHI and Conch Cement in comparison with the conventional business model for the application of Japanese advanced technologies abroad.

Conch Cement is a cement manufacturing company and has needs for the technologies of KHI. It has no similar technology potential with KHI and there is no competitive relationship between the two companies. On the contrary, their advantages are complementary; KHI is strong in technology development and engineering design, while Conch Cement is strong in facility operation. Both sides have worked together for technology localization and further development. In the joint ventures, KHI is responsible for technology development and management – that is, design optimization, quality assurance and development of overseas markets and Conch Cement is responsible for procurement, engineering management and development of the domestic market in China. The interviewee at KHI mentioned that at the outset it was somewhat difficult to work together. However, the technology was gradually fine tuned to the local conditions. For technology development and improvement, some patents have been applied for jointly in both countries. Further efforts have been made in forming a patent network for the protection of intellectual property rights. KHI's view is that, as regards technology localization, relationships with local business partners requires mutual benefits, trust, top management leadership, as well as nurturing of technology and human resources for technology transfer to succeed.

The WHR system was only adopted by 13 Chinese cement plants in 15 years independently by KHI before the establishment of the joint venture in 2006, while cases of adoption rapidly climbed to 144 plants in 5 years during 2007–2011 after the joint venture was established. For the CKK system, there were initially some technical problems, mainly as regards inappropriate design due to lack of know-how of Chinese technical staff. Such problems were soon resolved under the guidance of KHI.

Regarding the transfer of Japanese technologies abroad, the NEDO criteria of the need to subsidize the pilot projects of technologies is problematic, as is the need for the candidate technology to be of the latest design and backed up by cases of successful implementation. These strict requirements act as a barrier to Japanese companies for obtaining financial support from NEDO, which therefore hinders the smooth transfer of technologies.

Summary

This study conducts case analysis from the perspective of transfer of co-benefit technologies from Japan to China. One is the WHR system, which has been largely diffused, and the other is the CKK system, which is at the preliminary stage of wide dissemination. Due to the lack of available information, the co-benefits of target technologies could only be roughly estimated. Through on-site visits and interviews at the technology adopting and supplying companies, the experiences and barriers for technology transfer and adoption were identified. For the WHR system, as the technology is mature and an economic advantage is present, there were no difficulties in its application. However, for the CKK system, there exist management and economic barriers hindering its wide adoption. It is a priority to enhance the awareness of stakeholders on the merits of waste co-processing in cement kilns. Economic incentives, such as financial subsidies, tax reductions for procurement of major equipment and appropriate payment for the wastes treated, need to be put in place to encourage cement companies to invest in this technology.

Acknowledgements

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Geospatial technology development for mitigating natural disaster in Indonesia

Perspectives on policy, investment and business prospects

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Abstract

Indonesia is one of the most vulnerable countries experiencing natural disasters. All of these are due to its location in the ring of fire lines and at the cross sections of three active tectonic plates. The natural disasters would damage infrastructure and disrupt socioeconomic activities. This paper attempts to share a new breakthrough involving geospatial technology developed in the country to reduce the worst unpredictable losses of the disasters. It would help all phenomena to be mapped. Such a technology is based on spatial approaches to record and monitor all related activities in disaster management of the country. It could be applied by periods, pre and post-disasters, to estimate damage and losses due to natural devastations. Several types of the utilization for geospatial technologies in disaster management comprise radar interferometry, InaSAFE, InaWARE and so on. To support and overcome the obstacles encountered in the utilization of the technologies, Indonesia has set up relevant policy and regulations.

Introduction

Official data from the United Nations state that Indonesia is the largest archipelago in the world consisting of 13.487 islands. In terms of geology and morphology of the region, Indonesia sits astride ring of fire and spreads dozens of active volcanoes, especially in Java and Sumatera islands (Figure 1). Moreover, Indonesia is located in the cross section of three major tectonic plates such as Eurasia, Pacific and Indo-Australia plates.

Indonesia becomes one of the world's most vulnerable countries to natural disasters such as earthquake, tsunami, volcano eruption, flood and so on. Several natural disasters occurred in Indonesia such as the eruption of the Krakatau volcano in 1883, earthquake and tsunami in Nanggroe Aceh Darussalam in 2004, earthquake of West Sumatera in 2009 and currently the eruption of the Sinabung volcano in 2015.

Natural disasters in any country in the world could happen unavoidably without any prediction and prevention. Natural disaster would cause physical damage and thus it might have a great impact on the economy in that region. Indonesia is the country with the biggest economy in Southeast Asia because it has diverse and abundant natural resources, and locationally strategic. Therefore, if natural disaster occurs then it may greatly affect the economic growth of the country. According to the Urban Planning and Disaster Management of Ministry of National Development Planning board for Indonesia/BAPPENAS-Rep of Indonesia, over the last ten years a number of infrastructural losses caused by disasters in Indonesia reached Rp 162 trillion. Meanwhile, according to the Head of Data, Information, Public Relations of National Disaster Management Agency/BNPB, the losses suffered from January to February 2014 were of more than Rp 26.75 trillion, with a basis of USD 1.00 equals to Rp14,000.

To resolve such a problem, one would need a new breakthrough involving a technology that is day by day more and more properly adaptable. This paper discusses the role of geospatial technology to mitigate natural disaster in Indonesia. The technology, in this context, is based on spatial aspects and location-based service (LBS). Such a geospatial technology basically might be applied to any segment of disasters, pre- and post-disasters, to estimate damage and losses assessment caused by the natural disasters in the prone areas.

Macro perspective

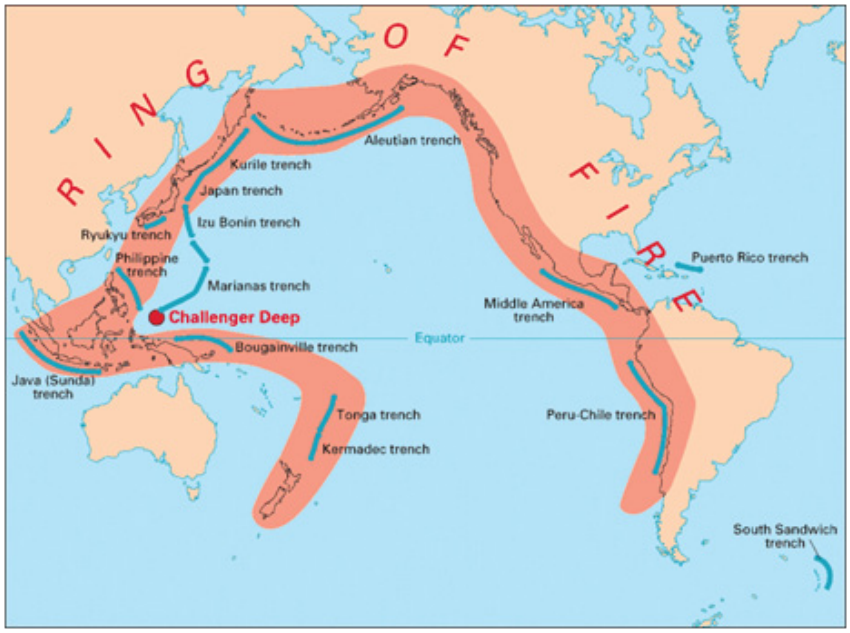
Geospatial technology is a modern technology. It is applied to geographical mapping and analyses of the formation of Earth and human. Geospatial technology describes the use of a number of different high-tech systems and tools that acquire, analyze, manage, store, or visualize various types of location-based data (Shellito, 2012). The use of geospatial technologies is concerned with geographical information system (GIS) and geospatial services. The term LBS has been commonly used in relation to modern communication technology to describe services that provide information that is fundamentally concerned with the spatial relation between the information receiver and the location of other people, objects or natural phenomena. LBS are information and entertainment services accessible with mobile devices, such as phones, through

the mobile network and utilizing the ability to make use of the geographical position of the mobile device (Scholten *et al*., 2009).

While the spatial dimension is the core dimension in perspective of geography, with its prime focus on the spatial distributions of phenomena, much other scientific investigation has a spatial or location aspect – the 'where' question. To explore these location dimensions adequately, tools are needed to collect, integrate, analysis and visualize geo-reference information that relates raster (grid) cells or vector (line, point and polygon) elements to a specified coordinate system or map projection.

Such a technology has been evolving since the first time the map was made in prehistoric times. Since the nineteenth century, a cartographer had used aerial photo taken by a camera fitted on a hot air balloon or a dove to the aircraft which continued to the twentieth century. The science of aerial photo interpretation and making maps developed rapidly during the Second World War and the Cold War appeared to be a new innovation using satellite and computer. Satellites take a picture from the Earth surface and human activities in it with limitations. Meanwhile, computer serves as a storage and transfers images with the support of software in the form of digital, map and database, which occur in the phenomena of social, economy and environmental concerns.

In the last decade, the geospatial technology data evolved into a comprehensive GIS desktop and plat aerial remote sensing using unmanned aircraft such as drones. Moreover, the development of various technologies, data and geospatial services has been available for a wider user. It makes easier to communicate effectively on land, sea and air, but the world has the ability to monitor all spatial behaviors and to capture a lot of information (MacEachren *et al*., 2005). Armies, governments, non-governmental organizations and multinational enterprises have devised new methods of data capture and analysis to satisfy their different requirements. Individual consumers, employees and scientists have



Source: http://pubs.usgs.gov/gip/dynamic/fire.html

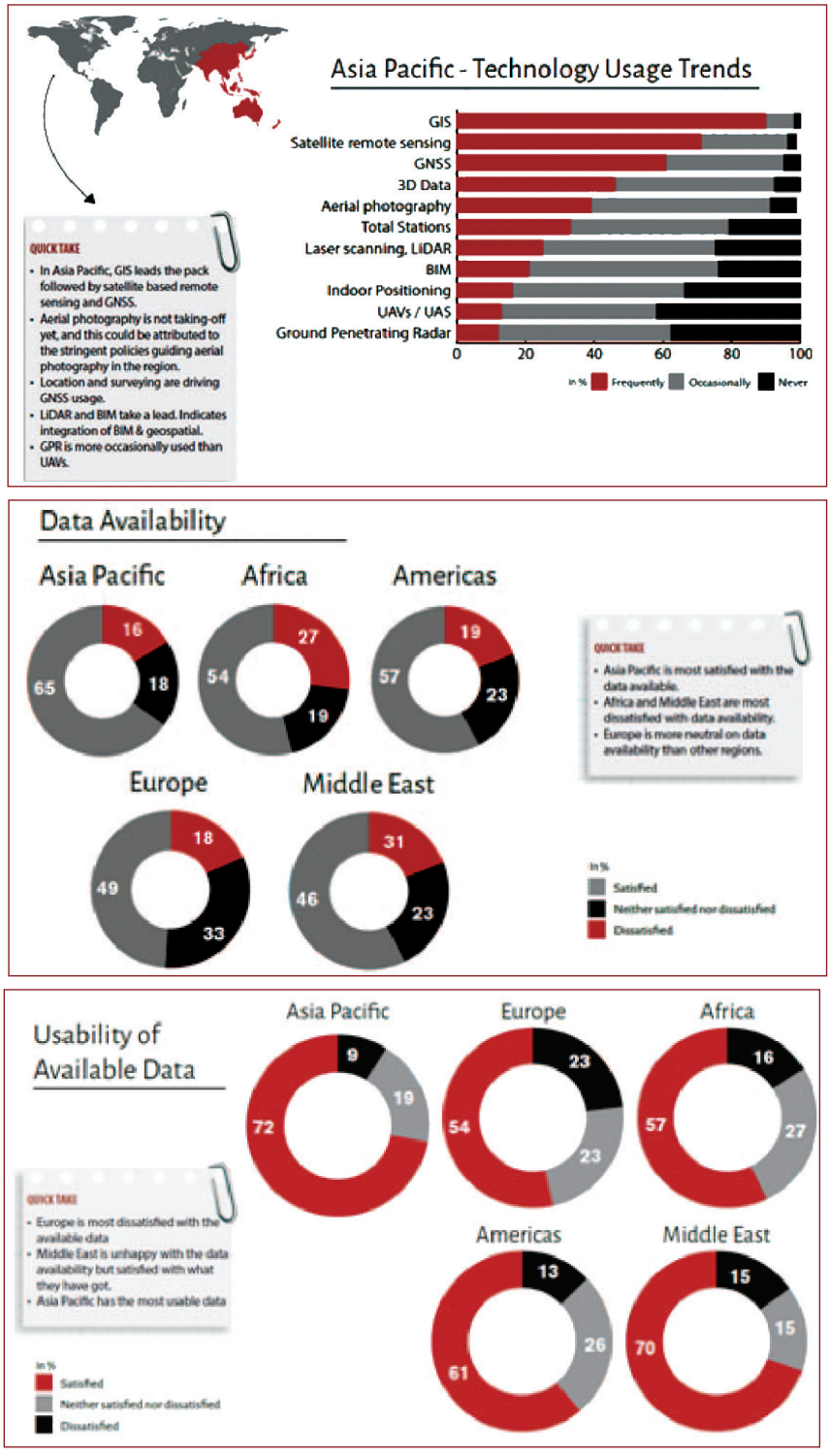
Figure 1: The Ring of fire

enjoyed the advances in data provision and accessibility that have become available, particularly with the development of the internet.

To date, there are various types of geospatial technologies that have been developed and utilized, including:

- Remote sensing, the science and art of obtaining information about the object, territory or natural phenomena by analyzing data obtained using tools without any direct contact with the object or region observed (Lillesand and Kiefer, 2007); retrieval of spatial data and satellite imagery using aircraft, satellites, spacecraft, as well as sensor platforms.
- Geographic information systems (GIS), a computer-based information system that has the ability to handle geographic-referenced data that enter, manage, manipulate and analyze the data and member description (Aronoff, 1989). GIS can be used to detect geographic patterns such as development planning, natural resource management, emergency response and so on.
- Global positioning system (GPS), a system for determining the location on the earth's surface with the aid of the alignment of the satellite signal. The existence of this navigation system technology can easily record the exact position of an object.
- Internet mapping technologies, the internet-based mapping programs such as Google Maps or OpenStreetMap useful to modify and add spatial data that can be shared and viewed by others.

Currently, the use of geospatial technologies has been developed by experts and society in various fields, for example, in the fields of archeology, demography, economy, disaster management, transport, and so on. The applications of geospatial technology are varied depending on the implementation of each field. Of course, the impact of developments in geospatial technology has not been restricted to the academic world, and applications can be found in many other areas of society, including public sector activities, such as health service provision, transport and land-use planning, and private sector activities such as retailing. Urban and regional planning is an activity that has adopted national, regional and local applications of GIS across the world in different contexts (Scholten and Stillwell, 1990).



Source: Geospatial World Magazine, Vol 5, 2015

Figure 2: Geospatial technologies and availability of spatial data

Currently, the geospatial technology develops rapidly in Asia-Pacific region. Based on a survey of Geospatial World magazine in 2014, the Asia-Pacific rim belongs to the highest rank in the use of geospatial technologies, especially in the field of GIS, the availability of spatial data, and the use of existing spatial data (Figure 2). This is because the Asia-Pacific is the first rim in the world to start developing spatial infrastructure data at sub-regional levels. Characteristics of the Asia-Pacific region are very complex when one sees in terms of language, population, political system, social, economic and infrastructure, allowing communities and governments to develop and use such spatial data infrastructure.

One example of geospatial technologies widely employed in Asia-Pacific rim, is the application in the field of disaster management including planning and mitigation, preparedness, response and recovery. The Asia-Pacific region consists of a heterogeneous group of countries that are vulnerable to various hazards such as earthquakes, floods, hurricanes, drought, epidemics and so on. Based on the data from EM-Dat – International Disaster Database, between the years 1990–2001 and 2002–2014, the number of catastrophic events that occurred in the Asia-Pacific region increased from 3947 to 5377 and caused an economic loss of US $ 1,204.9 billion (Figure 3).

Number of natural disaster in Asia-Pacific from 1990 to 2014

The Asia-Pacific region has emerged as the most dynamic region in the world (Pelkmans and Fukasaku, 1995). The Asia-Pacific region is being characterized by growing wealth and is emerging as a market to reckon with on the global economic map. Rapidly, a sustained development has created extensive trade and investment opportunities for the economies of individual states. These gains can slip out of the hand if they are not protected from the risks and impacts of disasters. It, thus, becomes imperative to reduce disaster vulnerability and protect both the lives and development gains from the impact of disasters. Therefore, geospatial technology becomes essential to reduce vulnerability to disasters and protect the lives and the progress of construction of the impact of disasters in the Asia-Pacific region.

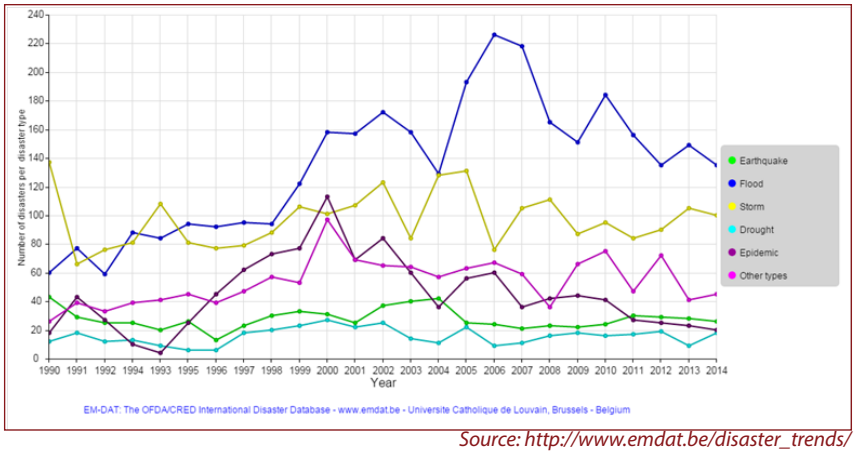
The Philippines, for example, which is one of the most susceptible countries in the region, has been strengthening its pool of geospatial information and adopt-

ing geospatial technology. The Department of Science and Technology (DOST) is undertaking the micro mapping Disaster Risk Exposure Assessment and Mitigation (DREAM) project. Under the project, the Department will acquire geospatial data with LiDAR and airborne radar interferometry (INSAR) technologies. The project will produce detailed topographic information that will enable the creation of more accurate flood inundation maps. The Department of Environment and Natural Resources' Mines and Geosciences Bureau has conducted densification or geo-hazard assessment and mapping with a scale of 1:10,000 on 49 barangays (administrative units). This activity determined each barangay's vulnerability to coastal erosion, storm surges and coastal flooding. Areas in Metro Manila at high risk during natural disasters may now be known through an accurate hazard map. The Australian government has formally handed over the 3D maps of the capital to the Philippines government. The map uses LiDAR technology to identify areas severely at risk during natural disasters (Roy, 2012).

Geospatial technology development in Indonesia

In Indonesia, the development of geospatial technologies has been around quite a while. Judging by the government agency tasked to provide geospatial data and information in Indonesia is called Geospatial Information Agency, or *Badan Informasi Geospasial*, acronamed as BIG. BIG has duties and functions to ensure the availability of access to geospatial information that can be accounted for, realize the implementation of geospatial information efficiently and effectively through cooperation, coordination, integration and synchronization as well as encouraging the use of geospatial information in governance and in various aspects of community life.

In addition, the President and the Parliament have set the Law No. 4 Year 2011 on Geospatial Information that aims to utilize such information system that can be used to support the public sector in carrying out the planning, implementation and evaluation of development, both at the government level of the central and local levels, and also utilized in sector for individuals and groups of people, as well as a single reference in the field of geospatial information in Indonesia. BIG is a competent board in implementing the goals of the Geospatial Information Act. Through BIG, the Government attempts to raise 'one map policy' as the basis for coordinating system to make all users easily handle the issues concerned.



Source: http://www.emdat.be/disaster_trends/

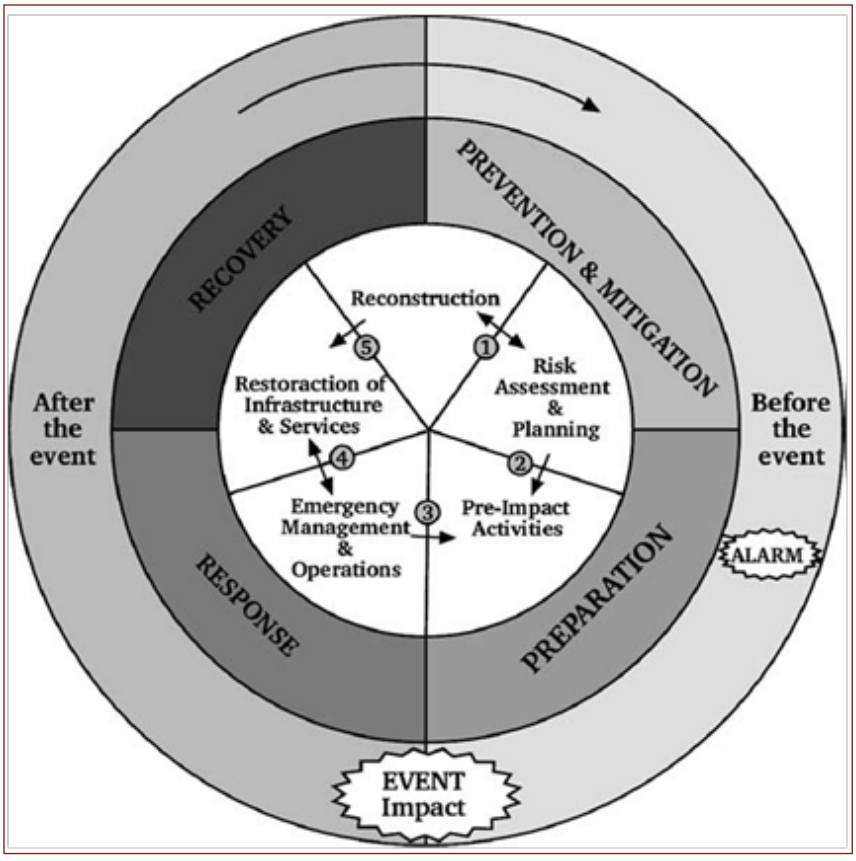
Figure 3: Number of natural disasters in Acia-Pacific from 1990 to 2014

Then BIG geospatial technology builds a network of infrastructure for geospatial information portal archipelago containing GISs as a form of implementation of the disclosure which is also a part of the mandate of the Act. A site geoportal created by BIG known as Ina-Geoportal (Indonesia-Geospatial Portal) was built with the participation of various ministries and agencies and local governments in the country. By Ina-Geoportal, any person or user can search, integrate and obtain geospatial information that has been provided by BIG for free, which is easily accessible and accuratable.

Utilization of geospatial technology in Indonesia is not only carried out by BIG, but also by other government agencies, non-governmental organizations, academia and the community. Geospatial technology is of great importance in many ways including spatial planning, natural resource management, management of the integrity of the Unitary Republic of Indonesia, climate change, the increase in the business sector, the environmental management, the natural disaster management, improve public services and so on. The Agency for the Assessment and Application of Technology, known as *Badan Penerapan dan Pengkajian Teknologi*, or BPPT, as an institution assesses the applicability of technology, is already in a position to develop a laboratory of advanced technology remote sensing and geospatial information systems and technologies such as Remote Sensing Hyperspectral capable of distinguishing an object for forest mapping, radar interferometry for disaster mitigation, and Laser Airborne Depth Sounder for mapping shallow water.

In Indonesia, a mainstay of geospatial technology is to anticipate the disaster and to improve the quality of emergency response process. Disaster in Indonesia is almost always influencing on peoples' lives. Not only lives but also the damage and economic losses ultimately degrades society and economic prosperity. Based on several studies, the economic impact of the disaster for data from 1 January to the end of February 2014 by the National Agency for Recovering Disasters, known as Badan Nasional Penanggulangan Bencana, or BNPB is noted as:

- Catastrophic losses smoke from the burning of land and forests in Riau economically Rp 10 trillion. This reflected a decline in productivity, mobility of goods and people through land transportation, air and sea delayed and disrupted by the smog.
- Damage and loss eruption of Mount Sinabung of Rp 1 trillion.



Source: PSC Forum, www.publicsafetycommunication.eu

Figure 4: The disaster management cycle

- Jakarta flood damage and losses amounting to Rp 5 trillion.
- Damage and loss of floods and landslides in 16 districts/cities in Central Java of Rp 2.01 trillion.
- Damage and loss flash floods in North Sulawesi of Rp 1.74 trillion.
- Damage and loss of flooding in the northern coast of Java (from Banten, West Java, Central Java, East Java) to Rp 6 trillion.
- Damage and loss Kelud eruption of Rp 1 trillion.

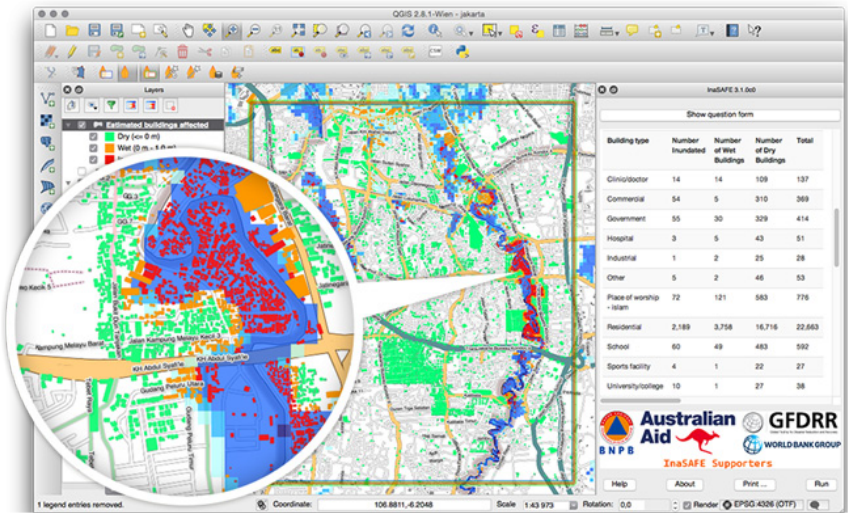
Geospatial technology could address various stages of disaster management, including prevention and mitigation, preparedness, response and recovery. Prevention and mitigation, as potential emergency situations are identified and mitigation needs can be determined and prioritized (Figure 4). Using geospatial information, officials can pinpoint hazards and evaluate the risk and consequences of potential emergencies or disasters. Values at risk can be displayed quickly and efficiently through a GIS. Preparedness includes those activities that prepare for actual emergencies. GIS can provide answers to questions such as how many paramedics and logistics units are required and where should they be located.

Response is an acute phase following the occurrence of an emergency and is the most challenging stage because of the dynamics and unpredictability of these situations. Geo-information can assist immediately in the event of a disaster by helping decision makers understand the scope of the damage and identify locations where people may be trapped or injured or require medical support and rescue. Recovery is the phase in which a GIS can work in concert with GPS to locate each damaged facility, identify the type and amount of damage and help relief workers and decision makers to establish priorities for action. A GIS can display areas where services have been restored to quickly reallocate recovery work to priority tasks. Long-term plans and progress can be displayed and tracked utilizing a GIS. Priority for major restoration investments can be made using GIS (Roy, 2012).

Location identification and Geo-ICT play a major role in all phases of disaster management. The first question asked in call centers after a disaster has been reported is all about the location of the incident and its possible ramifications. A variety of systems use maps, models, tracking logs of rescue personnel obtained from various scanners to monitor a disaster, make forecast, estimate damages, predict risks and vulnerability, and so on. (Kerle *et al*., 2008; Li and Chapman 2008; Zhang and Kerle 2008).

In some cases, imagery from various sensors can be quickly provided for analysis and estimation of damage caused by recent major disasters, such as the effects of the tsunami in Banda Aceh in January 2005. Amdahl (2001) and Green (2002) provide numerous examples of the use of maps and GIS technology in all the phases of risk and disaster management using ESRI software. Significant progress has also been made by suppliers of CAD/AEC tools and database management systems in providing solutions for managing disasters, predicting risk, training and simulation, and in geovisualization.

Currently, in the utilization of geospatial technologies for disaster management, BNPB cooperates with Australia Indonesia Facility for Disaster Reduction (AIFDR) and the World Bank to develop Indonesian Scenario Assessment for Emergencies (InaSAFE) as a free software for disaster preparedness in the world (Figure 5). This InaSAFE helps answer questions about the impact of disasters on people and infrastructure so as to develop a plan based on the worst-case scenario. InaSAFE is able to impart information about the number of buildings or infrastructure affected by the disaster, the population had to be evacuated, as well as the minimum requirement needed by the refugees. With geospatial technologies that have been developed,



Source: inasafe.org

Figure 5: The InaSAFE software for disaster preparedness

Source : http://atlas.pdc.org/atlas/

Figure 6: PDC atlas for disaster monitoring

Source: Urban Development Series - Asian Development Bank (ADB)

Figure 7: Mapping for reconstruction in housing and infrastructure sectors

it could minimize the damage and losses in various sectors of the economy mainly caused by the natural disasters that occurred in Indonesia to standardize the calculation of the minimum needs of the refugees created by Perka BNPB No. 7 of 2008.

In addition, InaWARE or Indonesian All-Hazards Warning and Risk Evaluation is an application used for monitoring and evaluation of the risk of natural disasters. BNPB is funded by the US Agency for International Development (USAID), Office for Foreign Assistance (OFDA) and the Pacific Disaster Center (PDC) to provide technical assistance to improve the impact of early warning systems and decision-making system in the management of disasters and to enhance the ability BNPB and BPBDs in providing early warning to the people exposed to disaster risks. The project provides a network-based decision-making system for use at the national and the provincial level. InaWARE, a modification of Disaster AWARE PDC, is an application that integrates disaster monitoring from various data monitoring disasters worldwide.

Then, Agency Reconstruction and Rehabilitation Agency (BRR), Nanggroe Aceh Darussalam and Nias and BIG develop technology radar sensors in the field of disaster that utilize technology Interferometric Synthetic Aperture Radar (IFSAR) for mapping in the reconstruction, particularly in housing development program and infrastructure of Aceh and Nias after the earthquake and tsunami in the region (Figure 7). IFSAR technology produces a product that is Orthorectified Radar Imagery (ORI) with a resolution of 1.25 m and data Digital Elevation Model (DEM) with a resolution of 5 m is then reprocessed to produce 3D visualization.

Constraints in the use of geospatial technology

Although the Geospatial Information Law has been released, the utilization of geospatial technology in Indonesia is yet optimal. When it is used properly and synergized with all existing data in various institutions, especially institutions that exist in the area, such a technology would help to present the data and information that is complete and ready to support the various activities of governmental and non-governmental as well as assist in making the decisions in various sectors.

Obstacles encountered in the use of geospatial technology in Indonesia caused by various factors, among others is as follows:

- The use of geospatial or map is just purely as a map while low public knowledge of the map becomes one of the obstacles. As a result, if a disaster occurs, people do not use maps because they do not really understand the significance of a map.
- Limited capacity of human resources (HR), especially in areas that will affect the availability of geospatial information. So far geospatial information generated by the various institutions have not been referring to the national standard, and not have been updated and validated.
- The sector-wise minded, where the developments of geospatial database are often carried out individually so that overlapping and inconsistency of data between the agencies with other agencies occur. Such discrepancies would be resolved by 'one map policy' implementation of BIG coordination.
- Completeness of data in each agency is less; so all parties involved need to work together to collect data access from ministries, agencies and among agencies concerned.
- Funding is limited – perceptions that build technology and geospatial information systems need a bunch of investment while funds are not available.
- Weak support research on geospatial technology and lack of incorporation of the principle for spatial depth analysis based on geospatial data and relevant scientific theories.

Business prospects in the use of geospatial technology in Indonesia

Indonesia has a business potential and relatively very attractive in the field of promising spatial technology. Geospatial technology is a breakthrough in the technology revolution and is growing rapidly. This condition is due to the nature of the spatial and visual exceptional usability. When viewed from the area of Indonesia's vast territory, there are still many areas that are yet to be mapped in detail.

Map is just a basic information that requires a touch of geospatial technology for data and information which is easily accessed and utilized easily and quickly. The series of events from the process of collecting, processing and use of the geospatial data offer a lucrative business opportunity. In the data collection process or the surveying and mapping, Indonesian technological support and equipment is necessary to do the mapping and in the processing of spatial data using software or hardware that has now been developed by companies engaged in the field of surveying and software.

In addition, geospatial technologies can open up growth opportunities as well as derivatives of basic industry or start–up services in this field. The need to build geospatial technology industry is to avoid being trapped as the object of the patient in the middle of the rapid development of technology. Economic development based on science and technology becomes the foundation of future development. Geospatial technology industry will grow into environmentally friendly industries related to technology and innovation. Other business opportunities are education for the improvement of HR. This study is devoted to provide knowledge about geospatial technology for the human form of training and workshops for geospatial technology.

Investments in geospatial technology

One area that has a role in the development of the economy of the country is investment. Investment can spur increased production capacity of the economy, so as to create optimal economic growth. Investments that drive economic growth would create jobs and in turn, reduce poverty. The policy on investments is designed by understanding the various potentials and constraints, both on national and regional scales. All forms of investment risk must be dealt with well manageable sources, so as to facilitate the entry of capital flows to Indonesia. Therefore, all forms of data and information that share beneficial to the growth and development of investment in Indonesia, is one of the requirements that must be taken into consideration.

Data and information to take out a policy should not be only in the form of tables and graphs, since they cannot solve the problem of the location and distribution. The solution to such data and information must be carried out through spatial or geospatial approach. Utilization of geospatial data and information is considered to improve the effectiveness and efficiency. In developed countries, geospatial technology contributes to generate financial income of the public sector in the field of public services. In Indonesia, geospatial technologies are the main components of a disaster information system which is increasingly perceived, along with frequent disasters.

With the geospatial technology, location of assets and economic activities can be mapped easily. Data and information can be processed properly by performing the calculation of estimated damage and loss of economic assets when disasters occur. Since one needs to invest to build resilience to natural disasters, utilization of such technology protects economic assets that exist in an area affected by a disaster.

Policy related to geospatial technology utilization in Indonesia

Legal reference of geospatial information used in Indonesia is under the Act No. 4 of 2011 as stated above. The birth of this legislation is to ensure availability and access to geospatial information that can be accounted for. Geospatial information is needed to support a wide range of development processes and is the basis for spatial planning, disaster management, natural resource management and other resources that can be utilized for the greater prosperity of the people of Indonesia.

Associate with the use of data and geospatial information to support the development, is also cooperating to form understanding of the need for data and geospatial information for development planning. This is followed by the making of the program data utilization and integrated geospatial information with statistics, economic and social, as one

of the tools of analysis to produce the regional-based information for development planning which was then called the utilization of geospatial data for regional development planning.

Geospatial information can be the foundation of development, if it becomes a reference of various stakeholders for the development of Indonesia. For this, it is necessary to have policy One Map (One Map Policy) which implies Reference One, One Standard, One Database and One Geoportal. Before making this policy, agency/ministry already has its own map according to its interests and after the policy of this map, the map belonging to agencies/ministries will be updated with more accurate information.

This policy will be influential in the development of geospatial technologies in Indonesia. With the advancing technology, people can easily obtain data and geospatial information through the internet facility using various tools. The geospatial technology along with advanced technology is utilized for the acquisition of geospatial information data whether by land, sea and air, either through direct measurement or using remote sensing technology using satellites or aircraft. Then, geospatial technology is also used in the management and dissemination of geospatial data and information.

Conclusions and recommendations

The importance of geospatial technology as a tool in the formulation of policy decisions relates to spatial aspect in reducing economic losses due to natural disasters in Indonesia. Geospatial technology has a significant role in pre-disaster to indicate a level of vulnerability to a disaster area and estimate damage and economic losses if a disaster was actually happening. When disaster strikes, geospatial technologies can help to update the existing damage and needs in the field, such as aerial photos or satellite imagery. This will help efforts to address the victims and the distribution of aid. While in the post-disaster, geospatial technology is able to provide information for the purposes of reconstruction and rehabilitation of areas affected by the disaster. In addition, it is worth applying for monitoring the progress of phenomena.

To enhance the geospatial technology in the mitigation of natural disasters in Indonesia, there are a few things to overcome the constraints faced, among others;

- The need for strengthening of institutions for coordination and integration among institutions, agencies and ministries concerned in collecting and complete spatial data together so that the data can be accounted for accuracy and quality up to date. So that when the disaster occurs, the data and information that will be used are already ready to be processed using geospatial technologies that have been developed.
- Improvement in the number and capacity of HR in the field of geospatial technologies. To meet the needs of HR, the government could involve the private sector through socialization and training to urban as well as to remote areas so that spatial data processing is not controlled by foreigners only.
- Improvement in infrastructure and facilities by building a network of information and communication technology (ICT), the development of technology applications, as well as developing cooperation between the private and the government.

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CTI Private Financing Advisory Network

The CTI Private Financing Advisory Network (CTI PFAN) is a multilateral public private partnership, initiated by the Climate Technology Initiative and the United Nations Framework Convention on Climate Change, which connects clean energy businesses and projects with private sector financing. Through its network of private sector consultants, CTI PFAN provides targeted professional support and advice and technical assistance to selected projects on the preparation of commercially viable, sustainable and climate friendly business models for introduction to investors. For investors CTI PFAN represents a deal pipeline of investment ready clean energy projects. To date CTI PFAN has successfully raised USD 802 million of investment and financing for clean energy projects in developing countries across Africa, Asia, the CIS and Central Asia, Latin and Central America and the Caribbean.

CTI PFAN identifies promising clean energy projects at an early stage and provides mentoring for development of a business plan, investment pitch, and growth strategy, significantly enhancing the possibility of financial closure.

Over 296 clean energy projects have been inducted into the CTI PFAN Project Development Pipeline. These projects include biogas, biomass, waste to energy, clean transport, wind, solar, small hydro and energy efficiency initiatives. Successfully 68 projects have achieved financial closure with over US$802 million of investment raised. Combined, these projects have the potential to mitigate over 2.5 million tons of CO2e per year and provide over 592 MW of Clean Generation Capacity.

CTI PFAN services are provided through cyclical calls for proposals, on-going project identification, screening and development, outreach road shows, business plan development workshops and financing forums. Clean energy project developers can participate in CTI PFAN services through two tracks:

(a) unsolicited proposals are submitted for review by CTI PFAN coordinators, followed by acceptance and ongoing coaching. Please locate your Country Coordinator, or Regional Coordinator, in the contact us section to make your submission. The submission must follow the Guidelines and the format of the Template provided under the resourcessection; and

(b) additionally, from time to time, calls for proposals for workshops and financing forums are announced through the website and other channels, followed by project selection and short-listing, coaching and mentoring, and investor presentations. Information about current calls for proposals can be found on this website under the events section.

CTI PFAN works across all the countries of its regional coverage and projects and advisors/investors from all countries within the identified regions are eligible for receiving PFAN support and services or becoming network members. To facilitate our response please direct all initial correspondence to your country coordinator and the respective regional coordinator.

For more information, contact:

CTI PFAN Global Coordinator
E-mail; peter.storey@ppl-int.com

CTI PFAN Regional Coordinator – Asia
E-mail: nr@dawnconsulting.com

Web: http://www.cti-pfan.net

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Fax: +1-831-464-4240
E-mail: rlkilpatrick@techvision.com

Feb 21–24
Tehran, Islamic Republic of Iran

Renewable Energy & Energy Saving Exhibition 2016
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Dadman Blvd., Shahrak e Gharb
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Fax: +98-21-4291-7100
E-mail: info@mandtiraq.com

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Conference Secretary
UNIT B, RM 06, 29/F, Legend Tower, 7 Shiing Yip St, Kwun Tong, Kl, Hong Kong
Tel: +852-30697937
E-mail: icresg@smehk.org
URL: http://www.icresg.org/

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Tel: +44-20-7608-7030
Fax: +44-20-7608-7040
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Tel: +65-6222-8550
Fax: +65-6226-3264
E-mail: enquiry.sg@terrapinn.com

March 23–25
Bangkok, Thailand

Sustainable Energy & Technology Asia (SETA 2016)
Contact: Ms.Wuttaya Hnunphagdee
Show Manager
Tel: +66-2-519-2727
Fax: +66-2-509-8587
Mobile: +66-8-9897-7700
E-mail: wuttaya@gat.co.th
Web: http://www.seta.asia

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Hong Kong, China

2016 International Conference on Sustainable Waste
Management – ICSWM
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Web: http://icswm.org

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www.techmonitor.net

Investment promotion: incentives and privileges in Thailand

Thailand Board of Investment, Thailand
http://www.boi.go.th

Incentives under the Investment Promotion Act

In order to obtain investment promotion, the Board of Investment (BOI) applicant must follow the conditions prescribed by the BOI as specified in the BOI promotion certificate in which the following incentives will be granted:

Incentives

Tax incentives:

- Exemption/reduction of import duties on machinery (Section 28/29)
- Reduction of import duties for raw or essential materials (Section 30)
- Exemption of corporate income tax and juristic person income tax (Sections 31 and 34)
- A 50% reduction of the corporate income tax (Section 35(1))
- Double deduction from the costs of transportation, electricity and water supply (Section 35(2))
- Additional 25% deduction of the cost of installation or construction of facilities (Section 35(3))
- Exemption of import duty on raw or essential materials imported for use in production for export (Section 36)

Non-tax incentives:

- Permit for foreign nationals to enter the Kingdom for the purpose of studying investment opportunities (Section 24)
- Permit to bring into the Kingdom skilled workers and experts to work in investment promoted activities (Sections 25 and 26)
- Permit to own land (Section 27)
- Permit to take out or remit money abroad (Section 37)

Criteria for granting tax and duty privileges as investment zones

The Board stipulates two types of incentives as follows:

1. Activity-based incentives

The Board classifies two groups of incentives based on the importance of activities as follows:

Group A consists of activities that shall receive corporate income tax incentives, machinery and raw materials, import duty incentives and other non-tax incentives. This group can be divided into four subgroups as follows:

Group A1 shall receive the following incentives:

- 8-year corporate income tax exemption without being subject to a corporate income tax exemption cap
- Exemption of import duty on machinery
- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year, which can be extended as deemed appropriate by the Board
- Other non-tax incentives

Group A2 shall receive the following incentives:

- 8-year corporate income tax exemption, accounting for 100% of investment (excluding cost of land and working capital)
- Exemption of import duty on machinery
- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year, which can be extended as deemed it appropriate by the Board
- Other non-tax incentives

Group A3 shall receive the following incentives:

- 5-year corporate income tax exemption, accounting for 100% of investment (excluding cost of land and working capital) unless specified in the list of activities eligible for investment promotion that the activity shall be granted corporate income tax exemption without being subject to a corporate income tax exemption cap
- Exemption of import duty on machinery
- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year which can be extended as deemed it appropriate by the Board
- Other non-tax incentives

Group A4 shall receive the following incentives:

- 3-year corporate income tax exemption, accounting for 100% of investment (excluding cost of land and working capital)
- Exemption of import duty on machinery
- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year, which can be extended as deemed it appropriate by the Board

- Other non-tax incentives

Group B consists of activities that shall receive only machinery and raw materials import duty incentives and other non-tax incentives. This group can be divided into two subgroups as follows:

Group B1 shall receive the following incentives:

- Exemption of import duty on machinery
- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year which can be extended as deemed it appropriate by the Board
- Other non-tax incentives

Group B2 shall receive the following incentives:

- Exemption of import duty on raw or essential materials used in manufacturing export products for 1 year which can be extended as deemed it appropriate by the Board
- Other non-tax incentives

2. Merit-based incentives

In order to attract and stimulate more investment or spending on activities that benefit the country or industry at large, the Board stipulates additional incentives based on merits of the projects as follows:

2.1 Merit on competitiveness enhancement

In case the projects have the following investments or expenditures:

1. Research and development in technology and innovation including in-house R&D, outsourcing R&D in Thailand or joint R&D with overseas institutes
2. Donations to Technology and Human Resources Development Funds, educational institutes, specialized training centers, research institutes or governmental agencies in the science and technology field in Thailand, as approved by the Board
3. IP acquisition/licensing fees for commercializing technology developed in Thailand
4. Advanced technology training
5. Development of local suppliers with at least 51% Thai shareholding in advanced technology training and technical assistance or
6. Product and packaging design; either in-house or outsourcing in Thailand, as approved by the Board

Details shall be in accordance with criteria set by the Office of the BOI.

Additional incentives shall be granted as follows:

1. One additional year of corporate income tax exemption will be granted if qualified investments or expenditures are not less than 1% of the project's total revenue of the first 3 years combined, or not less than 200 million baht, whichever is less. However, the total period of corporate income tax exemption shall not exceed 8 years.
2. Two additional years of corporate income tax exemption accounting will be granted if qualified investments or expenditures are not less than 2% of the project's total revenue of the first 3 years combined, or not less than 400 million baht, whichever is less. However, the total period of corporate income tax exemption shall not exceed 8 years.
3. Three additional years of corporate income tax exemption will be granted if qualified investments or expenditures are not less than 3% of the project's total revenue of the first 3 years combined, or not less than 600 million baht, whichever is less. However, the total period of corporate income tax exemption shall not exceed 8 years.

The cap on additional corporate income tax exemption accounts for 200% of the investments and expenditures specified in No. 9.2.1(1) and 100% of the investments and expenditures specified in No. 9.2.1(2-6).

2.2 Merit on decentralization

Projects located in investment promotion zones specified in No. 8.1 shall receive additional incentives as follows:

1. Three additional years of corporate income tax exemption shall be granted. However, the total period of corporate income tax exemption shall not exceed 8 years. Projects with activities in **Group A1** or **A2** which are already granted 8-year corporate income tax exemption shall instead receive a 50% reduction of corporate income tax on net profit derived from promoted activity for 5 years after the corporate income tax exemption period expires.
2. Double deduction for transportation, electricity and water costs for 10 years from the date of first revenue derived from the promoted activity shall be granted.
3. Deduction from net profit of 25% of the project's infrastructure installation or construction costs shall be granted in addition to normal depreciation. Such deduction can be made from the net profit of one or several years within 10 years from the date of first revenue derived from the promoted activity.

2.3 Merit on industrial area development

Projects located within industrial estates or promoted industrial zones shall be granted one additional year of corporate income tax exemption. However, the total period of corporate income tax exemption shall not exceed 8 years.

This merit-based incentive shall not be granted to activities with conditions specifying that projects must be located within industrial estates or promoted industrial zones.

Managing your business: records management

SME Corporation Malaysia
http://www.smeinfo.com.my

Records management, or RM, is the practice of maintaining the records of an organization from the time they are created up to their eventual disposal. This may include classifying, storing, securing, and destruction (or in some cases, archival preservation) of records.

A record can be either a tangible object or digital information – for example, birth certificates, medical X-rays, office documents, databases, application data, and e-mail. Records management is primarily concerned with the evidence of an organization's activities, and is usually applied according to the value of the records rather than their physical format.

Definitions of records management

In the past, 'records management' was sometimes used to refer only to the management of records which were no longer in everyday use but still needed to be kept 'semi-current' or 'inactive' records, often stored in basements or offsite. More modern usage tends to refer to the entire 'lifecycle' of records from the point of creation right through until their eventual disposal.

The ISO 15489: 2001 standard defines records management as "The field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records, including the processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records".

The ISO defines records as "information created, received, and maintained as evidence and information by an organization or person, in pursuance of legal obligations or in the transaction of business".

The International Council on Archives (ICA) Committee on Electronic Records defines a record as "a recorded information produced or received in the initiation, conduct or completion of an institutional or individual activity and that comprises content, context and structure sufficient to provide evidence of the activity". The key word in these definitions is evidence. Put simply, a record can be defined as "evidence of an event".

Practicing records management

A Records Manager is someone who is responsible for records management in an organisation. The practice of records management may involve:

- planning the information needs of an organization;
- identifying information requiring capture;
- creating, approving, and enforcing policies and practices regarding records, including their organization and disposal;
- developing a records storage plan, which includes the short- and long-term housing of physical records and digital information;
- identifying, classifying and storing records;
- coordinating access to records internally and outside the organization, balancing the requirements of business confidentiality, data privacy and public access; and
- executing a retention policy on the disposal of records which are no longer required for operational reasons; according to organizational policies, statutory requirements and other regulations this may involve either their destruction or permanent preservation in an archive.

Records management principles and automated records management systems aid in the capture, classification and ongoing management of records throughout their lifecycle. Such a system may be paper based (such as index cards as used in a library), or may be a computer system, such as an electronic records management application.

ISO 15489:2001 states that records management includes:

- setting policies and standards;
- assigning responsibilities and authorities;
- establishing and promulgating procedures and guidelines;
- providing a range of services relating to the management and use of records;
- designing, implementing and administering specialized systems for managing records; and
- integrating records management into business systems and processes

Managing physical records

Managing physical records involves different disciplines and may draw on a variety of forms of expertise. Records must be identified and authenticated. This is usually a matter of filing and retrieval; in some circumstances, more careful handling is required.

Identifying records

If an item is presented as a legal record, it needs to be authenticated. Forensic experts may need to examine a document or artifact to determine that it is not a forgery, and that any damage, alteration, or missing content is documented. In extreme cases, items may be subjected to a microscope, X-Ray, radiocarbon dating or chemical analysis. This level of authentication is rare, but

requires that special care be taken in the creation and retention of the records of an organization.

Storing records

Records must be stored in such a way that they are accessible and safeguarded against environmental damage. A typical paper document may be stored in a filing cabinet in an office. However, some organisations employ file rooms with specialized environmental controls including temperature and humidity. Vital records may need to be stored in a disaster-resistant safe or vault to protect against fire, flood, earthquakes and conflict. In extreme cases, the item may require both disaster-proofing and public access. Civil engineers may need to be consulted to determine that the file room can effectively withstand the weight of shelves and file cabinets filled with paper; historically, some military vessels were designed to take into account the weight of their operating procedures on paper as part of their ballast equation (modern record-keeping technologies have transferred much of that information to electronic storage). In addition to on-site storage of records, many organizations operate their own off-site records centers or contract with commercial records centers.

Circulating records

Tracking the record while it is away from the normal storage area is referred to as circulation. Often this is handled by simple written recording procedures. However, many modern records environments use a computerized system involving bar code scanners, or radio-frequency identification technology (RFID) to track movement of the records. These can also be used for periodic auditing to identify unauthorized movement of the record.

Disposal of records

Disposal of records does not always mean destruction. It can also include transfer to a historical archive, museum, or private individual. Destruction of records ought to be authorized by law, statute, regulation, or operating procedure, and the records should be disposed of with care to avoid inadvertent disclosure of information. The process needs to be well documented, starting with a records retention schedule and policies and procedures that have been approved at the highest level. An inventory of the records disposed of should be maintained, including certification that they have been destroyed. Records should never simply be discarded as refuse. Most organizations use processes including pulverization, paper shredding or incineration.

Commercially available products can manage records through all processes, namely, active, inactive, archival, retention scheduling and disposal. Some also utilizes RFID technology for tracking of the physical file.

Managing electronic records

The general principles of records management apply to records in any format. Digital records (almost always referred to as electronic records) raise specific issues. It is more difficult to ensure that the content, context and structure of records is preserved and protected when the records do not have a physical existence. Particular concerns exist about the ability to access and read electronic records over time, since the rapid pace of change in technology can make the software used to create the records obsolete, leaving the records unreadable. A considerable amount of research is being undertaken to address this, under the heading of digital preservation. The Public Record Office Victoria (PROV) located in Melbourne, Australia published the Victorian Electronic Records Strategy (VERS) which includes a standard for the preservation, long-term storage and access to permanent electronic records. The VERS standard has been adopted by all Victorian Government Departments. A digital archive has been established by PROV to enable the general public to access permanent records.

Electronic tax records

Electronic tax records are computer-based/non-paper versions of records required by tax agencies like the Internal Revenue Service. There is substantial confusion about what constitutes acceptable digital records for the IRS, as the concept is relatively new. The subject is discussed in Publication 583 and Bulletin 1997-13, but not in specific detail.

Businesses and individuals wishing to convert their paper records into scanned copies may be at risk if they do so. For example, it is unclear if an IRS auditor would accept a .jpg, .png, or .pdf format scanned copy of a purchase receipt for a deducted expense item.

Compulsory licensing in India

Office of the Controller General of Patents, Designs and Trade Marks, India
http://ipindia.nic.in

Selected provisions of the Patents Act, 1970

(1) At any time after the expiration of 3 years from the date of the grant of a patent, any person interested may make an application to the Controller for grant of compulsory licence on patent on any of the following grounds, namely:

(a) that the reasonable requirements of the public with respect to the patented invention have not been satisfied, or

(b) that the patented invention is not available to the public at a reasonably affordable price, or

(c) that the patented invention is not worked in the territory of India.

(2) An application under this section may be made by any person notwithstanding that he is already the holder of a licence under the patent and no person shall be estopped from alleging that the reasonable requirements of the public with respect to the patented invention are not satisfied or that the patented invention is not worked in the territory of India or that the patented invention is not available to the public at a reasonably affordable price by reason of any admission made by him, whether in such a licence or otherwise or by reason of his having accepted such a licence.

(3) Every application under sub-section (1) shall contain a statement setting out the nature of the applicant's interest together with such particulars as may be prescribed and the facts upon which the application is based.

(4) The Controller, if satisfied that the reasonable requirements of the public with respect to the patented invention have not been satisfied or that the patented invention is not worked in the territory of India or that the patented invention is not available to the public at a reasonably affordable price, may grant a licence upon such terms as he may deem fit.

(5) Where the Controller directs the patentee to grant a licence he may, as incidental thereto, exercise the powers set out in section 88.

(6) In considering the application field under this section, the Controller shall take into account:

(a) the nature of the invention, the time which has elapsed since the sealing of the patent and the measures already taken by the patentee or any licensee to make full use of the invention

(b) the ability of the applicant to work the invention to the public advantage

(c) the capacity of the applicant to undertake the risk in providing capital and working the invention, if the application were granted

(d) as to whether the applicant has made efforts to obtain a licence from the patentee on reasonable terms and conditions and such efforts have not been successful within a reasonable period as the Controller may deem fit.

(7) For the purposes of this Chapter, the reasonable requirements of the public shall be deemed not to have been satisfied:

(a) if, by reason of the refusal of the patentee to grant a licence or licences on reasonable terms:

(i) an existing trade or industry or the development thereof or the establishment of any new trade or industry in India or the trade or industry of any person or class of persons trading or manufacturing in India is prejudiced; or

(ii) the demand for the patented article has not been met to an adequate extent or on reasonable terms; or

(iii) a market for export of the patented article manufactured in India is not being supplied or developed; or

(iv) the establishment or development of commercial activities in India is prejudiced; or

(b) if, by reason of conditions imposed by the patentee upon the grant of licences under the patent or upon the purchase, hire or use of the patented article or process, the manufacture, use or sale of materials not protected by the patent, or the establishment or development of any trade or industry in India, is prejudiced; or

(c) if the patentee imposes a condition upon the grant of licences under the patent to provide exclusive grant back, prevention to challenges to the validity of patent or coercive package licensing; or

(d) if the patented invention is not being worked in the territory of India on a commercial scale to an adequate extent or is not being so worked to the fullest extent that is reasonably practicable; or

(e) if the working of the patented invention in the territory of India on a commercial scale is being prevented or hindered by the importation from abroad the patented article by:

(i) the patentee or persons claiming under him; or (ii) persons directly or indirectly purchasing from him; or (iii) other persons against whom the patentee is not taking or has not taken proceedings for infringement.

Assignment and licensing in Thailand

ASEAN Intellectual Property Association (IPA)

http://www.aseanipa.org

The assignment, or license agreements, of Intellectual Property (IP) objects must be made in writing, contain minimum requirements, and not be contrary to specific prescriptions in regard to the related rules. Most types of IP objects shall be registered with the related authorities to make them valid and enforceable in Thailand. The important rules and regulations in relation to the three main IP objects – i.e., *(a) trademark, (b) patent and (c) copyright are as follows:*

Trademark assignment

The assignment must be made in writing and registered with the Trademark Office, to make it valid and enforceable. The Trademark Office accepts the registration assignment for any pending and registered trademarks and there is no specific deadline for registering the assignment in Thailand.

An important rule relating to trademark assignment is prescribed under Section 50 of the Trademark Act, whereby all associated trademarks shall be transferred, or inherited, only as a whole. The assignment cannot be registered only for some associated trademarks, and partial assignment is not allowed. In addition, the cancellation of filed/registered license agreements relating to assigned trademarks is always a prerequisite, before the assignment is granted in Thailand.

Trademark licensing

The license agreement and any sub-license agreement must be made in writing and registered with the Trademark Office, to make it valid and enforceable. To register a sub-license agreement, the main license agreement must also be registered. If the license agreement is subject to a renewal, such renewal must be re-registered to maintain its validity.

A registrable license agreement, according to Section 68 of the Trademark Act, shall at least provide the following: (a) conditions and terms of the agreement between the trademark proprietor and the person applying to be an authorized licensee, which must actually enable the former to control the quality of the goods manufactured by the latter; and (b) the goods on which the licensed trademark is to be used.

The license agreement can include all pending and registered trademarks in Thailand. However, the Trademark Office will only register the licenses of registered trademarks. The license agreement for pending trademarks can be registered, only after it is granted registration, and without the requirement to enter into a new license agreement. There is no deadline for registering a license agreement in Thailand. The main consequence of a non-registered license agreement is that it is non-enforceable under Thai law and the use by a licensee is not legitimate to defend against a non-use cancellation action.

Patent assignment

The assignment must be made in writing and registered in compliance with the requirements, procedures and conditions as prescribed by the relevant Ministerial Regulations, to make it valid and enforceable. The Patent Office registers the assignment for any pending and registered patents and there is no specific deadline for registering the patent assignment in Thailand. The application to register the assignment must be separately submitted with the Patent Office, together with the agreement which transfers the patent for each assigning patent.

Patent licensing

The license agreement must be made in writing, and registered in compliance with the requirements, procedures and conditions as prescribed by the Ministerial Regulations, to make it valid and enforceable.

In granting a license, according to Section 39 of the Patent Act: (a) the patentee shall not impose upon the licensee on any condition or restrictions, or on any royalty term which unfairly limits competition. Conditions, restrictions or terms which tend to unfairly limit competition are prescribed in the Ministerial Regulation No. 25 (B.E. 2542), issued under the Patent Act B.E. 2522, and these include for example: (i) prescribing the licensee to provide material, for use in the production, from the holder of the patent, or from the distributor, which the holder of the patent has prescribed or permitted, except where it can be proved that it has to be prescribed so that the product produced gives the result as stipulated under the patent, or it is a material which cannot be acquired from another source; (ii) prescribing conditions or restrictions of the licensee concerning the hire of persons for the production of the invention, except where it can be proved that such has to be prescribed, so that the product produced gives results which are in accordance with the patent; (iii) prescribing that the licensee sells, or distributes more than half of the product produced, to the holder of the patent; (iv) prescribing that the licensee limits the quantity of production, sale or distribution; (v) prescribing that the licensee discloses the invention, which the licensee has improved, or to allow the patent holder to seek interest from the said invention without

prescribing a suitable remuneration for the licensee; (vi) prescribing that the licensee exercise the rights under the patent to pay remuneration for the use of the invention according to the patent, after the patent expires and so on; and (b) the patentee shall not require the licensee to pay royalties for use of the patented invention after the patent has expired. Conditions, restrictions or terms concerning royalties, which are contrary to this provision, are null and void.

Copyright assignment

The copyright owner can assign the whole, or part, of his copyright to another person for a limited period of time, or for the entire term of copyright protection. An assignment of copyright, other than by inheritance, shall be made in writing and signed by the assignor and the assignee. There is no need to register such assignment with the Copyright Office. If the assignment contract does not specify a period of time, it shall be deemed that the assignment is for a period of 10 years.

The rights of a performer can also be assigned, wholly or in part, and can be assigned for a specified period of time, or for the duration of the term of protection. Where there is more than one performer, a performer is entitled to assign only that portion of the rights belonging to him. An assignment of a performance right, other than by inheritance, shall be made in writing, and signed by the assignor and the assignee. There is no need to register such assignment with the Copyright Office. Should there be no period of time specified in the assignment contract, it shall be deemed that the assignment is for a period of 3 years.

Copyright licensing

The copyright owner can grant licenses to other persons to use the rights to reproduce or adapt, disseminate to the public, or rent the original or a copy of a computer program, audio-visual work, cinematographic work, and sound recording, with or without imposing any conditions, but any conditions specified shall not restrict fair competition. The conditions which restrict fair competition are prescribed in the Ministerial Regulations (B.E. 2540), issued under the Copyright Act B.E. 2537, and include for example: (a) prescribing that the licensee acquire materials for use in the production of a copied work so permitted, either wholly or partly, from the owner of the copyright, except where it is necessary to do so for the purpose of obtaining a copied work which is in accordance with the standards set by the owner of the copyright; (b) prescribing conditions or restricting the rights of the licensee, in relation to the hiring of a person to produce a copied work, except where it is necessary to do so for the purpose of obtaining copied work which is in accordance with the standards prescribed by the owner of the copyright; (c) prescribing considerations for the granting of permission to exercise the rights in a copyrighted work at an unfair rate, when compared to the rate prescribed by the owner of the copyright for other licensees who have been granted permission in the same period of time for the same copyrighted work; (d) prescribing conditions or restricting the rights of the licensee in regard to research or study of the copyrighted work, for which permission has been granted; (e) prescribing conditions which enable that the licensor has the right to terminate the permission at will, and without reasonable cause and so on.

Multilingual Interface for ePCT

The World Intellectual Property Organization (WIPO) has launched the multilingual interface of ePCT, marking a major expansion of its global gateway for online filing and management of international patent applications. After an initial pilot phase that was limited to English, the ePCT user interface is now available in the other nine languages of international publication under the Patent Cooperation Treaty (PCT): Arabic, Chinese, French, German, Japanese, Korean, Portuguese, Russian and Spanish. This will contribute significantly to increased use of the ePCT system in countries where a language other than English predominates.

In 2014, users filed – by various means, including ePCT - some 215,000 international patent applicationsunder the Patent Cooperation Treaty, which initiates the process to obtain protection for inventions in 148 member states. In eight of the top 10 PCT filing countries in 2014, applications were in a language other than English, the most common being Japanese, Chinese, German, Korean and French. With the addition of these new languages, the web-based ePCT portal is now poised for further growth with an increasingly global user base.

Among the benefits of the ePCT is an automatic checking function during the preparation phase, ensuring the validity of the data provided, and reducing and potentially eliminating errors before filing. After filing, ePCT allows both applicants and patent Offices to manage international applications in a paperless environment, saving time and money.

The PCT System facilitates the acquisition of patent rights in multiple jurisdictions. It simplifies the process of multiple national patent filings by delaying the requirement to file a separate application in each jurisdiction in which protection is sought. However, the decision of whether or not to grant patents remains the prerogative of national or regional patent offices, and patent rights are limited to the jurisdiction of the patent granting authority. The PCT system now has 148 member states.

For more information, contact

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Infosys Innovation Fund

Infosys Limited, India

http://www.infosys.com

In 2015, Infosys Limited, India, launched the Infosys Innovation Fund to invest in entrepreneurial ventures delivering innovation in domains relevant to our core business. The aspiration was to amplify start-ups that build purposeful solutions while being steered by innovators who share the same mindset as the seven founders of Infosys – nurturing deep client relationships with an unwavering commitment to ethics and mutual respect. Infosys is the sole investor in the Fund and invests on the basis of finding and forging strategic fits that also bring adequate financial return. This differentiates the Infosys Innovation Fund from most other venture capital institutions, in that we have a strong motivation to create long-term value for the end users of the technology and solutions being developed.

Working with start-ups

The Innovation Fund helps start-ups by providing early-stage capital, mentorship, product validation, customer introductions and go-to-market scale. For many of the start-ups that approach us, these advantages, particularly mentorship and customer introductions are the most significant reasons to partner with Infosys. The Innovation Fund offers a great deal more than capital; and for start-ups that are post-seed and post-product, having a strong go-to-market partner is extremely valuable.

The Innovation Fund's strategic goals include identifying start-ups that can transform and grow our core services, help us expand into new areas, or are able to identify disruptive new business models. Identifying innovative start-ups and introducing them to our clients help deepen the relationship that we have with the customers and provide long-term value.

Clients look to Infosys to work with them to evaluate exciting new start-ups technology, build larger solutions around the start-up technology, and ensure successful deployment and end user acceptance.

During the investment and diligence process, we involve our business units early on to provide feedback on the technology and viability of the solution being built. We also involve go-to-market specialists who have deep experience in designing new business models, pricing and marketing strategies. The Innovation Fund team also assesses the quality of the executive/founding team and their ability to execute to their operational plan.

The Infosys Innovation Fund invests in start-ups that demonstrate the following characteristics:

- are early stage (typically Series A or B, occasionally seed)
- have demonstrated product-market fit
- fit within one of the key focus areas: machine intelligence, big data and analytics, infrastructure and cloud, collaboration and design, convergence of industries, disintermediation of layers and new business models.

Benefits to start-ups

As a strategic partner, Infosys offers the following benefits to start-ups:

Financial scale: Provide early-stage capital to start-ups that have already established a product-market fit and are looking to scale.

Technical scale: Provide start-ups with development resources, mentorship and technical skills to help build out a product or enhance existing capabilities.

Market scale: Provide start-ups with go-to-market assistance, including introductions to global customers, bundling and/or integration with existing or new Infosys solutions, joint marketing with related Infosys industry groups and geographic reach where Infosys has presence.

Social impact: Help start-ups taking on problems with big social impact. We can provide social entrepreneurs with connections to customers, think tanks and organizations already on the ground through the Infosys Foundation.

Incubation: For start-ups at the pre-product stage, the incubation program can provide seed capital, mentorship and coaching to help get a product built and launched. Or we can connect you with our partner network of incubators and accelerators in the US, Europe and India.

Customer validation: Invite start-ups to meet senior executives from some of the world's leading companies through curated events that we host regularly across the world.

SME Finance Forum

The SME Finance Forum works to expand access to finance for small and medium businesses. The Forum operates a global membership network that brings together financial institutions, technology companies, and development finance institutions to share knowledge, spur innovation, and promote the growth of SMEs. The Forum helps others build on good practices in SME finance through its knowledge sharing platforms and activities. It has leveraged partnerships to make SME data "open," that is, freely available and readily accessible to the public. The Forum supports regional and global conferences and webinars that bring together financial institutions, technology companies and policy-makers. The Forum uses its linkages with development finance institutions and policy-makers to inform SME policy. In addition, it facilitates closer interaction between private and public sector players to help create a more conducive policy and regulatory environment for SMEs.

For more information, access:

https://www.smefinanceforum.org

Financing with debt and equity financing

SME Corporation Malaysia
http://www.smeinfo.com.my

Financing with debt

Financing a business with debt involves securing a loan. This can be in the form of either unsecured or secured debt. Unsecured debt refers to a loan taken without having to put up any specific form of security or collateral. This involves mainly borrowing from family or friends, a credit card, line of credit and other similar means.

Secured debt, on the other hand, refers to loans where you are required to put up some form of collateral in exchange for the loan – for example, mortgage on the house or refinancing your car, among others. For secured debts, you need to be able to assure the lender about your ability to meet your payments either through your business or other means. To secure such debt is some cases you will need to present a solid business plan, evidence of your experience and of your ability to repay.

Family and friends

Raising finance from family and friends can be rewarding for both parties: you get the finance to start or expand your business, while your family and friends have the satisfaction of helping you while earning interest on their spare cash.

Family and friends may accept more flexible terms and conditions that are better suited to your business than those offered by commercial banks.

Often arrangements with family and friends are informal and are based purely on trust and verbal assurances. However, a formal written agreement is strongly advised to minimise disputes in the future. Preserving your relationships with friends and family is as important as pursuing your business opportunity.

Personal loan

Financing a business with personal loans means that you borrow the money personally to invest it in your business. This is typically used at start-up or early stages where the business has not established enough history or performance to be able to secure a loan on its own merit.

Mortgage loan

Another source for financing a business is a home mortgage loan. Some banks allow you to mortgage or refinance your house. This may be a risky move as if you are unable to make the scheduled payments, you risk losing your home. It is, therefore, crucial that you are confident on your continued ability to make all payments scheduled.

Insurance loan

Another source of loan could be from your insurance policy. If you have been paying for a life insurance policy that builds up a cash value you are entitled to take up a loan on the cash value amount. Many insurance companies will loan you money with the cash value as security. This is a rather expensive method of financing a business and also means reduced benefits if you are unable to clear the loan and interests accrued.

Credit cards

Credit cards can also be a source for financing a business when you are first getting started. However, this is another expensive method as the rates charged can be high and it could also affect your credit rating, required for other sources of financing.

Equity financing

Equity financing is borrowing where the investor/financier becomes a part-owner of the business in the process. This could be through venture capital or issuing shares. Venture capitalists do not want to remain in your business forever. In general, they want to see an exit strategy that will see them out in about 5 years, with a high return on their investment as their reward.

In terms of areas of interest, venture capitalists are interested in both high technology and various other industries. Normally, they fund businesses which have already been launched and have probably reached profitability.

The angel investor, on the other hand, is a special type of venture capitalist. Usually an individual with substantial funds, the 'angel' provides capital to start-up companies and takes a personal stake in the venture. Depending on the individual 'angel', their requests for any form of control or a quick return on investment will differ. However, similar to regular venture capitalists, they seek high returns on their investment for the risks they take on.

SME/Finance Initiative

The SME/Finance Initiative (SME/FI) is a knowledge-cum-business network that will put together development banks, other specialized financial institutions and development organizations in different countries to discuss and address specific issues in the financing of and other support services to SMEs. The purpose of the Initiative is to enable and promote an international exchange of information, experiences, and best practices on financing SMEs among banking and finance professionals and institutions and to further improve the development and growth of the SME sector.

For more information, contact
http://www.smefi.com

The Innovation Partnership Programme of Viet Nam

IPP Viet Nam

http://ipp.vn

The Innovation Partnership Programme (IPP) is an Official Development Assistance (ODA) program financed jointly by the governments of Viet Nam and Finland. IPP is in its second phase running through 2014–2018. IPP supports Viet Nam's overall goal of becoming an industrialised middle-income knowledge economy by the year 2020. The program's objective is to boost sustainable economic growth in Viet Nam through the increased production and export of innovative products and services.

IPP targets long-term benefits for the Vietnamese economy and innovation system. The program works with key national and international partners to scale up practical innovation and entrepreneurship training as well as to improve local support mechanisms and programs for Vietnamese new innovative companies. It connects key actors in the ecosystem to build a strong foundation for Viet Nam's next-generation entrepreneurs and promotes innovation and business partnerships between Viet Nam and other countries, particularly Finland.

Support and services

IPP supports Viet Nam's overall goal of becoming an industrialised middle-income knowledge economy by 2020. The program's objective is to boost sustainable economic growth in Viet Nam through the increased production and export of innovative products and services.

IPP is an initiator, facilitator and connector with the aim of strengthening the Vietnamese innovation and entrepreneurial ecosystem. It fosters new activities, connections and collaboration regionally, nationally and internationally. IPP works with key local and international partners to develop and scale up practical innovation and entrepreneurship training and to improve local support mechanisms and programs for Vietnamese new innovative companies. The program connects key actors in the ecosystem to build a strong foundation for Viet Nam's next-generation entrepreneurs and promotes innovation and business partnerships between Viet Nam and other countries, particularly Finland.

IPP runs the following activities in 2015:

- *Grants and an Innovation Accelerator program* for two types of innovation projects: new innovative companies that are targeting international growth and startup support organisations such as incubators and accelerators. IPP's support for innovation projects in 2015 tests and showcases mechanisms for working with Vietnamese young companies and their supporters, helping them develop, overcome challenges and reach their goals faster.
- Practical innovation and entrepreneurship training for individuals that are interested in becoming innovation experts, trainers, coaches and mentors. IPP runs its first *Training of Trainers Program* for 12 Vietnamese nationals from different backgrounds in 2015.
- Design and testing of a *Core Curriculum on Innovation and Entrepreneurship***.** This curriculum is an open-source material bank that all interested parties can use and further develop for their own needs.

From 2016 until the end of the program in 2018, IPP focuses on key activities to further support the ecosystem:

- *Grant, coaching and network support for innovation ecosystem developers*: a grant call for startup support organisations such as incubators and accelerators is organised in early 2016.
- *Support for Vietnamese universities and other educational organisations* for the development of their innovation and entrepreneurship training and related offering, including a ecosystem. A call is organised in April 2016. As part of collaboration, IPP will introduce its core curriculum and organise a second Training of Trainers Program for the organisations selected for support.
- Continued support for most in drafting of key policies and laws related to innovation and support for growth entrepreneurship.
- Frequent events, active communications and strategic network building (especially strengthening Finnish-Vietnamese innovation and business networks).

Global Design Database

Via a single, intuitive interface, the Global Design Database enables free, simultaneous searches of more than 1,540,000 industrial designs registered under the WIPO-administered Hague System and/or in participating national collections. The newly expanded database accommodates searches using different national classification systems alongside the Locarno Classification.

The Global Design Database enables simultaneous searches across the international industrial designs registered under the WIPO-administered Hague System and, in addition to the three new collections, the national collections of Canada and New Zealand. The Database will continue to expand as more national collections are added in the coming months.

For more information, access:

http://www.wipo.int/designdb/

Innovation assets

InnoSupport, Germany
http://www.innosupport.net

Local assets are in the heart of regional innovation. Local assets might include R&D capacity (e.g., universities, research organizations, private inventors and so on), human resources (e.g., talented people, skilled workforce and so on), financial capital in support of entrepreneurship and innovation (e.g., innovation support funds, community programmes, venture capitalists, business angels and so on), legal and regulatory environment, physical infrastructure and so on. The following sections aim to describe each of the innovation assets that form the local innovation environment of a community or a region.

Human resources

Human resources are one of the most important that drives innovation process forward in local communities. At the same time, the human factor is the most important element of the innovation potential in the company. The development and the successful implementation of innovation are mostly considered as creative processes. The so-called human factor in the innovation process is constituted by the following elements – creative personality, creative environment, team work, system for creating and managing knowledge. On a larger scale when talking about human assets at regional level, local communities constantly strive to attract and retain innovation companies by investing in the skills and technical knowledge of the workforce. In addition, skilled labour is considered as such an important asset that many communities have made it the central theme of their regional marketing efforts. At the heart of improving local skills and labour capacities lies the education and lifelong learning systems development. Economic developers must account for all three factors – available workforce, specialized or skilled workforce, and quality of educational institutions – when evaluating local assets for innovation.

Universities and research institutions as root of innovation and ideas

Universities are key pillars in every local innovation system. Universities and research centres are considered as creators, receptors and very often interpreters of innovation and ideas. They are the most important source of human capital and resources. As a key component of social infrastructure they are considered as the key asset of regional innovation and essential to long-term economic growth. R&D investments at universities create opportunities for partnerships between education and industry that can significantly benefit all social economic actors in a certain local community and environment.

Financial capital for innovation

Innovation and entrepreneurship require access to capital to flourish in local environment. Transforming ideas into products and services require significant resources. Very few companies, private researchers or even universities have the ability to finance the entire innovation development process. Some regions which are generally more technologically developed have little trouble in retaining entrepreneurs and start-ups because of the significant presence of both risk investors and other financial institutions. On the contrary less developed and more isolated areas must seek different solutions with providing businesses with access to capital, such as forming public-private partnerships, local innovation funds, business angels and so on.

Legal and regulatory environment

National and regional government authorities create the necessary legal and regulatory framework, develop the infrastructure, foster the financial sector to participate in the innovation process and facilitate the development of R&D and technology by forming development policies at both local and national levels. The importance of taxation and regulations can attract or deflect businesses from a certain region or community. Innovation is less likely to develop in areas with very heavy administrative burdens for SMEs and employment systems. The lack of incentives for investments and innovations is another barrier which will hinder the development of successful and sustainable local innovation system. In addition, an inadequate regulatory environment is particularly unfriendly for small businesses.

Industrial base

In order to develop an effective economic development strategy, it is necessary to take into account the industrial base of the region, including key business entities, main products and services, traditional business models, market advantages and so on. Regional potential is best served by first building and supporting the areas of traditional strength (e.g., industry, tourism, services and so on).

Physical infrastructure

Physical infrastructures such as transportation and communication, telecommunication networks, public utilities, or access to natural resources are key assets in achieving ks. Public utilities, or access to natural resources are key assets in achieving local environment which will be beneficial for innovation.

Value-driven approaches for quality improvement

International Institute for Sustainable Development, Canada
https://www.iisd.org

In an era of intense global competition, companies are searching for ways of gaining a competitive advantage to protect or improve their market position. Delivering value – high quality, sustainable, durable and reliable products at low cost – has become the key to survival in today's global economy.

A number of corporations have adopted value-driven strategies in implementing quality programmes and pursuing manufacturing excellence. Businesses that lead the field in quality and manufacturing excellence are now using the same strategies to adopt environmentally and socially responsible solutions.

There is evidence that companies which conform with ISO 9000 guidelines have significantly less difficulty in meeting the requirements of ISO 14000.

Methods like 'Hoshin Kanri', 'Kaizen' and 'Poka-Yoke' are being used to support quality improvements and to embed sustainability into products and processes.

Hoshin Kanri

The Hoshin Kanri technique is often described as a target-means strategy. The Japanese word 'hoshin' means 'shining metal pointing direction' and 'kanri' means management or control. Hence, the term Hoshin Kanri is described as a system for translating an organization's vision and objectives into actionable and measurable strategies throughout the company. It is a process of focusing many resources on a few high-priority issues to achieve a breakthrough.

The greatest strength of this system is its ability to translate qualitative, executive goals into quantitative, achievable actions. It has proven its usefulness in the implementation of concepts like Total Quality Management and Total Quality Environmental Management.

Hoshin Kanri is seen as an important component of value-driven product and process development, since it describes characteristics of the product or process as a function of the characteristics of the organization that produces it. From the Hoshin Kanri perspective, the success of the product or process development is directly linked to the ability of an organization to put into practice its strategic goals.

Kaizen

'Kaizen' is often translated in western literature as ongoing, continuous improvement. In contrast to the traditional emphasis on revolutionary, innovative change on an occasional basis, Kaizen advocates uninterrupted, ongoing incremental change.

Originally a Buddhist term, Kaizen comes from the words 'Renew the heart and make it good'. Adoption of the Kaizen concept requires changes in the 'heart' of a business's corporate culture and structure, since Kaizen requires companies to translate their corporate vision into every aspect of a company's operational practice.

In practice, Kaizen can be implemented in corporations by improving every aspect of a business process in a step-by-step approach, while gradually developing employee skills through training and increased involvement. The key areas in implementing Kaizen are:
Shop floor – GENBA
Product – GENBUTSU
The facts – GENJITSU
By pursuing improvements in the three 'GENs', a manager develops an eye for problems. Gradual enhancements to the key operations – product development, manufacturing, service and sales – multiply into greater success, sustainable competitiveness and good business performance.

Poka-Yoke

Poka-Yoke is the Japanese term for mistake proofing. It is designed either to prevent an error from happening or to make an error obvious at a glance. Therefore, a product development process that respects Poka-Yoke logic aggressively seeks to eliminate the possibility of errors and waste and to increase resource efficiency in the entire life cycle of the product.

The industrial engineer responsible for the introduction of zero quality control (ZQC) in modern manufacturing was Toyota's production manager Shigeo Shingo. ZQC is firmly rooted in the Poka-Yoke approach to quality management.

Multidisciplinary optimization (MDO)

'Multidisciplinary optimization' (MDO) is an emerging discipline that relies on mathematics, statistics, operations research and computer science. Objectives and environmental constraints are stated in terms of mathematical equations, and the best solution is obtained by way of a solution to those equations.

There is a more qualitative version of the MDO method that uses the same algorithm. It is more comprehensive than the quantitative method, since it includes all relevant components. On the other hand, in this broader version of MDO, a number of components are not easily quantified. The qualitative MDO must therefore include a degree of subjectivity.

MDO is a useful tool for product or process optimization. The equations can be defined so that the objective is to maximize quality and resource efficiency and to minimize cost, and thus to maximize value. However, it is important to identify and define all design parameters to achieve the desired result.

Eco-innovation in Sri Lanka

National Cleaner Production Centre, Sri Lanka
http://www.ncpcsrilanka.org

"Rethinking the business strategy"

Improving the organizational structure, products/services, processes, market approach, service delivery mechanisms and so on in a creative and innovative way is necessary to maintain the competitiveness of the businesses. Incorporating the sustainability dimension to the innovation process helps the companies to emerge as green enterprises with extraordinary performance that leads eventually to be triumphant in the global and local markets.

Eco-innovation is an approach that has been adopted by enterprises knowingly or unknowingly to harness to benefits by incorporating sustainability dimension to the innovation process; United Nations Environmental Programme (UNEP) undertook in 2009 to develop this concept into a formal approach/tool with an application methodology so that small and medium enterprises in the developing countries can also benefit.

Why is eco-innovation approach necessary?

In recent decades, there has been a growing recognition amongst manufacturing business leaders on sustainability challenges such as climate change, worker welfare and resource constraints which have a significant impact on businesses. Ultimately, companies that do not take action now run a higher risk of failure when these issues inevitably take effect in their industry. Sticking with the 'business as usual' approach will leave companies unable to respond to issues such as rising energy costs, disruptions to supply of the raw materials or changes in legislation. Thus, an alternative approach going beyond the boundaries of Cleaner Production or EMS and that can help to address sustainability-related business drivers is needed whilst offering opportunities for growth, cost reduction and competitive advantage.

Eco-innovation is an approach that aims to fulfill these multiple requirements by identifying the key sustainability challenges and opportunities and then using these to drive changes throughout the company and its value chain, from the business strategy and business model to the operational level.

Eco-innovation is the development and application of a business model, shaped by a new business strategy that incorporates sustainability throughout all business operations based on life cycle thinking and in cooperation with partners across the value chain. It entails a coordinated set of modifications or novel solutions to products (goods/services), processes, market approach and organizational structure which leads to a company's enhanced performance and competitiveness.

Added value from eco-innovation

- **Access new and emerging markets**
  - Increase productivity and technical capacity
- **Increase profitability along the value chain**
  - Stay ahead of standards and regulations
- **Attract investment**

The UNEP eco-innovation project was initiated in 2014 aiming to develop local resources and capacities for eco-innovation in developing and emerging economies. It specifically targets small- and medium-sized enterprises (SMEs) of agri-food sector.

To reach the SMEs, the UNEP eco-innovation project co-operates with National governments and National Cleaner Production Centres as service providers. National Cleaner Production Centre Sri Lanka (NCPCSL) is the implementing partner for the project in Sri Lanka. NCPCSL is entrusted to initiate the first pilot project on eco-innovation under agri-food sector.

Initially, 20 enterprises will be selected to conduct a feasibility study by identifying the potential to apply eco-innovation approach with desire of the industry. Finally, eight enterprises will be provided technical assistance together with comprehensive training by international experts for the implementation of eco-innovation. The success stories of those companies will be publicized internationally.

The industries will be enabled to handle their sustainability issues in a holistic way and position as a sustainability thought leader. NCPC is seeking interested SMEs in agri-food sector (except from tea, livestock, rice mills and fisheries) to engage in the pilot project.

ASEAN Pilot Network of Excellence in Green Energy Research

The ASEAN Pilot Network of Excellence in Green Energy Research (ANEGER) aims to support the development of a highly competitive clean energy industry in ASEAN, contributing to the region's energy security needs. The main means for reaching this objective is a structured exchange on state-of-the-art clean technologies and related recent developments (for instance, in biomass utilization and solid fuels technologies). This sharing of experiences, best practices and recent developments allows the pan-ASEAN network to advance technological capacities, help construct a Southeast Asian bioeconomy and reach out to the private sector.

There are promising synergies between the ANEGER network, READI's work in the energy component, an EU FP7 project linking research efforts in resource efficiency (SUSTAIN EU-ASEAN), IEA Bioenergy and related European initiatives, like the Bioenergy Network of Excellence and bioeconomy development efforts in European Member States.

For more information, access:
http://readi-asean.mnconcept.eu

Technology Offers

HUNGARY

Metal reclamation technology in electroplating

Description

Our client is a SME in Hungary. They offer an equipment for recovering metals, applied in electroplating technique of surface treatment. It can be used to recover the metal waste, which arises during the silver-, copper-, tin-, nickel-, eventually zinc-plating process and it can be recycled into the electroplating process. The investment returns in 3 or 4 years. The equipment was designed for recovering all the metal ions from the flushing water. Along the galvanic line, 90% of the galvanic solution sticked to the metal surface aggregates in the economy rinsing vat while the rest 10% comes to the stream rinsing vat. The aim is to recover all metal ions from the solution aggregated in the economy rinsing vat (90% of the total loss). This aim can be reached by electrolysis. As metal ions remain in the solution after the process, the solution is reverted and the electrolysis is repeated.

Area of application

Potential users: companies providing electroplating services, companies active in metal processing and/or machinery industry having an in-house electroplating workshop.

Advantages

Main advantages are as follows: an economical method, the investment returns in 3 or 4 years in a medium-sized enterprise; an environmental friendly method, dangerous emission (quantity of galvanic sludge) can be radically reduced; the metal loss of the electroplating can be reduced to 1–2%; costs of deposition of the dangerous waste (galvanic sludge) can be reduced; the equipment works automatically, expensive labour force is not necessary.

Environmental aspects

Waste utilization

Development status

Fully commercialized

Legal protection

Know-how

Transfer terms

Technology licensing

Silicate-based lightweight building system

Description

Our partner, a Hungarian SME has developed a new silicate-based lightweight building system. This innovative construction technology is the result of a long-lasting search and development meeting the requirements of the latest market trends and serves as a really simple and fast building procedure. The client is seeking for partners (governments/companies/investors) for knowhow purchase or joint ventures abroad. Innovation of the technology: The technology can be defined as a silicate-based lightweight building system. The building blocks are already covered by the insulating material and serve as remaining formwork elements at concreting procedure. After concreting the formed reinforced concrete tissue grid in the special elements becomes load-bearing. There is no need for applying any subsequent heat or sound insulation. During the development, we continuously tried to work out the simplest construction technologies.

Area of application

Our goal with our new building system is primarily to ensure an alternative technology for home builders on the already crowded world market offering tectonic materials for construction. Using the easy to install elements, such self-supporting storey and attics can be achieved which has not had any appropriate solution so far. Providing the technology and building blocks of residential buildings, we would like to create opportunity to their own investments for those who wish to build with lower incomes with their 'DIY' method that proved to be very popular in the past. In compliance with the rigorous requirements, we offer our fire-resistant, easy to install wall modules for industrial buildings to construct boundary and partition structures. Since the system is earthquake resistant, it is extremely well suited for the reconstruction of disaster-stricken areas; furthermore it is also suitable for upgrading in traditional renovations.

Advantages

Silicate-based lightweight construction does not contain any wood or organic material; 'breathing', vapor pressure equalization of wall and floor structure; incombustible, fire-resistant exterior components; sound-bridge- and heat-free, heat-sound-proof; building block surfaces are partly ready; environmentally friendly building; rapid on-site installation, construction time of a 100 m^2 ready-storey residential building is 10 working days; also suitable for new, modern ECO residential buildings; cost- and material-saving; manual labor construction and does not require other lifting machinery; material cost of a structurally complete, 100 m^2 residential floor areas built in m^2 approaches the cost of traditional brick buildings, however, the construction time is extremely fast on-site so manpower labor cost is saved.

Environmental aspects

Cleaner production

Development status

Fully commercialized

Legal protection

Patent

Technical specifications

The main components of the technology: plaster, gypsum fiber, rock wool, foam silicate, concrete. When producing these building elements and construction, there is no need for greater

Transfer terms

Joint venture, technology licensing

For the above two offers, contact:

Laser Consult Ltd (Hungary), H-6701 PO Box 1191, Szeged, Hungary
Tel: +36-62-562-782
Fax: +36-62-562-783
E-mail: laserconsult@t-online.hu

New green stove design

Description

An improved wood burning metallic cook stove is presently designed and fabricated. During test, the measured thermal efficiency is found to be 28.3%. Smoke emission is also reduced. Wood sticks, twig and so on can be used as a fuel in this stove. Power output rating of the present prototype is 2.5 Kw per hour. Cost of the stove is within economical limit.

Area of application

For the use in rural area both for domestic and community cooking purpose according to the size of the stove.

Advantages

1. High thermal efficiency with reduced rate of smoke emission. 2. In the stove, primary air is supplied throughout the perforated circumferential wall at the lower part of combustion chamber for better mixing with wood fuel during combustion. 3. In addition to typical preheating system of secondary air while passing through annular air passage surrounding the combustion chamber wall, the primary air is also preheated in this stove while coming in contact with perforated lower circumferential wall of the combustion chamber. 4. The primary air is entered through perforated wall located above the fuel rest plate, not through conventional grate at bottom so that, deposited ash on fuel rest plate cannot be able to block the air passage for primary air entry. 5. Ash removal is very easy, just by opening of holding clip of fuel rest plate. 6. Sliding cover plate of fuel feed opening prevents entry of outside cold air to inside of combustion chamber.

Environmental aspects

Cleaner production, energy efficiency

Legal protection

Patent will be applied soon

Technical specifications

Cross sectional area of combustion chamber = 314 sq.cm; cross sectional area of solid fuel rest plate = 346.2 sq.cm; cross sectional area of larger diameter portion of stove = 880.9 sq.cm.

Transfer terms

Consultancy, joint venture, technology licensing, research partnerships

Contact:

Subhra Datta , Mohanta Para, Lane opp. to Senior Citizens Park.
P.O: Dist. Jalpaiguri 735101 West Bengal, India.
Tel: +91-9474390725
E-mail: subhradatta611@gmail.com

Bricks machine

Description

We are offering our client an excellent quality range of Bricks Machine. These Bricks Machine are made from very high-quality raw material which ensures high durability at its user end. These Bricks Machine are in high demand in the market. Different sizes and designs are easily available in the market. Our Bricks Machine are available at industrial leading prices.

Legal protection

Trade mark

Transfer terms

Equipment supply

Contact:

Development Alternatives
29, Ghitorni, M.G. Road, Near Ghitorni Metro Station,
New Delhi 110030, India
Tel: 91-9555974338
E-mail: nmkhan@taramachines.com

Sensor for detecting nitrogen dioxide gas

Description

A novel nitrogen-dioxide gas detecting film has been developed. The detecting film is based on light-emitting conjugated polymer poly [2-methoxy-5-(3′,7′-dimethyloctyloxy)-1,4-phenylenevinylene] (MDMO-PPV). It has been demonstrated for the first time that a thin film of MDMO-PPV deposited on glass substrate or filter paper can be used to sense NO2 gas by just change in color at room temperature. It has been observed that the bright orange fluorescence of MDMO-PPV is quenched to yellow in color in the presence of NO2 gas above 150 ppm level in few seconds. The quenching time is proportional to the concentration of the NO2 gas.

Area of application

The technology is useful for monitoring nitrogen dioxide in: (1) factories, (2) environmental monitoring, (3) medical applications

Advantages

1. Easy detection procedure in the form of color code in few minutes above 150 ppm. 2. A sensor based on conjugate polymer on various substrates such as glass, plastic or paper. 3. No change in color of the sensor is observed on exposer to any other gases and chemical vapors like LPG, ammonia gas, hydrogen peroxide and alcohols. 4. Process is very cheap and hence can be used as disposable strips.

Environmental aspects

Security purpose

Development status

Laboratory model

Legal protection

Patent

Technical specifications

A conjugate polymer polyp[2-methoxy-5-(3′,7′-dimethyloctyloxy) -1, 4-phenylene-vinylene] (MDMO-PPV)-based NO2 gas sensor film.

Transfer terms

Consultancy, technical services, technology licensing, research partnerships

Contact:

Amity University, Sector-125, Noida 201303
Distt Gautam Buddha Nagar, India
Tel: 91-0120-4392815
Fax: 91-0120-4-2431870
E-mail: registrar@amity.edu

Technology Offers

INDIA

Wire positioning system for orthopaedic implant/trauma surgeries

Description

In orthopaedic traumatic surgeries, first guide wire has to be introduced over which the implant is finally positioned. This is currently done with the help of C-arm imaging and then inserting the guide wire in the bone tissue by the surgeon with a free-hand technique, by trial-and-error method. This method may be time consuming as the position of the guide wire is checked in both the planes and if not accurate, the wire is removed and re-introduced. This makes the process more time consuming and accuracy may not be always obtained. Our innovative guide wire positioning system consists of jigs (different jigs for different parts of the body such as hip, knee, wrist and so on) and software, which projects the future position of the guide wire.

Area of application

Orthopaedic implant/trauma surgery

Advantages

Less consumption of pre-surgery time with increased accuracy; allows managing the version, angle and entry point all at the a time; accompanying software allows accurate positioning of the guide wire by making the process more visual

Development status

Commercial prototype

Legal protection

Patent

Transfer terms

Technology licensing

Contact:

Entrepreneurship Development Center
Venture Center 100, NCL Innovation Park, Pashan Road
Pune 411007
India
Tel: 91-20-64011024
E-mail: tremap@venturecenter.co.in

IRAN

New designs for woodworking furniture

Description

This idea is use of wood mosaic based on the 4 kinds: (1) puzzle, (2) parquet, (3) brick and (4) covered (3 mm covering shackled) in two formats of level and salient. In the production of photo/photographs frames and clocks and so on, in the different kinds such as painting tableau frames and mosaic tableaus and inlay & inlaid and carpets panel frames rug of a picture and frames outside non-artistic products, ornamental and handicrafts and cultural & tourism heritage and use of walnut oil or sweet and bitter peanut as the color on the frame. Of course before the oil should be cleaning the frame by compressor.

Area of application

New designs have uses in woodworking furniture.

Transfer terms

Joint venture, technology licensing, research partnerships, assignment – investment

Contact:

Molavi BLVD, Shahid Kazem, Nasiri Alley, 1st Northern Floor, No 13
Semnan
Islamic Republic of Iran
35196-54891
Tel: 00982313332494
E-mail: keyvanaghvami@gmail.com

Ecodesigned spherical for latex handling

Description

Introduction of Natural Rubber Latex Industry, Sri Lanka is the seventh largest "Natural Rubber" (NR) producer in the World Natural Rubber Processing and Manufacturing Industry and it plays an especially major role in local and global economy. Further Natural Rubber Processing and Manufacturing Industries in the world have a huge economic impact on rural poor livelihood. In this industry, the main Raw Material used is "Natural Rubber Field Latex", which tapped from the Rubber Trees and it is processed in two forms named as: (a) liquid form and (b) dry form which will be selected in accordance with the Final Product Manufactures Requirements and passes through "Many Collection, Transferring, Transport, Storing and Handling" processes.

Area of application

Rubber processing and manufacturing industry

Advantages

It is a national and global need to develop a new technology, which can help natural rubber latex production processes on minimization of their wastages, improve their productivity and prevent adverse effects to environment. To overcome above shortcomings, we should think of new ways such as modifying equipment where necessary and improving processing techniques and controls. This led me in invention of new technology of single transfer- multi purpose- ecodesigned spherical for natural rubber latex industry, having following techno-economic feasibilities with sustainability.

Environmental aspects

Cleaner production, waste utilization, energy efficiency

Development status

Commercial prototype

Legal protection

Patent

Transfer terms

Technology licensing, Turnkey

Contact:

378/2F, Umagiliya Place, Nungamugoda,
Kelaniya
Sri Lanka
0094
Tel: +94714913737
E-mail: tsunilgomes@gmail.com

SRI LANKA

Technology Requests

BANGLADESH

Proper utilization of CO2 from gas fields

Description
We need epc contractor and also investment to utilize properly a silent derivative from the oil and gas field (4% derivative), assumed a remarkable printing ink will be possible to produce from this wastage and also indirectly help to make a green environment.

Area of application
Environment

Studies available
Environmental Impact Studies (EIA/EIS)

Project type
Start-up

Contact:
Seek Investor
Mirpur, Dhaka, Bangladesh
1216
Tel: 008801710962792
E-mail: seekinvestor2007@yahoo.com

INDIA

Full cereal and health bar extrusion line

Description
We are a company that is looking at setting up an entire cereal flakes extrusion line. At the next stage, we will be setting up the same for health bars.

Area of application
Food-processing equipment

Project type
Start-up

Contact:
Kottaram Agro Foods
No. 9 &10, 3'rd Cross, Muneshwara Block, Harlugatte village, Kudlu Gate
Bangalore
India
560068
Tel: 00919686202763
E-mail: support@kottaram.co.in

Disposable/AD syringes

Description
We are looking for technology transfer, critical machinery supply and detailed engineering for setting up of a disposable/auto disable syringe (ADS) facility in India.

Area of application
Medical industry

Studies available
Feasibility report, approvals, Environmental Impact Studies (EIA/EIS)

Project type
Start-up

Contact:
Mr. Narender Chowdhary
J.P.Nagar
Bangalore
India
Tel: 00919916800110
E-mail: narender.chowdhary@yahoo.co.in

Medical disposables

Description
Medical disposables (surgical dressing)

Area of application
Health and medical

Project type
Expansion/modernisation

Contact:
Drug Authority
Near Mandi Samitte, Moradabad Road, Mannagar, Kanth
Moradabad 244501
India
Tel: 05912220061
Fax: 05912220061
E-mail: shreejeekanth@gmail.com

Hydrogen fuel cell technology

Description
We are looking for hydrogen fuel cell technology joint venture in India. Hydrogen-based fuel cells is an upcoming area in India, and hence we are interested in technology offers for hydrogen fuel cells.

Area of application
Car manufacturer, Car engine manufacturer

Project type
New idea

Assistance sought from potential partner
Joint venture

Additional information
New technology for Indian automobile sector having future prospect

Contact:
C.G.Motors
Plot -No-PAPR-73,Rabale MIDC, Rabale, Navi Mumbai, Maharashtra, India
400701
Tel: 00912227642073
Fax: 00912227642073
E-mail: dinesh.khandagale@gmail.com

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(Free access at www.techmonitor.net)

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- ❑ VATIS Update (4 issues/year)
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❑ Proceedings of the Consultative Meeting on Technology Management Education and Training for Developing Countries, 1997	800.00	40.00

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